BEFORE THE
ENERGY FACILITY SITING COUNCIL
OF THE STATE OF OREGON

In the Matter of Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate	))))	FINAL ORDER

March 27, 2026

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ABBREVIATIONS AND ACRONYMS

AADT	Average Annual Daily Traffic
AGL	Above ground level
APLIC	Avian Powerline Interaction Committee
ASC	Application for Site Certificate
AVA	American Viticulture Area
BESS	Battery Energy Storage system
bgs	Below ground surface
BIGL bn, LLC	BIGL
Biglow Canyon Wind Farm	facility
BLM	Bureau of Land Management
BMPs	Best management practices
BPA	Bonneville Power Administration
Certificate holder	Portland General Electric Company
Council or EFSC	Energy Facility Siting Council
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
CWPP	Community Wildfire Protection Plan
dBA	A-weighted decibels
DC	direct current
DOGAMI	Oregon Department of Geology and Mineral Industries
DSL	Oregon Department of State Lands
EFSC or Council	Energy Facility Siting Council
EFU	Exclusive Farm Use
EOP	Emergency Operations Response
ESCP	Erosion Sediment Control Plan
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
Final Order on RFA1	Final Order on Request for Amendment 1 of the Site Certificate
Final Order on RFA2	Final Order on Request for Amendment 2 of the Site Certificate
Final Order on RFA3	Final Order on Request for Amendment 3 of the Site Certificate
GIS	Geographic Information System
GSU	generator step-up
GW	gigawatt
HB	House Bill
HFRZ	High Fire Risk Zones
HMA	Habitat Mitigation Area
HVF	High value farmland
HVRA	highly valued resources and assets
IDP	Inadvertent Discovery Plan
IEEE	Institute of Electrical and Electronics Engineers
KOP	Key Observation Point

ABBREVIATIONS AND ACRONYMS

kV	kilovolt
kV/m	Kilovolt per meter
LCIS	Legislative Committee on Indian Services
LGIA	large generator interconnection agreement
LiDAR	light detection and ranging
Li-ion	Lithium ion
LOS	Level of Service
MCEDD	Mid-Columbia Economic Development District
mG	Magnetic field
MW	Megawatts
MWh	Megawatt hour
NH	Natural Hazards
NHD	National Hydrography Dataset
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSR	noise-sensitive receptor
NWI	National Wetlands Inventory
O&M	operations and maintenance
OAR	Oregon Administrative Rules
OARRA	Online Archaeological Records Remote Access
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODOE or Department	Oregon Department of Energy
ODOT	Oregon Department of Transportation
ONHT	Oregon National Historic Trail
OPUC	Oregon Public Utilities Commission
ORBIC	Oregon Biodiversity Information Center
ORS	Oregon Revised Statutes
OSHD-1	Oregon Seismic Hazard Database release 1
OWRD	Oregon Water Resources Department
PCS	Power Conversion Station
PGE	Portland General Electric Company
PILOT	Payment in Lieu of Property Taxes
PWCA	Priority Wildlife Connectivity Area
RACE	Remove, Alarm, Confine and Extinguish or Evacuate
RAIs	Request for Additional Information
RFA	Request for Amendment
RFA4	Request for Amendment 4

ABBREVIATIONS AND ACRONYMS

SCADA	Supervisory Control and Data Acquisition System
SCSWCD	Sherman County Soil and Water Conservation District
SCZO	Sherman County Zoning Ordinance
SGHAT	Solar Glare Hazard Analysis Tool
SHPO	State Historic Preservation Office
SLIDO	Oregon Statewide Landslide Database
SPCC	Spill Prevention Countermeasure and Control
SSURGO	Soil Survey Geographic
STATSGO	State Soil Geographic Database
T&E	Threatened and Endangered
USGS	U.S. Geological Survey
WEG	Wind erodibility group
WMP	Wildfire Mitigation Plan
ZVI	Zone of visual influence

I. INTRODUCTION

On December 10, 2025, Portland General Electric Company (certificate holder), filed Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm (Request or RFA4).

As described below, the Biglow Canyon Wind Farm (facility) is an operational wind energy facility consisting of 217 wind turbines with a combined peak generating capacity of 450 megawatts (MW) and related or supporting facilities located within an approximately 25,000-acre (39 sq. mile) site in Sherman County.

As described in Section I.D. of this Order, in the Request the certificate holder seeks authorization from the Energy Facility Siting Council (Council) to expand the facility to include a 125 MW solar photovoltaic power generation facility, a 125 MW battery energy storage system, and other related or supporting facilities within a 1,924-acre Solar Micrositing Area within the approved site boundary. The certificate holder would own and operate the solar components as a part of the existing facility with the support of a third-party developer, BIGL bn, LLC, which is in turn, a subsidiary of BrightNight, LLC.

Under OAR 345-027-0375, to issue an amended site certificate, the Council must determine that the preponderance of evidence on the record supports the conclusion that the proposed facility, as amended, complies with all applicable laws and Council standards. Section II.A provides additional information regarding the Council's scope of review. An evaluation of compliance with these standards is provided in Section III.

In accordance with OAR 345-027-0371, the Council issues this Final Order approving the Request, subject to the existing, amended and new site certificate conditions set forth in this Order.

I.A. SITE CERTIFICATE PROCEDURAL HISTORY

On June 30, 2006, the Council issued a Site Certificate for the Biglow Canyon Wind Farm authorizing Orion Sherman County Wind Farm LLC to construct and operate a wind energy facility in Sherman County. The site certificate has since been amended three times.

On November 3, 2006, the Council issued its Final Order on Request for Amendment 1 of the Site Certificate (Final Order on RFA1), approving a transfer of the Site Certificate from the original certificate holder to Portland General Electric Company and issuing the First Amended Site Certificate.

On May 10, 2007, the Council issued its Final Order on Request for Amendment 2 of the Site Certificate (Final Order on RFA2), authorizing the construction of new access road and collector line segments, increasing the area of authorized temporary disturbance during construction, modifying one micrositing corridor, and revising several site certificate conditions in the Second Amended Site Certificate.

On October 31, 2008, the Council issued its Final Order on Request for Amendment 3 of the Site Certificate (Final Order on RFA3), authorizing the expansion of the site to accommodate new access roads, collector lines, temporary crane paths, and extended turbine corridors; authorizing expansion of the facility's Operations & Maintenance (O&M) building; and to remove or amend several conditions in the Third Amended Site Certificate.

In addition to amendments of the site certificate, the certificate holder has submitted seven Change Requests and Amendment Determination Requests for modifications of the facility, such as realignment of turbine corridors, access roads, and collector lines, and expansions of the facility's O&M building. The Department reviewed each of the requests and determined that amendment proceedings were not required.[1]

I.B. EXISTING OPERATIONAL FACILITY DESCRIPTION

The Third Amended Site Certificate authorizes the construction and operation of a wind energy facility and related or supporting facilities at a site in Sherman County. A description of the existing facility is provided below.

I.B.1. Energy Facility

The wind facility consists of 217 wind turbines (76 Vestas V82 1.65 MW and 141 Siemens 2.3 MWs) with a combined nominal nameplate generating capacity of up to 450 megawatts (MW). The Vestas V82 turbines are mounted on tubular steel towers with a height of 262 feet at the hub and an overall height of 397 feet including the turbines blades. The Siemens 2.3 MW turbines are mounted on tubular steel towers with a height of 262 feet at the hub and an overall height of 413 feet including the turbine blades. The wind turbines are located on private land that the certificate holder has leased from the participating landowners.

Construction of the facility began on April 1, 2007, and was completed on August 20, 2010. Construction of the final phase was completed on August 20, 2010.[2]

I.B.2. Related or Supporting Facilities

As related or supporting facilities to the wind energy facility, the site certificate authorizes the construction and operation of the facility components described in Table1, below:

[1] Change Request Determination 1, June 4, 2007; Change Request Determination 2, June 27, 2007; Change Request Determination 3, July 21, 2008; Change Request Determination 4, July 21, 2008; Change Request Determination 5, March 12, 2009; Change Request Determination 6, January 12, 2017; Amendment Determination Request 7, March 14, 2019.

[2] BCWOPSDoc139 BCW 6th Semi-Annual Report

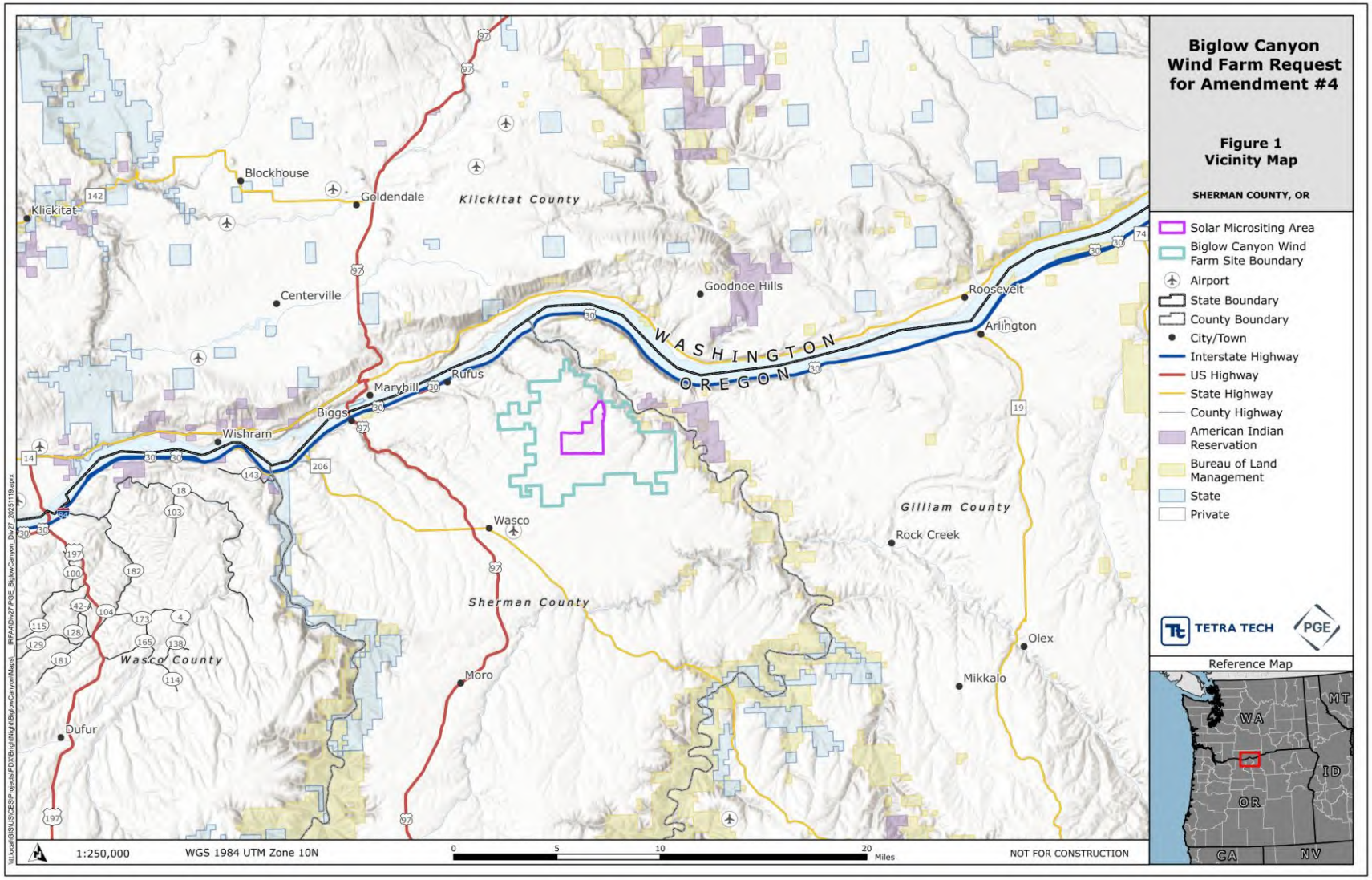
Table 1: As-built Facility Component Summary

Component and Design Standard	No.	Unit
Site Boundary		
Site Area	25,000	Acres
Wind Energy Facility		
Wind Turbines		
Vestas V82 1.65 MW Turbines (Phase I)	76	Turbines
Hub Height	262.5	Feet
Rotor Diameter	269	Feet
Siemens 2.3 MW Turbines (Phase II/III)	141	Turbines
Hub Height	262.5	Feet
Rotor Diameter	305	Feet
Related or Supporting Facility Components		
34.5 kV Collection System		
Collector line length, underground	75	miles
Collector line length, overhead (OH)	5	miles
Collection system support pole height	23 to 28	Feet
Collector Substations		
Substations	1	each
Site size	6	acres
Meteorological Towers		
Towers	4	Each
Max. Height	279	Feet
O&M Building		
Number of Buildings	3	each
Site size	5	acres
Appurtenances	On-site well, septic system, SCADA System	
Facility Roads (Gravel)		
Length	41.7	miles
Width	16	feet
Acronyms: dBA = A-weighted decibels; HVAC = heating, ventilation and air conditioning; kV = kilovolt; OH = overhead; O&M = operations and maintenance; SCADA = supervisory, control and data acquisition		

I.C. APPROVED SITE DESCRIPTION

As shown in Figure 1, below, the approved site boundary encompasses approximately 25,000 acres of land in Sherman County, Oregon. The site is located approximately 2.5 miles northeast of the City of Wasco in Townships 1 and 2 North, Ranges 17 and 18 East, Willamette Meridian.

Figure 1: Approved Site Boundary and Vicinity



I.D. REQUESTED AMENDMENT

In RFA4, the certificate holder seeks authorization to construct and operate a 125 MW solar photovoltaic power generation facility; a battery energy storage system (BESS) with up to 500 megawatt-hours (MWh) of discharge capacity; and other related or supporting facilities. The dimensions and specifications for the facility components proposed in RFA4 are summarized in Table 2, below.

Table 2: Solar Facility Component Summary

Component and Design Standard	No.	Unit
Site Boundary		
Solar Micrositing Area[1]	1,924	acres
Solar photovoltaic power generation facility		
Solar Photovoltaic Arrays		
Max. Permanent footprint[1]	1,445	acres
Min. setback from turbines	520	feet
Maximum nominal generating capacity	125	MW
Modules (590w module with monocrystalline solar cells, antireflective coating, metal frame, and factory installed wire connectors)		
Approx. number of modules	264,836	modules
Approx. module dimensions (W x L)	45x90	inches
Tracking System		
Mounting height	5	feet AGL
Avg. Height at full tilt	7.5 to 10	feet AGL
Max. Height at full tilt	15	feet AGL
Steel Posts (hollow, screw, or pile-type)		
Approx. total number	32,621	posts
Avg. Installation Depth	7 to 15	Feet BGL
Power Conversion Stations (Inverter with integrated Step-Up Transformer)		
Approx. total number	33	each
Noise level	92	dBA (Broadband)
Transformer oil-containing capacity (each)	700	gallons
Battery Energy Storage System (Lithium-ion)		
Discharge Capacity	125	MW
Total Storage Capacity	500	MWh
BESS Yard Site Size	5	acres
Battery Containers (of Battery Containers on foundations with integrated inverters, HVAC and fire suppression systems, SCADA		
Max. Number Enclosures / Inverters	153	Units
Approx. Dimensions (HxWxL)	10 x 5.5 x 29	Feet
Noise level during discharge	84	dBA (Broadband)
BESS Transformers	39	each

Table 2: Solar Facility Component Summary

Component and Design Standard	No.	Unit
Transformer Height	10	feet
Transformer Noise level	80	dBA (Broadband)
Transformer oil-containing capacity	700	gallons
Related or Supporting Facility Components		
34.5 kV Collection System		
Collector line length, underground	52	miles
Temporary Impact Corridor	50	feet
Collector Substation		
Includes GSU transformers, switches, breakers, surge arrestors, metering equipment, grounding, and associated control wiring. Certain equipment is enclosed in a control building.		
Site size	4.2	acres
Generator Step-Up Transformers	1	each
Transformer oil-containing capacity	10,000-15,000	gallons
Transformer noise level	106	dBA
Control building dimensions	40x15	Feet
Height of structures	8 to 25	feet
230 kV Transmission Line		
Length	600	feet
Corridor Width (contains all disturbance)	150	Feet
Corridor Area	2	acres
Steep Monopole Support Structures	4	each
Height of Support Poles	80	feet
O&M Facility		
Steel building/prefabricated office structure with adjacent storage enclosures and parking areas, well, septic system.		
Building Dimensions	60 X 12	foot
Site size	3	Acres
400 ft2 Storage Containers	3	Each
Internal Access Roads		
Length (graveled)	10.5	miles
Width	16-20	Feet
Vegetation Management Buffer (both sides)	10	feet
Perimeter Fence		
Total Length	92,400	Feet
Height	8	Feet
Access gates	5	each
Vegetation Management Buffer	20	Feet
Temporary Construction Areas		

Table 2: Solar Facility Component Summary

Component and Design Standard	No.	Unit
Site Size	8.7	Acres
1,000-gal aboveground fuel storage tanks	3	Each

Acronyms: dBA = A-weighted decibels; HVAC = heating, ventilation and air conditioning; kV = kilovolt; OH = overhead; O&M = operations and maintenance; SCADA = supervisory, control and data acquisition

Sources: RFA4, Table 1.

Notes:

1. Solar facility components would permanently occupy up to 1,445 acres within the 1,924-acre Solar Micrositing Area. Area within the perimeter fenceline of the solar facility is considered a permanent impact under the Fish and Wildlife Habitat standard; however, impacts within the perimeter fenceline to soils, vegetation and noxious weeds are not considered permanent under the Soil Protection and Land Use standards and must be minimized and mitigated, as discussed in applicable sections in this order.

The certificate holder also proposes to amend existing Site Certificate Conditions as proposed in Attachment 1 to RFA4. New conditions were proposed where needed to demonstrate that the new facility components would comply with Council standards.[3] Changes to specific conditions related to specific standards are discussed in Section III., *Evaluation of Council Standards*.

I.D.1. Proposed Solar Photovoltaic Power Generation Facilities

As described above, in RFA4, the certificate holder proposes to add a solar photovoltaic power generation facility to the existing facility. The proposed solar components would have a nameplate generating capacity of up to 125 MW. The addition of the proposed solar and battery components would increase the peak generating capacity of the facility, as a whole, to 575 MW.[4]

Solar photovoltaic power generation facilities typically consist of rows of photovoltaic modules mounted on a racking system that is either fixed in place or able to track the sun on one or more axes. The racking system is typically supported by steel posts that are either driven directly into the ground or installed into pre-drilled holes. The low voltage DC output of the photovoltaic modules is collected with a cabling system and transmitted to inverter and transformer units which convert the output of several rows of modules to 35-kV AC power that can be collected via the facility's electrical collector system.

The ground below and surrounding the solar arrays would mostly be vegetated, with gravel where needed for maintenance and access roads or where gravel already exists.[5]

[3] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.0, 6.0.

[4] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.0.

[5] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.

Individual components proposed in RFA4 are discussed in more detail in the sections that follow.

Modules

Solar modules generate electricity by converting sunlight into direct current (DC) electrical energy through the photovoltaic effect. Modules typically consist of mono or poly-crystalline solar cells, antireflective coating, non-specular, galvanized steel racks, and factory installed wire connectors.[6]

The modules would be connected in series to form strings which are then collected via combiners, cables, and switchboards. The type and number of modules required will be determined at final facility design based on the technology available at that time. For the purposes of the analysis in RFA4, the certificate holder assumed use of N-type monocrystalline solar cells.[7]

Tracking System

As proposed, strings of modules would be mounted on single-axis tracker systems to optimize electricity production by rotating the solar modules to follow the path of the sun throughout the day. Each set of modules is expected to be mounted approximately 5 feet off the ground on a single-axis tracker that rotates 60 degrees to the east and west. At maximum tilt, the top edge of the modules is expected to be 7.5 to 10 feet above ground level with a maximum of 15 feet where topography curves under a row. The tracker system and associated posts will be designed to withstand wind, snow, and seismic loads anticipated at the site.[8]

Posts and Foundations

Each tracker row will be supported by multiple steel posts. Hollow steel sections, screw piles, or pile-type posts may be used. Posts will typically be installed 7 to 15 feet below the ground surface and extend approximately 5 feet above grade. Exterior posts at the end of tracker rows are typically installed to greater depth to withstand inclement weather including high wind conditions. In some soil conditions, concrete grouting may be used as backfill, as required. The total number of posts and foundation installation methods required will be determined during detailed design of the tracker system and future geotechnical investigations. For the purposes of the analysis in RFA4, the certificate holder assumed that all the posts may require pre-drilling and/or concrete grouting as backfill.[9]

[6] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.1; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 2.0.

[7] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.1.

[8] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.2.

[9] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.3.

Cabling

Cables will be used to collect and aggregate the DC output of multiple tracker rows for transmission to the inverter/inverter step-up transformer units described below. Cabling may be installed underground along tracker rows and aggregated using combiner boxes or installed aboveground in aluminum trays or using harnessing if a trunk bus system is used for aggregation. Either system requires a similar amount of cabling. The cabling system will be selected at final facility design, but for the purposes of analysis, the certificate holder assumed that a centralized trunk bus system will be used. [10]

Power Conversion Stations (PCS)

Integrated inverter and step-up transformer systems called Power Conversion Stations (PCS), or similar systems, would be installed throughout the solar arrays to convert the low-voltage DC output of the modules to 34.5kV AC power that can be transmitted via the electrical collector system. Each transformer would contain approximately 700 gallons of mineral oil. Each PCS would be installed on a concrete pad or pile-supported foundation. [11] The inverter specifications would comply with the applicable requirements and standards of the National Electric Code and Institute of Electrical and Electronics Engineers standards.[12]

I.D.2. Proposed Battery Energy Storage Systems

The certificate holder proposes to construct and operate a 125 MW alternating current (AC)-coupled BESS with up to 500 MWh of storage capacity within the proposed Solar Micrositing Area.[13]

The BESS would consist of modular enclosures that hold lithium-ion batteries, battery management systems, integrated inverters, and fire prevention systems. Cooling units would be placed either on top of or along the side of the enclosures may include separate chiller plants. Each enclosure would be placed on a concrete pad or pile-supported foundation.[14] The enclosures would be manufactured, assembled, and inspected off-site prior to installation. Each enclosure would be installed on a concrete pad or pile foundation. [15]

[10] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.4.

[11] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.5, 4.1.2.6; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 2.1, Table G-2; BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Attachment X-1.

[12] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.6.

[13] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.0.

[14] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3; 4.1.3.3.

[15] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.3; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 2.1, Table G-2; BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Attachment X-1.

As proposed, the BESS will use lithium-ion (Li-ion) batteries. Li-ion batteries are a type of rechargeable battery where lithium ions, suspended in a gel or liquid electrolyte, move from negative to positive electrodes and back when recharging. A variety of chemistries fall under the "Li-ion" term, each with varying performance, cost, and safety characteristics. The certificate holder will select the specific battery chemistry at final facility design.[16]

A Li-ion battery typically consists of a modular unit containing multiple cells, which are hermetically sealed pouches that serve as primary containment for the electrolyte solution. Each module is generally about the size of a desktop computer and serves as leak-proof secondary containment for the electrolyte. Modules are placed in anchored racks and wired into strings, with each enclosure containing multiple battery strings. Each enclosure may contain up to 10,000 cells.

Lithium-ion batteries and electrolyte are typically considered to be hazardous materials due to their flammability and potential for chemical reaction. Electrolyte can only escape (as vapor) in the unlikely case that a battery module fails, and while the enclosure itself provides additional containment in the event of a module failure, venting may be required in the event of a fire or other emergency. Due to the risks, the U.S. Department of Transportation and U.S. Environmental Protection Agency also require special handling when transporting or disposing of lithium-ion batteries.[17] Specific issues related to the fire-risk posed by lithium-ion batteries are discussed in Section III.N, *Wildfire Prevention and Risk Mitigation*. Other issues related to potential hazards associated with transportation, use, and disposal of lithium-ion batteries are discussed in Section III.D., *Soil Protection*; III.M., *Public Services*; and Section III.O, Waste Minimization.

Initially, the BESS would include up to 153 modular enclosures; however, because battery performance degrades over time the certificate holder has stated that additional batteries and associated equipment would be periodically augmented as needed to maintain the design capacity of the system.[18] The certificate holder estimates that approximately 183 enclosures would be installed at the site over the life of the facility. Any augmentation activities would be subject to the requirements of OAR chapter 345, division 27.

BESS Transformers

The BESS will include up to 39 transformers to increase the output voltage from the inverters integrated into the BESS enclosures (typically 660 volts) to the substation feed voltage (34.5-kilovolt [kV] AC). The transformers are anticipated to be approximately 8 to 10 feet in height and would be installed on a concrete pad or pile-supported foundation.[19] Each transformer

[16] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.3.

[17] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.3; 4.1.4.1; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 2.2.

[18] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.3.

[19] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.3.

would contain approximately 700 gallons of mineral oil for cooling. Oils needed for maintenance will be delivered by a licensed maintenance contractor on an as-needed basis, and no substantial quantities will be stored on-site.[20]

BESS Yard

The BESS facilities would be located in a fenced, graveled yard, adjacent to the proposed collector substation discussed below. The total area expected to be occupied by the BESS yard is approximately 5 acres.[21]

I.D.3. Other Proposed Related or Supporting Facilities

34.5 kV Electrical Collection System

The output of the ISU and BESS transformers will be aggregated and transmitted to the collector substations via underground 34.5-kV collector lines. In the maximum buildout design scenario proposed in RFA4, approximately 52 miles of collector line would be installed within the solar array fence lines. The collector lines would be buried to a minimum of 3 feet at lateral depth, with junction splice boxes positioned intermittently along the lines for maintenance access.[22]

Collector Substation

A new collector substation would be constructed at the proposed solar array areas to aggregate and convert the 34.5 kV power transmitted through the electrical collection system to 230-kV power that can be transmitted to the grid from the existing Biglow Canyon Substation. [23]

The substation would include a generator step-up (GSU) transformer and other electrical equipment including, but not limited to switches, breakers, surge arrests, metering equipment, grounding, and associated control wiring. Certain equipment, including breakers and transformer equipment, would be enclosed in a control building. [24] The GSU transformers are expected to be a ground-mounted unit constructed on a concrete pad. The transformer would contain between 10,000 and 15,000 gallons of mineral or seed oil for cooling and insulation.[25] To minimize the potential for spills, the GSU transformer would be equipped with a secondary

[20] BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 2.2.
[21] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.0, 4.1.3.3.
[22] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.6, 4.1.3.1.
[23] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.2.6.
[24] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.2., 4.1.4.1.
[25] Consistent with federal regulations, the oils used in transformers do not contain polychlorinated biphenyls or compounds listed as extremely hazardous by the U.S. Environmental Protection Agency.

containment trap sized to contain the amount of oil inside the transformer plus an additional volume for deluge water and required freeboard.[26]

230-kV Overhead Transmission Line

The facility would include an approximately 1,900-foot long 230 kV overhead transmission line connecting the Collector Substation to the existing Biglow Canyon Substation. The transmission line would be supported by up to three 80-foot steel monopole support structures ranging from 80 to 160 feet tall.[27]

O&M Building

A new O&M facility would be constructed in the proposed solar area. The O&M facility would include a steel building or prefabricated office structure with facilities for staff use; enclosures for storing spare parts and maintenance equipment; and space for parking service staging zone. A vegetation-free, noncombustible space, or gravel surface will be maintained around the O&M buildings. The O&M facility would have a septic system, and a septic system permit would be obtained from the Sherman County Public Health Department.[28] Small quantities of lubricants, degreasers, herbicides, or other chemicals may be stored at the O&M facilities.[29] In addition, up to approximately 4,080 spare modules may be stored at the O&M facilities for replacement over the life of the proposed solar components.[30]

Communications and SCADA System

Controls for the facility components proposed in RFA4 would be integrated into the facility's existing Supervisory Control and Data Acquisition (SCADA) System which allows facility operating parameters, power output, and other variables such as meteorological conditions to be constantly monitored from the facility control rooms and remote locations.[31]

Internal Access Roads

Approximately 10.5 miles of new access roads would be constructed within the proposed Solar Micrositing Area to provide access to the facility components proposed in RFA4. In accordance with Oregon Fire Code Section 503, roads needed for emergency access would be approximately 20 feet wide and designed to meet load requirements for all equipment and

[26] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.4.1.
[27] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.1; BCWAMD4Doc21-20 RFA Exhibit AA EMF 2025-12-10, Section 2.1.; BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28
[28] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.4.
[29] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.4.1.
[30] BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 2.2.
[31] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.5.

emergency access needs.[32] Other roads would be approximately 16 feet wide. All roads would have a 10-foot buffer maintained with low-growing, fire resistant vegetation on either side.

Perimeter Fencing, and Gates

Each solar array, with any collocated related or supporting facility components, would be enclosed by seven-foot-tall chain-link perimeter fencing with one foot of razor or barbed wire at the top. Alternatively, wire mesh or similar perimeter fencing up to 8 feet in height may be used. Fences would be constructed and grounded in accordance with NESC Rule 110. Vehicle access to the facility would be provided by lockable vehicle gates. Additional gates may be installed for emergency exit or removal of wildlife.[33]

Temporary Construction Areas

An approximately 8.7 acre, temporary construction area would be used to store supplies and equipment and facilitate the delivery and assembly of materials and equipment during construction. Additional temporary construction areas may be utilized within the Solar Micrositing Area. The areas would consist of a crushed gravel surface that will be removed following construction and revegetated, crushed gravel surface that will remain following construction because that was the pre-existing surface condition, or vegetation that is left in place for which the need to revegetate would be evaluated following construction.[34]

As discussed in Section III.D., nonreportable quantities of herbicides, insecticides, paint, cleaners, solvents, or other chemicals may be used and stored in the temporary construction areas. In addition, up to three aboveground 1,000-gallon fuel tanks may be installed in an area within the temporary construction area that provides secondary containment.[35] The certificate holder represents that concrete for construction of foundations would come directly from licensed suppliers and there would not be an on-site batch plant installed at the temporary construction area.[36]

I.D.4. Proposed Solar Micrositing Area

The facility components proposed in RFA4 would be located within a proposed 1,924-acre Solar Micrositing Area.[37] The Solar Micrositing Area is located approximately 4.8 miles northeast of the City of Wasco. The Council permits final siting flexibility within a micrositing corridor when the certificate holder demonstrates that the entire micrositing corridor has been evaluated and

[32] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.6, 4.1.4.2.
[33] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.6.
[34] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.7
[35] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.4.1.
[36] BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 2.0.
[37] A micrositing corridor is "a continuous area of land within which construction of facility components may occur, subject to site certificate conditions." OAR 345-001-0010(21).

that the requirements of all applicable standards would be satisfied regardless of the location of facility components within the corridor. For RFA4, the certificate holder conducted desktop and field surveys for the proposed Solar Micrositing Area, which are discussed further in the applicable sections of this order. The existing Biglow Canyon Substation, which will be the point of interconnection for the facility components proposed in RFA4 with the regional transmission grid, is located within the proposed Solar Micrositing Area.[38]

II. COUNCIL REVIEW PROCESS FOR AMENDMENTS

With some exceptions, under Oregon Administrative Rule (OAR) 345-027-0350(4), an amendment to a site certificate is required to design, construct, or operate a facility in a manner different from that described in the site certificate, if the proposed change (1) Could result in a significant adverse impact that the Council has not addressed in an earlier order and the impact affects a resource or interest protected by an applicable law or Council standard; (2) Could impair the certificate holder's ability to comply with a site certificate condition; or (3) Could require a new condition or a change to a condition in the site certificate.[39] The proposed addition of new area to the site, and the construction and operation of the facility components proposed in RFA4 could result in a significant adverse impact that the Council has not addressed in an earlier order and could require new conditions or changes to existing conditions in the site certificate.

II.A. SCOPE OF COUNCIL REVIEW: OAR 345-027-0375

(1) In making a decision to grant or deny issuance of an amended site certificate, the Council must apply the applicable laws and Council standards required under section (2) of this rule and in effect on the dates described in section (3) of this rule.

(2) To issue an amended site certificate, the Council must determine that the preponderance of evidence on the record supports the following conclusions:

(a) The facility as amended complies with all applicable laws and Council standards;

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(3) In making findings under section (2) of this rule, the Council must apply the applicable laws and Council standards in effect on the following dates, regardless of when the site certificate was previously approved or amended:

[38] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 1.2.

[39] See OAR 345-027-0350(1)-(3) for a list of other changes that require an amendment, including a transfer of ownership, application of later adopted laws, or construction deadline extension.

(a) For the applicable substantive criteria under the Council's land use standard, as described in OAR 345-022-0030, the date the request for amendment was submitted; and

(b) For all other applicable laws and Council standards, the date the Council issues its final order on the request for amendment.[40]

As described in more detail below, in RFA4, the certificate holder seeks authorization to construct and operate a new solar photovoltaic power generation facility, battery energy storage system, and other related or supporting facilities within the existing site.

Under OAR 345-027-0375(2)(a), to issue an amended site certificate the Council must determine that the preponderance of evidence on the record supports the conclusion that the facility, as amended, complies with all applicable laws and Council standards. Because the construction and operation of the new solar photovoltaic power generation facility and other related or supporting facilities would potentially impact all resources protected by Council standards, and because the certificate holder proposes to rely on the technical expertise of a third-party to construct and operate the facility components proposed in RFA4, the Council finds that all laws and Council standards applicable to an original site certificate application are applicable to the review of the facility components proposed in RFA4. This includes all the Council's general standards in OAR chapter 345, division 22, and for the proposed 600-foot 230-kV transmission line segment, Siting Standards for Transmission Lines under OAR 345-024-0090. Because there are no proposed changes to the existing Wind Power Generation Facility, the specific siting standards for wind facilities in OAR chapter 345, division 24 are not applicable to this review.

II.B. AMENDMENT PROCESS

The standard amendment review process, set forth in OAR 345-027-0360 through 345-027-0375, is the default review process and applies to the Council's review of a request for amendment proposing a change described in OAR 345-027-0350(2), (3), (4), or (5).[41] These steps are detailed in Section II.C., *Council Review Process for Amendments*, below.

II.B.1. Request for Amendment

On April 17, 2024, the certificate holder met with the Department for a pre-amendment conference. Pursuant to OAR 345-027-0360, following the pre-amendment conference the certificate holder submitted a written request to use the proposed Solar Micrositing Area boundary as the basis for the study area boundaries under OAR 345-001-0010(35) and property

[40] Permanent Administrative Order EFSC 5-2025, amend filed 10/24/2025, effective 10/24/2025.
[41] OAR 345-027-0351(2).

owner lists under OAR 345-027-0360(1)(f) for the proposed amendment. On May 2, 2024, the Department provided written concurrence authorizing the request.[42]

On April 21, 2025, the certificate holder submitted its preliminary Request for Amendment 4. The Department reviewed the pRFA4 to determine whether or not the request contained sufficient information for the Council to make findings.

On April 29, 2025, the Department issued Public Notice that pRFA4 had been received as required by OAR 345-027-0360(2).[43]

On April 30, 2025, the Department requested recommendations for Applicable Substantive Criteria from the Sherman County Court, as the Special Advisory Group for the facility appointed under ORS 469.480.[44]

On the same date, the Department also requested comments from the tribes identified by the Legislative Commission on Indian Services as potentially affected by the construction and operation of the facility components proposed in RFA4, including the Confederated Tribes of Warm Springs, Burns Paiute Tribe, and Confederated Tribes of the Umatilla Indian Reservation.[45]

The Department also requested comments on pRFA4 from the following reviewing agencies:

- Oregon Department of Agriculture
- Oregon Department of Aviation
- Oregon Department of Fish and Wildlife
- Oregon Department of Forestry
- Oregon Department of Geology and Mineral Industries
- Oregon Department of Land Conservation and Development
- Oregon Department of State Lands
- Oregon Public Utility Commission
- Oregon State Historic Preservation Office
- Oregon Department of Environmental Quality
- Oregon Water Resources Department
- City of Wasco
- Gilliam County[46]

[42] BCWAMD4Doc01-00 ODOE Concurrence on OAR 345-027-0360(3) Request 2024-05-02.

[43] BCWAMD4Doc08-00 pRFA Public Notice 2025-04-29

[44] BCWAMD4Doc13-00 pRFA SAG MEMO 2025-04-30

[45] BCWAMD4Doc09-00 pRFA CTWS Memo 2025-04-30, BCWAMD4Doc10-00 pRFA Burns Paiute Tribe Memo 2025-04-30, BCWAMD4Doc11-00 pRFA CTUIR Memo 2025-04-30.

[46] BCWAMD4Doc12-00 pRFA Reviewing Agency Notice 2025-04-30

Copies of all written reviewing agency comments on pRFA4 are included in Attachment B of this Order. Table 3, below, includes a summary of the agency comments and where in the order the comment is addressed, if applicable.

Table 3: Summary of Reviewing Agency Comments on pRFA4

Comment Date	Name/Title	Agency	Summary and Location in Order
5/2/2025	Daniel Hubner, Information Analyst	Oregon Department of Forestry (ODF)	Recommended certificate holder be familiar with and fulfill any & all relevant obligations related to fire prevention under ORS chapter 477. These requirements are discussed further in Section III.N., *Wildfire Prevention and Risk Mitigation*.
5/23/2025	Daniel Evans, Wetland Ecology Specialist	Oregon Department of State Lands (DSL)	Provides requirements for Wetland Delineation and Removal-Fill Permits. These requirements are discussed further in Section IV.B., *Removal-Fill.*
5/29/2025	Jason McClaughry, Eastern Oregon Regional Geologist	Oregon Department of Geology and Mineral Industries (DOGAMI)	As discussed in Section III.C., *Structural Standard,* DOGAMI recommended the preliminary geotechnical report included as Exhibit H, Attachment H-2 contains up-to-date references and data. Noted that seismic hazard model used was from 2018 and recommended updated 2023 version of the National Seismic Hazard Model.
5/29/2025	Georgia Macnab, Sherman County Planning Director	Sherman County Court	The County raised concerns about the potential visual impacts of the facility on non-participating landowners and nearby protected areas, potential for increased wildfire risk, potential impacts on soils, and loss of agricultural land. As discussed in Section III.B., *Organizational Expertise,* the County raised concerns about lack of maintenance at the existing wind facility and asked what actions or procedures would be enforced at the solar facility to prevent similar neglect. The County recommended the developer consult with the county Weed Master for this project. In development of a weed plan. As discussed in Section III.D., *Soil Protection,* this has been included as a

			requirement for finalization of the Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to this Order. The County recommended use of updated Comprehensive Plans for the Cities of Wasco, Rufus and Moro. This comment was addressed during the completeness review, see Section III.J., *Scenic Resources*. Recommended preliminary RFA underestimated demand on local fire protection services based on heightened risk of fire in County. Noted Sherman County process for declaration of Fire Season. See Section III.M., *Public Services* and Section III.N., *Wildfire Protection and Risk Mitigation,* for discussion of wildfire risk. Provided recommendations for Applicable Substantive Criteria. See Section III.E., *Land Use* for evaluation of these criteria.
5/30/2025	Jessica Wilkes, Deschutes Regional Habitat Biologist	Oregon Department of Fish and Wildlife (ODFW)	As discussed in Section III.H., *Fish and Wildlife Habitat,* ODFW*:* • Recommended laws and rules applicable to facility components proposed in RFA4. • Raised concerns Habitat Mitigation Area initially proposed for in-kind mitigation, this proposal has since been revised. • Discouraged the use of vegetation control via domestic livestock to avoid transmission of zoonotic diseases to mapped bighorn sheep populations. • Provided guidance for habitat categorization, encourages certificate holder to avoid in-tact wetlands, sagebrush steppe, and native grasslands due to limited availability in region. • Encouraged certificate holder to avoid Priority Wildlife Connectivity Areas (PWCAs) located on the edge of the micrositing area and provide sufficient setbacks to facilitate wildlife movement.

			• Recommended the certificate holder work with the county weed department to develop a revegetation and weed control plan. Encouraged retention of native vegetation within project boundaries to the maximum extent possible and use of diverse seed mix with consideration given to pollinator-friendly varieties and shrub reestablishment when revegetating. • Recommended seasonal restrictions on activities to minimize impacts on wintering wildlife, ground nesting birds, and nesting raptors.
7/10/2025	Aspen Kemmerlin, Special Projects Archaeologist	State Historic Preservation Office (SHPO)	As discussed in Section III.K., *Historic, Cultural, and Archaeological Resources*, SHPO: • Concurred with recommended determinations that certain resources are not eligible for listing in the National Register of Historic Places (NRHP) • Recommended 20-meter avoidance buffer for all unevaluated and eligible resources. • Recommended Oregon Qualified Archaeologist be present to monitor ground disturbing activities. • Recommended Inadvertent Discovery Plan be implemented during construction.

1

On June 10, 2025, the Department notified the certificate holder that pRFA4 was incomplete and issued requests for additional information (RAIs) needed to recommend findings and condition on applicable standards to the Council. The Department requested the certificate holder submit the additional information on or before July 11, 2025.[47]

On June 27, 2025, the certificate holder informed the Department that it intended to provide RAI responses in batches and expected to be able to respond to all RAIs by September 19, 2025.[48] The RAI responses were provided on July 18, August 22, and September 19, 2025.[49]

On November 7, 2025, the Department informed the certificate holder that it had completed its review of the RAI responses. Following further discussion with the Department, the certificate holder provided a revised version of pRFA4 which, in addition to incorporating responses to the initial RAIs, removed facility components in a "Southern Solar Area" and a proposed 230-kV overhead transmission line from the proposal.[50] The revised pRFA4 was submitted between November 18 and 22, 2025. While new RAIs were not issued, the Department provided informal comments on the revised pRFA4 which resulted in additional changes.[51]

On December 4, 2025, the Department completed its review of the revised pRFA4 and has determined that the revised pRFA4, along with the RAI responses, generally contains adequate information for the Department to recommend findings and conditions to the Energy Facility Siting Council (Council) on all applicable laws, rules, and Council standards. On December 5, 2025, the Department notified the certificate holder that it considered pRFA4, with the RAI responses, to be complete.[52]

On December 10, 2025, the certificate holder filed a complete RFA4 under OAR 345-027-0363(6) that included all revisions to pRFA4 and all additional information requested by the Department.

On December 16, 2025, the Department issued Public Notice of the Proposed Order and Complete Request for Amendment as required by OAR 345-027-0365 and -0367.

[47] BCWAMD4Doc16-00 pRFA4 Completeness Review Letter and RAI1 2025-06-10

[48] BCWAMD4Doc17-00 pRFA RAI1 Responses Extension Request and Response Schedule 2025-06-27

[49] BCWAMD4Doc17-01 pRFA RAI1 Responses Batch 1 2025-07-18, BCWAMD4Doc17-02 pRFA RAI1 Responses Batch 2 2025-08-22, BCWAMD4Doc17-03 pRFA RAI1 Responses Batch 3 2025-09-19.

[50] BCWAMD4Doc18-00 pRFA ODOE Email to CH RE Completeness 2025-11-07

[51] BCWAMD4Doc19-00 Revised pRFA 2025-12-05

[52] BCWAMD4Doc20-00 Revised pRFA Completeness Determination Letter 2025-12-05. A request for amendment is complete when the Department finds that the certificate holder has submitted information adequate for the Council to make findings or impose conditions on all applicable laws and Council standards. OAR 345-027-0363(5). The completeness letter issued by the Department on December 5, 2025 identified that the proposed order would be issued within 21-days (or December 26, 2025). OAR 345-027-0365(1)

II.B.2. Proposed Order

A Public Notice of the complete RFA4, Proposed Order, and Public Hearing was issued concurrently with this Order and sent via mail or email to individuals identified in OAR 345-027-0367(4).[53] The Public Notice of the Proposed Order initiated a public comment period on RFA4 and the Proposed Order. The comment period includes a new public comment process, based on recently amended rules effective October 24, 2025. The new public comment process included the additional steps and deadlines presented in Table 4 below.

Table 4: Proposed Order Public Comment Process and Deadlines

Process Step	Explanation	Deadline
Comment Period	Opportunity to provide comments with sufficient specificity.[1]	Dec. 16, 2025 – Jan. 30, 2026 (45 days)
Certificate holder/Department responses	Opportunity for certificate holder and Department to identify whether comments were raised with sufficient specificity, and to respond with explanation of deficiencies or additional information, evaluation and proposed conditions.	Feb. 13, 2026
Commenter Reply	Opportunity for commenter to supplement their initial comments or determine whether the issue is resolved by the certificate holder or Department's additional information, evaluation or proposed conditions.	Feb. 27, 2026
Certificate holder/Department sur-replies	Final opportunity for certificate holder and Department to resolve issues raised, based on any clarification or supplemental information provided in commenter replies.	March 6, 2026

Notes:
1. OAR 345-027-0367(7) explains that to provide comments with "sufficient specificity," comments should reference recommended findings of fact, conclusions of law or conditions of approval identified in the Proposed Order to which you object; identify the Council standard or other applicable state and local requirements on which your objection is based; and/or present facts or statements supporting your objection.

II.B.3. Draft Final Order

[53] (A) All persons on the Council's general mailing list as defined in OAR 345-011-0020;
(B) All persons on any special mailing list established for the facility;
(C) The reviewing agencies for the facility, as defined in OAR 345-001-0010(52); and
(D) The property owners on the list provided under OAR 345-027-0360.

On March 13, 2026, the Department issued a draft Final Order. Attachment B-3 to this draft Final Order includes the Department's written evaluation of the public comments on the Proposed Order, including all responses, replies, and sur-replies. All recommended changes to the Proposed Order were described in the evaluation and shown in the draft Final Order in track changes.[54] Of note, the Department recommended the following changes based on the evaluation of public comments, responses, replies, and sur-replies:

- Facility Description (Section I.D.3 and Attachment A) and draft Construction Wildfire Mitigation Plan (Attachment G) were revised to grant additional flexibility in road design requested by certificate holder (Issues GS-06, WF-04)
- Recommended Amended Condition 68 (Section III.C and Attachment A) was revised to grant additional flexibility to conduct ground disturbing activities on steep slopes outside of County Natural Hazard Combining Zone (Issue SS-01).
- The draft Comprehensive Revegetation and Soil Management Plan (Attachment D) and the draft Construction Wildfire Mitigation Plan (Attachment G) were revised to specify that vegetation within the Solar Array Areas must be limited to height of 4 to 8 inches during the dry season (Issues SP-04, WF-09 and WF-10).
- The draft Comprehensive Revegetation and Solar Management Plan (Attachment D) and draft Construction Wildfire Mitigation Plan (Attachment G) were revised to align vegetation management standards to Oregon Fire Code (Issue SP-09) and make other minor changes requested by certificate holder (Issue SP-10)
- The draft Community Investment Plan (Attachment E) was revised to add Oregon Wheat Growers League to Selection Committee (Issue LU-11) and remove Agrivoltaics research from list of "pre-screened" projects (Issue LU-13).
- Recommended Historic, Cultural, and Archaeological Condition 2 (GEN-HC-03) (Section III.K and Attachment A) was revised to require a qualified archaeologist or tribal monitor to be on site during ground disturbing activities (Issue HCA-2)
- Facility Description (Section I.D.3 and Attachment A) and recommended Amended Condition 119 (Section III.P and Attachment A) were revised to accommodate new substation location (Issue TL-01).
- Recommended Water Rights Condition 1 (PRE-WR-01) (Section IV.C and Attachment A) revised to clarify timing of requirement for well log submission (Issue WR-01)
- Recommended Amended Condition 75 (OPR-WR-01) (Section IV.C and Attachment A) revised to clarify applicability of cumulative water use limitations (Issues WR-02 and WR-03).

Concurrent with issuing the draft Final Order, the Department issued a Notice of the draft Final Order which was mailed or emailed to all persons, agencies, or organizations who commented during the public comment period.[55] The Department also posted an announcement of the draft Final Order on the Department's webpage for the facility.

[54] OAR 345-027-0371(1).

[55] OAR 345-027-0371(3).

II.B.4. Final Order

At its meeting in Boardman, Oregon, on March 20, 2026, Council reviewed the draft Final Order and all related comments, responses, replies, sur-replies, and the Department's evaluation of issues raised in comments.[56]

After reviewing, the Council, based on the considerations described in OAR 345-027-0375[57] adopted the Department's draft Final Order as the basis for a Final Order and granted issuance of an amended site certificate, which is effective upon execution by the Council Chair and by the certificate holder.[58]

Judicial review of the Council's final order either granting the amended site certificate is as provided in ORS 469.403(3).[59]

III. EVALUATION OF COUNCIL STANDARDS

As described in Section II.A., *Scope of Council Review*, all laws and Council standards applicable to an original site certificate application for a solar photovoltaic power generation facility, including all of the Council's general standards in OAR chapter 345, division 22 are applicable to the review of all new facility components proposed in RFA4. In addition, the Siting Standards for Transmission Lines under OAR 345-024-0090 are applicable to the proposed 230-kV transmission lines. Because there are no proposed changes to the existing Wind Power Generation Facility, the specific siting standards for wind facilities are not applicable to this review.

Consistent with OAR 345-027-0360(3), for all standards that require evaluation of impacts within an analysis area, the analysis areas are based on the proposed Solar Micrositing Area boundary.

III.A. GENERAL STANDARD OF REVIEW: OAR 345-022-0000

> *(1) To issue a site certificate for a proposed facility or to amend a site certificate, the Council shall determine that the preponderance of evidence on the record supports the following conclusions:*
>
> *(a) The facility complies with the requirements of the Oregon Energy Facility Siting statutes, ORS 469.300 to 469.570 and 469.590 to 469.619, and the standards adopted by the Council pursuant to 469.501 or the overall public benefits of the facility outweigh any adverse effects on a resource or interest*

[56] OAR 345-027-0371(6).
[57] See Section II.A., *Scope of Council Review*, in this Order.
[58] OAR 345-027-0371(7).
[59] OAR 345-027-0371(8).

protected by the applicable standards the facility does not meet as described in section (2);

(b) Except as provided in OAR 345-022-0030 for land use compliance and except for those statutes and rules for which the decision on compliance has been delegated by the federal government to a state agency other than the Council, the facility complies with all other Oregon statutes and administrative rules identified in the project order, as amended, as applicable to the issuance of a site certificate for the proposed facility. If the Council finds that applicable Oregon statutes and rules, other than those involving federally delegated programs, would impose conflicting requirements, the Council shall resolve the conflict consistent with the public interest. In resolving the conflict, the Council cannot waive any applicable state statute.

(2) The Council may issue or amend a site certificate for a facility that does not meet one or more of the applicable standards adopted under ORS 469.501 if the Council determines that the overall public benefits of the facility outweigh any adverse effects on a resource or interest protected by the applicable standards the facility does not meet. The Council shall make this balancing determination only when the applicant has shown that the proposed facility cannot meet applicable Council standards or has shown, to the satisfaction of the Council, that there is no reasonable way to meet the applicable Council standards through mitigation or avoidance of any adverse effects on a protected resource or interest. The applicant has the burden to show that the overall public benefits outweigh any adverse effects on a resource or interest, and the burden increases proportionately with the degree of adverse effects on a resource or interest. The Council shall weigh overall public benefits and any adverse effects on a resource or interest as follows:

*****

(3) Notwithstanding section (2) of this rule, the Council shall not apply the balancing determination to the following standards:

*****

(4) In making determinations regarding compliance with statutes, rules and ordinances normally administered by other agencies or compliance with requirements of the Council statutes if other agencies have special expertise, the Department of Energy shall consult with such other agencies during the notice of intent, site certificate application and site certificate amendment processes. Nothing in these rules is intended to interfere with the state's implementation of programs delegated to it by the federal government.

***[60]

III.A.1. Findings of Fact

OAR 345-022-0000 provides the Council's General Standard of Review and requires the Council to find that a preponderance of evidence on the record supports the conclusion that the facility, with the proposed RFA4 changes, complies with the applicable laws or Council standards that protect a resource or interest that could be affected by the proposed change. The findings of fact and conclusions of law presented in this order demonstrate that RFA4 includes sufficient facts and evidence to satisfy a preponderance of evidence under each standard and applicable rule.

Council Standards for Siting Facilities: OAR Chapter 345, Division 22

OAR Chapter 345, Division 22 establishes the Council's General Standards, which apply to all facilities. As described in Sections III.B to III.O, the Council finds that, subject to compliance with existing and new and amended conditions of approval, the preponderance of the evidence on the record supports the conclusion that the facility, with the changes proposed in RFA4, complies with these standards.

Specific Standards for Siting Facilities: OAR Chapter 345, Division 24

OAR Chapter 345, Division 24, establishes standards that are applicable to specific types of facilities including, as relevant to the proposed solar facility, standards for transmission lines under OAR 345-024-0090.

As described in Section III.P., *Siting Standards for Transmission Lines*, the Council finds that, subject to compliance with existing and new and amended conditions of approval, the preponderance of the evidence on the record supports the conclusion that the facility, with the changes proposed in RFA4, complies with this standard.

While not applicable to the proposed solar facility, OAR 345-024-0010 and 345-024-0015 establish specific standards for wind facilities that were evaluated in previous proceedings for this facility. The Council previously imposed Conditions 37 to 52 and 92 to 98 to ensure the existing wind facility complies with the standards. The Council maintains Conditions 38 to 45, 48 to 52, and 92 to 98 with minor alterations to clarify applicability to the existing facility as shown in Attachment A.

Site Certificate Conditions: OAR Chapter 345, Division 25

[60] OAR 345-022-0040, effective April 2, 2025. The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

Mandatory Conditions OAR 345-025-0006

OAR 345-025-0006 establishes mandatory conditions that must be included in all site certificates.[61] The Council previously imposed Site Certificate Conditions 101 to 116 to meet the requirements of the rule.

The mandatory conditions required under OAR 345-025-0006(1) prohibit the Council from changing the conditions of a site certificate except as provided under the OAR chapter 345, division 27. The Council imposed this requirement under Site Certificate Condition 101. The Council also imposed Site Certificate Condition 14 providing additional interpretation of the requirements then found under OAR 345-027-0050(2); which are now found under OAR 345-027-0353(1). The Council amends these conditions, as shown below, as applicable to the entire facility, including the facility components proposed in RFA4:

Amended Condition 101 (GEN-GS-01)
~~OAR 345-027-0020(1):~~ The Council shall not change the conditions of the site certificate except as provided for in OAR Chapter 345, Division 27.

Amended Condition 14 (GEN-GS-02)
Notwithstanding OAR 345-027-~~0050(2)~~0353(1), an amendment of the site certificate is required if the proposed change would increase the electrical generation capacity of the facility ~~and~~ or would increase the number of wind turbines or the dimensions of existing wind turbines.
[Final Order on AMD4]

The mandatory condition required under OAR 345-025-0006(2) requires the certificate holder to submit a legal description of the site to the Department within 90 days after beginning operation of the existing wind facility. This condition applies to the facility components proposed in RFA4. The Council amends the condition to clarify its applicability to the facility components proposed in RFA4, following the completion of construction, as shown below:

Amended Condition 102 (OPR-GS-01)
~~OAR 345-027-0020(2):~~ The certificate holder shall submit an updated legal description of the site to the Department of Energy within 90 days after beginning operation of the solar facility. The legal description required by this rule means a description of metes and bounds or a description of the site by reference to a map and geographic data that clearly and specifically identifies the outer boundaries that contain all parts of the facility.
[Final Order on AMD4]

[61] At the time the Third Amended Site Certificate was issued, these requirements were located under OAR 345-027-0020. See Administrative Order EFSC 4-2017.

The mandatory condition required under OAR 345-025-0006(3) requires the certificate holder to design, construct, operate and retire the facility substantially as described in the site certificate and in compliance with applicable state and local rules, laws, and permitting requirements. The draft Fourth Amended Site Certificate includes Table 1, Solar Facility Component Summary, and a description intended to establish the parameters for which the facility components must be designed and constructed (see Attachment A of this Order). The Council previously imposed these requirements under Condition 103. The Council amends the condition, as shown below, as applicable to the entire facility, including the facility components proposed in RFA4:

> **Amended Condition 103 (GEN-GS-03)**
> ~~OAR 345-027-0020(3):~~ The certificate holder shall design, construct, operate and retire the facility:
> a. Substantially as described in the site certificate;
> b. In compliance with the requirements of ORS Chapter 469, applicable Council rules, and applicable state and local laws, rules and ordinances in effect at the time the site certificate is issued; and
> c. In compliance with all applicable permit requirements of other state agencies.
> [Final Order on AMD4]

The Council also previously imposed Condition 13 imposing requirements identical to those required under OAR 345-025-0006(3)(a). The Council deletes this duplicative condition.

The mandatory condition required under OAR 345-025-0006(4) requires the certificate holder to begin and complete construction of the facility by the dates specified in the site certificate.[62]

The certificate holder expects construction of the facility components proposed in RFA4 to last approximately 17 to 19 months. Construction is expected to begin in Q2 of 2026 and continue through Q4 of 2027.[63] Despite its projected timelines, the certificate holder requests the Council establish a new construction commencement deadline that is 3 years from the effective date of the Fourth Amended Site Certificate, and a construction completion deadline 6 years from the effective date of the Fourth Amended Site Certificate.[64]

During the 2025 session, the Oregon Legislature passed House Bill (HB) 3681 requiring that the Council provide a new certificate holder with a minimum of 6-years from the date the Council issues the site certificate to start construction. While the measure, which will take effect January 1, 2026, does not apply directly to this amendment proceeding, the to align with the

[62] The Council previously imposed the mandatory condition under OAR 345-025-0006(4) as Site Certificate Condition 104. Deadlines for the beginning and completion of construction of the wind facility were imposed under Site Certificate Conditions 11 and 12. Because these conditions were already satisfied during the construction of the existing wind facility, the Council deletes these conditions.
[63] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Sections 4.1.2, 4.1.5.
[64] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Sections 4.1.5.1.

direction of HB 3681, the Council establishes a 6 year deadline for the commencement of construction. Consistent with recent decisions, the Council sets the construction completion deadline at three years from the date construction begins.

Deleted Condition 104

~~OAR 345-027-0020(4): The certificate holder shall begin and complete construction of the facility by the dates specified in the site certificate.~~

[Final Order on AMD4]

Deleted Condition 11

~~The certificate holder shall begin construction of the facility by June 30, 2009. Under OAR 345-015-0085(9), a site certificate is effective upon execution by the Council Chair and the applicant. The Council may grant an extension of the deadline to begin construction in accordance with OAR 345-027-0030 or any successor rule in effect at the time the request for extension is submitted.~~

~~[Amendment #2]~~

[Final Order on AMD4]

Deleted Condition 12

~~The certificate holder shall complete construction of the facility by June 30, 2011. Construction is complete when: (1) the facility is substantially complete as defined by the certificate holder's construction contract documents; (2) acceptance testing has been satisfactorily completed; and (3) the energy facility is ready to begin continuous operation consistent with the site certificate. The certificate holder shall promptly notify the Department of the date of completion of construction. The Council may grant an extension of the deadline for completing construction in accordance with OAR 345-027-0030 or any successor rule in effect at the time the request for extension is submitted.~~

~~[Amendment #2]~~

[Final Order on AMD4]

General Standard Condition 1 (CON-GS-01)

The certificate holder must begin construction of the solar facility, phase or component on or before March 27, 2032. Within 7 days of construction commencement, the certificate holder must provide the Department with written verification that it has met the deadline by satisfying applicable preconstruction conditions and completing at least $250,000 work in the Solar Micrositing Area.

[Final Order on AMD4]

General Standard Condition 2 (CON-GS-02)

The certificate holder must complete construction of the facility, phase or component within 3 years of the actual applicable construction commencement date under Condition CON-GS-01. Within 7 days after completing construction, the certificate holder shall provide the Department written verification that it has met the deadline.

[Final Order on AMD4]

With certain exceptions for wind facilities and linear facilities, the mandatory condition required under OAR 345-025-0006(5) prohibits the certificate holder from beginning construction of a facility until it has construction rights for all parts of the site. The Council imposed this requirement for the construction of the wind facility under Site Certificate Condition 105. The Council amends the condition, as specific to the construction of the solar facility, as shown below:

Amended Condition 105 (PRE-GS-01)

~~OAR 345-027-0020(5): Except as necessary for the initial survey or as otherwise allowed for wind energy facilities, transmission lines or pipelines under this section~~, the certificate holder shall not begin construction, as defined in OAR 345-001-0010, of the solar facility, or create a clearing on any part of the ~~site~~solar micrositing area, until the certificate holder has construction rights on all parts of the ~~site~~area. For the purpose of this rule, "construction rights" means the legal right to engage in construction activities. ~~For wind energy facilities, transmission lines or pipelines, if the certificate holder does not have construction rights on all parts of the site, the certificate holder may nevertheless begin construction, as defined in OAR 345-001-0010, or create a clearing on a part of the site if the certificate holder has construction rights on that part of the site and:~~

~~(a) The certificate holder would construct and operate part of the facility on that part of the site even if a change in the planned route of a transmission line or pipeline occurs during the certificate holder's negotiations to acquire construction rights on another part of the site; or~~

~~(b) The certificate holder would construct and operate part of a wind energy facility on that part of the site even if other parts of the facility were modified by amendment of the site certificate or were not built.~~

[Final Order on ASC; Condition 105; AMD3, AMD4l Mandatory Condition OAR 345-025-0006(5)]

The mandatory condition required under OAR 345-025-0006(6) requires the certificate holder to report any significant environmental changes or impacts attributable to the facility to the Department. At the time the Third Amended Site Certificate was issued, this mandatory condition was part of a larger rule for monitoring and mitigation programs under OAR 345-027-0028 (now OAR 345-025-0016), which was imposed as Condition 120. The Council also imposed Site Certificate Condition 106 based on a previous version of the mandatory condition rule. The condition requires any mitigation plans required by the site certificate to be developed in consultation with affected agencies and local governments and approved by the Department (then the Office of Energy) prior to construction or operation of the facility. These two conditions implement, in part, the current requirements of OAR 345-025-0016, and in part, the Council's discretion to delegate review and approval of future actions to the Department under ORS 469.402. Because the requirements to finalize monitoring and mitigation plans are established in individual conditions, Condition 106 is not necessary, and the Council deletes it in its entirety. Similarly, the Council amends Condition 120 to only retain the mandatory condition language, as shown below.

Deleted Condition 106

~~OAR 345-027-0020(6): If the Council requires mitigation based on an affirmative finding under any standards of Division 22 or Division 24 of OAR Chapter 345, the certificate holder shall consult with affected state agencies and local governments designated by the Council and shall develop specific mitigation plans consistent with Council findings under the relevant standards. The certificate holder must submit the mitigation plans to the Office and receive Office approval before beginning construction or, as appropriate, operation of the facility.~~

[Final Order on AMD4]

Amended Condition 120 (GEN-GS-04)

~~OAR 345-027-0028: The following general monitoring conditions apply:~~

~~(a) The certificate holder shall consult with affected state agencies, local governments and tribes and shall develop specific monitoring programs for impacts to resources protected by the standards of Divisions 22 and 24 of OAR Chapter 345 and resources addressed by applicable statutes, administrative rules and local ordinances. The certificate holder must submit the monitoring programs to the Department of Energy and receive Department approval before beginning construction or, as appropriate, operation of the facility.~~

~~(b) The certificate holder shall implement the approved monitoring programs described in section (a) and monitoring programs required by permitting agencies and local governments.~~

~~(c) For each monitoring program described in sections (a) and (b), the certificate holder shall have quality assurance measures approved by the Department before beginning construction or, as appropriate, before beginning commercial operation.~~

~~(d)~~ If the certificate holder becomes aware of a significant environmental change or impact attributable to the facility, the certificate holder shall, as soon as possible, submit a written report to the Department describing the impact on the facility and any affected site certificate conditions.

[Final Order on AMD4]

Additional discussion of the Council's discretion to delegate review of monitoring and mitigation plans to the Department is discussed in the evaluation of OAR 345-025-0016, below.

The mandatory conditions required under OAR 345-025-0006(7) to (9) and (16) require the certificate holder to prevent the development of any conditions on the site that would preclude restoration of the site to a useful, non-hazardous condition to the extent that prevention of such site conditions is within the control of the certificate holder. The Council previously imposed these requirements under Condition 107 to 109. The Council maintains this condition, as applicable to the entire facility:

Amended Condition 107 (GEN-GS-05)

~~OAR 345-027-0020(7):~~ The certificate holder shall prevent the development of any conditions on the site that would preclude restoration of the site to a useful, non-hazardous condition to the extent that prevention of such site conditions is within the control of the certificate holder.

[Final Order on AMD4]

The mandatory condition required under OAR 345-025-0006(8), (9), and (16) are related to the retirement of the facility and are discussed in Section III.G., *Retirement and Financial Assurance*.

OAR 345-025-0006(10) requires the Council to impose all representations in the site certificate application and supporting record the Council deems to be binding commitments made by the applicant or certificate holder as site certificate conditions. The Council previously imposed this requirement as Condition 110; however, the rule is a directive to the Council to impose additional conditions and is not, itself, a condition of approval. Because the rule is implemented through other conditions, including conditions imposed in this Order, the Council deletes Condition 110.

Deleted Condition 110

~~OAR 345-027-0020(10): The Council shall include as conditions in the site certificate all representations in the site certificate application and supporting record the Council deems to be binding commitments made by the applicant.~~

[Final Order on AMD4]

As discussed in Section III.D., *Soil Protection,* the Council maintains Condition 111, which imposes the mandatory condition required under OAR 345-025-0006(11). Similarly, the Council maintains Conditions 112 to 114 which, as discussed in Section III.C., *Structural Standard,* impose the mandatory conditions required under OAR 345-025-0006(12) to (14), and Condition 115, which as discussed under Section III.B., *Organizational Expertise,* imposes the mandatory condition required under OAR 345-025-0006(15).

Site Specific Conditions: OAR 345-025-0010

OAR 345-025-0010 establishes "site specific" conditions Council may impose to address issues specific to certain types of facilities or facility components. As described in Section III.P., *Siting Standards for Transmission Lines,* the Council previously imposed Site Certificate Conditions 118 and 119 in accordance with the site specific conditions for transmission lines under OAR 345-025-0010(4) and (5) and the Council amends these conditions as applicable to the proposed 230-kV transmission line segment.

Monitoring and Mitigation Conditions: OAR 345-025-0016

Under ORS 469.402, if the Council elects to impose conditions on a site certificate or an amended site certificate that requires subsequent review and approval of a future action, the Council may delegate the future review and approval to the Department if, in the Council's discretion, the delegation is warranted under the circumstances of the case.

As a matter of practicality, most site certificate conditions include some form of Department review or approval. Some conditions require that an applicant or certificate holder demonstrate that it has received proper permits or documentation or require a demonstration that facility design adheres to established specifications. In these circumstances, the Department's role in finding compliance with the condition is to verify that the future action described in the condition was completed.

The primary circumstance necessitating the application of ORS 469.402 is associated with the uncertainty of financing, developing, engineering, and designing large energy facilities prior to having secured permits. Typically, a proposal in an ASC or RFA to construct and operate an energy facility is based on a facility design that is approximately 30 percent complete. This stage in the facility design includes design features, dimensions, setbacks and resource avoidance areas that are informed by field surveys and desktop analysis conducted in preparation of an ASC or RFA, but may not be informed by final facility design and capacity needs, final engineering studies, and the selection of manufacturer and component specifications.

The timeline for permitting and construction of large energy facilities also necessitates the application of ORS 469.402. Council-approved energy facilities typically have three years to begin construction after Council approval, and then three years to complete construction. In this timespan, circumstances or conditions at the site change, which is why some conditions or mitigation plans include "truing up" information based on the final facility design which must be reviewed and approved prior to construction. Additionally, in the timeframe between EFSC approval and construction, permits, approvals or filings with other agencies or local governments may expire, which would necessitate resubmission.

Under OAR 345-027-0363(5), a Request for Amendment is complete when the Department finds that the certificate holder has submitted information, including any draft mitigation or monitoring plans, adequate for the Council to make findings or impose conditions on all applicable Council standards, and Council must include conditions that address monitoring and mitigation to ensure compliance with the standards contained in OAR Chapter 345, Division 22 and Division 24, including conditions requiring the future review and approval of the plans. Conditions requiring review and approval of such plans in this Order include:

- Organizational Expertise Condition 1 and 2: Draft Operations and Maintenance Framework Plan
- Soil Protection Conditions 1 and 3: Draft Comprehensive Solar Revegetation and Soil Management Plan
- Land Use Condition 6: Draft Community Investment Plan
- Fish and Wildlife Condition 1: Draft Amended Habitat Mitigation Plan

- Wildfire Prevention and Risk Mitigation Conditions 1 and 3: Construction and Operations Wildfire Mitigation Plans; Wildfire Prevention and Risk Mitigation

In accordance with OAR 345-025-0016, certificate holder developed draft plans in consultation with the Department, state agencies and local governments, and importantly, the Department provided additional edits to the mitigation plans that were presented in redline format to the plans that were attached to the Proposed Order. As discussed in the applicable sections of this order, these mitigation plans are in draft form because they include preliminary assessments, impact totals, criteria for avoidance and minimization of impacts to resources, as well as success criteria to determine short and long term success of the mitigation measures defined in the plans. These plans are in preliminary or draft form because, as discussed above, they are based on the design of the facility as presented in RFA4 and will be updated prior to construction and operation of the final designed facility, which could be several years in the future when it is important to capture circumstances at the site at that time.

Lastly, the mitigation plans include specific monitoring and success criteria to determine short and long term success of the mitigation measures defined in the plans. The mitigation plans listed above have an "amendment clause," which under ORS 469.402, allows Council and the Department, in conjunction with the certificate holder, to amend mitigation plans without a site certificate amendment under OAR 345-027-0350 through OAR 345-027-0375. The circumstances that necessitate the subsequent review and approval of a future action (amendment of a finalized mitigation plan) under ORS 469.402 are associated with ongoing compliance with the monitoring and success criteria. Ongoing compliance with monitoring and success criteria may need to be adapted based on site specific changes, environmental conditions, failing criteria, or new or emerging technologies or practices that could be more effective at mitigating an impact or restoring the site. As described in the amendment clause, the Department is required to notify the Council of all Plan amendments, and the Council retains the authority to approve, reject, or modify any amendment of the Plans agreed to by the Department because the delegation is not absolute.

III.A.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the existing and new and amended site certificate conditions described above, the Council finds that the facility components proposed in RFA4 would comply with the requirements of ORS 469.300 to 469.570 and 469.590 to 469.619, the Council's standards in OAR chapter 345, and all other Oregon statutes and administrative rules applicable to the issuance of an amended site certificate.

III.B. ORGANIZATIONAL EXPERTISE: OAR 345-022-0010

(1) To issue a site certificate, the Council must find that the applicant has the organizational expertise to construct, operate and retire the proposed facility in compliance with Council standards and conditions of the site certificate. To conclude that

the applicant has this expertise, the Council must find that the applicant has demonstrated the ability to design, construct and operate the proposed facility in compliance with site certificate conditions and in a manner that protects public health and safety and has demonstrated the ability to restore the site to a useful, non-hazardous condition. The Council may consider the applicant's experience, the applicant's access to technical expertise and the applicant's past performance in constructing, operating and retiring other facilities, including, but not limited to, the number and severity of regulatory citations issued to the applicant.

(2) The Council may base its findings under section (1) on a rebuttable presumption that an applicant has organizational, managerial and technical expertise, if the applicant has an ISO 9000 or ISO 14000 certified program and proposes to design, construct and operate the facility according to that program.

(3) If the applicant does not itself obtain a state or local government permit or approval for which the Council would ordinarily determine compliance but instead relies on a permit or approval issued to a third party, the Council, to issue a site certificate, must find that the third party has, or has a reasonable likelihood of obtaining, the necessary permit or approval, and that the applicant has, or has a reasonable likelihood of entering into, a contractual or other arrangement with the third party for access to the resource or service secured by that permit or approval.

(4) If the applicant relies on a permit or approval issued to a third party and the third party does not have the necessary permit or approval at the time the Council issues the site certificate, the Council may issue the site certificate subject to the condition that the certificate holder shall not commence construction or operation as appropriate until the third party has obtained the necessary permit or approval and the applicant has a contract or other arrangement for access to the resource or service secured by that permit or approval.

** * * * * [65]*

III.B.1. <u>Findings of Fact</u>

Expertise to Construct and Operate the Facility Components Proposed in RFA4

The certificate holder, Portland General Electric Company (PGE), is an Investor-Owned Utility based in Portland, Oregon. PGE has been in operation since the late 1800s; founded as the Willamette Falls Electric Company in approximately 1888, it filed Articles of Incorporation as the Portland General Electric Company in 1930. PGE has over $15.4 million in total utility plant

[65] OAR 345-022-0040, effective April 2, 2025. The information requirements included in the standard are omitted from the language above but evaluated within the findings of fact below.

assets and $2.8 million in annual retail revenues. PGE currently owns or operates six natural gas facilities (2,102 MW), seven hydro-electric facilities (684 MW), four wind facilities, including the existing facility (1,025 MW), and five small solar facilities (9 MW). It also has approximately 97 MW of operational BESSs at three facilities – Coffee Creek, Constable and Port Westward.

As proposed in RFA4, the certificate holder would construct and operate the solar components in partnership with a participating entity, BIGL bn, LLC (BIGL) under a Build Transfer Agreement.[66] BIGL will be responsible for the selection and management of external vendors, including architects, engineers, major component suppliers, and prime contractors for design, construction and operation of the facility components proposed in RFA4.[67] PGE would own, possess and control the facility components proposed in RFA4 and will remain the sole certificate holder.

The mandatory condition required under OAR 345-025-0006(15) requires the certificate holder to inform the Department of any transfer of ownership before it occurs. The Council previously imposed this requirement as Site Certificate Condition 115. The Council maintains this condition as applicable to both the existing facility and proposed facility components:

> **Amended Condition 115 (GEN-OE-01)**
> ~~OAR 345-027-0020(15):~~ Before any transfer of ownership of the facility or ownership of the site certificate holder, the certificate holder shall inform the Department of the proposed new owners. The requirements of OAR 345-027-01~~1~~400 apply to any transfer of ownership that requires a transfer of the site certificate.
> [OAR 345-027-0020(15); Final Order on ASC; Condition 115; AMD3; AMD4]

BIGL is a project-specific LLC and relies upon the organizational expertise and experience of its parent company, BrightNight, LLC. BrightNight, LLC is based in Florida and has designed and constructed over 6 gigawatts (GWs) of solar and storage projects across the United States.[68] The amendment request did not include any other information or evidence regarding BrightNight, LLCs experience or access to technical and financial resources necessary to design, construct and operate facility components proposed in RFA4 or in their technical ability and experience in selecting and managing qualified vendors and contractors. However, both PGE and BrightNight, LLC commit to having stringent contracting standards to ensure that selected contractors and vendors can adequately support the construction and operation of the facility components proposed in RFA4.[69]

[66] The Council's Organizational Expertise standard requires that information be provided for "participating persons" if those persons are being relied upon by the certificate holder for third party permits, approval, agreements or compliance with the standard.
[67] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 5.3.2.
[68] *Id.*
[69] BCWAMD4 pRFA RAI Response Att 1 OE-1 Response 2025-09-19.

The Council previously imposed Site Certificate Condition 1 which required that the selection of construction contractors and vendors for the construction of the existing wind facility was based on demonstrated qualifications and experience. Given that the certificate holder proposes BIGL as a participating entity to oversee vendors and contractors during construction, the Council amends Condition 1 as presented below:

Amended Condition 1 (PRE-OE-01)
~~Before beginning~~ Prior to construction of any component or phase ~~-~~of the solar facility, the certificate holder shall notify the Department of the identity and qualifications of primary vendors; the engineering, procurement and construction ~~(EPC)~~ contractor~~(s)~~ for specific portions of the work; and the identity and qualifications of the individuals that will manage and oversee the selected vendors and contractors. The certificate holder shall select ~~EPC~~ vendors, contractors, and personnel dedicated to managing vendors and contractors that have substantial experience in the design and construction of similar facilities. The certificate holder shall report to the Department any change of major construction contractors or management personnel.
[Final Order on ASC, Condition 1; AMD4]

The Council previously imposed Site Certificate Condition 2, which required the certificate holder to contractually require all construction contractors and subcontractors for the construction of the existing facility to comply with all applicable laws and regulations and with the terms and conditions of the site certificate. The Council amends this condition to make it clear that this requirement will also extend to the contractual relationship between PGE and BIGL during operation of the proposed facility components:

Amended Condition 2 (GEN-OE-02)
The certificate holder shall contractually require all ~~construction~~ contractors and subcontractors involved in the construction or operation of the facility to comply with all applicable laws and regulations and with the terms and conditions of the site certificate. Such contractual provisions shall not operate to relieve the certificate holder of responsibility under the site certificate. Any notice of violation, civil penalties, or other enforcement action issued under the site certificate will be issued to the certificate holder.
[Final Order on ASC, Condition 2; AMD4]

The Council previously imposed Site Certificate Condition 15, which required the certificate holder to obtain all necessary state and local permits or approvals required for construction, operation and retirement of the facility or ensure that its contractors obtain necessary state and local permits or approvals. The Council maintains this Condition as applicable to the existing and proposed facility components.

The Council previously imposed Site Certificate Condition 3, which required a qualified manager responsible for site certificate compliance to be on site during construction of the existing facility.

Amended Condition 3 (CON-OE-01)

During construction of any component or phase of the solar facility, the certificate holder shall ~~have~~:

a. Maintain a~~n~~ qualified on-site ~~assistant~~ construction manager ~~who is qualified~~ with demonstrated experience in environmental compliance;

b. Require the construction manager to ensure compliance with all construction-related site certificate conditions. ~~During operation, the certificate holder shall have a project manager who is qualified in environmental compliance to ensure compliance with all ongoing site certificate conditions.~~

c. ~~The certificate holder shall n~~Notify the Department of the name, telephone number, and e-mail address of the~~se~~ manager~~s and shall keep the Department informed of~~ within 72 hours after any change in this information.

[Final Order on ASC, Condition 3; AMD4]

Similar to the approach for construction, certificate holder proposes to rely on the participating entity, BIGL, for operations and maintenance of the facility components proposed in RFA4, for a minimum of the first 5 years. This includes relying on the participating entity for the selection of vendors and contractors, the management of those vendors and contractors, and operations and maintenance.

The certificate holder represents that it will implement a procurement process for O&M vendors and contractors that prioritizes, over low cost, technical qualifications, safety performance, environmental compliance and relevant experience in utility-scale solar and battery storage facilities. The certificate holder affirmed that its contracts with the participating entity, contractors and subcontractors involved in O&M will require adherence to industry best practices including, at a minimum, the following:

- Implementing detailed preventive maintenance schedules,
- Providing trained and certified personnel,
- Utilizing real-time monitoring and fault detection systems,
- Following all OEM maintenance and service guidelines,
- Maintaining transparent documentation and reporting protocols, including ensuring that 100% of preventative maintenance activities scheduled for any given month are logged prior to monthly reporting,
- Using digital maintenance management systems,
- Conducting regular QA/QC inspections,
- Establishing clear escalation procedures for unplanned outages, and
- Participating in site-specific safety trainings and continuous improvement processes.
- Ability to provide additional resources or solutions if inspection and maintenance activities are not completed on time (performance issue will be identified if 5% or more of inspection/maintenance activities are not completed on time).
- Compliance with all applicable terms and conditions of the Site Certificate, including the O&M Plan.

The above representations are included in a draft framework O&M Plan provided by the certificate as Attachment 5 to RFA4. The O&M Framework Plan provides an outline for contractor selection, performance monitoring, inspection and maintenance activities, emergency preparedness and contractor and staff oversight.

During its review, the Council imposed clear requirements in the framework plan to ensure that actions required for plan finalization and plan implementation are clear, as presented below (as presented in red-line changes presented in Attachment C of this Order).

Table 5: Council Imposed Requirements for O&M Plan Finalization

Summary	Requirement
Action Based Plan	This plan shall be finalized based on actions that can be monitored, tracked and recorded. Detailed narrative or explanation that is not a specific action must be removed. Filter for clarity and remove unnecessary high-level narrative.
Qualifications and Contact Information	<u>In the Plan</u>: Include the contact information for: 1. The individuals that will manage and oversee vendors and contractors. 2. The individuals that will perform design-phase safety reviews. <u>Evidence to Support Plan Review</u>: Certificate must provide to the Department the names, contact information and qualifications of the individuals that will manage and oversee vendors and contractors; and of the individuals that will perform design-phase safety reviews. The Department may request additional information or justification for any individuals where the experience or qualifications are inadequate.
Incorporation of requirements/citations from applicable site certificate conditions, protocols and technical plans	<u>In the Plan</u>: Identify all technical and site management plans applicable to operations and compliance for the solar components; incorporate relevant action items into the plan. At a minimum, the plan must reference and incorporate the Emergency Operations Responses Plan, Operational Spill Prevention Control and Countermeasure Plan, Operational Wildlife Mitigation Plan, and Comprehensive Revegetation, Noxious Weed and Soil Reclamation Plan.
Inspection and maintenance	<u>In the Plan</u>: Identify all inspections and maintenance activities, schedule, protocol and inspection documentation format. <u>Evidence to Support Plan Review</u>:

Table 5: Council Imposed Requirements for O&M Plan Finalization

Summary	Requirement
	Provide documentation to be used to track maintenance and inspection activities. If information is tracked via software, explain, demonstrate and provide available data.
Vendor Performance Scoring System	In the Plan: The final plan shall include details about the certificate holder's vendor performance scoring system. The scoring system must, at a minimum, evaluate vendor response time, corrective maintenance scoring rates and inspection completion.
Operations and Maintenance Budget Tracking and Forecasting	In the Plan: The final plan shall include a section for Operations and Maintenance Budget Tracking, including but not limited to, a summary of the basis for the amount estimated in the initial maintenance reserve, and an explanation of the 5-year life cycle cost modeling. The plan shall include information about the estimated and available budget. Future plan updates must include 5-year life cycle cost modeling results.
Third-Party O&M Budget Audit	In the Plan: The final plan shall include information about annual third-party condition assessments, and ensure that the scope of the assessment includes annual review of vendor/contractor performance against warranty and reliability benchmarks.
Build Transfer Agreement	Evidence to Support Plan Review: Provide a copy of the executed Build Transfer Agreement (BTA). Confidential terms and conditions, unrelated to the roles, responsibilities, oversight and control of the certificate holder, third-parties, site certificate and facility, may be redacted from the executed BTA provided to the Department.
Community Outreach	In the Plan: The final plan shall include names and addresses of participating landowners, and shall detail the schedule, agenda and outreach efforts for annual coordination meetings, to be conducted by the certificate holder. The final plan shall require that the certificate holder invite Sherman County emergency responders and ODOE to each annual meeting. The plan shall require minutes from each meeting. Any issues will be tracked and evaluated to determine the appropriate response.
Reporting	In the Plan: Require reporting to the Department of the following: 1. Within 72-hours of a change in contractors, vendors or contract terms, report the change, the reasons for the change, and the

Table 5: Council Imposed Requirements for O&M Plan Finalization

Summary	Requirement
	identification, contact information and qualifications to the Department. 2. Monthly, report to the Department a summary of performance monitoring results (Vendor Performance Scoring System), including identification of any significant performance issues and corrective actions taken by or for the participating entity, contractor(s) and vendor(s). Certificate holder shall identify corrective actions, including stop work or removal from site, required of the vendor(s) for any performance scores less than 95% percent on-time inspection and repair completion rate. 3. Annually, provide the Department a written report from a third-party contractor evaluating whether the established or forecasted operations and maintenance budget is adequate for site operations. 4. Annually, provide the agenda, attendees list and meeting minutes from the community outreach meetings. Certificate holder shall report any issues identified at the meeting and shall provide their response and/or resolution of the identified issue.

The Council imposes the following conditions to ensure that the O&M Plan is finalized and implemented throughout operations:

Organizational Expertise Condition 1 (PRO-OE-01)
Prior to beginning operation of the solar facility, the certificate holder shall submit a final Operation and Maintenance Plan to the Department for review and approval. The plan must be finalized in accordance with Table 1 of the O&M Framework provided in Attachment C to the Final Order on AMD4.
[Final Order on AMD4]

Organizational Expertise Condition 2 (OPR-OE-02)
During operation of the solar facility, the certificate holder shall require onsite contractors and employees to adhere to the O&M Plan approved under Condition PRO-OE-01. The O&M Plan may be amended, subject to Department review and approval
[Final Order on AMD4]

The existing wind facility has experienced substantial equipment and maintenance issues over the past several years (blade detachment, oil and grease releases, transformer failures, and turbine door malfunctions), which demonstrate a deficiency in the adequacy of the existing site certificate conditions in ensuring systematic oversight of vendor performance, preventive maintenance, and safe, reliable construction and operation.

OAR chapter 345, division 26 includes the ongoing compliance obligations, including requirements for compliance plans, inspections, reporting and notification of incidents that will apply to the facility, as amended, if the Council issues an amended site certificate. Note that, if a site certificate is issued, the certificate holder must also comply with additional construction- and operation-related regulations that may apply to the facility components proposed in RFA4 but that may not be covered by the site certificate, as provided in ORS 469.401(4).

Under OAR 345-026-0048, the certificate holder must develop and implement a plan that verifies compliance with all site certificate terms and conditions and applicable statutes and rules. The Council previously imposed these requirements as Site Certificate Condition 121. The Council amends this condition as applicable to the construction of the solar facility:

Amended Condition 121 (PRE-OE-02)

a. ~~OAR 345-026-0048: Following receipt of the site certificate or an amended site certificate,~~ Prior to construction of any component or phase of the solar facility, the certificate holder shall ~~implement~~ submit, to the Department for review and approval, a plan that verifies compliance with all site certificate terms and conditions and applicable statutes and rules. As a part of the compliance plan, to verify compliance with the requirement to begin construction by the date specified in the site certificate, the certificate holder shall report promptly to the Department of Energy when construction begins. Construction is defined in OAR 345-001-0010. In reporting the beginning of construction, the certificate holder shall describe all work on the site performed before beginning construction, ~~including work performed before the Council issued the site certificate,~~ and shall state the cost of that work. For the purpose of this ~~exhibit~~condition, "work on the site" means any work within ~~a site or corridor~~the solar micrositing area, other than surveying, exploration or other activities to define or characterize the site or corridor.
b. The certificate holder shall ~~document~~ implement the compliance plan prior to and during construction and ~~maintain it~~ make documentation of compliance available for inspection by the Department or the Council upon request.

[Final Order on ASC, Condition 121; AMD3, AMD4]

The Council previously imposed Site Certificate Condition 16, which partially duplicated the reporting requirements of Condition 121, with different timing. The Council deletes this condition.

Deleted Condition 16

~~Before beginning construction, the certificate holder shall notify the Department in advance of any work on the site that does not meet the definition of "construction" in OAR 345-001-0010 or ORS 469.300 and shall provide to the Department a description of the work and evidence that its value is less than $250,000.~~

[Final Order on AMD4]

The Council previously imposed Site Certificate Conditions 122, requiring the certificate holder to comply with the reporting requirements of OAR 345-026-0080 during construction and operation of the existing facility. The Council finds that existing conditions and required reporting do not provide sufficient visibility into the effectiveness of corrective actions taken in response to vendor/contractor performance issues at the site, and amends Condition 122 to require enhanced reporting on progress made toward corrective actions that are applicable to the existing facility and the proposed facility components, once operations begin:

Amended Condition 122 (OPR-OE-01)

~~OAR 345-026-0080: The certificate holder shall report according to the following requirements:~~

~~(a) General reporting obligation for energy facilities under construction or operating:~~

~~(i) Within six months after beginning construction, and every six months thereafter during construction of the energy facility and related or supporting facilities, the certificate holder shall submit a semiannual construction progress report to the Department of Energy. In each construction progress report, the certificate holder shall describe any significant changes to major milestones for construction. The certificate holder shall include such information related to construction as specified in the site certificate. When the reporting date coincides, the certificate holder may include the construction progress report within the annual report described in this Condition.~~

a. By April 30 of each year after beginning construction, the certificate holder shall submit an annual report to the Department ~~addressing the subjects listed in this Condition~~. The Council Secretary and the certificate holder may, by mutual agreement, change the reporting date.

~~(ii) To the extent that information required by this rule is contained in reports the certificate holder submits to other state, federal or local agencies, the certificate holder may submit excerpts from such other reports to satisfy this rule. The Council reserves the right to request full copies of such excerpted reports.~~

b. In the annual report, the certificate holder shall include the following information for the calendar year preceding the date of the report:

   i. Facility Status: An overview of site conditions, the status of facilities under construction, and a summary of the operating experience of facilities that are in operation. In this section of the annual report, the certificate holder shall describe any unusual events, such as earthquakes, extraordinary windstorms, major accidents or the like that occurred during the year and that had a significant adverse impact on the facility.

   ii. Reliability and Efficiency of Power Production: For electric power plants, the plant availability and capacity factors for the reporting year. The certificate holder shall describe any equipment failures or plant breakdowns that had a significant impact on those factors and shall describe any actions taken to prevent recurrence of such problems;

   ~~(iii) Fuel Use: For thermal power plants:~~

   ~~(A) The efficiency with which the power plant converts fuel into electric energy. If the fuel chargeable to power heat rate was evaluated when the facility was sited,~~

~~the certificate holder shall calculate efficiency using the same formula and assumptions, but using actual data; and~~

~~(B) The facility's annual hours of operation by fuel type and, every five years afterbeginning operation, a summary of the annual hours of operation by fuel type as described in OAR 345-024-0590(5).~~

iii. Status of Surety Information: Documentation demonstrating that bonds or letters of credit as described in the site certificate are in full force and effect and will remain in full force and effect for the term of the next reporting period;

iv. Monitoring Report: A list and description of all significant monitoring and mitigation activities performed during the previous year in accordance with site certificate terms and conditions, a summary of the results of those activities, and a discussion of any significant changes to any monitoring or mitigation program, including the reason for any such changes.

v. Compliance Report: A description of all instances of noncompliance with a site certificate condition. For ease of review, the certificate holder shall, in this section of the report, use numbered subparagraphs corresponding to the applicable sections of the site certificate.

vi. Facility Modification Report: A summary of changes to the facility that the certificate holder has determined do not require a site certificate amendment in accordance with OAR 345-027-0350.

~~(viii) Nongenerating Facility Carbon Dioxide Emissions: For nongenerating facilities that emit carbon dioxide, a report of the annual fuel use by fuel type and annual hours of operation of the carbon dioxide emitting equipment as described in OAR 345-024-0630(4).~~

c. To the extent that information required by this condition is contained in reports the certificate holder submits to other state, federal or local agencies, the certificate holder may submit excerpts from such other reports to satisfy this condition. The Council reserves the right to request full copies of such excerpted reports. [Final Order on AMD4]

The Council also adopts a new Condition to incorporate Construction progress reporting requirements established in OAR 345-026-0080(1) but increasing the frequency of reporting from semi-annual to every three months to allow the Department to track more closely the ability of the participating entity to adequate manage site certificate compliance during construction, as presented below:

Organizational Expertise Condition 3 (CON-OE-02)

a. Within three months after beginning construction of any phase or component of the solar facility, and every three months thereafter during construction, the certificate holder shall submit a construction progress report to the Department.

b. Each construction progress report shall describe:

i. Any significant changes to major milestones for construction;

ii. Facility Status: An overview of site conditions, the status of facilities under construction, and a summary of the operating experience of facilities that are in

operation. In this section of the annual report, the certificate holder shall describe any unusual events, such as earthquakes, extraordinary windstorms, major accidents or the like that occurred during the year and that had a significant adverse impact on the facility.

iii. Status of Surety Information: Documentation demonstrating that bonds or letters of credit as described in the site certificate are in full force and effect and will remain in full force and effect for the term of the next reporting period;

iv. Monitoring Report: A list and description of all significant monitoring and mitigation activities performed during the reporting period in accordance with site certificate terms and conditions, a summary of the results of those activities, and a discussion of any significant changes to any monitoring or mitigation program, including the reason for any such changes.

v. Compliance Report: A description of all instances of noncompliance with a site certificate condition. For ease of review, the certificate holder shall, in this section of the report, use numbered subparagraphs corresponding to the applicable sections of the site certificate.

vi. Facility Modification Report: A summary of changes to the facility that the certificate holder has determined do not require a site certificate amendment in accordance with OAR 345-027-0050.

c. When the reporting date coincides, the certificate holder may include the construction progress report within the annual report required under Condition OPR-OE-01.

[Final Order on AMD4]

The Council amends Site Certificate Conditions 4, as presented below:

Amended Condition 4 (GEN-OE-04):

The certificate holder shall, as soon as reasonably possible:

a. ~~Within 72 hours after discovery of conditions or circumstances that may violate the terms or conditions of the site certificate, the certificate holder shall report the conditions or circumstances to the Department.~~ Report incidents or circumstances that may violate the terms or conditions of the site certificate, terms or conditions of any order of the Council, to the Department. In the report to the Department, the certificate holder shall provide all pertinent facts including an estimate of how long the conditions or circumstances existed, how long they are expected to continue before they can be corrected, and whether the conditions or circumstances were discovered as a result of a regularly scheduled compliance audit;

b. Initiate and complete appropriate action to correct the conditions or circumstances and to minimize the possibility of recurrence;

c. Submit a written report within 30 days of discovery to the Department. The report must refer to the language in (d) of the condition and contain:

i. A discussion of the cause of the reported conditions or circumstances;

ii. The date of discovery of the conditions or circumstances by the responsible party;

iii. A description of immediate actions taken to correct the reported conditions or

circumstances;

iv. A description of actions taken or planned to minimize the possibility of recurrence; and

v. For conditions or circumstances that may violate the terms or conditions of a site certificate, an assessment of the impact on the resources considered under the standards of OAR Chapter 345 Divisions 22 and 24 as a result of the reported conditions or circumstances.

d. Upon receipt of the written report in sub(c) of this condition, the Department may review the facility record for incidents or circumstances reported or reportable under sub(a) related to public health and safety, the environment, or other resources protected under Council standards. If these incidences are determined by the Department to impact the adequacy of the facility decommissioning cost, the Department or Council may adjust the contingencies identified in Final Order on RFA4 Attachment I and shall request and receive an updated bond or letter of credit from certificate holder in the adjusted amount.
[Final Order on ASC, Condition 4; AMD4]

The Council also previously imposed Conditions 124 and 125 which impose reporting requirements under OAR chapter 345, Division 26. And Condition 37, which required the certificate holder to report accidents or mechanical failures that could result in public health or safety concerns to the Department. The Council maintains these conditions as applicable to the entire facility under Conditions GEN-OE-05 to GEN-OE-07.

Restoration of the Site to a Useful, Non-hazardous Condition

The certificate holder's ability to restore the site of the facility components proposed in RFA4 to a useful, non-hazardous condition is evaluated in Section III.G., *Retirement and Financial Assurance* of this order, in which the Council finds that the certificate holder has demonstrated an ability to comply with the Retirement and Financial Assurance standard.

Third-party Permits

The certificate holder represents that it would rely upon third-party contractors to obtain any required permits from the Oregon Department of Transportation, and any required state and local building and electrical permits, if required for the construction of the facility components proposed in RFA4.

Under OAR 345-022-0010(4), if the certificate holder relies on a permit or approval issued to a third-party contractor, and the third party does not have the permit, the Council may issue an amended site certificate subject to the condition that the certificate holder shall not commence construction or operation as appropriate until the third party has obtained the necessary permits or approvals and the certificate holder has a contract or other arrangement for access to the resource or service secured by that permit or approval. The Council imposes

Organizational Expertise Condition 4, as presented below, to ensure that the certificate holder's contractors obtain all necessary permits and approvals prior to the beginning of construction

Organizational Expertise Condition 4 (PRE-OE-03):
Prior to construction of any component or phase of the solar facility, the certificate holder shall:
a. Provide the Department a list of federal, state and local permits, including any third-party permits; and a schedule for obtaining identified permits.
b. Once obtained, provide copies of all permits, including third-party permits to the Department.
[Final Order on AMD4]

III.B.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with existing and new and amended conditions described above, the Council finds that the certificate holder has the organizational expertise to construct, operate and retire the facility components proposed in RFA4 in compliance with Council standards and conditions of the site certificate.

III.C. STRUCTURAL STANDARD: OAR 345-022-0020

(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that:

(a) The applicant, through appropriate site-specific study, has adequately characterized the seismic hazard risk of the site; and

(b) The applicant can design, engineer, and construct the facility to avoid dangers to human safety and the environment presented by seismic hazards affecting the site, as identified in subsection (1)(a);

(c) The applicant, through appropriate site-specific study, has adequately characterized the potential geological and soils hazards of the site and its vicinity that could, in the absence of a seismic event, adversely affect, or be aggravated by, the construction and operation of the proposed facility; and

(d) The applicant can design, engineer and construct the facility to avoid dangers to human safety and the environment presented by the hazards identified in subsection (c).

(2) The Council may not impose the Structural Standard in section (1) to approve or deny an application for an energy facility that would produce power from wind, solar or geothermal energy. However, the Council may, to

the extent it determines appropriate, apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

(3) The Council may not impose the Structural Standard in section (1) to deny an application for a special criteria facility under OAR 345-015-0310. However, the Council may, to the extent it determines appropriate, apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.[70]

*****[71]

III.C.1. Findings of Fact

For the purposes of RFA4, the analysis area for the Structural Standard is the area within the proposed Solar Micrositing Area.[72] The analysis area for historical and potentially active faults and earthquakes also includes a 50-mile buffer around the Solar Micrositing Area.

Based on consultation with DOGAMI, the evaluation of seismic hazards at the site is based, in part, on review of 2021 GIS data available through the Oregon Seismic Hazard Database, release 1 (OSHD-1); use of the United States Geologic Survey (USGS)'s 2023 National Seismic Hazard Model; and DOGAMI's 2023 Landslide Inventory and Risk Reduction of the North and Central Portions of Wasco County. The Luna Butte Fault, as presented in Figure 2 below, is based on review of Oregon's HazVu Statewide Geohazards Viewer.[73]

Seismic and non-seismic hazards at the site are also based on previous geotechnical investigations completed in the vicinity of the site, some of which overlap with the Solar Micrositing Area. These include:

- Initial Geotechnical Investigations Phase I Development, Biglow Canyon Wind Farm, Sherman County, Oregon, prepared by Cornforth Consultants for PGE, October 2006 (Cornforth 2006). This investigation was conducted in large portions of the Solar Micrositing Area.

[70] OAR 345-022-0040, effective April 2, 2025.

[71] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

[72] On April 17, 2024, the certificate holder met with the Department for a pre-amendment conference. Under OAR 345-027-0360, rules which have since been amended, following the pre-amendment conference the certificate holder submitted request to use the proposed Solar Micrositing Area boundary as the basis for the study area boundaries under OAR 345-001-0010(35) and property owner lists under OAR 345-027-0360(1)(f) for the proposed amendment. On May 2, 2024, the Department provided written concurrence authorizing the study area boundaries. BCWAMD4Doc01-00 ODOE Concurrence on OAR 345-027-0360(3) Request 2024-05-02.

[73] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Attachment H-1. To inform the evaluation of the Structural standard, OAR 345-022-0020(4)(b) requires that a certificate holder consult with DOGAMI on the appropriate methods and scope of seismic, geology and soil related hazards. On November 1, 2024, the certificate holder consulted with DOGAMI where DOGAMI requested that the above sources be relied upon for the evaluation of seismic hazard risk within the proposed site.

- Report of Geotechnical Exploration, Biglow Canyon Wind Farm Phase I, northwest Wasco, Oregon, prepared by GN Northern, Inc., Consulting Geotechnical Engineers for Blattner & Sons, Inc., April 2007 (GN Northern 2007). This investigation was conducted in large portions of the Solar Micrositing Area.
- Report of Geotechnical Exploration, Biglow Canyon Wind Farm Phase II, northwest Wasco, Oregon, prepared by GN Northern, Inc., Consulting Geotechnical Engineers for Blattner & Sons, Inc., July 2008 (GN Northern 2008a). This investigation was conducted in an area northwest of the Solar Micrositing Area.
- Report of Geotechnical Exploration, Biglow Canyon Wind Farm Phase III, northwest Wasco, Oregon, prepared by GN Northern, Inc., Consulting Geotechnical Engineers for Blattner & Sons, Inc., November 21, 2008 (GN Northern 2008b). This investigation was conducted in areas west and south of the Solar Micrositing Area.

For the facility components proposed in RFA4, Terracon Consultants, Inc. conducted a preliminary geotechnical investigation of the Solar Micrositing Area.[74] The geotechnical investigation included completion of 51 borings to depths of 5 to 51.5 feet below ground surface (bgs), laboratory testing, field electrical resistivity testing, pile load testing, and engineering analysis. Fifteen of the borings (B-26 through B-40) were located within the Solar Micrositing Area with depths of 17 to 21.5 feet bgs. The geotechnical report identified earthwork considerations; predrilling considerations for the solar array; footing construction considerations for solar arrays, substation, and transmission line structures; shallow foundation and mat/slab foundation considerations; earthwork considerations; and considerations for access roads and parking areas.[75] As described below, the final geotechnical investigation will further address and/or adhere to these recommendations (see Amended Condition 66).

Topography and Geology of the Site

In general, the terrain within the proposed Solar Micrositing Area is relatively flat or gently sloping with moderate slopes along some drainages. Areas with steeper slopes are located along Biglow Canyon and associated drainages that bound the northeastern portion of the area. Slopes range from 0 to 35 percent, with an average of 4.9 percent. Elevations range from 727 to 1,561 feet above mean sea level.[76]

The proposed Solar Micrositing Area is located in the western portion of the Columbia Plateau, which is dominated by geologically young lava flows known as the Columbia River basalts. The bedrock underlying the Solar Micrositing Area is mapped as part of the Frenchman Springs Member of the Wanapum Basalt formation. In borings conducted as part of the geotechnical investigations, bedrock was encountered from 2.5 to 60 feet bgs. Highly to completely weathered bedrock was encountered as very thin layers above the more competent bedrock

[74] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Attachment H-2. November 2024 Preliminary Geotechnical Engineering Report.

[75] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 5.1.

[76] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Sections 3.2.1., 3.2.2.

and as thicker units. The Frenchman Springs Member is approximately 300 to 500 feet thick in the area of the Columbia Plateau.[77]

Surficial deposits generally consist of loess soil, consisting of eolian (wind-deposited) silt to fine sand overlying alluvial soil. Some older "caliche" loess units are semi-consolidated through cementation of calcium carbonate components. The alluvium layer generally consists of unconsolidated silt, sand, and gravel derived from local sources.[78] Soils under the majority of the proposed Solar Micrositing Area have thicknesses greater than 7 feet, but about 20 percent are shallower, with thicknesses of 12 to 40 inches to lithic bedrock.[79] A more detailed discussion of the soils in the micrositing area is provided in Section III.D. *Soil Protection.* Groundwater was only encountered in one test boring during the 2024 geotechnical investigation; however, the water was determined to be seepage from localized perched groundwater and not a static groundwater condition.[80]

Seismic Hazards at the site

Seismic hazards at the site were evaluated using available data from DOGAMI, the Oregon Water Resources Department, USGS, and the Natural Resources Conservation Service (NRCS), as well as previous geotechnical investigations in the proposed Solar Micrositing Area. The seismic-hazard analysis was conducted to identify and characterize potential seismic events, evaluate seismic hazards, and recommend mitigation based on the characteristics of the subsurface soils and design earthquakes.[81] Further information about seismic hazards is provided in the 2024 Preliminary Geotechnical Engineering Report prepared by Terracon. The results of the analysis and geotechnical report are summarized below. The Council finds that the information provided adequately characterizes seismic hazards at the site.

The four sources of earthquakes and seismic activity in Northern Oregon are crustal, intraplate, volcanic, and the Cascadia Subduction Zone. The proposed Solar Micrositing Area is not in a volcano hazard zone. The DOGAMI HazVu map shows the proposed Solar Micrositing Area would expect moderate shaking from a Cascadia Subduction Zone event. Figure 2, below, shows crustal faults within 50 miles of the proposed Solar Micrositing Area. The Quaternary-age faults shown in the figure are considered to be Class A, active faults; Class B faults are considered to be potentially active. There are no faults mapped within the proposed Solar Micrositing Area. The preliminary geotechnical engineering report indicates that the nearest Class A faults include the Luna Butte fault (USGS Fault 579), Columbia Hills Structures (USGS Fault 568), and faults near The Dalles (USGS Fault 580). There are several Class B faults located approximately 12 miles south/southeast of the Solar Micrositing Area around the John Day

[77] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Sections 3.2.2., 3.2.2.1., 3.2.2.2.
[78] Id.
[79] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 3.2.2.3.
[80] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Sections 3.2.2.2.
[81] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.1.

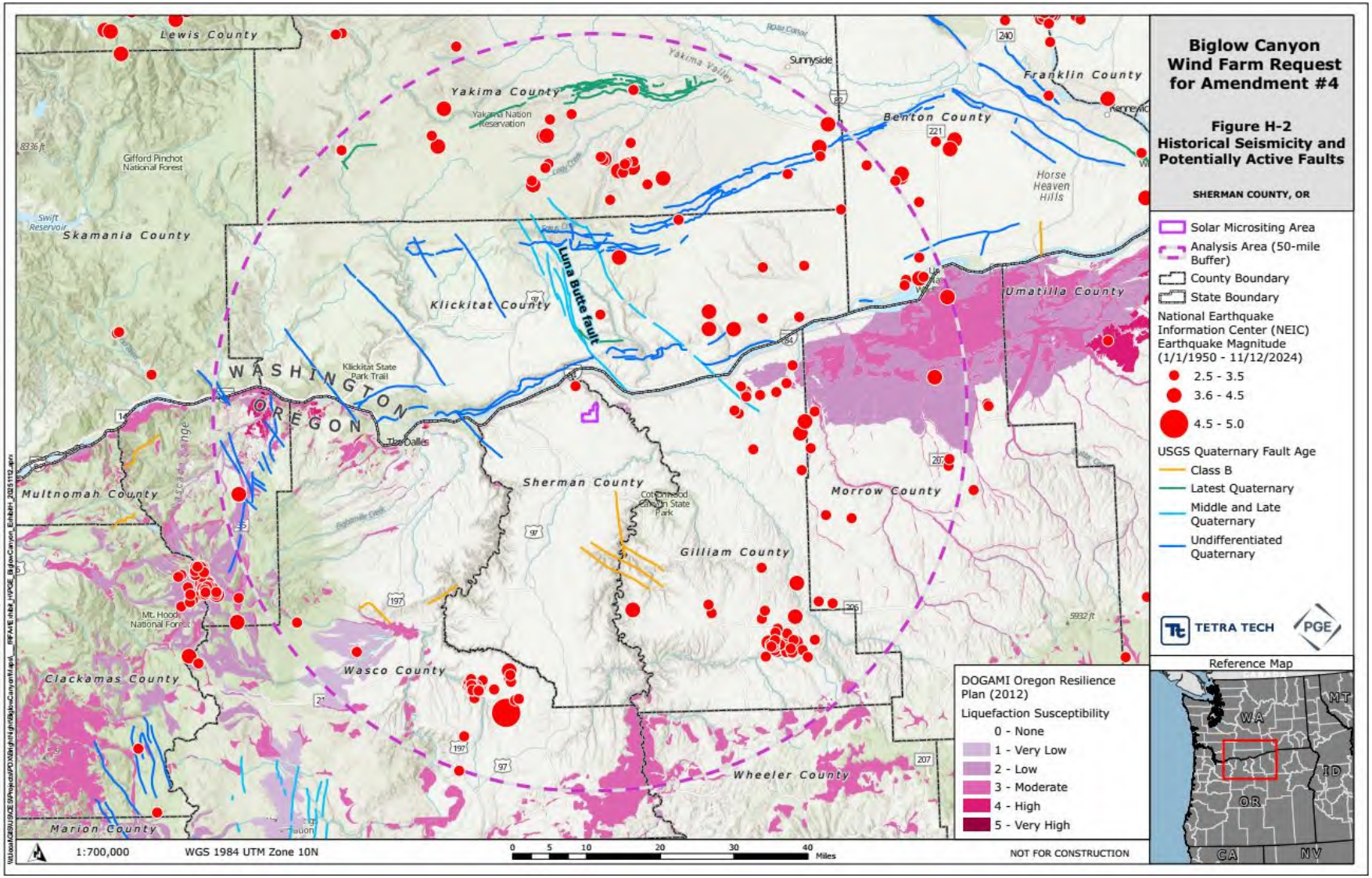
River.[82] The figure also shows recorded earthquakes within approximately 50 miles of the Solar Micrositing Area. One earthquake greater than magnitude 4.5 was recorded approximately 40 miles southwest of the Solar Micrositing Area. The nearest earthquake is magnitude 2.5 to 3.5 and is located less than 5 miles north of the Solar Micrositing Area. Earthquakes between magnitude 3 and 4 are generally equivalent to a Modified Mercalli Intensity III, indicating shaking that is "noticeable indoors but may not be recognized as an earthquake."[83]

Potential seismic hazards from a design seismic event for the Solar Components include seismic shaking or ground motion, fault displacement, instability from landslides or subsurface movement, and adverse effects from groundwater or surface water.

[82] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.1; Attachment H-1.

[83] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.2

Figure 2: Historical Seismicity and Potentially Active Faults



Seismic Shaking or Ground Motion

The DOGAMI HazVu Geohazards mapping tool indicates that the general earthquake hazard in the proposed Solar Micrositing Area is rated strong in most of the Solar Micrositing Area with an area rated very strong in a portion of the southwestern Solar Micrositing Area. The International Building Code and Oregon Structural Specialty Code require new construction to be designed for the highest strength earthquake that has a 2 percent probability of exceedance in 50 years, or a 2,475-year return period. The tool considers seismicity and soil conditions to identify design parameters for a site. Based on the soil properties observed at the site and as described in the exploration logs and results, the preliminary geotechnical engineering report recommended that Seismic Site Class D**,** reflecting the presence of loess and stiff soils at depths up to 20 feet at the site, was appropriate. The USGS's 2023 National Seismic Hazard Tool was used to identify this design event earthquake.[84] As shown in Table 6, below, the design event for the proposed Solar Micrositing Area would be a 6.47 magnitude earthquake with a peak ground acceleration of 0.2386 acceleration from gravity at the bedrock surface.[85]

Table 6: Seismic Design Parameters – Maximum Considered Earthquake

Location	Site Class	Earthquake Magnitude[1]	Peak Horizontal Ground Acceleration	Return Period
Solar Micrositing Area	D	6.47	0.2386g	2,475 years
Solar Micrositing Area	D	6.57	0.1089g	475 years

Notes:
1. Mean over all sources.
Source: BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Table H-2; USGS 2025.

Fault Rupture

There are no active faults within the proposed Solar Micrositing Area. The Luna Butte Fault is located approximately 4.5 miles south/southeast of the proposed Solar Micrositing Area.[86] There is a mapped unnamed fault located about 0.5 to 1 mile north of the Solar Micrositing Area, but the fault is not considered active within recent geologic time.[87] The preliminary geotechnical engineering report recommended that the risk of surface rupture due to ground

[84] BCWAMD4 pRFA Reviewing Agency Comment DOGAMI 2025-05-29. As requested by DOGAMI in their pRFA comments, the certificate holder relied on the 2023 version of the National Seismic Hazard Model to evaluate the probability of earthquakes occurring on previously unmapped or unrecognized faults within or near the site.
[85] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2; 7.2.1, 7.2.2. Probabilistic seismic-hazard disaggregation at 475-year and 2,475-year intervals are shown in Attachments H-3 and H-4, respectively.
[86] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Figure H-2 identifies the location of the Luna Butte Fault based on review of DOGAMI's HazVu data, consistent with the request by DOGAMI during the Nov 2024 consultation. BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10 Attachment H-1.
[87] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.5.

faulting is low based on the available fault information, the depth to bedrock, and the site's proximity to the nearest known faults.[88]

Liquefaction

Liquefaction occurs when saturated and cohesionless soils are subjected to dynamic forces like intense or prolonged ground shaking and temporarily lose their strength and liquefy. There is no evidence of historic liquefaction or alluvial fan deposits within the proposed Solar Micrositing Area. While eolian deposits with a high liquefaction potential are present within the proposed Solar Micrositing Area, because the area has a moderate potential for ground shaking and groundwater is indicated to be at least 100 feet bgs, soil liquefaction is unlikely.[89]

Seismically Induced Landslides

DOGAMI's landslide database does not show any historic landslides within the Solar Micrositing Area or within the immediate vicinity. Landslide hazard within the proposed Solar Micrositing Area is generally low or moderate, but areas of high hazard are present along Biglow Canyon and other steep areas in the northeast portion of Solar Micrositing Area. Landslide hazard is discussed more generally below.[90]

Subsidence

Subsidence is the sudden sinking or gradual downward settling of surface land, often caused by groundwater drawdown, compaction, tectonic movements, mining, or explosive activity. The preliminary geotechnical engineering report indicates that subsidence due to a seismic event is unlikely due to the depth of groundwater at the site and lack of saturated soils. Geologic hazards associated with collapsible soils are discussed more generally below.[91]

<u>Non-seismic Geologic Hazards</u>

Non-seismic geologic hazards that may affect the proposed Solar Micrositing Area include landslides, volcanic eruptions, collapsing soils, and erosion. No soils that are highly susceptible to shrinking and swelling are known to be present in the proposed Solar Micrositing Area.[92]

Landslides

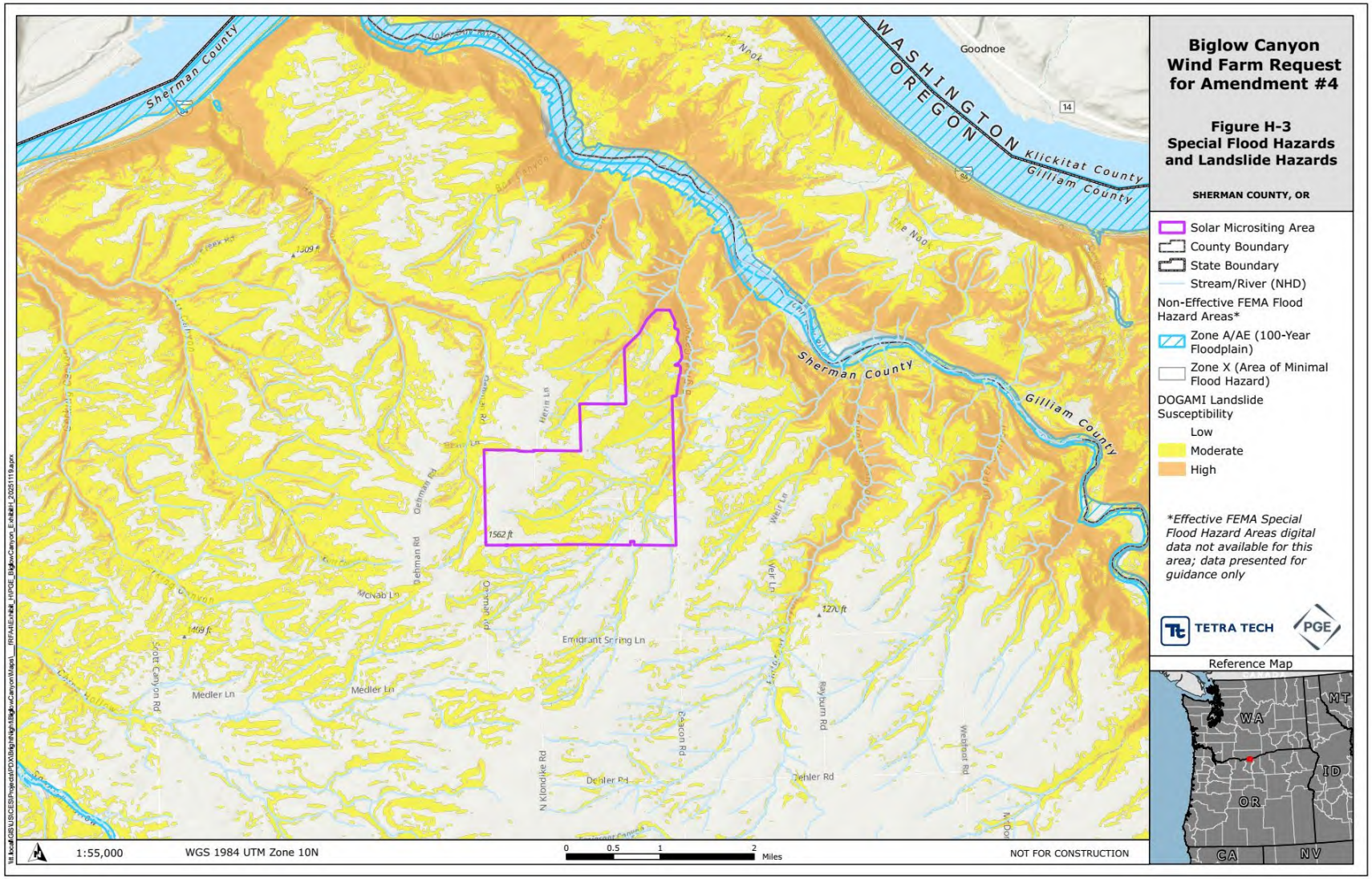
No mapped historic landslides, debris flows, alluvial fans, colluvium or talus are identified in the Oregon Statewide Landslide Database (SLIDO-4.4). As shown in Figure 3, below, most of the

[88] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Attachment H-2.
[89] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.6.
[90] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.7.
[91] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.8.
[92] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.5.

proposed Solar Micrositing area is identified as having low or moderate susceptibility for landslides. Areas of high susceptibility for landslides are present along the drainages/canyons along the eastern and northwestern boundaries of the Solar Micrositing Area.[93] As discussed in Section III.E., *Land Use*, some of these areas are also designated as Hazard Areas under Sherman County's Natural Hazard Overlay Zone.

[93] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.1.

Figure 3: Special Flood Hazards and Landslide Hazards



1

Volcanic Activity

The proposed Solar Micrositing Area is not in a mapped volcano hazard area and no waterways that would be likely to experience pyroclastic flows in the event of an eruption are in the vicinity of the area. The closest volcano to the Solar Micrositing Area is Mount Hood (approximately 50 miles west/southwest). In the event of an eruption, ash fallout could reach the proposed Solar Micrositing Area depending on the size of the eruption and wind conditions. While ash fallout would likely impair facility operations, the presence of the facility components proposed in RFA4 are not expected to aggravate any hazards to public health and safety associated with activity.[94]

Erosion

Erosion can occur when soils are increasingly exposed to wind or water. As discussed in Section III.D. *Soil Protection*, loess soils generally have low resistance to fugitive dust propagation; wind erosion hazard is generally high to very high. The runoff and water erosion hazard is generally moderately low, but some silty soils have higher erosion risk particularly in areas with slopes greater than 15 percent. Erosion potential and available precipitation make site soils especially sensitive to water erosion during winter and spring.[95]

Flooding

As shown in Figure 4, the Federal Emergency Management Agency (FEMA) National Flood Hazard data does not identify flood hazard areas within the proposed Solar Micrositing Area. Seasonal thunderstorms can result in concentrated stormwater runoff and localized flooding in canyons and drainages.[96]

Collapsing Soils

As discussed in Section III.D. *Soil Protection*, soils with low soil compaction resistance, including Lickskillet very stony loam (16D) and Lickskillet-Rock outcrop complex (18E), are present at the site, but are limited to two small soil units along drainages and represent less than one percent of the proposed Solar Micrositing Area.[97]

The preliminary geotechnical engineering report indicates that the semi-stable "honeycomb" structure characteristic of loess soils present throughout the site also makes those soils susceptible to collapse under additional applied load from structures constructed on foundations or saturation due to wetting or ponding. Based on testing, the report estimates that soils could subside by about 1.2 to 3.6 inches if the loess were to remain in place and be

[94] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.2
[95] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.3.
[96] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.4.
[97] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 3.2; Figure I-1.

utilized for support. Collapsible soils were also identified as a geotechnical hazard in the previous Phase I-III geotechnical investigations for the existing wind facility.[98]

Hazard Mitigation

As described above, the site is in a moderate earthquake hazard zone and there is some potential for damaging shaking at the site. The primary risks to human health and safety associated with ground shaking include the failure of electrical equipment and structural failure of O&M buildings or other occupied structures. No other seismic hazards that would require mitigation are likely to occur at the site.

Non-seismic geologic hazards include areas with high potential for landslide, water-erosion, and flooding along Biglow Canyon and other drainages to the north and northeast of the site and the presence throughout the site of loess soils that are susceptible to collapse under loading and saturation. Additional non-structural hazards associated with soil erosion are addressed in Section III.D. *Soil Protection*.

Additional site specific geotechnical work will be completed prior to construction. The scope will be substantially similar to the scope of the 2024 preliminary geotechnical investigation, but will include an increased number of samples and testing locations.[99] To ensure that the additional geotechnical investigation work is completed, consistent with but expanding the scope of the 2024 preliminary geotechnical investigation, the Council amends Condition 66 as follows:

Amended Condition 66 (PRE-SS-01)

a. ~~Before beginning~~ Prior to construction of any component or phase of the solar facility, the certificate holder shall ~~conduct a site-specific~~submit, to the Department for review and comment, a final geotechnical ~~investigation and shall report its findings to the Oregon Department of Geology & Mineral Industries (DOGAMI)~~report that, at a minimum, addresses the recommendations in the in the Preliminary Geotechnical Engineering Report provided as RFA4, Exhibit H, Attachment H-2.

b. The certificate holder shall ~~conduct the geotechnical investigation after consultation with DOGAMI and~~prepare the report in accordance with the Oregon Board of Geologists Examiners ~~guidelines entitled:~~ 2014 Guidelines for Preparing Engineering Geolog~~y~~ic Reports ~~and Site-Specific Seismic Hazard Report~~.

c. The Department may utilize a third-party consultant in the review of the report. The certificate holder shall obtain concurrence from the Department that all comments have been adequately addressed before beginning construction.
[Final Order on ASC, Condition 66; AMD4]

[98] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.6.

[99] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 5.2 includes a description of the scope and schedule of additional geotechnical investigation work that must be done before construction, consistent with OAR 345-022-0020(4)(c).

Existing Conditions 113 and 114 require the certificate holder to notify the Department, the State Building Codes Division, and DOGAMI if the site investigation or other work indicated that geologic conditions at the site were significantly different than those described in the ASC or If specific geologic features are discovered. These conditions correspond to the mandatory conditions currently required under OAR 345-025-0006(13) and (14). The Council readopts these conditions, as applicable to the facility components proposed in RFA4:

Amended Condition 113 (PRE-SS-02):
~~(113) OAR 345-027-0020(13):~~ The certificate holder shall notify the Department, the State Building Codes Division and the Department of Geology and Mineral Industries promptly if ~~site~~ investigations or trenching in the Solar Micrositing Area reveal that conditions in the foundation rocks differ significantly from those described in ~~the application for a site certificate~~ Request for Amendment 4. After the Department receives the notice, the Council may require the certificate holder to consult with the Department of Geology and Mineral Industries and the Building Codes Division and to propose mitigation actions.
[OAR 345-027-0020(13); Final Order on ASC, Condition 113, AMD3, AMD4]

Amended Condition 114 (PRE-SS-03):
~~(114) OAR 345-027-0020(14):~~ The certificate holder shall notify the Department, the State Building Codes Division and the Department of Geology and Mineral Industries promptly if shear zones, artesian aquifers, deformations or clastic dikes are found at or in the vicinity of the ~~site~~ Solar Micrositing Area.
[OAR 345-027-0020(14); Final Order on ASC, Condition 114, AMD3, AMD4]

Existing Site Certificate Condition 67 required the certificate holder to construct all components of the existing facility in compliance with applicable codes and design procedures. In RFA4, the certificate holder represents that the facility components proposed in RFA4 would be designed to withstand the maximum risk-based earthquake in accordance with the latest version of the International Building Code and the Oregon Structural Safety Code in effect at the time of construction. Substation equipment would meet all requirements in the latest version of the Institute of Electrical and Electronics Engineers (IEEE) 693-2018 which establishes standards to ensure equipment installed in substations can withstand expected seismic events. [100] Based on the certificate holder's design and code compliance representations, the Council amends this condition as presented below:

Amended Condition 67 (CON-SS-01):
~~(67)~~ The certificate holder shall design and construct the solar facility in accordance with the applicable requirements ~~set forth by the State of Oregon's~~ of the International Building Code, Oregon Structural Specialty Code, ~~Division~~ and any other applicable codes and design procedures in effect at the time of construction.

[100] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.4, 7.2.9.

[Final Order on ASC, Condition 67, AMD4]

Existing Condition 112 requires the certificate holder to avoid dangers to human safety associated with seismic hazards affecting the site.[101] This condition is applicable to the facility components proposed in RFA4, with additional changes to reflect updates to the mandatory condition:

Amended Condition 112 (CON-SS-02)
~~(112) OAR 345-027-0020(12):~~ The certificate holder must design, engineer and construct the solar facility to avoid dangers to human safety and the environment presented by seismic hazards affecting the site that are expected to result from all maximum probable seismic events. As used in this ~~rule~~ condition "seismic hazard" includes ground shaking, ground failure, landslide, liquefaction triggering and consequences (including flow failure, settlement buoyancy, and lateral spreading), ~~tsunami inundation, fault displacement, and subsidence~~ cyclic softening of clays and silts, fault rupture, directivity effects and soil-structure interaction.
[OAR 345-027-0020(12); Final Order on ASC, Condition 112; AMD4]

The Council finds that subject to the amended conditions above, the certificate holder can design, engineer, and construct the facility components proposed in RFA4 to avoid dangers to human safety and the environment presented by seismic hazards affecting the site.

Significant geologic hazard areas are present along the steep slopes of Biglow Canyon and its tributaries where landslide and erosion hazard are severe and flash flooding can potentially occur. As discussed in Section III.E. *Land Use*, these areas are also identified as being in the County's Natural Hazard Combining Zone, and any development in these areas would need to be addressed through the Conditional Use Review process. The certificate holder represents that areas of steep slope would be avoided or that remedial measures to improve slope stability will be implemented.[102]

The 2024 preliminary geotechnical engineering report concluded that, due to the presence of collapsible soils, soil improvement would likely be required for proposed structures that would be supported by shallow or mat foundations to reduce total and differential settlements from soil subsidence to acceptable levels. Because soils at the site may also be prone to collapse when saturated, site drainage will be designed to prevent ponding or other concentration of surface water flows, especially near structures. Development over existing drainage ways will be avoided wherever possible. If development over existing drainage ways cannot be avoided, rerouting of surface water will also be avoided to not induce potential subsidence.[103]

[101] Mandatory condition OAR 345-025-0006(12).
[102] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 7.2.4, 7.2.9, 8.1, 11
[103] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.6.

Existing Condition 68 requires the certificate holder to design, engineer and construct the facility to avoid dangers to human safety presented by non-seismic hazards. Considering the severe hazard rating, the restrictions in the County Zoning Ordinance, and the potential for harm to waterways and habitat that could result from severe erosion or landslide issues in Biglow Canyon and its tributaries, as well as the certificate holder's representations that these hazard areas can be avoided, the Council amends the condition to prohibit development within Sherman County's Natural Hazard Combining Zone where slopes are greater than 20 percent:

> **Amended Condition 68 (CON-SS-03)**
> ~~(68)~~ The certificate holder shall design, engineer and construct the solar facility to avoid dangers to human safety presented by non-seismic hazards~~. As used in this condition, "non-seismic hazards",~~ including, but not limited to, ~~settlement,~~ landslides, flooding~~, and~~ erosion, and collapsible soils. ~~No g~~Ground disturbing activities are not permitted in areas within Sherman County's Natural Hazard Combining Zone where slopes exceed 20 percent.
> [Final Order on AMD4]

Subject to the amended conditions described above, the Council finds that the certificate holder can design, engineer and construct the facility components proposed in RFA4 to avoid dangers to human safety and the environment presented by the non-seismic geologic hazards identified at the site.

III.C.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the amended site certificate conditions described above, the Council finds the certificate holder has adequately characterized potential seismic and geologic hazards in the Solar Micrositing Area and can design, engineer and construct the facility components proposed in RFA4 to avoid dangers to human safety and the environment presented by those hazards.

III.D. SOIL PROTECTION: OAR 345-022-0022

> *To issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are not likely to result in a significant adverse impact to soils including, but not limited to, erosion and chemical factors such as salt deposition from cooling towers, land application of liquid effluent, and chemical spills.*
>
> ** * * * * [104]*

[104] OAR 345-022-0040, effective April 2, 2025. The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

III.D.1. Findings of Fact

The analysis area for the Soil Protection standard is the area within the proposed Solar Micrositing Area. Near-surface soils and their characteristics, within the analysis area, were identified based on data from the NRCS Soil Survey Geographic (SSURGO) Database.[105]

As shown in Figure 4 and Table 7, below, approximately 78.6 percent of the Solar Micrositing Area is comprised of Walla Walla silt loams, which are deep soils made up of loess over fractured basalt. Approximately 20.5 percent of the Solar Micrositing Area is comprised of Anderly silt loams which have a similar formation setting as Walla Walla silt loams but are much shallower soils.[106] These silt loam soils are also productive agricultural soils, and most areas within the proposed Solar Micrositing Area are currently used for dryland wheat cultivation and 25 acres for irrigated row crops.[107] Walla Walla silt loam soils are considered to be especially productive, and where slopes are less than seven percent are considered to be Class II soils under the NRCS's soil capability classification system regardless of whether the soils are irrigated or not. Approximately 40.4 percent of the site is comprised of these high-value farmland (HVF) soils. Other silt loam soils at the site with slopes less than 15 percent are considered Class III soils under the NRCS classification system.[108] Smaller areas where agriculture is not feasible due to the presence of steep slopes, drainages, shallow soils or other factors are not cultivated. Some sections of the analysis area are planted into a grassland mix.

The remaining less than percent of the Solar Micrositing area is comprised of Lickskillet very stony loam, Lickskillet-Rock outcrop complex, and Nansene-Rock outcrop complex. Like other soils at the site, these soils also have moderate to severe erosion potential and the Lickskillet soils also have low resistance to soil compaction.[109] Within the site boundary, these soils are considered Class VII soils under the NRCS classification system and are generally considered to be non-arable.

[105] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 3.1.

[106] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 3.1, Table I-1.

[107] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 4.0; BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.2, Figure K-4.

[108] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.3.2, Figure K-6, K-7.

[109] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 3.1, 3.2, Table I-1.

Figure 4: Soils within the RFA4 Analysis Area

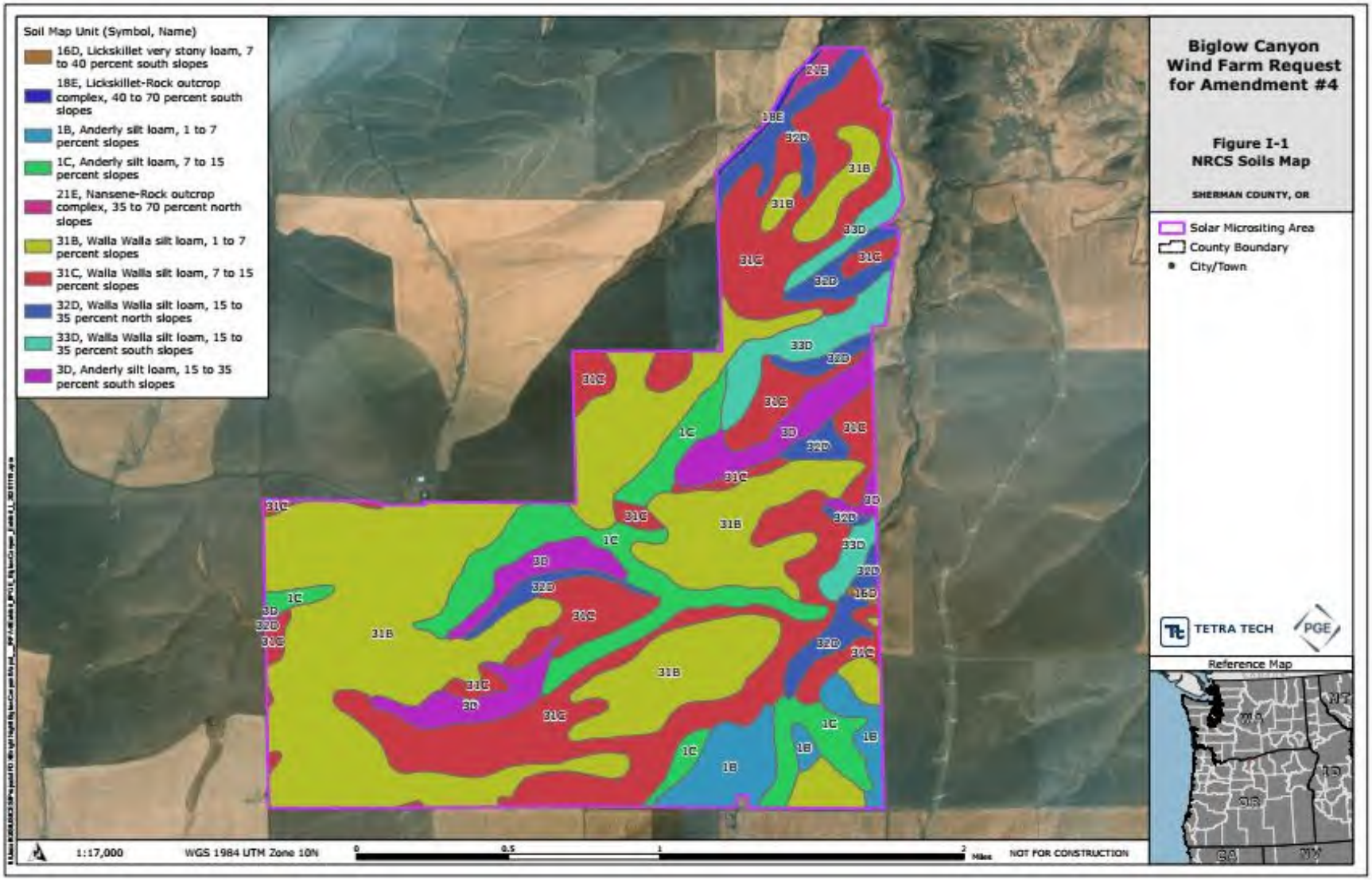


Table 7: General Description of Mapped Soil Units in the Analysis Area

ID	Soil Unit	Approximate Thickness	Formation Setting	Area within Solar Micrositing Area		K-factor[1]	Wind Erodibility Group[2]	Fugitive Dust Resistance	Offroad, Off trail[4]	Road, Trail[5]	Soil Compaction Resistance
				Acres	Percent						
1B	Anderly silt loam, 1 to 7 percent slopes	20 to 40 inches to lithic bedrock	Loess over fractured basalt	79	4.1	0.43	5	Low	Slight	Moderate	Moderate
1C	Anderly silt loam, 7 to 15 percent slopes	20 to 40 inches to lithic bedrock	Loess over fractured basalt	196	10.2	0.43	5	Low	Moderate	Severe	Moderate
3D	Anderly silt loam, 15 to 35 percent south slopes	20 to 40 inches to lithic bedrock	Loess over fractured basalt	119	6.2	0.43	5	Low	Moderate	Severe	Moderate
16D	Lickskillet very stony loam, 7 to 40 percent south slopes	12 to 20 inches to lithic bedrock	Loess mixed w/colluvium from basalt	4	0.1	0.2	7	Moderate	Moderate	Moderate	Low
18E	Lickskillet-Rock outcrop complex, 40 to 70 percent south slopes	12 to 20 inches to lithic bedrock	Loess mixed w/colluvium from basalt	8	0.4	0.2	7	Moderate	Moderate	Severe	Low
21E	Nansene-Rock outcrop complex, 35 to 70 percent north slopes	40 to 60 inches to lithic bedrock	Loess over fractured basalt	8	0.4	0.37	5	Low	Moderate	Severe	Moderate
31B	Walla Walla silt loam, 1 to 7 percent slopes	Greater than 7 feet	Loess over fractured basalt	777	40.4	0.49	5	Low	Slight	Moderate	Moderate
31C	Walla Walla silt loam, 7 to 15 percent slopes	Greater than 7 feet	Loess over fractured basalt	539	28.0	0.49	5	Low	Moderate	Severe	Moderate
32D	Walla Walla silt loam, 15 to 35 percent north slopes	Greater than 7 feet	Loess over fractured basalt	115	6.0	0.49	5	Low	Moderate	Severe	Moderate
33D	Walla Walla silt loam, 15 to 35 percent south slopes	Greater than 7 feet	Loess over fractured basalt	81	4.2	0.49	5	Low	Moderate	Severe	Moderate

1. K-factor: Erosion factor K indicates the susceptibility of soil to sheet and rill erosion by water.
2. Wind Erodibility Group: A wind erodibility group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.
3. Fugitive Dust Resistance: This rating indicates the vulnerability of soil for eroded soil particles to go into suspension upon disturbance. Rating class terms indicate the extent to which all of the soil features affect the formation of dust. "Low resistance" indicates that the soil has features that are very favorable for the formation of dust. "Moderate resistance" indicates that the soil has features that are favorable for dust formation. "High resistance" indicates that the soil has features that are unfavorable for dust formation.6. Soil Compaction Resistance: This rating indicates the ability of the soil to resist compaction. “High resistance" indicates that the soil has features that are very favorable to resisting compaction. "Moderate resistance" indicates that the soil has features that are favorable to resisting compaction. "Low resistance" indicates that the soil has one or more features that favor the formation of a compacted layer.
4. Hazard for Erosion (Off-road, Off-trail): This rating indicates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope, soil erosion factor K, and an index of rainfall erosivity (R). A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.
5. Hazard for Erosion (Road, Trail): The ratings in this interpretation indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments. A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Potential Impacts to Soils

Construction of the facility components proposed in RFA4 has the potential to adversely impact soils within the proposed Solar Micrositing Area. Construction activities including clearing and grubbing vegetation around facility components and conducting earthwork such as grading, excavating, and filling can disturb soils and increase the potential for erosion. The operation of heavy machinery and equipment can compact soils, which can reduce water infiltration and impede plant growth. Vehicle and equipment fueling and maintenance activities, as well as the use and storage of fuels and other chemicals, increase the risk of spills and soil contamination.[110] As described above, sensitive soils are present at the site and may be particularly susceptible to impacts.

The facility components proposed in RFA4 would occupy up to approximately 1,445 acres within the 1,924-acre Solar Micrositing Area. While the entire occupied area is considered to be a permanent disturbance, existing vegetation and/or root systems will be preserved to the extent practicable, however, vegetation will be cleared around solar arrays, temporary construction areas, collector line trenches, the battery energy storage system foundations, collector circuits, substation, construction areas, and new access roads. Significant earthwork will also likely be required for the installation of roads and foundations. The certificate holder expects grading to result in a balanced cut-and-fill quantity of earthwork.[111]

Estimated permanent and temporary disturbance associated with construction and operation of the facility components proposed in RFA4 are presented in Table 8 below.

Table 8: Permanent and Temporary Disturbances in the Solar Micrositing Area

Component	Description	Permanent (Acres)	Temporary (Acres)
Solar Area	Permanent disturbance includes areas and infrastructure inside the perimeter fence for the Solar Arrays. Temporary disturbance is for laydown areas, collector lines, and fence line construction area. Assumes a 6-foot temporary disturbance corridor on the outer side of the fence.	1,445.0	9.6
Gen-Tie Line (230 kV)	Permanent disturbance assumes 2-foot diameter area for poles. Temporary disturbance assumes a 150-foot temporary disturbance corridor (final corridor pending design) plus 20x20-foot pulling/tensioning areas (temporary disturbance).	<0.1	1.8
Road Crossings	Permanent disturbance for road crossings outside the solar area fenceline. Assumes a 16-foot road width, with additional 20-foot width temporary disturbance for construction.	0.3	0.8
Underground Collector Lines	Permanent disturbance includes a total of 52 miles of underground collector lines and a 50-foot-wide impact corridor. These disturbances would be in the solar array fenceline but would be stabilized and revegetated following construction.	315.2	-

[110] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.1.1.

[111] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.1.1., 6.1.

Table 8: Permanent and Temporary Disturbances in the Solar Micrositing Area

Component	Description	Permanent (Acres)	Temporary (Acres)
BESS	Permanent disturbance includes the area of the BESS yard.	5.0	-
O&M Building	Permanent disturbance for parking area, three 40-foot storage containers for housing spare parts and maintenance equipment, one 40x15-foot control building inside the substation, and one 60x12-foot office structure with electricity, internet, water facilities. Temporary disturbance is for construction of the building and assumes a 25-foot temporary disturbance corridor located around the permanent disturbance footprint.	0.01	0.04
Laydown Area	Temporary disturbance for the laydown area for construction. Additional temporary construction areas may be used within the solar array fencelines.	-	8.7
Substation	Permanent disturbance includes all areas for the proposed collector substation, which is within the solar array fencelines.	4.2	-
	TOTAL	**1,445**	**21**
Source: BCWAMD4Doc21-01 RFA Div27 2025-12-10, Table 2.			

Erosion and Compaction

As described in Table 8 above, the silt loam soils underlying the majority of the site have moderate potential for wind erosion and low fugitive dust resistance, which indicates the need to address potential dust generation by onsite traffic during construction and operation.

The soils also have moderate permeability with slow to rapid runoff potential. The soils are also associated with a moderate to severe hazard for water erosion, depending on slope, particularly when disturbed and unvegetated. At least 55.4 percent of soils within the proposed Solar Micrositing Area have a severe hazard for erosion when used as unsurfaced roads or trails.[112] As shown in Figure 5, these soils are concentrated in the eastern portion of the proposed solar micrositing area around Biglow Canyon and its tributaries. As discussed in Section IV.B. *Removal-Fill Law*, the wetland delineation surveys conducted at the site also identified wetlands and waterways considered to be waters of the state in this portion of the proposed Solar Micrositing Area.

As shown on Figure 5, below, less than one percent of the soils are identified as having low compaction resistance in the NRCS Soils database; however, the preliminary geotechnical engineering report provided in support of Exhibit H notes that the loess soils present are also susceptible to collapse under additional applied load or saturation due to wetting or ponding.[113]

[112] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 3.2.2.3; BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 3.2, Table I-1.

[113] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 3.2.2.3; BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 3.2, Table I-1.

Figure 5: Sensitive Soils within the Solar Micrositing Area



Erosion and Compaction Best Management Practices

The Council previously imposed several conditions to address the potential for erosion and other soil impacts at the site during the construction and operation of the wind facility. These conditions required the certificate holder to conduct all construction work in compliance with an Erosion and Sediment Control Plan (ESCP) that satisfies the requirements of the Oregon Department of Environmental Quality's National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge General Permit 1200-C (Condition 26), to minimize open trenches and disturbance areas (Condition 31), and to install and maintain Best Management Practices (BMPs) to conserve topsoil and limit wind- and water-borne erosion and during construction (Conditions 32 to 35).

The certificate holder has incorporated all BMPs related to revegetation, soil management, dust control, stormwater management, and noxious weed control into a draft Comprehensive Solar Revegetation and Soil Management Plan (Exhibit I, Attachment I-2.) A draft plan with additional revisions imposed by the Council is included as Attachment D to this Order.

A draft ESCP was incorporated into Appendix C of the Comprehensive Solar Revegetation and Soil Management Plan, but the ESCP will be updated by the construction contractor according to the final layout and design of the facility components proposed in RFA4 and any additional requirements imposed by DEQ. The final ESCP will include any procedures and BMPs necessary to meet local erosion and sediment control requirements or stormwater management requirements.[114] Specific BMPs identified in the Plan include:

- The installation of stabilized construction entrances and exits where construction vehicles move from newly constructed roads or disturbed areas to paved roads. Stabilized construction entrances and exits will be inspected and maintained during operation of the facility components proposed in RFA4.

- The preservation of existing vegetation and/or root systems, to the extent practicable.

- The installation of silt fencing throughout the construction area as a perimeter control, material stockpile perimeter control, and on the contour downgradient of excavations.

- The use of straw wattles to decrease the velocity of sheet flow stormwater to prevent erosion along the downgradient edge of access roads adjacent to slopes or sensitive areas.

- The use of mulch, stabilization matting, soil binders, and tackifiers to stabilize areas of soil disturbance quickly and during reseeding.

[114] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.1.1.

- The establishment of dedicated concrete washout areas near foundation construction locations to keep concrete washout water from concrete chutes and trucks in a localized area.

- Scheduling construction activities in the dry season when soils are less susceptible to compaction, to the extent possible.[115]

The ESCP establishes stormwater management BMPs intended to ensure that engineered access roads and drainages would direct stormwater runoff away from structures and into drainage ditches and culverts. This will also minimize risks associated with flooding and soil subsidence.[116]

The ESCP also establishes measures that would be used to stockpile and protect topsoil removed from areas where grading or excavation is required for use in site reclamation and restoration.[117]

The Comprehensive Solar Revegetation and Soil Management Plan also includes provisions to limit the propagation of fugitive dust during construction, including by limiting construction traffic to designated roads with improved surfaces to the extent possible and applying water or stabilizers to roads and disturbed soils, and implementing trackout control at site exits. Appendix D of the plan contains the dust monitoring and reporting methods that will be used to ensure compliance with the requirements of OAR chapter 340, division 208.[118]

Stormwater management infrastructure and erosion control features installed during construction will be left in place during operation as needed to manage stormwater and prevent discharges.[119]

Site Reclamation and Revegetation

The Council previously imposed Conditions 29, 35, 62, and 111, which required the certificate holder to restore and revegetate disturbed areas following construction. The Council deletes Conditions 35 and 62; and maintains Condition 29 and 111 as applicable to the wind and solar facilities, respectively.

Appendix E of the Comprehensive Solar Revegetation and Soil Management Plan provides soil monitoring methods that would be used to identify whether construction activities resulted in

[115] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 6.1; BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.3.
[116] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 8.4.
[117] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.2.2, 6.1.
[118] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.1.1; 6.1; Attachment I-2; BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 5.2.4.3.
[119] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.2.2.

significant compaction of soils. Pre- and post-construction field measurements of subsurface soil compaction would be collected for all areas where significant vegetation removal or grading activities occur. The certificate holder would also be required to conduct pre-disturbance surveys of non-agricultural areas that would fall outside of the solar array fenceline to determine baseline vegetation conditions prior to construction.

Appendix F of the Comprehensive Solar Revegetation and Soil Management Plan described above describes the methods that will be used to stabilize disturbed areas following construction activities. This may include the use of straw, hydromulch, or tackifier, or planting areas with winter wheat or sterile triticale.[120] Disturbed areas would then be revegetated using approved seed mix and methods as soon as is practicable following construction. The seed mix would include native grasses and forbs. When required, the seed will be applied with mulch or stabilization matting to protect the growing grass seed.[121]

The criteria for when revegetation would be considered successful depends on whether the disturbed area would be located inside or outside of the solar array fenceline and whether or not the land is currently used for agriculture. Temporary disturbance areas that are currently used for agriculture would be considered to be restored after the land is returned to farm operations and landowners provide written confirmation that they are satisfied that any impacts to soil productivity have been addressed. In non-agricultural areas outside the solar array area, the certificate holder would be required to make reasonable efforts to restore vegetation and soils to their pre-disturbance condition. In the area within and extending 10 feet from the solar array fenceline, the certificate holder will establish and maintain uniform (i.e., evenly distributed, without large bare areas) perennial, non-invasive vegetation that provides 70 percent or more cover.[122]

Vegetation Management and Weed Control

The management of noxious weeds and other undesirable plants is important for maintaining long-term soil health at the site and ensuring the site can be returned to a useful, non-hazardous, condition after the facility components proposed in RFA4 are decommissioned. The treatment methods, monitoring procedures, and management objectives that will be used to control the introduction and spread of weeds have been incorporated into Appendix G of the Comprehensive Solar Revegetation and Soil Management Plan.

Weed Control BMPs required under the plan include flagging and treating areas of noxious weed infestations prior to construction, cleaning vehicles and equipment prior to ground disturbance, strategic use of herbicide, mechanical removal and revegetation of disturbed soils. Additional steps may include monitoring areas of disturbance for noxious weeds after

[120] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.1.1, Attachment I-2.
[121] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 6.1.
[122] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Attachment I-2, Appendix F.

construction, training construction and operations staff and limiting vehicle traffic in noxious weed-infested areas.[123]

The certificate holder currently contracts with the Sherman County Weed Control District to inspect and treat weeds at the wind facility, and there have been no compliance issues associated with weed control at the site..[124] Prior to and during construction and operation of the facility components proposed in RFA4, the certificate holder will be required to hire a Weed Control Contractor responsible for performing weed control in accordance with the Comprehensive Solar Revegetation and Soil Management Plan under Soil Protection Conditions 1 through 3.[125]

In addition to weed management, the certificate holder represents that vegetation under the solar panels will be managed to minimize fire risk and erosion by maintaining low growing vegetation, the certificate holder did not provide specific management standards. The Council added standards to the draft plan based on the applicable provisions of Oregon Fire Code Section 1205. The provisions would require the certificate holder to maintain a clear, brush-free area of 10 feet from both the interior and exterior perimeter fence of all solar array areas (20-feet total). Within the perimeter fenceline, extending from the 10-foot clear, brush free area, vegetation would be maintained at a height of no more than 4 to 8 inches during the dry season (June to October) and no more than 12 inches outside the dry season (November to May) within and adjacent to the solar modules and associated electrical equipment, unless otherwise specified by the local fire official. A minimum 10-foot clear, brush free area would also be required around all BESS components, substations, and other high-voltage, electrical installations, unless otherwise specified by the local fire official or applicable safety code. Activities necessary to maintain the area as clear, brush free shall be based on consultation with local fire code officials, prior to construction, as established in the draft Construction Wildfire Mitigation Plan and the Comprehensive Solar Revegetation and Soil Management Plan under Soil Protection Conditions 1 through 3.

The Council finds that the methods, monitoring protocols, and reporting requirements related to revegetation, soil management, dust control, stormwater management, proposed by the certificate holder and additional requirements imposed by the Council in the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to this Order, demonstrate that the facility components proposed in RFA4 can be designed, constructed, and operated, in a manner that are not likely to result in a significant adverse

[123] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Attachment I-2, Appendix G; BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 5.2.4.3.

[125] BCWAMD4Doc22-00. Proposed Order on AMD4 2025-12-16. Attachment D, Table A-2, pg. A-3. The draft Comprehensive Solar Revegetation and Soil Management Plan includes additional experience requirements for the Weed Control Contractor.

[125] BCWAMD4Doc22-00. Proposed Order on AMD4 2025-12-16. Attachment D, Table A-2, pg. A-3. The draft Comprehensive Solar Revegetation and Soil Management Plan includes additional experience requirements for the Weed Control Contractor.

impact to soils from erosion, compaction, or topsoil loss. To ensure the certificate holder finalizes and implements the plan, the Council imposes the following conditions:

Soil Protection Condition 1 (PRE-SP-01):
Before beginning construction of any component or phase of the solar facility, the certificate holder shall:

a. Finalize the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to the Final Order on RFA4 based on final facility design and the approved National Pollutant Discharge Elimination System (NPDES) General Permit 1200-C for the facility. The final Comprehensive Solar Revegetation and Soil Management Plan shall be submitted to the Department for review and approval.
b. Complete all items included in the Pre-construction Compliance Checklist in the final plan, as applicable to the facility components or phase.

[Final Order on AMD4]

Soil Protection Condition 2 (CON-SP-02)
During and following construction of any component or phase of the solar facility, the certificate holder shall conduct all work in compliance with the Comprehensive Solar Revegetation and Soil Management Plan required under Condition PRE-SP-01.
[Final Order on AMD4]

Soil Protection Condition 3 (OPR-SP-06)
During operation of the solar facility, the certificate holder shall monitor and maintain vegetation and any necessary erosion controls in compliance with the Comprehensive Solar Revegetation and Soil Management Plan required under Condition PRE-SP-01, as amended. The certificate holder shall include any reports required by the plan in the annual facility operations reports required under Condition OPR-OE-01.
[Final Order on AMD4]

Because the provisions of the draft Comprehensive Solar Revegetation and Soil Management Plan effectively replace their requirements, the Council deletes existing Conditions 26, 27, and 31 to 35. The Council retains existing Conditions 28 and 30 as they continue to be applicable to the operating facility. Because it applied to the construction of the wind facility, Condition 62 is deleted.

Amended Condition 28 (OPR-SP-03)
~~(28)~~ The certificate holder shall cover turbine pad areas with gravel or other non-erosive material immediately following exposure ~~during construction~~ and shall maintain the pad area covering during operation of the facility.
[Final Order on AMD4]

Amended Condition 29 (OPR-SP-04)

~~(29) During construction of the facility, the certificate holder shall restore areas that are temporarily disturbed in accordance with the methods, monitoring procedures and success criteria described in the Revegetation Plan that is incorporated in this order as Attachment B and as that Revegetation Plan may be amended from time to time.~~ During operation of the wind energy facility, the certificate holder shall restore areas that are temporarily disturbed during facility maintenance or repairs according to the ~~same~~ methods and monitoring procedures in the Revegetation Plan included as Attachment B to the Final Order on the ASC, as amended.
[Final Order on AMD4]

Amended Condition 30 (OPR-SP-05)
~~(30)~~ During operation of the wind energy facility, the certificate holder shall routinely inspect and maintain all roads, pads and trenched areas and, as necessary, maintain or repair erosion control measures.
[Final Order on AMD4]

Deleted Condition 62
~~The certificate holder shall restore areas that are temporarily disturbed during construction in accordance with the methods, monitoring procedures and success criteria set forth in the Revegetation Plan that is incorporated in the Final Order on Amendment #2 as Attachment B and as may be amended from time to time.~~
[Final Order on AMD4]

The Council also retains the mandatory condition established under Site Certificate Condition 111, as applicable to the construction of the proposed solar facility:

Amended Condition 111 (CON-SP-01)
~~OAR 345-027-0020(11):~~ Upon completion of construction of the solar facility, the certificate holder shall restore vegetation to the extent practicable and shall landscape all areas disturbed by construction in a manner compatible with the surroundings and proposed use. Upon completion of construction, the certificate holder shall remove all temporary structures not required for facility operation and dispose of all timber, brush, refuse and flammable or combustible material resulting from clearing of land and construction of the facility.
[OAR 345-027-0020(11); Final Order ASC, Condition 11; AMD3, AMD4]

Once revegetation is complete, typical operation and maintenance activities are not expected to disturb significant areas of soil; however, runoff could be generated if significant volumes of water are used to wash solar modules or other equipment. The certificate holder represents that any water used for module washing is expected to evaporate or infiltrate into the ground. The Council previously imposed Site Certificate Condition 88 requiring the certificate holder to ensure that wind turbine blade washing avoid causing run-off and requiring the use of non-

corrosive, biodegradable and phosphate-free cleaners.[126] To ensure that solar panel washing adheres to the same measures imposed for blade washing activities, the Council amends Condition 88 as follows:

> **Amended Site Certificate Condition 88 (OPR-SP-01)**
> During operation of the facility, the certificate holder may engage in wind turbine blade and solar panel washing activities but shall ensure that these activities do not cause runoff of Washwater from the site or discharges to surface waters, storm sewers or dry wells. The certificate holder shall not use acids, bases or metal brighteners with the wash water. The certificate may use biodegradable, phosphate-free cleaners sparingly. [Final Order on ASC, Condition 88; AMD2, AMD4]

Spills and Soil Contamination

As explained in Section I.D., *Requested Amendment*, above, up to three 1,000 gallon temporary above-ground fuel tanks would be installed in the temporary construction yards during construction. It is anticipated that each diesel tank will be filled once per month or as needed. Each fuel tank would be required to be equipped with secondary containment in accordance with 40 CFR §112.7(c). The certificate holder anticipates that the majority of fuel containers would have self-contained secondary containment (e.g., double-walled containers) that provide capacity for the entire container plus precipitation, but in some cases smaller containers (e.g., drums) would be placed in a constructed secondary containment area that is impervious and is diked or otherwise contained to provide the required fuel and precipitation capacity.[127]

No substantial quantities of lubricating oils, hydraulic fluid for construction equipment, or other hazardous materials would be stored on-site during construction. Lubricating oil or hydraulic fluids for construction equipment will be brought in on an as-needed basis for equipment maintenance by a licensed contractor using a specialized vehicle, and waste oils removed by the same maintenance contractor. As described in more detail below, transformers would be filled with cooling oils during operations, but the certificate holder represents that the oil would arrive on an as-needed basis and transferred into the receiving components, so that none would be stored on-site.[128]

The certificate holder represents that secondary containment and refueling procedures for on-site fuel storage will follow a Spill Prevention, Control, and Countermeasures (SPCC) Plan and proposed a new condition requiring the SPCC to be developed and implemented, and submitted to the Department prior to the *operation* of the facility components proposed in

[126] BCWAMD4Doc21-17 RFA Exhibit W Waste Minimization 2025-12-10, Section 2.2.3
[127] BCWAMD4Doc21-04 RFA4 Exhibit I 2025-12-10, Section 4.1.4.1; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 3.1.
[128] BCWAMD4Doc21-04 RFA4 Exhibit I 2025-12-10, Section 4.1.4.1.

RFA4.[129] The certificate holder does not explain why the SPCC Plan would not be available prior to operations or whether a separate condition is intended to apply to the fuel storage and refueling activities. In accordance with the certificate holder's representation that secondary containment and refueling procedures for on-site fuel storage during construction will follow a SPCC Plan, the Council adopts new conditions requiring the SPCC plan to be provided prior to beginning construction of the solar components and to implement the SPCC plan during construction, as shown below:

Soil Protection Condition 4 (PRE-SP-02)
Prior to beginning construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department, a Construction Spill Prevention, Control and Countermeasure (SPCC) Plan that complies with the requirement of 40 CFR 112.
[Final Order on AMD4]

Soil Protection Condition 5 (CON-SP-03):
During construction of the solar facility, the certificate holder and all onsite contractors and personnel shall adhere to the requirements of the SPCC Plan approved under Condition PRE-SP-02. Updates or revisions to the Plan shall be submitted to the Department prior to implementation.
[Final Order on AMD4]

During operations, the substation GSU transformer and ISU transformers will contain oil for cooling purposes. Transformers typically use mineral oil or seed oil that is considered nontoxic. Federal regulations prohibit transformer coolant from containing significant concentrations of polychlorinated biphenyls or other extremely hazardous compounds.[130]

Each GSU transformer would contain up to 10,000 to 15,000 gallons of oil. The GSU transformers are expected to be a ground-mounted unit constructed on a concrete pad with secondary spill containment traps designed to minimize the possibility of accidental leakage on soil. The concrete catchment system is typically sized to contain the amount of oil inside the transformer plus deluge water and required freeboard. Each of the ISU transformers in the solar arrays and transformers in the BESS would also contain approximately 700 gallons of cooling oil. Due to the smaller capacity, the ISU transformers would not require secondary containment.[131]

[129] BCWAMD4Doc21-04 RFA4 Exhibit I 2025-12-10, Section 4.1.4.1; Attachment 1; Condition 132; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 3.0, 3.2; BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 5.1.1;.

[130] BCWAMD4Doc21-04 RFA Exhibit I, Section 4.1.4.1. 2025-12-10.

[131] BCWAMD4Doc21-04 RFA Exhibit I, Section 4.1.4.1. 2025-12-10.; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 3.0, Table G-1;

As discussed in Section III.B, Organizational Expertise, there have been numerous transformer failures at the existing wind facility. In the event of a transformer that results in a release of Oil, the certificate holder would follow response measures outlined in an operations SPCC Plan. As part of this plan, equipment containing oil or hazardous materials will be regularly monitored for leaks, and measures will be put in place if any are found to quickly control and remove spills.[132] Consistent with these representations, the Council imposes conditions requiring the development and implementation of an operational SPCC Plan, as shown below:

> **Soil Protection Condition 6 (PRO-SP-01)**
> Prior to beginning operation of the solar facility, the certificate holder shall submit, to the Department, an Operations Spill Prevention, Control and Countermeasure Plan that complies with the requirement of 40 CFR 112.
> [Final Order on AMD4]
>
> **Soil Protection Condition 7 (OPR-SP-07):**
> During operation of the solar facility, the certificate holder and all onsite contractors and personnel shall adhere to the requirements of the Operations Spill Prevention, Control and Countermeasure Plan approved under Condition PRO-SP-01. Updates or revisions to the Plan shall be submitted to the Department prior to implementation.
> [Final Order on AMD4]

In addition to fuels and oils, small quantities of herbicides, insecticides, paint, cleaners, solvents, and other hazardous materials may also be used on site during construction and stored in a secure location within the temporary construction yard. Potentially hazardous substances will not be permanently present within the construction areas in quantities that exceed Oregon State Fire Marshal Reportable Quantities. Limited amounts of hazardous materials would be stored in the proposed O&M buildings during the operation of the proposed solar facility, including small quantities of lubricants, degreasers, herbicides, or other chemicals. Storage of these chemicals will follow label instructions. No underground storage tanks will be installed at the proposed O&M building. The certificate holder represents that no highly toxic substances or explosive materials will not be necessary to support either the construction or the operations phase of the Solar Components. Lithium-ion batteries and solar modules do not pose a significant hazard for soil contamination under normal operating conditions, but can sometimes be considered hazardous waste by the EPA and will be disposed of according to the most current guidelines at end of life. [133] Requirements for the handling and disposal of these materials is discussed in Section III.O, Waste Minimization.

The Council previously imposed Site Certificate Condition 80, which requires all potentially hazardous substances to be sorted, handled, and disposed of in a manner that is protective of

[132] BCWAMD4Doc21-04 RFA Exhibit I, Section 4.1.4.1. 2025-12-10.

[133] RFA4, Section 4.1.4.1.; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 3.0; 3.1; BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Section 6.1.. BCWAMD4Doc21-17 RFA Exhibit W Waste Minimization 2025-12-10, Section 6.2

human health, safety, and the environment and that complies with all applicable local, state, and federal environmental laws and regulations. The Council maintains this condition as applicable to both the wind and solar facility.

The certificate holder further represents that at the proposed solar facility all potentially hazardous substances, as defined by Oregon Revised Statute 465.200, would be stored, handled, and disposed in accordance with a Hazardous Materials Management and Monitoring Plan.[134] The certificate holder proposed two new conditions requiring the development and implementation of this plan:

> **Certificate Holder Proposed Condition 130:**
> The certificate holder must prepare and implement a Hazardous Materials Management and Monitoring plan approved by the Department. The plan(s) must address the handling of potentially hazardous substances (as defined by ORS 465.200) during construction and operation of the facility, measures to prevent on- and off-site contamination and documentation of plan implementation. Separate plans for the construction and operation phases are acceptable. The certificate holder must use hazardous materials in a manner that protects public health, safety and the environment and must comply with all applicable local, state and federal environmental laws and regulations.
> [Final Order on AMD4]
>
> **Certificate Holder Proposed Condition 131:**
> The Hazardous Materials Management and Monitoring Plan shall contain the same information required for a Spill Prevention, Control and Countermeasure Plan (40 CFR 112). Whereas the SPCC Plan addresses spill prevention for oil products, the materials management and monitoring plan shall address hazardous substances. The Plan shall include operating procedures to prevent hazardous substances releases, control measures to contain hazardous substance releases, countermeasures to contain, cleanup, and mitigate hazardous substance releases, and procedures for required inspections and testing. This Plan must be submitted to the Department for review and approval prior to respective construction or operation phase of the facility.
> [Final Order on AMD4]

Because the certificate holder represents that no reportable quantities of hazardous materials would be used or stored at the site during construction or operation of the facility components proposed in RFA4, the Council finds that the new conditions are unnecessary.

The Council previously imposed Site Certificate Condition 80 under the Waste Minimization Standard, which requires all potentially hazardous substances to be sorted, handled, and disposed of in a manner that is protective of human health, safety, and the environment and that complies with all applicable local, state, and federal environmental laws and regulations.

[134] BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 3.0, 3.1, 3.2.

The Council maintains this condition as applicable to both the wind and solar facility as Condition GEN-SP-01.

The Council previously imposed Site Certificate Condition 81, requiring the Certificate holder to notify the Department of any spill or release of hazardous material, including fuels or oils, within 72 hours. In RFA4, the certificate holder proposes that this condition be amended to also apply to the construction and operation of the proposed solar components.[135] The Council agrees with the certificate holder's proposal and amends the condition as applicable to any spills that occur at the site. The Council also adopts a new condition specifying that no reportable quantities of hazardous substances that are not covered by the SPCC Plan may be maintained at the solar facility site.

Amended Condition 81 (OPR-SP-02)

a. If a spill or release of a reportable quantity of fuel, oil, or other hazardous materials occurs during construction or operation of the facility, the certificate holder shall notify the Department within 72 hours.
b. The certificate and shall clean up ~~the~~ any spill or release of hazardous materials and dispose of any contaminated soil or other materials according to applicable regulations.
c. The certificate holder shall ensure that spill kits containing items such as absorbent pads are located on equipment and storage facilities to respond to accidental spills and shall instruct employees handling hazardous materials in the proper handling, storage and cleanup of these materials.

[Final Order on ASC, Condition 81; AMD4]

Soil Protection Condition 8 (GEN-SP-02)

Except for those fuels and oils covered by an SPCC Plan approved under Condition PRE-SP-01 or PRO-SP-02, no reportable quantities of hazardous materials or substances, as defined in OAR chapter 340, division 142, may be stored at the site of any solar facility component.

[Final Order on AMD4]

III.D.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the existing and site certificate conditions described above, the Council finds that the facility components proposed in RFA4 are not likely to result in a significant adverse impact to soils.

III.E. LAND USE: OAR 345-022-0030

[135] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Attachment 1; BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 3.0, 3.2.

(1) To issue a site certificate, the Council must find that the proposed facility complies with the statewide planning goals adopted by the Land Conservation and Development Commission.

(2) The Council shall find that a proposed facility complies with section (1) if:

(a) The applicant elects to obtain local land use approvals under ORS 469.504(1)(a) and the Council finds that the facility has received local land use approval under the acknowledged comprehensive plan and land use regulations of the affected local government; or

(b) The applicant elects to obtain a Council determination under ORS 469.504(1)(b) and the Council determines that:

(A) The proposed facility complies with applicable substantive criteria as described in section (3) and the facility complies with any Land Conservation and Development Commission administrative rules and goals and any land use statutes directly applicable to the facility under ORS 197.646(3);

(B) For a proposed facility that does not comply with one or more of the applicable substantive criteria as described in section (3), the facility otherwise complies with the statewide planning goals or an exception to any applicable statewide planning goal is justified under section (4); or

(C) For a proposed facility that the Council decides, under sections (3) or (6), to evaluate against the statewide planning goals, the proposed facility complies with the applicable statewide planning goals or that an exception to any applicable statewide planning goal is justified under section (4).

(3) As used in this rule, the "applicable substantive criteria" are criteria from the affected local government's acknowledged comprehensive plan and land use ordinances that are required by the statewide planning goals and that are in effect on the date the applicant submits the application. If the special advisory group recommends applicable substantive criteria, as described under OAR 345-021-0050, the Council shall apply them. If the special advisory group does not recommend applicable substantive criteria, the Council shall decide either to make its own determination of the applicable substantive criteria and apply them or to evaluate the proposed facility against the statewide planning goals.

(4) The Council may find goal compliance for a proposed facility that does not otherwise comply with one or more statewide planning goals by taking an exception to the applicable goal. Notwithstanding the requirements of ORS 197.732, the statewide planning goal pertaining to the exception process or

any rules of the Land Conservation and Development Commission pertaining to the exception process, the Council may take an exception to a goal if the Council finds:

(a) The land subject to the exception is physically developed to the extent that the land is no longer available for uses allowed by the applicable goal;

(b) The land subject to the exception is irrevocably committed as described by the rules of the Land Conservation and Development Commission to uses not allowed by the applicable goal because existing adjacent uses and other relevant factors make uses allowed by the applicable goal impracticable; or

(c) The following standards are met:

(A) Reasons justify why the state policy embodied in the applicable goal should not apply;

(B) The significant environmental, economic, social and energy consequences anticipated as a result of the proposed facility have been identified and adverse impacts will be mitigated in accordance with rules of the Council applicable to the siting of the proposed facility; and

(C) The proposed facility is compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts.

(5) If the Council finds that applicable substantive local criteria and applicable statutes and state administrative rules would impose conflicting requirements, the Council shall resolve the conflict consistent with the public interest. In resolving the conflict, the Council cannot waive any applicable state statute.

(6) If the special advisory group recommends applicable substantive criteria for an energy facility described in ORS 469.300(11)(a)(C) to (E) or for a related or supporting facility that does not pass through more than one local government jurisdiction or more than three zones in any one jurisdiction, the Council shall apply the criteria recommended by the special advisory group. If the special advisory group recommends applicable substantive criteria for an energy facility described in ORS 469.300(11)(a)(C) to (E) or a related or supporting facility that passes through more than one jurisdiction or more than three zones in any one jurisdiction, the Council shall review the recommended criteria and decide whether to evaluate the proposed facility against the applicable substantive criteria recommended by the special advisory group, against the statewide planning goals or against a combination of the applicable substantive criteria and statewide planning goals. In making

the decision, the Council shall consult with the special advisory group, and shall consider:

(a) The number of jurisdictions and zones in question;

(b) The degree to which the applicable substantive criteria reflect local government consideration of energy facilities in the planning process; and

(c) The level of consistence of the applicable substantive criteria from the various zones and jurisdictions.[136]

***** [137]

III.E.1. Findings of Fact

In accordance with ORS 469.504, the Land Use standard requires the Council to find that a proposed facility or facility, with proposed changes, complies with Oregon's statewide land use planning goals. An applicant or certificate holder may demonstrate compliance with the statewide planning goals either by obtaining local land use approval from the affected local government or by obtaining a Council determination of compliance. In this proceeding, the certificate holder has elected to seek a Council determination of compliance under ORS 469.504(1)(b).[138]

The analysis area for the Land Use standard includes the area within and extending one-half mile from the proposed Solar Micrositing Area. Approximately 5,198 acres are located within the analysis area, including the approximately 1,924 acres within the Solar Micrositing Area itself.

The Council previously imposed Site Certificate Conditions 17 to 25 and 128 to ensure that the existing wind energy facility complied with the Land Use standard. Conditions 17, 19-21, 23-25, and 128 continue to apply to the facility components proposed in RFA4, as Conditions GEN-LU-02 to GEN-LU-09, with minor administrative updates to clarify applicability to the operating wind facility. Changes to the remaining land use conditions are discussed below.

Existing Land Uses

The proposed Solar Micrositing Area includes all or part of two subject tracts. One of the tracts is owned by the certificate holder and contains the facility's existing substation.[139] Turbines and

[136] OAR 345-022-0040, effective April 2, 2025.

[137] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

[138] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 1.0.

[139] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.2. Under OAR 660-033- 0020(14), "tract" means one or more contiguous lots or parcels under the same ownership.

other facility components are present on the other tract; however, the majority of lands on that tract are currently used for the cultivation of dryland winter wheat and other small grains. As shown in Figure 6, below, some irrigated farmland is also present on the tract.

The cultivation of dryland wheat and other grains is also the dominant use on adjacent lands in the analysis area. There is also a 125.7-acre irrigation pivot used for the cultivation of garlic, carrot seed, mint, wheat and other row crops located approximately 300 feet north of the Solar Micrositing Area.[140] Energy uses are also present on adjacent lands within the analysis area, including the existing wind energy facility and several transmissions lines.[141]

Water Rights

There are two locations appurtenant to a water right within the analysis area.

Oregon Water Right Certificate 57620 authorizes use of up to 3 acre-feet of water per acre for irrigation on up to 325.7 acres of land in the proposed Solar Micrositing Area. The water right has a priority date of February 17, 1976. The point of diversion for the water is also within the proposed Solar Micrositing Area. While the water right certificate authorizes the irrigation of up to 325.7 acres, only 25 acres in a half-pivot are currently irrigated. The irrigated land is currently used for the cultivation of garlic, carrot seed, mint, wheat and other row crops.[142] The certificate holder represents that it is working with the landowner to transfer this water right to industrial use for the life of the solar facility to avoid forfeiture and preserve the ability to transfer the water back to irrigation use following facility decommissioning.[143]

Oregon Water Right Permit G 16704 (McCullough Water Right) authorizes the irrigation of 125.7 acres of land in an irrigation pivot on land adjacent to the proposed Solar Micrositing Area. The irrigated land supports a range of crop types depending on the year that include mint, garlic, and carrot seed.[144]

Soil and Farmland Classifications

As described in Section III.D., *Soil Protection*, approximately 99 percent of the soils in the proposed Solar Micrositing Area are moderately deep, well-drained silt loams formed in loess overlying basalt. The remaining one percent is made up of stoney soils and loess deposits.[145]

[140] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.2.1, 3.3.1, Table K-8.
[141] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.2.2.
[142] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.3.1.
[143] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.3.2.
[144] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.3.1.
[145] BCWAMD4Doc21-04 RFA Exhibit I Soil Conditions 2025-12-10, Table I-1; BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.3.2.

The NRCS assigns land capability classifications to each soil unit based on the general suitability of the soils for agriculture. Class I and II soils are the most productive soils. These soils are also considered to be "high-value farmland soils" under ORS 195.300(10). Class III and IV soils are also suitable for agriculture and are considered "arable" soils under OAR 660-033-0130(38). Class V to VII are generally not suitable for agriculture and are considered "not arable" under LCDC's rules. The capability classification is typically dependent on whether or not the land is irrigated, but the non-irrigated and irrigated capability classes for soils in the Solar Micrositing Area are the same. The NRCS also assigns farmland classifications, including "prime" or "unique" designations, based on the suitability of soils for specific crops. Soil units designated by the NRCS as "prime" or "unique" farmland are also considered high-value farmland.

According to the NRCS Web Soil Survey, there are five soil types and ten soil units within the Solar Micrositing Area. The soil capability and farmland classification for each of the soil units in the Solar Micrositing Areas are shown in Table 9 and Figure 6, below. As shown in the table, approximately 40.4 percent of the soils in the Solar Micrositing Area are Class II, high-value farmland soils, and about ninety-nine percent of soils are suitable for agriculture. Additional information about the characteristics of and hazards associated with the soil units is provided in Section III.D., *Soil Protection*.

Table 9: Soil Capability and Farmland Classification within Solar Micrositing Area

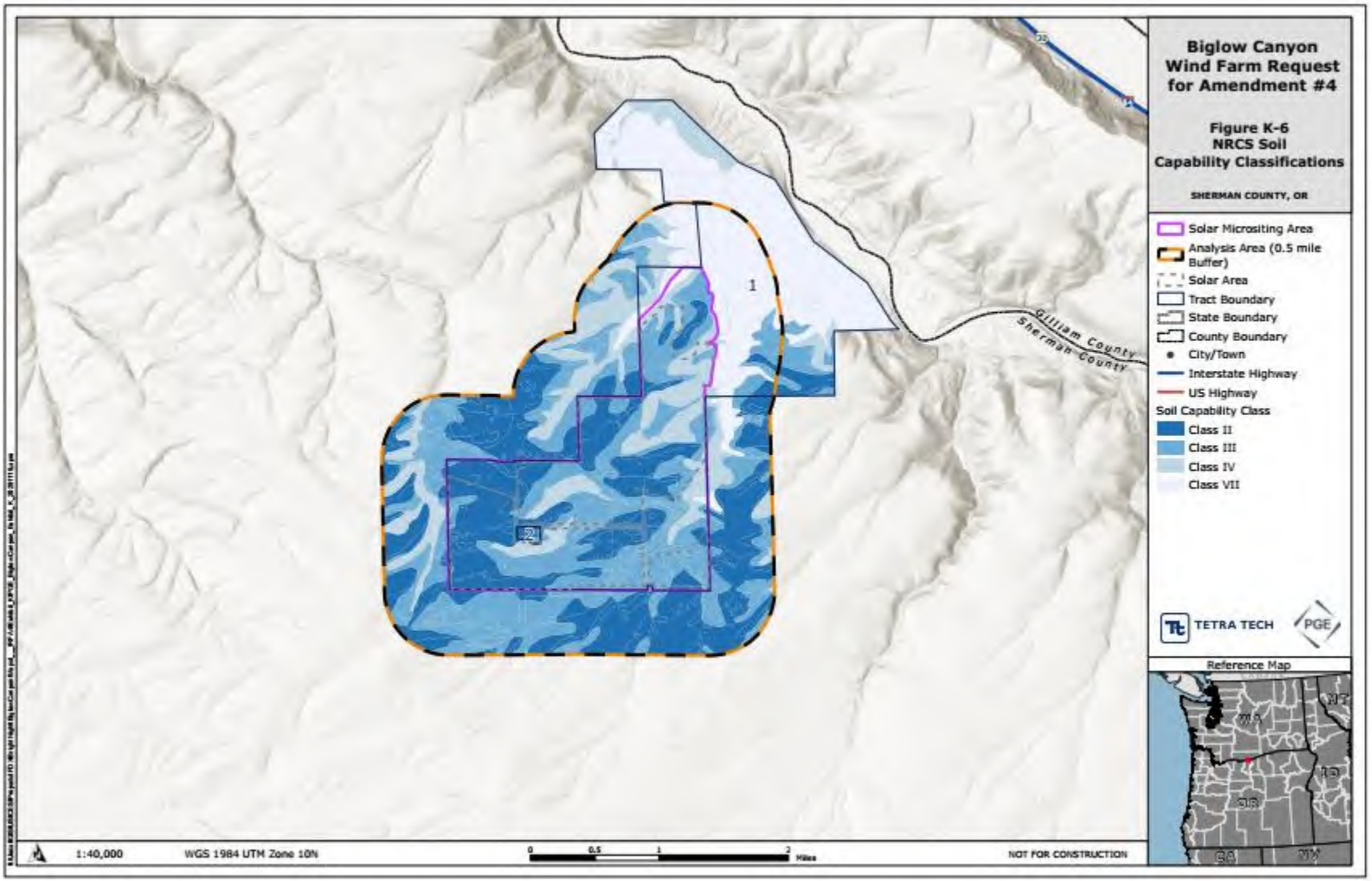
Soil Type ID/Soil Unit	NRCS Farmland Classification	Soil Capability Class	Area within Solar Micrositing Area	
			Acres	Percent (%)
1B/Anderly silt loam, 1 to 7 percent slopes	Prime farmland if irrigated	III	79	4.1
1C/Anderly silt loam, 7 to 15 percent slopes	Farmland of statewide importance	III	195	10.2
3D/Anderly silt loam, 15 to 35 percent south slopes	Farmland of statewide importance	IV	119	6.2
16D/Lickskillet very stony loam, 7 to 40 percent south slopes	Not prime farmland	VII	3	0.2
18E/Lickskillet-Rock outcrop complex, 40 to 70 percent south slopes	Not prime farmland	VII	7	0.4
21E/Nansene-Rock outcrop complex, 35 to 70 percent north slopes	Not prime farmland	VII	7	0.4
31B/Walla Walla silt loam, 1 to 7 percent slopes	Prime farmland if irrigated	II	778	40.4
31C/Walla Walla silt loam, 7 to 15 percent slopes	Farmland of statewide importance	III	538	28
32D/Walla Walla silt loam, 15 to 35 percent north slopes	Farmland of statewide importance	IV	116	6.0

Table 9: Soil Capability and Farmland Classification within Solar Micrositing Area

Soil Type ID/Soil Unit	NRCS Farmland Classification	Soil Capability Class	Area within Solar Micrositing Area	
			Acres	Percent (%)
33D/Walla Walla silt loam, 15 to 35 percent south slopes	Farmland of statewide importance	IV	82	4.2
Total High-Value Soils (Class I and II)			**778**	**40.4**
Total Arable Soils (Class III and IV)			**1,129**	**58.6**
Total Non-arable Soils (Class V, VI, VII)			**17**	**1**
Total			**1,945**	**100%**

1

Figure 6: Soil Capability Classes on Subject Tract



1

Under ORS 215.710, when a tract is predominantly composed of high-value farmland soils, the entire tract is considered to be high-value farmland. As shown in Table 10, below, only the smaller tract that underlies the existing substation site is considered to be high-value farmland. The other tract is predominantly composed of arable soils and is therefore considered arable land.

Table 10: High-Value Farmland Soils Predominance Per Tract

Tract	Owner	Total Tract Area	Total High-Value Farmland Soils		HVF Due to Predominance of HVF Soils
			Acres	Percent	
1	SCHARF, R & A LLC	3,336	890	26.7%	0
2	PORTLAND GENERAL ELECTRIC	13	9	69.2%	13
Total:		**3,349**	**899**	**26.8**	**13**
Source: RFA4 Exhibit K, Table K-2.					

Under ORS 195.300(10)(c), land may also be designated high-value farmland if it is appurtenant to a water right or located within the boundaries of an irrigation district. As discussed above, there are two authorized places of use for existing water rights within the analysis area. As described above, there is one existing place of use water right within the proposed Solar Micrositing Area, which includes approximately 311 acres of high-value farmland.

Finally, under ORS 195.300(10)(f), land located within the Columbia Valley American Viticulture Area (AVA) is considered to be high-value farmland if it meets certain elevation, slope, and aspect criteria, regardless of whether the land has been used for viticulture. An additional 779 acres are considered high-value farmland due to their location within the Columbia Valley AVA.

As shown in Table 11, below, after removing areas of overlap there are approximately 1,305 acres of high-value farmland within the proposed Solar Micrositing Area, which is about 68 percent of the total area.[146] The distribution of high-value farmland within the Solar Micrositing Area is shown in Figure 7.

[146] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, 3.3.2.

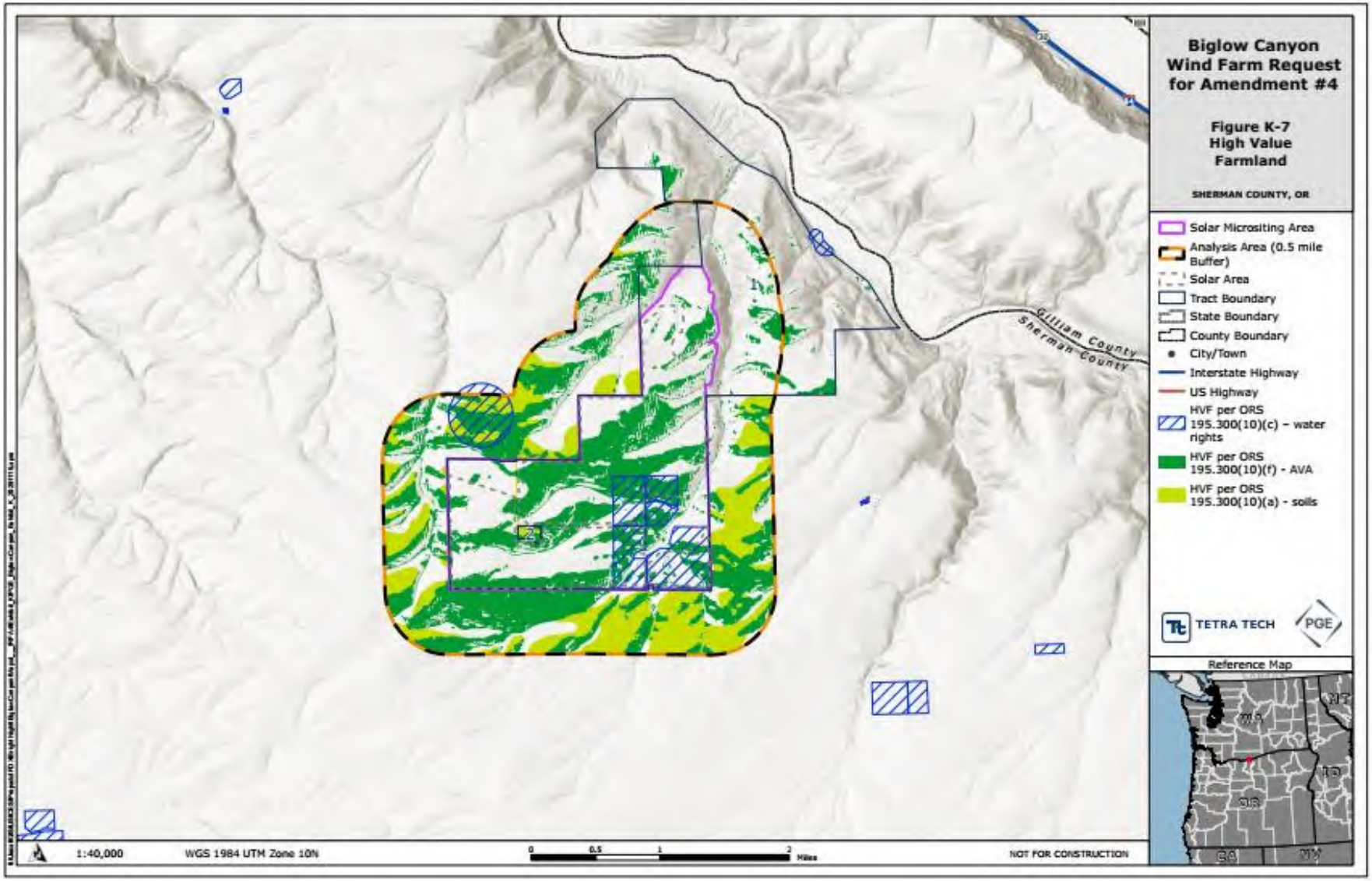
1

Table 11: High-Value Farmland in the Solar Micrositing Area

High-Value Farmland Type	Solar Micrositing Area		Tract Area		Est. Perm. Dist. Area	
	Acres	Percent	Acres	Percent	Acres	Percent
Predominance of HVF Soils ORS 195.300(10)(a)	13	1%	13	3%	0	0%
Appurtenant to Water Right ORS 195.300(10)(c)(A)	311*	16%	3,15	9%	227	16%
Located within AVA ORS 195.300(10)(f)	779	40%	880	26%	635	44%
Total High-Value Farmland (merged)	1,305	68%	1463	44%	1,006	70%
Notes: * Acreage is based on GIS data from OWRD, which is less than the 325.7 acres authorized by Water Right Cert: 57620. Approximately 194 of these acres are located on Class II soils.						

2

Figure 7: High-value Farmland within the Proposed Solar Micrositing Area



1

Local Applicable Substantive Criteria

As shown in Figure 8, below, all land within the analysis area is in Sherman County and is located entirely within the County's Exclusive Farm Use (F-1) Zone. Portions of the analysis area and the proposed Solar Micrositing Area are also located within the County's Natural Hazards (NH) combining zone.[147]

On April 30, 2025, the Department requested recommendations for Applicable Substantive Criteria from the Sherman County Court, as the Special Advisory Group for the facility appointed under ORS 469.480.[148] "Applicable substantive criteria" includes criteria from Sherman County's acknowledged comprehensive plan and land use regulations that are required by the statewide planning goals and in effect on the date preliminary RFA4 was submitted, April 21, 2025, and any Land Conservation and Development Commission administrative rules and goals and any land use statutes that apply directly to the facility under ORS 197.646.

Table 12 below provides the applicable substantive criteria from the Sherman County Zoning, Subdivision, Partitioning, and Land Development Ordinance of 1994 (SCZO) as amended by Ordinances 22-05-2003 and 24-06-2003, as recommended by the SAG.[149]

Table 12: Applicable Substantive Criteria from the Sherman County Zoning Ordinance (SCZO)

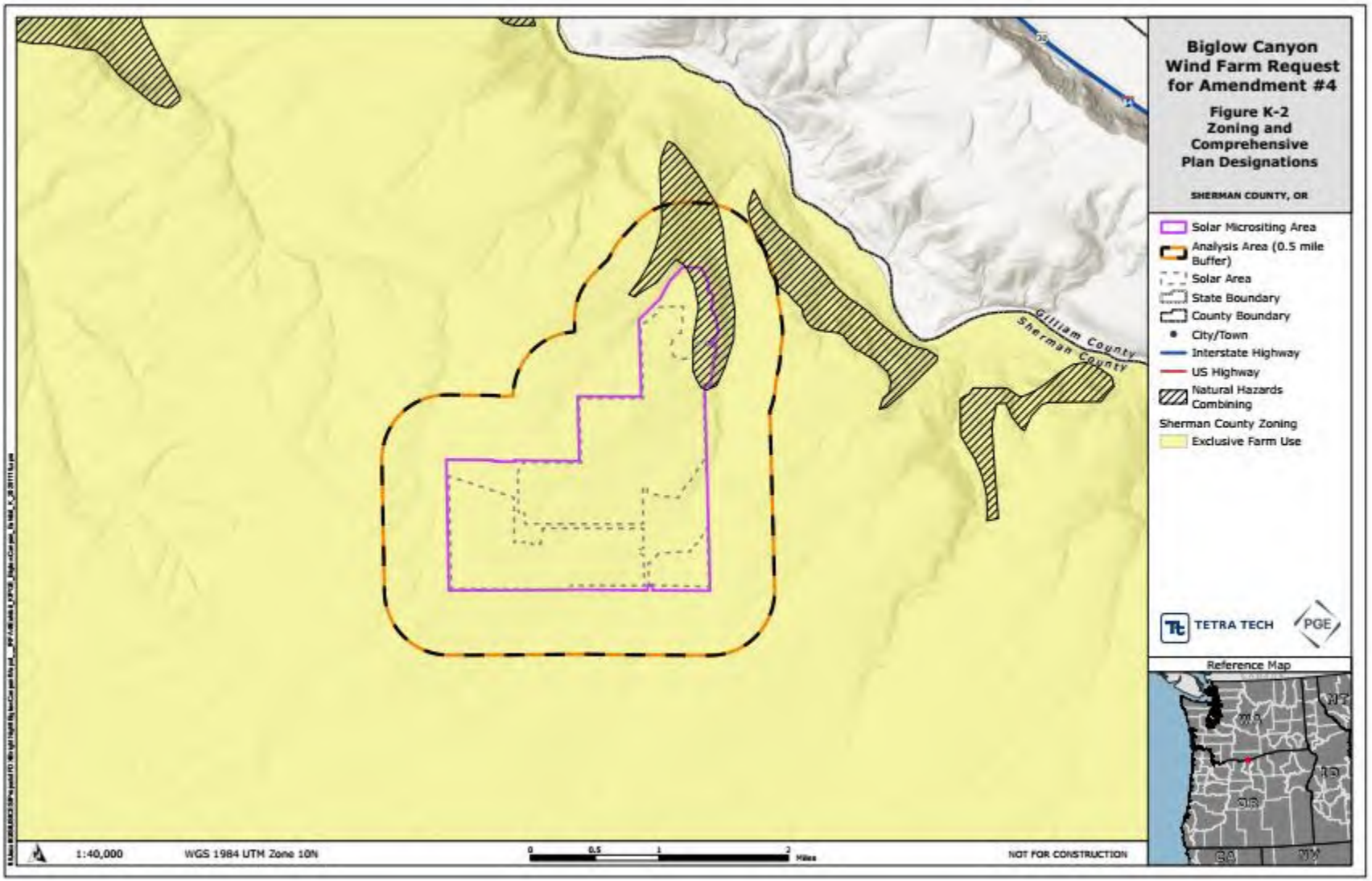
Section	Title
Section 3.1	Exclusive Farm Use Zone, F-1 Zone
Section 3.6	Significant Resource Combining Zone
Section 3.7	Natural Hazards Combining Zone
Section 5.1	Authorization to Grant or Deny Conditional Uses
Section 5.2	General Criteria
Section 5.3	General Conditions
Section 5.8	Standards Governing Specific Conditional Uses

[147] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 2.0.

[148] BCWAMD4Doc13-00 pRFA SAG MEMO 2025-04-30

[149] BCWAMD4Doc14-07 pRFA Reviewing Agency Comment Sherman County 2025-05-29.

Figure 8: Land Use Zones within Analysis Area



SCZO Section 3.1 Exclusive Farm Use Zone, F-1 Zone

> *3. Conditional Uses Permitted - In an F-l Zone, the following uses and their accessory uses are permitted when authorized in accordance with the requirements of Article 5 of this Ordinance and this Section:*
>
> ***
>
> *(q) Commercial utility facilities.*

The facility components proposed in RFA4 would generate power for public use by sale, and is considered to be a commercial utility facility, which under SCZO 3.1.3(q) is a conditionally permitted use in Sherman County's F-1 Zone. For the purposes of the land use evaluation, all proposed related or supporting facilities are considered to be part of, or accessory to, the solar photovoltaic power generation facility. The proposed solar photovoltaic power generation facility's compliance with SCZO Article 5 is evaluated below.

Because the facility components proposed in RFA4 are a permitted conditional use, a Conditional Use Permit must be obtained from the County subject to the provisions of ORS 469.401(3). To ensure the certificate holder obtains the permit prior to beginning construction of the facility components proposed in RFA4, the Council imposes the following condition:

Land Use Condition 3 (PRE-LU-01)

a. Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department and the Sheman County Planning Commission, an application for Conditional Use Permit meeting the requirements of SCZO Section 5.4(1) and (3).
b. The Site Plan required under SCZO 5.4(1) must demonstrate compliance with all site certificate conditions and the local applicable substantive criteria addressed in the Final Order on AMD4.
[Final Order on AMD4]

> *(z) Construction, reconstruction, or widening of highways, roads, bridges or other transportation projects that are in the Sherman County Transportation system plan.*

The certificate holder identifies SCZO 3.1.3(z) as applicable to the facility components proposed in RFA4, stating: "…If improvements to county roads are required for construction of the solar facility, they would likely be in the form of road widening and/or improving the surface condition. To be conservative, it is assumed that the roads receiving improvements will be roads within the Sherman County Transportation System Plan."[150] The certificate holder has

[150] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 5.2.1.2.

also proposed amendments to Site Certificate 17 that would authorize public road improvements.

While the certificate holder is correct that road widening or other improvements to roads included in the Sherman County Transportation Plan would be a conditionally permitted use under SCZO 3.1.3(z), no road improvements are proposed as part of RFA4, and the certificate holder specifically represents that it does not anticipate that improvements of or alterations to existing public roads will be required for the construction and operation of the proposed solar components.[151]

Because no modifications of existing roads are proposed by the certificate holder, or anticipated to the required for, the construction of the proposed solar components, the Council finds that SCZO 3.1.3(z) is not applicable to the facility components proposed in RFA4. The Council rejects the certificate holders' proposed changes to Condition 17. As described in Section III.A, *General Standard of Review*, the Council finds the condition is no longer effective and deletes it in its entirety. The Council further finds that if the certificate holder determines that improvements or modifications of public roads are necessary for the construction of the facility components proposed in RFA4, that the certificate holder must obtain any required approvals for the modifications directly from the County or seek an amendment to the site certificate.

> *4. Dimensional Standards - In an F-1 (EFU) Zone, the following dimensional standards shall apply:*
>
> *(a) New farm parcels shall be a minimum of 80 acres.*
>
> *(b) MINIMUM LOT SIZE-NON-FARM PARCELS. Non-farm parcels allowed pursuant to the provisions of this Ordinance and more specifically this Section, shall meet the following standards:*
>
> *1) Shall be of adequate size and dimensions to meet applicable setback requirements.*
>
> *2) Shall be of the minimum size necessary to accommodate the intended use and provide for subsurface sewage disposal thereof.*
>
> *3) Each such parcel shall contain a minimum of I Net Buildable Acre as defined in section 1.4 of this Ordinance.*
>
> *(c) SETBACK (YARD) REQUIREMENTS. In an F-l (EFU) Zone, the minimum setback requirements shall be as follows:*

[151] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.6, Table 1.

1) The front and rear yard setbacks from the property line shall be 30 feet, except that the front yard setback from the right-of-way line of an arterial or major collector road or street shall be 50 feet unless approved otherwise by the Planning Commission.

2) Each side yard setback from a property line shall be a minimum of 25 feet, and for parcels or lots involving a non-farm residential use with side yard(s) adjacent to farm lands, said adjacent side yards shall be a minimum of 50 feet unless approved otherwise by the Planning Commission.

The certificate holder does not propose to divide any existing lots or create new parcels, as such SCZO 3.1.4(a) and (b) are not applicable to the review of RFA4. The setback requirements of SCZO 3.1.4(c) would apply to the proposed solar components.

As described in SCZO 3.1.4(c)(1), the minimum setback for structures is generally 30 feet from front and rear lot lines and 25 feet from side lot lines, except when a property is fronted by an arterial or major collector road or street, in which case the minimum front setback is 50 feet from the right-of-way line. As defined in SCZO 1.4, a "lot line" is the property line bounding a "lot", and a lot in turn is:

A parcel, tract, or area of land whose boundaries have been established by some, legal instrument, which is recognized as a separate legal entity for purposes of transfer of title, has frontage upon a public or private street, and complies with the dimensional requirements of this code.

In the Final Order on the ASC, the Council imposed Site Certificate Condition 20, requiring the wind power generation facility to comply with the minimum setback requirements of the ordinance. The Council maintained this condition despite a recommendation from the Department that a 50-foot setback requirement be imposed based on representations made by the certificate holder.[152]

In this proceeding, the certificate holder once again represents that all above ground facility components would be set back at least 50 feet from all property lines to maintain compliance

[152] BCWAPPDoc94 BCW Final Order 2006-06-30; pg. 43-44. Site Certificate Condition 20 specifically excludes aboveground power collection lines, transmission lines, and junction boxes from the setback requirements for the wind facility. In granting the exclusion, the Council found that the proposed wind facility would not comply with the requirements of SCZO 3.1.4(c) but found that the proposal to site aboveground electrical collection and transmission components along property lines and public rights-of-way would nevertheless comply with Statewide Planning Goal 3 because it would reduce impacts of the facility on continued agricultural operations at the site. The certificate holder has not requested a similar exclusion for the facility components proposed in RFA4; however, even if it had, the Council finds that such an exclusion is not necessary because all proposed electrical collection system cables would be installed underground, and, as utility facilities necessary for public service, the associated transmission lines are permitted outright under ORS 215.283 and are not subject to additional local restrictions.

with the ordinance, and also to demonstrate compliance with the Council's Wildfire Prevention and Risk Mitigation Standard.[153] As explained in Section III.O., *Wildfire Prevention and Risk Mitigation*, the 50-foot setback from the property line of a non-participating landowner to the perimeter fence of a solar array would be in addition to a20-foot clear, brush free area around the perimeter of the arrays, and would create an additional buffer between the facility components proposed in RFA4 and adjacent uses.

Consistent with these representations, and in accordance with the requirements of SCZO 3.1.4(c)(1), the Council adopts a new condition requiring the outer-perimeter fence of all solar array areas to be setback at least 50 feet from all property lines with nonparticipating landowners and public roads:

> **Land Use Condition 1 (GEN-LU-10)**
> All aboveground components of the solar facility, including perimeter fences, must be setback at least 50 feet from:
> a. The right-of-way line of an arterial or major collector road or street, including, but not limited, to Hilderbrand Lane (Old Wasco-Heppner Highway);
> b. The property line extending along a public road not described in (a); and
> c. Any property line with a tract that is not within the Solar Micrositing Area.
> [Final Order on AMD4]

SCZO Section 3.6 Significant Resources Combining Zone

> *In a (SR) Combining Zone, the following regulations shall apply:*
>
> *1. Purpose - The purpose of this Zone is to protect significant mineral, geothermal, scenic, natural, unique, archaeological and historical resources identified and so designated by the County's Comprehensive Plan, and to permit development which is compatible with such resources and the applicable protection measures.*
>
> *2. Application - This Zone shall be applied to those sites and resources designated as Significant Resource Sites in the County's Comprehensive Plan Goal 5 Significant Resource Inventory and determined by said Plan to be worthy of full protection (i.e. a 3A Site), or a limited protection site (i.e. a 3C Site) against identified conflicting uses. Such resources identified for ongoing inventories as potential resources shall not be subject to this Zone until, as a result of such inventory(s), said resources are officially designated as a significant resource.*
>
> *3. Permitted Uses - If a use or activity permitted Outright in the underlying Zone is listed herein as a Conflicting Use or Activity it shall become a*

[153] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 5.2.1.3.

Conditional Use subject to the provisions of this Zone. If a use or activity permitted as a Conditional Use in the underlying Zone is listed herein as a Conflicting Use or Activity it shall be reviewed for compliance with the provisions of this Zone as an integral part of the overall Conditional Use Permit process as well as the approval requirements of the underlying Zone and Article 6 of this Ordinance.

4. Review Process and Procedures

(a) When a 3A decision (i.e. To fully protect the subject resource) has been made for the significant resource as designated by the County's Plan, any application for a conflicting use or activity listed herein shall be denied unless the applicant can clearly demonstrate that the proposed use or activity will have no significant negative impacts on the resource, or that such impacts can be effectively mitigated, and findings to that effect are established by the designated County Official or the Planning Commission. Findings to this effect shall be based, at a minimum, on consultation with the responsible agency(s) listed within the provisions of this Zone applicable to the subject impacted resource.

(b) When a 3C decision (i.e. Partial Resource Protection) has been made for the significant resource as designated by the County's Plan, any application for a conflicting use or activity shall be reviewed according to the requirements set forth below:

1) The applicant shall submit a map(s) of the location of the resource site affected by the proposed use or activity, and a written description of the resource type and the potential impacts, positive or negative, of the proposed use or activity.

2) The applicant shall submit a written statement stipulating to the proposed mitigation measures to be provided for to minimize or eliminate any potential adverse impacts on the subject resource.

3) The applicant shall consult with the responsible resource agency(s) listed in this Zone for the purpose of identifying any limitations on the sitting, construction, operation or maintenance of the proposed use or activity, which would effectively reduce or eliminate any negative impacts to the subject resource site.

4) In addition to other applicable requirements of this and other County Ordinances, the subject application shall only be approved if it is clearly demonstrated that the proposed use or activity will have no significant

negative impact on the subject resource site, or that the reduced preservation review criteria set forth in Subsection 5 are met.

5. Reduced Preservation Review Criteria - The environmental, social, economic and energy consequences of allowing the proposed use or activity shall be described in sufficient detail to provide a clear demonstration that the applicable criteria below are met:

(a) All Significant Resource Sites.

1) The resource site shall not be altered or impacted to the point where it no longer has any significant resource value.

2) The amount of alteration of or impact to the significant resource shall be the minimum necessary to accomplish the purpose of the proposed use or activity.

3) An alternative site for the proposed use or activity, which would have less impact on the resource value of the site, does not exist on the applicant's lot or parcel or on contiguous lots or parcels that are reasonably available for the proposed use.

** * * * **

(c) Mineral and Aggregate Resource Sites.

1) A conflicting use listed under Subsection (6) of this Section within 1,320 feet from a significant mineral or aggregate resource site (active or potential) may be required to establish setbacks in excess of those required in the underlying primary zone. The required setback shall be determined by the County after consultation with the applicant and the owner/operator of the mineral resource land (or vice versus) to insure visual and sound screening between present and future resource uses and the conflicting use or activity. Such setbacks shall be no less than that set forth by the primary zone.

** * * * **

6. Conflicting Uses and Activities

** * * * **

(g) Mineral and Aggregate Resources.

1) Any permanent use, which reasonably precludes the development and use of such resource for the use designated or intended.

2) Residential, church, schools, medical care facilities and other noise or dust sensitive uses.

3) Public recreation use or development.

4) Wildlife habitat area or scenic waterway.

5) Tourist or travelers accommodations.

6) Dude or guest ranch, or resort facility.

7) Manufactured Home Park or RV campground.

** * * * **

In 2006, the Sherman County Court adopted Ordinance 32-2006 adding an aggregate resource site in Tax lot 02N18E00003900 to the County's Goal 5 inventory. The tax lot containing the site is owned by Robert and Alda Scharf. The adopting ordinance identified the Scharf Site as a "small significant site" worthy of full protection (i.e., a 3A Site). The site was approved by the Oregon Department of Geology and Mineral Industries under Permit No. 28-0032.

While commercial energy facilities or utility facilities are not necessarily considered a conflicting use for aggregate sites, the construction and operation of the facility components could preclude the development and use of the aggregate site if the aggregate site was occupied by facility components or access to the site was blocked by fences or other components. As such, the Council finds the facility is a conflicting use under SCZO Section 3.6(6). Because a 3A decision was made to list the Scharf Aggregate site as a significant resource, the certificate holder must demonstrate that the construction and operation of the facility components proposed in RFA4 will have no significant negative impacts on the aggregate site and the criteria of SCZO 3.6(5) are met.

The preliminary site plan provided by the certificate holder shows that the active portion of the aggregate site would be outside of the proposed solar array fencelines and that access to the site from Herin Lane would be maintained. To ensure that impacts to the aggregate site are minimized, the certificate holder represents that the solar components will be set back at least 30 feet from the boundary of the significant aggregate resource site. The certificate holder provided confirmation from the landowner that the 30 foot setback was sufficient to avoid impacts to the aggregate site, and the certificate holder further represented that it will coordinate with the landowner during construction to ensure minimal disruption to on-going

aggregate mining activities, and that the site may be used as a source of a source of aggregate for the construction of the facility. [154]

While the proposed setback appears to be sufficient to ensure that construction and operation of the facility components proposed in RFA4 would not directly impact aggregate mining operations at the site, the Council finds that it is the certificate holder's responsibility to ensure that the facility components proposed in RFA4 are designed to be compatible with the aggregate mining operations and may not require the mining operation to curtail or alter operations to reduce the impacts of the mining operation (e.g. dust generated by mining activity or road use) on the proposed solar facility.

To ensure that impacts to the aggregate site are avoided, as represented by the certificate holder, the Council imposes Land Use Condition 2, as presented below:

> **Land Use Condition 2 (GEN-LU-11)**
> All components of the solar facility, including perimeter fences, must be setback at least 30 feet from the aggregate site located on Tax lot 02N18E00003900, as identified in Sherman County Ordinance 32-2006. Facility components must be arranged in a manner that allows for continued access to and operation of the aggregate site.
> [Final Order on AMD4]

Subject to compliance with the condition above, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to result in significant impacts to the significant aggregate site and therefore comply with the requirements of SCZO Section 3.6.

SCZO Section 3.7 Natural Hazards Combining Zone

> *In any Zone that is combined with the (NH) Combining Zone, the requirements and standards of this Section shall apply in addition to those set forth in the primary zone, provided that if a conflict occurs, the more restrictive provisions shall govern.*
>
> *1. Purpose - The purpose of the (NH) Combining Zone is to promote and protect the public health, safety and general welfare and to minimize potential losses by providing guidelines for development in hazard areas. Development limitations are applicable to developments in areas of surface water accumulations and high groundwater, unstable or fragile soils, geological hazards, and steep slopes, generally those of 30 percent or greater.*

[154] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 5.2.2.

2. Uses Permitted Outright - In a Zone with which the (NH) Zone is combined, the following uses are the only uses permitted outright, and these uses are permitted as such if so permitted by the underlying primary zone.

(a) Agricultural uses conducted without locating a structure, except for boundary fences, and, so restricted as to prevent destruction of vegetation sufficient to cause or increase erosion hazards, and so restricted as to prevent the contamination of surface or ground waters.

(b) Industrial or commercial uses that do not require a structure other than surfacing at ground level such as a loading and/or parking area, or that requires only temporary structures that will not necessitate ground excavation for placement or impede surface water flows.

(c) Recreational uses that require no permanent structures, alteration of natural geology, or vegetation removal without immediate replacement.

(d) Portions of a residential use that do not contain buildings such as a lawn, garden, parking or play area, or a related use thereof that does not require excavation or alteration of the natural geology, or vegetation removal without immediate replacement.

3. Conditional Uses - In any Zone with which the (NH) Zone is combined, all uses permitted by the primary Zone, except those set forth in Subsection (2) above, shall be permitted only as Conditional Uses and subject to the provisions of this Zone and the primary Zone. Said permits shall be processed in accordance with the provisions set forth for a Conditional Use, or as set for by this Ordinance.

4. Permit for Use or Development in a (NH) Zone - No person shall construct, reconstruct, or install a use or development unless a permit therefore has been received, except for those uses permitted as Outright by Subsection (2) of this Section. Except for the improvement of an existing structure which is less than substantial as determined by a Certified Building Official or the County upon appeal, no permit shall be issued unless the use or development will be determined to be reasonably safe from the applicable hazard, and otherwise in compliance with the provisions of this Section, the ~ Zone, this Ordinance and other applicable regulations.

5. Application Requirements for a Use in a (NH) Zone - An application for a use or development in a Zone with which the (NH) Zone is combined, shall be accompanied by the following:

(a) Site Investigation Report: An application for a use or development in a (NH) Zone requires a site investigation report for the subject-affected area. The site investigation report shall provide information on the site of the proposed use or development and surrounding and adjacent lands that are most likely to be affected thereby. Unless the County determines that specific items are not required, the report shall include the information described in this Subsection, together with appropriate identification of information sources and the date of the information. The approved site investigation report may be required to be referenced in the deed and other documents of sale, and may be required to be recorded with the deed of record.

(b) Background Data in Report. At a minimum, the Site Investigation Report shall contain the following background information:

1) A general analysis of the affected site and general area's topography and geology, including faults, folds, geologic and engineering geologic units, and any soils, rock and structural details important to the engineering or geological interpretations and the their relative activity.

2) Location and approximate depths of seasonal surface water accumulations and groundwater tables, and location and direction of all watercourses, including intermittent flows.

3) A history of soil and water related problems on the site and adjacent lands, which may be derived from discussions with local residents and officials and the study of old photographs, reports and newspaper files.

4) The extent of the surface soil formation and its relationship to the vegetation of the site, the activity of the landform, and the locations on the site and surrounding areas.

5) The following ground photographs of the site and surrounding areas with information showing the scale and date of photographs and their relationship to the topographic map and profiles:

A. A view of the general area.

B. The site of the proposed development.

C. Any features which are important to the interpretation of the hazard potential of the site, including all sites of erosion, surface or groundwater accumulations, or accretion.

(c) Topography Map. A topography base map at a scale of not more than 1:100 with a contour interval of 2 feet shall be prepared identifying the following features and accompanied by references to the source(s) and date(s) of information used.

1) Position of lot lines.

2) Boundaries of the property.

3) Each geological feature classification type.

4) Areas of open ground and the boundaries and species identification of major plant communities.

5) Any springs, streams, marshy areas, standing bodies of water, intermittent waterways, drainage ways, and high groundwater areas with highest annual levels.

6) Cut terraces, erosion scarps, and areas exhibiting significant surface erosion due to improper drainage and runoff concentration.

7) Geological information, including lithologic and structural details important to engineering and geologic interpretations.

(d) Subsurface Analysis. If upon initial investigation if it appears there are critical areas where the establishment of geologic conditions at specific depths is required, a subsurface analysis obtained by drilling holes, well logs, and other geophysical techniques shall be conducted, or caused to be conducted by a qualified expert, by the person responsible for the site, and investigation report to include the following data as appropriate:

1) The lithology and compaction of all subsurface horizons to bedrock.

2) The depth, width, slope and bearing of all horizons containing significant amounts of silt and clay and any other subsurface layers which could reduce the infiltration of surface waters.

(e) Development Proposal. The site investigation report shall include the following information on the proposed development as applicable:

1) Plans and profiles showing the position and height of each structure, paved areas, and areas where cut and fill is required for construction.

2) The percent and location of the surface of the site, which will be covered by impermeable surfaces.

3) A stabilization program for the development describing:

A. How much of the site will be exposed during construction and what measures will be taken to reduce erosion and soil movement during construction.

B. A revegetation plan designed to return open soil areas, both preexisting and newly created, to a stable condition as soon as possible following construction and the period of time during which revegetated areas will receive revegetation maintenance.

C. Areas to be protected from vegetation loss or ground water pollution shall be identified and means for protection described.

(f) Conclusions in the Site Investigation:

1) The site investigation report shall contain conclusions stating the following:

A. How the intended use of the land is compatible with the natural conditions; and

B. Any existing or potential hazards noted during the investigation.

2) Mitigating recommendations for specific areas of concern shall be included.

3) Conclusions shall be based on data included in the report, and the sources of information and facts relied upon shall be specifically referenced.

6. Standards for Building Construction in NH Zone

(a) Building construction shall only be approved under conditions that do not adversely affect geological stability, surface or ground waters, or vegetation.

(b) The grading of land and the orientation and design of buildings shall avoid creating conditions that will cause erosion or accretion of soil, or surface and ground water contamination. Where there is some risk of these conditions occurring, a Qualified Geological or Hydrological Expert, whichever is applicable, shall certify that the design and control measures will comply with this standard.

(c) Construction work shall be scheduled and conducted to avoid erosion, and temporary stabilization measures may be needed until permanent installations are accomplished.

7. Standards for an Access Route in a NH Zone - An access route within a (NH) Zone shall comply with the following provisions:

(a) A road or street shall be stabilized by planking, gravel or pavement as deemed necessary; and

(b) Roadways shall be built without installation of excessive fill, diversion of water, or excessive cuts unless the site investigation determines that such conditions will not be detrimental to the area or create unwarranted maintenance problems or additional hazards.

8. Regulations Not a Guarantee - The degree of natural hazard protection afforded by the provisions of this Section or this Ordinance is considered reasonable for regulatory purposes and is based upon engineering and scientific methods of study. Greater hazards than those anticipated by these provisions may occur on occasion, or the natural hazard may be increased by human or natural causes. The identification of areas subject to natural hazards pursuant to the provisions of this Section does not imply that lands outside such areas will be free from such hazards. This Section, nor this Ordinance, shall not create liability on the part of the County or any officer or employee thereof for any damages that result from reliance on the provisions or designations of this Section or this Ordinance, or any administrative decisions lawfully made thereunder.

As shown in Figure 8, above, the area within and immediately adjacent to the northeastern corner of the proposed Solar Micrositing Area is within a Natural Hazards (NH) Combining Zone. The NH Zone is located along areas of steep slopes along Biglow Canyon and its tributaries.

The proposed solar facility is not a use permitted outright in the NH Zone under SCZO 3.7(2) because it is a commercial or industrial use that would require permanent structures to be installed above grade. As such the portions of the facility components proposed in RFA4 in the NH Zone are subject to the provisions of SCZO 3.7(5) to (8). As stated in SCZO 3.7(1), the development limitations in the ordinance apply in hazard areas, including areas with unstable or fragile soils, geological hazards, and steep slopes.

In the area overlapping the NH Zone, the proposed Solar Micrositing Area boundary generally follows the edges of cultivated lands which are on the plateau above the canyons. As discussed in Section III.C., *Structural Standard*, erodible and collapsible soils are present in these areas, but slopes are generally less than 30 percent within the proposed Solar Micrositing Area and

DOGAMI maps show that landslide susceptibility is generally moderate, but some hazard areas are present along the northern fork of Biglow Canyon.

The certificate holder proposes that the Council include a condition of approval requiring the certificate holder to submit an application for a "Permit for Use or Development in an NH Zone to Sherman County" if it determines that the NH zone or hazard areas cannot be avoided.[155] The Council rejects this proposed condition for two reasons. First, the certificate holder has elected to demonstrate compliance with the statewide land use planning goals by obtaining a Council determination that the construction and operation of the facility complies with applicable substantive criteria for the land use decision. As provided under SCZO 3.7(3), a decision to authorize development in the NH Zone must be processed as part of the overall decision to authorize the construction and operation of the facility as a conditional use in both the primary and combining zone. As such, the Council finds that a condition deferring approval for siting facility components in a hazard zone is likely impermissible both under the requirements of SCZO 3.7 and the Council's land use standard. Second, as described above, the development limitations of the NH zone only apply in hazard areas. The certificate holder relies on representations that these areas would be avoided, in part, to demonstrate compliance with the Council's standards, including but not limited to the Structural and Soil Protection Standards. These areas are also avoided in the layout of the facility components proposed in RFA4. [156] As described in Section III.C., *Structural Standard*, Amended Condition 68 would prohibit the certificate holder from siting facility components in hazard areas, including areas with slopes exceeding 20 percent, high landslide susceptibility areas, and other geologic hazards the NH zone is intended to protect against.

For areas that are in the NH zone, but not in hazard areas, the Council finds that existing and conditions of approval are adequate to ensure compliance with the requirements of SCZO 3.7.

As discussed in Section III.C., Structural Standard, the certificate holder will perform site-specific geotechnical work to inform the final design of the proposed solar components. In addition, as discussed in Section III.D, *Soil Protection*, Soil Protection Conditions 1 to 3 would require the certificate holder to finalize the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to this order based on final facility design and the approved NPDES General Permit 1200-C for the facility, and to conduct all construction work in compliance with the plan. The plan would include an ESCP which prescribes BMPS to reduce the potential for erosion and stormwater discharges into waterways.

Subject to compliance with the conditions described above, the Council finds that the construction and operation of the facility components proposed in RFA4 would comply with the requirements of SCZO Section 3.7.

<u>SCZO Section 5.1 Authorization to Grant or Deny Conditional Uses</u>

[155] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Section 5.2.2.

[156]BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 5.2.3.

Uses designated in this Ordinance as Conditional Uses may be permitted, enlarged or otherwise altered when authorized in accordance with the standards and procedures set forth in this Ordinance. In the case of a use existing prior to the effective date of this Ordinance, a change in use, enlargement or alteration of such use shall conform to the provisions of a conditional use if so classified. An application for a Conditional Use may be approved, modified, approved with conditions, or denied by the designated authority.

As described above, the certificate holder has elected to demonstrate compliance with the Statewide Planning Goals under ORS 469.504(1)(b), and as such the Council is responsible for determining whether the facility components proposed in RFA4 comply with the applicable substantive criteria from the affected local government's acknowledged comprehensive plan and land use regulations that are required by the statewide planning goals and in effect on the date the application is submitted, and the provisions of ORS chapters 197 and 215 and OAR chapter 660 that apply directly to the facility under ORS 197.646.

SCZO Section 5.2 General Criteria

In determining whether or not a Conditional Use proposal shall be approved or denied, it shall be determined that the following criteria are either met or can be met through compliance with specific conditions of approval.

1. The proposal is compatible with the County Comprehensive Plan and applicable Policies.

The Sherman County Comprehensive Plan includes goals and policies implementing the Statewide Planning Goals. The County did not recommend any specific policies or goals of the comprehensive plan as applicable substantive criteria for the review of the facility components proposed in RFA4, and as such, the Council finds that compatibility with the substantive policies and goals of the Comprehensive Plan is adequately addressed through the evaluation of the implementing ordinances of the Sherman County Zoning Ordinance, specifically the requirements of SCZO Sections 3.1, 3.6, 3.7, the provisions of ORS chapters 197 and 215 and OAR chapter 660 that apply directly to the facility under ORS 197.646.; and the Council's standards.

In addition, the Council finds that compliance with the procedural requirements of ORS chapter 469 and OAR chapter 345 are adequate to ensure compatibility with the policies and goals implementing Statewide Planning Goal 2 (Citizen Involvement) established in Section VIII of the Comprehensive Plan.

2. The proposal is in compliance with the requirements set forth by the applicable primary Zone, by any applicable combining zone, and other provisions of this Ordinance that are determined applicable to the subject use.

As described above, the facility components proposed in RFA4 are located entirely within Sherman County's F-1 Exclusive Farm Use zone, and a small portion is also located within the NH combining zone. Compliance with the requirements of SCZO 3.1, 3.6, and 3.7 are evaluated above. As described in the evaluation of directly applicable state rules and laws under ORS 197.646, below, the County has not adopted the minimum standards for solar photovoltaic facilities sited on EFU land and as such the provisions of OAR 660-033-0130 are directly applicable to the review of the facility components proposed in RFA4, the facility components proposed in RFA4 would exceed the maximum amounts of arable and high-value farmland allowed under OAR 660-033-0130(38), and for this reason cannot be approved without an exception to Statewide Planning Goal 3.

3. That, for a proposal requiring approvals or permits from other local, state and/or federal agencies, evidence of such approval or permit compliance is established or can be assured prior to final approval.

As described in Section III.B., *Organizational Expertise*, the Council finds the certificate holder has demonstrated that it has the capability to obtain all applicable federal, state, and local permits needed for the construction and operation of the facility components proposed in RFA4; and Organizational Expertise Condition 9 would require that the certificate holder, or its third party contractor has obtained all necessary permits prior to beginning construction of the facility components proposed in RFA4.

4. The proposal is in compliance with specific standards, conditions and limitations set forth for the subject use in this Article and other specific relative standards required by this or other County Ordinance.

Compliance with the Conditional use standards established in SCZO 5.8 is evaluated below.

5. That no approval be granted for any use which is or expected to be found to exceed resource or public facility carrying capacities, or for any use which is found to not be in compliance with air, water, land, and solid waste or noise pollution standards.

As described in Section III.M., *Public Services*, the Council finds that subject to existing and new conditions of approval, the construction and operation of the facility, with the proposed changes in RFA4, will not cause a significant adverse impact on the ability of public service providers to provide services.

As described in Section IV.A., *Noise Control Regulations,* the Council finds that, subject to compliance with existing, amended, and new conditions of approval, the facility, with the

changes proposed in RFA4 will comply with the noise regulations established under OAR 340-035-0035.

As described throughout this Order, the Council finds that the facility components proposed in RFA4 would generally comply with applicable air, water, and solid waste standards; however, as described in the evaluation of directly applicable state rules and laws under ORS 197.646, below, the facility components proposed in RFA4 would exceed the maximum amounts of arable and high-value farmland allowed under OAR 660-033-0130(38), and for this reason cannot be approved without an exception to Statewide Planning Goal 3.

6. That no approval be granted for any use violation of this Ordinance.

The proposed facility is not a use violation, therefore this section of SCZO 4.2 is not applicable.

SCZO Section 5.3 General Conditions

In addition to the standards and conditions set forth in a specific Zone, this Article, this Ordinance, and other applicable local, county, state and/or federal regulations, additional conditions may be imposed which are found to be necessary to avoid a detrimental impact on adjoining properties, the general area, or the County as a whole, and to otherwise protect the general welfare and interests of the surrounding area, the County as a whole and the general public. Such conditions may include, but are not limited to, the following:

1. Limiting the manner in which the use is conducted, including restricting the time an activity may take place, and restrictions to minimize environmental impacts such as noise, vibration, air or water pollution, glare and odor.

2. Establishing a special setback or other open space requirements, and increasing the required lot size or other dimensional standards.

3. Limiting the height, size or location of a building or other structure or use.

4. Increasing street width and/or requiring improvements to public streets and other public facilities serving the proposed use, even including those off-site but necessary to serve the subject proposal.

5. Designating the size, number, improvements, location and nature of vehicle access points and routes, and requiring pedestrian and/or bicycle ways.

6. Limiting or otherwise designating the number, size, location, height, and lighting of signs and outdoor or security lighting, and the intensity and/or direction thereof.

7. Requiring diking, screening, fencing, or other improvements or facilities deemed necessary to protect adjacent or nearby properties, and establishing requirements or standards for the installation and maintenance thereof.

8. Protecting and/or preserving existing trees, other vegetation, and water, scenic, historic, archaeological, unique, landmark, or other natural or manmade significant resources.

Throughout this Order, the Council imposes conditions of approval to ensure that the facility components proposed in RFA4 comply with all applicable local substantive criteria as well as all applicable State laws, rules, and Council Standards. The County has not recommended specific conditions of approval, and as such, no additional conditions of approval need be imposed under SCZO Section 5.3.

SCZO Section 5.8 Standards Governing Specific Conditional Uses

A Conditional Use set forth by this Ordinance shall be subject to review by the Planning Commission in accordance with the public hearing requirements set forth in this Ordinance.

** * * * **

10. Radio or Television Transmitter Tower, Utility Station or Substation - When authorized as a Conditional Use, the following standards and limitations shall apply:

(a) In a residential zone or area, all equipment storage on the site shall be enclosed within a building.

The facility components proposed in RFA4 are not located in a residential zone or area; therefore, the requirements of SCZO 5.8.10(a) do not apply.

(b) The use may be required to be fenced and provided with landscaping.

While this is described as an optional requirement, the National Electric Safety Code generally requires utility substations to be fully enclosed, and as described in Section I.E.3, the certificate holder represents that the proposed collector substations would be fenced or would be entirely within the proposed solar array fenceline. Amended Condition 103 would require the certificate holder to design, construct, and operate the facility, substantially as described in the site certificate.

(c) Coloring of structures, buildings and other permanent installations shall be of neutral colors or as otherwise required by the Commission or reviewing authority.

The Council previously imposed Site Certificate Conditions 50 and 51, requiring the certificate holder to paint wind facility structures with a low-reflectivity neutral-color finish. As described below, the Council imposes a similar condition for the solar facility components to maintain compliance with SCZO 5.8.10(c) and 14(b).

** * * * **

14. Public Facilities and Services

(a) Public facilities including, but not limited to, utility substations, sewage treatment plants, storm water and water lines, water storage tanks, radio and television transmitters, electrical generation and transmission devices, fire stations and other public facilities shall be located so as to best serve the County or area with a minimum impact on neighborhoods, and with consideration for natural or aesthetic values.

The Council finds that, as an electric generation facility, the requirements of SCZO 5.8.14 apply to the proposed solar facility. As described in Sections III.F., *Protected Areas,* III.J., *Scenic Resources,* and III.L., *Recreation,* the proposed solar facility is not expected to create significant visual impacts on any protected area, scenic resources, or recreational opportunities. While the facility components would be visible to nearby residences, the solar components are expected to be visually subordinate to existing wind and transmission facilities that are dominant on the landscape. Based on the Zone of Visual Influence Analysis provided to support the Scenic Resources exhibit, the facility components proposed in RFA4 would not be visible from any incorporated communities in Sherman County. Because the facility components proposed in RFA4 would have minimal impacts on residential areas and scenic and aesthetic values, the Council finds this criterion to be satisfied.

(b) Structures shall be designed to be as unobtrusive as possible. Wherever feasible, all utility components shall be placed underground.

The Council previously imposed Conditions 50 and 51, requiring wind turbines and other structures associated with the wind facility to be painted with low-reflectivity, neutral finishes. The Council also imposed Condition 52 requiring lighting to be minimized to reduce nighttime visual impacts. The Council imposes a similar condition applicable to the facility components proposed in RFA4 to further ensure that the visual impacts of facility components proposed in RFA4 are minimized, as provided below:

Land Use Condition 4 (GEN-LU-12)

a. <u>All structures and equipment associated with the solar facility, including but not limited to, power conversion stations, O&M buildings, and battery enclosures, must be designed or painted with a low-reflectivity, neutral gray, white, off-white or earth tone finish that minimizes contrast with the surrounding landscape.</u>

b. The certificate holder may install a sign identifying the facility near each O&M building or collector substation. No other signs may be installed except as required by law or for facility safety or security

c. All lighting installed at the O&M buildings, substation, or other facility components, shall be limited in intensity, shielded, and directed downward in a manner that prevents the lighting from projecting onto adjacent properties and roadways.

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The Council finds that, subject to compliance with the condition of approval, this criterion is satisfied.

(c) Public facilities and services proposed within a wetland or riparian area shall provide findings that: Such a location is required and a public need exists; and Dredge, fill and adverse impacts are avoided or minimized.

As discussed in Section IV.B., *Removal Fill,* the Council finds that, subject to compliance with Removal-Fill Condition 1, no impacts to wetlands or other waters of the state are expected to result from the construction or operation of the facility components proposed in RFA4. Accordingly, the Council finds that this criterion is satisfied.

20. Non-farm Uses in an F-1 Zone - Non-farm uses, excluding farm related, farm accessory uses, or uses conducted in conjunction with a farm use as a secondary use thereof, may be approved upon a finding that each such use:

The proposed solar facility and BESS are non-farm uses that would be located in Sherman County's F-1 Zone. Accordingly, the certificate holder must demonstrate that the facility components proposed in RFA4 comply with the Standards of SCZO 5.8.20.

1. Is compatible with farm uses described in [ORS] 215.203(2);

LCDC has adopted minimum standards for nonfarm uses in an EFU zone under OAR 660-033-0130, including standards for solar facilities under OAR 660-033-0130(38). As described in the evaluation below, the facility components proposed in RFA4 would use more high-value farmland and arable land than allowed under OAR 660-033-00130(38)(g) and (i). Accordingly, the Council finds that the facility components proposed in RFA4 are not compatible with farm use and cannot be approved without taking an exception to Statewide Planning Goal 3.

2. Does not interfere seriously with accepted farming practices on adjacent lands devoted to farm use;

Under ORS 215.296(1), a nonfarm use that is conditionally allowed in an EFU Zone may only be approved if the use will not:

"(a) force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; or

(b) significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use."

LCDC has adopted standards for evaluating whether or not a facility satisfies these criteria under OAR 660-033-0130(5). As discussed in more detail below, the Council finds that, subject to compliance with new and existing conditions of approval, the facility components proposed in RFA4 would not force a significant change in or significantly increase the costs of accepted farm practices on adjacent lands. Accordingly, the Council finds this criterion is satisfied.

3. Does not materially alter the overall land use pattern of the area;

As described in more detail below, under OAR 660-033-0130(38)(h)(G), the stability of an area's land use pattern would be materially altered if the cumulative effect of existing and potential nonfarm dwellings would make it more difficult for the existing types of farms in the area to continue operation due to diminished opportunities to expand, purchase or lease farmland, acquire water rights or diminish the number of tracts or acreage in farm use in a manner that will destabilize the overall character of the study area. While the test established in LCDC's rule is not directly applicable, the Council finds that it provides important context for evaluating compliance with this criterion.

The Council finds that the conversion of approximately 1,445 acres of cultivated land, including 1,006 acres of high-value farmland, to a nonfarm use does have the potential to materially alter the overall land use pattern of the analysis area by reducing the number of tracts available for farmland and potentially affecting the local agricultural economy, and as such, the Council finds that the criterion under SCZO 5.8.20(3) is not satisfied. Accordingly, the Council may not authorize the construction and operation of the facility components proposed in RFA4 without taking an exception to statewide planning goal 3.

4. Is situated upon generally unsuitable land for the production of farm crops and livestock, considering the terrain, adverse soil or land conditions, drainage and flooding, vegetation, location and size of the tract, and the availability of necessary support resources for agriculture;

Nearly all portions proposed Solar Micrositing Area that are not occupied by previously approved facility components are currently used for the production of farm crops. Accordingly, the Council finds that the criterion under SCZO 5.8.20(4) is not satisfied. Accordingly, the Council may not authorize the construction and operation of the facility components proposed in RFA4 without taking an exception to statewide planning goal 3.

5. Complies with other applicable significant resource provisions; and

The facility's compliance with the provisions of the County's Significant Resource Overlay Zone under SCZO Section 3.6 are evaluated above.

6. Complies with such other conditions as deemed necessary.

Throughout this Order, the Council imposes conditions of approval to ensure that the proposed solar facility complies with all applicable local substantive criteria as well as all applicable State laws, rules, and Council Standards. The County has not recommended specific conditions of approval, and as such, no additional conditions of approval need be imposed.

Directly Applicable State Rules and Statutes

OAR 660-033-0130(5) – Farm Impacts Test

(5) Approval requires review by the governing body or its designate under ORS 215.296. Uses may be approved only where such uses:

(a) Will not force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; and

(b) Will not significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.

(c) For purposes of subsection (a) and (b), a determination of forcing a significant change in accepted farm or forest practices on surrounding lands devoted to farm and forest use or a determination of whether the use will significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use requires:

(A) Identification and description of the surrounding lands, the farm and forest operations on those lands, and the accepted farm practices on each farm operation and the accepted forest practices on each forest operation;

As described above, the dominant accepted farming practice on lands adjacent to the proposed Solar Micrositing Area is the cultivation of dryland wheat, which typically includes a two-year cycle where half of the fields are left fallow each year to conserve moisture for the following year's crop. In addition to dryland wheat cultivation, approximately 125 acres in the analysis area are used for the cultivation of irrigated crops with an irrigation pivot.[157] Some non-cultivated lands located in the northeastern portion of the analysis area are also used for livestock grazing. A complete list of landowners within the analysis area and description of the

[157] See Permit: G 16704 * IR located within Analysis Area on Figure K-5; crops have included rotations of mint, garlic, and carrot seed.

accepted farming practices and nonfarm uses occurring on their lands is provided in Exhibit K, Table K-11.

> *(B) An assessment of the individual impacts to each farm and forest practice, and whether the proposed use is likely to have an important influence or effect on any of those practices; and*
>
> *(C) An assessment of whether all identified impacts of the proposed use when considered together could have a significant impact to any farm or forest operation in the surrounding area in a manner that is likely to have an important influence or effect on that operation.*
>
> *(D) For purposes of this subsection, examples of potential impacts for consideration may include but are not limited to traffic, water availability and delivery, introduction of weeds or pests, damage to crops or livestock, litter, trespass, reduction in crop yields, or flooding.*
>
> *(E) For purposes of subsection (a) and (b), potential impacts to farm and forest practices or the cost of farm and forest practices, impacts relating to the construction or installation of the proposed use shall be deemed part of the use itself for the purpose of conducting a review under subsections (a) and (b).*

As discussed in more detail below, the construction of the facility components proposed in RFA4 could potentially affect surrounding farm practices by increasing traffic on roads used by tractors and farm equipment, generating dust and stormwater discharges, and creating opportunities for the introduction and spread of noxious weeds and other nuisance plant species.

The operation of a solar photovoltaic power generation facility at the site is also not expected to interfere with accepted farming practices under normal conditions. The operation of solar photovoltaic facilities is not known to cause any direct impacts on adjacent crops or livestock and there are no emissions or effluents produced in the generation of electricity.

There would be some increased risk of wildfire associated with the presence of energized equipment and battery components at the site. In addition, there could be some minor increases in traffic and traffic-related impacts during the operation of the facility components proposed in RFA4.

Traffic

The expected traffic impacts of the facility components proposed in RFA4, generally, are discussed in Section III.M., Public Services. Potential traffic impacts on accepted farm practices include short-term delays or congestion that could affect tractor or equipment movement during harvest or other critical periods. The certificate holder notes that many of the

participating landowners were also operating during the construction of the existing wind facility and noted that construction related traffic could have some impacts on their operations and emphasized the need for coordinating traffic schedules around farm management road access needs.[158]

The certificate holder assumes county roadway traffic volumes are minimal, with some increase in traffic during the summer and early fall for harvest of various crops in the area. The certificate holder notes that construction-related heavy-vehicle traffic typically occurs in the middle of the day during off-peak hours and that commuter traffic will also generally occur out of phase with the truck traffic, as the workers report earlier and leave later than most of the truck traffic. The certificate holder did not provide evidence on what traffic patterns are associated with agricultural traffic; however, it can be assumed that it would also mostly occur during day-time hours. Peak construction periods are also assumed to coincide with peak harvest and planting seasons in the late summer and fall.

As discussed in Section III.M., *Public Services,* Amended Condition 79 and Amended Condition 77 would require the certificate holder to develop a Construction Traffic Management Plan prior to construction and implement the measures described above to minimize construction-related traffic impacts. The plan would include traffic minimization measures such staggering shift start times to reduce vehicle trips through the westbound I-84 ramp terminal at Biggs Junction and installing temporary traffic controls during peak construction periods. The certificate holder also represents that it will encourage carpooling for construction workers and include traffic safety as part of its safety training program. The certificate holder further represents that it will communicate with adjacent landowners to minimize and mitigate any traffic impacts to their farming practices during the temporary construction period.[159]

Amended Condition 77 and 78 would also require the certificate holder to enter into a Road Use Agreement with the County and ensure that any wear or damage to county roads that results from the construction of the facility components proposed in RFA4 is repaired, and that roads are restored to pre-construction condition or better.

The operation of the facility components proposed in RFA4 is not expected to result in significant volumes of traffic or road use impacts that would affect agricultural operations.

Water Availability and Delivery

As discussed in Section IV.C., *Water Rights*, the certificate holder represents that all water needed from construction and operation of the facility components proposed in RFA4 would be obtained from either the City of Wasco or a private source with an existing water right. Some water would also be obtained from on-site exempt wells constructed to serve the O&M

[158] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 6.2; Attachment K-1.

[159] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.3.

buildings, but in accordance with Water Rights Conditions 1 and 2 and the requirements of ORS 537.545 the use of water from all facility wells would not exceed 5,000 gallons per day.

The accepted farm uses in the analysis area, including dryland wheat farming and the use of groundwater for irrigation, do not depend on water deliveries and are not expected to be affected by any increases in demand for municipal water that result from the construction and operation of the facility components proposed in RFA4.

It is possible that water could be obtained from an existing private well if the certificate holder successfully transfers the water right under Oregon Certificate 57620 from agricultural irrigation to industrial use during operation of the facility; however no new water right is proposed and the facility components proposed in RFA4 is not in a critical groundwater area, so any groundwater use is not expected to reduce the amount of water available for irrigation.

Noxious and undesirable weeds

If unabated within the site, noxious weeds or other undesirable plant species could spread to adjacent lands and adversely affect farm operations. As described in Section III.D., *Soil Protection*, Soil Protection Condition 1 to 3, would require the certificate holder to finalize and implement a Comprehensive Solar Revegetation and Soil Management Plan that establishes the actions the certificate holder would be required to take to prevent the introduction of new noxious weed populations and spread of existing noxious weed populations during construction and operation of the solar facility. The Sherman County Weed Control District provides weed control services for the existing facility and the certificate holder represents that it will continue to contract with the district to inspect and treat weeds at the site, if available.

The Council finds that, subject to compliance with the Soil Protection Conditions 1 to 3, the construction and operation of the facility components proposed in RFA4 is not likely to result in the unbated spread or introduction of noxious or undesirable weeds into adjacent properties.

Litter and Solid Waste

As described in Section III.O., *Waste Minimization*, Amended Conditions 84 and 87 and Waste Minimization Condition 1 would require the certificate holder to manage solid waste generated during construction and operation of the facility components proposed in RFA4 in accordance with Construction and Operation Solid Waste Management Plans. The Council finds that, subject to compliance with the conditions, the construction and operation of the facility components proposed in RFA4 is not likely to result in significant amounts of litter or other waste that could affect adjacent properties.

Flooding and Stormwater runoff

The construction of the facility components proposed in RFA4 could create stormwater runoff or other erosion issues that, if unmitigated, could impact farm operations on adjacent properties. As described in Section III.D., *Soil Protection*, Soil Protection Conditions 1 to 3, would require the certificate holder to finalize and implement a Comprehensive Solar Revegetation and Soil Management Plan. The plan would require the certificate holder to construct the facility in compliance with a NPDES 1200-C Construction Stormwater Permit and implement BMPs to prevent the discharge of stormwater from the site.

Any BMPs needed to control stormwater during operation will be maintained for the life of the facility. If the certificate holder conducts solar panel washing during operation of the facility components proposed in RFA4, solar wash water would evaporate or will infiltrate into the ground within the immediate vicinity of its use.

The Council finds that, subject to compliance with the Soil Protection Condition 1 to 4, the construction and operation of the facility components proposed in RFA4 is not likely to result in the discharge of stormwater to adjacent properties.

Dust

As discussed in Section III.D., *Soil Protection*, soils throughout the site have a moderate potential for wind erosion and low fugitive dust resistance, which indicates the need to address potential dust generation by traffic generated during construction and operation of the facilities. Dust can affect photosynthesis, and, if unmitigated, dust generated during construction of the facility components proposed in RFA4 could impact farm operations on adjacent properties. Soil Protection Conditions 1 to 3 would require the certificate holder to finalize and implement a Comprehensive Revegetation and Soil Management Plan that establishes the actions the certificate holder would be required to take to mitigate dust propagation during construction and operation of the facility components proposed in RFA4. In particular, Appendix D of the plan requires the certificate holder to minimize dust during construction through application of water and other dust control measures and to conduct visual monitoring of dust emissions.

The Council finds that, subject to compliance with the Soil Protection Condition 1 to 3, the dust generated by the construction and operation of the facility components proposed in RFA4 is not likely to significantly interfere with farm operations on adjacent properties.

Wildfire

As discussed in Section III.N., *Wildfire Prevention and Risk Mitigation*, the proposed Solar Micrositing Area is in an area associated with high wildfire risk, and in addition to the loss of human life, previous wildfires in the area have resulted in the destruction of significant amounts of crops and damage to agricultural lands. Under Wildfire Prevention and Risk Mitigation Conditions 1 and 2, the certificate holder would be required to finalize and

implement a Construction Wildfire Mitigation Plan establishing the preventative actions and programs the certificate holder will take to minimize the risk of construction activities igniting a wildfire. Wildfire Prevention and Risk Mitigation Conditions 3 and 4 would require a similar plan to be finalized and implemented during operations.

The facility components proposed in RFA4 would also contain numerous features to reduce the risk of a wildfire being ignited by facility components, and to help mitigate the risk of wildfire spreading into or from the proposed solar micrositing area, including fire sensors with remote shutoff capability, vegetation clearances around roads and electrical equipment, and the 50-foot setback from adjacent properties required under Land Use Condition 1. The Council finds these features are adequate to minimize the wildfire risk from the operating facility, and to ensure that adjacent farm operations are not significantly affected.

Liability from Nuisance Claims

In addition to protecting adjacent farm practices from potential impacts that may result from the construction and operation of the facility components proposed in RFA4, ORS 30.930, also known as Oregon's right to farm law, protects farm operators from lawsuits based on noises, smells, dust or other nuisances or trespasses that may result from accepted farm practices. As described in the evaluation Of OAR 660-033-0130(38)(L), below, Land Use Condition 5 would require the certificate holder to sign and record in the deed records of Sherman County a document prohibiting them from pursuing a claim for relief or cause of action alleging injury from farming practices.

Cumulative Assessment

The Council finds that, subject to compliance with compliance with the conditions of approval described above, the construction and operation of the facility components proposed in RFA4 are not expected to significantly interfere with adjacent farm uses. There may be some temporary impacts related to traffic and dust during construction, but these impacts will be minimized in accordance with the Construction Traffic Management Plan required under Amended Condition 77 and the Comprehensive Solar Revegetation and Soil Management Plan required under Soil Protection Conditions 1 to 3. The potential for the introduction or spread of noxious weeds and other undesirable weed species from the site would also be addressed under the latter set of conditions.

The risk of wildfire is a significant concern at the site; however, the facility would be designed with features to reduce wildfire risk and minimize the potential for wildfire to spread out of or into the solar arrays. In addition, the Wildfire Mitigation Plans required under Wildfire Prevention and Risk Mitigation Conditions 1 to 4 would reduce the likelihood of fire ignition at the site, and the vegetation management standards established in the Comprehensive Solar Revegetation and Soil Management Plan required under Soil Protection Conditions 1 to 3 would help reduce the severity of a wildfire if one were to occur.

(F) In the consideration of potentially mitigating conditions of approval under ORS 215.296(2), the governing body may not impose such a condition upon the owner of the affected farm or forest land or on such land itself, nor compel said owner to accept payment to compensate for the significant changes or significant increases in costs described in subsection (a) and (b).

None of the conditions described above apply to adjacent lands or the adjacent landowners.

OAR 660-033-0130(38) – Minimum Standards for Photovoltaic Solar Power Generation Facilities

(38) A proposal to site a photovoltaic solar power generation facility shall be subject to the following definitions and provisions:

(a) "Arable land" means land in a tract that is predominantly cultivated or, if not currently cultivated, predominantly comprised of arable soils.

(b) "Arable soils" means soils that are suitable for cultivation as determined by the governing body or its designate based on substantial evidence in the record of a local land use application, but "arable soils" does not include high-value farmland soils described at ORS 195.300(10) unless otherwise stated.

(c) "Dual-use development" means developing the same area of land for both a photovoltaic solar power generation facility and for farm use.

(d) "Nonarable land" means land in a tract that is predominantly not cultivated and predominantly comprised of nonarable soils.

(e) "Nonarable soils" means soils that are not suitable for cultivation. Soils with an NRCS agricultural capability class V–VIII and no history of irrigation shall be considered nonarable in all cases. The governing body or its designate may determine other soils, including soils with a past history of irrigation, to be nonarable based on substantial evidence in the record of a local land use application.

(f) "Photovoltaic solar power generation facility" includes, but is not limited to, an assembly of equipment that converts sunlight into electricity and then stores, transfers, or both, that electricity. This includes photovoltaic modules, mounting and solar tracking equipment, foundations, inverters, wiring, storage devices and other components. Photovoltaic solar power generation facilities also include electrical cable collection systems connecting the photovoltaic solar generation facility to a transmission line, all necessary grid integration equipment, new or expanded private roads constructed to serve the photovoltaic solar power generation facility, office, operation and

maintenance buildings, staging areas and all other necessary appurtenances. For purposes of applying the acreage standards of this section, a photovoltaic solar power generation facility includes all existing and proposed facilities on a single tract, as well as any existing and proposed facilities determined to be under common ownership on lands with fewer than 1320 feet of separation from the tract on which the new facility is proposed to be sited. Projects connected to the same parent company or individuals shall be considered to be in common ownership, regardless of the operating business structure. A photovoltaic solar power generation facility does not include a net metering project established consistent with ORS 757.300 and OAR chapter 860, division 39 or a Feed-in-Tariff project established consistent with ORS 757.365 and OAR chapter 860, division 84.

The energy facility and all related or supporting facilities, except the proposed 230-KV overhead transmission line, are considered to be a "photovoltaic solar power generation facility" subject to the provisions of OAR 660-033-0130(38). The department is not aware of any existing or proposed solar facilities owned by the certificate holder within 1320 feet of the subject property.

(g) For high-value farmland described at ORS 195.300(10), a photovoltaic solar power generation facility shall not use, occupy, or cover more than 12 acres unless:

(A) The provisions of paragraph (h)(H) are satisfied; or

(B) A county adopts, and an applicant satisfies, land use provisions authorizing projects subject to a dual-use development plan. Land use provisions adopted by a county pursuant to this paragraph may not allow a project in excess of 20 acres. Land use provisions adopted by the county must require sufficient assurances that the farm use element of the dual-use development plan is established and maintained so long as the photovoltaic solar power generation facility is operational or components of the facility remain on site. The provisions of this subsection are repealed on January 1, 2022.

As relevant to the proposed site, ORS 195.300(10) defines high-value farmland as:

- Land in a tract composed predominantly of soils that classified prime, unique, Class I or Class II as determined by irrigation status. ORS 195.300(10)(a).
- Land within the place of use for a permit, certificate or decree for the use of water for irrigation issued by the Water Resources Department; or within the boundaries of an irrigation or diking district. ORS 195.300(10)(c).
- Land that is within the Columbia Valley American Viticultural Area and is no more than 3,000 feet above mean sea level, with an aspect between 67.5 and 292.5 degrees, and a slope between zero and 15 percent. ORS 195.300(10)(f).

As described above, approximately 1,305 acres within the proposed Solar Micrositing Area are considered to be high-value farmland for one or more of these reasons, including approximately 311 acres that are appurtenant to an active irrigation water right. In total, the certificate holder estimates the facility would use, occupy or cover up to 1,006 acres of high-value farmland.

As described below, the facility components proposed in RFA4 do not satisfy the criteria under OAR 660-033-0130(38)(h)(H) and the County did not implement paragraph (g)(B) of the rule. Accordingly, the Council finds that the facility components proposed in RFA4 would use more high-value farmland than permitted under the rule. Because this standard directly implements Statewide Planning Goal 3, the Council finds that the facility components proposed in RFA4 cannot be approved unless the Council takes an exception to the goal under ORS 469.504(2).

> *(h) The following criteria must be satisfied in order to approve a photovoltaic solar power generation facility on high-value farmland described at ORS 195.300(10).*
>
> *(A) The proposed photovoltaic solar power generation facility will not create unnecessary negative impacts on agricultural operations conducted on any portion of the subject property not occupied by project components. Negative impacts could include, but are not limited to, the unnecessary construction of roads dividing a field or multiple fields in such a way that creates small or isolated pieces of property that are more difficult to farm, and placing photovoltaic solar power generation facility project components on lands in a manner that could disrupt common and accepted farming practices;*

To support a finding that the proposed solar components would not create unnecessary negative impacts on agricultural operations, the certificate holder notes that the layout of the facility components proposed in RFA4 Figure 2 shows that areas outside of the proposed solar array fencelines that are suitable for farming are generally contiguous to adjacent farmland and would continue to be available for continued farm operations. Other unused areas include steep slopes or waterways that are generally unsuitable for farming.

The preliminary facility layout also shows that, due to the certificate holder's own requirement that all solar components be set back at least 520 feet from existing turbines, at least 500 acres of cultivated land surrounding existing wind turbines would be included in the proposed fencelines and presumably taken out of agricultural production but wouldn't otherwise be occupied by facility components. While the setbacks may be necessary to ensure the wind components can continue to operate safely and efficiently, the Council finds that the certificate holder did not provide sufficient evidence to demonstrate that the negative impacts on the unused farmland could not be avoided. Accordingly, the Council finds that the criterion under OAR 345-066-0130(38)(h)(A) is not satisfied.

(B) The presence of a photovoltaic solar power generation facility will not result in unnecessary soil erosion or loss that could limit agricultural productivity on the subject property. This provision may be satisfied by the submittal and county approval of a soil and erosion control plan prepared by an adequately qualified individual, showing how unnecessary soil erosion will be avoided or remedied. The approved plan shall be attached to the decision as a condition of approval;

The construction of the facility components proposed in RFA4 could create stormwater runoff or other erosion issues that, if unmitigated, could result in erosion or soil loss on the subject property. As described in Section III.D, Soil Protection, Soil Protection Condition 1 to 4, would require the certificate holder to finalize and implement a Comprehensive Solar Revegetation and Soil Management Plan. The plan would require the certificate holder to construct the facility in compliance with a NPDES 1200-C Construction Stormwater Permit and implement BMPs to prevent the discharge of stormwater from the site.

The Council finds that, subject to compliance with the Soil Protection Conditions 1 to 3, the construction and operation of the facility components proposed in RFA4 is not likely to result in unnecessary soil erosion or soil loss that could limit agricultural productivity on the subject property.

(C) Construction or maintenance activities will not result in unnecessary soil compaction that reduces the productivity of soil for crop production. This provision may be satisfied by the submittal and county approval of a plan prepared by an adequately qualified individual, showing how unnecessary soil compaction will be avoided or remedied in a timely manner through deep soil decompaction or other appropriate practices. The approved plan shall be attached to the decision as a condition of approval;

Construction of the facility components proposed in RFA4 could result in soil compaction, particularly in areas that are cleared of vegetation or graded. As described in Section III.D, Soil Protection, there are also some soils that are highly susceptible to compaction are present at the site.

Soil Protection Conditions 1 to 3, would require the certificate holder to finalize and implement a Comprehensive Revegetation and Soil Management Plan during construction of the facility components proposed in RFA4. The draft Plan, included as Attachment D to this Order includes provisions for soils compaction testing and monitoring and establishes remediation that will be implemented if excessive compaction is detected.

Subject to compliance with these conditions, and the Comprehensive Revegetation and Soil Management Plan, the Council finds the construction and operation of the facility components proposed in RFA4 will not result in unnecessary soil compaction that reduces the productivity of soil for crop production.

(D) Construction or maintenance activities will not result in the unabated introduction or spread of noxious weeds and other undesirable weed species. This provision may be satisfied by the submittal and county approval of a weed control plan prepared by an adequately qualified individual that includes a long-term maintenance agreement. The approved plan shall be attached to the decision as a condition of approval;

If unabated within the site, noxious weeds or other undesirable plant species could spread to adjacent lands and adversely affect farm operations. As described in Section III.D, Soil Protection, Soil Protection Conditions 1 to 3 would require the certificate holder to finalize and implement a Comprehensive Revegetation and Soil Management Plan that establishes the actions the certificate holder would be required to take to prevent the introduction of new noxious weed populations and spread of existing noxious weed populations. The Sherman County Weed Control District provides weed control services for the existing facility and the certificate holder represents that it will continue to contract with the district to inspect and treat weeds at the site, if available.

The Council finds that, subject to compliance with the Soil Protection Conditions 1 to 3, the construction and operation of the facility components proposed in RFA4 is not likely to result in the unbated spread or introduction of noxious or undesirable weeds into adjacent properties.

(E) Except for electrical cable collection systems connecting the photovoltaic solar generation facility to a transmission line, the project is not located on those high-value farmland soils listed in OAR 660-033-0020(8)(a);

OAR 660-033-0020(8)(a) identifies soils that are classified by the NRCS as Class I, Class II, prime, or unique, as high-value farmland soils. As described above and shown in Figure 6, approximately 778 of the 1,945 acres that make up the proposed Solar Micrositing Area are comprised of Class II soils. The certificate holder did not provide an estimate of how much of the high-value farmland soils would be occupied by facility components but based on the layout of the facility components proposed in RFA4, provided in Figure 2, aside from a small unused area in the northeast corner of the Northern Solar Area, nearly all of the high-value soils would be impacted.[160]

Because the facility components proposed in RFA4 would be located on up to approximately 778 acres of high-value soils, the Council finds that the facility components proposed in RFA4 would not satisfy the criterion under OAR 660-033-0130(38)(h)(E). Because this standard directly implements Statewide Planning Goal 3, the Council finds that the facility components

[160] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 6.3. The certificate holder also asserts that it would not be possible to completely avoid the high-value soils due to their prevalence at the site and their patchy and irregular nature, but did not provide evidence that would suggest that the presence of high-value soils was considered in the selection of the site or the development of the proposed layout.

proposed in RFA4 cannot be approved unless the Council takes an exception to the goal under ORS 469.504(2).

> *(F) The project is not located on those high-value farmland soils listed in OAR 660-033-0020(8)(b)-(e) or arable soils unless it can be demonstrated that:*
>
> *(i) Non high-value farmland soils are not available on the subject tract;*
>
> *(ii) Siting the project on non high-value farmland soils present on the subject tract would significantly reduce the project's ability to operate successfully; or*
>
> *(iii) The proposed site is better suited to allow continuation of an existing commercial farm or ranching operation on the subject tract than other possible sites also located on the subject tract, including those comprised of non high-value farmland soils; and*

OAR 660-033-0020(b) identifies soils used for growing specific perennial crops including nursery stock, berries, fruits, nuts, Christmas trees, or vineyards, but not including seed crops, hay, pasture or alfalfa. OAR 660-0033-0020(c) to (e) apply specifically to soils within the Willamette Valley. None of these soils are present within the proposed Solar Micrositing Area, as a result the criteria under OAR 660-033-0130(38)(h)(F) are not applicable to the review of RFA4.

> *(G) A study area consisting of lands zoned for exclusive farm use located within one mile measured from the center of the proposed project shall be established and:*
>
> *(i) If fewer than 48 acres of photovoltaic solar power generation facilities have been constructed or received land use approvals and obtained building permits within the study area, no further action is necessary.*
>
> *(ii) When at least 48 acres of photovoltaic solar power generation facilities have been constructed or received land use approvals and obtained building permits, either as a single project or as multiple facilities within the study area, the local government or its designate must find that the photovoltaic solar power generation facility will not materially alter the stability of the overall land use pattern of the area. The stability of the land use pattern will be materially altered if the overall effect of existing and potential photovoltaic solar power generation facilities will make it more difficult for the existing farms and ranches in the area to continue operation due to diminished opportunities to expand, purchase or lease farmland, acquire water rights, or diminish the number of tracts or acreage in farm use in a manner that will destabilize the overall character of the study area.*

No solar facilities have been constructed or have been approved within the study area identified by rule, so no further analysis is necessary; however, the Council finds that this test provides important context for the evaluation of SCZO 5.8.20(3). In the evaluation of that section, above, the Council finds that the conversion of approximately 1,445 acres of cultivated land, including up to 1,006 acres of high-value farmland, to a nonfarm use does have the potential to materially alter the overall land use pattern of the analysis area by reducing the number of tracts available for farmland and potentially affecting the local agricultural economy.

> *(H) A photovoltaic solar power generation facility may be sited on more than 12 acres of high-value farmland described in ORS 195.300(10)(f)(C) without taking an exception pursuant to ORS 197.732 and OAR chapter 660, division 4, provided the land:*
>
> *(i) Is not located within the boundaries of an irrigation district;*
>
> *(ii) Is not at the time of the facility's establishment, and was not at any time during the 20 years immediately preceding the facility's establishment, the place of use of a water right permit, certificate, decree, transfer order or ground water registration authorizing the use of water for the purpose of irrigation;*
>
> *(iii) Is located within the service area of an electric utility described in ORS 469A.052(2);*
>
> *(iv) Does not exceed the acreage the electric utility reasonably anticipates to be necessary to achieve the applicable renewable portfolio standard described in ORS 469A.052(3); and*
>
> *(v) Does not qualify as high-value farmland under any other provision of law; or*

The certificate holder does not claim to meet the requirements of OAR 660-033-0130(38)(h)(H); therefore, no further analysis of this paragraph is required.

> *(i) For arable lands, a photovoltaic solar power generation facility shall not use, occupy, or cover more than 20 acres. The governing body or its designate must find that the following criteria are satisfied in order to approve a photovoltaic solar power generation facility on arable land:*
>
> *(A) Except for electrical cable collection systems connecting the photovoltaic solar generation facility to a transmission line, the project is not located on those high-value farmland soils listed in OAR 660-033-0020(8)(a);*

(B) The project is not located on those high-value farmland soils listed in OAR 660-033-0020(8)(b)-(e) or arable soils unless it can be demonstrated that:

(i) Nonarable soils are not available on the subject tract;

(ii) Siting the project on nonarable soils present on the subject tract would significantly reduce the project's ability to operate successfully; or

(iii) The proposed site is better suited to allow continuation of an existing commercial farm or ranching operation on the subject tract than other possible sites also located on the subject tract, including those comprised of nonarable soils;

(C) No more than 12 acres of the project will be sited on high-value farmland soils described at ORS 195.300(10);

(D) A study area consisting of lands zoned for exclusive farm use located within one mile measured from the center of the proposed project shall be established and:

(i) If fewer than 80 acres of photovoltaic solar power generation facilities have been constructed or received land use approvals and obtained building permits within the study area, no further action is necessary.

(ii) When at least 80 acres of photovoltaic solar power generation facilities have been constructed or received land use approvals and obtained building permits, either as a single project or as multiple facilities within the study area, the local government or its designate must find that the photovoltaic solar power generation facility will not materially alter the stability of the overall land use pattern of the area. The stability of the land use pattern will be materially altered if the overall effect of existing and potential photovoltaic solar power generation facilities will make it more difficult for the existing farms and ranches in the area to continue operation due to diminished opportunities to expand, purchase or lease farmland, acquire water rights, or diminish the number of tracts or acreage in farm use in a manner that will destabilize the overall character of the study area; and

(E) The requirements of paragraphs (h)(A), (B), (C) and (D) are satisfied.

As described above, all of the land within the proposed Solar Micrositing Area that is not located on high-value farmland, or approximately 619 acres, is considered to be arable land. Because the facility components proposed in RFA4 would use more than 20 acres, the criterion under OAR 660-033-0130(i) is not satisfied. As described in the evaluation of OAR 660-033-0130(h), above the facility components proposed in RFA4 would also not comply with

paragraphs (i)(A), (C), and (E), and paragraph (D) is not appropriate to measure the potential impacts of the facility components proposed in RFA4 on the stability of the overall land use pattern of the area given its potential size.

Accordingly, the Council finds that the facility components proposed in RFA4 would use more arable land and high-value farmland soils than permitted under the rule. Because this standard directly implements Statewide Planning Goal 3, the Council finds that the facility components proposed in RFA4 cannot be approved unless the Council takes an exception to the goal under ORS 469.504(2).

> *(j) For nonarable lands, a photovoltaic solar power generation facility shall not use, occupy, or cover more than 320 acres. The governing body or its designate must find that the following criteria are satisfied in order to approve a photovoltaic solar power generation facility on nonarable land:*
>
> *(A) Except for electrical cable collection systems connecting the photovoltaic solar generation facility to a transmission line, the project is not located on those high-value farmland soils listed in OAR 660-033-0020(8)(a);*
>
> *(B) The project is not located on those high-value farmland soils listed in OAR 660-033-0020(8)(b)-(e) or arable soils unless it can be demonstrated that:*
>
> *(i) Siting the project on nonarable soils present on the subject tract would significantly reduce the project's ability to operate successfully; or*
>
> *(ii) The proposed site is better suited to allow continuation of an existing commercial farm or ranching operation on the subject tract as compared to other possible sites also located on the subject tract, including sites that are comprised of nonarable soils;*
>
> *(C) No more than 12 acres of the project will be sited on high-value farmland soils described at ORS 195.300(10);*
>
> *(D) No more than 20 acres of the project will be sited on arable soils;*
>
> *(E) The requirements of paragraph (h)(D) are satisfied;*
>
> *(F) If a photovoltaic solar power generation facility is proposed to be developed on lands that contain a Goal 5 resource protected under the county's comprehensive plan, and the plan does not address conflicts between energy facility development and the resource, the applicant and the county, together with any state or federal agency responsible for protecting the resource or habitat supporting the resource, will cooperatively develop a specific resource management plan to mitigate potential development*

conflicts. If there is no program present to protect the listed Goal 5 resource(s) present in the local comprehensive plan or implementing ordinances and the applicant and the appropriate resource management agency(ies) cannot successfully agree on a cooperative resource management plan, the county is responsible for determining appropriate mitigation measures; and

(G) If a proposed photovoltaic solar power generation facility is located on lands where, after site specific consultation with an Oregon Department of Fish and Wildlife biologist, it is determined that the potential exists for adverse effects to state or federal special status species (threatened, endangered, candidate, or sensitive) or habitat or to big game winter range or migration corridors, golden eagle or prairie falcon nest sites or pigeon springs, the applicant shall conduct a site-specific assessment of the subject property in consultation with all appropriate state, federal, and tribal wildlife management agencies. A professional biologist shall conduct the site-specific assessment by using methodologies accepted by the appropriate wildlife management agency and shall determine whether adverse effects to special status species or wildlife habitats are anticipated. Based on the results of the biologist's report, the site shall be designed to avoid adverse effects to state or federal special status species or to wildlife habitats as described above. If the applicant's site-specific assessment shows that adverse effects cannot be avoided, the applicant and the appropriate wildlife management agency will cooperatively develop an agreement for project-specific mitigation to offset the potential adverse effects of the facility. Where the applicant and the resource management agency cannot agree on what mitigation will be carried out, the county is responsible for determining appropriate mitigation, if any, required for the facility.

No nonarable land is present within the proposed Solar Micrositing Area, as such, OAR 660-033-0130(38)(j) is not applicable to the review of RFA4.

(k) An exception to the acreage and soil thresholds in subsections (g), (h), (i), and (j) of this section may be taken pursuant to ORS 197.732 and OAR chapter 660, division 4.

As described above, the Council finds that the facility components proposed in RFA4 would use more high-value farmland, arable land, and high-value farmland soils than permitted under OAR 660-033-0130(38)(g) and (i) and the Council finds that the facility components proposed in RFA4 cannot be approved unless the Council takes an exception to the goal under ORS 469.504(2). Whether or not an exception is justified is evaluated below.

(l) The county governing body or its designate shall require as a condition of approval for a photovoltaic solar power generation facility, that the project owner sign and record in the deed records for the county a document binding

the project owner and the project owner's successors in interest, prohibiting them from pursuing a claim for relief or cause of action alleging injury from farming or forest practices as defined in ORS 30.930(2) and (4).

The Council imposes a new condition of approval requiring the certificate holder to sign a binding document described in the rule, as presented below:

Land Use Condition 5 (PRE-LU-02)
Prior to construction of any component or phase of the solar facility, the certificate holder must sign and record in the deed records for the county a document binding the project owner and the project owner's successors in interest, prohibiting them from pursuing a claim for relief or cause of action alleging injury from farming or forest practices as defined in ORS 30.930(2) and (4).
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(m) Nothing in this section shall prevent a county from requiring a bond or other security from a developer or otherwise imposing on a developer the responsibility for retiring the photovoltaic solar power generation facility.

As described in Section III.G, Retirement and Financial Assurance, Retirement and Financial Assurance Conditions 1 and 2 and Amended Conditions 10 and 108 would require the certificate holder to submit, and maintain at all times until the facility has been retired, a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition.

(n) If ORS 469.300(11)(a)(D) is amended, the commission may re-evaluate the acreage thresholds identified in subsections (g), (i) and (j) of this section.

This subsection does not provide applicable substantive criteria for the review of the facility components proposed in RFA4.

Goal 3 Exception

As described above, the proposed solar facility would use, occupy, or cover more high-value and arable farmland than allowed under OAR 660-033-0130(38)(h) and (i). Because the facility components proposed in RFA4 would be located on up to approximately 778 acres of Class II high-value farmland soils, the facility components proposed in RFA4 would also not comply with the requirements of OAR 660-033-0130(38)(h)(E). While the SCZO does not provide specific siting standards for solar photovoltaic power generation facilities, the Council also finds that the facility components proposed in RFA4 do not comply with the County's standards for conditional uses under SCZO 5.2 and 5.8.20 based on noncompliance with the minimum standards adopted by LCDC.

Under ORS 469.504(2)(b)(B), if the facility components proposed in RFA4 do not comply with one or more of the applicable substantive criteria recommended by a Special Advisory Group, or with the rules that apply directly to the facility under ORS 197.646, the Council may still find compliance with Land Use standard if it finds the facility components proposed in RFA4 would otherwise comply with the applicable statewide planning goals, or that an exception to any applicable statewide planning goal is justified.

Statewide Planning Goal 3 is "to preserve and maintain agricultural lands for farm use." While certain non-farm uses, including solar facilities, are permitted within farm use zones the guidelines for implementing the goal states that permitted non-farm uses should be "minimized to allow for maximum agricultural productivity."[161] Because the rules in OAR 660-033-0130(38) prescribe the minimum standards for solar photovoltaic power generation facilities to be sited in compliance with Statewide Planning Goal 3, and because the facility components proposed in RFA4 would use more productive farmland, including high-value farmland and high-value farmland soils, than allowed by those standards, the Council finds that the facility components proposed in RFA4 would not otherwise comply with Statewide Planning Goal 3.

The Council may find goal compliance for a facility that does not otherwise comply with one or more statewide planning goals by taking an exception to the applicable goal. Pursuant to ORS 469.504(2)(c): "[t]he council may take an exception to a goal if the council finds" that each of the following standards are met:

- Reasons justify why the state policy embodied in the applicable goal should not apply.
- The significant environmental, economic, social and energy consequences have been identified and adverse impacts will be mitigated in accordance with rules of the Council applicable to the siting of the facility components proposed in RFA4.
- The facility components proposed in RFA4 are compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts.

Each of these standards are evaluated in detail below. It is important to note that the Council has the discretion to determine whether or not given reasons justify an exception to the policy embedded in an applicable goal. In addition, by stating the Council "may take an exception," the statute establishes that the Council is not obligated to grant an exception even if the standards are met. Rather has the discretion whether or not to grant an exception.[162]

[161] OAR 660-015-0000(3)

[162] Oregon courts recognize that the granting of an exception to a statewide land use planning goal is discretionary. See, e.g., Manning v. Land Conservation & Dev. Comm'n, 198 Or. App. 488, 497–98, 109 P.3d 376, 380 (2005) ("*We are aware of no existing authority and see nothing in Goal 2, the rules governing exceptions, or ORS 197.732 that requires a local government to take an exception to a goal. Evidence that an exception may be justified does not require the county to grant an exception. Goal 2 and ORS 197.732 provide that an exception may be granted on showing certain conditions, not that it must*. However, before deciding whether to grant an exception, the county must provide an opportunity for the requesting party to make a complete record and to argue in support of the exception, and the county must consider that record and argument in making its decision" (emphasis added).

Proposed Reasons why the applicable goal should not apply

As described above, the policy embedded in Statewide Planning Goal 3 is "to preserve and maintain agricultural lands for farm use" and to minimize nonfarm uses "to allow for maximum agricultural productivity."[163] In RFA4, the certificate holder proposes that this policy should not apply to the agricultural lands within the Solar Micrositing Area for the following reasons:

1. Locational Dependence: The facility components proposed in RFA4 are locationally dependent on an existing substation with available interconnection capacity, are sited in proximity to major transportation corridors, and are co-located with the existing wind facility and other energy infrastructure.
2. Economic Benefits: The facility components proposed in RFA4 provide local rural economic development benefits through the creation of jobs, the generation of tax revenues, lease payments, and the creation of a Community Investment Plan.
3. Minimal Impacts to Other resources: The facility components proposed in RFA4 avoid and minimize impacts on other resources protected by Council Standards.
4. Consistency with State Climate Goals and Policies: The facility components proposed in RFA4 are consistent with Oregon's Policies and Goals Requiring the State to Address the Climate Crisis.

Each of these reasons is discussed in more detail below. Following the evaluation of individual reasons, the exception request is discussed in its entirety.

Locational Dependence

Locational dependency refers to the proximity of the facility components proposed in RFA4 on existing infrastructure needed to construct and operate the facility, or the presence of uncommon geographical attributes at a site that would create a significant comparative advantage for the facility.

The certificate holder presents three distinct arguments to support its locational dependence reason. Specifically, the certificate holder argues that the facility components proposed in RFA4 are locationally dependent on:

- The regional transmission grid through an existing substation with available interconnection capacity to allow the output of the facility components proposed in RFA4 to be transmitted to the regional grid without the need to construct new regional substations or lengthy high-voltage transmission lines.
- Nearby transportation corridors and local arterial routes which provide access and materials transport to the site, minimizing the need to construct new or improve existing roads.

[163] OAR 660-015-0000(3).

- Other energy facilities, including the existing wind energy facility, because co-location with the wind facility will optimize the energy generated by the wind component by allowing excess wind energy to charge the BESS while keeping infrastructure costs to a minimum.[164]

For the reasons described below, the Council finds that the proposed Solar Micrositing Area's proximity to the regional transmission grid and transportation infrastructure supports a locational dependence reason, and find that the reason supports, but does not by itself justify, an exception to Statewide Planning Goal 3.

Proximity to the regional transmission grid

The proposed solar facility would connect to the regional transmission grid through the Biglow Canyon Substation, which was constructed as part of the existing facility and is located within the proposed Solar Micrositing Area. The Biglow Canyon Substation is connected to the regional grid by an approximately six mile 230-kV transmission line constructed by the Bonneville Power Administration (BPA) to interconnect the existing facility and the nearby Klondike III wind facility to the John Day Substation located outside of Rufus near I-84 and the Columbia River.[165] Several 500 kV transmission lines connect the John Day Substation with generating facilities in Oregon and Washington and load centers in the Portland metro region. In addition to the BPA 230 kV transmission lines connecting the Biglow Canyon Substation to the Klondike III (Klondike Schoolhouse) Substation and John Day Substations, three other medium voltage transmission lines connect the Biglow Canyon Substation with other nearby wind farms.[166]

The certificate holder has an existing interconnection with BPA allowing for power generated by the existing facility to be transmitted to the regional transmission grid via the John Day Substation but is not currently using all of the available transmission capacity under its existing Interconnection Agreement. The certificate holder indicates that it has submitted a new surplus LGIA to BPA that would allow the use of the unused surplus capacity to export additional energy from the proposed solar facility and BESS to the regional grid. The certificate holder has represented that the LGIA is expected to go into effect in January 2026.[167]

The certificate holder argues that the facility components proposed in RFA4 are locationally dependent on the surplus capacity available at the existing Biglow Canyon Substation and the BPA 230-kV Biglow Canyon-John Day transmission line. The certificate holder further argues that utilizing the available surplus capacity eliminates the need for a new regional substation,

[164] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.1; 8.1.1.3.

[165] Site Certificate, Section III.A.

[166] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.1.1.

[167] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.1.1. The BPA Interconnection Queue indicates that a surplus interconnection request for no more than 450 MW of combined capacity was submitted on October 27, 2023. While the Queue indicates a requested in service date of January 2, 2026, the agreed to date is listed June 1, 2028. BPA Interconnection Queue Output for Request G0978. Accessed 10/20/2025 at: https://www.bpa.gov/energy-and-services/transmission/interconnection

and that no new high-voltage transmission lines will be needed to connect the solar components to this hub.

The Council has previously found that a site's proximity to existing transmission infrastructure with the necessary capacity to transmit the output of the facility to the regional grid is an appropriate, but not sufficient, reason to justify an exception to statewide planning goal 3; however, the certificate holder's reliance on proximity to previously approved facility components is somewhat unique and warrants further discussion.[168] In particular, reliance on proximity to previously approved facility components, such as the Biglow Substation, to justify an exception to Statewide Planning Goal 3 for an expansion of that same facility is somewhat problematic and could incentivize future developers to phase facilities in a manner that circumvents the protections provided by the Statewide Planning Goals and other land use regulations. As such, the Council finds that proximity to the existing Biglow Substation is not an appropriate reason to justify an exception to Statewide Planning Goal 3. With the Biglow Substation eliminated from consideration as a potential locational attractor; the Council must consider whether the site's proximity to the BPA 230-kV Biglow Canyon-John Day transmission line and the BPA John Day Substation, which connect the existing facility to the regional transmission grid, supports a locational dependence reason.

As described above, the six-mile BPA 230-kV Biglow Canyon-John Day transmission line was constructed by BPA at least in part to serve the existing facility, but also connects other facilities in the area, including Avangrid's Klondike III facility, to the John Day Substation and the regional transmission grid. Because the Biglow Canyon-John Day transmission line is independently operated and was not constructed solely to serve the existing energy facility, the Council finds that it is an appropriate locational attractor.

The certificate holder argues that locating the facility components proposed in RFA4 in proximity to the Biglow Canyon-John Day transmission line demonstrates locational dependence because it eliminates the need for a new regional substation or lengthy high-voltage transmission line and increases the utilization of existing grid infrastructure in a manner that allows for efficient use of existing transmission infrastructure.[169]

The Council finds that these arguments support a locational dependence reason for the proposed solar facility, and finds that the proposed Solar Micrositing Area's proximity to its point of interconnection with the regional transmission grid and the availability of surplus interconnection capacity supports a locational dependence reason to partially justify an exception to Statewide Planning Goal 3.

[168] WRWAMD4 Final Order on Request for Amendment 4 2019-11-22; BSPAPPDoc2 Final Order 2020-04-24; MSEFAPPDoc4-1 Final Order (SIGNED) with Attachments 2021-08-02; WESAPPDoc 2-2 Final Order on ASC Combined w Attachments Signed 2023-03-24; WTSAPPDoc2 Final Order on ASC 2024-09-20; SSPAPPDoc56-00 Final Order with Attachments (Secure) 2024-11-20.

[169] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.1.1.

Proximity to transportation infrastructure

The certificate holder asserts that the facility components proposed in RFA4 are locationally dependent on nearby transportation corridors, including I-84 to the north, and US-97 and OR-206 to the west, which provide access and materials transport to the site. As discussed in Section III.M, *Public Services*, several major and minor collector routes travel provide direct access to the Solar Micrositing Area, including N Klondike Road, Old Wasco-Heppner Highway, Medler Lane, Oehman Road, Herin Lane, and Biglow Canyon Road. These routes have previously been used to support the construction of energy facilities in the vicinity of the site, and no major improvement or expansion of the roads is expected to be needed to support the construction of the facility components proposed in RFA4. The certificate holder notes that locating the facility components proposed in RFA4 adjacent to local roads providing access to these corridors eliminates the need to construct major new access routes to connect with the regional transportation network, and minimizes the need for new access roads within the proposed Solar Micrositing Area.[170]

The Council has previously found that proximity to transportation infrastructure can be relied upon to demonstrate locational dependence, particularly when existing infrastructure precludes the need for new external access roads or significant improvements to existing public roads.[171] Consistent with these previous findings, the Council finds that the proposed Solar Micrositing Area's proximity to existing transportation corridors, which would provide access to the site without the need for the construction of new, or substantial modification, of existing public roads, supports a locational dependence reason to partially justify an exception to Statewide Planning Goal 3.

Proximity to, and colocation with, existing energy infrastructure

The certificate holder asserts that siting the solar facility in proximity to the existing wind facility would allow the certificate holder to utilize existing turbine access roads, allow wind components to charge the newly proposed battery energy storage system, and consolidate land use impacts to agricultural lands that are already within or adjacent to the boundaries of renewable energy projects rather than spreading the impacts across a broader more dispersed portion of the county.[172]

The certificate holder points to several previous Council decisions in which it asserts the Council found that proximity to a facility's own existing energy infrastructure was a reason justifying a Goal 3 exception authorizing the expansion of an existing facility.

[170] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.1.3

[171] SSPAPPDoc56-00 Final Order with Attachments (Secure) 2024-11-20, pg. 113-114; WTSAPPDoc2 Final Order on ASC 2024-09-20, pg. 103; WESAPPDoc 2-2 Final Order on ASC Combined w Attachments Signed 2023-03-24, pg. 84-87.

[172] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.1.2.

The certificate holder cites the Final Order on the Application for Site Certificate (ASC) for the Nolan Hills Wind Farm; which authorized an exception to Goal 3 for the use of up to 1,896 acres of agricultural land for a solar photovoltaic power generation facility within a larger proposed wind power generation facility. The certificate holder cited the following finding as supporting the colocation reason:

> *"… The Council finds the land on which the solar site would be located, is particularly suited for development of a solar facility given its proximity to the proposed wind facility components and infrastructure because the solar facility would be able to: utilize an existing road during construction and operation of both wind and solar facility components; share energy infrastructure with wind facility components; and avoid any impacts to irrigated agriculture."*[173]

While the certificate holder correctly identifies that the site's suitability for collocation of wind and solar components was found to support locational dependency, this finding was made in the context of reviewing a proposal for new solar and wind components to be sited together and there was no reliance on proximity to *existing* energy infrastructure. On the contrary, the final order contained conditions of approval specifically requiring wind turbines and solar components to be designed and sited in a manner that maximized the energy density of the solar site to support the reason. In addition, in the Final Order on the ASC for Nolin Hills the locational dependence reason was further supported by proximity to the regional transmission grid (with a point of interconnection within one mile of the solar site) and transportation network; proximity to wind infrastructure was not separately evaluated. Even if the Council had explicitly relied on colocation as a reason in that proceeding, the certificate holder has not provided compelling evidence to support the argument that the efficient use of productive farmland was considered in the siting and design of the facility. As proposed in RFA4, turbine strings would be interspersed with solar components throughout the proposed Solar Micrositing Area, but as discussed in the evaluation of OAR 660-033-0130(38)(h)(A) above, the preliminary site plan shows approximately 500 acres of land, including land comprised of high-value farmland soils, that would be included in the proposed solar array fence lines and presumably taken out of agricultural production but wouldn't otherwise be occupied by facility components due to the certificate holder's requirements for spacing from turbine strings.

The certificate holder also points to the Final Order on Request for Amendment 4 of the Site Certificate for the Montague Wind Power Facility, which authorized an exception to Statewide Planning Goal 3 for the addition of a solar photovoltaic power generation facility on up to 1,189 acres of farmland within an, at that time, under construction wind facility. In that Order, the Council found: "It is relevant to the Goal 3 exception reasons to consider that the Phase 2 solar facility components would be located in close proximity to existing infrastructure, "co-located" with the Phase 1 Montague [wind] facility currently under construction."[174] While the Council

[173] Final Order on Nolan Hills ASC, pg. 132.

[174] Final Order on Request for Amendment 4 of the Site Certificate for the Montague Wine Power Facility, pg. 98.

found the colocation to be relevant, this passage notably lacks the conclusion that the argument was a relevant "reason" justifying a Goal 3 exception that was provided for every other supporting reason.

Finally, the certificate holder cites the Final Order on Request for Amendment 4 of the Wheatridge Wind Energy Facility, which authorized an exception to Goal 3 for the addition of a solar photovoltaic power generation facility on up to 1,527 acres of farmland within the site of at that time approved, but not constructed wind facility, as supporting this reason, but no direct quotation or further explanation is provided. In that final order, the Council Found that a locational dependency reason was a relevant reason supporting a Goal 3 exception, "…Based on the proximity to the UEC line [adjacent to the site], and the executed contractual agreement to use the line, which interconnects to BPA's regional system…" Because the Council appeared to base its finding not on proximity to existing wind components, but on access to transmission infrastructure needed to transmit power to the regional grid, this finding is not relevant to this argument.

The Council finds that none of these arguments appear to support the reliance on the presence of existing facility components at a site as a reason to justify an exception to Goal 3 to authorize an expansion of that same facility. As described in the discussion of the facility's proximity to transmission infrastructure, the Council finds that it would be inappropriate to justify an exception based on proximity to an existing energy generation facility that was previously authorized by the Council to be sited on agricultural lands. That could incentivize future developers to segment facilities in a manner that circumvents the protections provided by the Statewide Planning Goals and other land use regulations. Based on this reasoning, the Council finds that colocation with existing facility components does not support a locational dependence reason.

The certificate holder also notes that there are four operational EFSC jurisdictional wind power facilities, two local jurisdictional wind power generation facilities within 10 miles of the proposed Solar Micrositing Area, as shown on Exhibit K, Figure K-3. Citing provisions of the Sherman County Comprehensive plan, the certificate holder notes that development and maintenance of these facilities within Sherman County has created a "significant job market for high-tech maintenance people and thus a significant impaction the small communities, in terms of job creation and housing to serve the new technicians." The certificate holder also notes that local organizations such as the now-dissolved Mid-Columbia Council of Governments and the Columbia Gorge Community College have developed renewable energy facility-specific training programs for the region. The certificate holder argues that the on-going construction of new renewable energy facilities will leverage the existing local workforce skilled in constructing, maintaining and operating these facilities.[175]

The certificate does not explain how the location of the proposed Solar Micrositing Area specifically leverages the regional workforce when compared to any other site in the Mid-

[175] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.1.2.

Columbia region, or how that workforce benefits from locating the facility components proposed in RFA4 on highly productive agricultural land. For these reasons, the Council finds that the certificate holder has not provided sufficient information to demonstrate that proximity to existing infrastructure supports a locational dependence reason.

Rural Economic Development Benefits

The certificate holder argues that renewable energy generation facilities, including the facility components proposed in RFA4, promote rural economic development in several ways, including:

- By creating jobs as well as direct and indirect local economic benefits during construction and operation;
- By adding to the local tax base which directly benefits the agricultural community;
- Through landowner lease payments; and
- By creating a Community Investment Plan

Each of these economic benefits are discussed in more detail below.

Job creation and direct and indirect local economic benefits

As described in Section III.M, Public Services, the certificate holder estimates that, on average, there would be 165 workers on site each day during the 17- to 19-month construction period. The certificate holder estimates that approximately 30 percent of the construction workforce would be hired from communities within a one-hour commute of the site but provides no additional evidence of a local hiring policy or program. The certificate holder estimates that seven permanent workers will be employed during the operation of the proposed solar and battery facilities, and that additional workers would be contracted for specific tasks such as weed control. In addition to creating these jobs, the certificate holder argues that spending by visiting workers during construction and operation of the facility would indirectly benefit the local economy.[176]

The Council has previously considered the rural economic developments of job creation as supportive of an exception to Statewide Planning Goal 3; however in recent decisions, the Council has found that evidence demonstrating a proposed facility will benefit a local economy in general, including through creation of jobs or generating spending which supports businesses in the service and construction sectors, is not sufficient to serve as an economic benefits reason for granting an exception to Goal 3 because any development will result in some level of job creation. Instead, the Council has found that evidence demonstrating how the local agricultural

[176] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.3.1.

economy will benefit as a result of the proposed facility is needed to justify an exception to Goal 3.[177]

The Council finds that there is not sufficient evidence on the record to determine that the jobs created during the construction of the facility components proposed in RFA4 would provide any more direct benefit to the agricultural economy than any other development in the County. Accordingly, the Council finds that there is not sufficient evidence to demonstrate that the generation of property tax payments is a reason that justifies an exception to Statewide Planning Goal 3.

Property tax payments

The properties that make up the site are in Sherman County's Tax Code Area 7-2 (Rural Wasco, Rufus). The taxing districts which receive revenues from property taxes in this area include Sherman County, the Sherman County Soil and Water Conservation District (SCSWCD), and North Central Rural Fire Protection District. The certificate holder argues that spending by these districts directly benefits the local agricultural economy. In particular, the certificate holder notes that Sherman County is responsible for road maintenance and improvements, which farmers rely on to move their equipment and crops; and SCSWCD manages the Noxious Weed List and the County Cost Share program providing reimbursement to farmers for implementing conservation practices; and North Central Sherman Rural Fire Protection District provides protection of agricultural lands from wildfire. The certificate holder also notes that tax payments and community service fees provided through the Strategic Investment Program Agreements for existing wind energy facilities have been significant contributors to these districts.[178]

The certificate holder notes that it has not yet entered into any tax arrangements with the County for the facility components proposed in RFA4 but expects to enter into a Payment in Lieu of Property Taxes (PILOT) Agreement with the County. Based on an assumed 40-year operating life of the facility, the certificate holder estimates that minimum payments to Sherman County would be approximately $40.1 million under the Solar PILOT program. Payments under a PILOT agreement would extend over 20 years and be a fixed amount per MW over this period. Payments would be made to the taxing districts that comprise Tax Code Area 7-2 in accordance with their established levies.[179]

[177] For findings in support of this reason see WRWAMD4 Final Order on Request for Amendment 4 2019-11-22, pg. 64; BSPAPPDoc2 Final Order 2020-04-24, pg. 111; MWPAMD5 Final Order on RFA5 2020-09-25, pg. 93; OSCAPPDoc2 Final Order on ASC 2022-02-25, pg. 86-87. More recent orders rejecting this reason include MSEFAPPDoc4-1 Final Order (SIGNED) with Attachments 2021-08-02, pg. 104; WESAPPDoc 2-2 Final Order on ASC Combined w Attachments Signed 2023-03-24, pg. 95-96; WTSAPPDoc2 Final Order on ASC 2024-09-20, pg. 107-109; SSPAPPDoc56-00 Final Order with Attachments (Secure) 2024-11-20, pg. 118-120.

[178] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.3.2

[179] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.3.2

The certificate holder argues that due to the importance of agriculture in Sherman County, any local government investments will directly benefit the local agricultural community and economy. It argues that taxes received by Sherman County, the SCSWCD, and North Central Rural Fire Protection District have all resulted in investment back into the local agricultural economy. Sherman County is responsible for road maintenance and improvements, which farmers rely on to move their equipment on throughout the lifecycle of their crops and especially for moving their crops to their end destinations for sale. SCSWCD manages the Noxious Weed List and the County Cost Share program which reimburses farmers for implementing conservation practices and other practices, such as herbaceous weed control and pasture/range planting on their lands. [180]

The Council has previously considered the tax revenues generated by energy development as supportive of an exception to Statewide Planning Goal 3;[181] however in recent decisions, the Council has found that evidence demonstrating a proposed facility will benefit a local economy in general, including through the generation of tax revenue, is not sufficient to serve as an economic benefits reason for granting an exception to Goal 3 because any development will be required to pay some form of taxes. The Council has found that evidence demonstrating how the local agricultural economy will specifically benefit as a result of the proposed facility is needed to justify an exception to Goal 3.[182]

Here, the certificate holder argues that, due to the rural nature of Sherman County and the prevalence of the agricultural sector in its economy, the existing tax scheme guarantees that any increased revenue will directly benefit the agricultural economy.

The certificate holder does not provide a comparison of the estimated revenues that would be generated by the facility components proposed in RFA4 when compared to the existing farm uses, or provide any details about unique investments or improvements that the County or other taxing districts would be able to make if the facility components proposed in RFA4 were constructed. The Council finds that there is not sufficient evidence on the record to determine that the tax benefits from the facility components proposed in RFA4 would provide any more direct benefit to the agricultural economy than any other development in the County. Accordingly, the Council finds that there is not sufficient evidence to demonstrate that the generation of property tax payments is a reason that justifies an exception to Statewide Planning Goal 3.

Creation of a Community Investment Plan

[180] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.3.2

[181] See WRWAMD4 Final Order on Request for Amendment 4 2019-11-22; pg. 64; BSPAPPDoc2 Final Order 2020-04-24, pg. 111; MWPAMD5 Final Order on RFA5 2020-09-25, pg. 93; OSCAPPDoc2 Final Order on ASC 2022-02-25, pg. 86-87.

[182] MSEFAPPDoc4-1 Final Order (SIGNED) with Attachments 2021-08-02, pg. 104; WESAPPDoc 2-2 Final Order on ASC Combined w Attachments Signed 2023-03-24, pg. 95-96; WTSAPPDoc2 Final Order on ASC 2024-09-20, pg. 107-109; SSPAPPDoc56-00 Final Order with Attachments (Secure) 2024-11-20, pg. 118-120.

To ensure the creation of rural economic development, the certificate holder proposes to partner with Sherman County and the MCEDD to establish and manage a mitigation fund that would fund projects that benefit the Sherman County agricultural economy. Before beginning construction of a phase of construction, the certificate holder would contribute $1,600 per acre into the fund for each acre removed from agricultural production for any phase of construction.[183]

To arrive at this number, the certificate holder modeled the economic impacts of removing up to 1,445 acres of farmland within the proposed Solar Micrositing Area from agricultural production based on the productivity of land and average prices of wheat. NRCS assigns an average of 45 to 55 bushels per acre of winter wheat for non-irrigated Walla Walla silt loam and an average of 30 to 40 bushels per acre of winter wheat for non-irrigated Anderly silt loam. Mr. Scharf, the partial owner and farm manager for Tract 2, reported a higher five-year average yield of 62 bushels per acre on the lands he farms in the Tract.[184] Based on the average yields reported by Mr. Scharf, the typical two year crop cycle for dryland winter wheat, and the average price per bushel of winter wheat over the past 10 years, the modelling showed that the construction and operation of the facility components proposed in RFA4 would result in an estimated $281,300 annual reduction in crop output, or about 0.8 percent of the total crop output of Sherman County.[185] Because the direct revenue losses of the reduction would be made up by lease payments, the modelling focused on the indirect impacts on the local agricultural economy that would result from reduced spending on agricultural inputs like fertilizers and herbicides, repair and other services, and crop marketing. The certificate holder notes that it's modeling did not take the spending on services such as weed control and road maintenance into account even though this spending would be expected to reduce the overall indirect impacts.[186] Based on the modelling, the certificate holder estimates that at full build out, the construction and operation of the facility would result in a loss of up to $213,900 per year over the 40-year expected operating life of the facility components proposed in RFA4. Calculated over a period of 40 years of operation, and adjusting to present value, the estimated indirect output would be up to $2,315,128, or $1,600 per acre of farmland taken out of production.[187]

The Community Investment Plan provides details of the establishment and administration of the mitigation fund. As discussed further below, PGE, the Project Developer, Sherman County, and the Mid-Columbia Economic Development District (MCEDD) are negotiating a Memorandum of Understanding to document their working relationships and the procedures that will govern implementation of the Plan and allocation of dollars from the mitigation fund for selected projects.

[183] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.3.3.

[184] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 3.3.2.1; Attachment K-1

[185] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Attachment K-2, Section 4.4.1.

[186] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, See Footnote 29.

[187] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Attachment K-2.

To help inform the development of the CIP and to identify potential projects that would support the local agricultural economy the certificate holder met with local wheat farmers, the Oregon Watershed Enhancement Board, Oregon State University including its extension service in Sherman County and the College of Agricultural Sciences, the Oregon Wheat Commission, the Sherman County Fire District, Sherman County Emergency Services, the Rural Sherman County Fire Board, and local government officials and staff. The Council approved four "pre-screened" projects that would qualify for funding to be included in the CIP:

1. Investments in minimizing wildland fire risk to agricultural crops, properties, and infrastructure designated in the Sherman County Community Wildfire Protection Plan, and minimizing risk of liability to farmers from farm activities igniting fires and impacting non-farm uses in the agricultural district.
2. Providing additional funds to supplement SCSWCD cost share programs for technical assistance programs such as improving haul routes, weed control, establishing fire breaks, etc.
3. Providing grants to county wheat farmers to invest in precision agricultural technology such as weed management equipment, remote sensing technology to assist with weed mapping or soil mapping, variable rate technology to collect data on soil variability to inform application of fertilizers, and other technologies
4. Establishing a per-bushel support mechanism for Sherman County's wheat growers. An additional $0.05 per bushel would be paid directly to farmers on top of the prevailing market price to help offset the rising costs of inputs such as seed, fertilizer, fuel, machinery, and labor.[188]

For other proposals, a six-person advisory committee (Selection Committee) coordinated by MCEDD would review applications and make recommendations to Sherman County Board of Commissioners on funding. The Selection Committee would include one representative from Sherman County government; one representative from an academic institution engaged in agriculture research in Sherman County or an agricultural-related nonprofit entity located in Sherman County; one dryland farm producer in the County; one representative selected by the Oregon Wheat Grower's League; one community member; and one representative with expertise in wildfire as it relates to agricultural lands. The County would have an opportunity to propose candidates for the Selection Committee, otherwise candidates would be selected by MCEDD.[189]

Each application would be weighed against selection criteria intended to ensure that selected projects will bring economic benefit to the County's agricultural economy. The five selection criteria are as follows:

1. Improving resiliency and efficiency of Sherman County's agricultural economy;
2. Improving agricultural wildfire protection and risk management capacity;

[188] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Attachment K-4, Section 5.0.

[189] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Attachment K-4, Section 4.2.1.

3. Investing in research to further agrivoltaics for dryland wheat lands;
4. Investing in agricultural education for next-generation farmers; and
5. Subsidizing the price of wheat produced in Sherman County.[190]

Under the CIP, the Sherman County Board of Commissioners would make the final selection for what projects would be funded and/or what organizations would be awarded mitigation funds. The CIP identifies selection criteria unique to the Sherman County agricultural community and its specific needs that will be applied to proposed mitigation projects. The certificate holder argues that the CIP provides sufficient information to guide Sherman County's selection of mitigation projects to be a) responsive to the community's needs; b) beneficial to the dryland wheat community; and c) more than sufficient to counter any indirect economic impacts from the Solar Components. The Council finds that the proposed CIP was prepared using reasonable methods and the proposed mitigation reasonably addresses the indirect impacts of converting agricultural lands in the proposed Solar Micrositing Area to nonfarm use.

The Council has previously considered the creation of similar investment or mitigation funds to be supportive of a rural economic benefit reason, and that such a reason would partially justify an exception to Statewide Planning Goal 3.[191] While the calculation of mitigation, project selection process and criteria, and pre-screened projects are generally consistent with those included in previous agricultural mitigation plans the inclusion of wildfire prevention and risk mitigation as a benefit to the agricultural economy is a novel proposal and warrants more further discussion.[192]

As discussed in more detail in Section III.N., *Wildfire Prevention and Risk Mitigation*, Sherman County has experienced significant wildfires in recent years which have impacted agricultural lands and farmers are often directly engaged in firefighting activities. As noted by the certificate holder, the Sherman County Community Wildfire Protection Plan notes that the 2018 Substation Fire burned over 78,425 acres, destroyed over 1 million bushels of wheat, and resulted in the death of a farmer-firefighter. The CWPP identified several opportunities to assist the County and local fire protection providers to mitigate and respond to wildfire risk in the county, including upgrading, maintaining, or adding firefighting equipment for Sherman County's Rural Fire Protection Districts; upgrading and developing new facilities at Rufus Fire Hall, North Sherman Rural Fire Protection District Station, and/or South Sherman Rural Fire Protection District Station; training volunteers; funding staff, and funding projects to develop fuel breaks, reduce wildfire hazards, provide firefighting water.[193]

[190] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Attachment K-4, Section 5.0.
[191] WTSAPPDoc2 Final Order on ASC 2024-09-20, pg. 107-109; SSPAPPDoc56-00 Final Order with Attachments (Secure) 2024-11-20, pg. 121-124
[192] The proposed use of funds to directly subsidize the price of wheat for Sherman County growers is also novel, but the benefit to farmers from that approach seems to be clear.
[193] See the 2024 Sherman County CWPP, Section XII., Wildfire Mitigation Projects; https://storage.googleapis.com/proudcity/shermancountyor/2017/10/Sherman-County-CWPP-2024.pdf

The certificate holder has identified any of the projects identified in the CWPP as "pre-screened" projects for the CIP. The certificate holder emphasizes the interconnectedness of agricultural mitigation and wildfire mitigation in Sherman County and asserts that any project that reduces the risk or extent of wildfire damage to dryland wheat crops and their supporting infrastructure would provide a direct economic benefit to the County's agricultural community.[194] Because the certificate holder has provided strong evidence linking the benefits of wildfire protection to agricultural practices, producers, and the broader community, the Council finds that the inclusion of wildfire mitigation as a potential use of agricultural mitigation funds in the CIP is appropriate and supports a rural economic benefits reason. Based on the other pre-screened projects and selection criteria above, the Council further finds that the agriculture mitigation funds are likely to be used in a manner that benefits the local agricultural economy and responds to community need. Consistent with past proceedings, the Council finds that a non-voting Council representative should be included in the selection committee to ensure statewide and regional interests are represented and that future projects can benefit from any lessons learned from the selection process. This change is reflected in the Community Investment Plan included as Attachment E to this Order.

As discussed in more detail below, the Council finds that the implementation of the CIP may be considered as a reason to support an exception to Statewide Planning Goal 3 but is not sufficient to justify an exception by itself. To ensure the plan is implemented as proposed, and a Council representative is included on the selection committee, the Council imposes the following condition:

> **Land Use Condition 6 (PRE-LU-03)**
> Prior to construction of the solar facility, component or phase, as applicable, the certificate holder shall submit to the Department:
> a. A Memorandum of Understanding or other agreement executed by the certificate holder, Mid-Columbia Community Economic Development District, and Sherman County, establishing a Community Investment Fund in accordance with the Community Investment Plan included as Attachment E to the Final Order on RFA4.
> b. Evidence that that the certificate holder has contributed at least $1,600 per acre of cultivated land that will be occupied by facility components to the Community Investment Fund.
> [Final Order on AMD4]

Landowner Lease Payments

The certificate holder provides testimony from participating landowners that the lease payments that would be made for land taken out of agricultural production would allow the landowners to increase the dollars per acre spent on, and increase the economic viability of, their remaining farm operations.[195]

[194] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Attachment K-4, Section 5.2.
[195] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.3.4.

The Council has accepted lease payments made to landowners as an economic benefits reason justifying a Goal 3 exception when the applicant or certificate holder provides evidence of a direct connection between lease payments and specific benefits to significant agricultural operations. In this case, the landowner merely indicated that they will have fewer expenditures and will be farming fewer acres, but will increase general local spending.[196] In addition, the certificate holder notes that the landowner currently leases the land in the Proposed Solar Micrositing to other farmers, and those farmers' agricultural operations are not likely to benefit from the lease payments.

The certificate holder also notes that many of the farmers contacted during the development of the application have benefited from wind farm leases, which helped them diversify their income streams, allowed them to invest in their wheat farming operations and equipment, and strengthened the resilience of their farms in the face of the ongoing global wheat market challenges. These farmers indicated that adding solar leases to their existing farming operations would provide further flexibility to look at new agribusiness models such as agrivoltaics, new crops/markets, and/or agritourism. The farmers also expressed interest around the potential for developing agrivoltaics with dryland crops and stated that lease payments would provide this diversified income stream to allow landowners to take more risks in investing in new technologies, new cropping systems, and agrivoltaics.[197] While income diversification may help farmers strengthen and diversify their farm operations, the Council finds that these arguments are not relevant to the lands in the Proposed Solar Micrositing Area, as the participating landowner or individuals farming the land have not demonstrated, or even indicated, they intend to use the lease payments from the proposed solar facility to make or allow for new farm investment.

Accordingly, the Council finds that the certificate holder has not provided sufficient evidence to demonstrate that lease payments will benefit agricultural operations in a specific or unique manner. Accordingly, the Council finds that there is not sufficient evidence to demonstrate that lease payments made to landowners are a reason to justify an exception to Statewide Planning Goal 3.

Minimal Impacts on other resources protected by Council standards

The certificate holder argues that the facility components proposed in RFA4 are sited to avoid sensitive environmental features, including but not limited to, wetlands, big-game winter range, habitat for state-listed or special status species, in part because it is sited on land currently used for dry-land wheat cultivation. The certificate holder further notes that any additional impacts to resources, including soils, wetlands, protected areas, water resources, scenic and aesthetic

[196] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Attachment K-1. In Exhibit K, Section 8.1.3.4, the certificate holder claims the landowner testified that they anticipate to spending more per acre on their remaining farm operations, but this is unsupported by the record.

[197] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.3.4.

resources, and historic, cultural, and archaeological resources will be avoided, minimized, or otherwise mitigated in accordance with new and existing conditions of approval. The certificate holder specifically asserts that "choosing land in farm use allows for the preservation of undeveloped habitats, sensitive lands and waterways in other parts of the county." [198]

As described in Section III.H, as proposed, the facility would result in permanent impacts up to 44 acres of Category 2 to 4 habitat, including approximately 21 acres of Category 2 Sagebrush Shrub-Steppe habitat that is in or adjacent to a Priority Wildlife Connectivity Area.

The council has previously found "minimal impacts to resources protected by Council standards" or "minimal impacts to other environmental resources" as an appropriate, but not in itself sufficient, reason to justify an exception to Statewide Planning Goal 3.[199]

In addition to finding that there are sufficient reasons to justify taking an exception to the applicable goal, when taking an exception, ORS 469.504(2)(a)(B) requires the Council to find that the significant environmental, economic, social and energy consequences anticipated as a result of the facility components proposed in RFA4 have been identified and adverse impacts will be mitigated in accordance with rules of the Council. The Council finds that in order to justify a goal exception, the certificate holder must go beyond demonstrating that this criterion, or the requirements of the applicable Council Standards, has been satisfied and demonstrate that the lack of resources or impacts at a particular site goes beyond the conditions that would be expected on any developed farmland.

The Council finds that the certificate holder has not provided sufficient evidence to demonstrate that the level of impacts to resources that would result from the construction and operation of the facility components identified in RFA4 is exceptionally low, particularly when compared to other locations that are currently in farm use. Accordingly, the Council finds that the certificate holder has not provided sufficient evidence to support a minimal impact to resources reason.

Consistency with State Climate Policies and Goals

The certificate holder argues that authorizing the facility components proposed in RFA4 is consistent with State policies and goals addressing the climate crisis and that relate to the acceleration of Oregon's clean energy transition including the provisions of Statewide Planning Goal 13 and House Bill 2021 (2021).[200]

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[198] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.2.

[199] Final Order on the Application for Site Certificate for the Madras Solar Energy Facility (2021), Final Order on the Application for Site Certificate for the West End Solar Project (2023), Final Order on the Application for Site Certificate for the Nolin Hills Wind Power Project (2023), Final Order on the Application for Site Certificate for the Wagon Trail Solar Project (2024), and Final Order on the Application for Site Certificate for the Sunstone Solar Project (2024).

[200] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.4.

The Council has consistently rejected similar arguments in past proceedings, finding that neither Goal 13 nor House Bill 2021 require renewable energy to be procured from Oregon-based resources, address where renewable energy facilities should be located, or direct agencies to allow facilities to be placed on agricultural lands as an exception to Goal 3.[201]

Here, the certificate holder argues that the Council has the discretion and power to balance the state policies for the preservation of agricultural lands for farm use with its policy directive in ORS 469.010, and encourages the Council to consider recent studies demonstrating the need for additional renewable energy development in the state, including the Department's own Biennial Energy Report which estimates that approximately 63,300 acres in Oregon would need to be utilized for solar development to meet Oregon's renewable energy targets. The certificate holder states that locating the solar facility in the Solar Micrositing Area "helps achieve Oregon's clean energy goals while also taking advantage of the efficiencies of the existing electrical infrastructure in the RFA 4 Site Boundary, minimizing impacts to other state protected resources such as habitat and cultural resources, and while offering economic benefits to the rural community in Sherman County through the tax payments and community benefit program."[202]

The Council finds that the certificate holder has not presented any unique arguments that would require the Council to reconsider its established position regarding the "consistency with State climate goals and policies" reason. While ORS 469.010 does articulate State Polices to encourage the development of "permanently sustainable energy resources" the onus behind this policy is to ensure that "future generations not be left a legacy of vanished or depleted resources, resulting in massive environmental, social and financial impact." In ORS 469.310, the legislature further directed the Council to carry out these policies by ensuring that the siting, construction and operation of both renewable and nonrenewable energy facilities is accomplished "in a manner consistent with protection of the public health and safety and in compliance with the energy policy and air, water, solid waste, land use and other environmental protection policies of this state." In other words, neither the State Energy Policy in ORS 469.010 or ORS 469.310 suggest that the Council should grant an exception to the State's goals to preserve agricultural lands, particularly highly-productive farmlands, for farm use based on the general need for new sources of renewable energy to meet other state goals.

Consistent with the state policies in ORS 469.010, 469.310 and the Council's previous decisions, the Council finds that consistency with State climate goals and policies is not an appropriate reason to justify an exception to Statewide Planning Goal 3.

[201] BSPAPPDoc2 Final Order 2020-04-24, pg. 113; BSPAPPDoc2 Final Order 2020-04-24, pg. 112-113; MWPAMD5 Final Order on RFA5 2020-09-25, 94-95; MSEFAPPDoc4-1 Final Order (SIGNED) with Attachments 2021-08-02, pg. 103-104; MSEFAPPDoc4-1 Final Order (SIGNED) with Attachments 2021-08-02, pg. 104; OSCAPPDoc2 Final Order on ASC 2022-02-25, pg. 88; WESAPPDoc 2-2 Final Order on ASC Combined w Attachments Signed 2023-03-24, pg. 83-84; WTSAPPDoc2 Final Order on ASC 2024-09-20, pg. 100-101, SSPAPPDoc56-00 Final Order with Attachments (Secure) 2024-11-20, pg. 125.

[202] BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 8.1.4.

Overall Evaluation of Reasons

As described above, the Council finds that the certificate holder has provided sufficient evidence to demonstrate that the facility components proposed in RFA4 are locationally dependent on nearby major transmission infrastructure and transportation corridors and that the proposed Community Investment Plan is adequate to demonstrate the creation of rural economic development benefits. The Council has previously found that locational dependence and creation of local economic benefits reasons together can justify an exception to Statewide Planning Goal 3; however, as discussed below, these reasons are often coupled with other reasons addressing the productivity of the affected farmland. While not binding upon the Council, the standards for local governments also support such reasons being considered acceptable to justify an exception. Under OAR 660-004-0002(3)(c), a local government may grant a "reasons" exception for a solar facility as a Rural Industrial Development if the government found the facility "would have a significant comparative advantage due to its location…which would benefit the county economy and *cause only minimal loss of productive resource lands*." Emphasis added.

In this case, the Council must determine whether an exception is justified, despite the presence of productive farmland, including irrigated land and high-value farmland soils, at the site. The Council has previously granted exceptions for sites that contain irrigated land and high-value farmland soils, but these decisions have also included reasons establishing why the lands are in-fact not suitable for agriculture, are less productive than other available agricultural lands, or are located on water-challenged lands. For example, in the Council's Final Order on the Application for Site Certificate for the Sunstone Solar Project, the Council granted an exception to Goal 3 for a site that contained both land appurtenant to a water right, and 2,914 acres of soils considered Class II, *when irrigated*. This decision relied on similar locational dependence and economic benefits reasons as presented in RFA4, but the Council also found that there were practical and economic limitations on actually using water due to the site's location in a Critical Groundwater Area.[203]

The NRCS Class II soils at the Biglow site represent some of the most productive soils in the state, and while the underlying tract is not predominantly made up of those soils, up to 777 acres of high-value farmland soils would still be removed from agricultural production during construction and operation of the proposed solar facility. In addition, up to 311 acres of irrigated land are present on the site, although the area that is actually irrigated covers a much smaller area.[204] The Council finds this level of impact represents more than a minimal loss of productive resource lands; however, it is still within the Council's discretion to grant an

[203] SSPAPPDoc56-00 Final Order with Attachments (Secure) 2024-11-20, pg. 114-116. For similar decisions, see WRWAMD4 Final Order on Request for Amendment 4 2019-11-22, pg. 63-64; BSPAPPDoc2 Final Order 2020-04-24, pg. 111; WESAPPDoc 2-2 Final Order on ASC Combined w Attachments Signed 2023-03-24, pg. 87-94; MWPAMD5 Final Order on RFA5 2020-09-25; pg. 93-94.

[204] The site also contains a 13 acre tract which is considered high-value farmland due to the predominance of class II soils; however, because the existing Biglow Canyon Substation is already located on that site and no additional development is proposed, the Council finds it is not necessary to address this impact separately.

exception to Statewide Planning Goal 3 if it finds the accepted reasons provide sufficient justification, and the Council finds that they do. In particular, the Council finds that the availability of surplus capacity for interconnection at a location within the proposed Solar Micrositing Area is a unique reason, and represents a strong locational attractor given the limited availability of new interconnection in the state. While the proposal to provide compensatory mitigation to generate local economic benefits does not present a reason that is unique to the site itself, the Council finds the proposed Community Investment Plan was prepared using reasonable methods and the proposed mitigation reasonably addresses the indirect impacts of converting agricultural lands in the proposed Solar Micrositing Area to nonfarm use. The Council further finds that the screening criteria and pre-screened projected presented in the Community Investment Plan reflect the unique needs and priorities of the local community.

Mitigation of Environmental, economic, social and energy consequences

As discussed in Sections III.F, III.J, and III.L, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to have significant adverse impacts on any Protected Areas, significant or important Scenic Resources or Recreation Opportunities. As described in Section III.I, no state listed threatened or endangered species are known to occur at the site and no listed species are expected to be adversely affected by the construction and operation of the facility components proposed in RFA4. As discussed in Section III.D, III.H, and III.K, and IV.B, the construction and operation of the facility components proposed in RFA4 could have significant adverse impacts on soils, fish and wildlife habitat, cultural resources, and waters of the State, but the Council finds that existing and new conditions of approval are adequate to avoid, minimize, or mitigate these impacts.

Wildfire is a significant issue in Sherman County and any significant increase in wildfire risk could have significant environmental, economic, and social consequences. As discussed in Section III.M and III.N, and in this section, the finds that subject to compliance with Wildfire Prevention and Risk Mitigation Conditions 1 to 4, and other existing and new conditions of the site certificate, the construction and operation of the solar facility are not likely to significantly increase wildfire risk in the County.

As discussed in Section III.M., due to the limited number of workers that would be permanently employed by the construction and operation of the facility components proposed in RFA4, the Council finds that no other significant adverse impacts on public services are expected to result from the operation of the facility components proposed in RFA4, and temporary impacts during construction would be minimized in accordance with new and existing conditions of approval. As discussed in Section III.O, the Council finds that existing and new conditions of approval would also minimize any environmental or economic impacts associated with the generation of solid waste at the site.

As discussed in Section III.P and IV.A, the Council finds that the certificate holder has provided sufficient evidence to demonstrate that the construction and operation of the facility

components proposed in RFA4 will comply with the standards for EMF radiation and Noise Control established under OAR 345-024-0090 and 340-035-0035.

Compatibility with adjacent uses

To grant the exception, the Council must find that the facility components proposed in RFA4 are compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts. As discussed in the evaluation of OAR 660-022-0130(5), above, the Council finds that, subject to compliance with existing and new conditions of approval, the construction and operation of the facility components proposed in RFA4 are not expected to result in significant adverse impacts to adjacent farm uses from traffic, dust, noxious weeds, or wildfire.

As discussed in the evaluation of SCZO Section 3.6, the Council finds that the setback required under Land Use Condition 11 is adequate to ensure the facility components proposed in RFA4 are compatible with operations at the significant aggregate resource site located adjacent to the Northern Solar Area.

III.E.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the site certificate conditions described above, the Council finds that the facility components proposed in RFA4 will comply with the statewide planning goals adopted by the Land Conservation and Development Commission.

III.F. PROTECTED AREAS: OAR 345-022-0040

(1) To issue a site certificate, the Council must find:

(a) The proposed facility will not be located within the boundaries of a protected area designated on or before the date the application for site certificate or request for amendment was determined to be complete under OAR 345-015-0190 or 345-027-0363;

(b) The design, construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impact to a protected area designated on or before the date the application for site certificate or request for amendment was determined to be complete under OAR 345-015-0190 or 345-027-0363.

(2) Notwithstanding section (1)(a), the Council may issue a site certificate for:
(a) A facility that includes a transmission line, natural gas pipeline, or water pipeline located in a protected area, if the Council determines that other

reasonable alternative routes or sites have been studied and that the proposed route or site is likely to result in fewer adverse impacts to resources or interests protected by Council standards; or

(b) Surface facilities related to an underground gas storage reservoir that have pipelines and injection, withdrawal or monitoring wells and individual wellhead equipment and pumps located in a protected area, if the Council determines that other alternative routes or sites have been studied and are unsuitable.

(3) The provisions of section (1) do not apply to:

(a) A transmission line routed within 500 feet of an existing utility right-of-way containing at least one transmission line with a voltage rating of 115 kilovolts or higher; or

(b) A natural gas pipeline routed within 500 feet of an existing utility right of way containing at least one natural gas pipeline of 8 inches or greater diameter that is operated at a pressure of 125 psig.

(4) The Council shall apply the version of this rule adopted under Administrative Order EFSC 1-2007, filed and effective May 15, 2007, to the review of any Application for Site Certificate or Request for Amendment that was determined to be complete under OAR 345-015-0190 or 345-027-0363 before the effective date of this rule. Nothing in this section waives the obligations of the certificate holder and Council to abide by local ordinances, state law, and other rules of the Council for the construction and operation of energy facilities in effect on the date the site certificate or amended site certificate is executed.[205]

***** [206]

III.F.1. Findings of Fact

The analysis area for the Protected Areas standard is the area within and extending 20 miles from the proposed Solar Micrositing Area Boundary.[207]

[205] OAR 345-022-0040, effective April 2, 2025.

[206] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

[207] The Council's procedural requirements for site certificate amendments (OAR 345-027-0360(3) allow the Department to authorize modifications to analysis areas established in a Project Order, if warranted based on the scope of changes in the Request for Amendment. The October 10, 2005 Project Order established the analysis area as the area within and extending 20-miles from the site boundary, including areas outside of the state of Oregon. As authorized under OAR 345-027-0360(3), following a pre-amendment conference on March 5, 2024, the

Protected Areas in the Analysis Area

There are 12 designated protected areas in the analysis area, as presented in Table 13 and Figure 9 below. RFA4 Exhibit L presents potential impacts including noise, traffic, water use, wastewater disposal, and visual impacts during construction and operational. Those impacts are summarized in Table 13 and described further below in this section.

Department approved a modified analysis area for the Protected Areas standard based on the scope and extent of potential impacts associated with the facility components within the proposed Solar Micrositing Area. BCWAMD4Doc01-00 ODOE Concurrence on OAR 345-027-0360(3) Request 2024-05-02.

Table 13: Protected Areas in Analysis Area

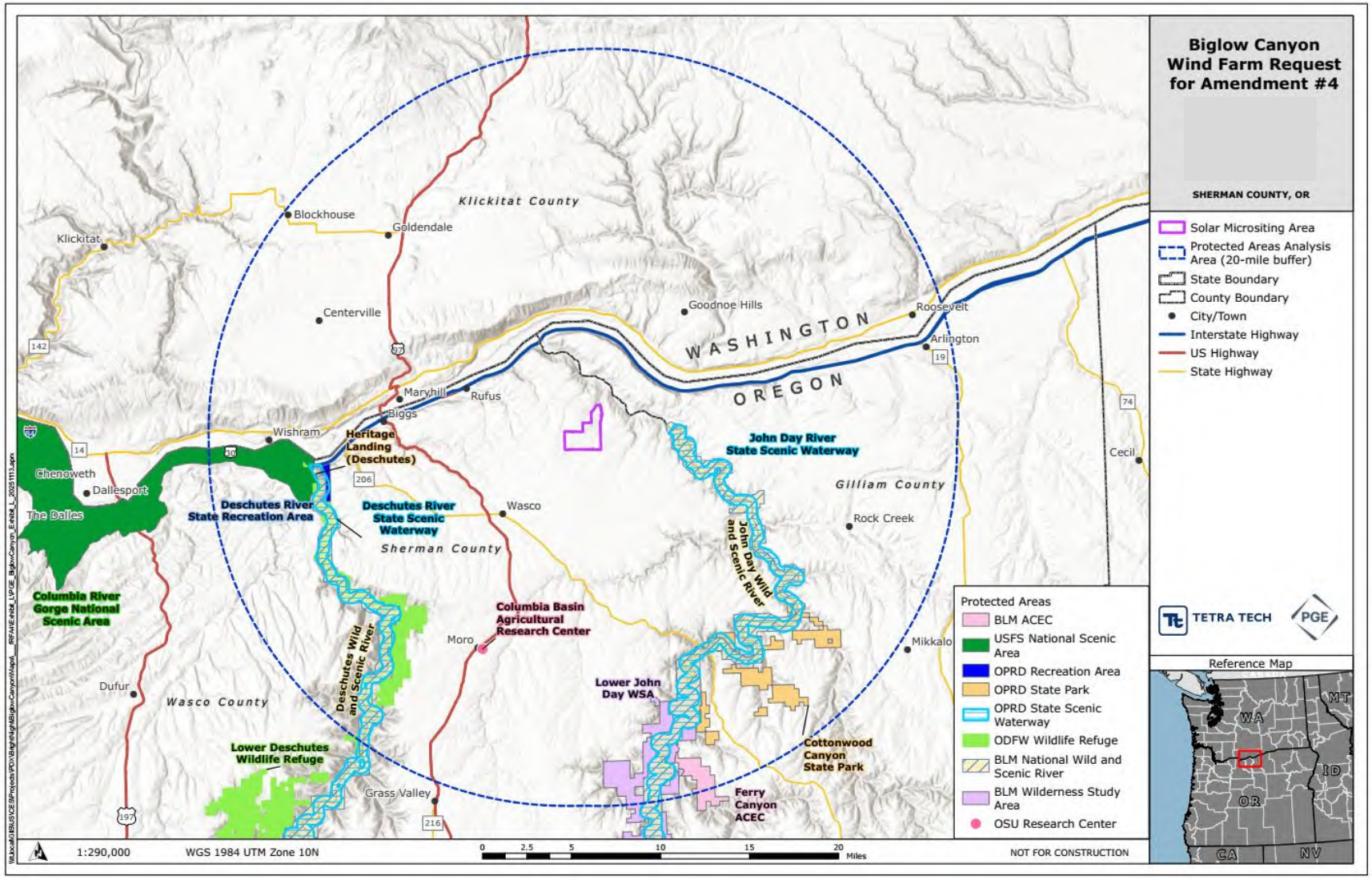
Protected Area Name & Basis for Protection	Distance from Facility Component		Direction from Solar Micrositing Area Site Boundary	Potentially Significant Visual Impact?		Construction		Operations	
	Solar Micrositing Area Boundary	Transmission Corridor		From Solar Micrositing Area Boundary	From Transmission Corridor	Noise	Traffic	Noise[1]	Traffic
John Day Wild & Scenic River OAR 345-001-0010(26)(d)	3.7	5.1	East	No	No	43 dBA	Temp Delays	< 26 dBA	No impact
John Day River State Scenic Waterway OAR 345-001-0010(26)(n)	3.8	5.1	East	No	No	< 43 dBA	Temp Delays		
Columbia Basin Agricultural Research Center (Moro Unit) OAR 345-001-0010(26)(q)	12.1	12.8	Southwest	No	No	Not audible	Temp Delays		
Lower Deschutes Wildlife Area OAR 345-001-0010(26)(o)	11.7	12.5	West	No	No		No impact		
Lower Deschutes Wild & Scenic River OAR 345-001-0010(26)(d)	12.8	13.6	West	No	No				
Lower Deschutes River State Scenic Waterway OAR 345-001-0010(26)(n)	12.9	13.7	West	No	No				
Cottonwood Canyon State Park OAR 345-001-0010(26)(j)	12.2	13.1	Southeast	No	No		Temp Delays		
Lower John Day Wilderness Study Area OAR 345-001-0010(26)(h)	12.6	14.9	Southeast	No	No		Temp Delays		
Columbia River Gorge National Scenic Area OAR 345-001-0010(26)(g)	12.0	12.7	West	No	No		No impact		

Table 13: Protected Areas in Analysis Area

Protected Area Name & Basis for Protection	Distance from Facility Component		Direction from Solar Micrositing Area Site Boundary	Potentially Significant Visual Impact?		Construction		Operations	
	Solar Micrositing Area Boundary	Transmission Corridor		From Solar Micrositing Area Boundary	From Transmission Corridor	Noise	Traffic	Noise[1]	Traffic
Deschutes River State Recreation Area OAR 345-001-0010(26)(j)	13.2	13.9	West	No	No				
Heritage Landing (Deschutes) OAR 345-001-0010(26)(j)	13.8	14.5	West	No	No				
Ferry Canyon Area of Critical Environmental Concern (ACEC) OAR 345-001-0010(26)(i)	17.5	18.2	Southeast	No	No		Temp Delays		

Notes:
1. Operational noise includes noise from the existing facility with operational noise generating equipment from the proposed changes in RFA4.

Figure 9: Protected Areas Within and Extending 20-miles of the Proposed Solar Micrositing Area



As presented in Table 13 above, the nearest protected areas are John Day Wild and Scenic River and the John Day River State Scenic Waterway, located 3.7 to 3.8 miles, respectively, east of the proposed Solar Micrositing Area. All other protected areas are located at distances of 8 miles or greater from the site.

Potential Impacts on Protected Areas

Noise

Estimated and modeled noise impacts at John Day Wild and Scenic River (approx. 3.7 miles east of the proposed Solar Micrositing Area) are 43 dBA during construction and 26 dBA during operations, respectively. A noise level of 43 dBA represents a similar noise level of light auto traffic at a distance of 100 feet.[208] A noise level of 26 dBA is equivalent to ambient noise levels and considered extremely quiet. These noise levels combined with a more than 3 mile separation distance would not be expected to result in a significant adverse impact at John Day Wild and Scenic River or at any other protected area located at greater distances from the proposed RFA4 site boundary. Therefore, the Council finds that noise impacts are not likely to have a significant adverse impact on users of any protected area within the analysis area.

Traffic

Construction routes will include I-84, US-97, OR-206, Klondike Road and Old Wasco-Heppner Highway. Six of the protected areas are accessed by US-97 or OR-206, including John Day Wild & Scenic River; John Day River State Scenic Waterway; Lower John Day Wilderness Study Area; Ferry Canyon ACEC; Cottonwood Canyon State Park; and Columbia Basin Agricultural Research Center. Visitors travelling to any of these six protected areas could experience short-term delays for the duration of construction. As presented in Section II.M. *Public Services*, there are three existing conditions, Conditions 77-79, that apply to construction-related traffic impacts. These conditions, as amended, will minimize potential traffic volume and road damage impacts, minimizing potential impacts to users of road serving the above-referenced protected areas. Therefore, the Council finds that construction-related traffic is not likely to have a significant adverse impact on roads used to access protected areas within the analysis area.

Only three additional full-time employees are expected to visit the site daily, and other trips for delivery or maintenance would be infrequent. As a result, the Council finds that operational traffic is not likely to have a significant adverse impact on roads used to access protected areas within the analysis area.

Water and Wastewater

No water will be withdrawn from or discharged to any protected area. Wastewater will be managed within the site. There are no water or wastewater related impacts during construction or operation of the changes proposed in RFA4. The Council finds that the facility components proposed in RFA4 would not result in impacts to protected area within the analysis area.

[208] BCWAMD4Doc21-19 RFA Exhibit Y Acoustic Assessment 2025-12-10, Table Y-2. See sound level, in dBA, of light auto traffic at 100 feet.

Visual

Permanent placement of energy infrastructure proposed in RFA4 could result in potential visual impacts including up to 15 foot tall solar arrays and up to 160 foot-tall transmission line poles. To evaluate potential visual impacts of these structures, RFA4 Exhibit R presents the results of a three-part approach including GIS-based viewshed (or zone of visual influence [ZVI]) modeling; key observation point (KOP) analysis and glare modeling.

First, the ZVI analysis used Esri GIS software and bare-earth 10-meter digital elevation model to determine locations within the analysis area where the changes proposed in RFA4 would be visible. Results of the ZVI analysis are presented in RFA4 Exhibit R Figure R-2 and R-3. Then, based on the results of the ZVI analysis, 21 KOPs were identified, representing locations where a "casual observer" could realistically view the proposed RFA4 structures. The KOP locations are presented in RFA4 Exhibit R Figure R-4. These KOPs are located along accessible viewpoints and near specific scenic resources and used to support the evaluation of the likelihood and magnitude of potential visual impacts (RFA4 Exhibit R Attachment R-3 presents photo locations associated with the KOPs demonstrating actual, existing viewshed conditions). Lastly, a glint and glare analysis was conducted using the Solar Glare Hazard Analysis Tool developed by Sandia National Laboratories to inform potential impacts to drivers on nearby roads.

As presented in Figures 9 and 10 below, visual modeling and viewshed analysis show that portions of six protected areas may have distant or background views of the proposed RFA4 components, while the remaining six protected areas would have no potential visibility. The six protected areas with potential views of the proposed solar components currently have views of other wind farms, transmission lines, industrial development and agricultural irrigation equipment. The glare analysis resulted in no predictions of red, yellow or green glare from the proposed solar arrays at any protected area within the analysis area. Based on these results, the Council finds that visual impacts from solar array glare and structural changes are not likely to result in potentially significant visual impacts to any protected area within the analysis area.

The Council previously imposed Site Certificate Condition 36 to address visual impacts of the wind facility on protected areas by limiting micrositing of turbines and requiring updated visual impact analysis prior to construction. Because the condition applied to the design and construction of the wind energy, the Council deletes the Condition.

Figure 10: **Zone of Visual Influence for Solar Arrays in Protected Areas Analysis Areas**

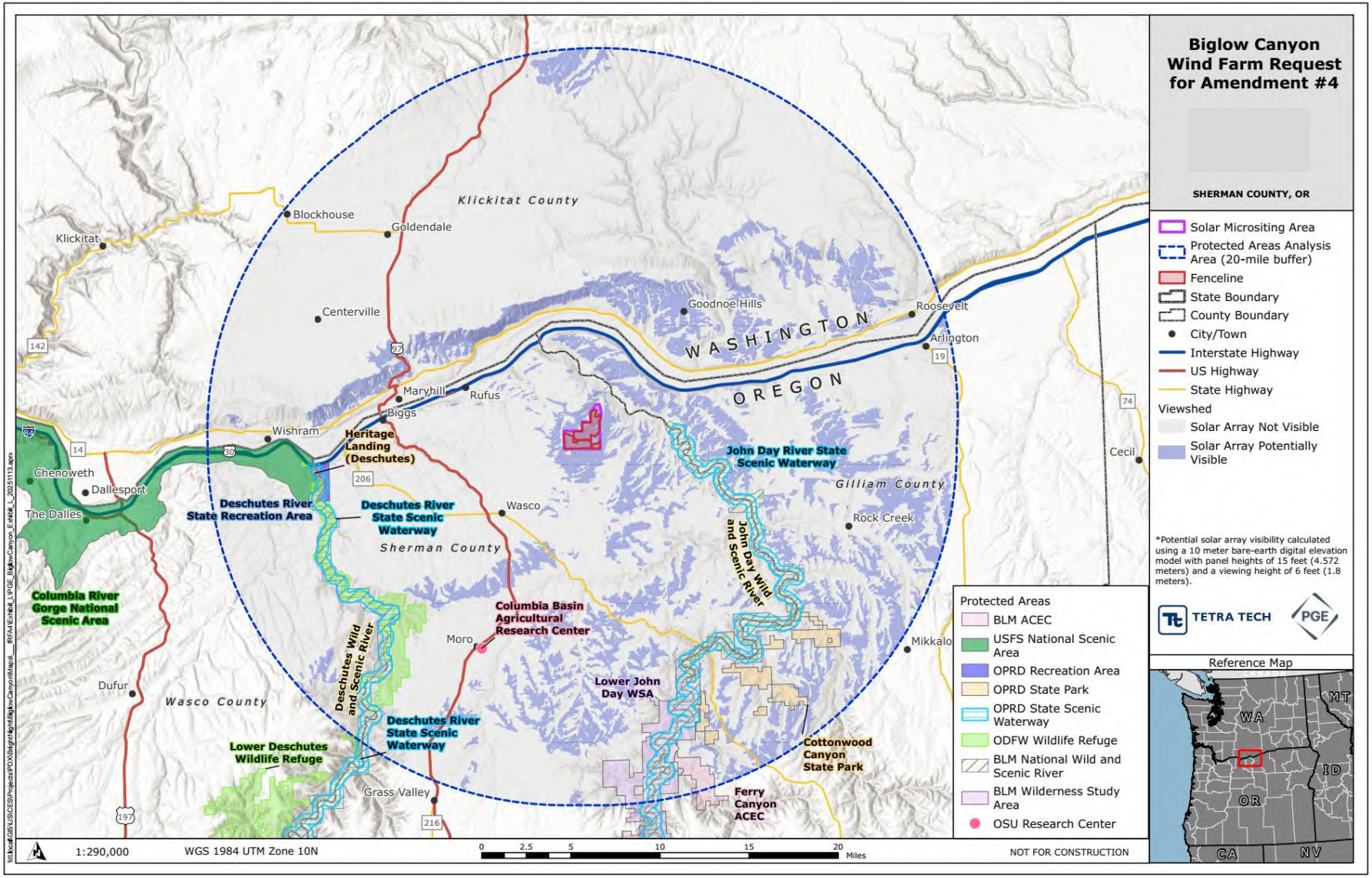
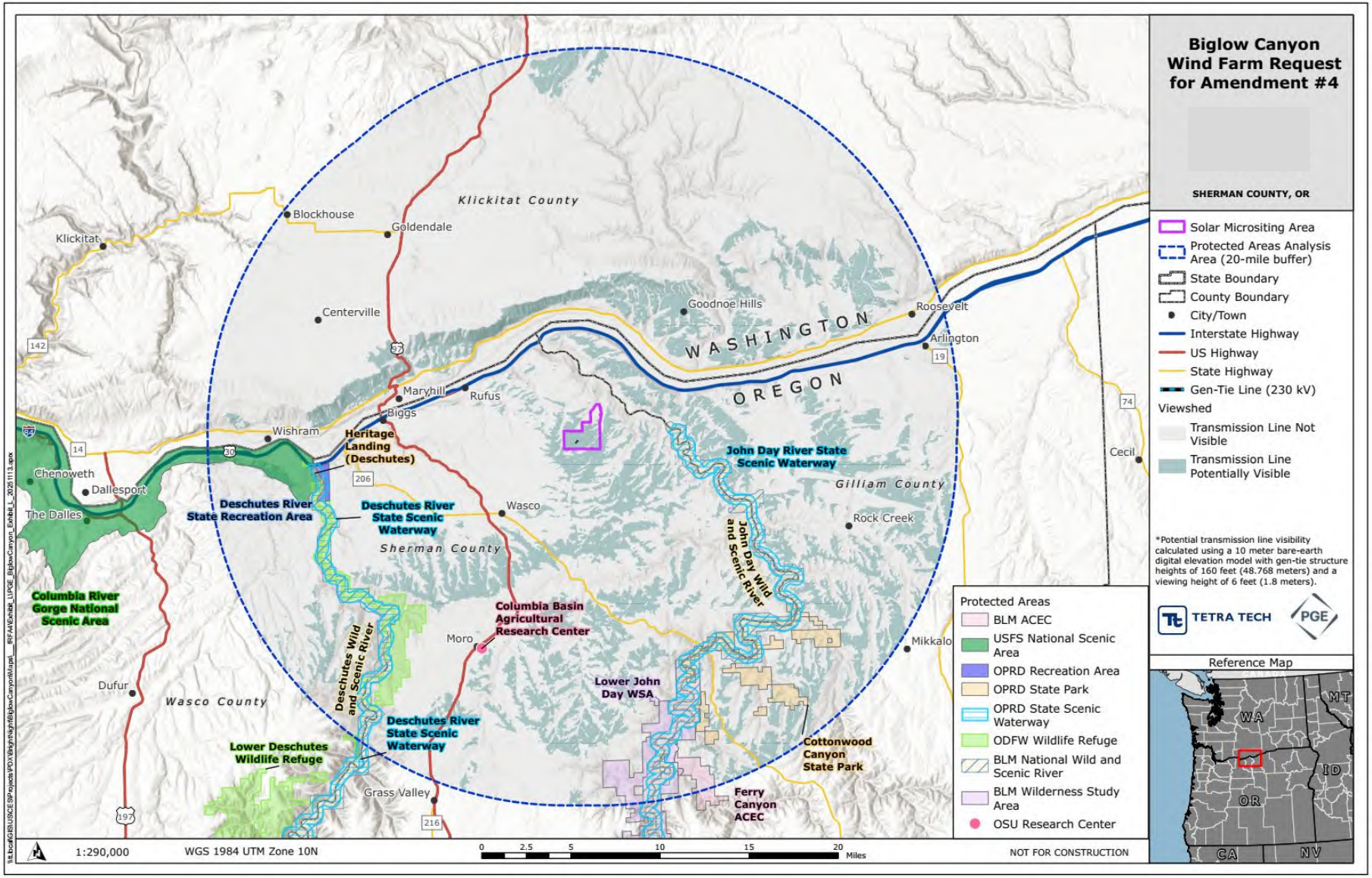


Figure 11: Zone of Visual Influence for Transmission Lines in Protected Areas Analysis Area



III.F.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with amended Conditions 77, 78 and 79, the Council finds that the facility components proposed in RFA4 are not located within the boundaries of a protected area and that the design, construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impact to any protected areas.

III.G. RETIREMENT AND FINANCIAL ASSURANCE: OAR 345-022-0050

> *To issue a site certificate, the Council must find that:*
>
> *(1) The site, taking into account mitigation, can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the facility.*
>
> *(2) The applicant has a reasonable likelihood of obtaining a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition.* [209]
>
> ***** [210]

III.G.1. Findings of Fact

At the end of its useful life, the facility components proposed in RFA4 would be decommissioned and the site would be restored to a useful, non-hazardous condition suitable for agricultural uses. The certificate holder estimates that the facility components proposed in RFA4 will have a useful life of at least 40 years. [211]

The certificate holder also acknowledges that some facility components, including but not limited to individual modules and batteries, may need to be replaced during operation of the facility through routine operations and maintenance activities.[212]

As discussed in Section III.D., *Soil Protection*, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impacts to soils that would preclude the restoration of the site to a useful, non-hazardous condition; and the Comprehensive Solar Revegetation and Soil management Plan required under Soil Protection Conditions 1 to 3 contain provisions to prevent soil loss, the introduction of weeds, or other impacts that may affect the long-term productivity of soils at

[209] OAR 345-022-0040, effective April 2, 2025.

[210] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

[211] BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Section 2.0.

[212] BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Section 2.0.

the site; although as discussed below, additional work may be needed at the time of decommissioning and retirement before lands can be returned to agricultural production.

Facility Decommissioning and Site Restoration

The certificate holder represents that it will conduct the following activities during decommissioning:

- All aboveground facility components would be removed.
  - Solar modules would be separated from the racking and loaded into a truck or roll-off container for off-site disposal or recycling.
  - Posts would be removed from the ground and recycled as scrap metal.
  - Transformers would be decommissioned and disposed of off-site. Transformer oil would be disposed of in accordance with applicable state and federal regulations.
  - Battery containers and associated components would be disassembled and transported off-site via truck for disposal or recycling with applicable regulatory requirements.
  - Refrigerant associated with heating, ventilation, and air conditioning systems would be recovered in accordance with applicable state and federal regulations.
  - Concrete slab-on-grade foundations for transformers, inverters, and battery storage system would be removed in their entirety.
- Underground electrical cables would be removed to lateral depth; lateral runs buried at or exceeding a minimum of 3 feet will be abandoned in place.
- Sub-grade foundations for the O&M buildings and collector substations would be removed to a minimum of at least 3 and 4 feet, respectively. Foundation areas would be backfilled with soil or gravel.
- Access roads constructed within the solar areas would be regraded to natural contours unless landowners request they remain in place. Road gravel would be used for backfill where needed.
- Disturbed areas would be covered with salvaged topsoil where needed and reseeded.[213]

In accordance with the rules for mandatory conditions currently located in OAR 345-025-0006, the Council previously imposed Site Certificate Conditions 107, 109 and 116, requiring the certificate holder to retire the facility according to a final retirement plan approved by the Council following the permanent cessation of construction or operation of the facility and to prevent the development of any conditions on the site that would preclude restoration of the site to a useful, non-hazardous condition during construction and operation of the facility.[214]

[213] BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Section 3.0, 4.2.

[214] At the time the Council issued the Third Amended Site Certificate, the rules for mandatory conditions were found in OAR chapter 345, division 027. In 2017, these rules were moved to OAR chapter 345, division 025.

The conditions were intended to apply to the wind facility and do not contemplate the potential need to decommission separate energy facilities with different expected operating lives independently from one another. The Council amends Condition 109 to provide a clear process to address any partial decommissioning of the facility and ensure any significant portions of the wind energy facility that are decommissioned during the operating life of the solar facility are retired in a timely fashion in accordance with a retirement plan approved by the Council. The Council makes additional administrative edits to Condition 116 to reflect the Council's current rules:

Amended Condition 109 (RET-RF-01)

~~OAR 345-027-0020(9):~~

a. The certificate holder shall retire the facility if the certificate holder permanently ceases construction or operation of the facility. The certificate holder shall retire the facility according to a final retirement plan approved by the Council, as described in OAR 345-027-0110. The certificate holder shall pay the actual cost to restore the site to a useful, non-hazardous condition at the time of retirement, notwithstanding the Council's approval in the site certificate of an estimated amount required to restore the site.

b. If the certificate holder permanently ceases construction or operation of a portion of the facility that is, by itself, an energy facility under ORS 469.300, the certificate holder must retire that portion of the facility within two years following cessation of construction or operation of the facility components in accordance with the provisions of OAR 345-027-0110(10).
[OAR 345-027-0020(9); Final Order on ASC, Condition 109; AMD4]

Amended Condition 116 (RET-RF-02)

~~OAR 345-027-0020(16)~~: If the Council finds that the certificate holder has permanently ceased construction or operation of the facility without retiring the facility according to a final retirement plan approved by the Council, as described in OAR 345-027-0110, the Council shall notify the certificate holder and request that the certificate holder submit a proposed final retirement plan to the Office within a reasonable time not to exceed 90 days. If the certificate holder does not submit a proposed final retirement plan by the specified date, the Council may direct the Department to prepare a proposed a final retirement plan for the Council's approval. Upon the Council's approval of the final retirement plan, the Council may draw on the bond or letter of credit ~~described in OAR 345-027-0020(8)~~ provided under Condition GEN-RF-01 to restore the site to a useful, non-hazardous condition according to the final retirement plan, in addition to any penalties the Council may impose under OAR Chapter 345, Division 29. If the amount of the bond or letter of credit is insufficient to pay the actual cost of retirement, the certificate holder shall pay any additional cost necessary to restore the site to a useful, non-hazardous condition. After completion of site restoration, the Council shall issue an order to terminate the site certificate if the Council finds that the facility has been retired according to the approved final retirement plan.
[OAR 345-027-0020(16); Final Order on ASC, Condition 116; AMD3, AMD4]

Estimated Costs of Site Restoration

The certificate holder estimates that it would cost approximately $14.24 million (Q4 2024 dollars) to retire the facility components proposed in RFA4 and restore the proposed Solar Micrositing Area as described in the section above.[215] As summarized in Table 14, below, the certificate holder identified individual tasks needed for retirement using the professional experience of its engineering staff and contractors. The costs of individual tasks were estimated based on labor requirements, equipment needs, and duration. Facility components were assumed to have no scrap value for the purpose of estimation. Additional methods and assumptions used to produce the estimate include the following:

- Crew, equipment needs, and production rates were established using professional experience and published data from RS Means and other sources.
- Labor costs were developed by reviewing the U.S. Department of Labor wage determinations and rates published by RS Means. Labor cost rates assume a 50 hour workweek and include base wages, overtime, benefits, and payroll tax liability.
- Equipment rates are based on data published by RS Means and historical vendor quotes. Rates include fuel, maintenance, and wear and tear of ground-engaging components. The rates assume the use of rental equipment, not owned equipment.
- Mobilization and demobilization costs reflect the actual costs to mobilize equipment, facilities, and crew to the site and do not include the front loading of cost from other tasks.
- Several other miscellaneous costs have been approximated, including permits, engineering, signage, fencing, traffic control, utility disconnects, etc. In the context of the overall estimate, these are incidental costs that are covered in the estimate's contingency.
- Temporary facilities including one office trailer and one Conex storage unit have been included in the restoration cost. Additional management costs include portable toilets, first aid supplies, and office supplies.
- Field management includes one Superintendent and one Field Engineer to ensure the safe and successful execution of work.
- The cost of transformer oil disposal was estimated at $4 per gallon (2024 dollars).
- Excess gravel from road removal that is not used for backfill was assumed to be accepted by local receivers at no cost.
- Reseeding was assumed to be required for the collector substation site, along with an estimated 35 percent of the areas where solar panels and associated facilities will be removed (217 acres). For cost estimating purposes, it is assumed that final seeding will utilize a mix of native grasses.[216]

[215] BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Section 4.1.

[216] BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Section 3.0, 4.2.

The certificate holder added contractor profit and overhead markups, including 5 percent for Home Office and Project Management and 15 percent for Contractor Overhead and Fee. The certificate holder also applied contingencies for costs that would be incurred by the State if the certificate holder defaulted on its obligations to retire the facility and restore the site, including a 1 percent Performance Bond, 10 percent Administrative and Project Management fee, as well as a 20 percent Future Development contingency for the battery components and a 10 percent contingency.

The Council finds that the certificate holder used reasonable methods and assumptions to estimate the retirement costs of the facility components proposed in RFA4. With markups and contingencies, the cost that would be incurred by the State if the certificate holder failed to retire the facility as required would be approximately $12.09 million (Q4 2024 dollars).[217]

Table 14: Decommissioning Tasks and Cost Estimate for Proposed RFA4 Facility Components

Task or Component	Quantity	Unit	Unit Cost ($)	Estimate ($)
1.1 Mobilization / Demobilization				
1.1.1 Equipment Mob	1	Lump Sum	61,200.00	61,200.00
1.1.2 Site Facilities	1	Lump Sum	2,200.00	2,200.00
1.1.3 Crew - Mob & Site Setup	3	Day	13,548.63	40,645.89
1.1.4 Crew - Demob & Site Cleanup	2	Day	13,548.63	27,097.26
			Subtotal	***131,143.15***
1.2 Project Site Support				
1.2.1 Site Facilities	6	Month	1,605.00	9,630.00
1.2.2 Field Management	6	Month	54,496.60	326,979.60
			Subtotal	***336,609.60***
1.3. Substation Retirement				
1.3.1 Fence Removal	1	Day	1,305.08	1,305.08
1.3.2 Transformer Removal	1	Each	94,140.68	94,140.68
1.3.3 Control Building Removal	1	Each	5,249.48	5,249.48
1.3.4 UG Utility & Ground Removal	2	Day	1,305.08	2,610.16
1.3.5 Remove Foundations	500	Cubic Yard	41.54	20,770.00
1.3.6 Misc. Material Disposal	1	Each	2,200.00	2,200.00
1.3.7 Restore Yard	1	Each	65,761.49	65,761.49
			Subtotal	***192,036.89***
1.4 230 kV Transmission Line Retirement				

[217] BCWAMD4Doc21-18 RFA Exhibit X Retirement 2025-12-10, Section 4.2, Attachment X-1.

Table 14: Decommissioning Tasks and Cost Estimate for Proposed RFA4 Facility Components

Task or Component	Quantity	Unit	Unit Cost ($)	Estimate ($)
1.4.1 Remove Structures	4	Each	4,684.35	18,737.40
1.4.2 Remove Foundations to Subgrade	4	Each	1,493.48	5,973.92
			Subtotal	***24,711.32***
1.5 O&M Structures Removal				
1.5.1 Loadout Containers	3	Each	165.31	495.93
1.5.2 Demo Structures	3	Each	2,249.48	6,748.44
1.5.3 Excavate / Remove Piles	5	Each	224.95	1,124.75
1.5.4 Structure Recycling Cost	40	Ton	70.00	2,800.00
1.5.5 Trucking - Per Load	5	Truck Loads	1,500.00	7,500.00
			Subtotal	***18,669.12***
1.6 BESS Removal				
1.6.1 BESS Unit Removal	153	Each	6,491.06	993,132.18
1.6.2 Inverter (153) / Transformer Removal (39)	192	Each	1,070.23	205,484.16
1.6.3 UG Cable Removal	3	Day	1,969.92	5,909.76
1.6.4 Support Pile Removal	318	Each	404.19	128,532.42
1.6.2 Structure & Components Removal	183	Each	987.03	180,626.49
			Subtotal	***1,513,685.01***
1.7 Inverter/Transformer Removal				
1.7.1 Disconnect Electrical	33	Each	111.39	3,675.87
1.7.2 Loadout Inverter & Transformer	33	Each	208.83	6,891.39
1.7.3 Trucking - Per Load	17	Truck Loads	1,500.00	24,750.00
			Subtotal	***35,317.26***
1.8 Inverter / Transformer Support Pile Removal				
1.8.1 Excavate / Remove Piles	33	Each	224.95	7,423.35
1.8.2 Trucking - Per Load	4	Truck Loads	1,500.00	5,820.00
			Subtotal	***13,243.35***
1.9 Solar Array Retirement				
1.9.1 Fence Removal	75,504	Linear Feet	1.27	95,890.08
1.9.2 Solar Panel Removal & Disposal	264,836	Each	8.10	2,145,171.60

Table 14: Decommissioning Tasks and Cost Estimate for Proposed RFA4 Facility Components

Task or Component	Quantity	Unit	Unit Cost ($)	Estimate ($)
1.9.3 Solar Rack (Tracker Strings) & Post Removal	10,186	Each	313.83	3,196,672.38
			Subtotal	***5,464,220.76***
1.10 UG Cable Removal				
1.10.1 Excavate & Remove Cable	20	Day	4,214.15	84,283.00
1.10.2 Trucking - Per Load	2	Truck Loads	1,500.00	3,000.00
			Subtotal	***87,283.00***
1.11 Site Restoration				
1.11.1 Strip & Decompact Roads	29,040	Linear Feet	1.43	41,527.20
1.11.2 Spot Grade Disturbed Areas	217	Acre	281.33	61,048.61
1.11.3 Re-Seed With Native Vegetation - Roads & Areas Disturbed By Construction	217	Acre	1,000.00	217,000.00
			Subtotal	***319,575.81***
Total Decommissioning Cost				***8,136,495.27***
Contractor Markups				
Home Office, Project Management			0.05	406,824.76
Contractor OH & Fee			0.15	1,281,498.01
			Subtotal	***1,688,322.77***
Total Decommissioning Cost				***9,824,818.04***
Performance Bond			0.01	98,248.18
			Gross Cost	***9,923,066.22***
	Basis (% of Cost)	**Basis ($)**	**Contingency**	**Estimate ($)**
Administration and Project Management	100%	9,923,066.22	0.10	992,306.62
Future Development (Exclude Battery)	81%	8,077,013.82	0.10	807,701.38
Future Development (Battery Only)	19%	1,846,052.40	0.20	369,210.48
			Subtotal	***2,169,218.48***
TOTAL ESTIMATED COST ($Q42024)		**12,092,284.70**		
ROUNDED		12,092,000.00		

Notes:
1. Unit costs in Q4 2024.
2. See RFA4 Exhibit X Attachment X-1 for detailed breakdown of tasks, actions and unit costs for the sum total costs presented in this table.

Table 14: Decommissioning Tasks and Cost Estimate for Proposed RFA4 Facility Components

Task or Component	Quantity	Unit	Unit Cost ($)	Estimate ($)
3. Tasks associated with a Lump Sum unit cost may be calculated using a fraction (in decimal form) of the actual quantities constructed or by using the more detailed breakdown of unit costs associated with the Lump Sum task identified in the cost estimating worksheet in RFA4 Exhibit X, Attachment X-1.				

Financial Assurance Requirements

The Council previously imposed Site Certificate Condition 108, requiring the certificate holder to provide and maintain a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition in accordance with the mandatory conditions currently found in OAR 345-025-0006. The Council maintains this condition, with changes to make it clear that the conditions apply to all phases of the facility, including the solar facility.

Amended Condition 108 (GEN-RF-01)

a. ~~OAR 345-027-0020(8): Before beginning~~ Prior to construction of the facility, or any component of the facility, the certificate holder shall submit to the State of Oregon, through the Council, a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition. The certificate holder shall maintain a bond or letter of credit in effect at all times until the facility has been retired. The Council may specify different amounts for the bond or letter of credit during construction and during operation of the facility.

b. The certificate holder shall annually adjust all bonds or letters of credit submitted in compliance with this condition to present value using the U.S. Gross Domestic Product Implicit Price Deflator, Chain-Weight, as published in the Oregon Department of Administrative Services' Oregon Economic and Revenue Forecast or by any successor agency (the "Index"). If at any time the Index is no longer published, the Department shall select a comparable calculation to adjust the amount to present value.

[Final Order on ASC, Condition 108; AMD3, AMD4]

The Council also imposed Site Certificate Conditions 8, 9 and 10 specifying the form and amount of assurance needed for the wind energy facility. In the Final Order on RFA3, based on estimates provided by the certificate holder and Department, the Council determined that $14.624 million (2008 dollars) was the amount satisfactory to decommission the wind energy facility and restore the site to a useful, non-hazardous condition.[218]

Based on inflationary adjustments since the time of the preconstruction decommissioning estimate, the amount has increased to $21.3 million. The Department currently has an Irrevocable Standby Letter of Credit issued by Mizuho Bank, Ltd. on file assuring the payment of

[218] BCWAMD3Doc33 BCW AMD3 Final Order 2008-10-31, pg. 10.

up to $21.3 million in the event the certificate holder defaults on its obligation to retire the existing facility and restore the site as required by the site certificate. The Council deletes Condition 8, make administrative edits to Condition 9 to remove outdated information, and amend Condition 10 to make it clear that it applies to all phases of the facility, and adopt a new condition establishing that the amount of assurance that must be provided for the solar facility and related or supporting components must be based on the unit costs, markups and contingencies established in Table 14, above:

Deleted Condition 8

~~If the certificate holder elects to build the facility in more than one phase using any turbines other than the GE 1.5-MW turbines or GE 3.0-MW turbines, before beginning construction of any phase of the facility and after considering all micrositing factors, the certificate holder shall provide to the Department a detailed map of that phase of the facility showing the final locations where facility components are proposed to be built in relation to the features and micrositing corridors shown on Figures 2, 2a, 2b and 2c as identified in the Final Order on Amendment #3, shall identify on this map the facilities that would constitute that phase of construction, and shall provide documentation defining the quantities of each of the following components that would constitute that phase of construction: turbines, pad transformers, meteorological towers, substation, O&M facility, miles of aboveground 34.5 kV collector system, miles of access road, acres of turnarounds and access road intersections, acres of temporary laydown area and miles of temporary crane paths. For each turbine, the certificate shall define the turbine manufacturer, turbine capacity, weight of steel, height of tower, sweep of blade, and size of concrete foundation.~~

[Final Order on AMD4]

Amended Condition 9 (GEN-RF-02)

~~(9) In February 2007, in accordance with the terms and conditions of the First Amended Site Certificate, the certificate holder submitted to the State of Oregon through the Council a letter of credit in the amount of $1.608 million before beginning construction of Phase 1 of the facility. The calculation of the amount of the letter of credit included a deduction from the estimated cost of site restoration for Phase 1 for the estimated value of scrap steel. In the Final Order on Amendment #2, the Council found that there should be no deduction of scrap or salvage value in calculating the amount of financial assurance required for site restoration.~~

~~In June 2007, in accordance with the terms and conditions of the Second Amended Site Certificate, the certificate holder submitted an amended letter of credit for Phase 1 in the amount of $5.001 million (3rd Quarter 2007 dollars). In January 2008, in accordance with the terms and conditions of the Second Amended Site Certificate, the certificate holder submitted an amended letter of credit for Phase 1 in the amount of $5.058 million (1st Quarter 2008 dollars).~~

~~Before beginning construction of any future phase of~~ For the wind energy facility, the ~~certificate holder shall submit a~~ bond or letter of credit ~~for that phase~~ required under

Condition GEN-RF-01 shall be in an amount approved by the Department and based on the costs shown in Table 1 of the Final Order on Amendment #3.

~~a.~~ The certificate holder shall adjust the amounts of all bonds or letters of credit submitted in compliance with this condition to present value as of the date of issuance, using the following calculation and subject to approval by the Department:

a. Adjust the Subtotal (in 2005 dollars) to present value, using the U.S. Gross Domestic Product Implicit Price Deflator, Chain-Weight, as published in the Oregon Department of Administrative Services' Oregon Economic and Revenue Forecast or by any successor agency (the "Index"). If at any time the Index is no longer published, the Council shall select a comparable calculation to adjust 2005 dollars to present value.
b. Add 1 percent of the adjusted Subtotal (i) for the adjusted performance bond amount to determine the adjusted Gross Cost.
c. Add 10 percent of the adjusted Gross Cost (ii) for the adjusted administration and project management costs and 10 percent of the adjusted Gross Cost for the adjusted future developments contingency.
d. Add the adjusted Gross Cost (ii) to the sum of the percentages (iii) and round the resulting total to the nearest $1,000 to determine the adjusted financial assurance amount.

~~(b) The certificate holder shall annually adjust all bonds or letters of credit submitted in compliance with this condition to present value as of the date of issuance as described in (a).~~

~~(c) The certificate holder shall use a form of bond or letter of credit approved by the Council.~~

~~(d) The certificate holder shall use an issuer of the bond or letter of credit approved by the Council.~~

~~(e) The certificate holder shall describe the status of all bonds or letters of credit for the facility in the annual report submitted to the Council under Condition (122).~~

~~(f) The bond or letter of credit shall not be subject to revocation or reduction before retirement of the facility.~~

[Final Order on ASC, Condition 9; AMD2, AMD3, AMD4]

Retirement and Financial Assurance Condition 1 (PRE-RF-01):

Prior to construction of the solar facility, component or phase, as applicable, the certificate holder shall:

a. Submit to the Department Table 14 (Retirement Table with tasks/unit/unit costs) of the Final Order on RFA4, updated based on final design and phased construction, if applicable. Certificate holder may not make changes to the unit cost without review and approval by the Department. Certificate holder must also request that the Department confirm the present-day inflation adjusted decommissioning estimate, rounded to the nearest $1,000, to be reflected in the bond or letter of credit in sub c of this condition.
b. Incorporate any additional decommissioning costs for facility changes which have been determined by the Department not to require a site certificate amendment.

c. Submit to the Department a bond or letter of credit, in the amount affirmed by the Department under (a), based on the Council's current pre-approved financial institution list and form.
[Final Order on RFA4]

Retirement and Financial Assurance Condition 2 (CON-RF-01): If construction extends more than 12 months, the certificate holder shall:

a. Annually adjust the amount of the bond or letter of credit to present dollar value, as determined by the Department.
b. Incorporate any additional decommissioning costs for proposed facility changes which have been determined by the Department not to require a site certificate amendment.
c. The Department and Council reserve the right to adjust the contingencies, as appropriate and necessary to ensure that costs to restore the site are adequate to maintain health and safety of the public and environment.
[Final Order on RFA4]

Retirement and Financial Assurance Condition 3 (OPR-RF-01): During operation of the solar facility, the certificate holder shall:

a. Annually adjust the amount of the bond or letter of credit provided to satisfy Condition GEN-RF-01 to present dollar value, as determined by the Department. The Department shall adjust to present value using the U.S. Gross Domestic Product Implicit Price Deflator, Chain-Weight, as published in the Oregon Department of Administrative Services' Oregon Economic and Revenue Forecast or by any successor agency (the "Index"). If at any time the Index is no longer published, the Department shall select a comparable calculation to adjust the amount to present value.
b. Incorporate any additional decommissioning costs for proposed facility changes which have been determined by the Department not to require a site certificate amendment.
c. The Department and Council reserve the right to adjust the contingencies, as appropriate and necessary to protect public health and safety or the environment and ensure the certificate holder's bond or letter of credit is sufficient to restore the site to a useful, non-hazardous condition.
[Final Order on AMD4]

Amended Condition 10 (GEN-RF-04)

If the certificate holder elects to use a bond to meet the requirements of Condition ~~(9)~~ GEN-RF-01, the certificate holder shall ensure that the surety is obligated to comply with the requirements of applicable statutes, Council rules and this site certificate when the surety exercises any legal or contractual right it may have to assume construction, operation or retirement of the facility. The certificate holder shall also ensure that the surety is obligated to notify the Council that it is exercising such rights and to obtain any Council approvals required by applicable statutes, Council rules and this site certificate

before the surety commences any activity to complete construction, operate or retire the facility.
[Final Order on ASC, Condition 10; AMD4]

The Council finds that, subject to compliance with the conditions described above, the certificate holder has provided sufficient evidence to demonstrate that the site can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the facility.

Ability of the Certificate Holder to Obtain a Bond or Letter of Credit

As described above, the Department currently has an Irrevocable Standby Letter of Credit issued by Mizuho Bank, Ltd. on file assuring the payment of up to $21,301,000 in the event the certificate holder defaults on its obligation to retire the existing facility and restore the site as required by the site certificate. Mizuho is also on the Council's 2025 pre-approved financial institution list. The certificate holder provided a letter from Mizuho explaining that, on a preliminary basis, Mizuho would be supportive of furnishing or arranging an additional letter of credit in an amount up to $53.5 million for the facility components proposed in RFA4.[219] While no commitment to issue the letter of credit was made, the amount is significantly more than the $12.09 million decommissioning estimate.

The certificate holder also provided a letter from Angelica Espinosa, PGE's Chief Legal and Compliance Officer, explaining that based upon her best knowledge, that the certificate holder has the legal authority to construct and operate the facility components proposed in RFA4 without violating its bond indenture provisions, Articles of Incorporation, common stock covenants or similar agreements.[220]

Because the certificate holder has provided evidence that it has an existing relationship with an approved financial institution that is willing to issue a letter of credit in an amount sufficient to retire the facility and restore the site in accordance with Council rules and standards, the Council finds that the certificate holder has a reasonable likelihood of obtaining a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition.

III.G.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the existing, new and amended site certificate conditions described above, the Council finds that the site can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the facility, and that the certificate holder has a reasonable likelihood of

[219] BCWAMD4Doc21-08 RFA Exhibit M Financial Capability 2025-12-10, Attachment M-2.
[220] BCWAMD4Doc21-08 RFA Exhibit M Financial Capability 2025-12-10, Attachment M-1.

obtaining a bond or letter of credit in a form and amount satisfactory to restore the site to a useful, non-hazardous condition.

III.H. FISH AND WILDLIFE HABITAT: OAR 345-022-0060

> *To issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are consistent with:*
>
> *(1) The general fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025(1) through (6) in effect as of February 24, 2017, and*
>
> *(2) For energy facilities that impact sage-grouse habitat, the sage-grouse specific habitat mitigation requirements of the Greater Sage-Grouse Conservation Strategy for Oregon at OAR 635-415-0025(7) and OAR 635-140-0000 through -0025 in effect as of February 24, 2017.*
>
> ** * * * * [221]*

III.H.1. Findings of Fact

The analysis area for the Fish and Wildlife Habitat standard is the area within and extending 0.5 mile from the proposed Solar Micrositing Area.[222] The analysis area covers approximately 5,198 acres in northern Sherman County, Oregon, which is located in the Columbia Plateau Ecoregion. As described in more detail below, the majority of the analysis area is comprised of agricultural lands with small areas of remnant grassland and shrub-steppe habitat. Only limited areas of native habitat types occur, and even in those areas, non-native, invasive grasses and forbs, including cheatgrass (Bromus tectorum), bulbous bluegrass (Poa bulbosa), cereal rye (Secale cereale), and prickly lettuce (Lactuca serriola), are abundant.[223]

This general fish and wildlife habitat mitigation goals and standards in OAR 635-415-0025 require the mitigation of impacts to fish and wildlife habitat based on the quantity and quality of the habitat impacted as well as the nature, extent, and duration of the impact. Habitat quality is measured using a habitat classification system based on the function and value the habitat provides to species or groups of species likely to use it. ODFW policy identifies six habitat categories, with Category 1 being the most valuable, and Category 6 the least valuable.

Discovery Measures

[221] OAR 345-022-0040, effective April 2, 2025. The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.
[222] BCWAMD4Doc01-00 ODOE Concurrence on OAR 345-027-0360(3) Request 2024-05-02.
[223] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Section 5.2.

RFA4 includes a 2024 Habitat Categorization and Special Status Wildlife Survey Report prepared by the certificate holder's qualified biologists from Tetra Tech.[224] The biological report was prepared by a combination of desktop analysis/literature review, and field surveys. The desktop survey for habitat categorization of the proposed Solar Micrositing Area delineated potential habitat categories using:

- ODFW information regarding habitat types;
- National Land Cover Database;
- Aerial photography;
- The original application materials for the BCWF and monitoring data from facility operations;[225]
- Oregon Conservation Strategy and ODFW Compass mapping tool;
- Sherman County Comprehensive Plan (Goal 5) for big game habitat

Tetra Tech conducted habitat categorization field surveys within the proposed Solar Micrositing Area in June 2024.[226] Ground-based raptor nest surveys were also conducted in June 2024, covering the area within and extending 0.5 mile from the proposed Solar Micrositing Area. Habitat mapping consistent with ODFW Fish and Wildlife Habitat Mitigation Policy was performed using a minimum of 1-acre mapping unit (except for specialized habitat such as cliffs or rock outcrops) during the growing season to aid in identification of vegetative species. Meandering transects were walked by a biologist to categorize the composition and structure of habitat by noting the dominant vegetation, presence of large trees, existing disturbance, or other habitat features such as shrub and grass composition and density.[227]

Field surveys for wetlands and waters of the state were conducted in July 2024 and used to inform habitat categorization summarized below. Results from the wetland delineations are discussed further in Section IV.B. *Removal-Fill*, of this order.

Fish and Wildlife Habitat within Analysis Area

Approximately 4,301 of 5,198-acres within the analysis area (83 percent) are made up of agricultural or developed lands considered to be Category 6 habitat due to the level of disturbance and limited potential to become essential or important habitat. The remaining 897 acres are made up of grasslands, sagebrush shrub steppe, waterways, wetlands and riparian habitat.[228] As shown in Figure 12 and 13, below, the majority of the habitat areas are

[224] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Attachment P-1.

[225] 2005, 2009-2014 reporting by WEST (Western EcoSystems Technology, Inc.), BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Sections 4.1 and 12.0.

[226] The 0.5 mile area outside the proposed Solar Micrositing Area was field surveyed for raptor nests and otherwise evaluated using the desktop methodologies. BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Table P-1, and Section 4.2.3.

[227] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Section 4.2.1.

[228] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10 Table P-4

concentrated to the northeast of the proposed Solar Micrositing Area, with some sagebrush shrub-steppe and grasslands following the lower fork of Biglow Canyon within the proposed Solar Micrositing Area.

Sagebrush shrub-steppe and riparian habitats in the analysis area are considered Category 2, "essential and limited habitat."[229] As presented in RFA4 Exhibit P Figure P-1 and P-3, these habitat subtypes occur within ODFW's designated Priority Wildlife Connectivity Area (PWCA); ODFW has not established habitat categorization for PWCAs but rather recommends that the information be used to inform avoidance areas and site-specific evaluation. Other non-developed habitats in the analysis area are considered 3 and 4 essential or important habitat.

Potential Impacts to Habitat and Mitigation Need

Table 15, below, summarizes estimated temporary and permanent impacts within the proposed Solar Micrositing Area by habitat category. All areas within the solar array fenceline area considered a permanent disturbance from a habitat impact perspective. All temporary disturbance areas are outside the fenced solar array areas.[230] Temporary impacts expected to have a longer restoration timeframe (5+ years) result in temporal loss, requiring mitigation beyond revegetation. Approximately 21 acres of Category 2 habitat, and 3.0 acres of Category 4 essential habitat would be permanently impacted by operation of the solar facility. Approximately 0.3 acres of Category 2 Sagebrush Shrub-Steppe would be temporarily impacted, with a temporal impact. All other anticipated impacts would be to Category 6 agricultural or developed lands.

Table 15: Potential Habitat Impacts by Habitat Category

Habitat Category	Habitat Subtype	Impact (acres)	
		Temporary	Permanent
2	Riparian Trees	<0.1	<0.1
	Sagebrush Shrub-Steppe	0.3	20.7
	Category 2 Subtotal	*0.3*	*20.7*
4	Grassland-steppe	0.1	3.0
	Ephemeral Streams	<0.1	<0.1
	Category 4 Subtotal	*0.1*	*3.0*
6	Irrigated Cropland	0.1	52.0
	Non-Irrigated Cropland	9.4	1,365.0
	Developed	1.0	3.9
	Category 6 Subtotal	*10.5*	*1,420.9*
Total Category 2 and 4 Impacts =		**0.4**	**23.7**

[229] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Figure P-1.

[230] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Section 8.0.

Figure 12: Habitat Categories within the Analysis Area

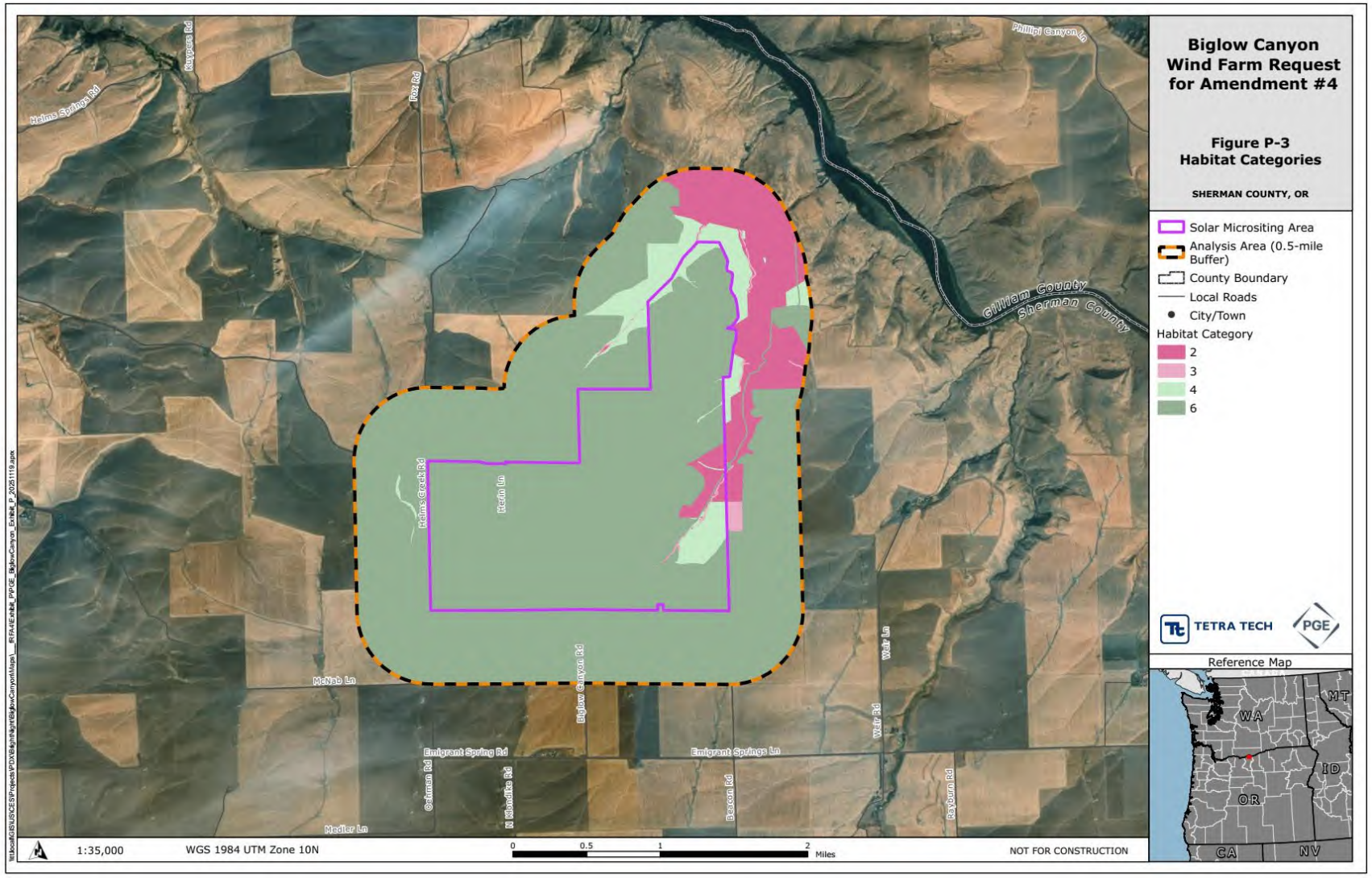
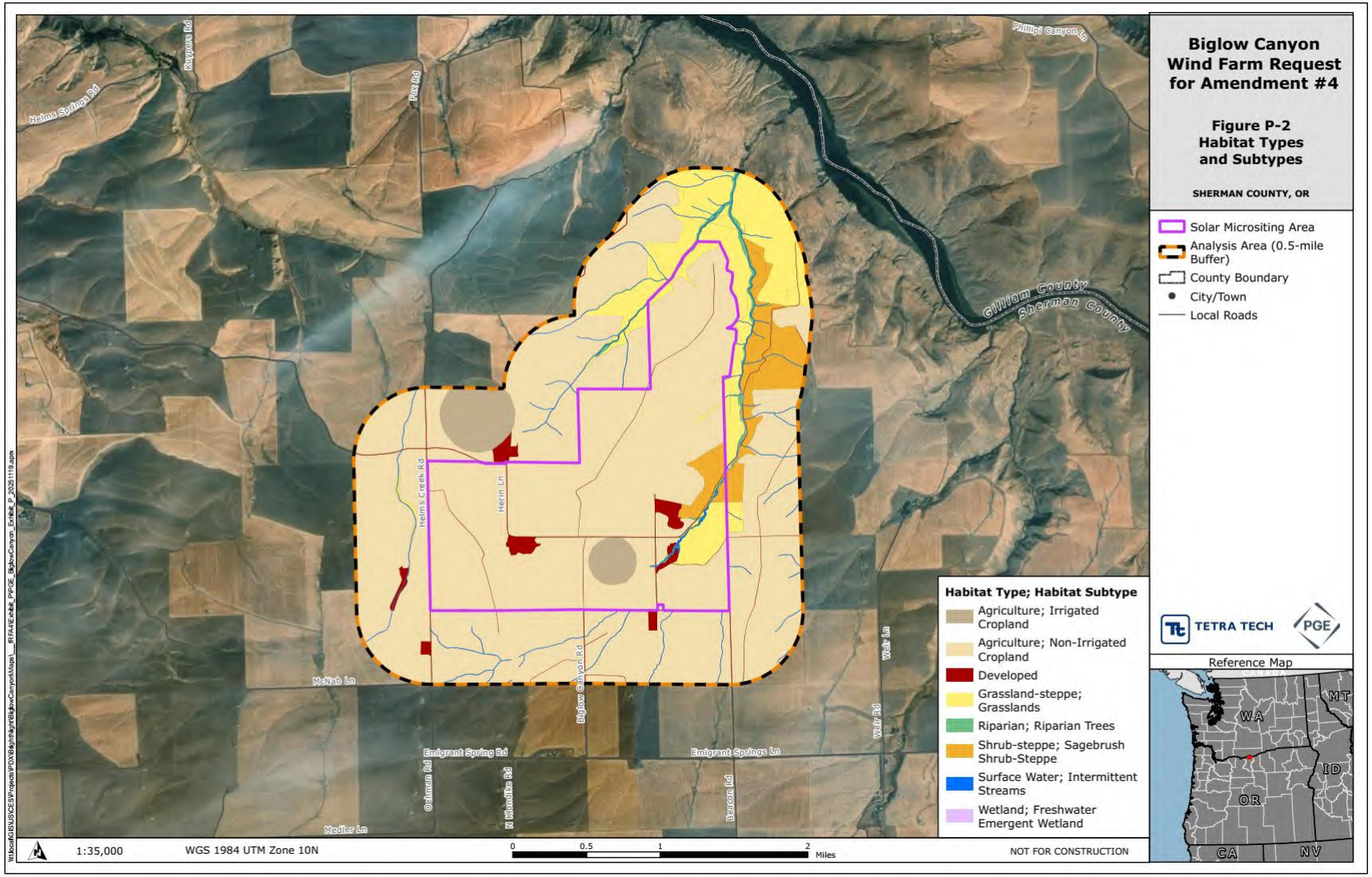


Figure 13: Habitat Subtype within Analysis Are



Mitigation of Potential Habitat Impacts

The Oregon Habitat Mitigation Policy requires mitigation actions to be considered in the following order of priority:

- Avoiding the impact altogether by not taking a certain development action or parts of that action;
- Minimizing impacts by limiting the degree or magnitude of the development action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the development action and by monitoring and taking appropriate corrective measures;
- Compensating for the impact by replacing or providing comparable substitute resources or environments.

Habitat Impact Avoidance

The facility components proposed in RFA4 have been designed to avoid many habitat impacts by using available land within existing site boundary for the operating wind facility and predominately located on previously disturbed agricultural lands.[231]

The northwest portion of the proposed Solar Micrositing Area would be adjacent to an ODFW designated PWCA, which includes Biglow Canyon and, at a distance of approximately 3.7 miles, John Day River. To the extent there are drainages or steep slope areas in proximity to the proposed fenceline, Amended Condition 68 would require the certificate holder to avoid placing facility components near areas with steep slopes, further limiting development near the canyon.[232]

Compensatory Mitigation for Habitat Loss

Under the ODFW Policy, compensatory mitigation must be provided for loss of habitat quantity or quality after implementation of avoidance and minimization measures. Mitigation for impacts to Category 2 and 4 habitats must be "in-kind" mitigation actions which create similar structure and function to that being disturbed and must be "in-proximity" to the disturbed area. For Category 2 habitat, the mitigation actions must ensure there is no net loss of either habitat quantity or quality and both habitat quantity and habitat quality must be improved. For Category 4 habitats, the mitigation actions must ensure there is no net loss of either habitat quantity or quality.

[231] BCWAMD4 pRFA Reviewing Agency Comment ODFW 2025-05-30. During review of pRFA4, ODFW acknowledged the value of the proposed site in minimizing potential wildlife impacts because it was co-located in available area within the existing wind facility.

[232] BCWAMD4 pRFA Reviewing Agency Comment ODFW 2025-05-30. Amended Condition 68 is consistent with ODFW's requested setbacks from the facility fenceline to drainages within the PWCA.

The certificate holder proposes to mitigate temporal (i.e. loss of habitat function and values from the time an impact occurs to the time when the restored habitat provides a pre-impact level of habitat function) and permanent habitat impacts in the form of a permanent conservation easement on a habitat mitigation area (HMA) in-proximity to the facility site, which contains similar habitat quality and quantity as the habitat to be impacted. Specifically, for temporal habitat impacts, the certificate holder proposes to include in its HMA 2 acres for every 1 acre of Category 2 habitat temporarily disturbed (a 2:1 ratio). Based on this proposed methodology, the HMA would include 0.6 acres as mitigation for temporal Category 2 habitat loss.

For permanent habitat impacts, the certificate holder proposes to include in its HMA 2 acres for every 1 acre of Category 2 habitat permanently impacted (a 2:1 ratio to provide no net loss and a net benefit of habitat quantity). The certificate holder proposes to mitigate impacts to Category 4 habitat by including 1 acre for every 1 acre permanently impacted within its HMA (a 1:1 ratio to provide no net loss). Based on this proposed methodology, the HMA would include 44.4 acres as mitigation for permanent habitat loss. As summarized in Table 16, below, based on the estimated impacts and proposed mitigation ratios, the habitat mitigation obligation for in-kind, in-proximity mitigation is approximately 45 acres of land.

Table 16: Estimated Habitat Impacts and Proposed Mitigation Ratios

Habitat Category	Temporal Impacts			Permanent Impacts			Total Mitigation Need
	Total Impact (Acres)	Mitigation Ratio	Mitigation Need	Total Impact Acres	Mitigation Ratio	Mitigation Need	
Category 2	0.3	2:1	0.6	20.7	2:1	41.4	42
Category 4	0.1	1:1	0.1	3	1:1	3	3
Total	**0.4**		**0.6**	**21.0**		**44.4**	**45**

To meet the mitigation need described above, a draft Habitat Mitigation Plan (HMP) was submitted in RFA4 Exhibit P Attachment P-2. The HMP proposes a 78-acre Habitat Mitigation Area (HMA), adjacent to the Carty Generating Facility in Morrow County. As shown in Figure 14, below, the HMA is adjacent to an existing conservation area operated by the certificate holder and a conservation area maintained by The Nature Conservancy (South Farm Conservation Area). The habitat mapped within the HMA includes rabbitbrush shrubland and broom snakeweed shrubland. The HMA is within a PWCA connector and contains Category 1 and Category 2 habitat associated with Washington ground squirrel (*Urocitellus washingtoni*) colonies that are immediately adjacent to the HMA. Access to the site is currently limited to the Nature Conservancy and Three Mile Canyon Farms occasional use of the two-track access crossing the property to access the other conservation areas and for the certificate holders' general operational needs. No livestock grazing is currently occurring on the site, and grazing would not be allowed in the future. ODFW provided concurrence that the proposed HMA is adequate to meet the Category 2 and 4 mitigation goals applicable to the impacts.

The HMA would be placed in a conservation easement or other legal mechanism which would restrict development, would apply for the life of the solar facility, and would be binding to the landowner upon sale or transfer of the land. The enhancement actions proposed at the HMA include access control; noxious weed control; shrub-planting; and restoration in the event of future wildfire.

The Council modifies the draft plan, as presented in Attachment F of this Order. Generally, the modifications are to specify the scope of finalization, to make clear to the certificate holder the actions that need to be taken to finalize the plan and evaluate the adequacy of the proposed enhancement actions and associated success criteria. To finalize the HMP, the certificate holder must evaluate baseline conditions of the HMA, identify the locations and scope of the proposed enhancement actions; finalize the success criteria; finalize the monitoring and survey methods; finalize the monitoring and implementation schedule; and establish the number and location of monitoring and reference sites to be used to evaluate existing conditions and long-term success of the enhancement actions.

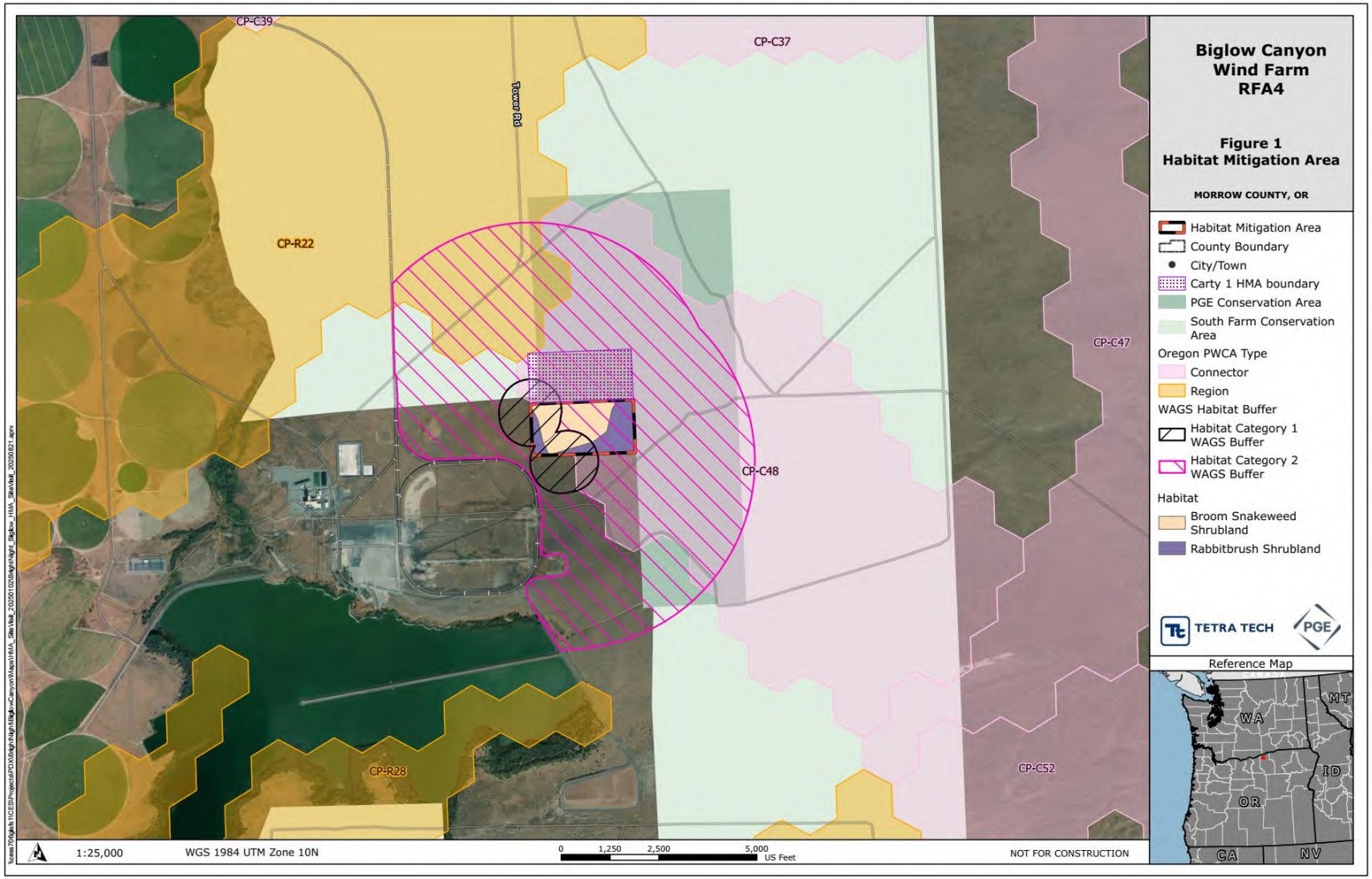
Based on the finalization of the HMP, the Council finds that the proposed HMA and uplift actions will provide appropriate in-kind, in-proximity, mitigation for the expected habitat impacts associated with the construction and operation of the facility components proposed in RFA4. Given the extent of information and actions needed to complete the HMP, the Council imposes the following conditions requiring that the draft HMP be finalized prior to construction, and that the plan be implemented and adhered to during the facility operational lifetime.

Fish and Wildlife Habitat Condition 1 (PRE-FW-01):
Prior to construction of a phase or component of the solar facility, as applicable, the certificate holder shall submit a final Habitat Mitigation Plan substantially similar to Final Order on RFA4 Attachment F, based on the finalization requirements included in Section 2.0 of the plan. The final plan must be submitted for review and approval by the Department, in consultation with ODFW.
[Final Order on AMD4]

Fish and Wildlife Habitat Condition 2 (OPR-FW-05):
During operation of the solar facility, the certificate holder shall implement the Habitat Mitigation Plan finalized under Condition PRE-FW-01. The HMP may be amended from time to time, subject to Department approval.
[Final Order on AMD4]

Temporary impacts to Category 4 grasslands will be restored in accordance with the Comprehensive Solar Revegetation and Soil Restoration Plan (Attachment D of this Order), required under Soil Protection Condition 2.

Figure 14: Proposed Habitat Mitigation Area



1
2

Minimization of Impacts to Sensitive Species

In addition to habitat loss, the construction and operation of the facility components proposed in RFA4 may impact habitat function and the species that depend on it, including sensitive species, by disturbing potential nesting and breeding activities, increasing mortality from collision with solar arrays, fencing, overhead collector lines, vehicles and heavy equipment, and creating disturbances related to artificial lighting. As shown in Table 17, below, while only one state sensitive species was identified during surveys conducted in support of RFA4, several state sensitive species and two protected eagles have been documented or are known to have the potential to occur in the analysis area.

Table 17: State Sensitive Species and Eagles with the Potential to Occur in the Analysis Area

Species	State Status	Probability of Occurrence within Analysis Area	Potential Habitat Within Analysis Area
Reptiles			
Northern sagebrush lizard (Sceloporus graciosus graciosus)	Sensitive	Moderate. Limited suitable habitat. Not detected in surveys.	Shrub-steppe habitats with sandy soils
Western painted turtle (Chrysemys picta bellii)	Sensitive-Critical	Low. Limited suitable habitat. Not detected during surveys.	Riparian, surface water, and wetland habitats
Birds			
Bald eagle (Haliaeetus leucocephalus)	None (Protected by Bald and Golden Eagle Protection Act.)	High. Known to nest along John Day River, but no suitable nesting habitat in analysis area. Regularly detected during avian use surveys for the wind facility.	All terrestrial habitats
Brewer's sparrow (Spizella breweri)	Sensitive	Moderate. Limited suitable habitat within the analysis area. One individual found during fatality monitoring for the wind facility.	Sagebrush and other shrublands
Burrowing owl (Western) (Athene cunicularia hypugaea)	Sensitive-Critical	Moderate. Suitable habitat within the analysis area, detected during pre-construction surveys for the wind facility.	Shrub-steppe, grassland agricultural, and developed habitats
Common nighthawk (Chordeiles minor)	Sensitive	Moderate. Suitable habitat within the analysis area. One individual found during fatality monitoring for the wind facility.	All terrestrial habitats
Ferruginous hawk (Buteo regalis)	Sensitive-Critical	High. Suitable nesting and foraging habitat within the Analysis Area. Low numbers detected during avian use surveys for the wind facility.	Shrub-steppe, grassland, and riparian habitats
Golden eagle (Aquila chrysaetos)	None (Protected by Bald and Golden Eagle Protection Act.)	High. Known historical nest territories along John Day River. Analysis Area lacks nesting habitat but provides foraging habitat. Species regularly detected during avian use surveys for the wind facility.	All mapped habitats within analysis area
Grasshopper Sparrow (Ammodramus savannarum)	Sensitive	Moderate. Suitable habitat within the Analysis Area, regularly detected during avian use surveys for the wind facility.	Grassland habitats

Table 17: State Sensitive Species and Eagles with the Potential to Occur in the Analysis Area

Species	State Status	Probability of Occurrence within Analysis Area	Potential Habitat Within Analysis Area
Lewis's woodpecker (Melanerpes lewis)	Sensitive-Critical	Low. Limited suitable habitat within the analysis area. Not detected during surveys.	Riparian habitats
Loggerhead shrike (Lanius ludovicianus)	Sensitive	High. Suitable nesting and foraging habitat within the analysis area. Detected within proposed Solar Micrositing Area during 2024 special status wildlife surveys and avian use surveys for the wind facility.	All terrestrial habitats
Long-billed curlew (Numenius americanus)	Sensitive-Critical	High. Suitable nesting and foraging habitat within the analysis area. Detected during avian use surveys for the wind facility.	Grassland habitats, agriculture
Swainson's hawk (Buteo swainsoni)	Sensitive	High. Suitable nesting and foraging habitat within the analysis area. Detected during avian use surveys for the wind facility and active nests detected during raptor nest surveys for the wind facility.	All mapped habitats within analysis area
Mammals			
Hoary bat (Lasiurus cinereus)	Sensitive	High, during migration. Frequently found during fatality monitoring at the wind facility.	Riparian and open water habitat
Pallid bat (Antrozous pallidus)	Sensitive	Moderate. Not detected during fatality monitoring at the wind facility.	Shrub-steppe grassland, riparian, and open water habitat
Silver-haired bat (Lasionycteris noctivagans)	Sensitive	High, during migration. Frequently found during fatality monitoring at the wind facility.	Riparian and open water habitat
Spotted bat (Euderma maculatum)	Sensitive	Low. Not detected during fatality monitoring at the wind facility.	Riparian, open water and shrub-steppe habitat
Townsend's big-eared bat (Corynorhinus townsendii)	Sensitive-Critical	Moderate. Not detected during fatality monitoring at the wind facility.	Riparian, open water and shrub-steppe habitat

1

Impacts from Construction

Ground disturbing activities have the potential to directly impact ground nesting birds; however, these impacts will be limited to Category 2 habitat within the proposed Solar Micrositing Area, and the associated subtypes presented in Table 16 above.[233] As presented in Table 17, there are three special status ground nesting birds (Loggerhead shrike, Brewer's sparrow and burrowing owl) that rely on the habitat Category 2 habitat/habitat subtype within the proposed Solar Micrositing Area and could be directly impacted if ground disturbing activities occur during their sensitive nesting/breading season (April 15 – Sept 1). To minimize potential impacts to state-sensitive ground nesting birds, the Council imposes a requirement that mowing, vegetation removal and other ground disturbing site preparation activities within Category 2 habitat be completed during any year in which construction occurs on or before April 15. This requirement is presented in the draft Comprehensive Revegetation and Soil Management Plan (Attachment D of this Order).

Construction activities including noise and disturbances associated with the presence of personnel, vehicles, and equipment has the potential to disrupt some bird species' feeding or breeding activities or cause birds to avoid the area. Construction occurring during the breeding season (as early as February and lasting through August) could also cause active nests to fail due to direct nearby disturbance causing nest abandonment. During the 2024 raptor nest surveys, one nest was presumed active based on observation of a juvenile great horned owl. The nest site is outside of the proposed Solar Micrositing Area, but within 0.5 mile of the site.

Given the potential for previously identified raptor nests or new nest sites to occur within the analysis area during construction, to minimize potential construction related impacts to avian species, the Council requires that active raptor nests be protected with an avoidance buffer. The Council previously imposed such a requirement applicable to the construction of the wind facility, Condition 60. The Council deletes Condition 60 and adopts a new condition with updated language, species list, buffer distances and seasonal timeframes, based on ODFW's March 2024 Solar Siting Guidelines, as presented below:

Deleted Condition 60

~~(60) During construction, the certificate holder shall protect the area within a 1300-foot buffer around any active nests of the following species during the sensitive period, as provided in this condition:~~

~~Species~~	~~Sensitive Period~~	~~Early Release Date~~
~~Swainson's hawk~~	~~April 1 to August 15~~	~~May 31~~
~~Golden eagle~~	~~February 1 to August 31~~	~~May 31~~
~~Ferruginous hawk~~	~~March 15 to August 15~~	~~May 31~~
~~Burrowing owl~~	~~April 1 to August 15~~	~~July 15~~

[233] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Section 8.2.2.

~~The 1300-foot buffer may be reduced, with Department approval, if there is an adequate physical barrier between the nest site and the construction impacts such that a 1300-foot buffer proves to be excessive.~~

~~During the year in which construction of any phase occurs, the certificate holder shall use a protocol approved by the Oregon Department of Fish and Wildlife (ODFW) to determine whether there are any active nests of these species within a half-mile of any areas that would be disturbed during construction. If a nest is occupied by any of these species after the beginning of the sensitive period, the certificate holder shall not engage in high-impact construction activities (activities that involve blasting, grading or other major ground disturbance) or allow high levels of construction traffic within 1300 feet of the nest site, or such lesser distance as may be approved by the Department in the event there is an adequate physical barrier between the nest site and the construction impacts.~~

~~In addition, the certificate holder shall flag the boundaries of the 1300-foot buffer area, or such lesser distance as may be approved by the Department in the event there is an adequate physical barrier between the nest site and the construction impacts, and shall instruct construction personnel to avoid any unnecessary activity within the buffer area. The certificate holder shall direct a qualified biologist, approved by the Department, to observe the active nest sites during the sensitive period for signs of disturbance and to notify the Department of any non-compliance with this condition. The Department has approved the qualifications of the four biologists identified in the Final Order on Amendment #2. The certificate holder may select other qualified biologists to observe the nest sites, subject to Department approval. If the biologist observes nest site abandonment or other adverse impact to nesting activity, the certificate holder shall implement appropriate mitigation, in consultation with ODFW and subject to the approval of the Department, unless the adverse impact is clearly shown to have a cause other than construction activity. The certificate holder may begin or resume high impact construction activities before the ending day of the sensitive period if any known nest site is not occupied by the early release date. If a nest site is occupied, then the certificate holder may begin or resume high-impact construction before the ending day of the sensitive period with the approval of ODFW, after the young are fledged. The certificate holder shall use a protocol approved by ODFW to determine when the young are fledged (the young are independent of the core nest site). [Amendment #2]~~
[Final Order on AMD4]

Fish and Wildlife Condition 3 (CON-FW-01)

a. Prior to the seasonal restriction referred in this condition and during any year in which construction of any component or phase of the solar facility occurs, the certificate holder shall:
    i. Use a protocol approved by ODFW to determine whether there are any active nests of the species listed in the table below within a half-mile of any areas that would be disturbed during construction.
    ii. If a nest is occupied by any of these species after the beginning of the seasonal restriction, the certificate holder shall not engage in high-impact construction

activities (activities that involve blasting, grading or other major ground disturbance) or allow high levels of construction traffic within the spatial buffer of the nest site.

iii. Any work areas within the spatial buffers during the seasonal restriction shall be flagged/marked.

b. The seasonal restrictions are as provided in the table below:

Species	Spatial Buffer	Seasonal Restriction	Early Release Date if Unoccupied
Golden eagle	0.5 – 1 mile	Feb 1 – Aug 15	May 15
Bald eagle	0.5 mile	Jan 1 – Aug 15	May 31
Ferruginous hawk	0.5 mile	Mar 15 – Aug 15	May 31
Northern goshawk**	0.5 mile	May 1 – Aug 15	June 30
Peregrine falcon**	0.25 mile	Jan 1 – Jul 1	May 15
Swainson's hawk**	0.25 mile	Apr 1 – Aug 15	May 31
White-tailed kite	0.25 mile	Jan 1 – Aug 15	
Osprey	0.25 mile	Mar 1 – Sep 15	
Burrowing owl**	0.25 mile	Apr 1 – Aug 15	May 31
Flammulated owl**	0.25 mile	May 1 – Jul 31	June 15
Great gray owl**	0.25 mile	Apr 1 – Jul 31	May 31
Red-tailed hawk	0.10 mile	Mar 1 – Aug 15	May 31
Other hawks and owls	0.25 mile	Mar 1 – Aug 15	May 31
Dates cover territory establishment through fledging. Release dates can be used for unoccupied or failed nests. Some geographic variation exists in seasonal restriction dates, please consult with local ODFW staff. ** Indicates Oregon Conservation Strategy Species.			

c. Upon request by the certificate holder, the Department in consultation with ODFW may provide exceptions to this restriction. The certificate holder's request must include a justification of the request, including any actions the certificate holder will take to avoid, minimize, or mitigate impacts to the raptor and its nest. [Final Order on AMD4]

To ensure the requirements above were implemented, the Council previously imposed Site Certificate Condition 57, requiring the certificate holder to provide environmental training to construction personnel during construction of the wind energy facility. The Comprehensive Soil and Revegetation Plan would require this training to take place before and during construction of the facility components proposed in RFA4 (See Attachment D, Table 5). Because the requirement for environmental training is addressed in the plan, the Council deletes Condition 57.

Deleted Condition 57

~~The certificate holder shall implement measures to mitigate impacts to sensitive wildlife habitat during construction including, but not limited to, the following:~~
~~(a) Preparing maps to show sensitive areas, such as nesting or denning areas for sensitive wildlife species, that are off limits to construction personnel.~~
~~(b) Ensuring that a qualified person instructs construction personnel to be aware of wildlife in the area and to take precautions to avoid injuring or destroying wildlife or significant wildlife habitat.~~
~~(c) Avoiding unnecessary road construction, temporary disturbance and vehicle use.~~
[Final Order on AMD4]

Impacts from Operations

Operating solar photovoltaic facilities are not known to result in the direct fatalities of significant numbers of birds and bat species and human activity at the site would be minimal during operations.

Artificial lighting has been shown to attract nocturnally migrating bird, including the Brewer's and grasshopper sparrows, as well as crepuscular insectivores such as the common nighthawk and bats, resulting in collisions with structures such as communication towers, guy wires, and wind turbines. Research has shown that using lights that are directed downward and shielded, have the lowest allowable intensity, and are on timers or motion sensors can minimize lighting impacts.[234] The Council previously imposed Condition 52, requiring the use of minimal lighting at the existing wind facility. As described in Section III.E, *Land Use*, Land Use Condition 4 would establish similar requirements for the proposed solar facility and would require all outdoor lighting to be sited, limited in intensity, shielded, and hooded in a manner that prevents the lighting from projecting onto adjacent properties and roadways.

Interactions with overhead electrical systems have the potential to negatively affect birds, especially raptors, primarily through electrocutions and collisions. To minimize the potential for electrocutions and collisions, the certificate holder represents that all overhead transmission lines would be constructed following the 2012 Avian Powerline Interaction Committee (APLIC) recommendations for collision avoidance (APLIC 2012).[235]

The Council previously imposed Condition 58 requiring transmission lines constructed as part of the wind facility to comply with the 1995 APLIC design standards. The Council amends Condition 58 to make clear that it applies to the existing facility and facility components proposed in RFA4, specific to aboveground transmission lines:

Amended Condition 58 (GEN-FW-01)
The certificate holder shall design and construct all aboveground transmission line support structures following the current practices suggested by the Avian Powerline

[234] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Section 8.2.2., 9.1.1.
[235] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Section 8.2.2.

Interaction Committee at the time of design. ~~APLIC 1996, referenced in the site certificate application, p. P-33) and shall install anti-perching devices on transmission pole tops and cross arms where the poles are located within one-half-mile of any wind turbines.~~

[Final Order on ASC, Condition 58; AMD4]

While outside of the analysis area, ODFW has identified mapped occupied bighorn sheep habitat within two miles of the proposed Solar Micrositing Area. Bighorn sheep are at high risk for zoonotic diseases such as *Mycoplasma ovipneumoniae* which can be transmitted by domestic sheep and goats. Due to the potential for devastating impacts on important species, the Council finds that domestic sheep or goats may not be used to control vegetation at the site unless adequate biosecurity protocols. A prohibition on the use of domestic sheep and goats at the site has been included in the Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to this Order (Soil Protection Condition 2)

The construction and operation of the facility may also impact habitat quality through the introduction and spread of noxious weeds and other undesirable plant species. The Comprehensive Solar Revegetation and Soil Management Plan described above would also contain provisions for the control and management of weeds at the solar facility site (see Attachment D, Appendix G.)[236]

The Comprehensive Solar Revegetation and Soil Management Plan also contains requirements for Environmental Training intended to ensure that all personnel are aware of and adhere to the conditions above during construction and operation of the proposed solar facility.

While no specific wildlife monitoring is proposed with respect to the operating solar facility, the Council previously imposed Site Certificate Condition 61, which requires the certificate holder to adhere to the requirements of a Wildlife Monitoring and Mitigation Plan, including ongoing requirements for monitoring and reporting wildlife fatalities under a wildlife incident response and handling system. The Council also imposed Conditions 64 and 65, requiring the certificate holder to provide mitigation and monitoring reports to the Confederated Tribes of the Warm Springs Reservation of Oregon and to meet with Tribal staff on an annual basis to discuss issues that may affect tribal properties near the site. The Council maintains these as applicable to the existing and proposed RFA4 facility components.

III.H.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the existing and new and amended conditions described above, the Council finds that the design, construction and operation of the facility components proposed in RFA4 are consistent with the mitigation goals and requirements of the Oregon Department of Fish and Wildlife's Fish and Wildlife Habitat Mitigation Policy under OAR 635-415-0025.

[236] BCWAMD4Doc21-10 RFA Exhibit P Fish and Wildlife 2025-12-10, Section 9.1.2.

III.I. THREATENED AND ENDANGERED SPECIES: OAR 345-022-0070

To issue a site certificate, the Council, after consultation with appropriate state agencies, must find that:

(1) For plant species that the Oregon Department of Agriculture has listed as threatened or endangered under ORS 564.105(2), the design, construction and operation of the proposed facility, taking into account mitigation:

(a) Are consistent with the protection and conservation program, if any, that the Oregon Department of Agriculture has adopted under ORS 564.105(3); or

(b) If the Oregon Department of Agriculture has not adopted a protection and conservation program, are not likely to cause a significant reduction in the likelihood of survival or recovery of the species; and

(2) For wildlife species that the Oregon Fish and Wildlife Commission has listed as threatened or endangered under ORS 496.172(2), the design, construction and operation of the proposed facility, taking into account mitigation, are not likely to cause a significant reduction in the likelihood of survival or recovery of the species. [237]

***** [238]

III.I.1. Findings of Fact

The analysis area for the Threatened and Endangered (T&E) Species standard is the area within and extending 5 miles from the proposed Solar Micrositing Area.[239]

Methodology – Literature Review and Field Studies

The certificate holder conducted a literature review and field surveys to evaluate the potential for state-listed threatened and endangered plant and wildlife species to occur within the analysis area. The literature review evaluated the following sources:

- Original 2005 application materials for the approved facility [240]
- Oregon Biodiversity Information Center (ORBIC) Threatened, and Endangered Species of Oregon

[237] OAR 345-022-0040, effective April 2, 2025.

[238] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

[239] BCWAMD4Doc01-00 ODOE Concurrence on OAR 345-027-0360(3) Request 2024-05-02.

[240] BCWAPPDoc45-2 BCW ASC Supplement Exh K-R, BCWAPPDoc17 BCW Additional 2005 Fall Wildlife Surveys.

- 2024 Oregon Department of Agriculture (ODA) Oregon Listed Plants by County
- 2024 ODA Plant Conservation Program, Complete List of Threatened, Endangered, and Candidate Species
- 2024 OregonFlora data
- ODFW threatened, endangered and candidate fish and wildlife species
- 2024 Streamnet, fish distribution data

No state-listed fish or wildlife species have the potential to occur within the analysis area based on the desktop review.[241] As shown in Table 18, five state-listed or candidate plant species were identified as having the potential to occur within Sherman County.

Table 18: State Listed Species with Potential to Occur in Sherman County

Species	State Status	Occurrence within the Analysis Area	Potential Habitat within with the Solar Micrositing Area
Northern wormwood (*Artemisia campestris var. wormskioldii)*	Endangered	Yes	No
Lawrence's milkvetch (*Astragalus collinus var. laurentii)*	Threatened	No	Limited
Henderson's ricegrass (*Eriocoma (Achnatherum) hendersonii)*	Candidate	No	No
Hepatic monkeyflower (*Erythranthe jungermannioides)*	Candidate	Yes	No
Sessile mousetail (*Myosurus sessilis)*	Candidate	No	No

As shown in the table, there are known occurrences of Northern wormwood and hepatic monkeyflower in the analysis area but no suitable habitat within the proposed Solar Micrositing Area. There is suitable habitat for Lawrence's milkvetch in the proposed Solar Micrositing Area but no records of it being present within the analysis area.[242]

Methods for botanical surveys were submitted to ODA for review on June 10, 2024. ODA provided concurrence with the methods on June 13, 2024, prior to Tetra Tech conducting field surveys.[243]

Botanical field surveys were conducted on July 9 and 10, 2024 to evaluate the potential presence of the state-listed plant species within the proposed Solar Micrositing Area. None of the species with potential to occur, including Lawrence's milkvetch, were observed during the field surveys.[244]

[241] BCWAMD4Doc21-11 RFA Exhibit Q TE Species 2025-12-10, Section 4.1.
[242] BCWAMD4Doc21-11 RFA Exhibit Q TE Species 2025-12-10, Section 4.1.
[243] BCWAMD4Doc21-11 RFA Exhibit Q TE Species 2025-12-10, 3.0.
[244] BCWAMD4Doc21-11 RFA Exhibit Q TE Species 2025-12-10, Section 4.2.

The Council previously imposed Conditions 55 to 57 and 126 to ensure the wind energy facility was constructed in compliance with the Threatened and Endangered Species Standard. Conditions 55, 56, and 126 required T&E plant and wildlife surveys of the existing site prior to construction. Because the certificate holder has already conducted biological surveys of the proposed Solar Micrositing Area, the Council deletes these conditions. The Council also deletes Condition 57 because the requirements (worker environmental training) have been incorporated into the Comprehensive Solar Revegetation and Management Plan required under Soil Protection Conditions 1 to 3.

Deleted Condition 55

~~Before beginning construction of the facility, the certificate holder shall deliver to the Department surveys for threatened and endangered plant and wildlife species in newly affected areas as identified in the ASC Supplement.~~

[Final Order on AMD4]

Deleted Condition 56

~~If construction of the facility begins after 2006, the certificate holder shall review the ONHIC and USFWS databases and consult with an expert designated by ODFW on an annual basis before beginning construction to determine whether nesting bald eagles or peregrine falcons have been documented to occur within two miles of the facility. The certificate holder shall report the results of the database review and consultation to the Department and to ODFW and, if there have been new documentations of nesting bald eagles or peregrine falcons within two miles of the facility, the certificate holder shall implement appropriate measures to protect the species from adverse impact, as approved by the Department and ODFW.~~

[Final Order on AMD4]

Deleted Condition 126

~~(126) Prior to any disturbance in the areas of the site added in the Final Order for Amendment #2, the certificate holder shall deliver to the Department the results of a spring survey of Crossing G, conducted during the appropriate bloom time for Northern wormwood and Henderson's ricegrass. If Northern wormwood or any other protected rare plant species are observed during the spring survey, the certificate holder shall ensure that construction and operation of the facility will have no impact on the rare plant habitat. [Amendment #2]~~

[Final Order on AMD4]

III.I.2. Conclusions of Law

Because there are no state listed wildlife species with the potential to occur in the analysis area, and no state listed plant species with suitable habitat in the analysis area were identified during field surveys of the proposed Solar Micrositing Area, the Council finds that the design, construction and operation of the facility components proposed in RFA4 are not likely to cause

a significant reduction in the likelihood of survival or recovery of species listed as threatened or endangered by the Oregon Department of Agriculture or Oregon Fish and Wildlife Commission.

III.J. SCENIC RESOURCES: OAR 345-022-0080

(1) To issue a site certificate, the Council must find that the design, construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse visual impacts to significant or important scenic resources.

*****

(3) A scenic resource is considered to be significant or important if it is identified as significant or important in a current land use management plan adopted by one or more local, tribal, state, regional, or federal government or agency.

(4) The Council shall apply the version of this rule adopted under Administrative Order EFSC 1-2007, filed and effective May 15, 2007, to the review of any Application for Site Certificate or Request for Amendment that was determined to be complete under OAR 345-015-0190 or 345-027-0363 before the effective date of this rule. Nothing in this section waives the obligations of the certificate holder and Council to abide by local ordinances, state law, and other rules of the Council for the construction and operation of energy facilities in effect on the date the site certificate or amended site certificate is executed. [245]

***** [246]

III.J.1. Findings of Fact

The analysis area for Scenic Resources is the area within and extending 10-miles from the proposed Solar Micrositing Area, as presented in Figure 15 below. The analysis area includes land governed or managed by two Oregon counties and one Washington county (Sherman, Gilliam and Klickitat); municipalities of Wasco and Rufus; Oregon Department of Transportation (ODOT); National Park Service (NPS); and Bureau of Land Management (BLM).

Land management plans published by the above-referenced cities, counties, state, and federal agencies were evaluated to identify potential scenic resources considered significant or

[245] OAR 345-022-0040, effective April 2, 2025.

[246] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

important under this standard.[247] Land management plans identifying significant or important scenic resources within the analysis area are presented in Table 19 below. As presented in the Table, there are 4 significant or important scenic resources within the analysis area, in Oregon (John Day River Canyon; I-84; Journey Through Time Scenic Byway/US-97; OR-206). The closest scenic resource to the proposed Solar Micrositing Area is John Day River Canyon, located 3.7 miles East.

[247] Land management plans and associated resources in Washington are omitted from the analysis because protection of Washington resources is not within Council's jurisdiction.

Table 19: Scenic Resources in Analysis Area

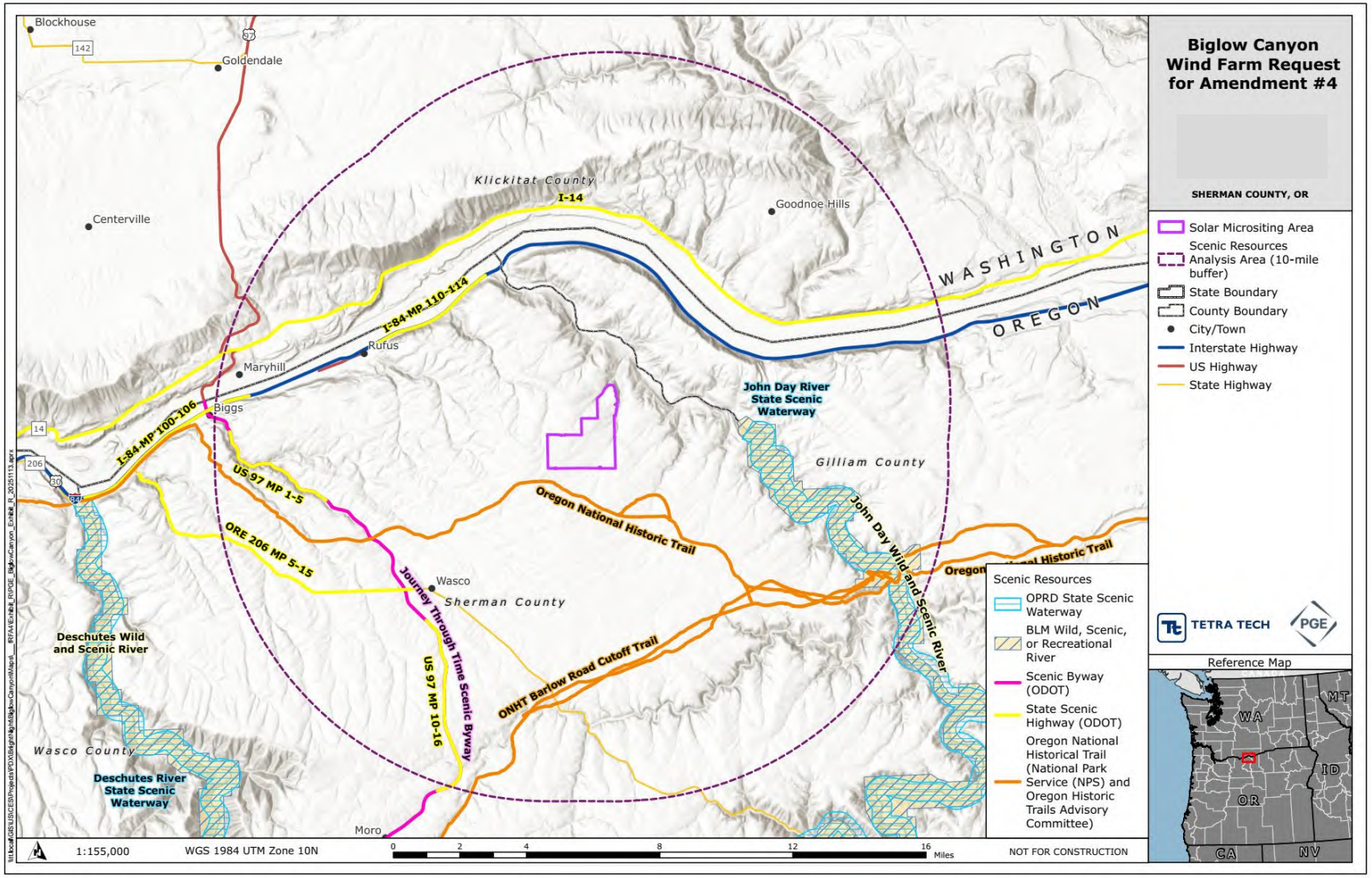
Jurisdiction	Plan	Significant or Important Scenic Resource/Distance from Site	Location Scenic Resource Discussed in Plan/Development Criteria
Counties			
Sherman County	Sherman County Comprehensive Plan (2007)	John Day River Canyon/3.7 miles East	p. 58 of 60: Lands within ¼ of the..John Day Rivers..does not affect the view from the waters within the scenic waterways.
		I-84 (Milepost 100-106, 110-114)/ 4.9 miles West	p. 18 of 60: ODOT has designated certain segments as Scenic Byways.
		Journey Through Time Scenic Byway/US-97 (Milepost I-5, 10-16)/ 5.9 miles West	
		OR-206 (Milepost 5-14)/ 5.5 miles East	
Gilliam County	Gilliam County Comprehensive Plan (2022)	John Day River Canyon/ 3.7 miles East	The Comprehensive Plan references both Federal Wild and Scenic Rivers as well as State Scenic Waterways, and implements the following goal: "To conserve open space and protect natural and scenic resources."
Cities and Towns			
Wasco	City of Wasco Comprehensive Land Use Plan (2007)	John Day River Canyon/ 3.7 miles East	p.14: Wasco..is positioned between two rivers classified under Oregon's Scenic Rivers System,..the John Day.
Rufus	City of Rufus Comprehensive Land Use Plan (2007)	John Day River Canyon/ 3.7 miles East	p.8: Rufus..is positioned between two rivers classified under Oregon's Scenic Rivers System,..the John Day.
State			
ODOT	Journey Through Time Tour Route Management Plan (1996)	Journey Through Time Scenic Byway (US-97)/ 5.4 miles West	
Federal			

Table 19: Scenic Resources in Analysis Area

Jurisdiction	Plan	Significant or Important Scenic Resource/Distance from Site	Location Scenic Resource Discussed in Plan/Development Criteria
BLM	Two Rivers Resource Management Plan of Record of Decision (ROD) (1986); Two Rivers Resource Management Plan Amendment ROD (2001)	John Day River Canyon/ 3.7 miles East	44153: On the South Fork of the John Day River scenery..are considered outstandingly remarkable..

1

Figure 15: Scenic Resources within RFA4 Analysis Area



Potential Visual Impacts on Significant or Important Scenic Resources

Permanent placement of energy infrastructure proposed in RFA4 could result in potential visual impacts including up to 15 foot tall solar arrays and up to 160 foot-tall transmission line poles. To evaluate potential visual impacts of these structures, RFA4 Exhibit R presents the results of a three-part approach including GIS-based viewshed (or zone of visual influence [ZVI]) modeling; key observation point (KOP) analysis and glare modeling.

First, the ZVI analysis used Esri GIS software and bare-earth 10-meter digital elevation model to determine locations within the analysis area where the changes proposed in RFA4 would be visible. Results of the ZVI analysis are presented in RFA4 Exhibit R Figure R-2 and R-3. Then, based on the results of the ZVI analysis, 21 KOPs were identified, representing locations where a "casual observer" could realistically view the proposed RFA4 structures. The KOP locations are presented in RFA4 Exhibit R Figure R-4. These KOPs are located along accessible viewpoints and near specific scenic resources and used to support the evaluation of the likelihood and magnitude of potential visual impacts (RFA4 Exhibit R Attachment R-3 presents photo locations associated with the KOPs demonstrating actual, existing viewshed conditions). Lastly, a glint and glare analysis was conducted using the Solar Glare Hazard Analysis Tool developed by Sandia National Laboratories to inform potential impacts to drivers on nearby roads.

<u>Facility Structures</u>

John Day River Canyon

The John Day River Canyon is located approximately 3.7 and 5.1 miles East of the proposed solar array and gen-tie line, respectively. The only land management plan with development criteria is the 2007 Sherman County Comprehensive Plan which protects the viewshed of the John Day River Canyon for ¼ mile. The distance between the facility components proposed in RFA4 to John Day River Canyon, at 3.7 miles, far exceeds the ¼-mile viewshed area protected in the Sherman County Comprehensive Plan.

The terrain between the proposed RFA4 site boundary and John Day River Canyon is hilly, limiting viewshed impacts, as presented in RFA4 Exhibit R Figure R2 and R3. The small location from where the proposed solar components are potentially visible is not easily accessed by the public. For these reasons, the Council finds that visual impacts from the facility components proposed in RFA4 are not likely to result in a potentially significant visual impact at John Day River Canyon.

Interstate 84

Interstate 84 is located approximately 4.9 and 5.7 miles North of the proposed solar array and gen-tie line, respectively. At this distance, there will be no visual impacts, as presented in RFA4 Exhibit R Figure R2 and R3. For these reasons, the Council finds that visual impacts from the

facility components proposed in RFA4 are not likely to result in a potentially significant visual impact at Interstate 84.

Journey Through Time Scenic Byway/Interstate 97

Journey Through Time Scenic Byway/Interstate 97 is located approximately 5.9 and 6.6 miles West of the proposed solar array and gen-tie line, respectively. KOPs were taken at two locations along and near US-97 (RFA4 Exhibit R Attachment R-3, Photos 15 and 16). Based on the visibility analysis at KOP 15 and 16, the solar array will introduce dark colors, geometric shapes, horizontal and vertical lines into the landscape setting. Views of the gen-tie line will be similar to the other power lines in the area.

The existing viewshed includes agricultural land with hilly terrain and existing wind turbines. These viewpoints reflect the views of drivers traveling along US-97, likely traveling at a high rate of speed. These impacts will be short term for travelers because the area where the solar array and gen-tie line is potentially visible is very limited and their focus will be on the road ahead.

Due to the distance to the facility components proposed in RFA4 and existing views of other utility infrastructure, the Council finds that visual impacts from the facility components proposed in RFA4 are not likely to result in a potentially significant visual impact along Journey Through Time Scenic Byway/Interstate 97.

Oregon State Highway 206

Oregon State Highway 206 is located approximately 5.5 and 6.3 miles southwest of the proposed solar array and gen-tie line, respectively. At this distance, there will be no visual impacts, as presented in RFA4 Exhibit R Figure R2 and R3. For these reasons, the Council finds that visual impacts from the facility components proposed in RFA4 are not likely to result in a potentially significant visual impact along Oregon State Highway 206.

Glare Impacts

The glare analysis resulted in no predictions of red, yellow or green glare from the proposed solar arrays at any of the significant or important scenic resources within the analysis area.[248] Based on these results, the Council finds that visual impacts from solar array glare are not likely to result in potentially significant visual impacts to any significant or important scenic resource within the analysis area.

Loss of Vegetation

Construction of the facility components proposed in RFA4 will result in up to 336 acres of temporary and 1,445 acres of permanent vegetation loss. Predominate vegetation within the

[248] BCWAMD4Doc21-12 RFA Exhibit R Scenic 2025-12-10, Section 5.3.

proposed Solar Micrositing Area includes dryland wheat; in areas where crop production is not feasible, the terrain includes steep slopes, sides of ditches and drainages. As previously described, John Day River Canyon is the closest scenic resource, located 3.7 miles East of the proposed Solar Micrositing Area. At a distance of nearly 4 miles, vegetation loss is not expected to be visible. Therefore, the Council finds that the facility components proposed in RFA4 are not likely to result in significant adverse visual impacts to John Day River Canyon or any other significant or important scenic resources located at greater distances.

The facility components proposed in RFA4 do not include combustion or thermal heat sources; therefore, the visual impacts from plumes or visible air emissions will not occur.

III.J.2. Conclusions of Law

Based on the foregoing analysis, the Council finds that the design, construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse visual impacts to significant or important scenic resources.

III.K. HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES: OAR 345-022-0090

(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that the construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impacts to:

(a) Historic, cultural or archaeological resources that have been listed on, or would likely be listed on the National Register of Historic Places;

(b) For a facility on private land, archaeological objects, as defined in ORS 358.905(1)(a), or archaeological sites, as defined in 358.905(1)(c); and

(c) For a facility on public land, archaeological sites, as defined in ORS 358.905(1)(c).

(2) The Council may issue a site certificate for a facility that would produce power from wind, solar or geothermal energy without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

(3) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility. [249]

[249] OAR 345-022-0040, effective April 2, 2025.

*** [250]

III.K.1. Findings of Fact

The Historic, Cultural and Archaeological Resources Standard includes direct and indirect analysis areas. The direct analysis area is the area within the proposed Solar Micrositing Area. The indirect analysis area includes the area within and extending 1-mile from the proposed Solar Micrositing Area to account for noise and visual impacts to historic sites (i.e., historic buildings, structures, or objects) and cultural resources, including Historic Properties of Religious or Cultural Significance to Indian Tribes.[251]

The proposed Solar Micrositing Area is in within the boundary of the ceded lands and traditional territories of the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) and near the ceded lands of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). Members of the CTWSRO include the Warm Springs, Wasco, and Northern Paiutes. Among the Warm Springs bands, the ancestral territory of the Dock-spus band is the most closely located to the proposed Solar Micrositing Area.[252]

On August 9, 2024, the certificate holder asked the Legislative Commission on Indian Services (LCIS) to identify the Tribes that should be contacted in regard to the requested Amendment. LCIS identified the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Burns Paiute Tribe as potentially affected by RFA4.

On October 10, 2024, and September 4, 2025, the certificate holder sent informal outreach letters via email to representatives of each of these Tribes requesting input regarding the facility components proposed in RFA4 and their potential impacts on resources of concern to the Tribes. The certificate holder represents that it has been in contact with all three Tribes and represented that no substantive issues were identified through informal coordination.[253]

As described in Section II.B., the Department also provided opportunities for the Tribes to review and comment on RFA4 as well as the Department's Proposed Order. As described below, comments were received from the Confederated Tribes of the Warm Springs Reservation of Oregon's Tribal Historic Preservation Officer during the Public Hearing on the Proposed Order.

[250] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

[251] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Section 2.0.

[252] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Attachment S-1, p. 11.

[253] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Section 3.0, 5.0. BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14.

Survey Methods and Results

The certificate holder contracted with GeoVisions to survey the analysis area in 2024. The survey included a desktop review of records from previous surveys and pedestrian surveys of the proposed solar micrositing area.

During the desktop review, GeoVisions reviewed the Oregon State Historic Preservation Office's (SHPO) Online Archaeological Records Remote Access (OARRA) database; historic maps; and ethnographic, ethnohistoric, and historical background records related to identify previously conducted surveys and recorded cultural resources within the analysis area. The review found several previous cultural resource studies that had been performed within the analysis area. Many of the previous surveys covered small linear portions of the proposed solar micrositing area that were primarily completed for wind energy projects, including the existing facility, Klondike III, and the PaTu Wind Farm. [254]

Between May 8 and November 3, 2024, GeoVisions conducted non-collection, archaeological surveys of the proposed Solar Micrositing Area to determine whether any previously unrecorded archaeological isolates or sites were present.[255] Consistent with SHPO's 2023 Oregon Archaeology Guidelines, GeoVisions archaeologists walked parallel transects separated by no more than 20-meter intervals across the entirety of the Project footprint. Areas determined to be of high probability or with low ground visibility (less than 50%) were surveyed at smaller transect intervals, at the discretion of the Field Director. For areas with previously recorded sites and isolates or known areas of interest that lay within the survey area, archaeologists walked transects spaced under 5 meters apart in North-South and East-West directions until the entirety of the resource was identified and documented, or the entirety of the area was covered. When an archaeological object was observed it was marked with pin flags and a team of archaeologists walked close (two meters or less) transects in a grid pattern radiating out from the object in the cardinal directions. This method was repeated for all artifacts observed within a single site boundary. The boundary for a single site or isolate was determined to be one meter outside the location of the artifact in the direction for which no other artifacts are observed within 30 meters. Once the boundary was determined it was recorded using a Geode, a minimum of two site overview photos from different directions with photo-scale and directional arrow was taken, as well as photographs of any site features and diagnostic artifacts. All site and isolate photographs were recorded in a photograph log and included in the digitized copy of the site form. Site forms were transcribed to the OR SHPO site database through OARRA. [256]

<u>Sites and Isolates in the Proposed Solar Micrositing Area</u>

[254] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Section 3.0, Attachment S-1.

[255] In accordance with ORS 358.905, isolated finds are defined as a single artifact, archaeological sites are defined as one feature, or two or more artifacts with contextual associations.

[256] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Section 3.0, Attachment S-1, pg. 26-27.

As summarized in Table 20, below, five archaeological sites and six isolates within the proposed Solar Micrositing Area were identified during the surveys described above. The sites included historic structures in ruin, historic debris scatters, and precontact lithic scatters. The isolates include an obsidian biface fragment and several historic era objects.[257]

One of the archaeological sites (35SH 00188) was recorded in previous surveys. GeoVisions archaeologists were able to identify, revisit, and perform site updates for the site during their surveys. The remaining sites and isolates were previously unrecorded.[258]

The majority of observed sites are historical in nature, appearing to mostly date to the late 19th and early 20th century. However, some of the observed resources at two of the sites originate in the precontact period.[259]

Four of the archaeological sites (35SH00188, BSP-1-S02BSP-1-S10, and BSP-1-S12) and one archaeological isolate (BSP-1-I04) are designated as unevaluated for NRHP eligibility. Unevaluated resources must generally be treated as likely to be eligible for listing until they are demonstrated to be ineligible by further testing or study.

GeoVisions recommended the remaining resources are likely not eligible for listing on the NRHP.[260] On June 10, 2025, Oregon SHPO provided a letter concurring with these recommendations.[261]

[257] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Section 3.0.
[258] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Attachment S-1.
[259] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Attachment S-1, pg. 2.
[260] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Section 3.0, 4.1.,4.2., Attachment S-1.
[261] BCWAMD4Doc14-06 pRFA Reviewing Agency Comment SHPO 2025-07-10.

Table 20: Cultural Resources in the Solar Micrositing Area

Temporary ID (Trinomial)	Period	General Resource Description	NRHP Recommendation	Distance to Disturbance (meters)	Management Recommendations
Sites					
06/1365-D2 (35SH00188)	Historic	Homestead; historic debris scatter/concentration	Unevaluated	18	Avoidance
BSP-1-S02	Multicomponent	Precontact Lithic; Historic Debris Scatter/Concentration	Unevaluated	28	Avoidance
BSP-1-S03	Historic	Debris Scatter/ Concentration	Not Eligible	0	None
BSP-1-S10	Historic	Homestead in-ruin	Unevaluated	0	Avoidance
BSP-1-S12	Multicomponent	Precontact lithic; historic debris concentration/scatter	Unevaluated	20	Avoidance
Isolates					
BSP-1-I02	Historic	Prince Albert tobacco tin	Not Eligible	50	None
BSP-1-I03	Historic	Liggett & Myers Tobacco Company Velvet pipe and cigarette pocket-tin	Not Eligible	49	None
BSP-1-I04	Precontact	Obsidian biface fragment	Unevaluated	6	Avoidance
BSP-1-I05	Historic	Steel fastener	Not Eligible	0	None
BSP-1-I06	Historic	Aqua bottle glass fragment	Not Eligible	9	None
BSP-1-107	Historic	Soil compactor	Not Eligible	142	None

Proposed Management and Mitigation

The certificate holder represents that the unevaluated archaeological sites (35SH00188, BSP-1-S02BSP-1-S10, and BSP-1-S12) and archaeological isolate (BSP-1-I04) would be avoided by construction and operational activities by a minimum buffer of 20 meters.

The certificate holder notes that the proposed site layout provided in RFA4 Figure 2 (Preliminary Site Plan, Solar Micrositing Area) would result in disturbance within 6 to 28 meters of the protected resources and the resources could be potentially impacted due to their proximity to the facility components proposed in RFA4. The certificate holder represents that additional changes will be made to avoid significant resources during final facility design. If disturbance could not be avoided within this buffer, but would be outside a resource boundary, the certificate holder represents that a Tribal Cultural Resources or archaeological monitor would be present. The certificate holder represents that all impacts to significant cultural resources will be avoided through design of the facility components proposed in RFA4.[262]

In their comments, SHPO concurred with the recommendation for a 20-meter avoidance buffer around all unevaluated and eligible resources, as well as the presence of an Oregon Qualified Archaeologist to monitor ground disturbing activities.[263]

The certificate holder proposed to conduct monitoring if ground disturbing activities occurred within the 20-meter avoidance buffer for NHRP eligible or unevaluated resources. Confederated Tribes of the Warm Springs requested that the certificate holder be required to have a Tribal monitor onsite during all ground-disturbing activities. The Council finds the request to have a Dedicated Tribal Monitor present during all ground disturbing activities goes beyond the recommendations in the GeoVisions Report; but that the Tribes' request to have a qualified archaeologist on site during ground disturbing activities is reasonable given the history of the area and potential for additional unidentified pre-contact sites or isolates to be present at the site documented in the cultural resources survey report. However, the Council finds the condition should allow for an evaluation of lessor frequent monitoring or more specified scope of monitoring if determined appropriate by the Department in consultation with CTWS, as presented below.

Historic, Cultural, and Archaeological Condition 1 (GEN-HC-02)
The certificate holder must design, construct, and operate the solar facility to avoid archaeological sites (35SH00188, BSP-1-S02BSP-1-S10, and BSP-1-S12) and archaeological isolate (BSP-1-I04) with a 20-meter avoidance buffer.

[262] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Sections 4.1, 4.2., 6.0. Section 5.0 states that if the certificate holder determined that impacts to a significant resource could not be avoided, the certificate holder would consult with ODOE, SHPO, and Tribes to determine appropriate mitigation. Because this statement contradicts other representations in the exhibit that impacts to significant resources could, and would, be avoided during final facility design the Council finds it was likely included in error.
[263] BCWAMD4Doc14-06 pRFA Reviewing Agency Comment SHPO 2025-07-10.

Historic, Cultural, and Archaeological Condition 2 (GEN-HC-03)

a. Prior to construction, the certificate holder must submit to the Department for approval, in consultation with SHPO, a Cultural Resources Monitoring Plan demonstrating that an Oregon Qualified Archaeologist or Tribal Cultural Resource Monitor will be onsite during ground disturbing activities at the site. The plan may provide for exceptions to monitoring scope and frequency, subject to approval by the Department, in consultation with the Confederated Tribes of Warm Springs.
b. During construction, the certificate holder shall adhere to the measures approved in the Cultural Resources Monitoring Plan.

[Final Order on AMD4]

The Council previously imposed Condition 70 through 73, to ensure a qualified archaeologist was present on site during any ground-disturbing activities during construction of the existing wind energy facility, and to cease all activities in the event a previously unrecorded site or object is encountered until a qualified archaeologist could evaluate the significance of the find. The certificate holder represents that all work on site would be conducted in compliance with its corporate Inadvertent Discovery Procedure (IDP), which the certificate holder requested be maintained as confidential. The IDP describes how the facility will maintain compliance with the Native American Graves Protection and Repatriation Act (43 CFR 10) and ORS 97.740-994 and 358.905-961. The IDP also requires all field personnel and contractors to complete Environmental Compliance Training provided by Environmental and Licensing Services that includes cultural awareness training.[264]

The Council adopts new conditions requiring that an IDP be finalized prior to construction to include updated contact information and that all work during the construction of the facility components proposed in RFA4 be conducted in compliance with the IDP.

Historic, Cultural and Archeological Condition 3 (PRE-HC-01)

Prior to construction, the certificate holder shall update the contact information provided in the Final Order on ASC Attachment H, Inadvertent Discovery Plan.

[Final Order on AMD4]

Historic, Cultural and Archeological Condition 4 (CON-HC-01)

During construction, the certificate holder shall require all onsite employees and contractors to implement and adhere to the requirements of the Inadvertent Discovery Plan, as submitted to the Department under Condition PRE-HC-01.

[Final Order on AMD4]

Historic, Cultural and Archeological Condition 5 (OPR-HC-01)

During operations, the certificate holder shall require all onsite employees and contractors to implement and adhere to the requirements of the Inadvertent Discovery

[264] BCWAMD4Doc21-13 RFA Exhibit S Cultural 2025-12-10, Section 5.0.

Plan, as provided in Condition PRE-HC-01. The IDP shall be reviewed and updated annually for current contact information.
[Final Order on AMD4]

Because the IDP and Cultural Resources Monitoring Plan required under the conditions above would establish the requirements previously located in Condition 70 to 73, the Council deletes those conditions.

III.K.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the site certificate conditions described above, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impacts to historic, cultural or archaeological resources that have been listed on, or would likely be listed on the National Register of Historic Places or other archaeological objects or sites identified under OAR 345-022-0090.

III.L. RECREATION: OAR 345-022-0100

(1) To issue a site certificate, the Council must find that the design, construction and operation of a facility, taking into account mitigation, are not likely to result in a significant adverse impact to important recreational opportunities.

(2) The Council must consider the following factors in judging the importance of a recreational opportunity:

(a) Any special designation or management of the location;

(b) The degree of demand;

(c) Outstanding or unusual qualities;

(d) Availability or rareness;

(e) Irreplaceability or irretrievability of the opportunity.

(3) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). In issuing such a site certificate, the Council may impose conditions of approval to minimize the potential significant adverse impacts from the design, construction, and operation of the facility on important recreational opportunities.

(4) The Council must apply the version of this rule adopted under Administrative Order EFSC 1-2002, filed and effective April 3, 2002, to the review of any Application for Site Certificate or Request for Amendment that was determined to be complete under OAR 345-015-0190 or 345-027-0363 before the effective date of this rule. Nothing in this section waives the obligations of the certificate holder and Council to abide by local ordinances, state law, and other rules of the Council for the construction and operation of energy facilities in effect on the date the site certificate or amended site certificate is executed. [265]

*** [266]

III.L.1. Findings of Fact

The Recreation standard requires the Council to find that the design, construction, and operation of a facility or facility, with proposed changes, would not likely result in significant adverse impacts to "important" recreational opportunities. Therefore, the Council's Recreation standard applies only to those recreation areas that the Council finds to be "important," utilizing the factors listed in the sub-paragraphs of section (1) of the standard. The importance of recreational opportunities is assessed based on five factors outlined in the standard: special designation or management, degree of demand, outstanding or unusual qualities, availability or rareness, and irreplaceability or irretrievability of the recreational opportunity.

Recreational Opportunities within the Analysis Area

The analysis area for recreational opportunities is the area within and extending 5 miles from the proposed Solar Micrositing Area Boundary.

Recreational opportunities within the analysis area were identified through review of existing published and unpublished information available from desktop research sources commonly used for recreation inventory efforts. Resources reviewed for the inventory include:

- Geographic Information System files documenting recreational resources obtained from key recreation provider agencies, *e.g.*, the Bureau of Land Management (BLM 2024), Oregon Department of Fish and Wildlife (ODFW 2022), United States Forest Service (USFS 2024), United States Geological Survey (USGS 2024), and Oregon Parks and Recreation Department (OPRD 2020);
- Land management agency planning documents;
- Comprehensive plans, park and recreation plans, and individual park master plans prepared by OPRD and by counties and municipal governments within the analysis area;

[265] OAR 345-022-0040, effective April 2, 2025.

[266] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

- Internet sites maintained by recreation provider agencies, including OPRD, ODFW, and county and city park departments (Sherman County 2024; ODFW 2024; ODOT 2024; OPRD 2024); and
- Internet sites maintained by various commercial entities, including sites providing general recreation and tourism information and sites applicable to specific private-sector recreation opportunities (Google Earth 2024; ORBIC 2024).

Based on the above review, three recreational opportunities were identified within the analysis area – a portion of the Oregon National Historic Trail (ONHT); John Day River and associated parks (Albert Philippi Park and LePage Park); and Giles L. French Park. These resources are evaluated below to determine whether they are "important" as defined by the standard.

Recreational Opportunity Importance Assessment

ONHT High Potential Segment/Sites

As presented in RFA4 Exhibit T, there is a historically mapped segment of ONHT extending 15 miles within the analysis area, approximately 0.4 miles from the proposed Solar Micrositing Area Boundary. For this historically mapped segment, there is no visible or physical evidence of intact segments, nor are any portions of the segment publicly available (i.e., all located on private land). ONHT trail segments have a special designation as a National Historic Trail, however, given that there is no remaining physical evidence of the trail within the analysis area, there are no outstanding or rare qualities. For these reasons, the Council agrees with the certificate holder's conclusions and finds this recreational opportunity not to be "important" under the standard.

John Day River, Albert Philippi Park and LePage Park

As presented in RFA4 Exhibit T, John Day River is approximately 3.7 miles from the proposed Solar Micrositing Area Boundary. John Day River is designated as a federal Wild and Scenic River and State Scenic Water Way. There are two parks associated with the John Day River, Albert Philippi Park and Lepage Park, which both offer river access and camping opportunities. The river and associated parks are popular for recreational opportunities, and access to, rafting, kayaking, and fishing. The river is irreplaceable and rare. For all of these reasons, the Council agrees with the certificate holder's conclusions and finds this recreational opportunity is "important" under the standard.

Giles L. French Park

As presented in RFA4 Exhibit T, Giles L. French Park is approximately 4.8 miles from the proposed Solar Micrositing Area Boundary. The park is located along the Columbia River and has free primitive camping, bathrooms, boat dock and trails. The park is one of several USACE parks in the analysis area, all of which offer similar amenities. The park is therefore not rare and

is replaceable. For all of these reasons, the Council agrees with the certificate holder's conclusions and finds this recreational opportunity not to be "important" under the standard.

Potential Impacts to Important Recreation Opportunities

Potential impacts to John Day River and associated parks are evaluated below.

Direct and Indirect Loss of Recreational Opportunity

Direct Loss

A direct loss to an important recreational opportunity would occur when construction or operation would impact a recreational opportunity by directly altering the resource so that it no longer exists in its current state. Based on the location of the facility components proposed in RFA4 in relation to the one identified important recreational opportunity, at 3.7 miles, physical disturbance, or ground disturbance, would not occur at John Day River. The facility components proposed in RFA4 would also not require any temporary or permanent closure or removal of John Day River to public use. Therefore, based upon review of the location and proximity of John Day River to the RFA4 site boundary, the Council finds that the facility components proposed in RFA4 would not be expected to result in indirect impacts to John Day River.

Indirect Loss

Similar to the assessment of direct loss, indirect loss would result if construction or operation of the facility components proposed in RFA4 would impact a recreational opportunity by indirectly altering the resource or some component of it. To evaluate indirect loss associated resulting from the construction and operation, the Council considers potential noise, traffic and visual impacts to the above mentioned important recreational opportunities, as presented below.

Potential Traffic-Related Impacts

Construction routes will include I-84, US-97, OR-206, Klondike Road and Old Wasco-Heppner Highway. John Day River is accessed by US-97 or OR-206. Visitors could experience short-term delays for the duration of construction. As presented in Section II.M. *Public Services*, there are three existing conditions, Conditions 77-79, that apply to construction-related traffic impacts. These conditions, as amended, will minimize potential traffic volume and road damage impacts, minimizing potential impacts to users of road serving the above-referenced protected areas. Based on compliance with the amended conditions, the Council finds that construction-related traffic is not likely to have a significant adverse impact on roads used to access John Day River.

Only three additional full-time employees are expected to visit the site daily, and other trips for delivery or maintenance would be infrequent. As a result, the Council finds that operational traffic is not likely to have a significant adverse impact on roads used to access John Day River.

Potential Noise Impacts

Estimated and modeled noise impacts at John Day River (approx. 3.7 miles east of the RFA4 site boundary) are 43 dBA during construction and 26 dBA during operations, respectively. A noise level of 43 dBA represents a similar noise level of light auto traffic at a distance of 100 feet.[267] A noise level of 26 dBA is equivalent to ambient noise levels and considered extremely quiet. These noise levels combined with a more than 3 mile separation distance would not be expected to result in a significant adverse impact at John Day River. Therefore, the Council finds that potential noise impacts are not likely to have a significant adverse impact on users of John Day River.

Potential Visual Impacts

Permanent placement of energy infrastructure proposed in RFA4 could result in potential visual impacts including up to 15-foot tall solar arrays and up to 160-foot-tall transmission line poles. To evaluate potential visual impacts of these structures, RFA4 Exhibit R presents the results of a three-part approach including GIS-based viewshed (or zone of visual influence [ZVI]) modeling; key observation point (KOP) analysis and glare modeling.

First, the ZVI analysis used Esri GIS software and bare-earth 10-meter digital elevation model to determine locations within the analysis area where the changes proposed in RFA4 would be visible. Results of the ZVI analysis are presented in RFA4 Exhibit R Figure R-2 and R-3. Then, based on the results of the ZVI analysis, 21 KOPs were identified, representing locations where a "casual observer" could realistically view the proposed RFA4 structures. The KOP locations are presented in RFA4 Exhibit R Figure R-4. These KOPs are located along accessible viewpoints and near John Day River and used to support the evaluation of the likelihood and magnitude of potential visual impacts (RFA4 Exhibit R Attachment R-3 presents photo locations associated with the KOPs demonstrating actual, existing viewshed conditions). Lastly, a glint and glare analysis was conducted using the Solar Glare Hazard Analysis Tool developed by Sandia National Laboratories to inform potential impacts to drivers on nearby roads.

Visual modeling and viewshed analysis show that portions of John Day River may have distant or background views of the proposed RFA4 components, but the existing viewshed includes existing wind farms, transmission lines, industrial development and agricultural irrigation equipment. The glare analysis resulted in no predictions of red, yellow or green glare from the proposed solar arrays at John Day River. Therefore, the proposed solar components will not introduce new or unusual features in the viewshed. For these reasons, the Council finds that potential visual impacts from the facility components proposed in RFA4 are not likely to have a significant adverse impact on users of John Day River.

III.L.2. Conclusions of Law

[267] BCWAMD4Doc21-19 RFA Exhibit Y Acoustic Assessment 2025-12-10, Table Y-2. See sound level, in dBA, of light auto traffic at 100 feet.

Based on the foregoing analysis, the Council finds that the design, construction and operation of the facility components proposed in RFA4 are not likely to result in a significant adverse impact to important recreational opportunities.

III.M. PUBLIC SERVICES: OAR 345-022-0110

(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that the construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impact to the ability of public and private providers within the analysis area described in the project order to provide: sewers and sewage treatment, water, storm water drainage, solid waste management, housing, traffic safety, police and fire protection, health care and schools.

(2) The Council may issue a site certificate for a facility that would produce power from wind, solar or geothermal energy without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

(3) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility. [268]

***** [269]

III.M.1. Findings of Fact

The analysis area for the Public Services standard is the area within and extending 10 miles from the proposed Solar Micrositing Area.[270] The analysis area includes Rufus, Wasco and portions of unincorporated Sherman and Gilliam counties; the analysis area also extends into Washington (portions of Klickitat County).

Impact Assessment Assumptions

[268] OAR 345-022-0040, effective April 2, 2025.

[269] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

[270] BCWAMD4 ODOE Concurrence on OAR 345-027-0360(3) Request. The Council's procedural requirements for site certificate amendments (OAR 345-027-0360(3)) allow the Department to authorize modifications to analysis areas established in a Project Order, if warranted based on the scope of changes in a Request for Amendment. As authorized under OAR 345-027-0360(3), following a pre-amendment conference on May 2, 2024, the Department approved a modified analysis area for RFA4 based on the scope and extent of potential impacts associated with RFA4 changes.

The following assumptions were relied upon to estimate potential impacts on public and private service providers:

Construction

- Construction would last approximately 17 to 19 months
- There would be an average of 165 workers on-site each day during construction, with up to 350 workers on site during peak construction periods.
- Approximately 30 percent of the construction workforce would be residents within a 1-hr commuting distance to the site. The remaining 70 percent would temporarily relocate to communities within a 1-hour commuting distance from the site.

Operation

- Up to three new employees would be needed for operations and maintenance activities.
- A household size of three is assumed for each permanent worker; a total of nine new permanent residents could be added to the local population. [271]

Sewer and Sewage Treatment

The certificate holder does not propose to connect to or modify any existing public or private sewer or sewage treatment system. During construction, sanitary waste would be collected on-site in portable toilets provided and serviced by a private sanitation service provider. The Council previously imposed Condition 82 requiring that, during construction, portable toilets be pumped and cleaned regularly by a licensed contractor. Condition 82 would continue to apply to construction of the facility components proposed in RFA4.

During operations, sanitary waste would be discharged through the existing septic system at the O&M building, or if the proposed new O&M building is constructed, it would be designed with a new, licensed septic system. The Council previously imposed Condition 83 requiring any onsite septic system be properly designed and licensed with the county, through the North Central Public Health District. Condition 83 would continue to apply if a new O&M building is constructed.

Because the facility components proposed in RFA4 would not connect to a public sewer or sewage disposal system, the Council finds that construction and operation are not likely to result in significant adverse impact to the ability of any public or private sewer/sewage treatment providers to provide sewer and sewage treatment services.

Stormwater and Wastewater Drainage

The certificate holder does not propose to connect to or modify any existing developed stormwater or wastewater drainage system. As described in Section III.D., *Soil Protection*, under

[271] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.2.2.

Soil Protection Conditions 1 to 3, the certificate holder would be required to construct the facility components proposed in RFA4 in accordance with the Department of Environmental Quality's National Pollutant Discharge Elimination System Construction Stormwater Discharge General Permit 1200-C and associated Erosion and Sediment Control Plan; and a Comprehensive Solar Revegetation and Soil Management Plan.

Because the facility components proposed in RFA4 will not connect to a developed stormwater or drainage system, the Council finds that construction and operation are not likely to result in significant adverse impact to the ability of any public or private service providers to provide stormwater and wastewater services.

Water Use

Under average conditions, up to 26 million gallons of water will be needed for construction for dust suppression, road compaction, concrete mixing, and equipment washing. Construction water will likely be obtained from a municipal source, such as City of Wasco, which affirmed capacity to meet the forecasted construction water demand.[272] Potable water will also be required for sanitation and drinking water, which will be obtained from the existing, exempt well or from bottled water.

The Council previously imposed Condition 74 which required that, during construction, the certificate holder and its contractors obtain water from previously permitted sources. This condition applies to the water usage associated with AMD4. However, the Council amends Condition 74 to add clarity on the documentation to be submitted to afford the Department the ability to verify that the water source has the legal ability to provide the type and quantity of water needed for construction, as presented below.

> **Amended Condition 74 (CON-PS-01)**
> Prior to and during construction of any component or phase of the solar facility, as applicable, the certificate holder and its contractors shall: ~~obtain all water required for construction activities from off-site sources previously permitted for such uses.~~
> a. Identify all water-related needs and estimate daily and annual water demand for facility construction.
> b. Provide evidence such as a contract or purchase agreement demonstrating that adequate water supply to meet facility construction demand has been secured and that water for all construction activities will be legally obtained by service providers or third-party permits.
> [Final Order on AMD4]

During operations, up to 330,000 gallons per year may be needed for potable water and panel washing. Potable water may be obtained from the facility's existing, exempt well or a newly constructed exempt well. As addressed in Section IV.C., *Water Rights*, the Council adopts Water

[272] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Attachment U-1.

Rights Condition 1 and amends Condition 75 requiring that, for any newly constructed well, the certificate holder comply with OWRD water record requirements as well as limit the well system's (i.e., well system including the existing and proposed well) combined withdrawal to 5,000 gallons per day or less, unless a permit is obtained from OWRD for either or both wells.

The Council previously imposed Condition 76 requiring that, during operation, the certificate holder and its contractors obtain water from previously permitted sources. The Council amends Condition 76 to add clarity on the documentation to be submitted to afford the Department the ability to evaluate whether the water source has the legal ability to provide the type and quantity of water needed for operation, as presented below.

Amended Condition 76 (OPR-PS-01)
During operation of the facility, for any water needed from offsite sources, the certificate holder and its contractors shall: ~~obtain all water required for blade-washing activities from off-site sources previously permitted for such uses or from the on-site well, provided such use of well water would not cause the rate of extraction to exceed 5,000 gallons in any one-day period.~~

a. Identify all water-related needs and estimate daily and annual water demand for facility operations.
b. Provide evidence such as a contract or purchase agreement demonstrating that adequate water supply to meet facility operational demand has been secured and that water for all operational activities will be legally obtained by service providers or third-party permits.

[Final Order on ASC, Condition 76; AMD4]

Because the certificate holder has demonstrated that it can obtain adequate water supply for the construction and operation of the facility components proposed in RFA4, and subject to the Amended Conditions 74 and 76, and new Water Rights Condition 1 described in this order, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impact to the ability of any public or private water providers to provide services.

Solid Waste Management

Construction would generate approximately 12,000 cubic yards total of solid waste over a twelve-month period, including discarded construction materials, packaging materials, wood forms from foundations, and spent erosion control materials.[273]

During operations, approximately two cubic yards of waste per month will be generated, including damaged or defective equipment and associated packing materials, and typical office waste. Any materials that cannot be recycled would be disposed of at Columbia Ridge Landfill

[273] BCWAMD4Doc21-17 RFA Exhibit W Waste Minimization 2025-12-10, Section 2.1.1.

(20 miles east of the proposed Solar Micrositing Area) and the Wasco County Landfill (25 miles west of the proposed Solar Micrositing Area).

As described in Section III.O., *Waste Minimization*, under Amended Conditions 84 and 87, the certificate holder would be required to implement Waste Management Plans that contain provisions for minimizing the generation of wastes and recycling materials to the extent reasonably practicable during construction and operation of the proposed solar facility. The plans would provide for hazardous wastes and electronic wastes from solar modules and the BESS to be handled in accordance with applicable regulations and sent to proper facilities for disposal or recycling.

WM Senior Industrial Account Executive, Mark Krening, affirmed that Columbia Ridge Landfill can accept construction and demolition waste, with capacity to operate for 100 more years. Oregon Landfills Business Development Manager, Jocelyn Jones, affirmed that Wasco County Landfill has 26 years of capacity, with a potential for an additional 20 years if future expansion occurs.[274]

Because the certificate holder will minimize solid waste generated by its waste management plan and has identified appropriate providers with adequate capacity to accept solid waste and recyclable materials from the site, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impact to the ability of any public or private solid waste providers to provide waste management services.

Housing

Temporary housing could be required for up to 245 workers during the peak construction period and about 116 workers on average during the construction period. Workers who temporarily re-locate to the area during construction are expected to utilize short-term rental housing, hotels, motels, RV parks or campgrounds in communities within a 1-hour commute of the site, including Morrow, Gilliam, Sherman, Wasco, and Klickitat counties. There are 33 hotels and motels in this area, with establishments concentrated in The Dalles (11 hotels) and Boardman (5 hotels/motels). Collectively, the hotels have 1,318 rooms. In 2023, hotels and motels in the region had an average occupancy rate of 63.8 percent, with a peak occupancy rate of 82.8 percent during August. Peak construction periods would likely occur during the peak occupancy periods; however, even at peak occupancy, 227 hotel or motel rooms were available.[275]

There are 17 RV parks or campgrounds with a combined 755 RV sites within a 1-hour commuting distance. This includes 188 RV sites in Sherman County. Occupancy rates were not provided for RV campgrounds, but assuming similar rates as hotels and motels would result in

[274] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Attachment U-1.

[275] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.3.7, 4.4.5

approximately 138 sites being available within a 1-hour commutable distance.[276] If temporary construction workers rely on RV sites within Sherman County, there could be a significant, temporary impact on local RV capacity. To minimize and mitigate potential impacts to local RV park capacity, the Council imposes the following conditions requiring that the certificate holder develop a construction worker housing plan to provide strategies to minimize impacts to the local housing supply based on an ongoing evaluation of patterns of uses and potential shortages or changes in housing demand, as presented below:

Public Services Condition 1 (PRE-PS-01)
At least 90-days prior to construction of a phase or component of the solar facility, the certificate holder shall provide to the Department and Sherman County a Construction Workforce Housing Plan. The Construction Workforce Housing Plan must include:

a. An evaluation of ongoing patterns of housing uses and potential shortages or changes in housing demand;
b. Consideration of concerns and suggestions from Sherman County; and
c. Provide strategies to minimize impacts to the local housing supply.

[Final Order on AMD4]

Public Services Condition 2 (CON-PS-02)
During construction of a phase or component of the solar facility, the certificate holder shall report on the implementation of the Construction Workforce Housing Plan required under PRE-PS-01, including any outstanding issues associated with workforce housing and potential solutions.
[Final Order on AMD4]

Based on compliance with the conditions above, the Council finds that construction of the facility components proposed in RFA4 are not likely to result in significant adverse impact to the ability of any public or private housing providers to provide housing services.

Permanent housing for up to three new households, including workers and their families, may be required during operations. Based on an analysis of data from the U.S. Census Bureau's American Community Survey, on average, there were approximately 596 unoccupied rental units in Sherman and Wasco Counties in 2022. Housing data for rural areas have high margins of error and that occupancy rates may have changed since 2022; however, the Council finds the data demonstrate that there is likely sufficient permanent housing available for the relatively small number of workers expected to be employed during operation of the proposed solar facility.[277]

Based on the limited increase in permanent households from operations, the Council finds that operation of the facility components proposed in RFA4 are not likely to result in significant

[276] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.3.7.
[277] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.3.7, 4.4.5.

adverse impact to the ability of any public or private housing providers to provide housing services.

Health Care

Health Care services with Level III Trauma center is Adventist Health Columbia Gorge Hospital in the Dalles. If more advanced treatment was needed, the nearest Level I Trauma centers are in Portland. Ground ambulance service at the site is provided by Sherman County Ambulance. Air ambulance service is available for more serious injuries.[278]

The Council previously imposed Site Certificate Conditions 46 and 47, which require the development and implementation of health and safety plans during construction and operation of the existing facility, accordingly. The Council amends Condition 46 to require a new health and safety plan to be developed for the construction of the facility components proposed in RFA4. The Council maintains Condition 47 to require the existing health and safety plan to be implemented for both the existing and proposed facility components.

> **Amended Condition 46 (CON-PS-03)**
> During construction of the solar facility, the certificate holder shall require that all on-site construction contractors develop and implement a site health and safety plan that informs on-site workers and others what to do in case of an emergency and that includes the locations of fire extinguishers and nearby hospitals, important telephone numbers, and first aid techniques.
> [Final Order on ASC, Condition 46; AMD4]

The relatively small increase in population expected to result from up to three workers permanently relocating to the area during operation of the facility components proposed in RFA4 is not expected to result in significant increase in demand for primary health care services in the analysis area.

Accordingly, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impact to the ability of public and private health care providers to provide health care services in the analysis area.

Schools

Workers temporarily relocating to the area during construction of the facility components proposed in RFA4 are not likely to be joined by family members or enrolled in local education programs in significant numbers. The relatively small increase in population expected to result from up to three workers permanently relocating to the area during operation of the facility components proposed in RFA4 is also not expected to result in significant increase in demand for education services in the analysis area. Accordingly, the Council finds that the construction

[278] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.3.10; 4.4.8.

and operation of the facility are not likely to result in a significant adverse impact to the ability of public and private education providers to provide education services in the analysis area.

Traffic Safety

Construction

Peak construction activities are expected to generate up to 350 worker-vehicle round trips per day. There would also be up to 54 round trips by small and large trucks making deliveries of equipment and materials. This equates to approximately 808 one-way trips each day during peak construction periods.[279]

The primary transportation route for construction-related, heavy-duty, and light-duty delivery vehicles, as well as some workforce traffic will start from either the west or east on I-84 to south on US-97 (from Biggs, Oregon) to Wasco, then southeast on Oregon Route 206 (OR-206), east on either Klondike Road or the Old Wasco Heppner Highway, and then onto various County roads providing local access to the site. A secondary route starting at the I-84/Rufus junction, continuing to Herin Lane via Scott Canyon Road would be used for some commuter vehicle traffic.[280] Existing roads for these routes are generally in fair to good condition and are not anticipated to require improvement or alterations to accommodate facility-related traffic.[281]

Based on 2024 Average Annual Daily Traffic (AADT) Volumes published by ODOT, peak construction related traffic could increase AADT volumes on I-84 by about 4.5 percent, along US-97 by up to 23 percent, and along OR-206 by up to 57 percent. The increase in traffic on I-84 was considered to be minimal. The increase in traffic on US-97 was shown to result in a level of service (LOS) B, which indicates the increased traffic volume could potentially cause some minor traffic delay, particularly during the AM and PM peak hours, but it is unlikely to cause significant disruption. While the percentage increase along OR-206 was the greatest, the evaluation showed that the roadway would maintain LOS A (minimal delays) even during peak construction period given the relatively low AADT compared to the capacity of the roadway.[282]

County and local roadways are expected to be able to safely accommodate construction-related traffic without significant improvement or modification.[283]

The Council previously imposed Conditions 77, 78 and 79 to mitigate the traffic related impacts from the construction of the existing wind facility. Condition 77 and 78 required the certificate holder to monitor impacts on roads during construction and to restore the roads to at least

[279] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.4.6

[280] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.3.8.1., 4.3.8.2.

[281] BCWAMD4Doc21-01 RFA Div27 2025-12-10, Section 4.1.3.6; BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.3.8.4.

[282] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.4.6.

[283] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.4.6.1.

their pre-construction condition following the completion of construction. Condition 79 required the certificate holder to implement specific measures to reduce traffic delays on county roads serving as transportation routes for delivery of equipment to the site during construction of the wind facility. The Council amends Conditions 77 and 78 to apply to construction of the facility components proposed in RFA4 because construction related traffic can result in damage to road surfaces. Consistent with the certificate holder's representations that it would comply with Condition 79 by developing a Construction Traffic Management Plan prior to construction describing how it will implement the traffic minimization measures in the condition,[284] the Council amends Conditions 77 to incorporate the requirements of Condition 79; and amends Condition 78 as presented below:

Amended Condition 77 (PRE-PS-02)

~~Before beginning~~ Prior to construction of any phase or component of the solar facility, the certificate holder shall ~~develop~~:

a. Provide an executed Road Use Agreement between the certificate holder and Sherman County Public Works Department, which includes, at a minimum:
   i. ~~a~~ A system for ~~monitoring~~ documenting the pre-construction condition of ~~state highways and~~ local roads that would serve as transport~~er~~ation routes for delivering equipment to the facility site ~~for degradation, e.g., major potholes, so that safe travel paths may be maintained. The monitoring system shall include site inspection and photographic cataloguing of existing road conditions~~ so that pre-construction conditions can be compared with conditions after construction has been completed to assess needed repairs and payment for repairs.
   ii. Protocols for monitoring road conditions for degradation during construction so that safe travel paths may be maintained.
   iii. An agreement to fund repairs of construction related damage to the satisfaction of Sherman County Public Works. ~~The certificate holder shall coordinate monitoring methods and preferred mitigation efforts with Sherman County Public Works and the Oregon Department of Transportation.~~
b. Submit a Construction Traffic Management Plan for Department review and approval. Unless the following are included in the executed Road Use Agreement, the plan shall, at a minimum, require that the certificate holder:
   i. Provide notice to adjacent landowners when construction takes place to help minimize access disruptions;
   ii. Provide proper road signage and warnings of "Equipment on Road," "Truck Access," or "Road Crossings;"
   iii. Implement traffic diversion equipment, such as advance signage and pilot cars, whenever possible when slow or oversized loads are being hauled;

[284] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.4.6. The certificate holder also cites Condition 17, 27 and 60. As discussed in Section III.E, Land Use, Condition 17 is not applicable to the construction and operation of the facility components proposed in RFA4. Condition 27 and 60 are intended to protect soils and wildlife within the site, and are discussed in Section III.D (Soil Protection) and III.H (Fish and Wildlife Habitat), respectively.

iv. Encourage carpooling for the construction workforce to reduce traffic volume;
v. Employ flaggers, as necessary, to direct traffic when large equipment is entering or exiting public roads to minimize risk of accidents; and
vi. Maintain at least one travel lane at all times so that roadways will not be closed to traffic as a result of construction vehicles entering or exiting public roads.

[Final Order on ASC, Condition 77; AMD1, AMD4]

Amended Condition 78 (CON-PS-04)

~~(78) After completing~~ During and following construction of a phase or component of the solar facility, the certificate holder shall ~~restore state highways and county roads affected by facility construction activities to at least their pre-construction conditions, to the satisfaction of Sherman County Public Works and the Oregon Department of Transportation~~ adhere to the requirements of the Road Use Agreement and Construction Traffic Management Plan required under Condition PRE-PS-02.

[Final Order on ASC, Condition 78; AMD4]

Deleted Condition 79

~~(79) During construction of a component or phase of the facility, the certificate holder shall implement the following measures to reduce traffic delays on county roads serving as transporter routes for delivery of equipment to the facility site:~~

~~a. Provide notice to adjacent landowners when construction takes place to help minimize access disruptions;~~
~~b. Provide proper road signage and warnings of "Equipment on Road," "Truck Access," or "Road Crossings;"~~
~~c. Implement traffic diversion equipment, such as advance signage and pilot cars, whenever possible when slow or oversized loads are being hauled;~~
~~d. Encourage carpooling for the construction workforce to reduce traffic volume;~~
~~e. Employ flaggers, as necessary, to direct traffic when large equipment is entering or exiting public roads to minimize risk of accidents; and~~
~~f. Maintain at least one travel lane at all times so that roadways will not be closed to traffic as a result of construction vehicles entering or exiting public roads.~~

[Final Order on AMD4]

Vehicle weight and dimension limits applicable to state highways are established under ORS chapter 818 and OAR chapter 734. Any vehicle that exceeds legal vehicle dimensions and weight must obtain an over-dimension permit from the Oregon Department of Transportation (ODOT) to utilize state highways. Overweight, or over-dimension, loads may be required for delivering the substation transformer or heavy construction equipment during construction. As described in Section III.B., *Organizational Expertise,* under Organizational Expertise Condition 9 (PRE-OE-03), the certificate holder would be required to submit copies of the required permits to the Department prior to any deliveries requiring over-dimensional loads.

Operation

As described above, only three additional full-time employees are expected to visit the site daily, and other trips for delivery or maintenance would be infrequent. As a result, the Council finds that operational traffic is not likely to have a significant adverse impact on traffic safety.

RFA4 includes an analysis of glare that could potentially be produced by solar arrays from specific viewpoints within the analysis area, including roadways. The analysis was produced using the ForgeSolar GlareGuage application, which relies on the Solar Glare Hazard Analysis Tool (SGHAT) developed by Sandia National Laboratories. SGHAT categorizes glare hazards based on the potential impacts on viewers based on predicted intensity of glare and the size and distance of a glare source to a potential receptor. Ocular hazards are categories as follows:

- Red glare: glare predicted with a potential for permanent eye damage (retinal burn);
- Yellow glare: glare predicted with a potential for temporary after-image; and
- Green glare: glare predicted with a low potential for temporary after-image.[285]

SGHAT was used to evaluate the potential for glint and glare when driving along 1) segments of Emigrant Springs Lane, Herin Lane, OR-206, I-97, Klondike Road, Medler Lane, N Klondike Road, Oehman Road, Old Wasco-Heppner Highway, and Webfoot Road. The analysis simulated modules equipped with an antireflective coating mounted on a single-axis tracking system with a 60-degree tilt and mounted 8 feet above ground surface. Importantly, the model does not account for varying ambient conditions (i.e., cloudy days, precipitation), atmospheric attenuation, screening due to existing vegetation or structures unless specified through obstruction modeling, screening due to existing topography not located within the defined array layouts, or the potential effects of grading within the array area.[286]

No red glare is expected to be produced by the proposed solar arrays. As shown in Figure 16, below, the yellow glare may be experienced by drivers travelling South along a short segment of Herin Lane and would occur mostly between 10:00 am and 5:00 pm, from November through February.[287]

[285] As a point of comparison, direct viewing of the sun without a filter is considered to be on the border between yellow glare and red glare, while typical camera flashes are considered to be lower tier yellow glare (approximately three orders of magnitude less than direct viewing of the sun). Upon exposure to yellow glare, the observer may experience a temporary spot in their vision temporarily lasting after the exposure. Upon exposure to green glare, the observer may experience a bright reflection but typically no spot lasting after exposure. https://efsec.wa.gov/sites/default/files/2025-05/20241009_Wautoma_FinalASC_AttachmentH_SolarGlareAnalysis.pdf Wautoma Solar Energy Project Solar Glare Analysis April 2022.

[286] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.4.6.3.

[287] BCWAMD4Doc21-12 RFA Exhibit R Scenic 2025-12-10, BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.4.6.3.

According to the 2015 Sherman County Transportation System Plan (TSP), this segment of Herin Lane has average daily traffic of 90 vehicles, where the peak time when its traveled is between 6:00-7:00 a.m., and a seasonally adjusted peak hour vehicle count of 16 vehicles.[288] This peak travel time on the roadway is outside the daily timeframe when glare may occur.

Because the certificate holders glare analysis did not predict any red glare, the yellow glare predicted is based on modeling that doesn't take into account cloud cover and the predicted glare would occur during winter months, and that the time of day where glare may occur would occur outside the most traveled times on Herin Lane, a County road that already experiences low traffic volumes, the Council finds that potential glare from the facility would be less than significant and would not impact vehicular traffic and public service providers responding to traffic incidents.

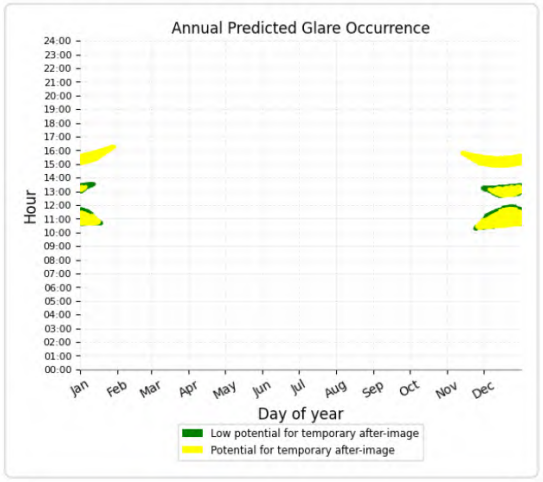
[288] Serman Cunty TSP, Volume 1, October 2015; Table 4-3, page 31. https://stkai01.blob.core.windows.net/kaiwebdata/04jlic8pz8xpv9juw4cnihjqe935?sp=r&sv=2018-11-09&se=2025-12-10T21%3A16%3A16Z&rscd=inline%3B+filename%3D%2218054_Final_vol1_with_appendices.pdf%22%3B+filename*%3DUTF-8%27%2718054_Final_vol1_with_appendices.pdf&rsct=application%2Fpdf&sr=b&sig=l1nNALed9ZF%2FUOFpVUKX7Y4%2Fxd9jaKHL6WhF4z7ppwc%3D

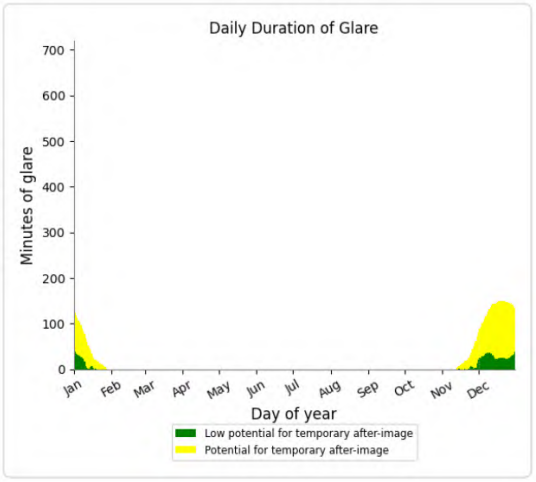
Figure 16: GlareGuage Output for Herin Lane Segment 1

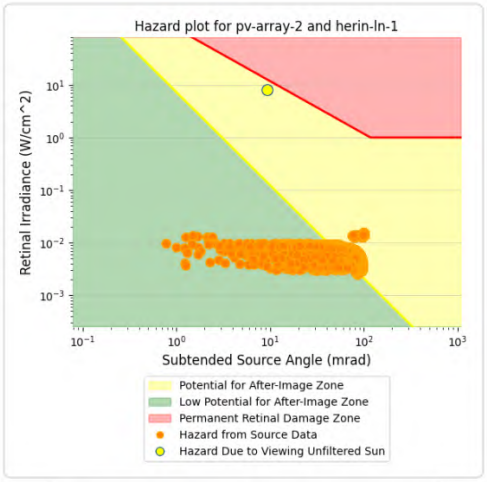
PV array 2 and Route: Herin Ln - 1

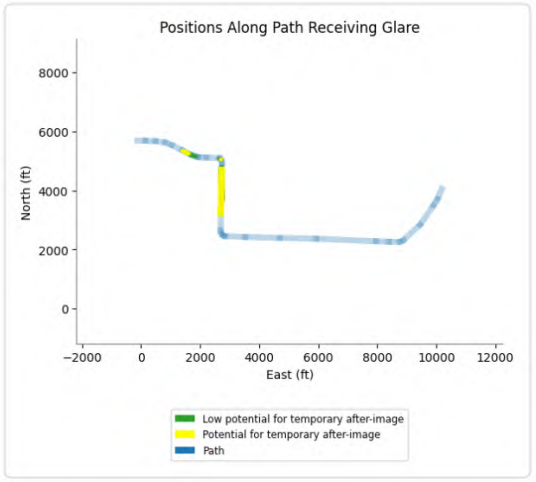
Yellow glare: 4,883 min.

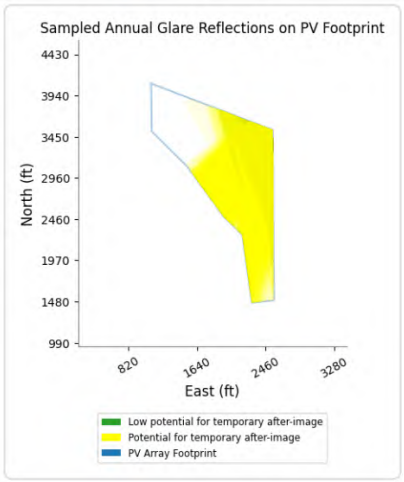
Green glare: 1,239 min.











1

Air Traffic Safety

Facility components proposed in RFA4 include solar arrays with a maximum height at full tilt of 15 feet; 230 kV transmission line poles with a maximum height of 80 feet; and substation, battery storage and O&M building with maximum height of 25 feet. Solar arrays may also produce glare that could potentially interfere with air travel, particularly if severe glare affects pilots operating in an approach pathway or low-altitude flight path.

Wasco State Airport is located approximately 4.4 miles southwest of the proposed Solar Micrositing Area. The glare analysis presented in RFA4 Exhibit U indicated that no glare was expected within the two 2-mile final approach paths for Wasco State Airport.[289]

The proposed Solar Micrositing Area is approximately 4 miles laterally away from military utilized airspace; based on this distance, Department of Defense confirmed no concerns with the facility components proposed in RFA4.[290]

Under 14 CFR 77, any person proposing to construct structures over 200 feet above ground level (AGL) or structures that exceed certain lower height restrictions within 20,000 feet of a public-use airport to submit a Notice of Construction or Alteration (Form 7460-1) to the Federal Aviation Administration (FAA). The same criteria and form are used to evaluate state standards for obstructions to navigable airspace under OAR chapter 738. Based on review of the FAA's Notice Criteria Tool and Oregon Department of Aviation review, the Council finds that the facility components proposed in RFA4 would not require future 7460 review.[291]

Because the facility components proposed in RFA4 are not expected to obstruct air navigation, or result in glare that could affect flight paths, the Council finds that the construction and operation of facility components proposed in RFA4 are not likely to result in significant adverse impacts on the ability of air navigation providers and facilities in the analysis area to operate safely.

Fire Protection and Emergency Response

Potential adverse impacts on North Sherman County Rural Fire Protection District could result if construction or operation or the increased population associated with either causes an increase in fires or other needs for fire protection services beyond the ability of local fire departments to provide those services. During construction, there could be some risk of accidental grass fires on the site due to metal cutting, welding, smoking, refueling vehicles and equipment, and operating or parking vehicles and other equipment off roadways in areas of tall dry grass. Once

[289] BCWAMD4Doc21-12 RFA Exhibit R Scenic 2025-12-10, Attachment R-2, BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.4.6.3.
[290] Reviewing Agency Comment DOD 2025-06-05.
[291] Reviewing Agency Comment ODAv. 2025-12-10.

constructed, the battery storage system would introduce an element that could pose a fire hazard.

The certificate holder provided a record of correspondence documenting coordination with the North Sherman Rural Fire Protection District Fire Board and Chief Jacob Burbank.[292] The correspondence indicates that NSRFPD raised several concerns about the access considerations, training, and equipment needed to address fire risk associated with the facility components proposed in RFA4.

As discussed in Section III.E., *Land Use,* and III.N., *Wildfire Prevention and Risk Mitigation,* the certificate holder represented that it would maintain a 20-foot setback from the perimeter fence to facility structures, and a 50-foot setback from the fence to the property line with a non-participating landowner to serve as fire-breaks and emergency access. These setbacks have been incorporated into the facility description and will be required under Amended Condition 103 and Land Use Condition 1. Training and on-site equipment requirements would be established under the Wildfire Mitigation Plans required under Wildfire Prevention and Risk Mitigation Conditions 1 to 4. The Fire Board made specific requests for additional wildfire equipment to increase capacity. While the certificate holder did not commit to providing the equipment, it did include the option to provide capacity building funds to local fire service providers as part of the Community Investment Plan proposed to support the certificate holder's Goal 3 Exception Request.

Under the Council's Wildfire Prevention and Risk Mitigation standard, as presented in Section IV.N. of this order, the certificate holder is required to characterize wildfire risk within the analysis area and demonstrate how the facility components proposed in RFA4 will be designed, constructed, and operated in a manner than minimizes wildfire risk and proposes an adequate response plan in the event of a wildfire. As presented in Section IV.N. of this order, the certificate holder will be required to finalize, implement and adhere to the requirements of a Department-approved Wildfire Mitigation Plan (WMP) during both construction and operation. The findings of fact, conditions and analysis from Section IV.N. are incorporated herein by reference.

Because the WMPs required under Wildfire Prevention and Risk Mitigation Conditions 1 to 4 would address fire hazards associated with the facility components proposed in RFA4, and would require coordination with local fire and emergency service providers, the Council finds that the construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impacts to fire protection or emergency response services in the analysis area.

Police

[292] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Attachment U-1.

Construction activities could result in increased demand of police protection services due to the increase in onsite temporary workers and new activity at the site. Generally, public safety concerns associated with solar photovoltaic power generation facilities include unauthorized access to facility components, traffic-related concerns, and general increases in demand on police services associated with increases in population.

The Sherman County Sheriff's Office provides law enforcement and police services in unincorporated Sherman County. Additional law enforcement service is available through the Oregon State Police. Sherman County Sheriff confirmed that they had no public safety concerns regarding RFA4.[293]

The small number of permanent-resident employees is not anticipated to place significant new demands on law enforcement agencies in the area.[294]

III.M.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with existing, proposed and amended site certificate conditions described above, the Council finds that construction and operation of the facility components proposed in RFA4 are not likely to result in significant adverse impacts to the ability of public and private providers to provide the services listed in OAR 345-022-0110.

III.N. WILDFIRE PREVENTION AND RISK MITIGATION: OAR 345-022-0115

(1) To issue a site certificate, the Council must find that:

(a) The applicant has adequately characterized wildfire risk within the analysis area using current data from reputable sources, by identifying:

(A) Baseline wildfire risk, based on factors that are expected to remain fixed for multiple years, including but not limited to topography, vegetation, existing infrastructure, and climate;

(B) Seasonal wildfire risk, based on factors that are expected to remain fixed for multiple months but may be dynamic throughout the year, including but not limited to, cumulative precipitation and fuel moisture content;

(C) Areas subject to a heightened risk of wildfire, based on the information provided under paragraphs (A) and (B) of this subsection;

[293] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Attachment U-1.

[294] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Section 4.3.9.

(D) High-fire consequence areas, including but not limited to areas containing residences, critical infrastructure, recreation opportunities, timber and agricultural resources, and fire-sensitive wildlife habitat; and

(E) All data sources and methods used to model and identify risks and areas under paragraphs (A) through (D) of this subsection.

(b) That the proposed facility will be designed, constructed, and operated in compliance with a Wildfire Mitigation Plan approved by the Council. The Wildfire Mitigation Plan must, at a minimum:

(A) Identify areas within the site boundary that are subject to a heightened risk of wildfire, using current data from reputable sources, and discuss data and methods used in the analysis;

(B) Describe the procedures, standards, and time frames that the applicant will use to inspect facility components and manage vegetation in the areas identified under subsection (a) of this section;

(C) Identify preventative actions and programs that the applicant will carry out to minimize the risk of facility components causing wildfire, including procedures that will be used to adjust operations during periods of heightened wildfire risk;

(D) Identify procedures to minimize risks to public health and safety, the health and safety of responders, and damages to resources protected by Council standards in the event that a wildfire occurs at the facility site, regardless of ignition source; and

(E) Describe methods the applicant will use to ensure that updates of the plan incorporate best practices and emerging technologies to minimize and mitigate wildfire risk.

(2) The Council may issue a site certificate without making the findings under section (1) if it finds that the facility is subject to a Wildfire Protection Plan that has been approved in compliance with OAR chapter 860, division 300.

(3) This Standard does not apply to the review of any Application for Site Certificate or Request for Amendment that was determined to be complete under OAR 345-015-0190 or 345-027-0363 on or before the effective date of this rule. [295]

[295] OAR 345-022-0040, effective April 2, 2025.

*** [296]

III.N.1. Findings of Fact

The analysis area for potential wildfire risks is the area within and extending one-half mile from the proposed Solar Micrositing Area, which includes approximately 5,198 acres.[297] The wildfire analysis area is generally bounded by Interstate 84 to the north, the John Day River to the east, Highway 206 to the south, and Highway 97 to the west.

Based on the certificate holder's and Council's assessment of wildfire risk at the site and within the analysis area, as described in RFA4 and this order, the Council finds that wildfire fire within the proposed Solar Micrositing Area and within the analysis area is high, particularly in the summer months.

Wildfire Risk Analysis

Under OAR 345-022-0115(1)(a), an applicant or certificate holder must adequately characterize the wildfire risk within the analysis area using reputable sources to describe Baseline Wildfire Risk, Seasonal Wildfire Risk, Areas Subject to Heightened Risk of Wildfire, and High-fire Consequence Areas.

Each of these are discussed in detail in this section with a description of the data source, as necessary to support the findings and conclusions. The data sources used to evaluate wildfire risk are listed in ASC Exhibit V and include but are not limited to:

- Community Wildfire Protection Plan Planning (CWPP), 2018 Tool Oregon Explorer;
- 2023 USFS, Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results;
- Conservation Biology Institute 2020 data;
- Sherman County September 2024 Community Wildfire Protection Plan;[298]
- 2024 National Oceanic and Atmospheric Administration climate data;

Baseline and Seasonal Wildfire Risk

As described in the Sherman County Community Wildfire Protection Plan, which was last updated in September 2024, conditions throughout the county are conducive to large and fast-moving wildfires. Conditions and concerns in the analysis area which are identified in the CWPP as contributing to the wildfire threat and potential for catastrophic losses include:

[296] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.
[297] BCWAMD4Doc01-00 ODOE Concurrence on OAR 345-027-0360(3) Request 2024-05-02.
[298] https://storage.googleapis.com/proudcity/shermancountyor/2017/10/Sherman-County-CWPP-2024.pdf

- The John Day River and numerous side canyons, all with very steep slopes, and other areas of moderate to steep slopes which add to the rate of wildfire spread and suppression difficulty.
- Climatic and topographic conditions including hot and dry conditions with frequent high winds which can contribute to fast moving fires that are difficult to control.
- Large agricultural areas that have the potential for fast moving fires which can destroy valuable crops in short periods of time.
- Lightning, power lines, debris burning, and equipment use add to the risk.
- All volunteer fire districts with limited resources.

For these reasons, and other reasons described below, the baseline wildfire risk within the analysis area is high, with additional seasonal risk during the summer months.

Topography

As discussed in detail in Section III.C, *Structural Standard*, the proposed Solar Micrositing Area is relatively flat or gently sloping with moderate slopes (up to 36 percent/25 degrees) along some drainages. Steeper slopes are located in the analysis area along Biglow Canyon and associated drainages that bound the northeastern portion of the site.[299]

Vegetation

Vegetation is a significant predictor of fire behavior and the US Forest Service has developed standardized set of fuel models representing wide range of vegetation conditions.[300] The certificate holder identified fuel models for the site based on the fuel models mapped in the CWPP Planning Tool, based on conditions observed during surveys conducted to support the habitat categorization discussed in Section III.H., *Fish and Wildlife Habitat*, and based on the understanding of landowner practices discussed in Section III.E., *Land Use*.

According to CWPP, approximately 90 percent of the analysis area (4,678 acres) and 93 percent of the solar micrositing area (1,790 acres) consists of vegetation in Fuel Models 102 and 242. These models reflect low load, dry climate grasses and wheat fields.[301] Small amounts of non-burnable areas, including irrigated farmland and paved surfaces, and small amounts of shrubland and other fuel types are also present.

Existing infrastructure

[299] BCWAMD4Doc21-03 RFA Exhibit H Geological Soil Stability 2025-12-10, Sections 3.2.1., 3.2.2; BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 2.1.1.

[300] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 2.2.2.

[301] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 2.1.2 and Table V-2.

In addition to the existing wind energy facility, infrastructure in the analysis area includes public roads and BPA transmission lines, as well as residential and agricultural buildings in the southeastern portion of the site.[302]

Climate

Based on NOAA climate normals, which average climate data collected between 1991 to 2020 for Arlington, Oregon, located approximately 18 miles east of the Solar Micrositing Area, the driest months on average are July, August, and September, typical for this region. These months have average monthly precipitation rates of 0.48 inch (June), 0.10 inch (July), and 0.15 inch (August). July, August, and September are the hottest months of the year with average maximum temperatures of 89.5° F, 88.9° F, and 80.0° F respectively. As an average, climate normals do not reflect the absolute maximum temperatures in the vicinity of the site, which regularly exceed 100° F in summer months.

The total average annual precipitation for Arlington is 9.3 inches per year, which is indicative of an arid climate. Fuel moisture content during the hot dry months is expected to be low, increasing risk of ignition and spread of fires.

Overall Wildfire Risk

The fuels, topography and climate in the analysis area contribute to a high-probability of wildfire in all burnable areas within the analysis area and micrositing area.[303] Average flame lengths are expected to be 4 to 6 feet, typical of dryland grasses and burnable wheat fields.[304] Fires in these fuels can spread quickly in dry, hot conditions especially when fueled by wind.

<u>High-Fire Consequence Areas</u>

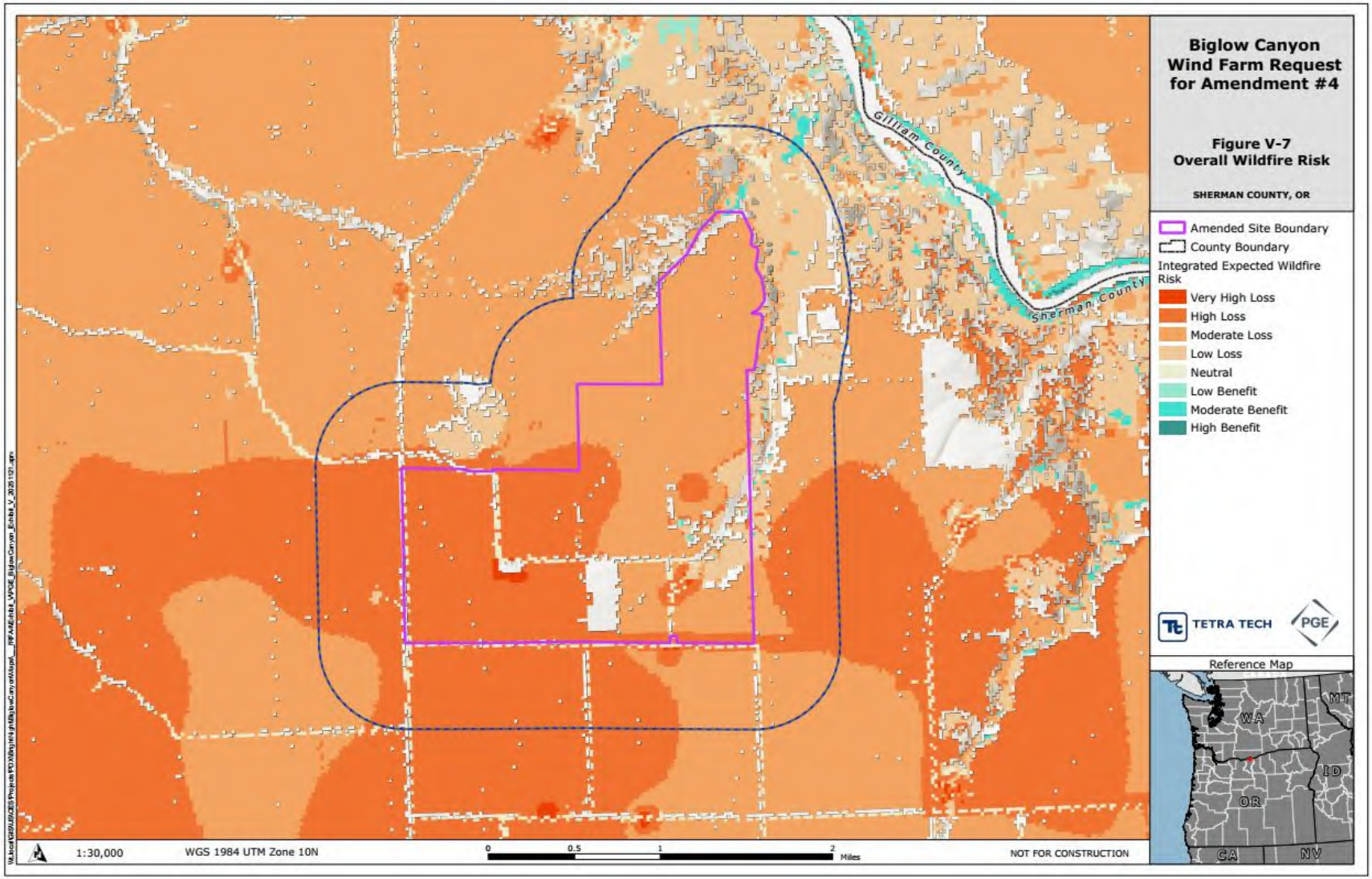
The CWPP data identifies Integrated Expected Wildfire Risk, which is a representation of cumulative risk at any location based on which highly valued resources and assets (HVRAs) are present, fire intensity, and the likelihood of a fire occurring (burn probability). The integrated risk maps synthesize risk across all resources and assets present at a specific location and the result is either net beneficial or net adverse impacts. As shown in Figure 17, below, most of the analysis area is identified as having a moderate- (43 percent) or high- (36 percent) loss rating. The area surrounding the existing Biglow Canyon substation and residences are shown as having a very-high loss rating.

[302] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 2.1.3

[303] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 2.1.5, Table V-4. A “high” burn probability corresponds to a 1 in 500 to 1 in 100 chance of fire in a given year based on the physical landscape, historical fire occurrence, and historical weather observations.

[304] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 2.3.3. Flame length is commonly used as a direct visual indication of fire intensity and is a primary factor to consider for firefighter safety and for gauging potential impacts to resources and assets.

Figure 17: Integrated Wildfire Risk within the Analysis Area



Wildfire Mitigation Plans

Under OAR 345-022-0115(1)(b), Council must find that the facility will be designed, constructed, and operated in compliance with a Wildfire Mitigation Plan (WMP) approved by Council; and under OAR 345-022-0115(2), the Council may issue a site certificate if it finds that a WMP has been approved for the facility by the Oregon Public Utility Commission (OPUC). The certificate holder provided a Construction Wildfire Mitigation Plan as Exhibit V, Attachment V-1. The certificate holder also provides its system wide 2024 Wildfire Mitigation Plan under OAR 345-022-0115(2.

Facility Design

As described in ASC Exhibit B, C, V and in Section I.E., *Requested Amendment* the below-listed facility fire-mitigation design features that are added to the amended site certificate. Under Amended Condition 108, the certificate holder would be required to design, construct and operate the facility substantially as described in the site certificate, which includes the facility design feature descriptions.

The certificate holder-presented design features and maintenance standards that would avoid and reduce the wildfire risk at the facility site include:

- The solar arrays will generally be oriented adjacent and parallel to existing roads. The BESS and substation would be enclosed within the solar fenceline located immediately adjacent to Herin Lane which is a paved two-lane road located north of the components. These paved roads act as a fire break as well as provide emergency responders local access to the facility site and electrical components;
- Roads used for emergency access within the facility will be 20 feet wide and designed to meet load requirements for all equipment and emergency access needs. Other roads would be approximately 16 feet wide. All roads would have a 10-foot, clear, brush free area maintained with low-growing, fire-resistant vegetation on either side.[305]
- All perimeter fences will be set back at least 50 feet from all property lines of non-participating landowners. Facility components will be set back at least 20 feet from fences.[306]
- A minimum 20-foot clear, brush free area will be maintained around the outside of all perimeter fences.[307]

[305] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Attachment U-1; BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 4.6.
[306] See Section III.E., *Land Use*; *SCZO Section 3.1 Exclusive Farm Use Zone, F-1 Zone*, of this order and BCWAMD4Doc21-06 RFA Exhibit K Land Use 2025-12-10, Section 5.2.1.3; BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Attachment U01.
[307] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 4.6.

- A minimum 20-foot gravel or compacted-soil buffer will be maintained around the O&M building, collector substation, and BESS. Fenced areas surrounding these related or supporting facilities will be fully graveled and vegetation-free.
- The solar array includes shielded electrical cabling, as required by applicable code, to prevent electrical fires;
- The BESS will be contained within self-contained enclosures in accordance with applicable UL Solutions, National Electric Code, and National Fire Protection Association standards, and will be placed on concrete foundations;
- BESS will have fire sensors, smoke and hydrogen and/or carbon monoxide detectors, alarms, emergency ventilation systems, cooling systems within each battery enclosure; and
- The SCADA system provides remote operation, including shut off, and monitoring of the facility's solar array, BESS, and substation components.

Construction WMP Finalization, Wildfire Risk Minimization Preventative Actions, Programs, and Procedures

The certificate holder provided a draft Construction WMP is included as Exhibit V, Attachment V- Attachment V-1. A Construction WMP would be finalized prior to beginning construction of the proposed solar facility.[308] Finalization of the WMP includes updating wildfire risk at the site, submitting site maps that identify access details and the location of fire protection equipment, and updated emergency contact information to the local fire department. The Construction WMP includes pre-construction onsite trainings with contractors, the Department, emergency service professionals, and the certificate holder. Additionally, prior to construction, the certificate holder must mail a letter to residences within the 0.5-mile wildfire analysis area which would provide the facility contact information and encourage individuals to sign up for the county's emergency notification system.

Section 4.5 of the Construction WMP has definitions for fire precaution levels and associated restrictions during fire season. The fire precaution levels include non-fire season, fire season, fire weather watch, and red flag weather warning, where the red flag weather warning would be the most restrictive for activities that may increase the risk of wildfire. Examples of fire season restrictions include maintaining a fire watch, driving and parking only on gravel surfaces, and limitations on hot work. The certificate holder will maintain a log of when construction and operational activities are impacted by the fire season restrictions.

Section 4.2 of the Construction WMP outlines the specifications for fire protection equipment that is maintained on site, which include fire extinguishers, hand tools, and pails. During fire season, on site water source(s), such as water trucks mist be on site and equipment with a

[308] Although both the construction and operational WMPs must be finalized prior to construction and operation, the Wildfire Prevention and Risk Mitigation Conditions do not label the WMPs as "Final". This is because, as designated in the WMP's, the WMP's may be updated and amended to address changes in wildfire risk at the site over time, therefore, there may be several iterations of the WMPs during construction and the life of the facility.

pump, hose and nozzle. All internal combustion engines must be equipped with exhaust systems, mufflers and screens, or include an appropriate spark arrestor.

Preventive Actions, Programs, and Procedures

The preventative actions, programs and procedures that manage vegetation and minimize wildfire risk during construction activities in the draft WMP include:

- During construction clearing, grubbing, and grading, the contractor will establish a clear, brush free area extending a minimum of 10 feet inside the fence line and another minimum 10-foot limits of disturbance buffer outside the fence line for a total of a minimum of 20 feet of clear, brush free area around the perimeter of the site.[309]
- Fire season, Red Flag Warnings and weather conditions that produce an increased risk of fire danger will be monitored and communicated to staff.
- Best management practices (BMPs) that minimize fire risk from vehicle travel, equipment use, and fueling activities will be implemented such as vegetation wetting, no idling vehicles and limited off-road travel.
- Vegetation height will be limited to 4-8 inches during the dry season (June to October). Vegetation will be mowed in advance of fire season or in accordance to any fire restrictions. Outside of the dry season (November to May), vegetation will be limited to a height of 10-12 inches.
- Vegetation buildup in the fence line(s), shall be removed.
- Personnel will be trained on the RACE (Remove, Alarm, Confine and Extinguish or Evacuate) and the use of fire protection equipment.

During facility construction, in the semi-annual construction progress report, the certificate holder will provide updates of the performance of the WMP including any changes of wildfire risk at the site, facility contact information, and training logs. The log of any changes in construction activities due to Fire Season Restrictions, as designated in Section 4.5, will be provided to the Department in the semi-annual construction report.

The certificate holder's draft Construction WMP, with revisions imposed by Council, is included as Attachment G to this Order. The Council imposes the two conditions below to require the Draft WMP be finalized prior to facility construction and be implemented during construction activities.

Wildfire Prevention and Risk Mitigation Condition 1 (PRE-WF-01)
Prior to construction of any component or phase of the solar facility, the certificate holder shall finalize and submit to the Department, for review and approval, a Construction Wildfire Mitigation Plan (WMP), consistent with Attachment G to the Final Order on AMD4.

[309] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Attachment V-1, Section 4.1.

[Final Order on AMD4]

Wildfire Prevention and Risk Mitigation Condition 2 (CON-WF-01)
During construction of the solar facility, the certificate holder shall require onsite contractors and employees to adhere to the Construction Wildfire Mitigation Plan (WMP) approved under Condition PRE-WF-01.
[Final Order on AMD4]

Operational WMP, Wildfire Risk Minimization Preventative Actions, Programs, and Procedures

The certificate holder is a public utility that is required to operate in compliance with a risk-based wildfire protection plan that is approved by the Oregon Public Utility Commission under ORS 757.963 and the requirements of OAR chapter 860, division 300. While the certificate holder relies on a facility specific WMP for construction of the proposed solar facility, the certificate holder requests that Council rely on its Corporate Wildfire Protection Plan during Operation under OAR 345-022-0115(2).

Under OAR 345-022-0115(2), the Council may, in its discretion, rely upon a PUC approved Wildfire Protection Plan that governs the construction and operation of a facility.[310] The certificate holder provided its 2024 Wildfire Protection Plan in support of its request under Exhibit V Attachment V-3. The plan is primarily concerned with managing fire-related risks associated with PGE's distribution and transmission system and contains minimal provisions for mitigation fire risks for generating facilities located outside of the utilities service territory. Section 3.1 of the WPP includes an overview of PGEs Annual Wildfire Risk Assessment and states that the certificate holder evaluates wildfire risk across PGE transmission and generation assets outside its service area, but no additional detail is provided. Section 8.0 of the WPP states that PGE conducts annual Ignition Prevention Inspections within High Fire Risk Zones (HFRZ) in its service territory, but states that, outside the service area, inspections primarily address conditions in the ROW for 230 kV or 500 kV transmission facilities. Appendix 5 does appear to indicate that ignition modelling does cover generating assets outside of the service territory in the certificate holder's Wildfire Risk Assessment Process. The certificate holder acknowledges that the current Wildfire Protection Plan does not include site-specific mitigation activities for individual facilities, but represents that its forthcoming Wildfire Protection Plan, scheduled for filing with the Oregon PUC on December 31, 2025, will expand upon the 2024 framework to include wildfire-risk analysis and mitigation measures for all generation sites, including the BCWF and proposed Solar Components. The certificate holder has stated that the corporate WMP is under active internal development and legal review and therefore cannot be shared in draft form.[311]

[310] OAR 860-300-0001(1), Scope and Applicability of OPUC Rules for Wildfire Mitigation Plans, states "The rules in this division prescribe the filing requirements for risk-based Wildfire Mitigation Plans filed by a Public Utility that provides electric service in Oregon pursuant to ORS 757.005." The certificate holder is a Public Utility that provides electric service in Oregon, and therefore must comply with the Wildfire Mitigation Plan (WMP) rules.
[311] BCWAMD4Doc21-16 RFA Exhibit V Wildfire 2025-12-10, Section 2.6.

The Council finds that there is not sufficient evidence on the record to demonstrate that all of the requirements of OAR 345-022-0115 would be adequately addressed by the certificate holder's system-wide Wildfire Protection Plan; however, some of the information required by the standard would be incorporated into other plans required under this Order. In particular, as discussed in Section III.B., *Organizational Expertise,* and III.D., *Soir Protection* the procedures, standards, and time frames for solar facility component inspections and vegetation management in the Solar Micrositing Area, as required under OAR 345-022-00115(1)(b)(B), would be established in the Operations and Maintenance Framework Plan included as Attachment C to this Order and the Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D.

As described in Section III.B., *Organizational Expertise*, Organizational Expertise Conditions 5 and 6 require the finalization and implementation of an Operation and Maintenance Plan and Operating Framework (O&M Plan). The O&M Plan would establish the inspections required for the proposed solar facility components as well as their frequency. The O&M Plan would also include the types of maintenance that would be required for each type of facility component with a tracking log that would be submitted during operations. The O&M Plan also outlines a framework for how BIGL and the certificate holder will coordinate and share responsibilities during the first five years of operation. As designated in the O&M Plan and conditions, it would be finalized prior to operations based on the final technology selected and manufacture recommendations.

As discussed in Section III.D., *Soil Protection*, Soil Protection Conditions 1 to 3 would require the certificate holder to finalize and implement the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to this order. The Comprehensive Solar Revegetation and Soil Management Plan includes success criteria and management standards for soil reclamation, revegetation, and long term weed management. Based on representations from the certificate holder in the technical specifications document provided as Attachment V-4, the following vegetation management standards and practices have been added to the Comprehensive Solar Revegetation and Soil Management Plan:

- Vegetation will be limited to a height of 10-12 inches during the rainy season (November to May) and 4-8 inches during the dry season (June-October) in:
    - All areas within the Solar Array Fencelines
    - A 10-foot clear, brush free area on either side of service roads outside of the solar array fenceline
    - A 20-foot clear, brush free area around the perimeter of the site
- Vegetation near, at, or taller than the maximum height shall be removed or mowed.
- A minimum vegetation clearance of 12 inches from electrical equipment will be maintained
- Mowing will be done in advance of fire season or in accordance to any fire restrictions.

- Any vegetation removed from the site will be disposed of and not stored onsite. Certificate holder and contractors will prevent the accumulation of combustible "burn piles" on site.
- Fenced areas around the collector substation, operations and maintenance structure, and meteorological stations will be graveled, with no vegetation present.

The Sherman County CWPP discusses the County's struggle with the invasive annual Cheatgrass, stating that Cheatgrass grows quickly, reaching heights of 4-32 inches annually and research has shown it can increase fire frequency, horizontal continuity of fuels and rate of wildfire spread. Cheatgrass does this by adding abundant fuels to an ecosystem. It grows quickly and recovers quickly from fires, providing hazardous fuel materials more quickly than native bunch grasses, potentially shortening fire return intervals.[312] Requirements for consultation for measures to eliminate, reduce and mitigate the growth of cheatgrass on the site have been added to the Comprehensive Solar Revegetation and Soil Management Plan, which is discussed in more detail below.

The Council finds that the added measures to the Comprehensive Solar Revegetation and Soil Management Plan and O&M Plan, imposed under Soil Protection Conditions 1 to 4, and Organizational Expertise Conditions 5 and 6, describe the procedures, standards, and time frames that the certificate holder will use to inspect facility components and manage vegetation. The Council imposes new conditions, as shown below, requiring the certificate holder to submit a plan that addresses the remaining criteria in the standard prior to Operation, whether that is the OPUC-approved Wildfire Protection Plan or a separate facility-specific WMP, and to adhere to the plan during Operation.

Wildfire Prevention and Risk Mitigation Condition 3 (PRO-WF-01)

a. Prior to operation of the solar facility, phase or component, as applicable, the certificate holder shall submit to the Department for review and approval, an Operational Wildfire Mitigation Plan that complies with the requirements of OAR 345-022-0115(1)(b).
b. The certificate holder may rely on a Wildfire Protection Plan approved by the Oregon Public Utility Commission under OAR chapter 860, division 300, or another plan approved by the Department in accordance with this Site Certificate to satisfy some or all of the requirements of this condition.

[Final Order on AMD4]

Wildfire Prevention and Risk Mitigation Condition 4 (OPR-WF-01)

During operation of the solar facility, the certificate holder must adhere to the requirements of the Operational Wildfire Mitigation Plan approved by the Department under Condition PRO-WF-01, as updated in accordance with the requirements of the plan.

[312] https://storage.googleapis.com/proudcity/shermancountyor/2017/10/Sherman-County-CWPP-2024.pdf, page 28.

[Final Order on AMD4]

III.N.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the proposed site certificate conditions described above and in this order, the Council finds that the certificate holder has adequately characterized wildfire risk within the analysis area using current data from reputable sources, and that, subject to Council approval, the facility components proposed in RFA4 will be designed, constructed, and operated in compliance with Wildfire Mitigation Plans.

III.O. WASTE MINIMIZATION: OAR 345-022-0120

(1) Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that, to the extent reasonably practicable:

(a) The applicant's solid waste and wastewater plans are likely to minimize generation of solid waste and wastewater in the construction and operation of the facility, and when solid waste or wastewater is generated, to result in recycling and reuse of such wastes;

(b) The applicant's plans to manage the accumulation, storage, disposal and transportation of waste generated by the construction and operation of the facility are likely to result in minimal adverse impact on surrounding and adjacent areas.

(2) The Council may issue a site certificate for a facility that would produce power from wind, solar or geothermal energy without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.
(3) The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.
**** 313, 314*

III.O.1. Findings of Fact

Construction

Solid Waste, Spoils and Concrete Waste

[313] OAR 345-022-0040, effective April 2, 2025.

[314] The information requirements included in the standard are omitted from the language above, but evaluated within the findings of fact below.

Construction would generate approximately 12,000 cubic yards of non-hazardous solid waste. Most of the waste would consist of packaging materials, but would also include scrap metal (e.g., wire and rebar scraps); wood; excavated soil[315]; and concrete waste/washwater.[316]

To minimize construction-related waste, the certificate holder and its contractors are required to implement a plan or actions designed to properly store and minimize waste, maximizing recycling and reuse. The Council previously imposed Site Certificate Condition 84 requiring that, prior to construction of the existing wind facility, the certificate holder develop a Construction Waste Management Plan that, at a minimum, included measures for employee training; waste generation minimization measures; requirements for recycling of steep, scrap metal, wood waste and packaging; properly collecting waste for transport to a landfill by a licensed waste hauler; and a requirement to segregate hazardous waste for proper disposal.

The Council amends Condition 84 to be specific to the facility components proposed in RFA4. In addition, based on experience working with the certificate holder on implementation and evaluating compliance with Waste Management Plans, Council is clarifies several condition subparts with additional specificity on the action and information expected to be included in the plan, as well as additional requirements to address new waste streams associated with solar and battery related electrical equipment, as explained below:

- Sub(a) of the condition previously required that the Construction Waste Management Plan include employee training. The Council amends the condition to clarify that the plan not only require employee training but that the plan must specify the format (in-person or computer based), content (training materials) and frequency of worker trainings.
- Sub(b) and (c) of the condition previously required the Construction Waste Management Plan to identify minimization measures based on detailed estimating and recycling of specific material types. The Council amends the condition language to more explicitly require that the plan identify waste stream and quantities; and then, subsequently, identify the specific measures/practices designed to minimize the estimated waste streams and types.
- Sub(g) of the condition previously required that the Construction Waste Management Plan include details about the segregation of hazardous waste. The Council amends the condition to require that, in addition to hazardous waste, the plan include segregation procedures for recyclable materials and non-hazardous waste (presented as Sub(e)).
- The Council adds a provision, Sub(d), requiring that the Construction Waste Management Plan include a procedure or policy for evaluating whether any damaged or defective solar panels and other electrical equipment delivered to the site should be

[315] Construction and grading of the proposed access roads and foundation excavations may generate dirt and rock spoils. Cut and fill activities are expected to balance the need for and use of soils, so the amount of spoils requiring disposal would be minimal.

[316] BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 4.1; BCWAMD4Doc21-17 RFA Exhibit W Waste Minimization 2025-12-10, Section 2.1.1. DATE.

treated as hazardous waste prior to storing and preparing the material for disposal or recycle.

- The Council adds a provision, Sub(g), requiring that Construction Waste Management Plan identify inspection and recordkeeping procedures to allow both certificate holder and the Department the ability to evaluate implementation and compliance with the Plan, once finalized.
- Consistent with ORS 469.402, the Council includes a provision, Sub(h), allowing the certificate holder to amend the plan, after finalization, subject to Department review and approval, in the event that changes are needed to adapt to the circumstances at the time.

Amended Condition 84 is presented below.

Amended Condition 84 (PRE-WM-01)

~~During~~ Prior to construction of any component or phase of the solar facility, the certificate holder shall ~~implement~~submit a Construction ~~w~~Waste ~~m~~Management ~~p~~Plan, for review and approval by the Department. The plan must include, at a minimum, ~~that includes but is not limited to~~ the following ~~measures~~:

a. The format, content and frequence of ~~Training~~ employee~~s~~ trainings to minimize and recycle solid waste;
b. Practices and measures that will be implemented to ~~M~~minimiz~~ing~~e the generation of wastes from construction ~~through detailed estimating of materials needs and through efficient construction practices~~;
c. Identify a procedure or process for evaluating whether photovoltaic modules, batteries, or other facility components are considered hazardous waste under state or federal regulations;
d. Identify procedures for the segregation of recyclable materials, non-hazardous waste, and hazardous waste for transport and disposal by a licensed hauler specializing in the proper recycling or disposal of the wastes.
e. Identify names and locations of licensed haulers and facilities that will be used for the following, including associated collection and hauling protocols and requirements:
    i. Recycling steel and other metal scrap;
    ii. Recycling wood waste;
    iii. Recycling packaging wastes, such as paper and cardboard;
    iv. Collecting non-recyclable waste for transport to a landfill by a licensed waste hauler; and

~~f. Segregating all hazardous wastes, such as used oil, oily rags and oil-absorbent materials, mercury-containing lights and lead-acid and nickel-cadmium batteries for disposal by a licensed firm specializing in the proper recycling or disposal of hazardous wastes.~~

~~g.~~ f. Identify inspection and recordkeeping procedures for waste handling, disposal and recycling.

~~h.~~ g. Include a provision allowing for updates of the plan, subject to Department review and approval.

[Final Order on ASC, Condition 84; AMD4]

The amended condition provides clear, enforceable requirements that ensure waste streams are identified, minimized, recycled or otherwise properly disposed, in accordance with the standard. The Council adopts Waste Minimization Condition 1, requiring that, during construction, the certificate and its contractors implement and adhere to the requirements of the final, Department approved Construction Waste Management.

Waste Minimization Condition 1 (CON-WM-01):
During construction of a component or phase of the solar facility, the certificate holder and all onsite contractors must implement the Construction Waste Management Plan required under Condition PRE-WM-01.
[Final Order on AMD4]

The Council previously imposed Site Certificate Conditions 85 authorizing the certificate holder to dispose of waste concrete in an excavated pit on site and Condition 86 requiring concrete washout to occur at a batch plant site or at a tower foundation location. Due to the high-alkalinity of washout water, current Best Management Practices under 1200-C NPDES General Permit require concrete washout water to be collected in an infiltration pit or tank in a dedicated area. To avoid any confusion, and to ensure that waste concrete and concrete washout water is handled and disposed of in accordance with current DEQ regulations, the Council deletes Conditions 85 and 86:

Deleted Condition 85
~~(85) The certificate holder may dispose of waste concrete on site with the permission of the landowner and in accordance with OAR 340-093-0080 and other applicable regulations. The certificate holder shall dispose of waste concrete on site by placing the material in an excavated hole, covering the concrete with at least 3 feet of topsoil, and grading the area to match existing contours. If the waste concrete is not disposed of on site, the certificate holder shall arrange for proper disposal in a licensed landfill.~~
[Final Order on AMD4]

Deleted Condition 86
~~(86) During construction of the facility, the certificate holder shall ensure that the wash down of concrete trucks occurs only at a contractor-owned batch plant or at tower foundation locations. If such wash down occurs at tower foundation locations, then the certificate holder shall ensure that wash down wastewater does not run off the construction site into otherwise undisturbed areas and that the wastewater is disposed of on backfill piles and buried underground with the backfill over the tower foundation.~~
[Final Order on AMD4]

Operations

Solid Waste

Operation of facility components proposed in RFA4 would generate up to 2 cubic yards per month, of both non-hazardous and potentially hazardous wastes. Non-Hazardous solid waste would include packing materials for replacement components, and waste typical of a small office, and would be disposed of at either the Wasco County Landfill or Columbia Ridge landfill.[317]

Repair or replacement of the solar modules and associated electrical equipment could generate incidental waste. However, a solar module typically lasts at least 25 years without significant degradation in function; modules will be replaced infrequently but requiring storage space for approximately 0.5% of replacement modules on site.[318] As described above, solar modules can potentially be considered hazardous waste depending on their composition.

Lithium-ion batteries may also contain hazardous materials, and the operation of the BESS may generate battery waste if batteries are damaged or decommissioned during the operating life of the facility. The Council previously imposed Site Certificate Condition 87, requiring the certificate holder to implement a waste management plan during operation of the wind facility that contains provisions for the minimization and recycling of solid wastes, as well as the segregation and safe handling of hazardous wastes. The Council maintains this condition as applicable to the entire facility, with the same changes described above for Amended Condition 84, to address the potential for hazardous battery and solar module waste generated during facility operation.

Amended Condition 87 (OPR-WM-02)
During operation of the facility, the certificate holder shall implement a waste management plan that includes but is not limited to the following ~~measures~~:

a. The format, content, and frequency of ~~Training~~ employee~~s~~ trainings to minimize ~~and recycle~~ the generation of solid waste, recycle materials, and properly handle and dispose of electronic wastes and hazardous materials;
b. Identify names and locations of licensed haulers and facilities that will be used for the following, including associated collection and hauling protocols and requirements:
   ~~(b)~~i. Recycling paper products, metals, glass and plastics, and other recyclable materials;
   ~~(c)~~ii. ~~Collecting~~ Disposing non-recyclable, nonhazardous waste for transport to a landfill ~~by a licensed waste hauler~~; ~~and~~
c. Identify a procedure or process for evaluating whether photovoltaic modules, batteries, or other facility components are considered hazardous waste under state or federal regulations;

[317] BCWAMD4Doc21-17 RFA Exhibit W Waste Minimization 2025-12-10, Section 2.1.2, 3.2.
[318] BCWAMD4Doc21-02 RFA Exhibit G Materials Analysis 2025-12-10, Section 3.2, Table G-2.

d. Identify procedures for the segregation of recyclable materials, nonhazardous waste, and hazardous waste sources ~~Segregating all hazardous wastes, such as used oil, oily rags and oil-absorbent materials, mercury-containing lights and lead-acid and nickel-cadmium batteries~~ for transport and disposal by a licensed ~~firm~~ hauler specializing in the proper recycling or disposal of ~~hazardous~~the wastes~~.~~;

e. Identify inspection and recordkeeping procedures for waste handling, disposal and recycling; and

f. Include a provision allowing for updates of the plan, subject to the Department review and approval.

[Final Order on AMD4]

The amended condition provides clear, enforceable requirements that ensure waste streams are identified, minimized, recycled or otherwise properly disposed, in accordance with the standard.

Wastewater

Operation of the facility components proposed in RFA4 will not generate wastewater. Operation will result in sanitary wastewater and solar panel wash water, if panel washing occurs. These sources are addressed in Section III.M. *Public Services* of this order.

III.O.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the amended and new conditions described above, the Council finds that the certificate holder's solid waste and wastewater plans are likely to minimize generation of solid waste and wastewater during the construction and operation of the facility components proposed in RFA4, result in recycling and reuse of such wastes, and that the certificate holder will manage the accumulation, storage, disposal and transportation of wastes in a manner that will result in minimal adverse impacts to surrounding and adjacent areas.

III.P. SITING STANDARDS FOR TRANSMISSION LINES – OAR 345-024-0090

To issue a site certificate for a facility that includes any transmission line under Council jurisdiction, the Council must find that the applicant:

(1) Can design, construct and operate the proposed transmission line so that alternating current electric fields do not exceed 9 kV per meter at one meter above the ground surface in areas accessible to the public;

(2) Can design, construct and operate the proposed transmission line so that induced currents resulting from the transmission line and related or supporting facilities will be as low as reasonably achievable.

*** [319]

III.P.1. Findings of Fact

The facility components proposed in RFA4 would include approximately 600 feet of a new 230-kV overhead transmission line. There are no occupied buildings, residences, or other sensitive receptors within 200 feet of the center line of the proposed transmission line.[320] The right-of-way for the proposed transmission line would be within the fenced solar array area and would not be accessible to the public.

Electric and magnetic fields

Electric and magnetic fields that could be generated by the proposed transmission line were modeled using Bonneville Power Administration's Corona and Fields Effect Program, Version 3. The modeling results and assumptions are presented in Table 21, below:

Table 21: Transmission Line Modelling Specifications

Item	Specification
Overhead pole height	80 feet
Site Elevation	1,500 feet above sea level
Amperage	314 amps
Voltage	230-kV phase/phase or 132.79-kV phase/ground
Ground wire configuration	One overhead ground wire, 0.68 inch in diameter Two overhead shield wires, 0.5 inch in diameter
Ground Wire Minimum Height	68 feet
Ground Wire Location	Centerline
Conductor type	Single 954 Cardinal Aluminum Conductor Steel Reinforced per phase, 1.196 inches in diameter
A-Phase Minimum Height	28 feet
A-Phase Location	Lower arm, 19 feet left of centerline
B-Phase Minimum Height	28 feet
B-Phase Location	Lower arm, 19 feet right of centerline
C-Phase Minimum Height	41 feet
C-Phase Location	Upper arm, 19 feet right of centerline

Table 22, below, shows the calculated strength of electric and magnetic fields within the right-of-way for the proposed transmission line. As shown in the table, electric fields generated by the transmission line would not exceed the 9 kV/m limit established by the Standard at any location within the right-of-way.

[319] OAR 345-024-0090, effective April 2, 2025.

[320] BCWAMD4Doc21-20 RFA Exhibit AA EMF 2025-12-10, Section 2.1.

Table 22: Calculated Electric and Magnetic Field Strength

Description	200 feet left of centerline	Peak Value	200 feet right of centerline
Electric Field (kV/m)	0.039	3.42 (24 feet left of centerline)	0.055
Magnetic Field (mG)	1.97	7.58 (4 feet left of centerline)	2.03

Because the right-of-way for the proposed transmission line would be in an area that is not accessible to the public, and based on modeling results demonstrating that electric fields generated by the proposed transmission line would not exceed 9 kV/m at ground level anywhere within the proposed right-of-way, the Council finds the certificate holder can design, construct and operate the proposed transmission in accordance with OAR 345-024-0090(1).

The Council previously imposed Condition 53, requiring the certificate holder to design transmission lines constructed as part of the existing facility in compliance with OAR 345-024-0090(1). This condition continues to apply to the proposed new transmission line segment. The Council amends the condition, modifying reference to a single transmission line to multiple transmission lines, to clarify applicability, as presented below.

> **Amended Condition 53 (GEN-TL-01)**
> The certificate holder shall design ~~the~~ all overhead transmission lines so that alternating current electric fields ~~shall~~ do not exceed 9 kV per meter at one meter above the ground surface in areas accessible to the public.
> [Final Order on ASC, Condition 53; AMD4]

The Council also adopted Condition 99, requiring the certificate holder to take reasonable steps to reduce or manage public exposure to EMF and provide information to the public about EMF levels associated with the wind facility and its associated transmission lines. The Council finds no such condition is needed for the proposed transmission line because the right-of-way for the proposed transmission line would not be accessible to the public.

Under OAR 345-025-0010(5), the Council must specify an approved corridor for a transmission line approved in a site certificate. Under OAR 345-001-0010(7), a transmission line corridor is defined as a continuous area of land not more than one-half mile in width, extending the length of the proposed alignment.

For the 1,900-foot segment of 230 kV transmission line, the proposed corridor width is equivalent to the right of way width at 150 feet, as presented in Amended Site Certificate, Figure 2. The location extends from the existing Biglow Canyon Substation to the proposed new

substation. The Council amends Condition 119 to establish the approved transmission line corridor, as presented below:[321]

> **Amended Condition 119 (GEN-TL-05):**
> ~~(119) OAR 345-027-0023(5): If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a pipeline or transmission line, the Council shall specify an approved corridor in the site certificate and shall allow t~~The certificate holder ~~to~~shall construct the ~~pipeline or~~ 230-kV transmission line connecting the Biglow Canyon Substation to the Solar Substation ~~anywhere~~ within a 150 foot corridor, as presented in Figure 3 of the Amended Site Certificate ~~the corridor, subject to the conditions of the site certificate. If the applicant has analyzed more than one corridor in its application for a site certificate, the Council may, subject to the Council's standards, approve more than one corridor~~.
> [Final Order on ASC, Condition 119, AMD4]

Induced-Currents and Grounding

The voltages and currents associated with the transmission line have the potential to induce voltage and current in nearby conductors (e.g., metal fences and irrigation systems). This effect is more likely where ungrounded fences or irrigation systems run parallel to a transmission line for longer distances (e.g. one mile or more). These induced voltages could result in a "nuisance" shock to anyone who touches such a fence or irrigation system.[322] The proposed transmission line would be within the fenced solar array and substation areas, and so the conductors most likely to be affected are the facility perimeter fences, which the proposed transmission line would cross perpendicularly.

The Council previously imposed Condition 54 requiring the certificate holder to design the transmission line to minimize induced voltages. The Council amends this condition to be applicable to the entire facility:

> **Amended Condition 54 (GEN-TL-02):**
> ~~(54)~~ The certificate holder shall design ~~the~~all overhead transmission lines so that induced voltages resulting from the transmission lines are as low as reasonably achievable.
> [Final Order on ASC, Condition 54; AMD4]

In accordance with site specific conditions now found in OAR 345-025-0010(4), the Council also imposed Condition 118, requiring the certificate holder to design and construct transmission lines constructed as part of the existing wind facility in accordance with the 1997 version of the National Electric Safety Code and to adopt a program to assure that all objects or structures of a

[321] The Council previously imposed Condition 119 with regards to transmission lines approved as part of the wind facility but removed from consideration in the Final Order on AMD2.
[322] BCWAMD4Doc21-20 RFA Exhibit AA EMF 2025-12-10, Section 5.1.3.

permanent nature that could become inadvertently charged with electricity are grounded or bonded throughout the life of the lines. The Council maintains this condition as applicable to the wind energy facility only and adopts a new condition to address the transmission line proposed to be constructed with the solar facility. The certificate holder represents that it will construct the proposed transmission lines in accordance with" all pertinent electrical codes to be protective of health and safety."[323] Based on this representation, the new condition requires the certificate holder to design, construct and operate the transmission line in accordance with the current (2023) version of the NESC. Because NESC Rule 110 also requires security fences for electric installations to be grounded, and no private fences or metal objects would be located within the right-of-way for the proposed transmission line, the Council finds the requirements of OAR 345-025-0010(4)(b), related to programs for grounding or bonding, are not necessary.

Amended Condition 118 (GEN-TL-04)

~~(118) OAR 345-027-0023(4): If the facility includes any transmission line under Council jurisdiction:~~

a. The certificate holder shall design, construct and operate ~~the~~ transmission lines associated with the wind energy facility in accordance with the requirements of the National Electrical Safety Code (American National Standards Institute, Section C2, 1997 Edition); and
b. The certificate holder shall develop and implement a program that provides reasonable assurance that all fences, gates, cattle guards, trailers, or other objects or structures of a permanent nature that could become inadvertently charged with electricity by the transmission lines are grounded or bonded throughout the life of the line.

[Final Order on ASC, Condition 118; AMD3; AMD4]

New Transmission Line Condition 1 (GEN-TL-06):

The certificate holder must design, construct, and operate transmission lines associated with the solar facility in accordance with the requirements of the 2023 Edition of the National Electrical Safety Code.

[Final Order on AMD4]

III.P.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the existing and new site certificate conditions described above, the Council finds that the certificate holder can design, construct, and operate the facility components proposed in RFA4 so that alternating current electric fields do not exceed 9-kV per meter at one meter above the ground surface in areas accessible to the public and that induced currents resulting from the transmission line and related or supporting facilities will be as low as reasonably achievable.

[323] *Id.*

IV. EVALUATION OF OTHER APPLICABLE REGULATORY REQUIREMENTS

IV.A. Noise Control Regulations: OAR 340-035-0035

1) Standards and Regulations:

(a) Existing Noise Sources. No person owning or controlling an existing industrial or commercial noise source shall cause or permit the operation of that noise source if the statistical noise levels generated by that source and measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceed the levels specified in Table 7, except as otherwise provided in these rules.

(b) New Noise Sources:

(A) New Sources Located on Previously Used Sites. No person owning or controlling a new industrial or commercial noise source located on a previously used industrial or commercial site shall cause or permit the operation of that noise source if the statistical noise levels generated by that new source and measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceed the levels specified in Table 8, except as otherwise provided in these rules. For noise levels generated by a wind or solar energy facility of any size and any associated equipment or machinery, subparagraph (1)(b)(B)(iii) applies.

(B) New Sources Located on Previously Unused Site:

(i) No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, L10 or L50, by more than 10 dBA in any one hour, or exceed the levels specified in Table 8, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule, except as specified in subparagraph (1)(b)(B)(iii).

(ii) The ambient statistical noise level of a new industrial or commercial noise source on a previously unused industrial or commercial site shall include all noises generated or indirectly caused by or attributable to that source including all of its related activities. Sources exempted from the requirements of section (1) of this rule, which are identified in subsections (5)(b)–(f), (j), and (k) of this rule, shall not be excluded from this ambient measurement.

(iii) For noise levels generated or caused by a wind or solar energy facility:

(I) The increase in ambient statistical noise levels is based on an assumed background L50 ambient noise level of 26 dBA or the actual ambient background level. The person owning the wind or solar energy facility may conduct measurements to determine the actual ambient L10 and L50 background level.

(II) The "actual ambient background level" is the measured noise level at the appropriate measurement point as specified in subsection (3)(b) of this rule using generally accepted noise engineering measurement practices. Background noise measurements shall be obtained at the appropriate measurement point, and for wind energy facilities synchronized with wind speed measurements of hub height conditions at the nearest wind turbine location. "Actual ambient background level" does not include noise generated or caused by the proposed wind or solar energy facility.

(III) The noise levels from a wind or solar energy facility may increase the ambient statistical noise levels L10 and L50 by more than 10 dBA (but not above the limits specified in Table 8), if the person who owns the noise sensitive property executes a legally effective easement or real covenant that benefits the property on which the wind or solar energy facility is located. The easement or covenant must authorize the wind or solar energy facility to increase the ambient statistical noise levels, L10 or L50 on the sensitive property by more than 10 dBA at the appropriate measurement point.

*****

(c) Quiet Areas. No person owning or controlling an industrial or commercial noise source located either within the boundaries of a quiet area or outside its boundaries shall cause or permit the operation of that noise source if the statistical noise levels generated by that source exceed the levels specified in Table 9 as measured within the quiet area and not less than 400 feet (122 meters) from the noise source.

(d) Impulse Sound. Notwithstanding the noise rules in Tables 7 through 9, no person owning or controlling an industrial or commercial noise source shall cause or permit the operation of that noise source if an impulsive sound is emitted in air by that source which exceeds the sound pressure levels specified below, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule:

(A) Blasting. 98 dBC, slow response, between the hours of 7 a.m. and 10 p.m. and 93 dBC, slow response, between the hours of 10 p.m. and 7 a.m.

(B) All Other Impulse Sounds. 100 dB, peak response, between the hours of 7 a.m. and 10 p.m. and 80 dB, peak response, between the hours of 10 p.m. and 7 a.m.

(e) Octave Bands and Audible Discrete Tones. When the Director has reasonable cause to believe that the requirements of subsection (1)(a), (b), or (c) of this rule do not adequately protect the health, safety, or welfare of the public as provided for in ORS Chapter 467, the Department may require the noise source to meet the following rules:

(A) Octave Bands. No person owning or controlling an industrial or commercial noise source shall cause or permit the operation of that noise source if such operation generates a median octave band sound pressure level which, as measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceeds applicable levels specified in Table 10.

(B) One-third Octave Band. No person owning or controlling an industrial or commercial noise source shall cause or permit the operation of that noise source if such operation generates a median one-third octave band sound pressure level which, as measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, and in a one-third octave band at a preferred frequency, exceeds the arithmetic average of the median sound pressure levels of the two adjacent one-third octave bands by:

(i) 5 dB for such one-third octave band with a center frequency from 500 Hertz to 10,000 Hertz, inclusive. Provided: Such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band; or

(ii) 8 dB for such one-third octave band with a center frequency from 160 Hertz to 400 Hertz, inclusive. Provided: Such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band; or

(iii) 15 dB for such one-third octave band with a center frequency from 25 Hertz to 125 Hertz, inclusive. Provided: Such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band;

(iv) This rule shall not apply to audible discrete tones having a one-third octave band sound pressure level 10 dB or more below the allowable sound pressure levels specified in Table 10 for the octave band which contains such one-third octave band.

(2) Compliance. Upon written notification from the Director, the owner or controller of an industrial or commercial noise source operating in violation of the adopted rules shall submit a compliance schedule acceptable to the Department. The schedule will set forth the dates, terms, and conditions by which the person responsible for the noise source shall comply with the adopted rules.

(3) Measurement:

(a) Sound measurements procedures shall conform to those procedures which are adopted by the Commission and set forth in Sound Measurement Procedures Manual (NPCS-1), or to such other procedures as are approved in writing by the Department;

(b) Unless otherwise specified, the appropriate measurement point shall be that point on the noise sensitive property, described below, which is further from the noise source:

(A) 25 feet (7.6 meters) toward the noise source from that point on the noise sensitive building nearest the noise source;

(B) That point on the noise sensitive property line nearest the noise source.[324]

IV.A.1. <u>Findings of Fact</u>

The analysis area for the Noise Control Regulation includes the area within and extending 1-mile from the proposed Solar Micrositing Area.[325]

The Council previously imposed Site Certificate Conditions 90 and 91 requiring wind turbines to be sited in compliance with the noise control regulations. Because these conditions have no ongoing requirements, the Council deletes them from the site certificate.

Exempt Construction Noise

Under OAR 340-035-0035(5), noise generated during construction is exempt from the requirement to meet DEQ's noise standards. However, construction-related noise impacts are evaluated under the Council's Protected Area, Scenic Resources, and Recreation standards, as provided in Sections III.F., III.J., and III.L of this order. To support the evaluation required under those standards, the predicted construction-noise is summarized in this section.

[324] OAR 345-035-0035, effective October 17, 2024.

[325] BCWAMD4Doc01-00 ODOE Concurrence on OAR 345-027-0360(3) Request 2024-05-02.

Construction activities include site preparation and grading; installation of foundations for solar arrays, conductors, and O&M building; assembly of solar panels and electrical connection components; construction of inverter and battery pads, substation and transmission lines; and commissioning. RFA4 Table Y-3 identifies typical construction equipment and the anticipated sound level from 50 to 5,000 feet from the noise source. However, as described in RFA4, construction equipment operates simultaneously with delivery trucks and other construction noise. Table 23, below, outlines examples of compiled construction noise based on potential construction phases.

Table 23: Estimated Construction Noise Levels Based on Roadway Construction Noise Model

Phase	Existing Noise Levels in dBA		Assumed Construction Operation	Equipment Assumed to Be Operating	Assumed Distance (in feet) from Equipment to Site	Estimated Noise from Construction Activity in dBA	
	L_{eq}	L_{max}				L_{eq}	L_{max}
1	62.7	76.8	Demolition	Backhoe	175	62.7	66.7
				Compressor	175	62.8	66.8
				Dump Truck	175	61.6	65.6
				Front End Loader	175	64.2	68.2
				Mounted Impact Hammer (hoe ram)	175	72.4	79.4
				All Equipment		**74.0**	**79.4**
2	75.7	86.3	Construction	Auger Drill Rig	30	81.8	88.8
				Compressor	100	67.7	71.6
				Crane	200	60.6	68.5
				Concrete Mixer Truck	100	68.8	72.8
				Welder/Torch	100	64.0	68.0
				Flat Bed Truck	200	58.2	62.2
				All Equipment		**82.3**	**88.8**
3	74.6	88.5	Excavation, Including Some Rock Removal	Backhoe	200	61.5	65.5
				Blasting	200	62.0	82.0
				Excavator	200	64.7	68.7
				Dump Truck	200	60.4	64.4
				Dump Truck	200	60.4	64.4
				Rock Drill	200	62.0	69.0
				All Equipment		**69.9**	**82.0**

Source: Table 8.1 from Federal Highway Administration HIGHWAY CONSTRUCTION NOISE HANDBOOK August 2006 U.S. Department of Transportation. https://rosap.ntl.bts.gov/view/dot/8837

Depending on the type of equipment operating at the same time during the phases of construction (excavation and installation), construction noise at approximately 100-200 feet

away would be between 79 and 89 dBA, which is considered loud. However, noise attenuates with distance, topography and intervening vegetation, therefore at 400 feet from the noise source, construction noise would be approximately 73-83 dBA, and at approximately 0.5 miles away the noise levels would be 61-71 dBA, which is the sound level of a passenger car or air condition unit.[326] Construction noise would occur during daytime hours would be temporary, and attenuates (lessens) with distance from the facility.

The certificate holder represents that it will comply with Condition 89, which requires the noisiest operation of heavy construction equipment to be limited to daylight hours; construction equipment be equipped with exhaust mufflers; and, that a noise complaint response system be established. The Council amends the condition, as shown below.

Amended Condition 89 (CON-NC-01)

~~(89) To reduce noise impacts at nearby residential areas~~ During construction of the solar facility, the certificate holder shall:

a. Confine the noisiest operation of heavy construction equipment to the daylight hours;
b. Require contractors to install and maintain exhaust mufflers on all combustion engine-powered equipment; and
c. Establish a complaint response system at the construction manager's office to address noise complaints.

[Final Order on ASC, Condition 89; AMD4]

Operational Noise

Noise generated by a new industrial or commercial source located on a previously unused site must comply with two standards: the "ambient noise degradation standard" and the "maximum allowable noise standard." Under the ambient noise degradation standard, facility-generated noise must not increase the ambient hourly L10 or L50 noise levels at any noise sensitive property by more than 10 dBA. Under the maximum allowable noise standard at OAR 340-035-0035(1)(b)(B)(i), new industrial or commercial noise sources may not exceed the noise levels specified in the noise rules, as represented in Table 24 below (50 dBA representing the lowest standard).

Table 24: Statistical Noise Limits for Industrial and Commercial Noise Sources

Statistical Descriptor	Maximum Permissible Hourly Statistical Noise Levels (dBA)	
	Daytime (7:00 AM – 10:00 PM)	Nighttime (10:00 PM to 7:00 AM)
L50	55	50

[326] Average noise attenuation is approximately 6 dB per doubling of distance for a point source. This means if you double your distance from a sound source, the sound level drops by about 6 decibels. And RFA4, BCWAMD4Doc21-19 RFA Exhibit Y Acoustic Assessment 2025-12-10, Table Y-2.

Table 24: Statistical Noise Limits for Industrial and Commercial Noise Sources

Statistical Descriptor	Maximum Permissible Hourly Statistical Noise Levels (dBA)	
	Daytime (7:00 AM – 10:00 PM)	Nighttime (10:00 PM to 7:00 AM)
L10	60	55
L1	75	60
Note: The hourly L50, L10, and L1 noise levels are defined as the noise levels equaled or exceeded 50 percent, 10 percent, and 1 percent of the hour, respectively. Source: OAR 345-035-0035, Table 8.		

The noise limits apply at an appropriate measurement point on noise sensitive properties or Noise Sensitive Receptors (NSRs), such as dwellings, schools, churches, hospitals, or public libraries.[327] There are six NSRs within the analysis area, including one (NSR-7) located inside the proposed Solar Micrositing Area.[328]

Noise Analysis and Potential Noise Impacts

DEQ's noise regulations apply to all noise sources attributable to a facility; therefore, for this analysis, the evaluation is based on operational noise from the existing facility and the facility components proposed in RFA4.[329] Sound power levels of the facility components proposed in RFA4 are presented in Table 25 below.

Table 25: Modeled Sound Power Level of Components

Equipment	Broadband (dBA)
Photovoltaic Inverter	92
BESS Unit and Inverter	84
BESS Transformer	80
Generator Step-up Transformer (135 MVA)	106
BESS = battery energy storage system; dBA = A-weighted decibel; MVA = megavolt ampere Source: Exhibit Y, Tables Y-4 and Y-5.	

The sound power levels of facility components proposed in RFA4 were used to model operational noise, using the 2025 version of DataKustik GmbH's Computer-Aided Noise Abatement Model (CadnaA). Then, sound levels of the existing wind turbines were combined

[327] "Noise sensitive property" is defined in OAR 340-035-0015(38) as "real property normally used for sleeping, or normally used as schools, churches, hospitals or public libraries. Property used in industrial or agricultural activities is not Noise Sensitive Property unless it meets the above criteria in more than an incidental manner."

[328] The certificate holder notes that, based on field observations, NSR ID 6 appears to be an abandoned structure.

[329] OAR 340-035-0035(1)(b)(ii), "the ambient statistical noise level of a new industrial or commercial noise source on a previously unused industrial or commercial site shall include all noises generated or indirectly caused by or attributable to that source including all of its related activities."

with the modelled sound levels of facility components proposed in RFA4 using energetic addition.[330]

As presented in Table 26, expected sound levels at 1 NSR would reach, but not exceed, the 50 dBA L50 nighttime maximum permissible noise level prescribed by OAR 340-035-0035(1)(b)(B)(i). Received noise levels at all other NSRs would be under the maximum permitted level.

Table 26: Modeled Operational Noise of the Facility, as Amended

NSR ID	Existing Facility Noise (dBA)	Noise from Proposed Solar Facility Components (dBA)	Combined Noise (Background + Solar) (dBA)	Combined Noise (Background + Wind/Solar) (dBA)	Change from Assumed 26 dBA Sound Level (dBA)
4	49	21	27	49	23
5	49	23	28	49	23
6	48	30	31	48	22
7	48	32	33	48	22
8	50	29	31	50	24
13	47	21	27	47	21
14	50	24	28	50	24
Source: RFA4 Exhibit Y, Table Y-6 and Table Y-7.					

The second column in Table 26 above shows the noise levels of the existing operational wind facility. Table 26 shows the combination of the combined noise with the ambient noise and noise from the wind and solar facility showing that, the additional of the solar facility does not change the noise levels of the operational facility. In other words, the addition of the noise generating equipment from the solar facility would not increase the overall noise from the facility as a whole, therefore, the additional of the solar facility components would not alter the previously approved noise levels and the certificate holder's compliance with the DEQ Noise Regulations.

Noise levels produced by equipment may vary based on the manufacturer and final configuration. To ensure the facility, as amended, complies with the 50 dBA L50 nighttime

[330] BCWAMD4Doc21-19 RFA Exhibit Y Acoustic Assessment 2025-12-10, Section 5.1. The predicted received sound levels at NSRs from the sound contributions of the solar and wind components were calculated using the following equation:

$$L_{Cumulative} = 10 \cdot log_{10}\left(10^{\left(\frac{L_{Solar}}{10}\right)} + 10^{\left(\frac{L_{BCWF}}{10}\right)}\right)$$

Where:
$L_{Cumulative}$ = Cumulative sound level from the Solar Components and BCWF (dBA)
L_{Solar} = Sound level from the Solar Components (dBA)
L_{BCWF} = Sound level from the BCWF (dBA)

maximum permissible noise level, which cannot be complied with through a noise waiver described below, the Council imposes a new condition requiring that, prior to construction of noise generating equipment, the certificate holder conduct an updated noise assessment demonstrating compliance based on final facility design and the manufacture specifications for the equipment selected. As shown below, the condition would require the cumulative analysis of noise as evaluated in this section.

> **Noise Control Condition 1 (PRE-NC-01):**
> Prior to beginning construction of noise generating equipment, the certificate holder shall provide an updated acoustic modeling analysis based on final facility design and equipment specifications demonstrating that the cumulative operational noise levels of the wind and solar facility, taking into account any necessary acoustic mitigation, will comply with the maximum permissible noise level, 50 dBA L50.
> [Final Order on AMD4]

The 10 dBA anti-ambient noise degradation standard is modeled to be exceeded at seven NSRs. Under OAR 340-035-0035(1)(b)(B)(iii), the noise levels from a solar or wind facility may increase the ambient statistical noise levels L10 and L50 by more than 10 dBA (but not above the limits specified in Table 8), if the person who owns the NSR executes a legally effective easement or real covenant that benefits the property on which the facility is located (benefits the certificate holder/operation of the facility).[331] The certificate holder relies on easements or "noise waivers" previously obtained for the operational wind facility to maintain compliance with the standard, however, copies of the easements were not provided in RFA4.[332] Because the certificate holder relies on the noise waivers from the wind facility and the addition of the solar facility components would not change the noise levels from the facility as a whole, the Council finds that if the results from the updated noise assessment under Noise Control Condition 1 shows exceedances of the ambient degradation standard at any NSR impacted by the RFA4 solar facility, the Council imposes the following condition which requires the submission of executed noise easements for the RFA4 NSRs:

> **Noise Control Condition 2 (PRE-NC-02):** Prior to construction of the solar facility, the certificate holder must submit to the Department copies of executed legally effective easement(s) or real covenant(s) for all Noise Sensitive Properties identified in RFA4 that are impacted by the facility with noise exceedance.
> [OAR 340-035-0035(1)(b)(B)(iii); Final Order on AMD4]

Based on the results of the noise modeling for operations, and subject to compliance with the new site certificate conditions, the Council finds that the facility, with the changes proposed in RFA4, would remain in compliance with OAR 340-035-0035.

[331] The easement or covenant must authorize the energy facility to increase the ambient statistical noise levels, L10 or L50 on the sensitive property by more than 10 dBA at the appropriate measurement point.
[332] BCWOPSDoc108 BCW Noise Easements, 2008-10-16. (Pre-construction compliance).

IV.A.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the existing and new site certificate conditions described above, the Council finds that the facility, with proposed changes, will comply with the applicable Noise Control Regulations in OAR 340-035-0035.

IV.B. Removal-Fill

The Oregon Removal-Fill Law (ORS 196.795 through 196.990) and Department of State Lands (DSL) regulations (OAR 141-085-0500 through 141-085-0785) require a removal-fill permit if 50 cubic yards or more of material is removed, filled, or altered within any "waters of the state."[333] The Council, in consultation with DSL, must determine whether a removal-fill permit is needed and if so, whether a removal-fill permit should be issued. The analysis area for wetlands and other waters of the state is the area within the site boundary.

IV.B.1. Findings of Fact

There is one riverine wetland (WT03) and one intermittent stream (ST04) delineated, and concurred on August 12, 2025 by DSL, to be regulated waters of the state within the proposed Solar Micrositing Area.[334, 335] The location of WT03 and ST04 are presented in Figure 18 below. These two waters of the state are located outside of the perimeter fenceline; there is also an existing road that parallels WT03, providing additional buffer and separation from the perimeter fenceline for the majority of the length of the stream.[336] Based on the preliminary facility layout, impacts to WT03 and ST04 are not anticipated. The certificate holder represents that it would maintain a minimum 50-foot avoidance buffer from any disturbance activities to the boundary of the delineated waters of the state.[337]

Changes in land use, hydrology or in DSL's regulations could occur over time; therefore, DSL's concurrence is only valid for a 5-year timeframe, or until August 12, 2030.[338] As presented in Section III.A. *General Standard of Review* of this Order, the Council imposes a construction commencement deadline 6-years from the date of approval, if approval is granted. Because the amended commencement deadline allows for construction to occur after the DSL concurrence expiration, and because it is necessary to ensure waters of the state are properly delineated and either avoided, mitigated if impacted and/or that a removal fill permit is obtained if impacts are 50 cubic yards or greater, the Council imposes a requirement that the certificate

[333] ORS 196.800(15) defines "Waters of this state." The term includes wetlands and certain other waterbodies.
[334] BCWAMD4Doc21-05 RFA Exhibit J Wetlands 2025-12-10, Attachment J-1.
[335] BCWAMD4Doc21-05 RFA Exhibit J Wetlands 2025-12-10, Attachment J-1 Wetland Delineation Concurrence 2025-0012.
[336] BCWAMD4Doc21-05 RFA Exhibit J Wetlands 2025-12-10, Figures 5.12 – 5.18.
[337] BCWAMD4Doc21-05 RFA Exhibit J Wetlands 2025-12-10, Section 4.0.
[338] BCWAMD4Doc21-05 RFA Exhibit J Wetlands 2025-12-10, Attachment J-1 Wetland Delineation Concurrence 2025-0012.

holder submit and obtain a renewed concurrence of its WD 2025-0012, if construction activities do not commence by August 12, 2030.[339]

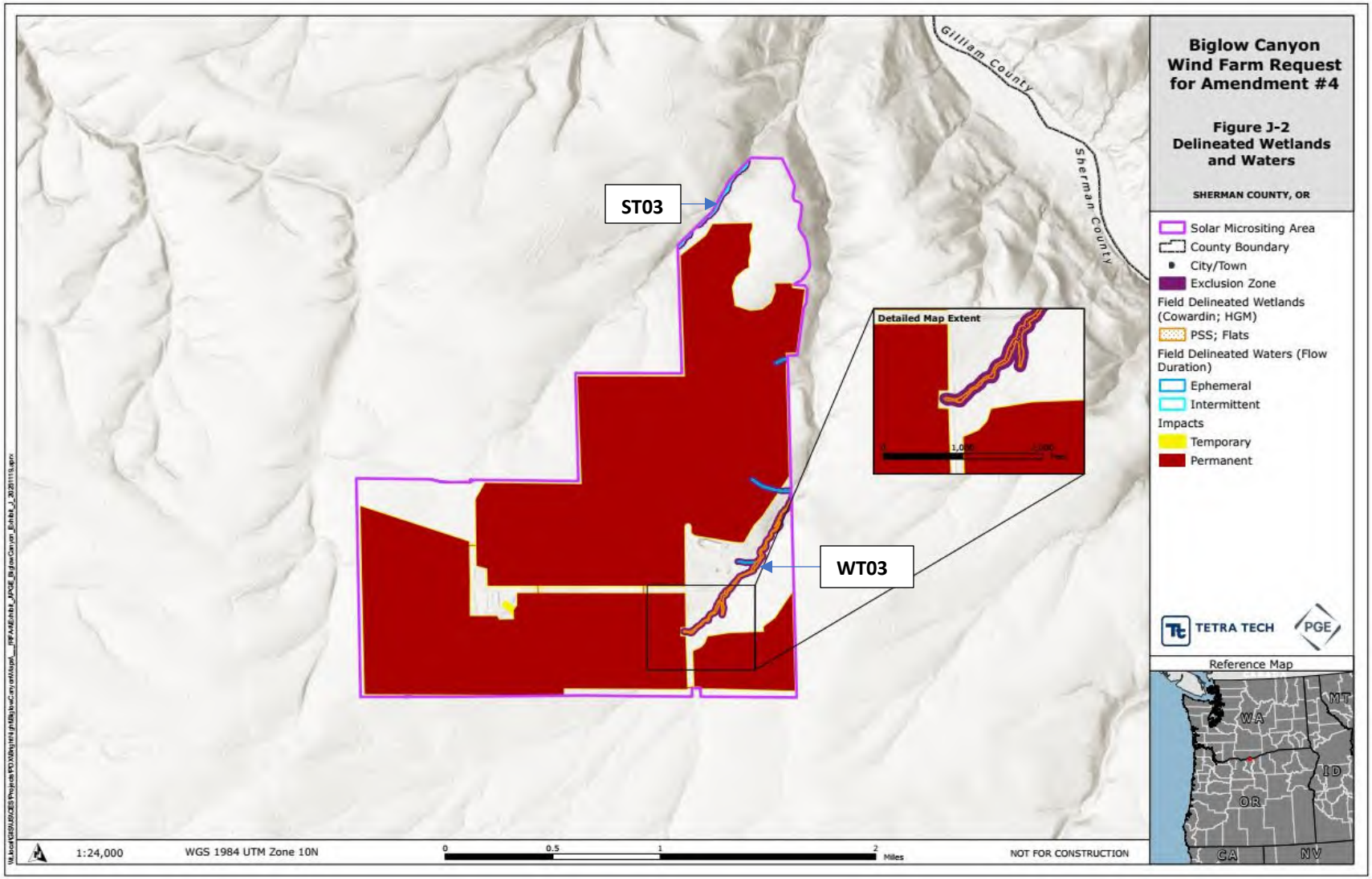
Removal-Fill Condition 1 (PRE-WL-01):

a. Certificate holder shall flag and avoid, or develop constraints mapping, identifying a 50-foot avoidance buffer from the delineated boundary of wetland WT03 and intermittent waterway ST04 (Wetland Delineation Report WD #2025-0012) to ground disturbing activities.

b. Prior to August 12, 2030, if construction of the solar facility has not yet commenced, the certificate holder must submit a renewal request to DSL for Wetland Delineation Report WD #2025-0012. Certificate holder must provide a copy of DSL reissuance to the Department, once obtained.
[Final Order on AMD4]

[339] Renewal requests is an allowable process under OAR 141-090-0045.

Figure 18: Delineated Wetlands and Waters



IV.B.2. Conclusions of Law

Based on the foregoing analysis, and subject to compliance with the proposed conditions described above, the Council finds that the facility components proposed in RFA4 will comply with the Council's Soil Protection standard.

IV.C. Water Rights

Under ORS Chapters 537 and 540 and OAR Chapter 690, the Oregon Water Resources Department (OWRD) administers water rights for appropriation and use of the water resources of the state. Under OAR 345-022-0000(1)(b), the Council must determine whether the facility, with proposed changes, would comply with the statutes and administrative rules identified in the project order. The project order identifies OAR 690, Divisions 310 and 380 (Water Resources Department permitting requirements) as the administrative rules governing use of water resources and water rights as applicable to the facility.

IV.C.1. Findings of Fact

Construction related water use is anticipated to utilize up to 28,390 gallons per day, or approximately 26 million gallons total, for dust suppression, road compaction, concrete mixing, and equipment washing. Construction water will likely be obtained from a municipal source, such as the City of Wasco, which affirmed capacity to meet the forecasted construction water demand.[340] Potable water will also be required for sanitation and drinking water, which will be obtained from the existing, exempt well or from bottled water.

As presented in Section IV.M.1 *Public Services, Water Use* of this order, the Council previously imposed Condition 74 which required that, during construction, the certificate holder and its contractors obtain water from previously permitted sources. This condition applies to the water usage associated with AMD4. However, the Council amends Condition 74 to add clarity on the documentation to be submitted to afford the Department the ability to verify that the water source has the legal ability to provide the type and quantity of water needed for construction.

During operations, up to 330,000 gallons per year may be needed for potable water and panel washing. Operational water would be obtained from the facility's existing, exempt well or a newly constructed exempt well. The existing well at the O&M building is limited to 5,000 gallons per day in order to maintain permit-exempt status from OWRD.[341] If a new well is constructed to support a new O&M building, the same 5,000 gallons per day limit applies, but applies to combined well water usage (i.e., 5,000 gallon per day limit applies to one or many wells located on any lands under common ownership).

[340] BCWAMD4Doc21-15 RFA Exhibit U Public Services 2025-12-10, Attachment U-1.

[341] Under ORS 537.545(1)(f), an exempt use of ground water includes any single industrial or commercial purpose in an amount not exceeding 5,000 gallons a day.

Under OWRD rules, a well system that uses less than 5,000 gallons of water per day for a single industrial or commercial purpose are exempt from registration, permits, or ground water right certificates. The provisions of ORS 537.545 require the owner of the land on which an exempt well is drilled to provide to the OWRD a certified map showing the exact location of the well, as well as pay a recording fee to OWRD. ORS 537.765 requires a well log containing specific information described in ORS 537.765 to be filed with the Water Resources Commission within 30-days after the completion of construction of a new exempt well is drilled, or an existing well is altered, converted, or abandoned.

If a new exempt, well is constructed, the Council imposes the following conditions:

Water Rights Condition 1 (CON-WR-01)
No later than 30 days after completing construction of any new well, the certificate holder shall provide the Department a copy of the map, well log and all other information it provided to OWRD pursuant to ORS 537.545 and ORS 537.765 to qualify for an exempt ground water use for any onsite exempt wells.
[Final Order on AMD4]

The Council previously imposed Condition 75 restricting the water use and quantity of the onsite well. This condition continues to apply; however, the Council amends the condition to require usage monitoring and recording to ensure that the 5,000 gallons per day limit for the system is not exceeded without a permit.

Amended Condition 75 (OPR-WR-01)
a. For any onsite exempt wells, ~~Before beginning operation of the facility, the certificate holder shall have in operation a well suitable for delivering water,~~ combined water usage shall not exceed~~ing~~ 5,000 gallons per day~~,~~ for domestic use at the facility's O&M buildings and~~, provided the rate of extraction would not exceed 5,000 gallons per day,~~ solar panel and blade-washing activities.
b. If new exempt wells are constructed for the solar facility, certificate holder shall install flow meters on the existing and new wells; monitor the volume of groundwater used from all onsite wells on a daily basis; maintain a record of such use; and, make the monitoring records available to the Department upon request. ~~The certificate holder shall not change the source of water for the facility's domestic use without prior Council approval.~~
[Final Order on AMD4]

The Council also amends Condition 75 to remove a requirement that the certificate holder obtain Council approval for any offsite water sources because of the changes to Condition 76.

As presented in Section IV.M.1 *Public Services, Water Use* of this order, Amended Condition 76 requires that, prior to and during operations, the certificate holder estimate its annual operational water demand and provide evidence that any offsite source has the legal ability to provide the quantity and serve the use needed by the facility.

IV.C.2. Conclusions of Law

Based on the foregoing findings of facts and new conditions, the Council concludes that the facility components proposed in RFA4 do not need a groundwater permit, surface water permit, or water right transfer.

V. FINAL CONCLUSIONS AND ORDER

Based on the findings of fact and conclusions of law included in this order, under OAR 345-027-0375, the Council finds that the preponderance of evidence on the record, including the record of RFA4 and of the *Final Order on ASC*, supports the following conclusions:

1. The facility as amended complies with the applicable substantive criteria under the Council's Land Use standard, as described in OAR 345-022-0030, from the date RFA4 was submitted.

2. The facility as amended complies with the requirements of the Energy Facility Siting Statutes ORS 469.300 to 469.520.

3. The facility as amended complies with all applicable standards adopted by Council pursuant to ORS 469.501, in effect on the date Council issues its Final Order.

4. The facility as amended complies with all other Oregon statutes and administrative rules identified in effect on the date Council issues its Final Order.

Accordingly, the Council finds that the facility as amended complies with the General Standard of Review, OAR 345-022-0000, and OAR 345-027-0375. The Council finds, based on a preponderance of the evidence on the record, that the site certificate may be amended as requested.

The Council therefore approves Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate, and issue the 4th Amended Site Certificate included as Attachment A to this Order.

Issued March 27, 2026

OREGON ENERGY FACILITY SITING COUNCIL

Cynthia R. Condon

Cynthia R. Condon (Mar 30, 2026 10:54:44 PDT)

Cindy Condon, Chair

VI. NOTICE OF RIGHT TO APPEAL

Judicial review of this Order is as provided under ORS 469.403 and 469.405(1). Notwithstanding ORS 183.482 and 183.484, judicial review of the Council's approval of a request for an amendment to a site certificate is conferred solely on the Supreme Court. Only the certificate holder or persons who submitted comments on the Request for Amendment in compliance with council rules may seek judicial review. A person who seeks judicial review is limited to the issues the person raised in their comments.

ATTACHMENTS

Attachment A: Fourth Amended Site Certificate
Attachment B-1: Reviewing Agency Comments on preliminary RFA4
Attachment B-2: Proposed Order Public Comments, Responses, Replies and Sur-replies
Attachment B-3: Department Evaluation of Public Comments
Attachment C: Draft Operations and Maintenance Framework Plan
Attachment D: Draft Comprehensive Solar Revegetation and Soil Management Plan
Attachment E: Draft Community Investment Plan
Attachment F: Draft Amended Habitat Mitigation Plan
Attachment G: Draft Construction Wildfire Mitigation Plan
Attachment H: Draft Inadvertent Discovery Plan
Attachment I: Decommissioning Cost Estimate Summary Table

Attachment A: Fourth Amended Site Certificate

ENERGY FACILITY SITING COUNCIL

OF THE STATE OF OREGON

FOURTH AMENDED SITE CERTIFICATE FOR THE BIGLOW CANYON WIND FARM

ISSUANCE DATES

Site Certificate	June 30, 2006
First Amended Site Certificate	November 3, 2006
Second Amended Site Certificate	May 10, 2007
Third Amended Site Certificate	October 31, 2008
Fourth Amended Site Certificate	March 27, 2026

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1.0 Introduction

This site certificate for the Biglow Canyon Wind Farm ("Biglow" or the "facility") is issued and executed in the manner provided by ORS Chapter 469, by and between the State of Oregon ("State"), acting by and through its Energy Facility Siting Council (the "Council"), and Portland General Electric Company ("certificate holder"). This site certificate is a binding agreement between the State, acting by and through the Council, and the certificate holder. [Amendment #1]

The findings of fact, reasoning and conclusions of law underlying the terms and conditions of this site certificate are set forth in the following documents related to the facility, which are incorporated herein by this reference: (a) the Council's Final Order in the Matter of the Application for a Site Certificate for the Biglow Canyon Wind Farm (the "Final Order on the Application"); (b) the Council's Final Order on Amendment #1; (c) the Council's Final Order on Amendment #2; (d) the Council's Final Order on Amendment #3; and (e) the Council's Final Order on Amendment #4. [Amendments #1, #2, #3 and #4]

In interpreting this site certificate, any ambiguity shall be clarified by reference to the following, in order of priority: (1) this Fourth Amended Site Certificate; (2) the Final Order on Amendment #4; (3) the Final Order on Amendment #3; (4) the Final Order on Amendment #2; (5) the Final Order on Amendment #1; (6) the Final Order on the Application; and (6) the record of the proceedings that led to the Final Orders on the Application, Amendment #1, Amendment #2, Amendment #3, and Amendment #4. [Amendments #1, #2, #3 and #4]

The terms used in this site certificate shall have the same meaning as set forth in ORS 469.300 and OAR 345-001-0010, except where otherwise stated or where the context clearly indicates otherwise.

2.0 Site Certification

A. To the extent authorized by state law and subject to the conditions set forth herein, the State authorizes the certificate holder to construct, operate and retire a wind and solar power generation facility, together with certain related or supporting facilities, at the site in Sherman County, Oregon, as described in Section 4.0 of this site certificate. ORS 469.401(1)

B. This site certificate is effective until it is terminated under OAR 345-027-0110 or the rules in effect on the date that termination is sought or until the site certificate is revoked under ORS 469.440 and OAR 345-029-0100 or the statutes and rules in effect on the date that revocation is ordered. ORS 469.401(1)

C. This site certificate does not address, and is not binding with respect to, matters that were not addressed in the Council's Final Orders on the Application, Amendment #1, Amendment #2, Amendment #3, or Amendment #4. These matters include, but are not limited to: building code compliance, wage, hour and other labor regulations, local government fees and charges, and other design or operational issues that do not relate to siting the facility (ORS 469.401(4)) and permits issued under statutes and rules for which the decision on compliance has been delegated by the federal government to a state agency other than the Council. ORS 469.503(3). [Amendments #1, #2, #3, #4]

D. Both the State and the certificate holder shall abide by local ordinances, state law, and the rules of the Council in effect on the date this site certificate is issued. In addition, upon a clear showing of a significant threat to public health, safety or the environment that requires application of later-adopted laws or rules, the Council may require compliance with such later-adopted laws or rules. ORS 469.401(2)

E. For a permit, license or other approval addressed in and governed by this site certificate, the certificate holder shall comply with applicable state and federal laws adopted in the future to the extent that such compliance is required under the respective state agency statutes and rules. ORS 469.401(2)

F. Subject to the conditions herein, this site certificate binds the State and all counties, cities and political subdivisions in Oregon as to the approval of the site and the construction, operation and retirement of the facility as to matters that are addressed in and governed by this site certificate. ORS 469.401(3)

G. Each affected state agency, county, city and political subdivision in Oregon with authority to issue a permit, license or other approval addressed in or governed by this site certificate shall, upon submission of the proper application and payment of the proper fees, but without hearings or other proceedings, issue such permit, license or other approval subject only to conditions set forth in this site certificate. ORS 469.401(3)

H. After issuance of this site certificate, each state agency or local government agency that issues a permit, license or other approval for the facility shall continue to exercise enforcement authority over such permit, license or other approval. ORS 469.401(3)

I. After issuance of this site certificate, the Council shall have continuing authority over the site and may inspect, or direct the Department to inspect, or request another state agency or local government to inspect, the site at any time in order to ensure that the facility is being operated consistently with the terms and conditions of this site certificate. ORS 469.430

3.0 Descriptions

3.1 The Wind Facility

Major Structures

The Biglow Canyon Wind Farm consists of 217 wind turbines (76 Vestas V82 1.65 MW and 141 Siemens 2.3 MWs) with an aggregate nominal nameplate generating capacity of up to 450 megawatts (MW) of electricity and an average electric generating capacity of up to 150 MW. The Vestas V82 turbines are mounted on tubular steel towers with a height of 262 feet at the hub and an overall height of 397 feet including the turbine blades. The Siemens 2.3 MW turbines are mounted on tubular steel towers with a height of 262 feet at the hub and an overall height of 413 feet including the turbine blades. The wind turbines are located on private land that the certificate holder has leased from the affected landowners.
[Final Order on ASC, AMD1, AMD2, AMD4]

Related or Supporting Facilities

The facility includes the following related or supporting facilities:

Power Collection System

Each wind turbine generates power at about 600 volts. The transformer sitting at the base of each wind turbine unit increases the voltage to 34.5 kilovolts (kV). From the transformer, power is transmitted to a central substation by means of electric cables. Most of the cables are buried three feet or more below the surface in trenches about 3 feet wide. In areas where collector cables from several turbine strings follow the same alignment, e.g., on approach to the substation, multiple sets of cables have been installed within a single trench. The facility contains approximately 75 miles of 3-wire collector cables are underground. Generally, these cables are above, below or adjacent to the fiber optic cables comprising the supervisory control and data acquisition system.

Approximately 5 miles of 34.5 kV collector cables are above ground on pole or tower structures. Poles or towers supporting aboveground segments of the power collection system are about 23 to 28 feet tall. [Final Order on ASC, AMD1, AMD2, AMD4]

Substations and Interconnection System

The substation site is a graveled, fenced area of up to 6 acres with transformers, switching equipment and a parking area. Transformers are non-polychlorinated biphenyl (PCB) oil-filled types. The facility interconnects with a new Bonneville Power Administration (BPA) system transmission line adjacent to the facility substation. [Final Order on ASC, AMD2, AMD4].

Meteorological Towers

There are 4 meteorological towers throughout the facility site to collect wind resource data. The towers are 279 feet tall. [Final Order on ASC, AMD4]

Operations and Maintenance Buildings

The site of the operations and maintenance buildings is 5 acres adjacent to the substation on Herin Lane. The O&M buildings occupy about 19,500 square feet and include office and workshop areas, control room, kitchen, bathroom, shower, utility sink, and other typical facilities. Water for the bathroom, shower and kitchen is obtained from an onsite well constructed by a licensed contractor in accordance with local and state requirements. Water use from all onsite wells may not cumulatively exceed 5,000 gallons per day, unless a permit is obtained from OWRD. Domestic wastewater generated at the O&M facility drains into an onsite septic system. A graveled parking area for employees, visitors and equipment is located adjacent to the O&M facility. [Final Order on ASC, AMD2, AMD3, AMD4]

Control System

The facility includes a supervisory control and data acquisition (SCADA) system to assist with the remote operation of the wind turbines, to collect data from each wind turbine, and to archive wind and performance data from various sources. The SCADA system is linked by means of fiber optic cables or other means of communication to a central computer in the O&M facility. [Final Order on ASC]

Access Roads

The facility includes about 41.7 miles of roads to provide access to the wind turbine strings, together with turnaround areas at the end of each wind turbine string. The roads are about 16 feet wide (possibly up to 28 feet wide in some locations) and are composed of crushed gravel with shoulders (without gravel) about 3 feet wide. [Final Order on ASC, AMD2, AMD3, AMD4]

3.2 The Solar Facility

The solar facility includes up to 125 MW solar photovoltaic power generation components; a battery energy storage system (BESS) with up to 500 megawatt-hours (MWh) of discharge capacity; and other related or supporting facilities.

The approximate dimensions and specifications approved to be constructed and operated are presented in Table 1 below. The final design of the solar facility must substantially comply with these dimensions and specifications.

Table 1: Solar Facility Component Summary

Component and Design Standard	No.	Unit
Site Boundary		
Solar Micrositing Area[1]	1,924	acres
Max. Permanent footprint[1]	1,445	acres
Min. setback from turbines	520	feet
Maximum nominal generating capacity	125	MW
Modules (590w module with monocrystalline solar cells, antireflective coating, metal frame, and factory installed wire connectors)		
Approx. number of modules	264,836	modules
Approx. module dimensions (W x L)	45x90	inches
Tracking System		
Mounting height	5	feet AGL
Avg. Height at full tilt	7.5 to 10	feet AGL
Max. Height at full tilt	15	feet AGL
Steel Posts (hollow, screw, or pile-type)		
Approx. Total Number	32,621	posts
Avg. Installation Depth	7 to 15	Feet BGL
Power Conversion Stations (Inverter with integrated Step-Up Transformer)		
Approx. Total Number	33	each
Noise Level	92	dBA (Broadband)
Transformer Oil-Containing Capacity (each)	700	gallons
Battery Energy Storage System (Lithium-ion)		
BESS Yard Site Size	5	acres
Battery Containers (of Battery Containers on foundations with integrated inverters, HVAC and fire suppression systems, SCADA		
Max. Number Enclosures / Inverters	153	Units
Approx. Dimensions (HxWxL)	10 x 5.5 x 29	Feet
BESS Unit and Inverter Noise Level	84	dBA (Broadband)
BESS Inverters	153	each
BESS Transformers	39	each
Transformer Height	10	feet
BESS Transformer Noise Level	80	dBA (Broadband)
Transformer Oil-Containing Capacity	700	Gallons/each
Related or Supporting Facility Components		
34.5 kV Collection System		
Collector line length, underground	52	miles
Temporary Impact Corridor (limit)	50	feet
Collector Substation		
Includes GSU transformers, switches, breakers, surge arrestors, metering equipment, grounding, and associated control wiring. Certain equipment is enclosed in a control building.		

Table 1: Solar Facility Component Summary

Component and Design Standard	No.	Unit
Site size	4.2	acres
Generator Step-Up Transformers	1	each
Transformer Oil-Containing Capacity	10,000-15,000	gallons
Transformer Noise Level	106	dBA
Control building dimensions	40x15	Feet
Height of structures	8 to 25	feet
230 kV Transmission Line		
Length	1900	feet
Corridor Width (contains all disturbance)	150	Feet
Corridor Area	2	acres
Steep Monopole Support Structures	3	each
Height of Support Poles	80	feet
O&M Facility		
Steel building/prefabricated office structure with adjacent storage enclosures and parking areas, well, septic system.		
Building Dimensions	60 X 12	foot
Site size	3	Acres
400 ft^2 Storage Containers	3	Each
Internal Access Roads		
Length (graveled)	10.5	miles
Width	16-20	feet
Vegetation Management Buffer (both sides)	10	feet
Perimeter Fence		
Total Length	92,400	Feet
Height	8	Feet
Access gates	5	each
Clear, brush free Area (10-feet from both exterior and interior)	20	Feet
Temporary Construction Areas		
Site Size	8.7	Acres
1,000-gal aboveground fuel storage tanks	3	Each

Acronyms: dBA = A-weighted decibels; HVAC = heating, ventilation and air conditioning; kV = kilovolt; OH = overhead; O&M = operations and maintenance; SCADA = supervisory, control and data acquisition
Sources: RFA4, Table 1.
Notes:

1. Solar facility components would permanently occupy up to 1,445 acres within the 1,924-acre Solar Micrositing Area . Area within the perimeter fenceline of the solar facility is considered a permanent impact under the Fish and Wildlife Habitat standard; however, impacts within the perimeter fenceline to soils, vegetation and noxious weeds are not considered permanent under the Soil Protection and Land Use standards and must be minimized and mitigated, as discussed in applicable sections in this order.

[AMD4]

Solar Photovoltaic Power Generation Facilities

The solar components have a nameplate generating capacity of up to 125 MW. The addition of the solar and battery components increases the peak generating capacity of the facility, as a whole, to 575 MW.

Solar photovoltaic power generation facilities typically consist of rows of photovoltaic modules mounted on a racking system that is either fixed in place or able to track the sun on one or more axes. The racking system is typically supported by steel posts that are either driven directly into the ground or installed into pre-drilled holes. The low voltage DC output of the photovoltaic modules is collected with a cabling system and transmitted to inverter and transformer units which convert the output of several rows of modules to 35-kV AC power that can be collected via the facility's electrical collector system. The ground below and surrounding the solar arrays would mostly be vegetated, with gravel where needed for maintenance and access roads or where gravel already exists. [Final Order on AMD4]

Modules

Modules typically consist of mono or poly-crystalline solar cells, antireflective coating, non-specular, galvanized steel racks, and factory installed wire connectors. The modules will be connected in series to form strings which are then collected via combiners, cables, and switchboards. The type and number of modules required will be determined at final facility design based on the technology available at that time. The certificate holder assumes use of N-type monocrystalline solar cells. [Final Order on AMD4]

Tracking System

Strings of modules will be mounted on single-axis tracker systems to optimize electricity production by rotating the solar modules to follow the path of the sun throughout the day. Each set of modules is expected to be mounted approximately 5 feet off the ground on a single-axis tracker that rotates 60 degrees to the east and west. At maximum tilt, the top edge of the modules is expected to be 7.5 to 10 feet above ground level with a maximum of 15 feet where topography curves under a row. The tracker system and associated posts will be designed to withstand wind, snow, and seismic loads anticipated at the site. [Final Order on AMD4]

Posts and Foundations

Each tracker row will be supported by multiple steel posts. Hollow steel sections, screw piles, or pile-type posts may be used. Posts will typically be installed 7 to 15 feet below the ground surface and extend approximately 5 feet above grade. Exterior posts at the end of tracker rows are typically installed to greater depth to withstand inclement weather including high wind conditions. In some soil conditions, concrete grouting may be used as backfill, as required. The total number of posts and foundation installation methods required will be determined during

detailed design of the tracker system and future geotechnical investigations. [Final Order on AMD4]

Cabling

Cables will be used to collect and aggregate the DC output of multiple tracker rows for transmission to the inverter/inverter step-up transformer units described below. Cabling may be installed underground along tracker rows and aggregated using combiner boxes or installed aboveground in aluminum trays or using harnessing if a trunk bus system is used for aggregation. Either system requires a similar amount of cabling. [Final Order on AMD4]

Power Conversion Stations (PCS)

Integrated inverter and step-up transformer systems called Power Conversion Stations (PCS), or similar systems, will be installed throughout the solar arrays to convert the low-voltage DC output of the modules to 34.5 kV AC power that can be transmitted via the electrical collector system. Each transformer will contain approximately 700 gallons of mineral oil. Each PCS will be installed on a concrete pad or pile-supported foundation. The inverter specifications will comply with the applicable requirements and standards of the National Electric Code and Institute of Electrical and Electronics Engineers standards. [Final Order on AMD4]

Battery Energy Storage Systems

The BESS will be AC-coupled and located adjacent to the collector substation on a fenced 5-acre site.

The BESS will consist of modular enclosures that hold lithium-ion batteries, battery management systems, integrated inverters, and fire prevention systems. Cooling units will be placed either on top of or along the side of the enclosures may include separate chiller plants. Each enclosure will be placed on a concrete pad or pile-supported foundation. The enclosures will be manufactured, assembled, and inspected off-site prior to installation. Each enclosure will be installed on a concrete pad or pile foundation.

The BESS will use lithium-ion (Li-ion) batteries. Li-ion batteries are a type of rechargeable battery where lithium ions, suspended in a gel or liquid electrolyte, move from negative to positive electrodes and back when recharging. A Li-ion battery typically consists of a modular unit containing multiple cells, which are hermetically sealed pouches that serve as primary containment for the electrolyte solution. Modules are placed in anchored racks and wired into strings, with each enclosure containing multiple battery strings. Each enclosure may contain up to 10,000 cells.

Lithium-ion batteries and electrolyte are typically considered to be hazardous materials due to their flammability and potential for chemical reaction. Electrolyte can only escape (as vapor) in

the unlikely case that a battery module fails, and while the enclosure itself provides additional containment in the event of a module failure, venting may be required in the event of a fire or other emergency. Due to the risks, the U.S. Department of Transportation and U.S. Environmental Protection Agency also require special handling when transporting or disposing of lithium-ion batteries.

Initially, the BESS will include up to 153 modular enclosures; however, because battery performance degrades over time additional batteries and associated equipment will be periodically augmented as needed to maintain the design capacity of the system. Approximately 183 enclosures will be installed at the site over the life of the facility. [Final Order on AMD4]

BESS Transformers

The BESS includes up to 39 transformers to increase the output voltage from the inverters integrated into the BESS enclosures (typically 660 volts) to the substation feed voltage (34.5-kilovolt [kV] AC). The transformers are anticipated to be approximately 8 to 10 feet in height and will be installed on a concrete pad or pile-supported foundation. Each transformer will contain approximately 700 gallons of mineral oil for cooling. Oils needed for maintenance will be delivered by a licensed maintenance contractor on an as-needed basis, and no substantial quantities will be stored on-site. [Final Order on AMD4]

BESS Yard

The BESS facilities will be located in a fenced, graveled yard, adjacent to the collector substation discussed below. The total area expected to be occupied by the BESS yard is approximately 5 acres. [Final Order on AMD4]

<u>Other Related or Supporting Facilities</u>

34.5 kV Electrical Collection System

The output of the ISU and BESS transformers will be aggregated and transmitted to the collector substations via underground 34.5-kV collector lines. Up to 52 miles of collector line will be installed within the solar array fence lines. The collector lines will be buried to a minimum of 3 feet at lateral depth, with junction splice boxes positioned intermittently along the lines for maintenance access. [Final Order on AMD4]

Collector Substation

A new collector substation will be constructed to aggregate and convert the 34.5 kV power transmitted through the electrical collection system to 230-kV power that can be transmitted to the grid from the existing Biglow Canyon Substation.

The substation will include a generator step-up (GSU) transformer and other electrical equipment including, but not limited to switches, breakers, surge arrests, metering equipment, grounding, and associated control wiring. Certain equipment, including breakers and transformer equipment, will be enclosed in a control building. The GSU transformer is expected to be a ground-mounted unit constructed on a concrete pad. The transformer will contain between 10,000 and 15,000 gallons of mineral or seed oil for cooling and insulation.[1] To minimize the potential for spills, the GSU transformer will be equipped with a secondary containment trap sized to contain the amount of oil inside the transformer plus an additional volume for deluge water and required freeboard. [Final Order on AMD4]

230-kV Overhead Transmission Line

The solar facility will include an approximately 1900-foot long 230 kV overhead transmission line connecting the Collector Substation to the existing Biglow Canyon Substation. The transmission line will be supported by three 80-foot steel monopole support structures. [Final Order on AMD4]

O&M Building

A new O&M facility will be constructed in the solar area. The O&M facility will include a steel building or prefabricated office structure with facilities for staff use; enclosures for storing spare parts and maintenance equipment; and space for parking service staging zone and clearance areas. The O&M facility will have a septic system, and a septic system permit will be obtained from the Sherman County Public Health Department. Small quantities of lubricants, degreasers, herbicides, or other chemicals may be stored at the O&M facilities. In addition, up to approximately 4,080 spare modules may be stored at the O&M facilities for replacement over the life of the solar components. [Final Order on AMD4]

Communications and SCADA System

The SCADA for the solar facility will be integrated with the SCADA for the wind facility, allowing facility operating parameters, power output, and other variables such as meteorological conditions to be constantly monitored from the facility control rooms and remote locations. [Final Order on AMD4]

Internal Access Roads

Approximately 10.5 miles of new access roads will be constructed within the solar array areas to provide access to the facility components. In accordance with Oregon Fire Code Section 503, roads needed for emergency access will be approximately 20 feet wide and designed to meet load requirements for all equipment and emergency access needs. Other roads would be

[1] Consistent with federal regulations, the oils used in transformers do not contain polychlorinated biphenyls or compounds listed as extremely hazardous by the U.S. Environmental Protection Agency.

approximately 16 feet wide. All roads would have a 10-foot buffer maintained with low-growing, fire resistant vegetation on either side. [Final Order on AMD4]

Perimeter Fencing, and Gates

Each solar array, with any collocated related or supporting facility components, will be enclosed by seven-foot-tall chain-link perimeter fencing with one foot of razor or barbed wire at the top. Alternatively, wire mesh or similar perimeter fencing up to 8 feet in height may be used. Fences will be constructed and grounded in accordance with NESC Rule 110. Vehicle access to the facility will be provided by lockable vehicle gates. Additional gates may be installed for emergency exit or removal of wildlife. [Final Order on AMD4]

Temporary *Construction Areas*

Up to 8.7 acres will be used as a temporary construction area to store supplies and equipment and facilitate the delivery and assembly of materials and equipment during construction. Additional temporary construction areas may be utilized within the Solar Micrositing Area . The area will consist of a crushed gravel surface that will be removed following construction, crushed gravel surface that will remain following construction because that was the pre-existing surface condition, or vegetation that is left in place for which the need to revegetate will be evaluated following construction. Nonreportable quantities of herbicides, insecticides, paint, cleaners, solvents, or other chemicals may be used and stored in the temporary construction areas. Up to three aboveground 1,000-gallon fuel tanks may be installed in an area within the temporary construction area that provides secondary containment. Concrete for construction of foundations will come directly from licensed suppliers and there would not be an on-site batch plant installed at the temporary construction area. [Final Order on AMD4]

Solar Micrositing Area

The solar facility components are approved to be located within a 1,924-acre Solar Micrositing Area, as presented in Figure 1.

The existing Biglow Canyon Substation, which will be the point of interconnection for the solar facility components to the regional transmission grid, is located within the Solar Micrositing Area. [Final Order on AMD4]

3.3 Location of The Facility

The facility is located about 2.5 miles northeast of the City of Wasco in Townships 1 and 2 North, Ranges 17 and 18 East, Willamette Meridian, Sherman County, Oregon. The Solar Micrositing Area is located approximately 4.8 miles northeast of the Town of Wasco. [Final Order on ASC, AMD4]

The conditions of this Site Certificate are organized and coded to indicate the phase of implementation, the standard the condition is required to satisfy, and an identification number (1, 2, 3, etc.).[2] The table below presents a "key" for phase of implementation:

Key	Type of Conditions/Phase of Implementation
GEN	General Conditions: Design, Construction and Operation
PRE	Pre-Construction Conditions
CON	Construction Conditions
PRO	Pre-Operational Conditions
OPR	Operational Conditions
RET	Retirement Conditions

The facility is approved to be constructed in phases. Therefore, preconstruction and construction conditions include language allowing for the condition to be satisfied based on the applicability of the requirements to the location or component to be constructed, rather than the entirety of the facility, components or site not yet constructed or impacted.

4.0 Conditions Applicable to the Entire Facility

The conditions listed in this section are based on representations in the site certificate application and supporting record. The Council deems these representations to be binding commitments made by the certificate holder. These conditions are required under OAR 345-025-0006(10).

This section includes other specific facility conditions the Council finds necessary to ensure compliance with the siting standards of OAR Chapter 345, Divisions 22 and 24, and to protect the public health and safety.

[2] The identification number is not representative of an order that conditions must be implemented; it is intended only to represent a numerical value for identifying the condition.

4.1 General (GEN) Conditions: Design, Construction and Operations

Condition Number	General (GEN) Conditions
STANDARD: GENERAL STANDARD OF REVIEW (GS) [OAR 345-022-0000]	
GEN-GS-01	The Council shall not change the conditions of the site certificate except as provided for in OAR Chapter 345, Division 27. [OAR 345-027-0020(1); Final Order on ASC, Condition 101; AMD4]
GEN-GS-02	Notwithstanding OAR 345-027-0353(1), an amendment of the site certificate is required if the proposed change would increase the electrical generation capacity of the facility or would increase the number of wind turbines or the dimensions of existing wind turbines. [Final Order on ASC, Condition 14; AMD4]
GEN-GS-03	The certificate holder shall design, construct, operate and retire the facility: a. Substantially as described in the site certificate; b. In compliance with the requirements of ORS Chapter 469, applicable Council rules, and applicable state and local laws, rules and ordinances in effect at the time the site certificate is issued; and c. In compliance with all applicable permit requirements of other state agencies. [OAR 345-027-0020(3); Final Order on ASC, Conditions 13, 103; AMD4]
GEN-GS-04	If the certificate holder becomes aware of a significant environmental change or impact attributable to the facility, the certificate holder shall, as soon as possible, submit a written report to the Department describing the impact on the facility and any affected site certificate conditions. [OAR 345-027-0028; Final Order on ASC, Condition 120; AMD3; AMD4]
GEN-GS-05	The certificate holder shall prevent the development of any conditions on the site that would preclude restoration of the site to a useful, non-hazardous condition to the extent that prevention of such site conditions is within the control of the certificate holder. [OAR 345-027-0020(7); Final Order on ASC, Condition 107; AMD4]
STANDARD: Organizational Expertise (OE) [OAR 345-022-0010]	
GEN-OE-01	Before any transfer of ownership of the facility or ownership of the site certificate holder, the certificate holder shall inform the Department of the proposed new owners. The requirements of OAR 345-027-0400 apply to any transfer of ownership that requires a transfer of the site certificate. [OAR 345-027-0020(15); Final Order on ASC; Condition 115; AMD3; AMD4]
GEN-OE-02	The certificate holder shall contractually require all contractors and subcontractors involved in the construction or operation of the facility to comply with all applicable laws and regulations and with the terms and conditions of the site certificate. Such contractual provisions shall not operate to relieve the certificate holder of responsibility under the site certificate. Any notice of violation, civil penalties, or other enforcement action issued under the site certificate will be issued to the certificate holder.

Condition Number	General (GEN) Conditions
	[Final Order on ASC, Condition 2; AMD4]
GEN-OE-03	The certificate holder shall obtain all necessary state and local permits or approvals required for construction, operation and retirement of the facility or ensure that its contractors obtain necessary state and local permits or approvals. [Final Order on ASC, Condition 15; AMD4]
GEN-OE-04	The certificate holder shall, as soon as reasonably possible: a. Report incidents or circumstances that may violate the terms or conditions of the site certificate, terms or conditions of any order of the Council, to the Department. In the report to the Department, the certificate holder shall provide all pertinent facts including an estimate of how long the conditions or circumstances existed, how long they are expected to continue before they can be corrected, and whether the conditions or circumstances were discovered as a result of a regularly scheduled compliance audit; b. Initiate and complete appropriate action to correct the conditions or circumstances and to minimize the possibility of recurrence; c. Submit a written report within 30 days of discovery to the Department. The report must contain: i. A discussion of the cause of the reported conditions or circumstances; ii. The date of discovery of the conditions or circumstances by the responsible party; iii. A description of immediate actions taken to correct the reported conditions or circumstances; iv. A description of actions taken or planned to minimize the possibility of recurrence; and v. For conditions or circumstances that may violate the terms or conditions of a site certificate, an assessment of the impact on the resources considered under the standards of OAR Chapter 345 Divisions 22 and 24 as a result of the reported conditions or circumstances. d. Upon receipt of a written report submitted under this condition, the Department may review the facility record for incidents or circumstances related to public health and safety, the environment, or other resources protected under Council standards. If these incidences are determined by the Department to impact the adequacy of the facility decommissioning cost, the Department or Council may adjust the contingencies identified in Final Order on RFA4, Attachment I and shall request and receive an updated bond or letter of credit from certificate holder in the adjusted amount. [Final Order on ASC, Condition 4; AMD4]
GEN-OE-05	The certificate holder shall notify the Department of Energy within 72 hours of any occurrence involving the facility if: a. There is an attempt by anyone to interfere with its safe operation;

Condition Number	General (GEN) Conditions
	b. A natural event such as an earthquake, flood, tsunami or tornado, or a human-caused event such as a fire or explosion affects or threatens to affect the public health and safety or the environment; or c. There is any fatal injury at the facility. [OAR 345-026-0170; Final Order on ASC, Condition 125; AMD3, AMD4]
GEN-OE-06	The certificate holder and the Department of Energy shall exchange copies of all correspondence or summaries of correspondence related to compliance with statutes, rules and local ordinances on which the Council determined compliance, except for material withheld from public disclosure under state or federal law or under Council rules. The certificate holder may submit abstracts of reports in place of full reports; however, the certificate holder shall provide full copies of abstracted reports and any summarized correspondence at the request of the Department. [OAR 345-026-0105; Final Order on ASC, Condition 124, AMD3, AMD4]
GEN-OE-07	During construction, operation or retirement of the facility, the certificate holder shall notify the Department within 72 hours of any accidents that may result in public health and safety concerns, including mechanical failures on the site associated with construction or operation of the facility. [Final Order on ASC, Condition 37; AMD4]
STANDARD: Soil Protection (SP) [OAR 345-022-0022]	
GEN-SP-01	The certificate holder shall use hazardous materials in a manner that protects public health, safety and the environment and shall comply with applicable local, state and federal environmental laws and regulations. [Final Order on ASC, Condition 80; AMD4]
STANDARD: Land Use (LU) [OAR 345-022-0030]	
GEN-LU-01	The certificate holder shall ensure that no equipment or machinery is parked or stored on any county road except while in use. [Final Order on ASC, Condition 18; AMD4]
STANDARD: Retirement and Financial Assurance (RF) [OAR 345-022-0050]	
GEN-RF-01	a. Prior to construction of the facility, or any component of the facility, the certificate holder shall submit to the State of Oregon, through the Council, a bond or letter of credit in a form and amount satisfactory to the Council to restore the site to a useful, non-hazardous condition. The certificate holder shall maintain a bond or letter of credit in effect at all times until the facility has been retired. The Council may specify different amounts for the bond or letter of credit during construction and during operation of the facility. b. The certificate holder shall annually adjust all bonds or letters of credit submitted in compliance with this condition to present value using the U.S. Gross Domestic Product Implicit Price Deflator, Chain-Weight, as published in the Oregon Department of Administrative Services' Oregon Economic and Revenue Forecast or by any successor agency (the "Index"). If at any time the Index is no

Condition Number	General (GEN) Conditions
	longer published, the Department shall select a comparable calculation to adjust the amount to present value. [Final Order on ASC, Condition 108; AMD3; AMD4]
GEN-RF-02	For the wind energy facility, the bond or letter of credit required under Condition GEN-RF-01 shall be in an amount approved by the Department and based on the costs shown in Table 1 of the Final Order on Amendment #3. The certificate holder shall adjust the amounts of all bonds or letters of credit submitted in compliance with this condition to present value as of the date of issuance, using the following calculation and subject to approval by the Department: a. Adjust the Subtotal (in 2005 dollars) to present value, using the U.S. Gross Domestic Product Implicit Price Deflator, Chain-Weight, as published in the Oregon Department of Administrative Services' Oregon Economic and Revenue Forecast or by any successor agency (the "Index"). If at any time the Index is no longer published, the Council shall select a comparable calculation to adjust 2005 dollars to present value. b. Add 1 percent of the adjusted Subtotal (i) for the adjusted performance bond amount to determine the adjusted Gross Cost. c. Add 10 percent of the adjusted Gross Cost (ii) for the adjusted administration and project management costs and 10 percent of the adjusted Gross Cost for the adjusted future developments contingency. d. Add the adjusted Gross Cost (ii) to the sum of the percentages (iii) and round the resulting total to the nearest $1,000 to determine the adjusted financial assurance amount. [Final Order on ASC, Condition 9, AMD2, AMD3, AMD4]
GEN-RF-03	For the solar facility, the bond or letter of credit required under Condition GEN-RF-01 shall be in an amount approved by the Department and based on the unit costs, markups, and contingencies shown in Attachment J of the Final Order on RFA4, as updated under Condition PRE-RF-01. [Final Order on AMD4, Retirement and Financial Assurance Condition 1]
GEN-RF-04	If the certificate holder elects to use a bond to meet the requirements of Condition GEN-RF-01, the certificate holder shall ensure that the surety is obligated to comply with the requirements of applicable statutes, Council rules and this site certificate when the surety exercises any legal or contractual right it may have to assume construction, operation or retirement of the facility. The certificate holder shall also ensure that the surety is obligated to notify the Council that it is exercising such rights and to obtain any Council approvals required by applicable statutes, Council rules and this site certificate before the surety commences any activity to complete construction, operate or retire the facility. [Final Order on ASC, Condition 10, AMD4]
STANDARD: Fish and Wildlife Habitat (FW) [OAR 345-022-0060]	

Condition Number	General (GEN) Conditions
GEN-FW-01	The certificate holder shall design and construct all aboveground transmission line support structures following the current practices suggested by the Avian Powerline Interaction Committee at the time of design. [Final Order on ASC, Condition 58; AMD4]
STANDARD: Siting Standards for Transmission Lines (TL) [OAR 345-024-0090]	
GEN-TL-01	The certificate holder shall design all overhead transmission lines so that alternating current electric fields shall not exceed 9 kV per meter at one meter above the ground surface in areas accessible to the public. [Final Order on ASC, Condition 53; AMD4]
GEN-TL-02	The certificate holder shall design all overhead transmission lines so that induced voltages resulting from the transmission lines are as low as reasonably achievable. [Final Order on ASC, Condition 54; AMD4]
STANDARD: Other – Removal-Fill (WL)	
GEN-WL-01	The certificate holder shall avoid any disturbance, including the placement of poles for the collector line, within 25 feet of the stream channel in the area identified as Crossing G in the Request for Amendment #2 and within a wetland area identified as "POWHX" on Figure J-1 of the site certificate application. [Final Order on AMD2, Condition 127; AMD4]
GEN-WL-02	The certificate holder shall avoid any disturbance within 25 feet of the stream channel in the area identified as "Stream Crossing H" in the Request for Amendment #3 and shall install any collector line through the area by tunneling or drilling beneath the stream channel. [Final Order on AMD3, Condition 129; AMD4]

4.2 Operational (OPR) Conditions

Condition Number	Operational (OPR) Conditions
STANDARD: Organizational Expertise (OE) [OAR 345-022-0010]	
OPR-OE-01	a. By April 30 of each year after beginning construction, the certificate holder shall submit an annual report to the Department. The Council Secretary and the certificate holder may, by mutual agreement, change the reporting date. b. In the annual report, the certificate holder shall include the following information for the calendar year preceding the date of the report: i. Facility Status: An overview of site conditions, the status of facilities under construction, and a summary of the operating experience of facilities that are in operation. In this section of the annual report, the certificate holder shall describe any unusual events, such as earthquakes, extraordinary windstorms, major accidents or the like that occurred during the year and that had a significant adverse impact on the facility. ii. Reliability and Efficiency of Power Production: For electric power plants, the plant availability and capacity factors for the reporting year. The certificate holder shall describe any equipment failures or plant breakdowns that had a significant impact on those factors and shall describe any actions taken to prevent recurrence of such problems; iii. Status of Surety Information: Documentation demonstrating that bonds or letters of credit as described in the site certificate are in full force and effect and will remain in full force and effect for the term of the next reporting period; iv. Monitoring Report: A list and description of all significant monitoring and mitigation activities performed during the previous year in accordance with site certificate terms and conditions, a summary of the results of those activities, and a discussion of any significant changes to any monitoring or mitigation program, including the reason for any such changes. v. Compliance Report: A description of all instances of noncompliance with a site certificate condition. For ease of review, the certificate holder shall, in this section of the report, use numbered subparagraphs corresponding to the applicable sections of the site certificate. vi. Facility Modification Report: A summary of changes to the facility that the certificate holder has determined do not require a site certificate amendment in accordance with OAR 345-027-0350. c. To the extent that information required by this condition is contained in reports the certificate holder submits to other state, federal or local agencies, the certificate holder may submit excerpts from such other reports to satisfy this condition. The Council reserves the right to request full copies of such excerpted reports.

Condition Number	Operational (OPR) Conditions
	[OAR 345-026-0080; Final Order on ASC, Condition 122; AMD3; AMD4]
STANDARD: Soil Protection (SP) [OAR 345-022-0020]	
OPR-SP-01	During operation of the facility, the certificate holder may engage in wind turbine blade and solar panel washing activities but shall ensure that these activities do not cause runoff of washwater from the site or discharges to surface waters, storm sewers or dry wells. The certificate holder shall not use acids, bases or metal brighteners with the wash water. The certificate may use biodegradable, phosphate-free cleaners sparingly. [Final Order on ASC, Condition 88; AMD2; AMD4]
OPR-SP-02	a. If a spill or release of a reportable quantity of fuel, oil, or other hazardous materials occurs during construction or operation of the facility, the certificate holder shall notify the Department within 72 hours. b. The certificate holder shall clean up any spill or release of hazardous materials and dispose of any contaminated soil or other materials according to applicable regulations. c. The certificate holder shall ensure that spill kits containing items such as absorbent pads are located on equipment and storage facilities to respond to accidental spills and shall instruct employees handling hazardous materials in the proper handling, storage and cleanup of these materials. [Final Order on ASC, Condition 81; AMD4]
STANDARD: Land Use (LU) [OAR 345-022-0030]	
OPR-LU-01	During operation of the facility, the certificate holder, in cooperation with landowners, shall avoid impact on cultivated land to the extent reasonably possible when performing facility repair and maintenance activities. [Final Order on ASC, Condition 22; AMD4]
STANDARD: Retirement and Financial Assurance (RF) [OAR 345-022-0050]	
OPR-RF-01	During operation of the facility, the certificate holder shall: a. Annually adjust the amount of bonds or letters of credit provided to satisfy Condition GEN-RF-01 to present dollar value, as determined by the Department. The Department shall adjust to present value using the U.S. Gross Domestic Product Implicit Price Deflator, Chain-Weight, as published in the Oregon Department of Administrative Services' Oregon Economic and Revenue Forecast or by any successor agency (the "Index"). If at any time the Index is no longer published, the Department shall select a comparable calculation to adjust the amount to present value. b. Incorporate any additional decommissioning costs for proposed facility changes which have been determined by the Department not to require a site certificate amendment. c. The Department and Council reserve the right to adjust the contingencies, as appropriate and necessary to protect public health and safety or the environment

Condition Number	Operational (OPR) Conditions
	and ensure the certificate holder's bond or letter of credit is sufficient to restore the site to a useful, non-hazardous condition. [Final Order on AMD4, Retirement and Financial Assurance Condition 3]
STANDARD: Fish and Wildlife Habitat (FW) [OAR 345-022-0060]	
OPR-FW-01	The certificate holder shall conduct wildlife monitoring and mitigation in accordance with the Wildlife Monitoring and Mitigation Plan that is incorporated in the Final Order on Amendment #2 as Attachment A and as may be amended from time to time. [Final Order on ASC, Condition 61; AMD2; AMD4]
OPR-FW-02	For the life of the project, the certificate holder shall provide to the appropriate staff of the Confederated Tribes of the Warm Springs Reservation of Oregon the same annual mitigation and monitoring reports it submits to the Department. [Final Order on ASC, Condition 64; AMD4]
OPR-FW-03	For the life of the project, the certificate holder shall consult annually with the appropriate staff of the Confederated Tribes of the Warm Springs Reservation of Oregon to discuss noxious weed or other issues that may arise from the close proximity of the facility site and tribal lands. The certificate holder shall provide a summary of that consultation in the annual report it provides to the Department. [Final Order on ASC, Condition 65; AMD4]
STANDARD: Public Services (PS) [OAR 345-022-0110]	
OPR-PS-01	During operation of the facility, for any water needed from offsite sources, the certificate holder and its contractors shall: a. Identify all water-related needs and estimate daily and annual water demand for facility operations. b. Provide evidence such as a contract or purchase agreement demonstrating that adequate water supply to meet facility operational demand has been secured and that water for all operational activities will be legally obtained by service providers or third-party permits. [Final Order on ASC, Condition 76; AMD4]
OPR-PS-02	During operation of the facility, the certificate holder shall develop and implement a site health and safety plan that informs on-site employees and others what to do in case of an emergency and that includes the locations of fire extinguishers and nearby hospitals, important telephone numbers, and first aid techniques. [Final Order on ASC, Condition 47]
STANDARD: Waste Minimization (WM) [OAR 345-022-0120]	
OPR-WM-01	During operation of the facility, the certificate holder shall discharge sanitary wastewater generated at the O&M buildings to licensed on-site septic systems in compliance with county permit requirements. The certificate holder shall design the septic systems with a capacity that is less than 2,500 gallons per day. [Final Order on ASC, Condition 83; AMD3; AMD4]
OPR-WM-02	During operation of the facility, the certificate holder shall implement a waste management plan that includes but is not limited to the following :

Condition Number	Operational (OPR) Conditions
	a. The format, content and frequency of employee trainings to minimize the generation of solid waste, recycle materials, and properly handle and dispose of electronic wastes and hazardous materials; b. Identify names and locations of licensed haulers and facilities that will be used for the following, including associated collection and hauling protocols and requirements: i. Recycling paper products, metals, glass and plastics, and other recyclable materials; ii. Disposing non-recyclable, nonhazardous waste for transport to a landfill; c. Identify a procedure or process for evaluating whether photovoltaic modules, batteries, or other facility components are considered hazardous waste under state or federal regulations; d. Identify procedures for the segregation of recyclable materials, nonhazardous waste, and hazardous waste sources for transport and disposal by a licensed hauler specializing in the proper recycling or disposal of the wastes; e. Identify inspection and recordkeeping procedures for waste handling, disposal and recycling; and f. Include a provision allowing for updates of the plan, subject to the Department review and approval. [Final Order on ASC, Condition 87; AMD4]
STANDARD: Other – Water Rights (WR)	
OPR-WR-01	a. For any onsite exempt wells, combined water usage shall not exceed 5,000 gallons per day for domestic use at the facility's O&M buildings and solar panel and blade-washing activities. b. If new exempt wells are constructed for the solar facility, the certificate holder shall install flow meters on the existing and new wells; monitor the volume of groundwater used from all onsite wells on a daily basis, maintain a record of such use and make the monitoring records available to the Department upon request. [Final Order on ASC, Condition 75; AMD3, AMD4]

4.3 Retirement (RET) Conditions

Condition Number	Retirement (RET) Conditions
STANDARD: Retirement and Financial Assurance (RF) [OAR 345-022-0050]	
RET-RF-01	a. The certificate holder shall retire the facility if the certificate holder permanently ceases construction or operation of the facility. The certificate holder shall retire the facility according to a final retirement plan approved by the Council, as described in OAR 345-027-0110. The certificate holder shall pay the actual cost to restore the site to a useful, non-hazardous condition at the time of

Condition Number	Retirement (RET) Conditions
STANDARD: Retirement and Financial Assurance (RF) [OAR 345-022-0050]	
	retirement, notwithstanding the Council's approval in the site certificate of an estimated amount required to restore the site. b. If the certificate holder permanently ceases construction or operation of a portion of the facility that is, by itself, an energy facility under ORS 469.300, the certificate holder must retire that portion of the facility within two years following cessation of construction or operation of the facility components in accordance with the provisions of OAR 345-027-0110(10). [OAR 345-027-0020(9); Final Order on ASC, Condition 109; AMD4]
RET-RF-02	If the Council finds that the certificate holder has permanently ceased construction or operation of the facility without retiring the facility according to a final retirement plan approved by the Council, as described in OAR 345-027-0110, the Council shall notify the certificate holder and request that the certificate holder submit a proposed final retirement plan to the Office within a reasonable time not to exceed 90 days. If the certificate holder does not submit a proposed final retirement plan by the specified date, the Council may direct the Department to prepare a proposed a final retirement plan for the Council's approval. Upon the Council's approval of the final retirement plan, the Council may draw on the bond or letter of credit provided under Condition GEN-RF-01 to restore the site to a useful, non-hazardous condition according to the final retirement plan, in addition to any penalties the Council may impose under OAR Chapter 345, Division 29. If the amount of the bond or letter of credit is insufficient to pay the actual cost of retirement, the certificate holder shall pay any additional cost necessary to restore the site to a useful, non-hazardous condition. After completion of site restoration, the Council shall issue an order to terminate the site certificate if the Council finds that the facility has been retired according to the approved final retirement plan. [OAR 345-027-0020(160); Final Order on ASC, Condition 116; AMD3, AMD4]

5.0 Conditions Applicable to the Wind Energy Facility

5.1 General (GEN) Conditions: Design, Construction and Operations

Condition Number	General (GEN) Conditions
STANDARD: Land Use (LU) [OAR 345-022-0030]	
GEN-LU-02	The certificate holder shall construct the public road improvements described in the site certificate application to meet or exceed road standards for the road classifications in the County's Transportation System Plan and Zoning Ordinance because roads will require a more substantial section to bear the weight of the vehicles and turbine components than would usually be constructed by the County. [Final Order on ASC, Condition 17; AMD4]
GEN-LU-03	The site certificate holder shall design and construct private access roads associated with the wind energy facility to minimize the division of existing farm units. [Final Order on ASC, Condition 19; AMD4]
GEN-LU-04	The certificate holder shall not locate any aboveground facility structure associated with the wind energy facility (including wind turbines, O&M buildings, substations, and meteorological towers, but not including aboveground transmission and collector lines and junction boxes) within 30 feet from any property line or within 50 feet from the right-of-way of any arterial or major collector road or street and shall not allow any architectural feature, as described in Sherman County Zoning Ordinance Section 4.2, to project into these required setbacks by more than 2 feet. [Final Order on ASC, Condition 19; AMD3, AMD4]
GEN-LU-05	The certificate holder shall locate access roads associated with the wind energy facility to minimize disturbance with farming practices and, wherever feasible, shall place turbines and transmission interconnection lines along the margins of cultivated areas to reduce the potential for conflict with farm operations. The certificate holder shall place aboveground collector lines and junction boxes along property lines and public road rights-of-way to the extent practicable. [Final Order on ASC, Condition 19; AMD2, AMD4]
GEN-LU-06	Where necessary and feasible, the certificate holder shall provide access to fields within the wind energy facility site and otherwise provide adequate and timely access to properties during critical periods in the farming cycle, such as harvest. [Final Order on ASC, Condition 19; AMD4]
GEN-LU-07	Before beginning construction of the wind energy facility, the certificate holder shall record a Farm Management Easement covering the properties on which the certificate holder locates wind power generation facilities. The certificate holder shall record the easements in the real property records of Sherman County and shall file a copy of the recorded easement with the Sherman County Planning Director.

Condition Number	General (GEN) Conditions
	[Final Order on ASC, Condition 19; AMD4]
GEN-LU-08	The certificate holder shall remove from Special Farm Assessment the portions of parcels on which facilities are located and shall pay all property taxes due and payable after the Special Farm Assessment is removed from such properties. [Final Order on ASC, Condition 19; AMD4]
GEN-LU-09	With respect to any turbine constructed within a micrositing corridor approved by the Council after November 21, 2007, the certificate holder shall not locate such turbine within the setback prescribed by Section 4 of the Sherman County Wind Power Set Back Ordinance (Ordinance No. 39-2007) unless the Council has approved a variance to such setback for the turbine or the certificate holder has negotiated a setback agreement with the affected adjacent property owner and wind project developer. [Final Order on AMD3, Condition 128; AMD4]
STANDARD: Fish and Wildlife Habitat (FW) [OAR 345-022-0060]	
GEN-FW-02	The certificate holder may construct turbines and other facility components within the 500-foot turbine corridors shown on Figures P-1 through P-10 of the site certificate application and March 2006 supplement and within the "Permitted Areas" and "Amendment III Areas" as shown on Figures 2, 2a, 2b and 2c of the Request for Amendment #3, subject to the following requirements addressing potential habitat impact: a. The certificate holder shall not construct any facility components within areas of Category 1 or Category 2 habitat and shall avoid temporary disturbance of Category 1 or Category 2 habitat. b. The certificate holder shall design and construct facility components that are the minimum size needed for safe operation of the energy facility. c. Prior to constructing any turbines or permanent related or supporting facilities within the northward extension of Corridor 3 shown on Figure 2a of the Request for Amendment #3, the certificate holder shall provide the Department with maps and calculations documenting the additional permanent impacts, if any, to Category 3 and Category 4 habitat predicted to result from construction. If the construction would result in additional permanent impacts, the certificate holder shall increase the area of mitigation for permanent loss of Category 3 and Category 4 habitat as described in the Habitat Mitigation Plan incorporated herein by GEN-FW-03. [Final Order on ASC, Condition 59; AMD3; AMD4]
GEN-FW-03	Before beginning construction of the facility, the certificate holder shall acquire the legal right to create, maintain and protect a habitat mitigation area for the life of the facility by means of an outright purchase, conservation easement or similar conveyance and shall provide a copy of the documentation to the Department. Within the habitat mitigation area, the certificate holder shall improve the habitat quality in accordance with the Habitat Mitigation Plan that is incorporated in the

Condition Number	General (GEN) Conditions
	Final Order on Amendment #3 as Attachment C and as may be amended from time to time. [Final Order on ASC, Condition 63; AMD2; AMD3; AMD4]
STANDARD: Historic, Cultural and Archaeological Resources (HC) [OAR 345-022-0090]	
GEN-HC-01	Before beginning construction of any phase of the facility, the certificate holder shall provide to the Department a map showing the final design locations of all components of that phase of the facility and areas that would be temporarily disturbed during construction and also showing the areas surveyed by CH2M Hill and Archaeological Investigations Northwest, Inc. (AINW) in preparing the Cultural Resources Surveys for Biglow Canyon Wind Farm included in the site certificate application as Attachment S-1 and in Request for Amendment #2 as Attachment 15. The certificate holder shall hire qualified personnel to conduct field investigation of all areas of permanent or temporary disturbance that CH2M Hill and AINW did not previously survey and shall provide to the Department a written report of the field investigation. If any significant historic, cultural or archaeological resources are found during the field investigation, the certificate holder shall ensure that construction and operation of the facility will have no impact on the resources. The certificate holder shall instruct all construction personnel to avoid areas where the resources were found and shall implement other appropriate measures to protect the resources. [Amendment #2]
STANDARD: Public Health and Safety for Wind Energy Facilities (PHSW) [OAR 345-024-0010]	
GEN-PHSW-01	Before beginning construction or alteration of any phase of the wind energy facility, the certificate holder shall submit a Notice of Proposed Construction or Alteration to the Federal Aviation Administration (FAA) identifying the proposed final locations of the turbines and related or supporting facilities for that phase of the facility. The certificate holder shall notify the Department of the FAA's response as soon as it has been received. [Final Order on ASC, Condition 38; AMD4]
GEN-PHSW-02	The certificate holder shall enclose the facility substation with appropriate fencing and locked gates to protect the public from electrical hazards. [Final Order on ASC, Condition 39; AMD4]
GEN-PHSW-03	The certificate holder shall not locate turbine towers within 450 feet of any residence. The certificate holder shall not locate turbine towers within 450 feet of any public road, unless the certificate holder demonstrates to the Department's satisfaction that a lesser setback is consistent with the protection of public health and safety. [Final Order on ASC, Condition 40; AMD4]
GEN-PHSW-04	The certificate holder shall construct turbine towers that are smooth steel structures with no exterior ladders or access to the turbine blades and shall install locked access doors accessible only to authorized personnel. [Final Order on ASC, Condition 41; AMD4]

Condition Number	General (GEN) Conditions
GEN-PHSW-08	During construction of the wind energy facility, the certificate holder shall install generator step-up transformers at the base of each turbine tower in locked cabinets designed to protect the public from electrical hazards and to avoid creation of artificial habitat for raptor prey. [Final Order on ASC, Condition 45; AMD4]
Siting Standards for Wind Energy Facilities (WF) [OAR 345-024-0015]	
GEN-WF-01	The certificate holder shall construct turbines on concrete foundations and shall cover the ground within a minimum 10-foot radius with non-flammable material. The certificate holder shall maintain the non-flammable pad area covering throughout operation of the facility. [Final Order on ASC, Condition 48; AMD4]
GEN-WF-03	During construction of the wind energy facility, to reduce the visual impact of the facility, the certificate holder shall: a. Paint turbine towers, nacelles, rotors, meteorological towers, and cabinets containing pad-mounted equipment with a low-reflectivity, neutral gray, white, off-white or earth tone finish to reduce contrast with the surrounding background. b. Apply a low-reflectivity finish to the exterior of the O&M buildings and substation equipment to control their visual integration into the surrounding background. c. With the exception of the turbine manufacturer's logo that may appear on turbine nacelles, not allow any advertising to be used on any part of the facility or on any signs posted at the facility. In addition, the certificate holder may place its logo on the nacelles of not more than 20 percent of the wind turbines. d. Use only those signs required by law or for facility safety or security, except that the certificate holder may erect a sign near the O&M facility or substation to identify the wind energy facility. [Final Order on ASC, Condition 50; AMD2;AMD3; AMD4]
GEN-WF-04	The certificate holder shall design and construct the O&M buildings for the wind energy facility to be generally consistent with the character of similar buildings used by commercial farmers or ranchers in the area and shall paint the building in a neutral color to blend with the surrounding background. [Final Order on ASC, Condition 51; AMD3; AMD4]
GEN-WF-05	The certificate holder shall not use exterior nighttime lighting at the wind energy facility except: a. The minimum turbine tower lighting required by the Federal Aviation Administration. b. Security lighting at the O&M buildings and substation, provided that such lighting is shielded or directed downward to reduce glare. c. Minimum lighting necessary for repairs or emergencies.

Condition Number	General (GEN) Conditions
	d. Minimum lighting necessary for nighttime construction. The certificate holder may use lighting only at the work location and only directed downward to illuminate the work area at the turbine base or upward from the base to illuminate the turbine tower; construction lighting shall not be directed outward. The certificate holder shall use nighttime lighting only with the approval of the owner of the property on which the work is conducted and shall provide notice of nighttime construction to occupants of all residences within one-half mile of the construction site. [Final Order on ASC, Condition 52; AMD3]
STANDARD: Siting Standards for Transmission Lines (TL) [OAR 345-024-0090]	
GEN-TL-03	The certificate holder shall take reasonable steps to reduce or manage exposure to electromagnetic fields (EMF), consistent with Council findings presented in the "Report of EMF Committee to the Energy Facility Siting Council," March 30, 1993, and subsequent findings. Effective on the date of this site certificate, the certificate holder shall provide information to the public, upon request, about EMF levels associated with the wind energy facility and its related transmission lines. [Final Order on ASC, Condition 38; AMD4]
GEN-TL-04	a. The certificate holder shall design, construct and operate transmission lines associated with the wind energy facility in accordance with the requirements of the National Electrical Safety Code (American National Standards Institute, Section C2, 1997 Edition); and b. The certificate holder shall develop and implement a program that provides reasonable assurance that all fences, gates, cattle guards, trailers, or other objects or structures of a permanent nature that could become inadvertently charged with electricity by the transmission lines are grounded or bonded throughout the life of the line. [Final Order on ASC, Condition 118; AMD3; AMD4]
STANDARD: Other – Removal-Fill (WL)	
GEN-WL-01	The certificate holder shall avoid any disturbance, including the placement of poles for the collector line, within 25 feet of the stream channel in the area identified as Crossing G in the Request for Amendment #2 and within a wetland area identified as "POWHX" on Figure J-1 of the site certificate application. [Final Order on AMD2, Condition 127; AMD4]
GEN-WL-02	The certificate holder shall avoid any disturbance within 25 feet of the stream channel in the area identified as "Stream Crossing H" in the Request for Amendment #3 and shall install any collector line through the area by tunneling or drilling beneath the stream channel. [Final Order on AMD3, Condition 129; AMD4]

5.2 Operational (OPR) Conditions

Condition Number	Operational (OPR) Conditions
STANDARD: Soil Protection (SP) [OAR 345-022-0020]	
OPR-SP-03	The certificate holder shall cover turbine pad areas with gravel or other non-erosive material immediately following exposure and shall maintain the pad area covering during operation of the facility. [Final Order on ASC, Condition 28; AMD4]
OPR-SP-04	During operation of the wind energy facility, the certificate holder shall restore areas that are temporarily disturbed during facility maintenance or repairs according to the methods and monitoring procedures in the Revegetation Plan included as Attachment B to the Final Order on the ASC, as amended. [Final Order on ASC, Condition 29; AMD4]
OPR-SP-05	During operation of the wind energy facility, the certificate holder shall routinely inspect and maintain all roads, pads and trenched areas and, as necessary, maintain or repair erosion control measures. [Final Order on ASC, Condition 30; AMD4]
STANDARD: Fish and Wildlife Habitat (FW) [OAR 345-022-0060]	
OPR-FW-04	During operation of the wind energy facility, the certificate holder shall implement a plan to control the introduction and spread of noxious weeds. The certificate holder shall develop the weed control plan in consultation with the Sherman County Weed Control District and the Department. [Final Order on ASC, Condition 49; AMD4]
STANDARD: Public Health and Safety for Wind Energy Facilities (PHSW) [OAR 345-024-0010]	
OPR-PHSW-01	During operation of the wind energy facility, the certificate holder shall follow manufacturers' recommended handling instructions and procedures to prevent damage to towers or blades that could lead to failure. [Final Order on ASC, Condition 42; AMD4]
OPR-PHSW-02	During operation of the wind energy facility, the certificate holder shall have an operational safety-monitoring program and shall inspect turbine blades on a regular basis for signs of wear. The certificate holder shall repair turbine blades as necessary to protect public safety. [Final Order on ASC, Condition 43; AMD4]
OPR-PHSW-03	During operation of the wind energy facility, the certificate holder shall install and maintain self-monitoring devices on each turbine, connected to a fault annunciation panel or supervisory control and data acquisition (SCADA) system at the O&M facility, to alert operators to potential dangerous conditions, and the certificate holder shall remedy any dangerous conditions immediately. [Final Order on ASC, Condition 44; AMD4]
OPR-PHSW-04	During operation of the wind energy facility, the certificate holder shall maintain built-in fire prevention measures in each turbine that would shut down the turbine automatically before mechanical problems create excess heat or sparks.

Condition Number	Operational (OPR) Conditions
	[Final Order on ASC, Condition 92; AMD4]
OPR-PHSW-05	During construction and operation of the wind energy facility, the certificate holder shall develop and implement fire management plans in consultation with local fire control authorities to minimize the risk of fire and to respond appropriately to any fires that occur on the facility site. In developing the fire management plans, the certificate holder should take into account the dry nature of the region and should address risks on a seasonal basis. [Final Order on ASC, Condition 93; AMD4]
OPR-PHSW-06	During construction and operation of the wind energy facility, the certificate holder shall ensure that each on-site company vehicle contains a fire extinguisher, water spray can, shovel, emergency response procedures book, and two-way radio for immediate communication with the O&M facility. [Final Order on ASC, Condition 94; AMD4]
OPR-PHSW-07	Upon beginning operation of the wind energy facility, the certificate holder shall provide to all local fire departments maps of the facility site. During operation of the facility, the certificate holder shall provide to all local fire departments the names and telephone numbers of facility personnel available to respond on a 24-hour basis in case of an emergency on the facility site. [Final Order on ASC, Condition 96; AMD4]
OPR-PHSW-08	During operation of the wind energy facility, the certificate holder shall ensure that all on-site employees receive annual fire prevention and response training by qualified instructors or members of the local fire department and that all employees are instructed to keep vehicles on roads and off dry grassland, except when off-road operation is required for emergency purposes. [Final Order on ASC, Condition 97; AMD4]
OPR-PHSW-09	During operation of the wind energy facility, the certificate holder shall comply with the written fire protection recommendations of the Fire Chief of the applicable Rural Fire Protection District and shall promptly provide to the Department any correspondence from the Fire Chief regarding those recommendations. [Final Order on ASC, Condition 98; AMD3, AMD4]

6.0 Conditions Applicable to the Solar Facility

6.1 General (GEN) Conditions: Design, Construction and Operations

Condition Number	General (GEN) Conditions
STANDARD: Soil Protection (SP) [OAR 345-022-0022]	
GEN-SP-02	Except for those fuels and oils covered by an SPCC Plan approved under Condition PRE-SP-01 or PRO-SP-02, no reportable quantities of hazardous materials or

Condition Number	General (GEN) Conditions
	substances, as defined in OAR chapter 340, division 142, may be stored at the site of any solar facility component. [Final Order on AMD4, Soil Protection Condition 8]
STANDARD: Land Use (LU) [OAR 345-022-0030]	
GEN-LU-10	All aboveground components of the solar facility, including perimeter fences, must be setback at least 50 feet from: a. The right-of-way line of an arterial or major collector road or street, including, but not limited, to Hilderbrand Lane (Old Wasco-Heppner Highway); b. The property line extending along a public road not described in (a); and c. Any property line with a tract that is not within the Solar Micrositing Area. [Final Order on AMD4, Land Use Condition 1]
GEN-LU-11	All components of the solar facility, including perimeter fences, must be setback at least 30 feet from the aggregate site located on Tax lot 02N18E00003900, as identified in Sherman County Ordinance 32-2006. Facility components must be arranged in a manner that allows for continued access to and operation of the aggregate site. [Final Order on AMD4, Land Use Condition 2]
GEN-LU-12	a. All structures and equipment associated with the solar facility, including but not limited to, power conversion stations, O&M buildings, and battery enclosures, must be designed or painted with a low-reflectivity, neutral gray, white, off-white or earth tone finish that minimizes contrast with the surrounding landscape. b. The certificate holder may install a sign identifying the facility near each O&M building or collector substation. No other signs may be installed except as required by law or for facility safety or security c. All lighting installed at the O&M buildings, substation, or other facility components, shall be limited in intensity, shielded, and directed downward in a manner that prevents the lighting from projecting onto adjacent properties and roadways. Final Order on AMD4, Land Use Condition 4]
STANDARD: Historic, Cultural and Archaeological Resources (HC) [OAR 345-022-0090]	
GEN-HC-02	The certificate holder must design, construct, and operate the solar facility to avoid archaeological sites (35SH00188, BSP-1-S02BSP-1-S10, and BSP-1-S12) and archaeological isolate (BSP-1-I04) with a 20-meter avoidance buffer. [Final Order on RFA4, Historic, Cultural, and Archaeological Condition 1]
GEN-HC-03	a. Prior to construction, the certificate holder must submit to the Department for approval, in consultation with SHPO, a Cultural Resources Monitoring Plan demonstrating that an Oregon Qualified Archaeologist or Tribal Cultural Resource Monitor will be onsite during ground disturbing activities at the site. The plan may provide for exceptions to monitoring scope and frequency, subject to

Condition Number	General (GEN) Conditions
	approval by the Department, in consultation with the Confederated Tribes of Warm Springs. b. During construction, the certificate holder shall adhere to the measures approved in the Cultural Resources Monitoring Plan. [Final Order on AMD4, Historic, Cultural, and Archaeological Condition 2]
STANDARD: Siting Standards for Transmission Lines (TL) [OAR 345-024-0090]	
GEN-TL-05	The certificate holder shall construct the 230-kV transmission line connecting the Biglow Canyon Substation to the Solar Substation within a 150-foot corridor, as presented in Figure 2 of the Amended Site Certificate. . [Final Order on ASC, Condition 119; AMD4]
GEN-TL-06	The certificate holder must design, construct, and operate transmission line associated with the solar facility in accordance with the requirements of the 2023 Edition of the National Electrical Safety Code. [Final Order on AMD4. Transmission Line Condition 1]

6.2 Pre-Construction (PRE) Conditions

Condition Number	Preconstruction (PRE) Conditions
STANDARD: General Standard of Review (GS) [OAR 345-022-0000]	
PRE-GS-01	Except as necessary for the initial survey, the certificate holder shall not begin construction, as defined in OAR 345-001-0010, of the solar facility, or create a clearing on any part of the solar micrositing area until the certificate holder has construction rights on all parts of the area. For the purpose of this rule, "construction rights" means the legal right to engage in construction activities. [Final Order on ASC; Condition 105; AMD3; AMD4; Mandatory Condition OAR 345-025-0006(5)]
STANDARD: Organizational Expertise (OE) [OAR 345-022-0010]	
PRE-OE-01	Prior to construction of any phase or component of the solar facility, the certificate holder shall notify the Department of the identity and qualifications of primary vendors; the engineering, procurement and construction contractors for specific portions of the work; and the identity and qualifications of the individuals that will manage and oversee the selected vendors and contractors. The certificate holder shall select vendors, contractors, and personnel dedicated to managing vendors and contractors that have substantial experience in the design and construction of similar facilities. The certificate holder shall report to the Department any change of major construction contractors or management personnel. [Final Order on ASC, Condition 1; AMD4]
PRE-OE-02	a. Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department for review and approval, a plan that verifies compliance with all site certificate terms and conditions and applicable statutes and rules. As a part of the compliance plan, to verify compliance with the requirement to begin construction by the date specified in the site certificate, the certificate holder shall report promptly to the Department of Energy when construction begins. Construction is defined in OAR 345-001-0010. In reporting the beginning of construction, the certificate holder shall describe all work on the site performed before beginning construction, and shall state the cost of that work. For the purpose of this condition, "work on the site" means any work within the Solar Micrositing Area, other than surveying, exploration or other activities to define or characterize the site or corridor. b. The certificate holder shall implement the compliance plan prior to and during construction and make documentation of compliance available for inspection by the Department or the Council upon request. [Final Order on ASC, Condition 121 AMD3; AMD4]
PRE-OE-03	Prior to construction of any component or phase of the solar facility, the certificate holder shall: a. Provide the Department a list of federal, state and local permits, including any third-party permits; and a schedule for obtaining identified permits.

Condition Number	Preconstruction (PRE) Conditions
	b. Once obtained, provide copies of all permits, including third-party permits to the Department. [Final Order on AMD4; Organizational Expertise Condition 4]
STANDARD: Structural (SS) [OAR 345-022-0020]	
PRE-SS-01	a. Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department for review and comment, a final geotechnical report that, at a minimum, addresses the recommendations in the Preliminary Geotechnical Engineering Report provided as RFA4, Exhibit H, Attachment H-2. b. The certificate holder shall prepare the report in accordance with the Oregon Board of Geologists Examiners 2014 Guidelines for Preparing Engineering Geologic Reports. c. The Department may utilize a third-party consultant in the review of the report. The certificate holder shall obtain concurrence from the Department that all comments have been adequately addressed before beginning construction. [Final Order on ASC, Condition 66; AMD4]
PRE-SS-02	The certificate holder shall notify the Department, the State Building Codes Division and the Department of Geology and Mineral Industries promptly if investigations or trenching in the Solar Micrositing Area reveal that conditions in the foundation rocks differ significantly from those described in Request for Amendment 4. After the Department receives the notice, the Council may require the certificate holder to consult with the Department of Geology and Mineral Industries and the Building Codes Division and to propose mitigation actions. [OAR 345-027-0020(13); Final Order on ASC, Condition 113; AMD3; AMD4]
PRE-SS-03	The certificate holder shall notify the Department, the State Building Codes Division and the Department of Geology and Mineral Industries promptly if shear zones, artesian aquifers, deformations or clastic dikes are found at or in the vicinity of the Solar Micrositing Area. [OAR 345-027-0020(14); Final Order on ASC, Condition 114; AMD3; AMD4]
STANDARD: Soil Protection (SP) [OAR 345-022-0020]	
PRE-SP-01	Prior to beginning construction of any component or phase of the solar facility, the certificate holder shall: a. Finalize the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to the Final Order on RFA4 based on final facility design and the approved National Pollutant Discharge Elimination System (NPDES) General Permit 1200-C for the facility. The final Comprehensive Solar Revegetation and Soil Management Plan shall be submitted to the Department for review and approval. b. Complete all items included in the Pre-construction Compliance Checklist in the final plan, as applicable to the facility components or phase. [Final Order on AMD4, Soil Protection Condition 1]

Condition Number	Preconstruction (PRE) Conditions
PRE-SP-02	Prior to beginning construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department, a Construction Spill Prevention, Control and Countermeasure (SPCC) Plan that complies with the requirement of 40 CFR 112. [Final Order on AMD4, Soil Protection Condition 4]
STANDARD: Land Use (LU) [OAR 345-022-0030]	
PRE-LU-01	a. Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department and the Sheman County Planning Commission, an application for Conditional Use Permit Meeting the requirements of SCZO Section 5.4(1) and (3). b. The Site Plan required under SCZO 5.4(1) must demonstrate compliance with all site certificate conditions and the local applicable substantive criteria addressed in the Final Order on AMD4. [Final Order on AMD4, Land Use Condition 3]
PRE-LU-02	Prior to construction of any component or phase of the solar facility, the certificate holder must sign and record in the deed records for the county a document binding the project owner and the project owner's successors in interest, prohibiting them from pursuing a claim for relief or cause of action alleging injury from farming or forest practices as defined in ORS 30.930(2) and (4). [Final Order on AMD4, Land Use Condition 5]
PRE-LU-03	Prior to construction of the solar facility, component or phase, as applicable, the certificate holder shall submit to the Department: a. A Memorandum of Understanding or other agreement executed by the certificate holder, Mid-Columbia Community Economic Development District, and Sherman County, establishing a Community Investment Fund in accordance with the Community Investment Plan included as Attachment E to the Final Order on RFA4. b. Evidence that that the certificate holder has contributed at least $1,600 per acre of cultivated land that will be occupied by facility components to the Community Investment Fund. [Final Order on AMD4, Land Use Condition 6]
STANDARD: Retirement and Financial Assurance (RF) [OAR 345-022-0050]	
PRE-RF-01	Prior to construction of the solar facility, component or phase, as applicable, the certificate holder shall: a. Submit to the Department Table 14 (Retirement Table with tasks/unit/unit costs) of the Final Order on RFA4, updated based on final design and phased construction, if applicable. Certificate holder may not make changes to the unit cost without review and approval by the Department. Certificate holder must also request that the Department confirm the present-day inflation adjusted

Condition Number	Preconstruction (PRE) Conditions
	decommissioning estimate, rounded to the nearest $1,000, to be reflected in the bond or letter of credit in sub c of this condition. b. Incorporate any additional decommissioning costs for facility changes which have been determined by the Department not to require a site certificate amendment. c. Submit to the Department a bond or letter of credit, in the amount affirmed by the Department under (a), based on the Council's current pre-approved financial institution list and form. [Final Order on AMD4, Retirement and Financial Assurance Condition 1]
STANDARD: Fish and Wildlife Habitat (FW) [OAR 345-022-0060]	
PRE-FW-01	Prior to construction of a phase or component of the solar facility, as applicable, the certificate holder shall submit the final Habitat Mitigation Plan substantially similar to Final Order on RFA4 Attachment F, based on the finalization requirements included in Section 2.0 of the plan. The final plan must be submitted for review and approval by the Department in consultation with ODFW. [Final Order on AMD4, Fish and Wildlife Habitat Condition 1]
STANDARD: Historic, Cultural and Archeological (HC) [OAR 345-022-0090]	
PRE-HC-01	Prior to construction, the certificate holder shall update the contact information provided in the Final Order on ASC Attachment H, Inadvertent Discovery Plan. [Final Order on AMD4; Historic, Cultural and Archeological Condition 3]
STANDARD: Public Services (PS) [OAR 345-022-0100]	
PRE-PS-01	At least 90-days prior to construction of a phase or component of the solar facility, the certificate holder shall provide to the Department and Sherman County a Construction Workforce Housing Plan. The Construction Workforce Housing Plan must include: a. An evaluation of ongoing patterns of housing uses and potential shortages or changes in housing demand; b. Consideration of concerns and suggestions from Sherman County; and c. Provide strategies to minimize impacts to the local housing supply. [Final Order on AMD4, Public Services Condition 1]
PRE-PS-02	Prior to construction of any phase or component of the solar facility, the certificate holder shall: a. Provide an executed Road Use Agreement between the certificate holder and Sherman County Public Works Department, which includes, at a minimum: i. A system for documenting the pre-construction condition of local roads that would serve as transportation routes for delivering equipment to the facility site so that pre-construction conditions can be compared with conditions after construction has been completed to assess needed repairs and payment for repairs. ii. Protocols for monitoring road conditions for degradation during construction so that safe travel paths may be maintained.

Condition Number	Preconstruction (PRE) Conditions
	iii. An agreement to fund repairs of construction related damage to the satisfaction of Sherman County Public Works. b. Submit a Construction Traffic Management Plan for Department review and approval. Unless the following are included in the executed Road Use Agreement, the plan shall, at a minimum, require that the certificate holder: i. Provide notice to adjacent landowners when construction takes place to help minimize access disruptions; ii. Provide proper road signage and warnings of "Equipment on Road," "Truck Access," or "Road Crossings;" iii. Implement traffic diversion equipment, such as advance signage and pilot cars, whenever possible when slow or oversized loads are being hauled; iv. Encourage carpooling for the construction workforce to reduce traffic volume; v. Employ flaggers, as necessary, to direct traffic when large equipment is entering or exiting public roads to minimize risk of accidents; and vi. Maintain at least one travel lane at all times so that roadways will not be closed to traffic as a result of construction vehicles entering or exiting public roads. [Final Order on ASC, Condition 77; AMD1; AMD4]
STANDARD: Wildfire Prevention and Risk Mitigation (WF) [OAR 345-022-0115]	
PRE-WF-01	Prior to construction of any component or phase of the solar facility, the certificate holder shall finalize and submit to the Department, for review and approval, a Construction Wildfire Mitigation Plan (WMP) consistent with Attachment G to the Final Order on AMD4. [Final Order on AMD4, Wildfire Prevention and Risk Mitigation Condition 1]
STANDARD: Waste Minimization (WM) [OAR 345-022-0120]	
PRE-WM-01	Prior to construction of any component or phase of the solar facility, the certificate holder shall submit a Construction Waste Management Plan, for review and approval by the Department. The plan must include, at a minimum, the following : a. The format, content and frequency of employee trainings to minimize and recycle solid waste; b. Practices and measures that will be implemented to minimize the generation of wastes from construction; c. Identify a procedure or process for evaluating whether photovoltaic modules, batteries, or other facility components are considered hazardous waste under state or federal regulations; d. Identify procedures for the segregation of recyclable materials, non-hazardous waste, and hazardous waste for transport and disposal by a licensed hauler specializing in the proper recycling or disposal of the wastes. e. Identify names and locations of licensed haulers and facilities that will be used for the following, including associated collection and hauling protocols and requirements:

Condition Number	Preconstruction (PRE) Conditions
	i. Recycling steel and other metal scrap; ii. Recycling wood waste; iii. Recycling packaging wastes, such as paper and cardboard; iv. Collecting non-recyclable waste for transport to a landfill by a licensed waste hauler; and f. Identify inspection and recordkeeping procedures for waste handling, disposal and recycling. g. Include a provision allowing for updates of the plan, subject to Department review and approval. [Final Order on ASC, Condition 84; AMD4]
STANDARD: Noise Control Regulations (NC) [OAR 340-035-0035]	
PRE-NC-01	Prior to beginning construction of any noise generating equipment, the certificate holder shall provide an updated acoustic modeling analysis based on final facility design and equipment specifications demonstrating that the cumulative operational noise levels of the wind and solar facility, taking into account any necessary acoustic mitigation, will comply with the maximum permissible noise level, 50 dBA L50 [Final Order on AMD4, Noise Control Condition 1]
PRE-NC-02	Prior to construction of the solar facility, the certificate holder must submit to the Department copies of executed legally effective easement(s) or real covenant(s) for all Noise Sensitive Properties impacted by the facility with noise exceedance. [OAR 340-035-0035(1)(b)(B)(iii)(; Final Order on AMD4; Noise Control Condition 1]
STANDARD: Other – Removal-Fill (WL)	
PRE-WL-01	a. Certificate holder shall flag and avoid, or develop constraints mapping, identifying a 50-foot avoidance buffer from the delineated boundary of wetland WT03 and intermittent waterway ST04 (Wetland Delineation Report WD #2025-0012) to ground disturbing activities. b. Prior to August 12, 2030, if construction of the solar facility has not yet commenced, the certificate holder must submit a renewal request to DSL for Wetland Delineation Report WD #2025-0012. Certificate holder must provide a copy of DSL reissuance to the Department, once obtained. [Final Order on AMD4, Removal-Fill Condition 1]
STANDARD: Other – Water Rights (WR)	

6.3 Construction (CON) Conditions

Condition Number	Construction (CON) Conditions
STANDARD: GENERAL STANDARD (GS) [OAR 345-022-0000]	
CON-GS-01	The certificate holder must begin construction of the solar facility, phase or component on or before March 27, 2032. Within 7 days of construction commencement, the certificate holder must provide the Department with written

Condition Number	Construction (CON) Conditions
	verification that it has met the deadline by satisfying applicable preconstruction conditions and completing at least $250,000 work in the Solar Micrositing Area. [OAR 345-025-0006(4), Final Order on AMD4, General Standard Condition 1]
CON-GS-02	The certificate holder must complete construction of the facility, phase or component within 3 years of the actual applicable construction commencement date for the facility or applicable phase reported under Condition CON-GS-01. Within 7 days after completing construction, the certificate holder shall provide the Department written verification that it has met the deadline. [OAR 345-025-0006(4), Final Order on AMD4, General Standard Condition 2]
STANDARD: Organizational Expertise (OE) [OAR 345-022-0010]	
CON-OE-01	During construction of any component or phase of the solar facility, the certificate holder shall: a. Maintain a qualified on-site construction manager with demonstrated experience in environmental compliance; b. Require the construction manager to ensure compliance with all construction-related site certificate conditions. c. Notify the Department of the name, telephone number, and e-mail address of the manager within 72 hours after any change in this information. [Final Order on ASC, Condition 3; AMD4]
CON-OE-02	a. Within three months after beginning construction of any phase or component of the solar facility, and every three months thereafter during construction, the certificate holder shall submit a construction progress report to the Department. b. Each construction progress report shall describe: i. Any significant changes to major milestones for construction; ii. Facility Status: An overview of site conditions, the status of facilities under construction, and a summary of the operating experience of facilities that are in operation. In this section of the annual report, the certificate holder shall describe any unusual events, such as earthquakes, extraordinary windstorms, major accidents or the like that occurred during the year and that had a significant adverse impact on the facility. iii. Status of Surety Information: Documentation demonstrating that bonds or letters of credit as described in the site certificate are in full force and effect and will remain in full force and effect for the term of the next reporting period; iv. Monitoring Report: A list and description of all significant monitoring and mitigation activities performed during the reporting period in accordance with site certificate terms and conditions, a summary of the results of those activities, and a discussion of any significant changes to any monitoring or mitigation program, including the reason for any such changes. v. Compliance Report: A description of all instances of noncompliance with a site certificate condition. For ease of review, the certificate holder shall, in this

Condition Number	Construction (CON) Conditions
	section of the report, use numbered subparagraphs corresponding to the applicable sections of the site certificate. vi. Facility Modification Report: A summary of changes to the facility that the certificate holder has determined do not require a site certificate amendment in accordance with OAR 345-027-0050. c. When the reporting date coincides, the certificate holder may include the construction progress report within the annual report required under Condition OPR-OE-01. [Final Order on AMD4, Organizational Expertise Condition 3]
STANDARD: Structural Standard (SS) [OAR 345-022-0020]	
CON-SS-01	The certificate holder shall design and construct the solar facility in accordance with the applicable requirements of the International Building Code, Oregon Structural Specialty Code, and any other applicable codes and design procedures in effect at the time of construction. [Final Order on ASC, Condition 67; AMD4]
CON-SS-02	The certificate holder shall design, engineer and construct the solar facility to avoid dangers to human safety and the environment presented by seismic hazards affecting the site that are expected to result from all maximum probable seismic events. As used in this condition "seismic hazard" includes ground shaking, ground failure, landslide, liquefaction triggering and consequences (including flow failure, settlement buoyancy, and lateral spreading), cyclic softening of clays and silts, fault rupture, directivity effects and soil-structure interaction. [OAR 345-027-0020(12); Final Order on ASC, Condition 112; AMD4]
CON-SS-03	The certificate holder shall design, engineer and construct the solar facility to avoid dangers to human safety presented by non-seismic hazards, including, but not limited to, landslides, flooding, erosion, and collapsible soils. Ground disturbing activities are not permitted in areas within Sherman County's Natural Hazard Combining Zone where slopes exceed 20 percent. [Final Order on ASC, Condition 68; AMD4]
STANDARD: Soil Protection (SP) [OAR 345-022-0022]	
CON-SP-01	Upon completion of construction of the solar facility, the certificate holder shall restore vegetation to the extent practicable and shall landscape all areas disturbed by construction in a manner compatible with the surroundings and proposed use. Upon completion of construction, the certificate holder shall remove all temporary structures not required for facility operation and dispose of all timber, brush, refuse and flammable or combustible material resulting from clearing of land and construction of the facility. [OAR 345-027-0020(11); Final Order on ASC, Condition 111; AMD3; AMD4]

<table>
<tr><th>Condition Number</th><th>Construction (CON) Conditions</th></tr>
<tr><td>CON-SP-02</td><td>During and following construction of any component or phase of the solar facility, the certificate holder shall conduct all work in compliance with the Comprehensive Solar Revegetation and Soil Management Plan required under Condition PRE-SP-01.
[Final Order on AMD4, Soil Protection Condition 2]</td></tr>
<tr><td>CON-SP-03</td><td>During construction of the solar facility, the certificate holder and all onsite contractors and personnel shall adhere to the requirements of the SPCC Plan approved under Condition PRE-SP-02. Updates or revisions to the Plan shall be submitted to the Department prior to implementation.
[Final Order on AMD4, Soil Protection Condition 5]</td></tr>
<tr><td colspan="2">STANDARD: Retirement and Financial Assurance (RF) [OAR 345-022-0050]</td></tr>
<tr><td>CON-RF-01</td><td>If construction extends more than 12 months, the certificate holder shall:
a. Annually adjust the amount of the bond or letter of credit to present dollar value, as determined by the Department.
b. Incorporate any additional decommissioning costs for proposed facility changes which have been determined by the Department not to require a site certificate amendment.
c. The Department and Council reserve the right to adjust the contingencies, as appropriate and necessary to ensure that costs to restore the site are adequate to maintain health and safety of the public and environment.
[Final Order on AMD4, Retirement and Financial Assurance Condition 2]</td></tr>
<tr><td colspan="2">STANDARD: Fish and Wildlife Habitat (FW) [OAR 345-022-0060]</td></tr>
<tr><td>CON-FW-01</td><td>a. Prior to the seasonal restriction referred in this condition and during any year in which construction of any component or phase of the solar facility occurs, the certificate holder shall:
i. Use a protocol approved by ODFW to determine whether there are any active nests of the species listed in the table below within a half-mile of any areas that would be disturbed during construction.
ii. If a nest is occupied by any of these species after the beginning of the seasonal restriction, the certificate holder shall not engage in high-impact construction activities (activities that involve blasting, grading or other major ground disturbance) or allow high levels of construction traffic within the spatial buffer of the nest site.
iii. Any work areas within the spatial buffers during the seasonal restriction shall be flagged/marked.
b. The seasonal restrictions are as provided in the table below:
<table>
<tr><th>Species</th><th>Spatial Buffer</th><th>Seasonal Restriction</th><th>Early Release Date if Unoccupied</th></tr>
<tr><td>Golden eagle</td><td>0.5 – 1 mile</td><td>Feb 1 – Aug 15</td><td>May 15</td></tr>
<tr><td>Bald eagle</td><td>0.5 mile</td><td>Jan 1 – Aug 15</td><td>May 31</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Condition Number</th><th>Construction (CON) Conditions</th></tr>
<tr><td></td><td>
<table>
<tr><td>Ferruginous hawk</td><td>0.5 mile</td><td>Mar 15 – Aug 15</td><td>May 31</td></tr>
<tr><td>Northern goshawk**</td><td>0.5 mile</td><td>May 1 – Aug 15</td><td>June 30</td></tr>
<tr><td>Peregrine falcon**</td><td>0.25 mile</td><td>Jan 1 – Jul 1</td><td>May 15</td></tr>
<tr><td>Swainson’s hawk**</td><td>0.25 mile</td><td>Apr 1 – Aug 15</td><td>May 31</td></tr>
<tr><td>White-tailed kite</td><td>0.25 mile</td><td>Jan 1 – Aug 15</td><td></td></tr>
<tr><td>Osprey</td><td>0.25 mile</td><td>Mar 1 – Sep 15</td><td></td></tr>
<tr><td>Burrowing owl**</td><td>0.25 mile</td><td>Apr 1 – Aug 15</td><td>May 31</td></tr>
<tr><td>Flammulated owl**</td><td>0.25 mile</td><td>May 1 – Jul 31</td><td>June 15</td></tr>
<tr><td>Great gray owl**</td><td>0.25 mile</td><td>Apr 1 – Jul 31</td><td>May 31</td></tr>
<tr><td>Red-tailed hawk</td><td>0.10 mile</td><td>Mar 1 – Aug 15</td><td>May 31</td></tr>
<tr><td>Other hawks and owls</td><td>0.25 mile</td><td>Mar 1 – Aug 15</td><td>May 31</td></tr>
<tr><td colspan="4">Dates cover territory establishment through fledging. Release dates can be used for unoccupied or failed nests.
Some geographic variation exists in seasonal restriction dates, please consult with local ODFW staff.
** Indicates Oregon Conservation Strategy Species.</td></tr>
</table>
c. Upon request by the certificate holder, the Department in consultation with ODFW may provide exceptions to this restriction. The certificate holder’s request must include a justification of the request, including any actions the certificate holder will take to avoid, minimize, or mitigate impacts to the raptor and its nest.
[Final Order on AMD4, Fish and Wildlife Condition 3]</td></tr>
<tr><td colspan="2">STANDARD: Historic, Cultural and Archeological (HC) [OAR 345-022-0090]</td></tr>
<tr><td>CON-HC-01</td><td>During construction, the certificate holder shall require all onsite employees and contractors to implement and adhere to the requirements of the Inadvertent Discovery Plan, as submitted to the Department under Condition PRE-HC-01.
[Final Order on AMD4; Historic, Cultural and Archeological Condition 3]</td></tr>
<tr><td colspan="2">STANDARD: Public Services (PS) [OAR 345-022-0100]</td></tr>
<tr><td>CON-PS-01</td><td>Prior to and during construction of any component or phase of the solar facility, as applicable, the certificate holder and its contractors shall:
a. Identify all water-related needs and estimate daily and annual water demand for facility construction.
b. Provide evidence such as a contract or purchase agreement demonstrating that adequate water supply to meet facility construction demand has been secured and that water for all construction activities will be legally obtained by service providers or third-party permits.
[Final Order on ASC, Condition 74; AMD4]</td></tr>
<tr><td>CON-PS-02</td><td>During construction of a phase or component of the solar facility, the certificate holder shall report on the implementation of the Construction Workforce Housing Plan required under PRE-PS-01, including any outstanding issues associated with workforce housing and potential solutions.
[Final Order on AMD4, Public Services Condition 2]</td></tr>
</table>

Condition Number	Construction (CON) Conditions
CON-PS-03	During construction of the solar facility, the certificate holder shall require that all on-site construction contractors develop and implement a site health and safety plan that informs on-site workers and others what to do in case of an emergency and that includes the locations of fire extinguishers and nearby hospitals, important telephone numbers, and first aid techniques. [Final Order on ASC, Condition 46; AMD4]
CON-PS-04	During and following construction of a phase or component of the solar facility, the certificate holder shall adhere to the requirements of the Road Use Agreement and Construction Traffic Management Plan required under Condition PRE-PS-02. [Final Order on ASC, Condition 78; AMD4]
STANDARD: Wildfire Prevention and Risk Mitigation (WF) [OAR 345-022-0115]	
CON-WF-01	During construction of the solar facility, the certificate holder shall require onsite contractors and employees to adhere to the Construction Wildfire Mitigation Plan (WMP) approved under Condition PRE-WF-01. [Final Order on AMD4, Wildfire Prevention and Risk Mitigation Condition 2]
STANDARD: Waste Minimization (WM) [OAR 345-022-0120]	
CON-WM-01	During construction of a component or phase of the solar facility, the certificate holder and all onsite contractors must implement the Construction Waste Management Plan required under Condition PRE-WM-01. [Final Order on AMD4, Waste Minimization Condition 1]
CON-WM-02	During construction of the facility, the certificate holder shall provide portable toilets for on-site sewage handling and shall ensure that the portable toilets are pumped and cleaned regularly by a qualified licensed contractor. [Final Order on ASC, Condition 82, AMD4]
Standard: Noise Control, OAR 340-035-0035	
CON-NC-01	During construction of the solar facility, the certificate holder shall: a. Confine the noisiest operation of heavy construction equipment to the daylight hours; b. Require contractors to install and maintain exhaust mufflers on all combustion engine-powered equipment; and c. Establish a complaint response system at the construction manager's office to address noise complaints. [Final Order on ASC, Condition 89; AMD4]
STANDARD: Other – Water Rights (WR)	
CON-WR-01	No later than 30 days after completing construction of any new well, the certificate holder shall provide the Department a copy of the map, well log and all other information it provided to OWRD pursuant to ORS 537.545 and ORS 537.765 to qualify for an exempt ground water use for any onsite exempt wells. [Final Order on AMD4, Water Rights Condition 1]

6.4 Pre-Operational (PRO) Conditions

Condition Number	Pre-Operational (PRO) Conditions
STANDARD: Organizational Expertise (OE) [OAR 345-022-0010]	
PRO-OE-01	Prior to beginning operation of the solar facility, the certificate holder shall submit a final Operation and Maintenance Plan to the Department for review and approval. The plan must be finalized in accordance with Table 1 of the O&M Framework provided in Attachment C to the Final Order on AMD4. [Final Order on AMD4, Organizational Expertise Condition 1]
STANDARD: Soil Protection (SP) [OAR 345-022-0020]	
PRO-SP-01	Prior to beginning operation of the solar facility, the certificate holder shall submit, to the Department, an Operations Spill Prevention, Control and Countermeasure Plan that complies with the requirement of 40 CFR 112. [Final Order on AMD4, Soil Protection Condition 6]
STANDARD: Wildfire Prevention and Risk Mitigation (WF) [OAR 345-022-0115]	
PRO-WF-01	a. Prior to operation of the solar facility, phase or component, as applicable, the certificate holder shall submit, to the Department for review and approval, an Operational Wildfire Mitigation Plan that complies with the requirements of OAR 345-022-0115(1)(b). b. The certificate holder may rely on a Wildfire Protection Plan approved by the Oregon Public Utility Commission under OAR chapter 860, division 300, or another plan approved by the Department in accordance with this Site Certificate to satisfy some or all of the requirements of this condition. [Final Order on AMD4, Wildfire Prevention and Risk Mitigation Condition 3]

6.5 Operational (OPR) Conditions

Condition Number	Operational (OPR) Conditions
STANDARD: General Standard of Review (GS) [OAR 345-022-0000]	
OPR-GS-01	The certificate holder shall submit an updated legal description of the site to the Department of Energy within 90 days after beginning operation of the solar facility. The legal description required by this rule means a description of metes and bounds or a description of the site by reference to a map and geographic data that clearly and specifically identifies the outer boundaries that contain all parts of the facility. [OAR 345-027-0020(2); Final Order on ASC, Condition 102; AMD3; AMD4]
STANDARD: Organizational Expertise (OE) [OAR 345-022-0010]	
OPR-OE-02	During operation of the solar facility, the certificate holder shall require onsite contractors and employees to adhere to the O&M Plan approved under Condition PRO-OE-01. The O&M Plan may be amended, subject to Department review and approval.

Condition Number	Operational (OPR) Conditions
	[Final Order on AMD4, Operational Expertise Condition 2]
STANDARD: Soil Protection (SP) [OAR 345-022-0020]	
OPR-SP-06	During operation of the solar facility, the certificate holder shall monitor and maintain vegetation and any necessary erosion controls in compliance with the Comprehensive Solar Revegetation and Soil Management Plan required under Condition PRE-SP-01, as amended. The certificate holder shall include any reports required by the plan in the annual facility operations reports required under Condition OPR-OE-01. [Final Order on AMD4, Soil Protection Condition 3]
OPR-SP-07	During operation of the solar facility, the certificate holder and all onsite contractors and personnel shall adhere to the requirements of the Operations Spill Prevention, Control and Countermeasure Plan approved under Condition PRO-SP-01. Updates or revisions to the Plan shall be submitted to the Department prior to implementation. [Final Order on AMD4, Soil Protection Condition 7]
STANDARD: Fish and Wildlife Habitat (FW) [OAR 345-022-0060]	
OPR-FW-05	During operation of the solar facility, the certificate holder shall implement the Habitat Mitigation Plan finalized under Condition PRE-FW-01. The HMP may be amended from time to time, subject to Department approval. [Final Order on AMD4, Fish and Wildlife Habitat Condition 2]
STANDARD: Historic, Cultural and Archeological (HC) [OAR 345-022-0090]	
OPR-HC-01	During operations, the certificate holder shall require all onsite employees and contractors to implement and adhere to the requirements of the Inadvertent Discovery Plan, as provided in Condition PRE-HC-01. The IDP shall be reviewed and updated annually for current contact information. [Final Order on AMD4; Historic, Cultural and Archeological Condition 5]
STANDARD: Wildfire Prevention and Risk Mitigation (WF) [OAR 345-022-0115]	
OPR-WF-01	During operation of the solar facility, the certificate holder must adhere to the requirements of the Operational Wildfire Mitigation Plan approved by the Department under Condition PRO-WF-01, as updated in accordance with the requirements of the plan. [Final Order on AMD4, Wildfire Prevention and Risk Mitigation Condition 4]

7.0 Successors and Assigns

To transfer this site certificate, or any portion thereof, or to assign or dispose of it in any other manner, directly or indirectly, the certificate holder shall comply with OAR 345-027-0100.

8.0 Severability and Construction

If any provision of this agreement and certificate is declared by a court to be illegal or in conflict with any law, the validity of the remaining terms and conditions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the agreement and certificate did not contain the particular provision held to be invalid. In the event of a conflict between the conditions contained in this site certificate and the Council's final order, the conditions contained in this site certificate shall control.

9.0 Governing Law and Forum

This site certificate shall be governed by the laws of the State of Oregon. Any litigation or arbitration arising out of this agreement shall be conducted in an appropriate forum in Oregon.

10.0 Execution

This site certificate may be executed in counterparts and will become effective upon signature by the Chair of the Energy Facility Siting Council and the authorized representative of the certificate holder.

IN WITNESS THEREOF, this site certificate has been executed by the State of Oregon, acting by and through the Energy Facility Siting Council, and by Portland General Electric Company.

ENERGY FACILITY SITING COUNCIL

By: Cynthia R. Condon (Apr 1, 2026 16:19:59 PDT)

Cindy Condon, Chair

Date: 01-Apr-2026

PORTLAND GENERAL ELECTRIC COMPANY

By: Debbie Powell (Mar 31, 2026 07:09:43 PDT)

Authorized Representative

Date: 31-Mar-2026

ATTACHMENT 1: FIGURES

Figure 1: Regional Location of Facility and Site Boundary

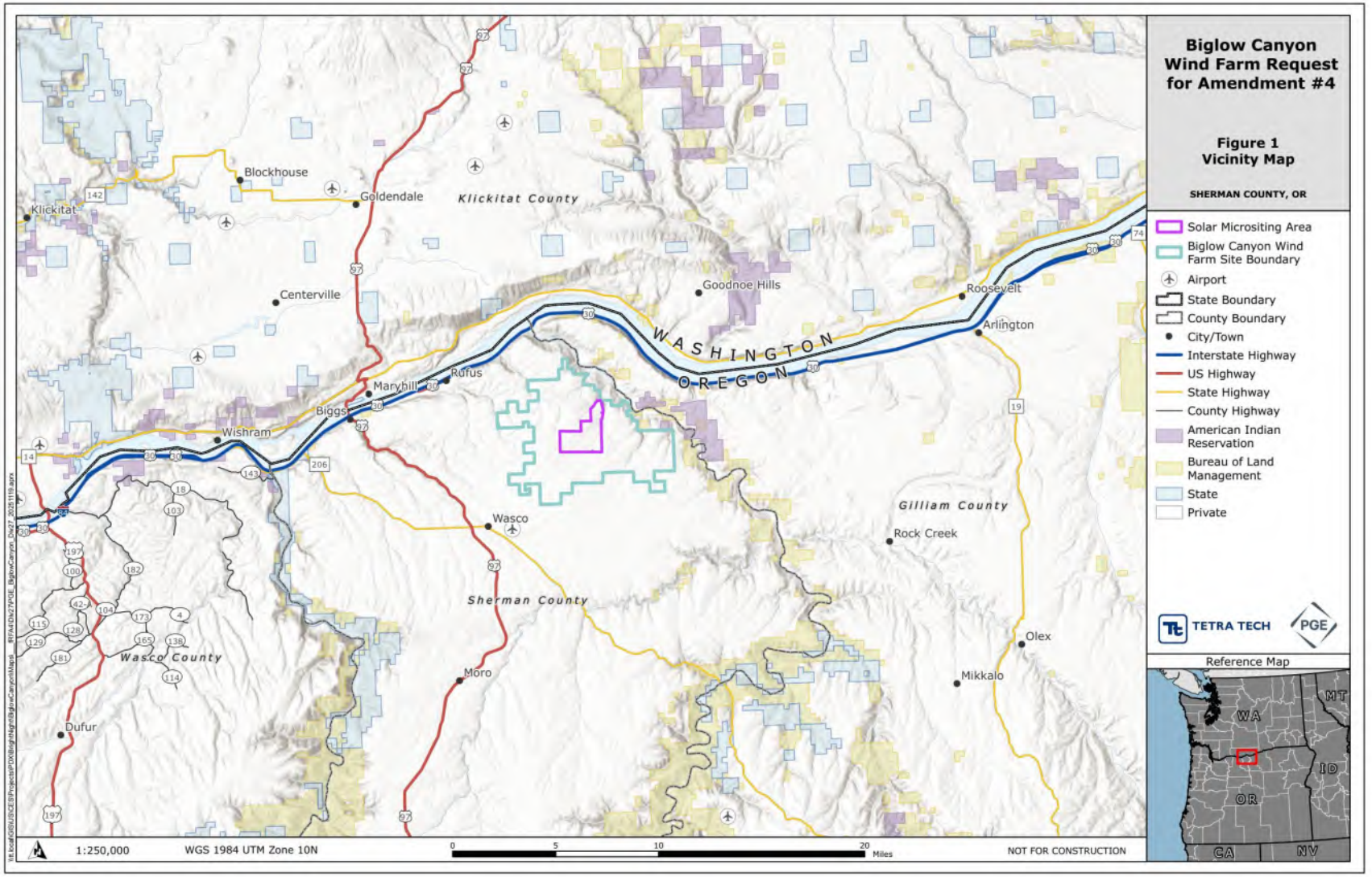
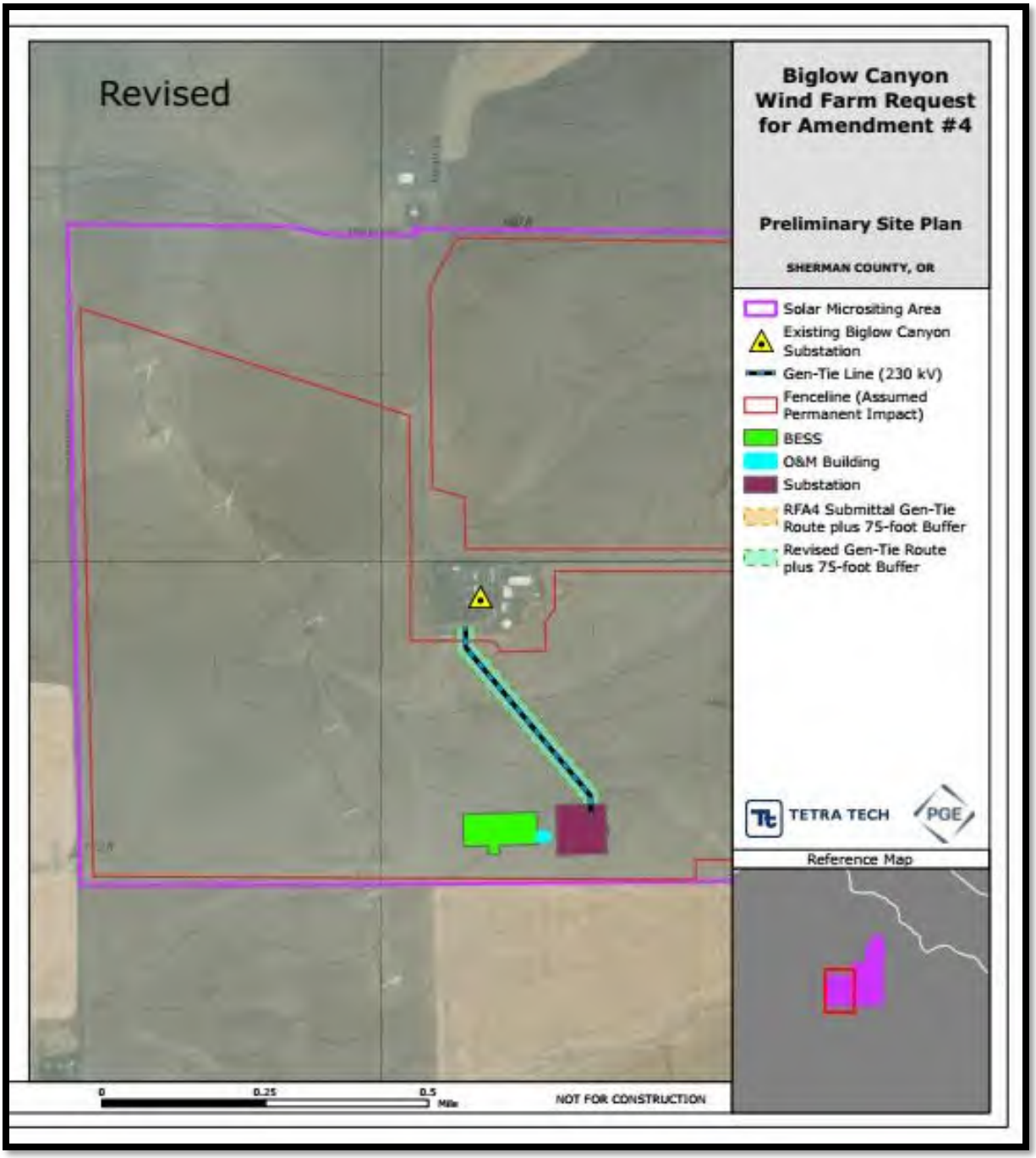


Figure 2: Approved Transmission Line Corridor



Attachment B-1: Reviewing Agency Comments on preliminary RFA4

From: HUBNER Daniel * ODF
Sent: Thursday, May 1, 2025 12:52 PM
To: CLARK Christopher * ODOE
Cc: TOKARCZYK John A * ODF
Subject: RE: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

---

Hi Christopher,

Based on review of the facility map (which indicates an absence of forested land in the project area), ODF does not have any specific comments on this preliminary amendment request – except to note as usual that the applicant is expected to be familiar with and fulfill any & all relevant obligations related to fire prevention (ORS Chapter 477).

Thanks for the opportunity to comment. Happy to provide a more formal no-comment letter if needed for your records – but if email suffices, we're all good from ODF's end.

Best,
Dan

Dan Hubner (he/him/his)
Information Analyst
Oregon Department of Forestry
503-779-4004

From: TOKARCZYK John A * ODF <John.A.TOKARCZYK@odf.oregon.gov>
Sent: Wednesday, April 30, 2025 12:04 PM
To: HUBNER Daniel * ODF <Daniel.HUBNER@odf.oregon.gov>
Subject: FW: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

---

From: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Sent: Wednesday, April 30, 2025 12:00 PM
To: BLEAKNEY Leann <lbleakney@nwcouncil.org>; ODA_listedplants <listedplants@oda.oregon.gov>; ODA_plant-weed <plant-weed@oda.oregon.gov>; Brandon.PIKE@aviation.oregon.gov; THOMPSON Jeremy L * ODFW <Jeremy.L.THOMPSON@odfw.oregon.gov>; WILKES Jessica S * ODFW <Jessica.S.Wilkes@odfw.oregon.gov>; MEYERS Andrew R * ODFW <Andrew.R.MEYERS@odfw.oregon.gov>; TOKARCZYK John A * ODF

<John.A.TOKARCZYK@odf.oregon.gov>; HOLSCHBACH Tim J * ODF <Tim.J.HOLSCHBACH@odf.oregon.gov>; FIELDS Tom * ODF <Tom.FIELDS@odf.oregon.gov>; HOPKINS Levi A * ODF <Levi.A.HOPKINS@odf.oregon.gov>; MCCLAUGHRY Jason * DGMI <Jason.MCCLAUGHRY@dogami.oregon.gov>; JININGS Jon * DLCD <Jon.JININGS@dlcd.oregon.gov>; FOOTE Hilary * DLCD <Hilary.FOOTE@dlcd.oregon.gov>; EVANS Daniel * DSL <Daniel.EVANS@dsl.oregon.gov>; SALGADO Jessica * DSL <Jessica.SALGADO@dsl.oregon.gov>; RASHID Yassir * PUC <Yassir.RASHID@puc.oregon.gov>; CRUSE Martha * DEQ <Martha.Cruse@deq.oregon.gov>; SVELUND Greg * DEQ <Greg.SVELUND@deq.oregon.gov>; KOWITZ Chris C * WRD <Chris.C.KOWITZ@water.oregon.gov>; BJORK Mary F * WRD <Mary.F.BJORK@water.oregon.gov>; wascocity@gmail.com; anja.mundy@co.gilliam.or.us
Cc: CORNETT Todd * ODOE <Todd.CORNETT@energy.oregon.gov>; ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Subject: FW: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

Hello,

The Oregon Department of Energy requests agency comments on preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm by **May 30, 2025.** In the preliminary Request, the certificate holder, Portland General Electric Company, seeks authorization from the Energy Facility Siting Council to construct and operate a 385-MW solar photovoltaic power generation facility, battery energy storage systems with up to 375 MW of discharge capacity, and other related or supporting facilities at the site of the operating Biglow Canyon Wind Farm in Sherman County. Please see the notice below for additional information.

You are receiving this request because the Department has identified your organization as a "reviewing agency" for this application. As defined in OAR 345-001-0010, this includes state agencies, local governments and tribal governments with subject matter or geographic jurisdiction over the construction and operation of the facility. If you represent a city and the proposed facility is not located within your jurisdiction, you are a reviewing agency because your jurisdiction is within 10 miles of the facility and construction or operation of the facility may impact your jurisdiction. I will follow up with specific requests for individual agency partners; but in general, the Department is seeking your agencies determination on whether the preliminary request contains sufficient information for the Energy Facility Siting Council to determine whether or not the proposed facility components would comply with all applicable standards, laws, and rules that are subject to the Council's review under ORS chapter 469.

The preliminary Request for Amendment and other information is available at: https://www.oregon.gov/energy/facilities-safety/facilities/Pages/BCW.aspx. If you need additional time or information, or require print copies materials to prepare your comments, please let me know as soon as possible. If you do not respond to this request by May 30, 2025, the Department will assume your agency does not have any comments at this time.

Thank you,

Christopher M. Clark
Senior Siting Analyst
he/him
550 Capitol St. NE | Salem, OR 97301
P: 503-871-7254

P (In Oregon): 800-221-8035

Stay connected!

From: Oregon Department of Energy <ODOE@cd.energy.oregon.gov>
Sent: Tuesday, April 29, 2025 2:25 PM
To: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Subject: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

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OREGON DEPARTMENT OF ENERGY ENERGY FACILITY SITING COUNCIL

Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

On April 21, 2025, the Oregon Department of Energy received preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm (pRFA4).

In pRFA4, Portland General Electric Company, the certificate holder, requests the Energy Facility Siting Council's approval to construct and operate a 385-MW solar photovoltaic power generation facility, battery energy storage systems with up to 375 MW of discharge capacity, and other related or supporting facilities within a 3,980-acre (6.2 sq. mile) solar micrositing area. The proposed solar micrositing area includes 2,571 acres within the approved wind energy facility site boundary and 1,409 acres which would be added to the site.

The pRFA4 and Public Notice of Receipt of the pRFA4 are available on the Department's website.

The Biglow Canyon Wind Farm is an is an operating wind energy facility located within a site boundary comprised of approximately 25,000 acres (39 square miles). The facility consists of 217 wind turbines, with a maximum blade tip height of 445 feet, and a peak generating capacity of 450 megawatts.

Please note, this notice is to provide early notification of this amendment request. There is no comment period associated with this phase of review. A comment period and public hearing will be held later in the process.

For more information about pRFA4, please contact Christopher Clark, Senior Siting Analyst, via phone, fax, email, or mail:
Christopher Clark, Senior Siting Analyst
550 Capitol Street NE
Salem, OR 97301
Phone: (503) 871-7254
Fax: (503) 373-7806
Email: christopher.clark@energy.oregon.gov

You received this notice either because you previously signed up for email updates through GovDelivery or ClickDimensions related to specific siting projects or all Energy Facility Siting Council activities (the "General List"). You will automatically receive all future notices per your request or GovDelivery/ClickDimensions choices, unless you unsubscribe via ClickDimensions or by contacting the Department.

If you have any questions or comments about ClickDimensions please feel free to contact the Department's Administrative Assistant, Nancy Hatch at 503-428-7905, toll-free in Oregon at 800-221-8035, or email to nancy.hatch@energy.oregon.gov.

Oregon Department of Energy
Leading Oregon to a safe, equitable, clean, and sustainable energy future.

The Oregon Department of Energy helps Oregonians make informed decisions and maintain a resilient and affordable energy system. We advance solutions to shape an

equitable clean energy transition, protect the environment and public health, and responsibly balance energy needs and impacts for current and future generations.



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Click here to unsubscribe or here to change your Subscription Preferences.

From: EVANS Daniel * DSL
Sent: Friday, May 23, 2025 11:49 AM
To: CLARK Christopher * ODOE
Subject: RE: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

---

Hi Christopher,

For the Amendment 4 for Biglow Canyon Wind Farm

1. **The name, address and telephone number of the contact person assigned to review the application for your agency**.

Trevor Griffiths 971-375-8886 is assigned review of a wetland delineation, WD2025-0012. It is currently in review.

2) **Comments on aspects of the proposed facility that are within the particular responsibility or expertise of your agency.**
DSL will review a wetland delineation report for determining Waters of the State. At this time it is not know if a Wetland Removal-Fill application governing the issuance and enforcement of removal-fill authorizations within Waters of Oregon, including wetlands, is required.

3) **A list of statutes, administrative rules and local government ordinances administered by your agency that might apply to construction or operation of the proposed facility and a description of any information needed for determining compliance.**

Wetland delineations will be reviewed per OAR 141-090
Wetland Removal-Fill applications, if required, will be reviewed per OAR 141-085

4) **A list of any permits administered by your agency that might apply to construction or operation of the proposed facility and a description of any information needed for reviewing a permit application.**

Wetland Removal-Fill Permit

5) **Recommendations regarding the size and location of analysis areas (see below for more information).**

Based on the proposed project area, it appears many potential resources, as mapped on the Statewide Wetland Inventories are present. A wetland delineation will determine the on-the-grounds extent. Once approved by DSL, awetland delineation will provide project designers the footprint of wetlands and waters and allow for avoidance and minimization of impacts to Waters of the State to the extent practicable.

6) **A list of studies that should be conducted to identify potential impacts of the proposed facility and mitigation measures.**

Wetland Delineation, which may include additional supporting studies, depending on the site. These may include but are not limited to Stream Duration Assessment Method, identification of Aquatic Resources of Special Concern (e.g.: vernal pools)

Wetland Removal-Fill Permit, which may include additional supporting studies, depending on the site. These may include but are not limited to the Oregon Rapid Wetland Assessment Protocol

and Stream Function Assessment Method.

Thank you,

Daniel Evans, PWS
He/him/his
Wetland Ecology Specialist
Oregon Department of State Lands
Mobile: 503-428-8188

From: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Sent: Wednesday, April 30, 2025 12:00 PM
To: BLEAKNEY Leann <lbleakney@nwcouncil.org>; ODA_listedplants <listedplants@oda.oregon.gov>; ODA_plant-weed <plant-weed@oda.oregon.gov>; Brandon.PIKE@aviation.oregon.gov; THOMPSON Jeremy L * ODFW <Jeremy.L.THOMPSON@odfw.oregon.gov>; WILKES Jessica S * ODFW <Jessica.S.Wilkes@odfw.oregon.gov>; MEYERS Andrew R * ODFW <Andrew.R.MEYERS@odfw.oregon.gov>; TOKARCZYK John A * ODF <John.A.TOKARCZYK@odf.oregon.gov>; HOLSCHBACH Tim J * ODF <Tim.J.HOLSCHBACH@odf.oregon.gov>; FIELDS Tom * ODF <Tom.FIELDS@odf.oregon.gov>; HOPKINS Levi A * ODF <Levi.A.HOPKINS@odf.oregon.gov>; MCCLAUGHRY Jason * DGMI <Jason.MCCLAUGHRY@dogami.oregon.gov>; JININGS Jon * DLCD <Jon.JININGS@dlcd.oregon.gov>; FOOTE Hilary * DLCD <Hilary.FOOTE@dlcd.oregon.gov>; EVANS Daniel * DSL <Daniel.EVANS@dsl.oregon.gov>; SALGADO Jessica * DSL <Jessica.SALGADO@dsl.oregon.gov>; RASHID Yassir * PUC <Yassir.RASHID@puc.oregon.gov>; CRUSE Martha * DEQ <Martha.Cruse@deq.oregon.gov>; SVELUND Greg * DEQ <Greg.SVELUND@deq.oregon.gov>; KOWITZ Chris C * WRD <Chris.C.KOWITZ@water.oregon.gov>; BJORK Mary F * WRD <Mary.F.BJORK@water.oregon.gov>; wascocity@gmail.com; anja.mundy@co.gilliam.or.us
Cc: CORNETT Todd * ODOE <Todd.CORNETT@energy.oregon.gov>; ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Subject: FW: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

Hello,

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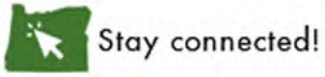
You are receiving this request because the Department has identified your organization as a "reviewing agency" for this application. As defined in OAR 345-001-0010, this includes state agencies, local governments and tribal governments with subject matter or geographic jurisdiction over the construction and operation of the facility. If you represent a city and the proposed facility is not located within your jurisdiction, you are a reviewing agency because your jurisdiction is within 10 miles of the facility and construction or operation of the facility may impact your jurisdiction. I will follow up with specific requests for individual agency partners; but in general, the Department is seeking your agencies determination on whether the preliminary request contains sufficient information for the Energy Facility Siting Council to determine

whether or not the proposed facility components would comply with all applicable standards, laws, and rules that are subject to the Council's review under ORS chapter 469.

The preliminary Request for Amendment and other information is available at: https://www.oregon.gov/energy/facilities-safety/facilities/Pages/BCW.aspx. If you need additional time or information, or require print copies materials to prepare your comments, please let me know as soon as possible. If you do not respond to this request by May 30, 2025, the Department will assume your agency does not have any comments at this time.

Thank you,



Christopher M. Clark
Senior Siting Analyst
he/him
550 Capitol St. NE | Salem, OR 97301
P: 503-871-7254
P (In Oregon): 800-221-8035


From: Oregon Department of Energy <ODOE@cd.energy.oregon.gov>
Sent: Tuesday, April 29, 2025 2:25 PM
To: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Subject: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

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OREGON DEPARTMENT OF ENERGY — ENERGY FACILITY SITING COUNCIL

Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

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The pRFA4 and Public Notice of Receipt of the pRFA4 are available on the Department's website.

The Biglow Canyon Wind Farm is an is an operating wind energy facility located within a site boundary comprised of approximately 25,000 acres (39 square miles). The facility consists of 217 wind turbines, with a maximum blade tip height of 445 feet, and a peak generating capacity of 450 megawatts.

Please note, this notice is to provide early notification of this amendment request. There is no comment period associated with this phase of review. A comment period and public hearing will be held later in the process.

For more information about pRFA4, please contact Christopher Clark, Senior Siting Analyst, via phone, fax, email, or mail:
Christopher Clark, Senior Siting Analyst
550 Capitol Street NE
Salem, OR 97301
Phone: (503) 871-7254
Fax: (503) 373-7806
Email: christopher.clark@energy.oregon.gov

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If you have any questions or comments about ClickDimensions please feel free to contact the Department's Administrative Assistant, Nancy Hatch at 503-428-7905, toll-free in Oregon at 800-221-8035, or email to nancy.hatch@energy.oregon.gov.

Oregon Department of Energy
Leading Oregon to a safe, equitable, clean, and sustainable energy future.

The Oregon Department of Energy helps Oregonians make informed decisions and maintain a resilient and affordable energy system. We advance solutions to shape an equitable clean energy transition, protect the environment and public health, and responsibly balance energy needs and impacts for current and future generations.



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From: MCCLAUGHRY Jason * DGMI
Sent: Thursday, May 29, 2025 3:29 PM
To: CLARK Christopher * ODOE
Cc: ESTERSON Sarah * ODOE; GUERRERO Lalo * DGMI
Subject: RE: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

---

Hello Christopher:

Greetings. Thank you for the opportunity to review the preliminary request for Amendment 4 of the site certificate for the Biglow Canyon wind farm project, as required by the Oregon Department of Energy. Overall, the report contains up-to-date references and includes the latest data sets from the 2021 Oregon seismic hazard database, as well as other sources from the USGS. One minor issue to note is that the seismic hazard model used is from 2018. DOGAMI recommends that practitioners use the 2023 version of the National Seismic Hazard Model, as it includes the probability of an earthquake occurring on a previously unmapped or unrecognized fault. If you have any additional questions about this review, please contact our geology hazards specialist Lalo Guerrero who is ccd on this email. Thank you.

Best Regards,
Jason

CC: Lalo Guerrero, Ph.D., G.I.T.

From: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Sent: Wednesday, April 30, 2025 12:00 PM
To: BLEAKNEY Leann <lbleakney@nwcouncil.org>; ODA_listedplants <listedplants@oda.oregon.gov>; ODA_plant-weed <plant-weed@oda.oregon.gov>; Brandon.PIKE@aviation.oregon.gov; THOMPSON Jeremy L * ODFW <Jeremy.L.THOMPSON@odfw.oregon.gov>; WILKES Jessica S * ODFW <Jessica.S.Wilkes@odfw.oregon.gov>; MEYERS Andrew R * ODFW <Andrew.R.MEYERS@odfw.oregon.gov>; TOKARCZYK John A * ODF <John.A.TOKARCZYK@odf.oregon.gov>; HOLSCHBACH Tim J * ODF <Tim.J.HOLSCHBACH@odf.oregon.gov>; FIELDS Tom * ODF <Tom.FIELDS@odf.oregon.gov>; HOPKINS Levi A * ODF <Levi.A.HOPKINS@odf.oregon.gov>; MCCLAUGHRY Jason * DGMI <Jason.MCCLAUGHRY@dogami.oregon.gov>; JININGS Jon * DLCD <Jon.JININGS@dlcd.oregon.gov>; FOOTE Hilary * DLCD <Hilary.FOOTE@dlcd.oregon.gov>; EVANS Daniel * DSL <Daniel.EVANS@dsl.oregon.gov>; SALGADO Jessica * DSL <Jessica.SALGADO@dsl.oregon.gov>; RASHID Yassir * PUC <Yassir.RASHID@puc.oregon.gov>; CRUSE Martha * DEQ <Martha.Cruse@deq.oregon.gov>; SVELUND Greg * DEQ <Greg.SVELUND@deq.oregon.gov>; KOWITZ Chris C * WRD <Chris.C.KOWITZ@water.oregon.gov>; BJORK Mary F * WRD <Mary.F.BJORK@water.oregon.gov>; wascocity@gmail.com; anja.mundy@co.gilliam.or.us
Cc: CORNETT Todd * ODOE <Todd.CORNETT@energy.oregon.gov>; ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Subject: FW: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

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Christopher M. Clark
Senior Siting Analyst
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OREGON DEPARTMENT OF ENERGY 50 YEARS of SERVICE ENERGY FACILITY SITING COUNCIL

Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

On April 21, 2025, the Oregon Department of Energy received preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm (pRFA4).

In pRFA4, Portland General Electric Company, the certificate holder, requests the Energy Facility Siting Council's approval to construct and operate a 385-MW solar photovoltaic power generation facility, battery energy storage systems with up to 375 MW of discharge capacity, and other related or supporting facilities within a 3,980-acre (6.2 sq. mile) solar micrositing area. The proposed solar micrositing area includes 2,571 acres within the approved wind energy facility site boundary and 1,409 acres which would be added to the site.

The pRFA4 and Public Notice of Receipt of the pRFA4 are available on the Department's website.

The Biglow Canyon Wind Farm is an is an operating wind energy facility located within a site boundary comprised of approximately 25,000 acres (39 square miles). The facility consists of 217 wind turbines, with a maximum blade tip height of 445 feet, and a peak generating capacity of 450 megawatts.

Please note, this notice is to provide early notification of this amendment request. There is no comment period associated with this phase of review. A comment period and public hearing will be held later in the process.

For more information about pRFA4, please contact Christopher Clark, Senior Siting Analyst, via phone, fax, email, or mail:
Christopher Clark, Senior Siting Analyst
550 Capitol Street NE
Salem, OR 97301
Phone: (503) 871-7254
Fax: (503) 373-7806
Email: christopher.clark@energy.oregon.gov

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If you have any questions or comments about ClickDimensions please feel free to contact the Department's Administrative Assistant, Nancy Hatch at 503-428-7905, toll-free in Oregon at 800-221-8035, or email to nancy.hatch@energy.oregon.gov.

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The Oregon Department of Energy helps Oregonians make informed decisions and maintain a resilient and affordable energy system. We advance solutions to shape an equitable clean energy transition, protect the environment and public health, and responsibly balance energy needs and impacts for current and future generations.



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May 29, 2025

Christopher M. Clark
Siting Analyst
550 Capitol Street NE
Salem, Or 97301

RE: Biglow Canyon Solar Farm
Dear Mr. Clark,
Thank you for the opportunity to comment on the Biglow Canyon Solar project. The following comments are conveyed on behalf of the Sherman County Court.

1) The name, address and telephone number of the contact person assigned to review the application for your agency:
Georgia Macnab
Sherman County Planning Director
PO Box 381
Moro, OR 97039

2) Comments on aspects of the proposed facility that are within the particular responsibility or expertise of your agency.
The document has been well prepared along with studies and research regarding fire and fire protection, scenic resources, noise, police protection, ect. Based on these studies and exhibits it appears that the project has been well thought out and researched. However the project and impacts on the ground can be much different than what is on paper. The other concern is the time frame for review and comments on the amendment. There are a lot of Exhibits and information to review and a months' time is not a sufficient amount of time to submit this back to the Department.

The Sherman County Court is concerned about the future impacts that the solar farm will create. These include the visual impact to adjacent land owners or residents, who are not under contract, wildfire, long term damage to the ground and loss of farm ground and grazing pasture.

Since this is an amendment to an existing permit for the Biglow Wind Farm concerns have been raised about the lack of maintenance to the wind towers associated with that farm. Will the same be true of the solar farm. What actions or procedures will be enforced to remedy this kind of neglect?

Other comments:
Weed Control: Has the company talked to the Weed Master for this project. The document states that they have a current weed plan but have they contacted the Weed Master for this project.
Ex L 4.4.2.2 Scenic John Day River, Pg 27-28: Cumulative Scenic Impacts of Wind Farms and Solar Farms cannot be ignored.

Ex R, Municipalities, Pg 9; Applicant did not use the most recent Comprehensive Plans for the Cities of Wasco, Rufus and Moro. The plans sited are from 1978 and those plans were updated in 2007. Moro is in the process of updating their 2007 Comprehensive Plan and is in the process of being adopted.
Exhibit U, 4.4.7, pg. 25: states that "fire and police concerns are not expected to be a significant demand on services". Fire concerns are of high significance to the county. Wildfires can and do start and spread quickly. All fire districts are manned by volunteers and work at day jobs. There is a history of wildfires in this area plus wildfire can spread from Wasco County to Sherman County. The county feels that this statement is highly underestimated and should be taken more seriously.
Ex U Pg. 27: Health care provider is no longer Mid Columbia Medical Center, it is now Adventist Health Columbia Gorge Hospital.
Ex V, 4.5.1 Page 10; States that the fire chief declares the fire season. However the county court declares the fire season after consultation with all county fire chiefs.

Also not clear is whether adjacent property owners to the proposed solar farm were contacted regarding the solar facility.

3) A list of statutes, administrative rules and local government ordinances administered by your agency that might apply to construction or operation of the proposed facility and a description of any information needed for determining compliance.
Article 3, 3.1, Exclusive Farm Use Zone 1.Conditional Uses Permitted
(q)Commercial Utility Facilities
(x) Transmission Lines over 200 Feet in Height.
Section 3.7 Natural Hazards Combining Zone
There appears to be areas within the proposed site that is bordering a Natural Hazards Combining Zone. The applicant has addressed this sufficiently in the submittal.

The regulations regarding Conditional Use Permits are found in the SCZO:
Article 5 Sections 5.1 Authorization to Grant or Deny conditional Uses

5.2 General Criteria

5.3 General Conditions

Section 5.8 Standards Governing Specific Conditional Uses
10. Radio or Television Transmitter Tower, Utility or Substation
14. Public Facilities and Services
20. Non Farm Uses in an F-1 Zone

Sherman County Goal 5 Inventory
Sherman County also has a Goal 5 Inventory that includes Historical, Cultural and Mineral sites. Mineral Sites must be protected. There is a possibility of 2 sites in the area and there is no reference to these in the application.

Sherman County Transportation Plan (TSP)
Sherman County TSP has an access management policy for the County's arterial and collector road system. Access spacing standards for all driveways and private roads are provided within this plan.

4) A list of any permits administered by your agency that might apply to construction or operation of the proposed facility and a description of any information needed for reviewing a permit application.

-Sanitation- North Central Public Health District provides sanitation permits for Sherman County. They are located in The Dalles, OR.
-Road Approach Permit- Sherman County Road Department
-Road Use Agreement- Sherman County Road Department
-Building permits- Oregon State building codes, Pendleton Regional Office.
-Conditional Use Permit- Sherman County Planning.

5. Recommendations regarding the size and location of analysis areas (see below for more information).

-Sherman County has a history of wildfires in the county. The analysis area should be expanded beyond the .5 mile radius.
-Land use should be expanded beyond the .5 mile radius.

6) A list of studies that should be conducted to identify potential impacts of the proposed facility and mitigation measures.

-Contact Sherman County Emergency Services for impacts of ambulance services for a final plan.
-Meet with North Sherman Rural Fire Protection District or the North Sherman Fire District Board for wildfire concerns or wildfire plan.
- Meet with the Sherman County Weed Department for weed control on the site.
-Soils Impact Analysis/Study--Watersheds-Sherman County SWCD
contact Sherman County NRCS and SWCD
- ODOT may require a Traffic Analysis Impact Study

If you have any questions please contact me at 541-565-3601.
Sincerely,

Georgia L. Macnab

Georgia L. Macnab, Sherman County Planning Director

cc: Sherman County Court

Oregon
Tina Kotek, Governor

Department of Fish and Wildlife
East Region
61374 Parrell Road
Bend, Oregon 97702
(541) 388-6363
FAX (541) 388-6281

May 30, 2025

Christopher Clark
Oregon Department of Energy
550 Capitol St. NE
Salem, OR 97301

RE: Request for comments on the Preliminary Request for Amendment 4 (pRFA4) of the Site Certificate for the Biglow Canyon Wind Farm submitted by Portland General Electric Company for the authorization to construct and operate a 385-MW solar photovoltaic power generation facility, battery energy storage systems with up to 375 MW of discharge capacity, and other related or supporting facilities at the site of the operating Biglow Canyon Wind Farm in Sherman County.

Dear Mr. Clark:

Oregon Department of Energy (ODOE) has requested comments from the Oregon Department of Fish and Wildlife (ODFW) on the pRFA4 for the Biglow Canyon Wind Farm. The Solar Micrositing Area identified as part of pRFA4 is approximately 3,980 acres and provides an estimate of the maximum area needed for development, micrositing, and temporary disturbances from the Solar Components during construction. This Letter contains: (1) ODFW contact information for the project; and (2) ODFW's comments on the Preliminary Request for Amendment 4.

A. Contacts

I will be the main contact person for ODFW for the Energy Facility Siting Council (EFSC) permitting process and my contact information is: Jessica Wilkes, 61374 Parrell Road, Bend, OR 97702. My phone number is (541) 388-6099, Jessica.S.Wilkes@odfw.oregon.gov. In addition, please copy Jeremy Thompson, Energy Program Coordinator, 4034 Fairview Industrial Drive SE, Salem OR 97302. Phone number (541) 980-8524, Jeremy.L.Thompson@odfw.oregon.gov. ODFW requests that as applicable, all correspondence for this project be conveyed electronically.

B. Comments on the Preliminary Application for Site Certificate

General Comments

Please find below a listing of the most applicable statutes, administrative rules and policies administered by ODFW that would pertain to the siting of this proposed facility. ODFW will review and make recommendations for the proposed project based on the following applicable statutes and rules.

Oregon Revised Statutes (ORS)

- ORS 496.012 Wildlife Policy

- ORS 506.036 Protection and Propagation of Fish

- ORS 496.171 through 496.192 Threatened and Endangered Wildlife and Fish Species. A listing of State and Federal threatened, endangered and candidate species can be found on ODFW's website at: http://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp

- ORS 498.301 through 498.346 Screening and By-pass devices for Water Diversions or Obstructions

- ORS 506.109 Food Fish Management Policy

- ORS 509-140 Placing Explosives in Water

- ORS 509.580 through 509.910 Fish Passage; Fishways: Screening Devices- a listing of requirements under ODFW's Fish Passage Program can be found on ODFW's website at http://www.dfw.state.or.us/fish/passage/

Oregon Administrative Rules (OAR)

- OAR Chapter 635, Division 100 provides authority for adoption of the State sensitive species list and the Wildlife Diversity Plan, and contains the State list of threatened and endangered wildlife and fish species. A current list of State sensitive species can be found on ODFW's website at: http://www.dfw.state.or.us/wildlife/diversity/species/docs/SSL_by_category.pdf

- OAR Chapter 635, Division 415 (ODFW's Fish and Wildlife Mitigation Policy found on ODFW's website at: http://www.dfw.state.or.us/lands/mitigation_policy.asp describes six habitat categories and establishes mitigation goals and standards for each wildlife habitat ranging from Category 1 (irreplaceable, essential, limited) to Category 6 (non-habitat)

- The Policy goal for Category 1 habitat is no loss of either habitat quantity or quality via avoidance of impacts through development alternatives, or an ODFW recommendation of denial of the proposed development action if impacts cannot be avoided. Categories 2-4 are essential or important but not irreplaceable habitats. Category 5 habitat is not essential or important habitat but has a high restoration potential. The application for a site certificate must identify the appropriate habitat category for all affected areas of the proposed project on mapping; provide basis for each habitat category selection; and provide an appropriate mitigation plan; all subject to ODOE and ODFW review and comment. ODOE has adopted this rule into OAR 345-022-0060 as an energy facility siting standard for Applicants to meet in order to obtain a site certificate.

- ODFW also provides technical review and recommendations on compliance with Oregon EFSC rules, particularly OAR 345-02100010(1) (p) and (q) and 345-22-040, 060 and 070.

- ODFW also advocates for project proponents to site solar facilities in a manner consistent with the Oregon Columbia Plateau Ecoregion (CPE) Wind Energy Siting and Permitting Guidelines that were established in conjunction with multiple state, federal and industry partners. The intent of these guidelines were to create a balance between the development of renewable energy and environmental protection. While these guidelines were developed for wind facilities, they are also applicable to solar projects within the CPE.

Specific Comments

- ODFW applauds co-location efforts by utilizing available area beneath wind farms for new solar facilities. The Department appreciates the applicant's communication and efforts to address fish and wildlife concerns related to the application.
- Specific to the HMA:
    - As discussed with the applicant, ODFW has concerns whether the BCWF HMA can successfully meet mitigation criteria.
    - ODFW requests more information about the alternative mitigation site location and uplift actions to meet the quality and quantity of impacted habitat to achieve "no net loss" and "net benefit."
    - ODFW requests a more detailed explanation of success criteria and uplift actions for the HMA, especially for weed control and seeding/shrub planting.
        - Methodology for uplift actions and success criteria should be written with enough detail such that someone who is new to the project would be able to reproduce the same actions and success criteria evaluation with no further explanation or instruction needed.
        - Uplift actions, success criteria and sampling methodology needs to be determined prior to construction and selection of an HMA.
- This project is within approximately 2 miles of mapped occupied bighorn sheep habitat. ODFW requests ODOE condition the facility to not allow utilization of domestic sheep or goats within the facility. We discourage the use of vegetation control via domestic livestock to avoid transmission of zoonotic diseases such as *M. ovi* ensure the integrity of the bighorn sheep population.
- ODFW considers all habitats within winter range, with the exception of areas designated as Category 6 in the CPE, to be Category 2 as per the Oregon Habitat Mitigation Policy. For Category 2 habitats, ODFW's policy is to have "no net loss of habitat quantity or quality," and asks for "in-kind, in-proximity mitigation" (OAR Chapter 635, Division 415). The CPE contains several habitats that are rare and declining including wetlands, sagebrush steppe, and native grasslands. ODFW encourages the applicant avoid these rare intact habitats when it comes to micro siting and favor siting in previously disturbed areas.
- ODFW continues to advocate for avoidance of Priority Wildlife Connectivity Areas (PWCAs) located on the edge of the facility. To avoid losing the function of this habitat, utilization of setbacks sufficient to facilitate wildlife movement along the edges of major drainages adjacent to the facility will be key.
- ODFW recommends that the applicant work with the county weed department or Oregon State Extension to develop a revegetation and weed control plan that will be successful within the project area, given the challenges realized within this ecoregion with revegetation projects. ODFW encourages retention of native vegetation within project boundaries to the maximum extent possible. When revegetating, ODFW encourages

utilizing a diverse seed mix with consideration given to pollinator-friendly varieties and shrub reestablishment.

- ODFW requests that any ground disturbance or vegetation removal within the project boundary be conducted prior to or after the critical period for ground nesting birds, April 15- September 1. Should ground disturbance occur during this period, ODFW requests that vegetative removal occurs prior to the critical nesting period.
- ODFW requests that the applicant limit construction activities outside of the project footprint during the winter period, December 1- April 1, to reduce disturbance to wintering wildlife. In addition, ODFW requests that the placement of project infrastructure, including buildings and roads be sited within the project boundary in a manner to reduce the potential for disturbing wildlife outside of the project boundaries both during construction and in the operational phase.
- Impacts to all nests located should be avoided, and all activities prohibited during the timeframes and within the distances listed below for the species that may occur within the project boundary.

Species	**Spatial Buffer**	**Seasonal Restriction**	**Release Date if Unoccupied**
Western burrowing owl	0.25 mile	April 1 to August 15	31-May
Golden eagle	0.5 mile	Feb 1- Aug 15	15-May
Red-tailed hawk	300-500 ft	Mar 1- Aug 15	31-May
Ferruginous hawk	0.25 mile	Mar 15- Aug 15	31-May
Swainson's hawk	0.25 mile	April 1- Aug 15	31-May
Prairie Falcon	0.25 mile	Mar 15- Jul 1	15-May
Peregrine falcon	0.25 mile	Jan 1- Jul 1	15-May
American kestrel	0.25 mile	Mar 1- Jul 31	15-May

Table 1. Recommended seasonal and spatial activity restrictions for raptor species.

ODFW appreciates the opportunity to comment on this pRFA4 and the actions taken to consider fish and wildlife impacts. ODFW looks forward to working with ODOE and the Applicant on this proposed project.

Respectfully,



Jessica Wilkes, Deschutes Regional Habitat Biologist

Cc: Jeremy Thompson, State Energy Coordinator
Andrew Meyers, Mid Columbia District Biologist
Sara Gregory, Deschutes Watershed Manager

From: Peacher, Kimberly N CIV USN NAVFAC NW SVD WA (USA)
Sent: Thursday, June 5, 2025 10:23 AM
To: CLARK Christopher * ODOE
Cc: Chris Bozzini; Lenna Cope; Betsey Biesty; ESTERSON Sarah * ODOE; KIANA.ZIOLA@tetratech.com
Subject: RE: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

---

Good morning Chris,

Thank you for reaching out and providing the project overview.

We did our analysis and the project is approx. 4 miles away laterally from any of our military utilized airspace. Given there are no new wind turbines, the NORAD portion within the GAC is not a concern either.

Thanks again.

V/R,

Kimberly Peacher
Community Planning & Liaison Officer
Northwest Training Range Complex
(360) 930-4085
NIPR: Kimberly.peacher@navy.mil
SIPR: Kimberly.peacher@navy.smil.mil

From: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Sent: Wednesday, June 4, 2025 11:40 AM
To: Peacher, Kimberly N CIV USN NAVFAC NW SVD WA (USA) <kimberly.n.peacher.civ@us.navy.mil>; ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Cc: Chris Bozzini <chris.bozzini@pgn.com>; Lenna Cope <lenna.cope@pgn.com>; Betsey Biesty <betsey.biesty@brightnightpower.com>; KIANA.ZIOLA@tetratech.com
Subject: [Non-DoD Source] FW: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

Hello Kim,

Sarah let me know that you did not receive our initial notice on Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm, my apologies for that. For context, this project proposes to add up to 385 MW of (~3,200 acres) of solar arrays; up to 1,500 MWh of Battery Energy Storage; and other related and supporting facilities including 2.7 miles of overhead 230-kV transmission lines, to the existing wind facility in Sherman County. No changes to existing wind infrastructure is proposed at this time. The project is within the Boardman Geographic Area of Concern.

More information is included below, and I have attached a shapefile of the micrositing boundary for the proposed components for your reference (please rename extension to .zip before use). Please let me

know if you have any comments or concerns regarding the project at your earliest convenience. I would be happy to schedule a call or send any other information along if that would be helpful.

I've also copied project contacts from PGE, Brightnight, and Tetra Tech on this message. They may be better able to answer any specific questions you may have about the proposal than I.

Thank you,

Christopher M. Clark
Senior Siting Analyst
he/him
550 Capitol St. NE | Salem, OR 97301
P: 503-871-7254
P (In Oregon): 800-221-8035
Stay connected!

From: Oregon Department of Energy <ODOE@cd.energy.oregon.gov>
Sent: Tuesday, April 29, 2025 2:25 PM
To: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Subject: Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

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OREGON DEPARTMENT OF ENERGY — ENERGY FACILITY SITING COUNCIL

Email Summary of Public Notice of Receipt of Preliminary Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm

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related or supporting facilities within a 3,980-acre (6.2 sq. mile) solar micrositing area. The proposed solar micrositing area includes 2,571 acres within the approved wind energy facility site boundary and 1,409 acres which would be added to the site.

The pRFA4 and Public Notice of Receipt of the pRFA4 are available on the Department's website.

The Biglow Canyon Wind Farm is an is an operating wind energy facility located within a site boundary comprised of approximately 25,000 acres (39 square miles). The facility consists of 217 wind turbines, with a maximum blade tip height of 445 feet, and a peak generating capacity of 450 megawatts.

Please note, this notice is to provide early notification of this amendment request. There is no comment period associated with this phase of review. A comment period and public hearing will be held later in the process.

For more information about pRFA4, please contact Christopher Clark, Senior Siting Analyst, via phone, fax, email, or mail:
Christopher Clark, Senior Siting Analyst
550 Capitol Street NE
Salem, OR 97301
Phone: (503) 871-7254
Fax: (503) 373-7806
Email: christopher.clark@energy.oregon.gov

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If you have any questions or comments about ClickDimensions please feel free to contact the Department's Administrative Assistant, Nancy Hatch at 503-428-7905, toll-free in Oregon at 800-221-8035, or email to nancy.hatch@energy.oregon.gov.

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Oregon
Tina Kotek, Governor

Parks and Recreation Department
Oregon Heritage/
State Historic Preservation Office
725 Summer St. NE, Suite C
Salem, OR 97301-1266
(503) 986-0690
Fax (503) 986-0793
oregonheritage.org

July 10, 2025

Mr. Christopher Clark
Oregon Dept of Energy
550 Capitol St. NE
Salem, OR 97301

RE: SHPO Case No. 25-0589
ODOE, 24-22, Biglow Solar
PGE has submitted an RFA for the Biglow Canyon Wind Farm to add photovoltaic solar energy generation and battery storage to the operating wind facility.
multiple, Sherman County

Dear Christopher Clark:

Thank you for submitting information for the project referenced above. According to our records and the provided archaeological report, there are previously identified archaeological objects or sites (Oregon Revised Statute [ORS] 358.905), or Native American cairn, burial, human remains, sacred objects and objects of cultural patrimony (ORS 97.740-760) in or adjacent to the project area. We concur with the determination that 11 of the archaeological resources identified are not eligible for listing in the National Register of Historic Places (NRHP); however, 8 archaeological resources remain unevaluated within the project area.

Our office concurs with the recommendation for a 20-meter avoidance buffer around all unevaluated and eligible resources, as well as the presence of an Oregon Qualified Archaeologist to monitor ground disturbing activities as proposed in the provided cover letter. Our office also concurs with the recommendation to have an Inadvertent Discovery Plan in place for all construction activities.

This recommendation is meant to assist with compliance of state law. Under ORS 358.920 and ORS 97.745, archaeological sites, objects and human remains are protected on both state public and private lands in Oregon.

A list of contractors can be found on the Association of Oregon Archaeologists website (www.oregonarchaeologists.com). This list includes qualified archaeologists in the state of Oregon. Some of these contractors have professional staff to address built-environment resources. For assistance in hiring a contractor, our office has published advice in Archaeology Bulletin 4 (https://www.oregon.gov/oprd/OH/Documents/Bulletin4.pdf).

If the project has a federal nexus (lands, funding, permitting, or oversight) coordinate with the lead federal agency to ensure compliance with Section 106 of the National Historic Preservation Act. If you have not already done so, be sure to consult with all appropriate Native American tribes regarding the proposed project. Additional consultation regarding this case must be sent through Go Digital. In order to help us track the project accurately, reference the SHPO case number above in all correspondence.

Our office has assigned the report SHPO biblio number 36068. Details will be available in the bibliographic database.

Please contact our office if you have any questions, comments or need additional assistance.

Sincerely,



Aspen Kemmerlin
Special Projects Archaeologist

Aspen.Kemmerlin@oprd.oregon.gov

cc: Brandon Gilliland, Warm Springs GeoVisions

From:	KEMMERLIN Aspen * OPRD
Sent:	Thursday, July 10, 2025 12:17 PM
To:	CLARK Christopher * ODOE
Cc:	bgilliland@wsgeovisions.com
Subject:	SHPO Case No.: 25-0589, ODOE, 24-22, Biglow Solar
Attachments:	SHPO Response Letter Case Nbr SHPO Case No._ 25-0589.pdf

Please find the SHPO's response to your request for comment on cultural resources at the above-identified project. This attachment serves as your file copy. If you have any questions, please feel free to contact me.

Aspen Kemmerlin (she, her, hers) | Special Projects Archaeologist

Oregon Heritage, Oregon Parks and Recreation Department
725 Summer St NE, Suite C, Salem, Oregon 97301
Cell: (503) 507 -3656

ESTERSON Sarah * ODOE

From: Sarah.ESTERSON@energy.oregon.gov
Subject: Biglow Canyon Wind Farm Request for Amendment 4 - Request for ODAv Concurrence on Applicability of 7460 Review

---

From: PIKE Brandon <Brandon.PIKE@odav.oregon.gov>
Sent: Thursday, December 11, 2025 10:13 AM
To: ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Cc: CLARK Christopher * ODOE <Christopher.CLARK@energy.oregon.gov>
Subject: RE: Biglow Canyon Wind Farm Request for Amendment 4 - Request for ODAv Concurrence on Applicability of 7460 Review

Hi Sarah,

Thanks again for your coordination on this. Based on what you've provided, I agree with PGE's consultant that it does not appear notice of construction to ODAV/FAA will be required. Let me know if any future revisions are made to the project—namely, if it gets closer to an airport or increases to pole/transmission line height are proposed.

Best,

BRANDON PIKE
OREGON DEPARTMENT OF AVIATION (ODAV)
AVIATION PLANNER

PHONE 971-372-1339
EMAIL brandon.pike@odav.oregon.gov
3040 25TH STREET SE, SALEM, OR 97302
WWW.OREGON.GOV/AVIATION

Alternative Contacts:
COAR Grants: Grants@ODAV.Oregon.Gov
Procurement / Contracts: Contracts@ODAV.Oregon.Gov
Pavement (PEP/PMP): Pavement@ODAV.Oregon.Gov
Land Use / Tall Structures: LandUse@ODAV.Oregon.Gov

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From: ESTERSON Sarah * ODOE <Sarah.ESTERSON@energy.oregon.gov>
Sent: Wednesday, December 10, 2025 10:45 AM
To: PIKE Brandon <Brandon.PIKE@odav.oregon.gov>
Cc: CLARK Christopher * ODOE <Christopher.CLARK@energy.oregon.gov>
Subject: Biglow Canyon Wind Farm Request for Amendment 4 - Request for ODAv Concurrence on Applicability of 7460 Review

This message was sent from outside the organization. Treat attachments, links and requests with caution. Be conscious of the information you share if you respond.

Hi Brandon,

Thanks for the phone call this morning. As we discussed, PGE's Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate has changed since Feb 2025 (when we originally received the request). We wanted to notify you of

the change, which includes removing the southern portion of the proposed solar area and the associated 230 kV transmission, reducing the changes under review to a 1,924 acre area encompassing up to 125 MW of solar photovoltaic power generation equipment, a substation, O&M building, two battery storage systems and approx. 600 feet of 230 kV transmission line. The solar arrays would be up to 15 feet in height; the transmission poles would be up to 80 feet in height; and the other components up to 25 feet in height. Figures with current layout and regional location are attached.

PGE (and their consultant, Tetra Tech) indicated that they ran the FAA Notice Criteria Tool to evaluate whether future notice and review under the 7460 process would be required. They confirmed that the tool indicated 7460 review would not be required. Could you confirm whether ODAv agrees that future 7460 review would not be needed for the facility components proposed in RFA4?

Please let us know if you need any additional information to evaluate the proposal/question. If you have everything you need, we would love a response this week if possible.

Thanks,
Sarah

50 YEARS of SERVICE
OREGON DEPARTMENT OF ENERGY

Sarah T. Esterson
Senior Policy Advisor
550 Capitol St. NE | Salem, OR 97301
P: 503-559-5218
1-800-221-8035
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Attachment B-2: Proposed Order Public Comments, Responses, Replies and Sur-replies

Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm
Draft Final Order

Public Comments Received as of January 30, 2026

Comment ID	Date	Commenter	Pages
BCWAMD4Doc24-01	12/23/2025	Kathryn McCullough	1-63
BCWAMD4Doc24-02	12/24/2025	Kathryn McCullough	64-114
BCWAMD4Doc24-03	1/1/2026	Kathryn McCullough	115-125
BCWAMD4Doc24-04	1/5/2026	Kathryn McCullough	126-144
BCWAMD4Doc24-05	1/6/2026	Kathryn McCullough	145-152
BCWAMD4Doc24-06	1/9/2026	Kathryn McCullough	153-155
BCWAMD4Doc24-07	1/14/2026	Mid-Columbia Economic Development District	156-156
BCWAMD4Doc24-08	1/14/2026	Certificate Holder	157-175
BCWAMD4Doc24-09	1/15/2026	Confederated Tribes of the Warm Springs THPO	176-177
BCWAMD4Doc24-10	1/16/2026	Kathryn McCullough	178-178
BCWAMD4Doc24-11	1/20/2026	Alan von Borstel	179-180
BCWAMD4Doc24-12	1/21/2026	Kathryn McCullough	181-300
BCWAMD4Doc24-13	1/21/2026	Kathryn McCullough	301-301
BCWAMD4Doc24-14	1/22/2026	Randy Hilderbrand	302-303
BCWAMD4Doc24-15	1/28/2026	Sherman County Weed District	304-304
BCWAMD4Doc24-16	1/29/2026	Jered Reid (Representing Donald Hilderbrand)	305-306
BCWAMD4Doc24-17	1/29/2026	Kathryn McCullough	307-309
BCWAMD4Doc24-18	1/30/2026	Kathryn McCullough	310-319
BCWAMD4Doc24-19	1/30/2026	Justin Scharf	320-323
BCWAMD4Doc24-20	1/30/2026	Oregon Wheat Growers League	324-327
BCWAMD4Doc24-21	1/30/2026	Sherman County Soil and Water Conservation District	328-331
BCWAMD4Doc24-22	1/30/2026	Certificate Holder	332-420
BCWAMD4Doc24-23	1/30/2026	Certificate Holder	421-775
BCWAMD4Doc25-03	1/15/2026	Various (Hearing Transcript)	776-1009

Responses to Comments Received as of February 13, 2026

Comment ID	Date	Commenter	Pages
BCWAMD4Doc26-01	2/12/2026	ODOE to Commenters	1010-1070
BCWAMD4Doc27-00	2/13/2026	Certificate Holder to Alan von Boerstel	1071-1073
BCWAMD4Doc27-01	2/13/2026	Certificate Holder to Chad Higgins	1074-1075
BCWAMD4Doc27-02	2/13/2026	Certificate Holder to Colton McCullough	1076-1079
BCWAMD4Doc27-03	2/13/2026	Certificate Holder to Dan Hilderbrand	1080-1081

BCWAMD4Doc27-04	2/13/2026	Certificate Holder to Jered Reid/Donald Hilderbrand	1082-1083
BCWAMD4Doc27-05	2/13/2026	Certificate Holder to Irene Gilbert	1084-1087
BCWAMD4Doc27-06	2/13/2026	Certificate Holder to MCEDD	1088-1089
BCWAMD4Doc27-07	2/13/2026	Certificate Holder to John Langdon	1090-1091
BCWAMD4Doc27-08	2/13/2026	Certificate Holder to Justin Scharf	1092-1093
BCWAMD4Doc27-09	2/13/2026	Certificate Holder to Kathy and Kevin McCullough	1094-1236
BCWAMD4Doc27-10	2/13/2026	Certificate Holder to Oregon Wheat Growers League	1237-1241
BCWAMD4Doc27-11	2/13/2026	Certificate Holder to Ormand Hilderbrand	1242-1243
BCWAMD4Doc27-12	2/13/2026	Certificate Holder to Randy Hilderbrand	1244-1245
BCWAMD4Doc27-13	2/13/2026	Certificate Holder to Sherman County Weed District	1246-1248
BCWAMD4Doc27-14	2/13/2026	Certificate Holder to Sherman County SWCD	1249-1254
BCWAMD4Doc27-15	2/13/2026	Certificate Holder to Confederated Tribes of Warm Springs	1255-1269

Replies to Responses Received as of February 27, 2026

Comment ID	Date	Commenter	Pages
BCWAMD4Doc28-01	2/24/2026	Kathy McCullough	1270-1428
BCWAMD4Doc28-02	2/27/2026	Colton McCullough	1429-1430
BCWAMD4Doc28-03	2/27/2026	Confederated Tribes of Warm Springs	1431-1433
BCWAMD4Doc28-04	2/27/2026	Certificate Hodler to ODOE	1434-1479

Sur-Replies to Replies Received as of March 6, 2026

Comment ID	Date	Commenter	Pages
BCWAMD4Doc29-01	3/6/2026	Certificate Holder to CTWS	1480-1483
BCWAMD4Doc29-02	3/6/2026	Certificate Holder to Kathy and Kevin McCullough	1484-1559
BCWAMd4Doc29-03	3/6/2026	Certificate Holder to Colton McCullough	1560-1567

From:	Kathryn McCullough
Sent:	Tuesday, December 23, 2025 7:57 AM
To:	CLARK Christopher * ODOE
Subject:	Biglow Canyon Wind Farm Facility
Attachments:	Wind Towers Down-compressed.pdf

Christopher,

Here is Exhibit One. Why in the world would we trust PGE to run a solar project in a high-risk wildfire area when the wind towers look like this? Yes, they still look like this. Supposedly, 17 of the 40+ broken Vestas towers will be fixed in 2026, **over four years after the "blade throw".**

We are over 100 miles from Portland. It is hard to find good help, especially when PGE pays less than the surrounding wind facilities like Avangrid. On weekends, the plant is not staffed, although there are some technicians working. On nights, no one is working. **Is this a power plant? Or a tax write-off?**

Yes, they have a new pitch system coming from Germany, and it looks great. But this project was built from the ground up in 9 months. That tells me this is a **financial** issue.

Will the solar facility be 24/7, especially during fire season? Will the weeds be kept down? Will the facility be protected by hundreds of feet of gravel on the west side or just 50, like they are proposing?

Will the BESS units be maintained better than the transformers? (pictures included below) I put this PDF together three years ago. The towers still look like this, and most of the Vestas are unsafe to run.

These are questions that need answers. We do not believe PGE is operating Biglow in good faith. They should not be allowed to build solar until the Vestas towers are fixed.

Sincerely,

Keven and Kathy McCullough

When Wind Towers Fall Apart

Portland General Electric's (PGE) Biglow Canyon

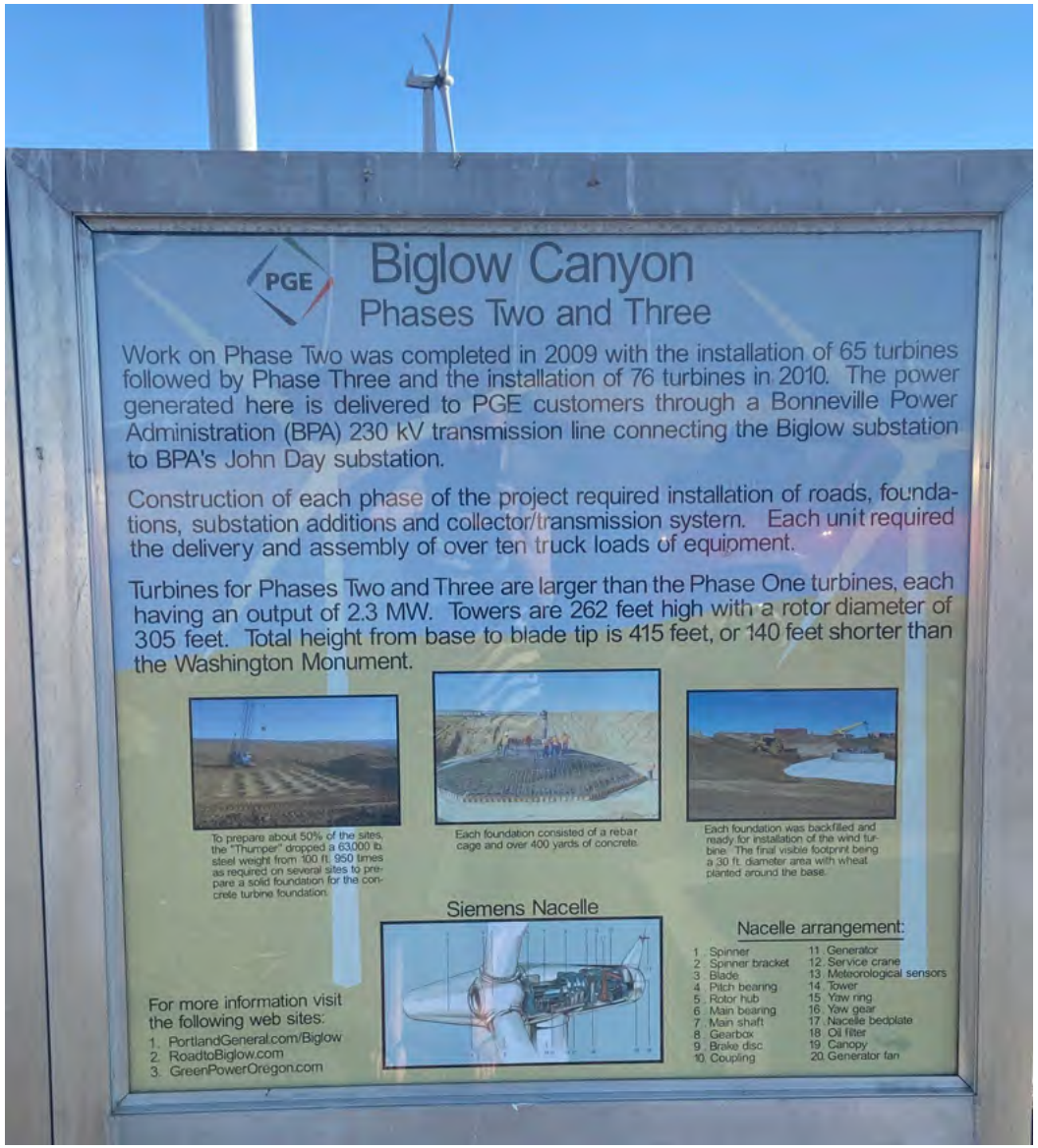
Without maintenance or good management, everything fails.



John DeMoss died in 2008 and his oversight went with him.



We were so proud of this wind farm. Thrilled. Excited.
We stayed outside at night in the cold watching them erect the towers.



Then, in 2010 the towers started leaking oil. Kevin and I complained, but nothing changed. The leaks got worse.

PGE says they have vegetable oil in all their transformers, and that it is safe. That's a bait and switch. The transformers are at the bottom of the towers. This is a blade pitch motor leak and it is definitely hydraulic oil.





There are 76 Vestas in this project, and over half of them are leaky, oily messes.



Disgusting.



No more great photos for me.

When things break, the towers sit idle for months before parts arrive or a crane is brought in.





Oil at the bases leaking onto the ground….

We fix our farm equipment when we see leaks.



Oily rags show just how dirty it is up there.



Oil all over the ground.



PGE puts oil pads around some of the bases to soak up the excess oil.



These bases are relatively clean…
it’s the transformers that look bad. A little paint?



This is one of the "vegetable oil" transformers. Vegetable oil still has a flashpoint…!



Then the biosolid spreaders and PGE technicians started finding bolts on the ground.

Sheared off.





Siemens Europe has had two deaths from bolts hitting people on the ground. And one man is permanently brain-injured, according to a safety presentation technicians here in Sherman County received.







Oregon Department of Energy (ODOE) says anything that falls from 265 feet can be deadly, especially since it can reach a velocity up to 130 feet per second.



Some of the bolts are almost two feet long.



There were bolts on the ground so the biosolid spreaders used them as paperweights!

It's not like taking them over to the PGE building makes a difference... when you have pieces lying on the ground for a year you get the impression that no one cares about this project.



Bolts aren't the only things that falls to the ground.



This one is missing a door. In fact, a lot of these towers are missing hatch doors, and the guys find them in our fields "all the time."

(Zoom in, it's hard to see with all the oil).



When a tower is this greasy, how can you see a problem?



This is a hatch door. We pick them up out of the fields and lean them against the towers - or take them over to the PGE building.



Zoom in.

(Two doors between each blade, 6 total.)



I leaned the door under the stairs for them to find and fix.

(Yes, I'm a dreamer...)



Another missing door.

I found three missing yesterday where we were harvesting. 22, 23, and 25.



See the hole? You can see where it broke away.

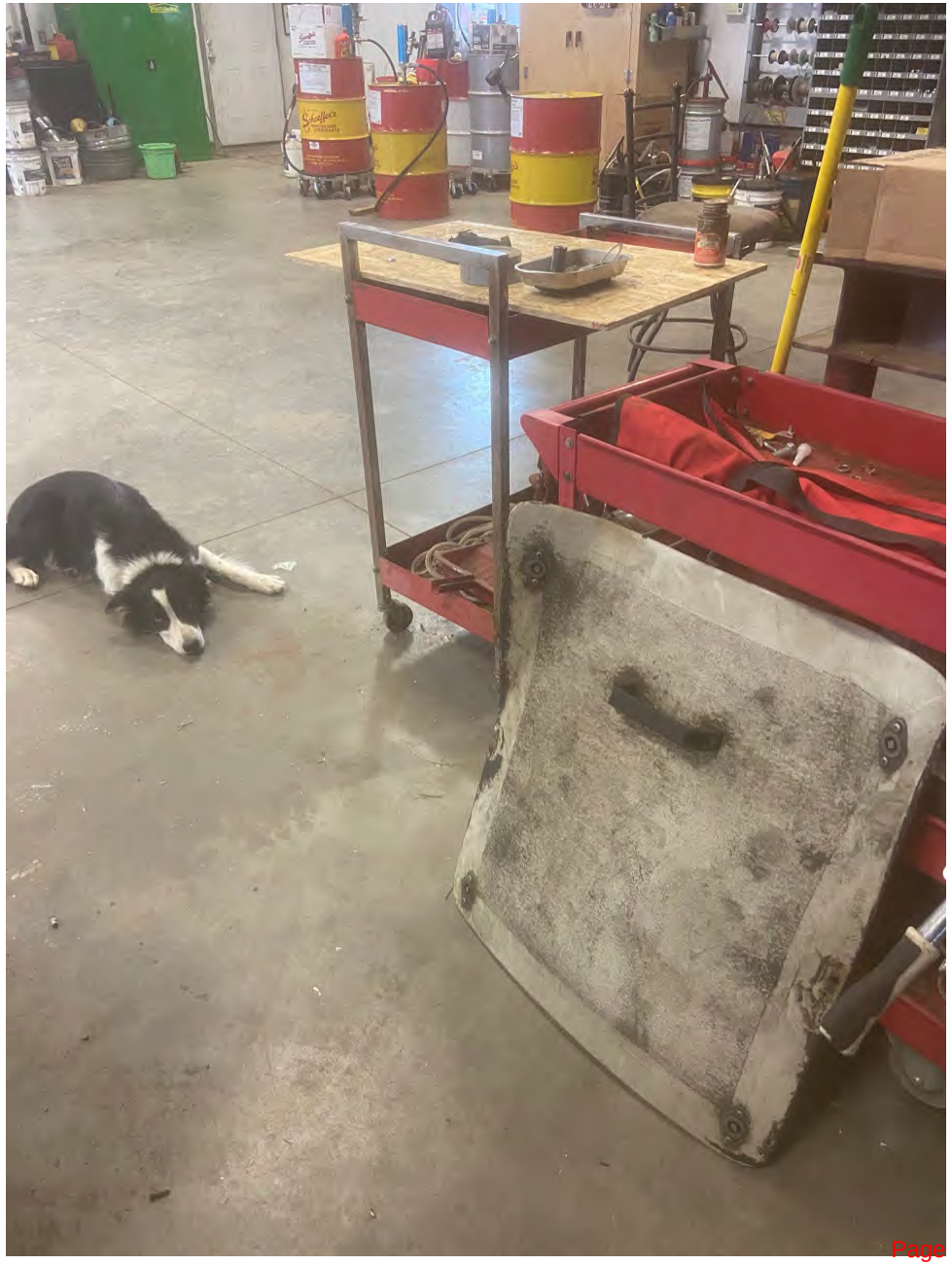


The backside of the door.

Really greasy on the inside, of course.



Even Turbo is discouraged.

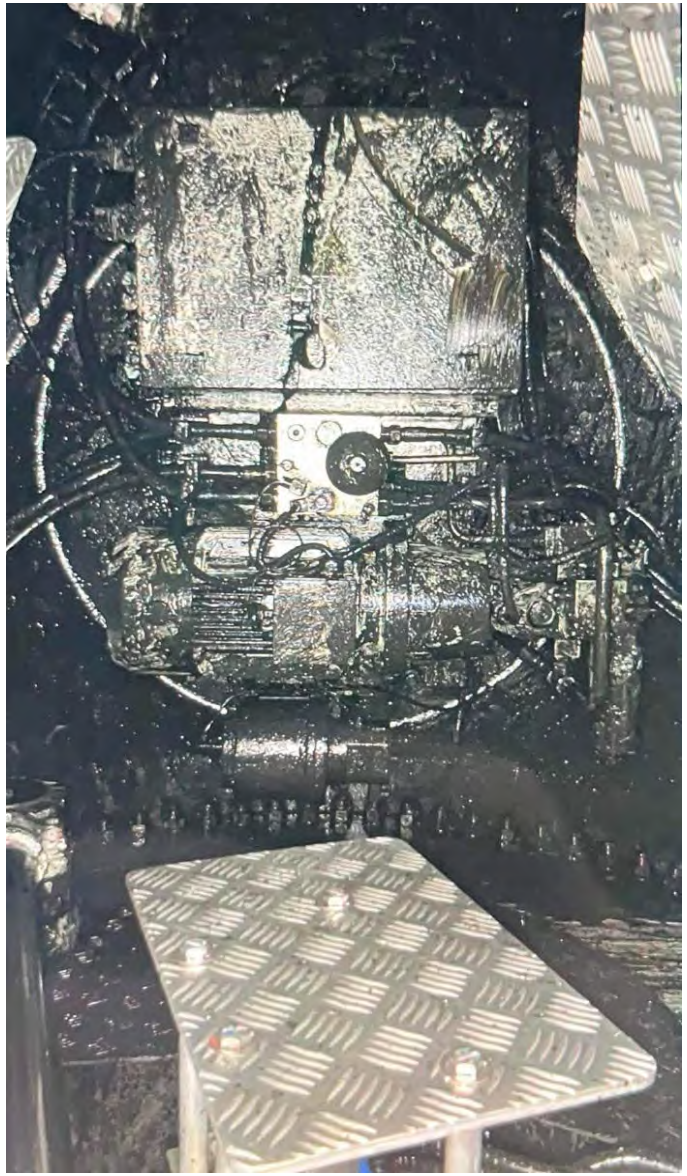


My other worry is fire. These things are oily and greasy inside.

PGE says they can't confirm this is a Biglow tower.

Well, I can.

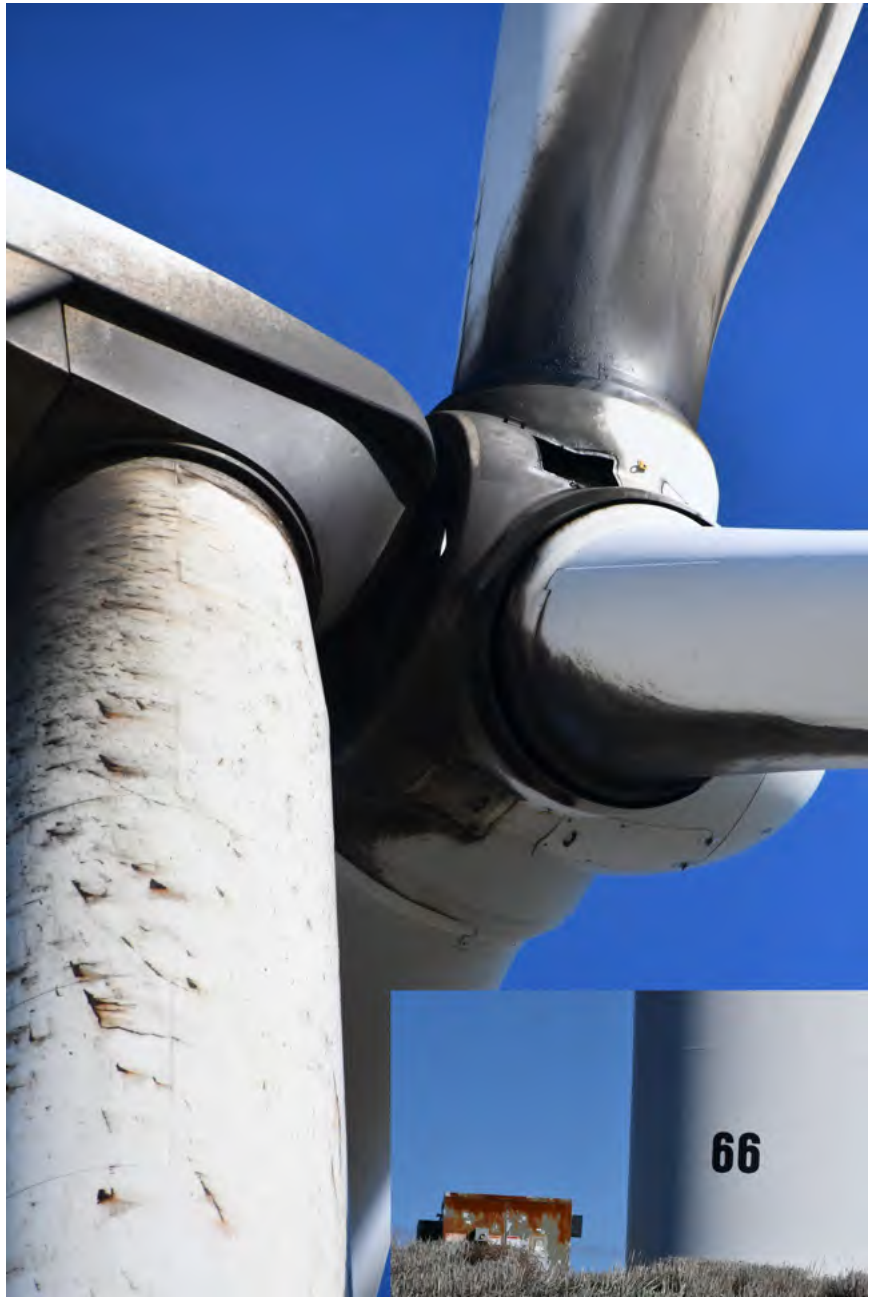





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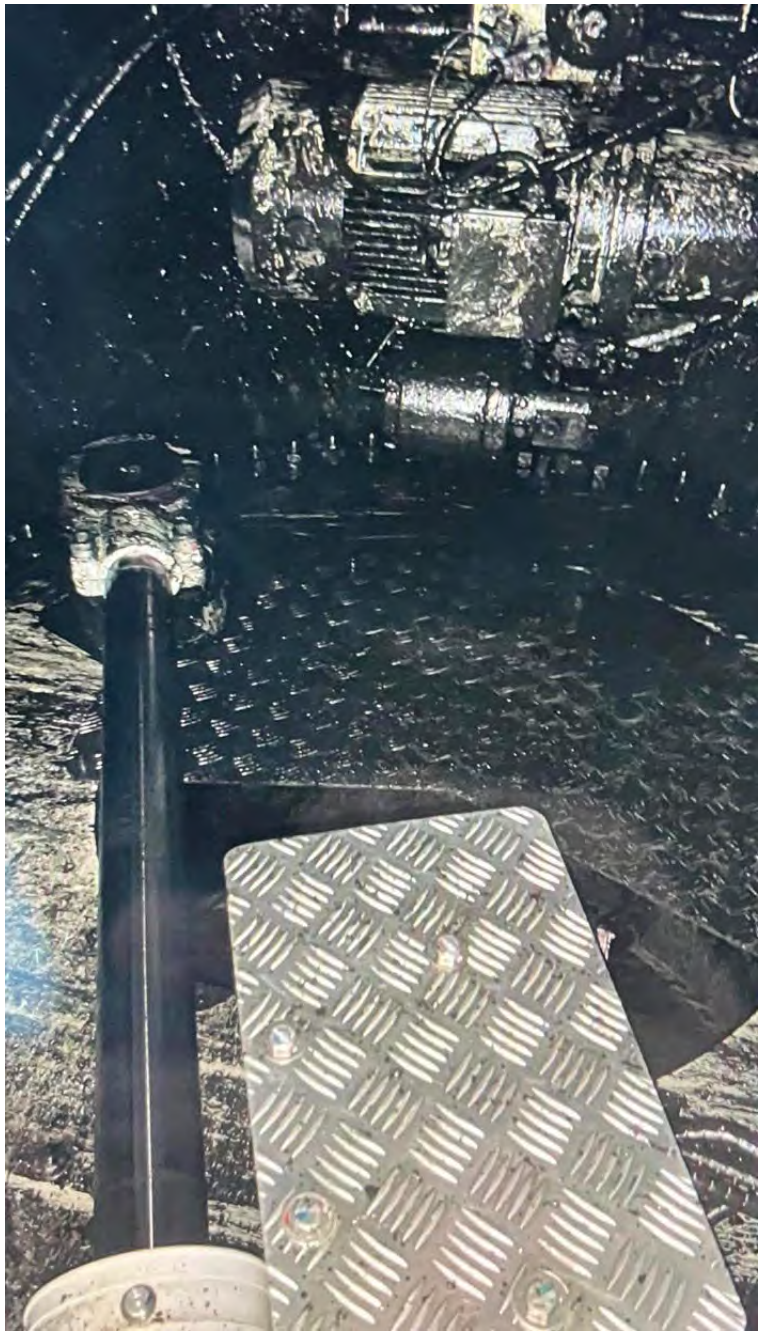
With our high summer temperatures
(111 degrees +), and their over-heating components, it's a fire waiting to happen.

We've told PGE this.
So it is on them.



This is what they actually look like in the ones that haven't been cleaned lately.

The trouble is, without fixing the problem, they keep leaking and within a couple weeks they are disgusting again.



PGE says they are clean, and even sent techs up to take a photo to confirm it. Yes.
This is a cleaned-up one, and what they should all look like inside.



But that's not all that falls off. Oh no. That's not all.

(I feel like I'm living in a Dr. Seuss book.)



This disk is a big flying saucer that weighs ten pounds.



About 100 yards away in a gully the guys found a disk from a Siemens tower.

So it isn't just the Vestas that have maintenance issues.



Don’t believe me?

It even has a part number on it.

(ZOOM IN)



It is metal, and it is thick. It belongs up in the hub… vibrations loosen them and they fly like a saucer through the air!

They basically plug a hole, a wind technician friend of mine says. But if you don’t get it screwed in properly…



I can't see where it should be from the ground, but apparently a good tech can see that it is missing.



It flew a long ways - about seventy-five yards… ouch.



A year ago, April 2021, part of a nose cone fell off. PGE took the rest of the nose cone down and left it.
We were seeding October 7 and it was still there.



We picked up the 3+ pieces that had dropped in the field and placed them under the tower.

When the blade fell off February 1, 2022, all the pieces were still there! (You can’t see the nose cone in the gully)



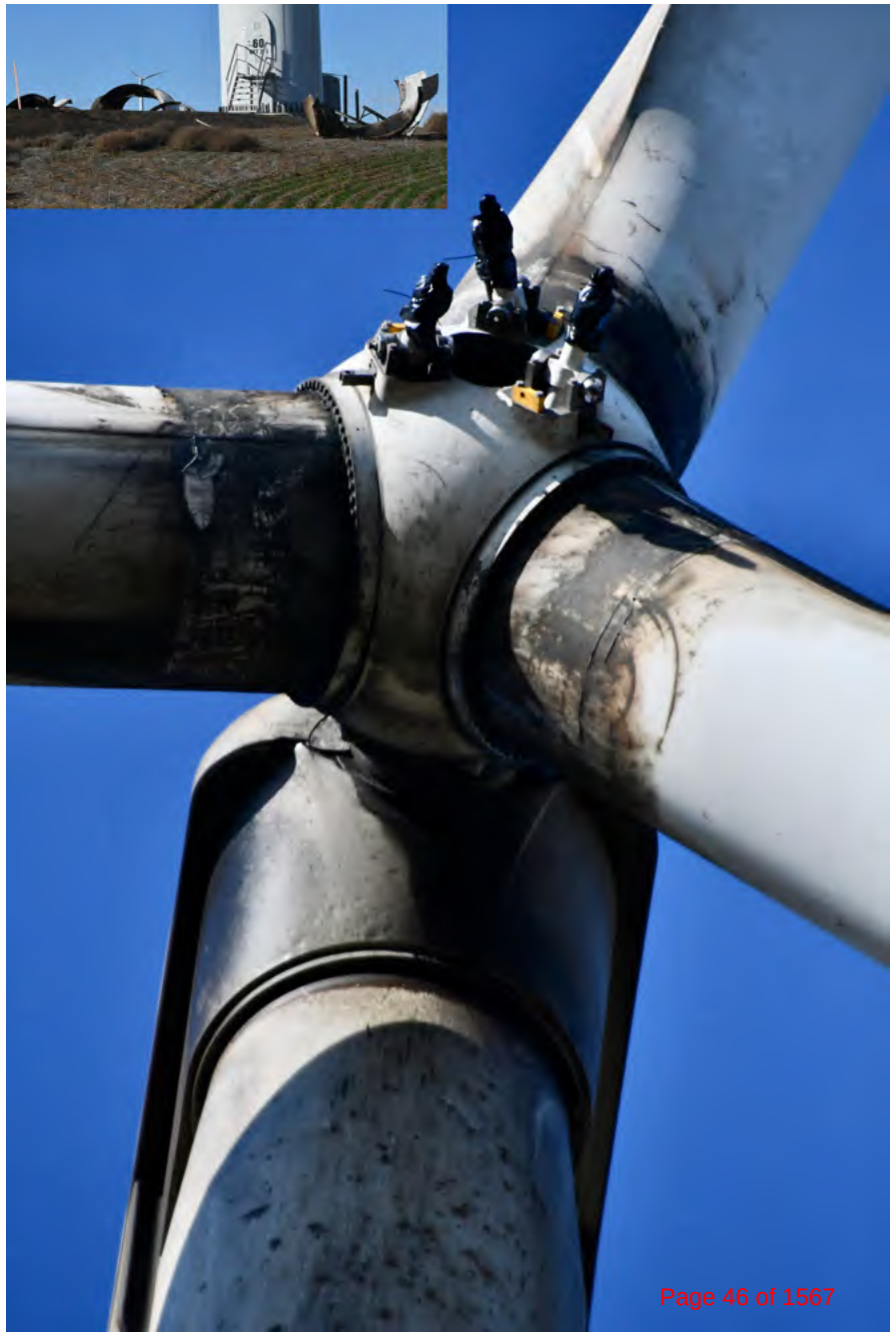
I mentioned the nose cone was still down in the gully on a Zoom call this July. They said that was because the farmer told them not to pick it up! *Well, kind of true.* We didn't want them driving through our growing wheat, but they had 6 months before we seeded!

Besides, it's not like that's the only thing that falls that they don't pick up…



You can't make this stuff up. But you can lie about it. When asked why the nose cone wasn’t reported to ODOE (a year later), PGE "self reported" within 72 hours and ODOE basically said, that's okay. You guys are good partners. Just don't let it happen again.

Anything that falls is reportable.



I feel like ODOE, PUC, PGE, and BPA are all in a secret club that doesn't include the ratepayers or the taxpayers or the landowners. Remember, they used federal and state money to build this project.



So what happens when you don't maintain a wind project?



A blade falls off.

That is our house in the background.



The blade fell off at 2:13 AM, and the thump woke Kevin and our dog, Turbo. It landed 300 feet away from the tower.

There was a load of biosolids delivered in this field by this tower at 10:30PM. It could have fallen then. And killed someone.



Crews flooded the fields after the blade fell. I have never seen that many workers checking and tightening bolts.

I believe it is only a matter of time until another blade falls.



Lies and broken promises.
(The landowner told us not to pick up the nose cone. You're our partners. We'll get a newsletter out to the landowners each quarter. And on and on.)







The worst part is that we have been talking to PGE about these issues for 12 years. We first noticed the leaks in 2010 when the pitch motors were still under warranty!

They must think we are dumb farmers who don't understand how difficult it is to run a wind project.

But all things mechanical have to be maintained,
and if you look at our farm equipment,
you will see we practice what we preach.
Besides, who doesn’t fix things under warranty?



Two weekends ago there were 40 towers down out of 217. No one is here to notice except us. Don’t we need electricity 24/7?

This isn’t a hobby farm and I’m pretty sure Biglow isn’t either.



I'm mad, but mostly I'm sad. We noticed that they were shutting down the towers on windy days. Eventually we learned PGE was getting paid to shut them down. BPA paid them “wheeling charges” when there was too much wind and the dams were running water through.



PGE told us we only got paid when the towers generated electricity. It had never occurred to us that PGE would get money for *not* producing electricity from towers on our land.

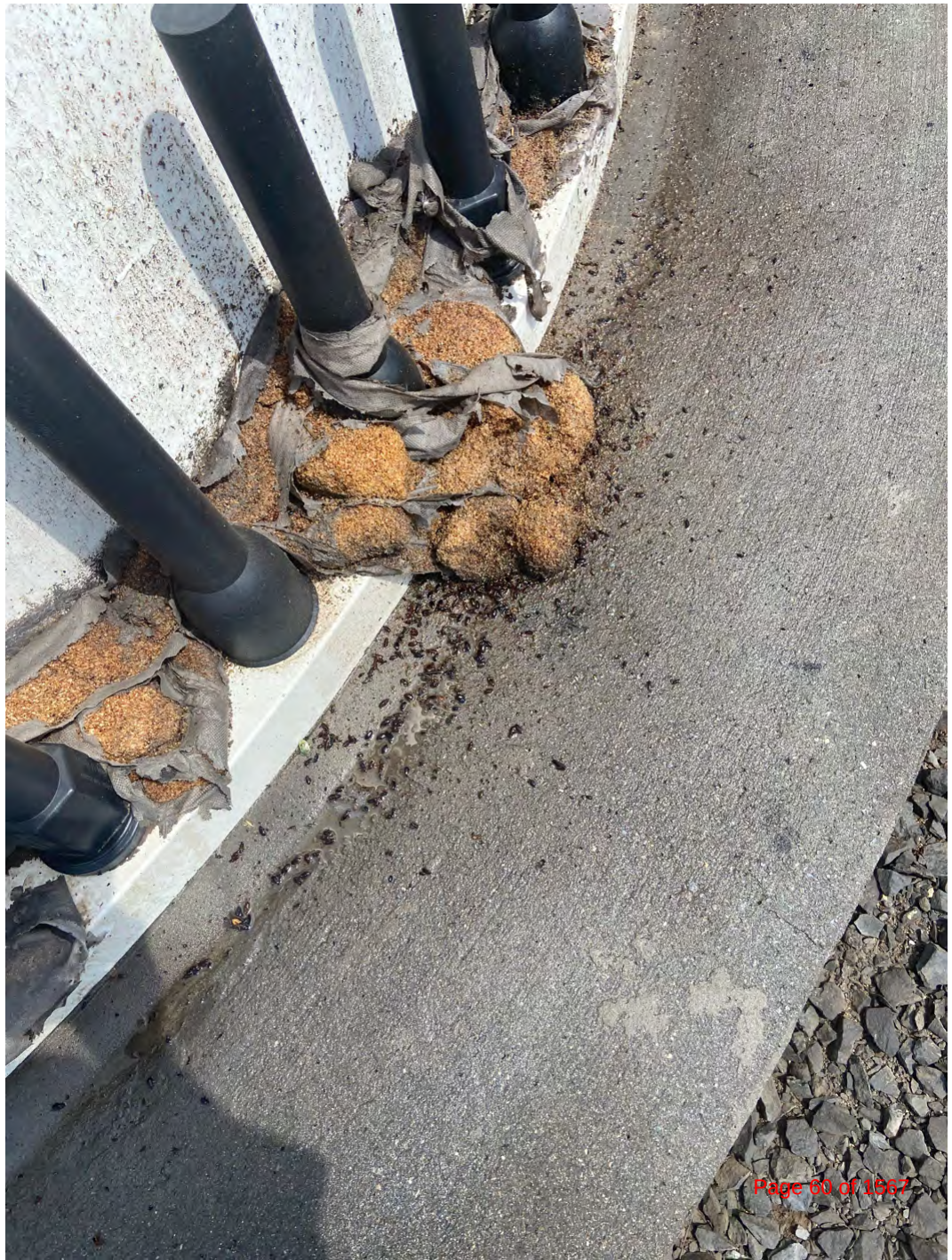




This could have been a great partnership. Like marriages that end in divorce after an affair, the relationship probably isn't salvageable. We don't trust PGE anymore.



Grease & oil, bolts, doors, disks, nose cone pieces, and blades.



Our payments are over 50% down.
But that’s the least of our worries.



What's next?
A tower falling over?

I don't want anyone else hurt or killed.

We already lost one life in this county when a wind tower fell over.





2007

WHERE DO WE GO FROM HERE?

WILL PGE FIX THE TOWERS AND MAKE US “WHOLE”?

OR WILL THEY CONTINUE TO RUN THIS PROJECT AS CHEAPLY AS POSSIBLE WITH NO INTEGRITY?

IT’S UP TO THEM, BECAUSE WE FEEL DISCOURAGED, USED, AND LIED TO.



2022

PGE has not maintained the Biglow Wind Project. We have observed Biglow's deterioration since 2010. We have no reason to expect that solar will be any different.

PGE has lied to us so many times over the years that I have lost count. It started when we noticed the towers were turned off on windy days or at night. The plant manager told us they were not turning them off at night. Besides, how could we tell if they were when it was dark out? After that ridiculous statement, I informed him of the large, lighted moon, as well as the red lights on the turbines flashing as I see the blades going around.

We found large pieces, including doors, discs, and a nose cone that had fallen off. Of course, we reported them to PGE, often taking them to the operations building. When the blade was "liberated" in February 2022, they could no longer deny our claims. PGE told ODOE they didn't know what size falling pieces had to be reported. ODOE said any size. DUH.

I asked ODOE why they hadn't noticed the oil leaks. The man on the phone said he had never looked up. The bases were in the site certificate, so he measured and inspected the gravel around the tower. Additionally, they had numerous projects to monitor in Oregon — the annual inspections on Biglow were being done by phone, since PGE was a trusted operator.

Now, almost four years later, despite promises to repair the turbines, including a new pitch system, 41 turbines are either too unsafe to operate or broken beyond repair for the foreseeable future. PGE claims they will fix 18 of them in 2026. We're waiting, but not holding our breath.

Now they want to install solar. We have no reason to believe that a solar project will be maintained any better than the wind, especially after the first five years. We are worried because we live and farm around the Biglow project. We have asked PGE for a hold harmless clause if we accidentally start a fire. Their answer is a firm no. No explanation, no discussion—just that their lawyers said NO.

"Matters of civil liability are generally outside of the Council's jurisdiction, and it is my understanding that EFSC cannot require a developer to indemnify surrounding farm operators from liability beyond the requirements of the existing right-to-farm law under ORS 30.930 to 30.947 or other state or local laws and ordinances, and as you have brought up in the past, the existing right to farm law does not cover damages from fire." Christopher Clark, ODOE

As stated above, Oregon's Right to Farm Law does not include fire. This may be outside the Council's jurisdiction, but it should be considered. Either the law needs to be amended, or solar projects should not be located in high-fire-risk areas.

Oregon adopted legislation in 1993 and updated it in 1995 and 2001 to protect farm and forest practices from adjacent conflicting issues. The program is called Oregon's Right to Farm laws. It protects farmers from claims over smell, dust, noise, and other trespass or nuisances associated with farming.

Oregon Department of Agriculture Literature
https://www.oregon.gov/oda/shared/Documents/Publications/NaturalResources/RightToFarm.pdf

ORS 30.930 to 30.947, Farming and Forest Practices
ORS 30.936 and 30.937, Immunity from private action based on farming practices

We need a hold harmless agreement from PGE before this project is approved or assurances in writing that they will not sue us or go through our insurance.

Every year, fires start in Sherman County from hot equipment or sparks. We keep our equipment in good condition, just like other operators around us do. Each year we help as volunteer firefighters to extinguish fires near us. It's not a matter of if we will have a fire, but when. PGE has already had two, but I don't believe they have reported all of their fires. Usually, we help extinguish between 6 and 10 fires a year.

Over half of the PGE Vestas towers are dripping oil. The transformer cases were allowed to rust. PGE Biglow transformers have blown and started a fire: at least two. Who knows if they have reported all of them.

The new Tesla battery cases look immaculate in the BESS photo from BrightNight. But the transformer cases around the existing wind turbines looked good when they were new, too. Lithium-ion batteries have a history of catching on fire when not properly maintained. In addition, there were five solar panel fires last year in the Avangrid project in the next county, and two this year in our county.

While we have not started any fires ourselves, that remains a possibility. So far, we have been lucky.

Our farm has $5 million in liability insurance, but that would be insignificant if we start a fire. Covering the cost of 700 or 800 acres of solar panels and/or BESS (battery storage) could bankrupt us. That's a blow to the right to farm. Placing a solar project in the heart of a county that has the highest percentage of agricultural land in Oregon interferes with our livelihood. With high temperatures and wind in the summer, this could lead to serious issues. We shouldn't be held responsible for normal farming practices.

PGE has verbally stated that they will not target us personally and will "only" use our insurance money if a fire results from typical farming activities. They miss the point. After such a large claim, we will never be insured again. No insurer will want to cover us. Insurance is already very

costly where we live, and our agent said that even a microwave fire in the PGE office building south of us could increase our rates.

Besides, we don't trust PGE or BrightNight. We have been lied to by both of them so many times that we have lost count.

PGE told us they were maintaining the towers, but they weren't. The budget allocated annually decreased instead of increasing. Everyone with equipment knows that costs rise, not fall, with age. PGE explained its approach to wind farm maintenance:

"…state regulators have not issued any violations for failing to report safety incidents; only two of the incidents it did report were actually related to public health and safety; leaking oil posed only a low environmental or fire risk; and lost service time is likely the result of grid constraints beyond its control. The issues at Biglow Canyon, it said, are consistent with those experienced by other utilities with similarly aged equipment."

BrightNight told us we would have a setback from our property, then sent us photos of them right up to our property line. Fortunately, the property owner raised concerns and got it pushed back ½ mile.

Here are a few of the highlights from the Wind Bust article (Linked below) in the Oregonian:

Although the Vestas machines were just halfway through their 30-year estimated useful lifespan by 2022, *The Oregonian* reported PGE was already thinking about retiring them.

Despite all this, a PGE spokeswoman gave a prickly reply about the tone of *The Oregonian*'s questions. https://capitalresearch.org/article/wind-turbines-produce-drama-cash-and-some-electricity-part-1/

"PGE entered into a long-term maintenance contract with the maker of the turbines, a wind sector leader, Vestas," PGE spokesperson Melissa Havel said in response to written questions. "This was a prudent and industry standard action on the part of PGE. "We challenge your categorization of the volume of troubles," she wrote. "Since coming online, Biglow Canyon wind farm has generated more than 13,000,000 MWh of clean electricity, which translates to powering 120,000 homes per year."

Problems began more than a decade ago. The McCulloughs said they expressed concern to PGE that the Vestas turbines, then only three years old, were leaking oil and lubricants from the nacelles, the box atop the turbine tower that houses its gearbox and other major components.

"PGE is updating our office regularly with the inspection status, as well as committing to provide our office with a longer-term inspection and maintenance plan," Hank Stern, a spokesperson, said in an email. "Sen. Wyden will keep watchdogging this issue to ensure PGE follows through on its commitment to him and the community."

Financially, PGE appears to have two routes to address issues.

Jenkins, the utility's vice president of operations, insists that PGE is managing the project – and the Vestas turbines – for longevity, focusing on preventive maintenance to keep small problems from turning into big ones. "I don't know that with the age of these assets, the case can be made that they're not performing," he said.

Biglow Canyon has never experienced a turbine fire. But they do happen in the industry, with a 2,000-acre blaze in Gilliam County four years ago linked to a turbine operated by a different company, according to compliance reports submitted to the state.

"Just because an asset is dirty doesn't mean it's not running well," Jenkins said. "We're more concerned with what's on the inside."

But keeping the turbines performing at a high level may require significant investments, and PGE's filings with regulators don't reflect that reality.

In fact, PGE's operations and maintenance expenses at Biglow Canyon have steadily declined, despite the aging equipment and acknowledged need for major repairs. PGE spent $13 million last year, down 40% from 2013, according to figures filed with the Federal Energy Regulatory Commission. That's the lowest total since 2010.

And in documents submitted to Oregon regulators, the company said it would spend even less this year: $10 million.

Jenks, the ratepayer advocate, said the review would also include an analysis of whether the current equipment has been properly maintained, and if not, what went wrong.

"If we're going to make a transition to clean energy," he said, "we need to hold the utilities responsible for managing these projects properly."

The landowners would like that same level of accountability.

"When we entered into the agreement, the objective of the company and the landowners leasing the land was to have the project work, and make money," said Cheryl Woods, a Biglow Canyon property owner and the accountant for the wind prospecting company that originally arranged the lease.

"But it doesn't seem to be exactly going that way. It just hasn't been managed well."

- PGE has failed to report public safety incidents at Biglow Canyon, in potential violation of its operating agreement with the state. The utility hasn't disclosed incidents where hatches, metal disks and blade bolts have fallen off turbines from a height of about 265 feet. PGE has questioned whether such incidents meet the reporting threshold, but regulators insist even small objects may be a hazard to anyone near a turbine because they can reach almost 90 mph when falling.
- PGE knowingly operated at least four turbines at Biglow Canyon with broken blade bolts, in one case for nearly a year, maintenance records show. Those bolts clamp blades to the rotor and bear the stress of wind and motion. Research indicates that broken bolts,

while not uncommon, can become a serious problem leading to catastrophic blade failures like the one in February.

- Oil leaks from Biglow Canyon's wind turbines and transformers are environmental and fire hazards. The turbines have been plagued by leaks of oil and lubricants that coat towers and blades and spit on to their gravel pads and surrounding fields. Transformers have ruptured regularly, causing two fires and spilling about 3,000 gallons of mineral oil into surrounding soil that prompted expensive cleanups.
- The number of problems PGE has disclosed to regulators is out of line with other wind farms. Since 2010, PGE has reported more than a dozen oil spills and other incidents at Biglow Canyon with the potential to affect public safety – about three times more than any other wind farm regulated by the state. But state officials only recently began pressing PGE to explain those troubles.
- Biglow Canyon has generated far less power than PGE originally projected. The availability of its Vestas wind turbines to produce energy has abruptly declined in recent years, and the project's rate of energy production is less than neighboring wind farms of comparable age.
- Ratepayers may end up footing the bill for assets that are no longer useful. The project's 76 turbines manufactured by Vestas are halfway through their projected life but PGE is already considering replacing them. If that happens by the end of 2023, ratepayers would be stuck covering $156 million in remaining costs.

Kathy McCullough:

I showed the Oregonian a real photo of the inside of a Biglow tower after Jenkins provided a clear photo. They say Biglow has not had a turbine fire, but they have experienced other fires, including transformer fires.

PGE spokesperson Havel did not admit that the maintenance contract was changed and that the pitch seal warranty claim was never finalized. I'm so tired of lying by omission.

All things considered, the energy they generated isn't something Havel should brag about. PGE produced much less energy than expected, with the project just south of us in a less windy area, generating only 37%. So, this isn't a wind issue. It's a maintenance problem. It's also because BPA is paying PGE wheeling charges.

"We will investigate if it's reported to us," said Todd Cornett, assistant director of the Department of Energy siting division.

PGE did not report violations to the Oregon Department of Energy, and ODOE did not investigate. Additionally, there aren't any reports from other utilities with similarly aged equipment.

Senator Wyden has not continued to watch over the situation; in my opinion, he has not taken any action.

_____

"…rules require issues in comments to be raised with "sufficient specificity" to afford the Council, the Department, and the certificate holder an opportunity to respond. Under OAR 345-027-0367(7)(a), that means the comments must identify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which you object; specify the Council standard or other applicable state and local requirements on which the objection is based; and present facts or statements supporting that objection." ODOE

_____

Sufficient specificity: I object to this project piggybacking on the wind without proper fire mitigation. Oregon has a "Right To Farm" law that should be respected. This project infringes on our Right To Farm. It's a high-risk fire area. There is a lot that PGE has not done in good faith in the past. Given PGE's track record, we need proof that things will be different with solar.

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Wind Bust



https://projects.oregonlive.com/wind-farms/?e=f4aa693a6abe4e79c6b29ce5788dac77

Story by **Ted Sickinger**
Photography by **Dave Killen**
The Oregonian/OregonLive
Aug. 27, 2022

In the waning days of January, a worker delivering fertilizer to a wheat farm in the rolling hills of Sherman County found some broken, industrial-size bolts on the ground near one of Portland General Electric's towering wind turbines.



A broken blade bolt found under a wind turbine at Biglow Canyon wind farm by a worker delivering fertilizer in late January. A day or two later, the turbine threw an eight-ton blade into a nearby field. (Courtesy Kevin Massie)

He was puzzled because it stood to reason the bolts fell from the machine. But he didn't know if there was a problem or, if so, who to tell. So he picked up one, sent a snapshot to his co-worker, Kevin Massie, and used it as a paperweight while he documented the delivery.

Massie arrived a day or two afterward to tow a delivery driver whose vehicle got stuck in the mud near the same turbine at Biglow Canyon. It was dark and windy. Nothing seemed out of the ordinary.

Hours later, at 2:11 a.m. Feb. 1, one of the turbine's three spinning blades launched into the night.

No one saw it. No one heard it. But it was evidently a violent affair.

The skinny blade, as tall as an 11-story building and weighing more than four Toyota Camrys, soared the full length of a football field. It plowed a furrow 4-feet deep in the wheat stubble where it eventually landed.

Heavy-duty bolts that once kept the blade fastened to the tower scattered around the turbine base like shrapnel, some spiked deep into the soil.



Broken blade bolts were scattered around turbine 71 at Portland General Electric's Biglow Canyon wind farm after the turbine threw a blade in the early hours of Feb. 1. Hours before the blade throw, a driver delivering fertilizer became stuck in close proximity to the turbine and had to be towed out. (Courtesy Kevin Massie)

"Someone could have been killed or badly injured," said Kathryn McCullough, whose husband, Kevin, farms under about half of Biglow Canyon's turbines – including the one that lost its blade.

The broken bolts preceding the incident weren't the only warning signs of problems at PGE's flagship wind facility, which opened 15 years ago amid a push to expand green energy technology in Oregon and nationally. But it took the so-called "blade liberation" for PGE to take urgent action at Biglow Canyon, one of Oregon's largest wind farms, shutting down all 217 turbines for testing and keeping some out of service for at least four months.

The dramatic episode in the rural landscape of the Columbia River Gorge represents a revealing, if concerning, inflection point in Oregon's two-decade history with the ubiquitous turbines that help fuel clean energy.



On Feb 1, turbine 71 at Portland General Electric's Biglow Canyon wind farm threw an eight-ton blade 100 yards into a nearby field, plowing a deep furrow in the ground where it landed. (Left, Dave Killen, right courtesy Kathryn McCullough)

Industry groups insist that wind farms are very safe and major malfunctions, such as blades flying off the turbines, are exceedingly rare. But as wind farms grow older and the underlying components age, regular and proactive maintenance become far more important.

More: Why accident, safety data is hard to come by for wind industry

Yet landowners have been raising concerns to PGE for the last decade about maintenance issues at Biglow Canyon and their impact on energy production at the facility. And an investigation by The Oregonian/OregonLive has found that the seemingly isolated blade incident is part of a wider set of maintenance problems and equipment failures that are now undercutting electricity generation at Biglow Canyon, shortchanging ratepayers and landowners, and putting those who cultivate crops under the turbines – and potentially their farmland itself – at risk.

Among the findings:

- PGE has failed to report public safety incidents at Biglow Canyon, in potential violation of its operating agreement with the state. The utility hasn't disclosed incidents where hatches, metal disks and blade bolts have fallen off turbines from a height of about 265 feet. PGE has questioned whether such incidents meet the reporting threshold, but regulators insist even small objects may be a hazard to anyone near a turbine because they can reach almost 90 mph when falling.
- PGE knowingly operated at least four turbines at Biglow Canyon with broken blade bolts, in one case for nearly a year, maintenance records show. Those bolts clamp blades to the rotor and bear the stress of wind and motion. Research indicates that broken bolts, while not uncommon, can become a serious problem leading to catastrophic blade failures like the one in February.
- Oil leaks from Biglow Canyon's wind turbines and transformers are environmental and fire hazards. The turbines have been plagued by leaks of oil and lubricants that coat towers and blades and spit on to their gravel pads and surrounding fields. Transformers have ruptured regularly, causing two fires and spilling about 3,000 gallons of mineral oil into surrounding soil that prompted expensive cleanups.

- The number of problems PGE has disclosed to regulators is out of line with other wind farms. Since 2010, PGE has reported more than a dozen oil spills and other incidents at Biglow Canyon with the potential to affect public safety — about three times more than any other wind farm regulated by the state. But state officials only recently began pressing PGE to explain those troubles.
- Biglow Canyon has generated far less power than PGE originally projected. The availability of its Vestas wind turbines to produce energy has abruptly declined in recent years, and the project's rate of energy production is less than neighboring wind farms of comparable age.
- Ratepayers may end up footing the bill for assets that are no longer useful. The project's 76 turbines manufactured by Vestas are halfway through their projected life but PGE is already considering replacing them. If that happens by the end of 2023, ratepayers would be stuck covering $156 million in remaining costs.



Kathryn McCullough, a Sherman County landowner, examines a bolt off the blade that was thrown from a turbine at PGE's Biglow Canyon wind farm on Feb. 1. "Someone could have been killed or badly injured," she said.

The Biglow Canyon turbine that launched its blade is one of about 72,000 machines nationwide, including some 2,300 turbines in Oregon, which has more production capacity than all but nine other states. Yet there is no effective national, state or county reporting requirement or database tracking safety or operational incidents at wind farms, and only 13 of the largest of Oregon's 48 wind farms are regulated by the state, numbers that include multiple phases of some projects.

PGE launched an investigation into this winter's blade throw and is filing written updates to regulators. But it has asked the Oregon Department of Energy to keep those confidential until the end of the year because of the possibility of litigation.

Seven months into that review, PGE told The Oregonian/OregonLive that preliminary results suggest the connection between the turbine blade and its hub was “not well clamped,” a problem likely caused by “bolts becoming loose and experiencing fatigue damage over time.”

PGE said it took the blade failure “very seriously as a safety incident” and is working to fully understand the cause, rectify it and make any other necessary adjustments to improve operations.

But PGE defended its overarching maintenance efforts. It said that state regulators have not issued any violations for failing to report safety incidents; only two of the incidents it did report were actually related to public health and safety; leaking oil posed only a low environmental or fire risk; and lost service time is likely the result of grid constraints beyond its control. The issues at Biglow Canyon, it said, are consistent with those experienced by other utilities with similarly aged equipment.

“PGE entered into a long-term maintenance contract with the maker of the turbines, a wind sector leader, Vestas,” PGE spokesperson Melissa Havel said in response to written questions. “This was a prudent and industry standard action on the part of PGE. We challenge your categorization of the volume of troubles. Since coming online, Biglow Canyon wind farm has generated more than 13,000,000 MWh of clean electricity, which translates to powering 120,000 homes per year.”

Even so, PGE said it has now taken a more active role monitoring the turbines at Biglow Canyon, analyzing incoming data for anomalies or patterns that may indicate performance or safety issues. PGE officials said the utility could also end up suing Vestas, which maintains all the turbines there and manufactured the one that launched the blade. PGE said it has streamlined Vestas’ scope of work so the company can focus more on preventative maintenance.

Vestas said it completed its own investigation into the blade failure but could not share results because they contain proprietary information. Vestas, which has its North American headquarters in Portland, said there was no evidence to suggest that inadequate maintenance has shortened the lifespan of turbines at Biglow Canyon, and that the project continues to operate at or above industry standards.

Most of the turbines at Biglow Canyon have now returned to service.

“We wouldn’t run it if it wasn’t safe,” said Jesus Carrera, PGE’s manager of wind operations.

Maintenance issues at Biglow Canyon matter broadly because PGE – Oregon’s largest electricity provider, serving some 900,000 homes and businesses in Oregon – plans to transition to 100% carbon-free energy by 2045. And its customers will be paying the bill.

To eliminate all its greenhouse emissions, PGE would need to supersize its fleet of renewable energy resources and manage them for longevity, maximizing production for decades to come. Yet the economics of wind power are heavily dependent on federal subsidies, and some experts suggest those subsidies are structured in a way that incentivizes operators to skimp on maintenance for older equipment that is no longer eligible.

PGE's operations and maintenance expenses at Biglow Canyon have declined precipitously, federal records show. In 2021, PGE spent 40% less than it did eight years earlier, and it told economic regulators that spending would be even lower this year.

PGE said it has consistently invested in Biglow Canyon's operations while also striving to maintain competitive rates and balancing customer cost implications. "We expect to remain consistent with our investments this year until we determine the best future course of investment," Havel added.



The blade thrown from a turbine at PGE's Biglow Canyon wind farm on Feb 1. An outbuilding next to the McCullough's residence is shown in the background.

Meanwhile, Biglow Canyon landowners who believe in the promise of green energy have been left frustrated, not only by a perceived lack of transparency from PGE, but also because they feel financially shortchanged by excessive turbine downtime, as payments to them are based on energy production.

Don Godier, a retired air force colonel who lives in Florida, said it's always been a team effort to scratch a modest living out of the farm his great grandparents established. The family was fired up by the prospect of "harvesting the wind" by placing turbines on their land. But the resulting payments from PGE, which he said he uses to support his mother's long-term care, haven't met expectations.

"We were a little naïve and trusting," he said, "but those days are over."

Landowners recently hired a Portland lawyer to investigate potential remedies.

The McCulloughs, whose house and farm are surrounded by turbines, have been particularly vocal. They've regularly complained to PGE and recently provided documentation about maintenance concerns to the office of U.S. Sen. Ron Wyden, Oregon's senior senator and a member of the Senate Energy and Natural Resources Committee.

"If you think about it, any of those things could come down at any time," said Kathryn McCullough, a retired 747 airline captain. "If we maintained our equipment like that, we wouldn't be farming for long."



Kathryn McCullough, a Sherman County landowner, examines the blade that was thrown from a turbine at PGE's Biglow Canyon wind farm on Feb. 1. Her husband, Kevin McCullough, farms wheat under about half the wind farm's 217 turbines, including the one that threw the blade. Thirteen of the wind farm's turbines are on their land.

'What's not to like?'

When a wind prospecting outfit first approached Sherman County residents in 2001 about leasing out portions of their cropland to a wind farm operator, the McCulloughs were immediately intrigued.

The nation's wind energy boom was just getting off the ground. California was adopting rules requiring utilities to invest in green power, soon to be followed by Oregon and Washington. And

the Columbia River Gorge, with solid winds and existing transmission lines established to carry hydropower around the west, would soon become a hotbed of wind farm development and eventually become one of the top ten wind energy producers in the nation.

The big-talking wind prospector was spinning tales of the Learjets landowners would soon own, the McCulloughs remember.

It seemed like a no-brainer.

And while state and county regulations limit public access to the land under wind farms, there are virtually no off-limit areas for farming. That meant farmers could continue to cultivate nearly right up to the base of the turbines, harvesting crops from the ground and a regular stream of lease payments from overhead machines.

The McCulloughs and their neighbors soon became big backers, expressing support for the Biglow Canyon project at various forums as other groups raised concerns about its visual and noise impacts, bird mortality and operations of a nearby airport. Kevin McCullough even appeared in a promotional video for the project.

It took several years, but the project gained momentum, first steered by Orion Energy, then PGE.



The first 76 Vestas turbines under construction at Biglow Canyon wind farm in 2007. Kevin McCullough, right, looked on enthusiastically at the time. He farms under about half of the wind farm's 217 turbines today and earns lease payments based on electricity production from the 13 turbines on land he and his wife own there. (File photos by Ross William Hamilton)

By 2007, the first 76 turbines manufactured by Vestas were up and spinning on the McCulloughs' and neighboring farms. They were followed by 141 Siemens machines by 2010, in what was then the largest wind farm on the Columbia Plateau. PGE said costs from the $1 billion project would raise ratepayers' monthly bills by a total of 4.5% while producing the equivalent amount of energy used by 125,000 homes in a year.

PGE's Biglow Canyon wind farm was a reality. The electricity – and the dollars – began to flow.

“We were ecstatic,” Kathryn McCullough said of the 13 turbines on their land. “What’s not to like? When these things are turning, we’re making $100,000 a year. How do you shake a stick at that?”

‘Just pure carelessness’

Long before the blade flew into the night at Biglow Canyon, landowners say they had concerns about substances spewing from PGE’s turbines.

Problems began more than a decade ago. The McCulloughs said they expressed concern to PGE that the Vestas turbines, then only three years old, were leaking oil and lubricants from the nacelles, the box atop the turbine tower that houses its gearbox and other major components.

It’s a condition that persists today. Many of the once-pristine white Vestas turbines are visibly soiled by oil, blackening the towers, the blades, the gravel pads and spitting into the fields below. The McCulloughs snapped photos of the problem as recently as early August showing their truck spattered in oil after just 30 minutes parked near a turbine, and the ground darkened with oil spots.

The leaks likely fall below the threshold for reporting oil spills to the Department of Environmental Quality, which requires disclosure only for discharges to the ground over 42 gallons in any 24-hour period. And officials at the Department of Energy said the problem had not been brought to their attention by a member of the public, during annual inspections or by PGE, so they haven’t looked into it.



Kevin McCullough parked his truck near one of Biglow Canyon’s Vestas wind turbines for about 30 minutes during wheat harvest in early August. When he returned, he said it was spattered in oil leaking from the top of the turbine. At right, oil spots on the ground nearby the same turbine. Landowners worry that regular leaks of oil and lubricants from Vestas turbines, which PGE says is a fixable problem if it chooses to make the investment, could be contaminating their cropland. (Courtesy Kathryn McCullough)

Godier, the property owner paying for his mother’s care, said he’s driven cross country twice in the past few years and made it a point to check conditions at other wind farms.

“I didn’t see a single one with the amount of oil and grease we have on ours,” he said, while speculating that it could be seeping into the water table. “It’s on the ground. Someone needs to hold these folks liable for what we’re going to find in 50 years.”



Residents who own land under PGE’s Biglow Canyon wind farm worry that regular leaks of oil and lubricants from turbines pose fire and environmental hazards.

Brett Gray, who farms under PGE’s turbines, said the Vestas turbines seem the worst, but the Siemens machines at Biglow Canyon leak, too. He also farms under turbines at another wind farm to the south, Klondike, and regularly passes by others.

“It’s not the norm for the projects I’ve been around,” he said of the oil, adding that PGE told landowners there’s “no way to fix” the Vestas turbines. “But that’s hard to believe.”

PGE’s spokesperson said Vestas has identified a solution and could install retrofit kits to equipment that is prone to leaking. But PGE hasn’t decided whether to make those fixes, saying it must first choose between enhanced maintenance of existing turbines or replacing them.



A metal frame and pieces of fiberglass fell from the spinner cone of this Vestas turbine into a field below at Biglow Canyon wind farm in April 2021. PGE didn't report the incident to regulators until this summer. Wind technicians later lowered the turbine's nose cone and spinner frame onto the turbine pad, where the pieces remained for a year. The nose cone blew into a nearby gully, and remained there earlier this month.

Mark Haller, a wind industry consultant who spent 40 years managing and developing wind farms across the globe until retiring last year, said that if the turbines continue to leak oil, "it's because someone isn't spending the money to fix them."

"Those machines should not be puking oil all over the place, other than just pure carelessness," he said.

The same model of Vestas turbines used at Biglow Canyon, officially known as the V82 1.65mw, are in operation at the Echo wind farm about 50 miles to the east. They were commissioned in 2009, two years after those at Biglow Canyon, and are partially owned by a group of farmers.

Kent Madison, one of the farmers there, said he's seen an occasional leak from the gears in several turbines, but they've been promptly fixed, cleaned and look nothing like the machines at Biglow.

"Ours have run like a fine watch," he said. "We have not had any issues over the years."

Brad Jenkins, PGE's vice president of utility operations, this summer led a reporter on a guided tour of Biglow Canyon that didn't include any of the soiled turbines. Jenkins downplayed the potential environmental issues, saying the oil leaks were confined to the machines, and said PGE would never run a turbine with a fire risk.

Biglow Canyon has never experienced a turbine fire. But they do happen in the industry, with a 2,000-acre blaze in Gilliam County four years ago linked to a turbine operated by a different company, according to compliance reports submitted to the state.

“Just because an asset is dirty doesn’t mean it’s not running well,” Jenkins said. “We’re more concerned with what’s on the inside.”



Portland General Electric provided a look inside the spotless nacelle of a Vestas turbines (left) at Biglow Canyon wind farm during a tour in late June. Kathryn McCullough sent the pictures at right to U.S. Sen. Ron Wyden, which she said shows the oil-coated nacelle of a Vestas turbine this spring at Biglow Canyon. (Photos courtesy PGE, left, and Courtesy Kathryn McCullough, right)

The guided tour included showing off the inside of a spotless turbine. But Kathryn McCullough recently emailed Oregon’s senior senator photos she said she obtained from a contractor showing the inside of a turbine at Biglow Canyon this spring.

The machinery appeared filthy, heavily coated in oil, the photos show.

PGE declined to comment, saying the photos had no metadata attached so it couldn’t confirm where or when they were taken.

Oil has also leaked from Biglow Canyon’s on-site transformers, which sit at the base of each turbine and are used to regulate electrical current.

Ten transformers have failed at Biglow since 2010, three times more than reported by any other facility regulated by the state, according to Department of Energy records. Nine transformers under both Vestas and Siemens turbines and one in a substation spilled some 3,400 gallons of mineral oil — 90% of it to the ground around the turbines, prompting excavation and soil replacement.

“Ten transformer failures?” said Haller, the industry consultant. “That’s bad.”

PGE’s Jenkins said oil used in transformers is essentially vegetable oil, and poses minimal environmental or fire hazard. But the mineral oil used in transformers is flammable, and transformers have caught fire at Biglow Canyon in 2011 and 2013.

After nine transformer ruptures and related oil spills since 2010, state regulators this year pressed PGE for answers about the problems. But after hearing from a utility official in January, they took no further action.



PGE has experienced 10 transformer failures at Biglow Canyon that have collectively leaked 3,000 gallons of mineral oil to the ground surrounding turbines and caused two fires. Pictured above, pad-mount transformers sit in cabinets below each turbine at Biglow Canyon.



Screen shots of a ruptured transformer and the required cleanup of a transformer oil spill from a presentation that PGE made to state regulators in January about transformer problems at the wind farm.

Lenna Cope, a project specialist at PGE, told regulators during a public meeting transformer failures are an industry-wide problem and PGE was replacing them with transformers with different specifications when they failed. She said the demand on turbine transformers is unique because it rises and falls with rapid changes in the wind, and resulting temperature changes can degrade transformer oil and insulators, leading to the buildup of combustible gasses. The gas accumulation can over pressurize a tank, cause a rupture or, if there's an electrical arc, flash off and cause an explosion.

"PGE has a program to sample each transformer for dissolved gasses, but there are no industry standards to compare the results for decision making and accurately predict pending failures," Cope said. "PGE does our best to make prudent choices."

After watching PGE's presentation online at The Oregonian/OregonLive's request, Tony Sleva, the president of Prescient Transmission Systems, said it appeared to be tailored for an audience with limited knowledge of electrical equipment, and a panel of electrical engineers would have been more skeptical. Sleva, whose expertise includes forensic analysis of aging and failed electrical equipment, told the newsroom that testing gas in oil is an effective method to predict remaining transformer life, the methodology is well understood, and the science simple.

“PGE needs to obtain the service of a forensics lab,” he said in a statement, adding that without intervention the number of failures would likely climb.

Two weeks after Cope’s comments to regulators, another transformer failed at Biglow Canyon, leaking 166 gallons of mineral oil to the surrounding ground.

‘They’d hurt you’

Pieces of turbine equipment are now falling into landowners’ fields with some regularity.

PGE has not reported those incidents to the state promptly, or in some cases at all. That’s a potential violation of state administrative rules governing wind farms, as well as the conditions in Biglow Canyon’s operating permit with the state.

Take the metal frame and pieces of fiberglass that fell off the damaged nose cone of a Vestas turbine in April 2021. PGE didn’t report it until June of this year, and only after a reporter asked why it hadn’t been disclosed to regulators.

State rules require wind farm owners to operate the facility in a way that prevents structural failures of the tower or blades that could endanger public safety, and PGE’s operating permit requires a report within 72 hours of any incident with the potential to impact public safety.



Pieces from a damaged Vestas V82 wind turbine at Biglow Canyon. PGE told regulators a metal frame and pieces of fiberglass fell off the turbine in April 2021. Wind technicians later lowered the turbine’s nose cone and spinner frame to the ground, where they were left for a year.

After PGE questioned whether such an incident was reportable, the Department of Energy made it clear to PGE that it was, noting that even a small item falling from about 265 feet could reach 130 feet per second, the equivalent of almost 90 miles per hour.

At “those speeds, even a small object may present a hazard and raises questions with both the adequacy of and compliance with the requirements of PGE’s Operational Safety-Monitoring Program,” Wally Adams, an analyst at the department, wrote to the utility.

Using that standard, it appears PGE should have been reporting a lot more public safety incidents, based on what landowners say happens.

Kevin McCullough said that over the years, he has found 10 to 12 hatch doors, most of them beaten up and coated in oil, that have broken off the top of the Vestas turbines and fallen into the fields he farms. Each measures 25 inches by 29 inches and weighs about 10 pounds. He picks them up so his combine doesn’t, and either sits them against the base of the turbines or delivers them to PGE’s office.

Gray, one of the neighboring farmers, confirmed the same. “The Vestas turbines, they lose doors all the time and you’ll see them laying in the field. They’d hurt you. My neighbors won’t park by them.”

Likewise, the McCulloughs’ son, Colton, said he’s found several metal disks with a Siemens label attached, of about the same size and weight as the Vestas hatches, that have fallen off the Siemens turbines.



Landowners say they find hatch doors (left) from the Vestas turbines at Biglow Canyon and metal disks (center) from the Siemens turbines that break off and fall into their fields from a height of about 265 feet. State regulators say even small objects falling from that height can reach speeds of nearly 90 mph and could endanger anyone below. (Courtesy Kathryn McCullough)

PGE has also discovered at least one instance of broken blade bolts falling from the turbines. Last year, the company discovered broken bolts on four of its Siemens turbines, maintenance

reports obtained by The Oregonian/OregonLive show. In three cases, those were identified during annual inspections or during repairs, while broken blade bolts were found under one of the turbines in the fourth instance.

It's not clear how many blade bolts were broken or missing on each turbine. But PGE did not report the bolts, or the fallen hatches or disks, to the state.

Havel said PGE has reported "consistent with our understanding" of state rules and "in alignment with other wind operators' reporting patterns" but will "continue to evaluate our practice to ensure we are meeting" the state's expectations. PGE told regulators in July that it would hold meetings with staff and contractors to review the types of events that trigger reporting requirements.

The Department of Energy told the newsroom it would require reporting of a broken blade bolt found below a turbine but wouldn't say if the obligation would apply to other items, without having more details from the wind farm operator or a member of the public.

"We will investigate if it's reported to us," said Todd Cornett, assistant director of the Department of Energy siting division.

What is clear is that PGE kept its four Siemens turbines with broken blade bolts running for months while awaiting spare parts. In one case, according to the maintenance reports, PGE left a turbine in service with broken bolts for nearly a year.

Jenkins, the PGE manager, defended the decision. He said both Siemens and Vestas specify how many bolts attaching a blade to the rotor hub can be loose or broken and have the turbine remain operational. He declined to say what those specifications are, saying PGE is under a non-disclosure agreement.



Flags marking debris in a wheat field after a Vestas V82 wind turbine at Biglow Canyon threw one of its eight-ton blades the length of a football field on Feb. 1.

Andrew Luther, a spokesperson for Siemens Gamesa, said in a statement that it provides focused recommendations for Siemens turbines with broken blade bolts, but that "as every wind farm has a unique combination of location, wind conditions, equipment, age, and maintenance schedules, we do not have the necessary information to comment on this situation." He also declined to comment on falling equipment or oil leaks because the company is not responsible for maintaining turbines at Biglow Canyon.

Vestas said most oil leaks are contained within the turbine structure, don't affect performance and have a low risk of migrating to surrounding areas.

In the "rare instance" that objects fall to the ground, it is the responsibility of the wind turbine owner to make any required report to regulators, it said.

"Vestas investigates and repairs issues provided the failure falls within Vestas's agreed upon scope with the wind turbine owner."

The company said that when broken blade bolts are found, engineers make the determination on a case-by-case basis.

"Under certain circumstances and with the necessary engineering assessment, Vestas' guidelines may allow for temporary wind turbine operation with additional guidelines," it said in response to written questions. Those might include extra inspections and replacing additional bolts around the broken bolt during repair.

PGE said it had not identified broken bolts on Vestas turbine No. 71 or any of the other Vestas machines before this winter's blade throw. But it found broken bolts and other problems on other machines afterward — including a cracked blade bearing, a steel ring that connects the blade to the rotor hub and controls the blade angle to the wind. PGE had to replace both the bearing and the attached blade as a result.

"A cracked blade bearing is a biggee," said Haller, the retired industry consultant.

PGE told regulators its inspections this year included hiring a contractor to check the torque on "a representative sample" of more than 10,000 blade bolts at Biglow Canyon, and it submitted 50 of the failed blade bolts from the thrown blade for specialized metal testing.

Project maintenance reports obtained by The Oregonian/OregonLive show broken blade bolts were found on four more Siemens turbines and two more Vestas machines. The reports show those machines were taken offline by PGE.

Jenkins told the newsroom that if a certain percentage of blade bolts on a given turbine were not within specifications, it planned to replace all bolts on that blade. Havel later said that it replaced all the bolts on four Vestas turbines but, after testing the metal, concluded full bolt replacement was unnecessary on additional turbines.

The failure of blade bolts due to stress and metal fatigue is cited as a frequent cause of turbine failure, according to a recent study published in the academic journal Engineering Failure Analysis, which presented a methodology to predict the remaining life of in-service wind turbine bolts.

Metal blade bolts do have some ability to stretch and deform without breaking. But over time, they begin to lose that elasticity, and corrosion or cracking can cause them to snap under severe loads.



Workers replacing the blades on a Vestas V82 wind turbine at Portland General Electric's Biglow Canyon wind farm in late June. The turbine threw one of its blades into a wheat field on Feb. 1. PGE blamed "a loss of clamping force."

When a fatigue failure occurs, the paper said, it's difficult to pinpoint the origin after the fact, which complicates the decision on whether to replace bolts on every turbine or just the one with failed bolts. "It is of paramount importance to know whether the fatigue-damaged bolts are in general throughout the whole farm/park, only of one turbine or only those of one connection."

One of the paper's authors, Daniel Garcia Vallejo, a professor of mechanical engineering at the University of Seville in Spain, said in an email that catastrophic failures typically result from a cascading set of events.

"Usually, the first bolt will break due to fatigue, and after a number of other bolt breakages the rest will break due to overload," he wrote.

Asked if it was considered safe, under any circumstance, to run a turbine with broken blade bolts, he replied, "I don't think so. When one bolt breakage is detected it should be analyzed and repaired."

'It could produce so much more'

Amid the problems, landowners say Biglow Canyon's turbines often resemble giant lawn ornaments, sometimes sitting idle for months at a time.

And that is what they find most exasperating, and something they contend should also concern utility ratepayers and regulators, who aren't getting the carbon-free energy production they are paying for and expect.

“It’s a good rent, but I’m complaining because it could produce so much more electricity,” said John Scharf, who has 26 of the project’s turbines on his land.

Where the turbines are

The U.S. Geological Survey maintains a database of more than 72,000 onshore and offshore wind turbine locations in the United States. Zoom to Biglow Canyon wind farm

© Mapbox © OpenStreetMap Improve this map © Maxar

Oregon wind farms

Oregon has about 2,300 turbines across 48 wind farms, mostly concentrated near the Columbia River Gorge.

Search:

Farm	County	Turbines	Model	Operator	Distributor
Farm	County	Turbines	Model	Operator	Distributor
Benson Creek Wind Farm	Baker	5	GE 2.0	DE Shaw Renewable Investment / Oregon Wind Farms	Idaho Power
Biglow Canyon Phase 1	Sherman	76	Vestas V82 1.65	PGE / Orion Energy	PGE
Biglow Canyon Phase 2	Sherman	65	Siemens SWT 2.3	PGE	PGE
Biglow Canyon Phase 3	Sherman	76	Siemens SWT 2.3	PGE	PGE
Combine Hills	Umatilla	41	Mitsubishi MWT 1000	Eurus	PacifiCorp / Energy Trust of Oregon
Combine Hills II	Umatilla	63	Mitsubishi MWT 1000	Eurus	PacifiCorp
Condon (Phase I)	Gilliam	41	Mitsubishi MWT 600	ALLETE / AES / SeaWest	BPA
Condon (Phase II)	Gilliam	42	Mitsubishi MWT 600	ALLETE / AES / SeaWest	BPA
Durbin Creek Wind Farm	Baker	5	GE 2.0	DE Shaw Renewable Investment / Oregon Wind Farms	Idaho Power
Echo – Big Top	Umatilla	1	Vestas V82 1.65	Exelon / Oregon Wind Farms	PacifiCorp
Echo – Butter Creek Power	Umatilla	3	Vestas V82 1.65	Exelon / Oregon Wind Farms	PacifiCorp

Farm Farm	County County	Turbines Turbines	Model Model	Operator Operator	Distributor Distributor
Echo – Four Corners Wind Farm	Umatilla	5	Senvion mm92	Exelon / Oregon Wind Farms	PacifiCorp
Echo – Four Mile Canyon Wind Farm	Morrow	5	Senvion MM92	Exelon / Oregon Wind Farms	PacifiCorp
Echo – Oregon Trail Wind Farm	Umatilla	6	Vestas V82 1.65	Exelon / Oregon Wind Farms	PacifiCorp
Echo – Pacific Canyon Wind Farm	Morrow	5	Vestas V82 1.65	Exelon / Oregon Wind Farms	PacifiCorp
Echo – Sand Ranch Wind Farm	Morrow	6	Vestas V82 1.65	Exelon / Oregon Wind Farms	PacifiCorp
Echo – Wagon Trail	Morrow	2	Vestas V82 1.65	Exelon / Oregon Wind Farms	PacifiCorp
Echo – Ward Butte Wind Farm	Umatilla	4	Vestas V82 1.65	Exelon / Oregon Wind Farms	PacifiCorp
Elkhorn Wind Power Project	Union	65	Vestas V82 1.65	EDP Renewables	Idaho Power
Golden Hills	Sherman	51	41 Vestas V150 4.3 10 GE 116.2.5	Avangrid Renewables	PSE
Hay Canyon	Sherman	48	Suzlon S88 2.1	Avangrid Renewables	Snohomish PUD
Jett Creek Wind Farm	Baker	5	GE 2.0	DE Shaw Renewable Investment / Oregon Wind Farms	Idaho Power
Klondike I	Sherman	16	GE 1.5	Northwestern Wind / Avangrid Renewables	BPA
Klondike II	Sherman	50	GE 1.5	Avangrid Renewables	PGE
Klondike III	Sherman	44	Siemens SWT 2.3	Avangrid Renewables	PG&E / PSE / EWEB / BPA
Klondike IIIa	Sherman	51	GE 1.5	Avangrid Renewables	PG&E
Leaning Juniper	Gilliam	67	GE 1.5	Avangrid Renewables	PacifiCorp
Leaning Juniper II	Gilliam	133	GE 1.5	Avangrid Renewables	
Lime Wind	Baker	6	Nordtank 500/41	Joseph Millworks	Idaho Power / BEF
Montague Wind Power Facility	Gilliam	56	Vestas V136/3450	Avangrid Renewables	

Farm Farm	County County	Turbines Turbines	Model Model	Operator Operator	Distributor Distributor
Patu	Sherman	6	GE 1.5	Ormand Hilldebrand	PGE
Pebble Springs Wind	Gilliam	48	Suzlon S88 2.1	Avangrid Renewables	Southern California Public Power Authority (SCPPA)
Project Chopin	Umatilla	6	GE 1.7	BayWa r.e. Wind	PacifiCorp
Prospector Wind Farm	Baker	5	GE 2.0	DE Shaw Renewable Investment / Oregon Wind Farms	Idaho Power
Rattlesnake Road Wind Phase I	Gilliam	49	Suzlon S88 2.1	EDP Renewables	PG&E / CEP / Confederate Tribes of the Umatilla
Shepherds Flat Central – South Hurlburt	Gilliam & Morrow	116	GE 2.5	Caithness Energy	Southern California Edison
Shepherds Flat North – N. Hurlburt	Gilliam	106	GE 2.5	Caithness Energy	Southern California Edison
Shepherds Flat South – Horseshoe Bend	Gilliam & Morrow	116	GE 2.5	Caithness Energy	Southern California Edison
Star Point	Sherman	47	Suzlon S88 2.1	Avangrid Renewables	
Stateline (OR side)	Umatilla	186	Vestas V47 .6	NextEra Energy	PacifiCorp
Stateline Expansion (1 of 2)	Umatilla	279	Vestas V47 .6	NextEra Energy	
Threemile Canyon Wind	Morrow	6	Vestas V82 1.65	Exelon / Momentum RE	PacifiCorp
Vansycle II (Stateline III)	Umatilla	43	Siemens SWT 2.3	NextEra Energy	PacifiCorp
Vansycle Windplant	Umatilla	38	Vestas V47 .6	NextEra Energy	PGE
Wheat Field Wind Farm	Gilliam	46	Suzlon S88 2.1	EDP Renewables	Snohomish PUD
Wheat Ridge	Morrow	120	GE 2.3 and 2.5	Next Era	PGE
Willow Creek	Gilliam & Morrow	48	GE 1.5	Invenergy	LADWP
Willow Spring Wind Farm	Baker	5	GE 2.0	DE Shaw Renewable Investment / Oregon Wind Farms	Idaho Power

Sources: U.S. Geological Survey, Renewable Northwest

Map: Mark Friesen/staff

Biglow Canyon has been a disappointment from the start.

In 2008, when PGE first asked the Oregon Public Utility Commission to approve a rate increase to cover the cost of the first phase of Biglow Canyon, it told commissioners it expected the Vestas turbines would generate, on average, about 37% of their rated capacity of 125.4 megawatts.

That number is known as a turbine's "capacity factor," which accounts for the fact that wind doesn't blow all the time. It's an important contributor to wind farm economics, as it tells you not only how much power they'll generate but how many federal subsidy dollars are likely to flow to the project.

The project's capacity factor has never hit 37%. In their first five years of operation, compliance reports filed with the state show the Vestas turbines had an average capacity factor of 31%, meaning the project widely missed its initial projections.



A Vestas V82 turbine, missing a hatch door, at PGE's Biglow Canyon wind farm this summer. Farmers say the hatches fall into their fields from a height of 265 feet. (Courtesy Kathryn McCullough)

"Phase one was clearly not very good," said Bob Jenks, a ratepayer advocate for the Citizens' Utility Board of Oregon. "They'd probably argue that it was new technology and they were learning how to operate it. But they asked us to pay for output, not a learning experience."

By the time the last turbines were finished in 2010, PGE said publicly that the entire project's capacity factor was expected to be about 33%. Instead, it's averaged 27.6% – again, well below projections.

PGE said its estimates were based on assumptions and history of wind at the location, and that as the industry matures and it collects more weather pattern data, it can now more accurately assess wind farms capacity factors.

Nearby facilities are performing better.

The Patu wind farm, a six-turbine operation owned by a neighboring landowner that opened in 2010 and sits directly adjacent to some of Biglow's turbines, has had an average capacity factor of 36%. Klondike III, a large, neighboring wind farm of comparable age, has maintained consistently higher capacity factors than Biglow, averaging 29.2%, which over the years adds up to a lot of extra generated electricity.

Gray said he has four Biglow Canyon turbines on his land to the north and west of the Patu wind farm. He said he seldom sees any of the neighboring turbines down.

"He's not on any exceptional ridge," Gray said of the Patu operator. "When they built Biglow, they built on the best wind resource available."

PGE said different environmental factors and plant features affect the capacity factors of each, and that "these wind farms are not directly comparable."

State regulators separately require wind farm operators under their jurisdiction to report how often equipment is available to generate power, regardless of whether the wind is blowing.

On-shore wind turbines tend to be very reliable, typically available more than 95% of the time, according to James Manwell, a professor in the Department of Mechanical and Industrial Engineering at the University of Massachusetts who studies wind energy.



Farmers cultivate wheat right up to the base of wind turbines at Portland General Electric's Biglow Canyon wind farm (left). An aerial shot (right) of a Vestas turbine on Feb. 22, after it threw a blade 100 yards into a field below.

Among wind farms under state jurisdiction that have been operational for at least 10 years, all have hit that mark, on average, including Biglow Canyon. But the Vestas machines at Biglow have failed to achieve that target in half the years they've operated, plummeting to 88.5% in 2020 and 86.5% in 2021.

This year's performance could be worse, as many of the Vestas turbines were down three or four months after the blade separation.

Doug Medler, a Portland resident who sold his land to the McCulloughs three years ago but retained the wind rights, said his payment for the second quarter of this year was about $5,250, compared to about $17,850 in the same quarter last year, a 71% reduction.

"It's a significant hit," he said. "It's a big source of income, but not one that affects my ability to put food on the table or pay the utility bill."

During the past five years, PGE has offered landowners various reasons for the turbine downtime: low wind; plant curtailments by the Bonneville Power Administration when the region's hydroelectric dams are producing too much energy; and more recently, aging equipment and a lack of parts due to disruptions in the global supply chain. PGE has also said it's sometimes advantageous to ratepayers to run its other wind plants that are still within the 10-year eligibility window for federal production tax credits, and shut down Biglow Canyon, which is no longer eligible for the subsidies.

PGE told the newsroom substation and transmission outages initiated by the Bonneville Power Administration likely affected Biglow Canyon in 2020 and 2021. "There were no equipment failures or breakdowns that significantly impacted availability or capacity," PGE previously told regulators about those years.

Yet in emails to Kathryn McCullough about frustrations over downtime, a PGE official last year acknowledged the role of failing equipment.

Nick Loos, the director of dam safety and renewable energy, blamed increased downtime on wear and tear, "end of life issues" that were "rearing its ugly head" and the need for PGE to stay ahead of the "failure curve."

"The past maintenance strategy of replace as main components fail has worked in the past," he told her, "but with the increase in failures we need to mature our maintenance strategy. Work we are doing in the background is focused on preventative maintenance."

'Need to hold the utilities responsible'

The path forward for Biglow Canyon is uncertain.

Company officials have pledged to improve safety and performance, and Wyden, the senator, has vowed to keep watch.

“PGE is updating our office regularly with the inspection status, as well as committing to provide our office with a longer-term inspection and maintenance plan,” Hank Stern, a spokesperson, said in an email. “Sen. Wyden will keep watchdogging this issue to ensure PGE follows through on its commitment to him and the community.”

Financially, PGE appears to have two routes to address issues.

Jenkins, the utility’s vice president of operations, insists that PGE is managing the project – and the Vestas turbines – for longevity, focusing on preventive maintenance to keep small problems from turning into big ones. “I don’t know that with the age of these assets, the case can be made that they’re not performing,” he said.



But keeping the turbines performing at a high level may require significant investments, and PGE’s filings with regulators don’t reflect that reality.

In fact, PGE’s operations and maintenance expenses at Biglow Canyon have steadily declined, despite the aging equipment and acknowledged need for major repairs. PGE spent $13 million last year, down 40% from 2013, according to figures filed with the Federal Energy Regulatory Commission. That’s the lowest total since 2010.

And in documents submitted to Oregon regulators, the company said it would spend even less this year: $10 million.

If that seems strange, perhaps it shouldn’t.

A 2020 study by researchers at Lawrence Berkeley National Lab found that wind plant performance in the United States declines suddenly after 10 years – far more abruptly than output dropped in Europe or Asia. One theory the authors offered: As plants aged out of the 10-year window for federal production subsidies, they don't warrant more intensive operations and maintenance activities to maximize production.



A wind technician enters a Vestas turbine at PGE's Biglow Canyon wind farm. The project's 76 Vestas turbines are now 15 years old, about halfway through their depreciable life. PGE is already considering replacing them.

A related hypothesis cited by the research: regular maintenance that was deferred to maximize production while the wind farms were still eligible for the tax credits eventually comes home to roost in the form of increased breakdowns.

PGE's alternative to spending more on maintenance would be to repower the Vestas turbines, replacing most of their components, increasing their efficiency and output. It's not uncommon. And PGE is considering it.

If that happens, ratepayers could end up eating the remaining value tied to the existing machines. The Public Utility Commission said that was $178 million at the end of last year and would decline to about $156 million by the end of 2023.

The likelihood of repowering may have just gotten higher, as the Inflation Reduction Act passed by Congress this month renewed the federal production tax credit subsidy for another 10 years for wind and solar farms that begin construction prior to Jan. 1, 2025, including those repowering turbines.

Any decision to repower turbines at Biglow Canyon would be subject to a so-called “prudency review” by the Oregon Public Utility Commission to determine whether the investment is in the public interest. That decision would include all the costs involved, including the remaining costs of the turbines being repowered, the cost of the new equipment, and the available tax credits.

Jenks, the ratepayer advocate, said the review would also include an analysis of whether the current equipment has been properly maintained, and if not, what went wrong.

“If we’re going to make a transition to clean energy,” he said, “we need to hold the utilities responsible for managing these projects properly.”

The landowners would like that same level of accountability.

“When we entered into the agreement, the objective of the company and the landowners leasing the land was to have the project work, and make money,” said Cheryl Woods, a Biglow Canyon property owner and the accountant for the wind prospecting company that originally arranged the lease.

“But it doesn’t seem to be exactly going that way. It just hasn’t been managed well.”



A Vestas wind turbine at PGE’s Biglow Canyon wind farm.

Wind Turbines Produce Drama, Cash, and Some Electricity: Big Trouble at Biglow Canyon



Diablo Canyon Power Plant, California's last operating nuclear power plant. Credit: Tracey Adams. License: Wikimedia.

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by Ken Braun
February 27, 2024

Danish Wind Turbines Produce Drama, Climate-Left Cash . . . and Some Electricity (full series)
Big Trouble at Biglow Canyon | "Unexpected"
"Extraordinarily Rare" | Support for Anti-Nuclear Nonprofits

At 2:11 a.m. on February 1, 2022, according to a report in *The Oregonian*, a wind turbine at the Biglow Canyon Wind Farm in Oregon hurled one of its giant blades the "full length of a football

field" away from its tower. Described as heavier than "four Toyota Camrys" and "as tall as an 11-story building," the detached blade sliced a four-foot-deep crater in a nearby farm field. In an eerie newspaper photo, the crash site looked like the wreckage of an alien spacecraft.

A few days earlier a driver delivering fertilizer had recovered and photographed "industrial-size bolts" on the ground near the troubled tower. His coworker returned to the same location during the evening of January 31, just hours before the blade flung loose, to tow out the vehicle of another delivery worker who had gotten stuck in the mud.

"Someone could have been killed or badly injured," observed Kathryn McCullough, whose husband farmed the same fields.

Owned by Portland General Electric, the turbine was built by Vestas, a Danish firm that has been one of the world's largest producers of wind-energy machines. *The Oregonian* investigative feature in August 2022 was headlined "Wind Bust: How an Airborne Blade Exposed Broader Problems at PGE's Flagship Wind Farm." The report revealed concerns about both Vestas turbines and PGE's maintenance of them.

The recently enacted Inflation Reduction Act is expected pay out *$400 billion* in carbon and climate policy pork, and much of it is crashing down on weather-restricted energy systems such as wind turbines. The wind welfare industry is already off to a flying start. Using 2022 data, energy journalist Robert Bryce compared the subsidies for all major American forms of energy, "calculated on an energy-produced basis," and found that wind power received nearly *70 times* more taxpayer loot than carbon-free nuclear power.

As a major wind industry supplier, Vestas stands to indirectly profit from the taxpayer largesse.

In 2012, facing the threat of Congress ending the wind production tax credit (PTC), a Vestas official warned that 75 to 95 percent of the American wind power industry could disappear without the corporate welfare. In 2014, according to the *Washington Free Beacon*, the two U.S. senators from Colorado specifically cited Vestas as the reason they were supporting renewal of the PTC.

Not surprisingly, Vestas has also been a big donor to major left-wing nonprofits that promote its problematic weather-dependent wind power.

Big Trouble at Biglow Canyon

PGE responded to the February 2022 blade detachment by shutting down and inspecting all 217 turbines at Biglow Canyon, 76 of which were made by Vestas and 141 by Siemens Gamesa, a Spanish-German firm. Some of the turbines were still out of action four months later.

The Oregonian investigation found that "hatches, metal disks and blade bolts" had repeatedly fallen off PGE's 265-foot-tall turbine towers and the utility had "knowingly operated at least four turbines at Biglow Canyon with broken blade bolts, in one case for nearly a year."

The newspaper cited concerns with all of PGE's turbines, but also revealed that the Oregon power company was considering suing Vestas. Although the McCullough family were initially supporters of the wind project, the newspaper said they began noticing problems just three years after the Vestas turbines were installed in 2007.

The turbines started leaking lubricants:

It's a condition that persists today. Many of the once-pristine white Vestas turbines are visibly soiled by oil, blackening the towers, the blades, the gravel pads and spitting into the fields below. The McCulloughs snapped photos of the problem as recently as early August showing their truck spattered in oil after just 30 minutes parked near a turbine, and the ground darkened with oil spots.

The Oregonian showed photos of the badly soiled turbines and the truck hood, plus large parts that had been falling from the Vestas machines:

Kevin McCullough said that over the years, he has found 10 to 12 hatch doors, most of them beaten up and coated in oil, that have broken off the top of the Vestas turbines and fallen into the fields he farms. Each measures 25 inches by 29 inches and weighs about 10 pounds.

"The Vestas turbines, they lose doors all the time and you'll see them laying in the field," confirmed another farmer quoted in the report. "They'd hurt you. My neighbors won't park by them."

The report also cited an official from the Oregon Department of Energy who estimated that the items falling from 265 feet up could smash into the ground (or anything and anyone else) at nearly 90 miles per hour.

In 2008, according to *The Oregonian*, PGE told state regulators its Vestas turbines would average 37 percent of their rated capacity. But the newspaper found the turbines never even achieved 37 percent of rated capacity, let alone made an average of that production level.

"They'd probably argue that it was new technology and they were learning how to operate it," chirped a ratepayer advocate quoted by *The Oregonian*. "But they asked us to pay for output, not a learning experience."

Because the weather is fickle, the capacity factor of wind turbines is very low. According to the U.S. Department of Energy, the average capacity factor of all American wind energy is just 34.6 percent. At 92.7 percent, carbon-free nuclear energy has the highest capacity factor of all major American sources of electricity.

Although the Vestas machines were just halfway through their 30-year estimated useful lifespan by 2022, *The Oregonian* reported PGE was already thinking about retiring them.

Despite all this, a PGE spokeswoman gave a prickly reply about the tone of *The Oregonian*'s questions.

“We challenge your categorization of the volume of troubles,” she wrote. “Since coming online, Biglow Canyon wind farm has generated more than 13,000,000 MWh of clean electricity, which translates to powering 120,000 homes per year.”

All things considered, that’s nothing to brag about.

Biglow Canyon came online in 2007 and covers 25,000 acres (39 square miles), almost the size of the city of Eugene, Oregon, home to 177,000 people. By comparison, California’s Diablo Canyon nuclear plant covers just 1,000 acres (1.5 square miles).

Yet every year Diablo Canyon produces at least 16.5 million MWh of carbon-free electricity (and sometimes more than 18.5 million MWh). That works out to a cumulative total of more than 281 million MWh during the era when Biglow Canyon generated just 13 million MWh.

Leave aside the years of oil leaks and smaller debris falling onto Oregon. If throwing just one 11-story, multi-ton piece of equipment since 2007 can be excused away as the acceptable price to pay for Biglow Canyon’s relatively pitiful zero-carbon energy output since then, then the hyper efficient Diablo Canyon needs to drop 22 giant blades on its local community just to catch up to the same level of incompetence.

Biglow Canyon’s turbine troubles should be considered a serious problem in any context, but even more so relative to the tiny power output and immense chunks of Oregon’s land and skies that it consumes.

https://capitalresearch.org/article/wind-turbines-produce-drama-cash-and-some-electricity-part-1/

In the next installment, Vestas wind turbines experience “unexpected and increasing wind turbine failure rates.”

Wind Turbines Produce Drama, Cash, and Some Electricity: “Unexpected”



by Ken Braun
February 27, 2024

Danish Wind Turbines Produce Drama, Climate-Left Cash . . . and Some Electricity (full series)
Big Trouble at Biglow Canyon | "Unexpected"
"Extraordinarily Rare" | Support for Anti-Nuclear Nonprofits

"Unexpected . . . Failure Rates"

But Biglow Canyon is far from the only place where Vestas turbines have been behaving badly according to the media. There were at least a half dozen additional incidents in the 20 months after the flying blade failure in Oregon.

In June 2022, an entire tower with a Vestas turbine fell over at an Australian facility run by the Iberdrola energy firm. "The failure of turbine 43 at Alinta Wind Farm is a serious event," said the Iberdrola's Australia CEO. "We are currently working closely with regulatory bodies and the operations and maintenance contractor, Vestas, to understand the factors that have contributed to the failure of the turbine."

A fire broke out at a Vestas turbine in Germany in December 2022, according to ReNews.Biz.

And in October 2022, a turbine owned by Warren Buffett's MidAmerican Energy caught on fire in Iowa. According to ReNews.Biz, the Vestas turbines at the facility had "began operating in 2020."

"An incident such as this is an extremely rare occurrence—throughout our fleet we have experienced only one other fire of this magnitude in the nearly 20 years since we began operating our first wind farm," said a MidAmerican official.

He soon learned the wind turbine gods can be as capricious as the wind itself. Almost precisely a year later, in October 2023, another Vestas turbine at a different MidAmerican facility in Iowa reportedly caught fire.

"Local fire brigades from Adair and surrounding towns responded but could do little as they lacked equipment to reach the nacelle," reported ReCharge. "The fire eventually consumed the nacelle and one of the blades, with burning debris falling into surrounding cornfields that sent up plumes of smoke that could be seen for miles."

Local TV news caught a dramatic video of a flaming blade crashing to the ground. "An incident such as this is an extremely rare occurrence," the MidAmerican official reportedly said once again.

According to other media accounts, 2023 had already been a thrilling year for Vestas turbines.

In February 2023, ReNews.Biz reported a fire at a Vestas machine in Denmark, its home nation. The report did not quote anyone claiming the fire was a "rare occurrence."

Good thing, because in August 2023, EnergyVoice reported an offshore Vestas turbine had caught fire just off the coast of Norfolk in the United Kingdom. A BBC account featured several dramatic photos of the destroyed machine billowing black smoke that could be easily seen from the coastline.

By July 2023 ReNew Economy was reporting maintenance troubles for Vestas:

Vestas has added €210 million in warranty provisions for repairs in the December quarter, as rising call outs and higher upgrade costs bite at the Danish company, too. Vestas also said its lost production factor is rising towards 4 per cent due to the number of "extraordinary" repairs and upgrades.

By then all of the big turbine makers were having troubles, according to ReNew Economy:

Unexpected and increasing wind turbine failure rates, largely in newer and bigger models, are savaging the profits of some of the world's biggest manufacturers, as Siemens Gamesa, GE and Vestas report heavy repair and maintenance losses.

In its Biglow Canyon investigation, *The Oregonian* correctly observed that "there is no effective national, state or county reporting requirement or database tracking safety or operational

incidents at wind farms." The newspaper also reported that Portland General Electric had claimed the "issues at Biglow Canyon" were "consistent with those experienced by other utilities with similarly aged equipment."

It is difficult and perhaps impossible for an outside party to objectively evaluate whether the problems for Vestas have been typically awful for the industry, or extraordinarily awful. In the absence of any substantive recordkeeping or obligation on the part of the turbine makers to publicly report their major malfunctions, we must rely on the accuracy of media accounts.

Even if accurately reported, such accounts often fail to mention critical details such as who manufactured the equipment. And there are likely major malfunctions that have gone unreported, particularly in lower-income nations with comparatively less robust media coverage.

Even with these caveats, Vestas wind turbines have been appearing in unpleasant media accounts for more than a decade.

https://capitalresearch.org/article/wind-turbines-produce-drama-cash-and-some-electricity-part-2/

In the next installment, Vestas characterizes the wind turbine failures as "extraordinarily rare."

Wind Turbines Produce Drama, Cash, and Some Electricity: "Extraordinarily Rare"


Offshore wind farm in Baltic Sea near Copenhagen, Denmark. License: Shutterstock.

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by Ken Braun
February 27, 2024

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An "Extraordinarily Rare Event"

"In December 2011, a wind turbine in the coastal town of Ardrossan in the UK spectacularly exploded during a storm," reported *New Scientist*. "Pictures of the flaming debris shower flashed across global media, triggering claims that turbines cannot cope in extreme weather." According to *New Scientist,* a Vestas wind turbine had been the star of that show.

A few months later in April 2012, according to the *Crescent News*, two blades broke off of a Vestas turbine in Ohio. The facility was owned by EDF Renewables. the *Crescent News* quoted an EDF spokesman who claimed the problem was an "extraordinarily rare event."

But within weeks of each other in the early summer of 2012, according to *Renewable Energy Magazine*, fires occurred at Vestas machines in Germany and Spain.

"Given the information available, the Casa del Aire incident is an isolated case with no connection to the fire involving the V112 in Germany or any other incident concerning a Vestas wind turbine," claimed a Vestas official.

And then *Lincoln Star Journal* reported another Vestas wind turbine fire in Nebraska in October 2012.

According to the *Bangor Daily News*, a Vestas wind turbine in Maine, near the Canadian border, caught fire in January 2013.

"Companies that operate wind farms in Maine are not currently required to report turbine fires to any state agency," reported the newspaper in late April, explaining why it was just getting around to covering a fire that had occurred on January 16. The newspaper began the report claiming the incident had "generated concern about the safety and reliability of turbines, and the process by which these fires are reported to government officials and the public."

In March 2013 a Vestas turbine tower collapse in Ireland, leaving wreckage that "had been strewn over a wide area," according to one local newspaper, and "just yards from a popular cycling route" according to the *Irish Independent*.

An Irish radio station interviewed Vestas officials who "said such incidents are very rare" but "refused to answer questions about how many times such collapses have happened in the past." In a statement, Vestas declined to speculate on the cause of the collapse, but ironically noted it had occurred in "very high winds."

In April 2013, *North American Windpower* reported that a Vestas turbine in Ontario had caught on fire. According to the *Stratford Beacon-Herald*, the fire "fueled the fierce debate between those who add fire hazard to their list of reasons to hate wind turbines and those who say an isolated incident doesn't detract from wind energy's exceptional safety record."

Two young Dutch workers trapped atop a turbine inferno died in October 2013. Multiple online images and videos show a "Vestas" logo on the machine, including those showing the doomed workers sharing a final hug. Two ReNews.Biz stories archived at the Wayback Machine from October 2013 and November 2013 identify the turbine as a "Vestas V66," with the first report stating "Vestas said it was saddened by the incident and extended its sympathies to the families involved."[1]

The German news site Soester Anzeiger posted a February 2014 account of another fire with photos of a Vestas turbine ablaze in Echtrop, Germany.

In late December 2015, according to ReNews.Biz, a Vestas turbine tower collapsed in Sweden. The report paraphrased a Vestas official who claimed that "incidents involving structural integrity are very rare."

Eight weeks later in February 2016 the *Huron Daily Tribune* in Michigan reported the collapse of a "400-foot, 485,000-pound" Vestas wind turbine and tower. According to the newspaper, investigators concluded it had "shook itself apart" in a "pretty violent act" during an "overspeed event." The reporter wrote there was a "dose of irony" involved in high winds wrecking a wind turbine.

"In Operation Less Than One Year"

In October 2016 blades broke off two different Vestas wind turbines at another wind facility in Michigan. According to the *Huron Daily Tribune*, the wind machines had just been turned on during the "startup phase" at the then-new Deerfield Wind Energy project. Also in October 2016, according to North American Windpower, a Vestas wind machine caught fire in Brazil.

In early January 2017, CBC News reported that a Vestas wind turbine tower "snapped in half" during a "severe wind warning" in Nova Scotia. One observer told CBC he could "see the debris was flying down towards the ocean."

"If it's too windy, then maybe it's not the right place for it," said another local Nova Scotian. "Because it is close to houses and I imagine the people up the hill . . . they must have been scared because it was right near to their house."

The Clarendon Enterprise reported in June 2017 that a Vestas turbine had caught fire near Jericho, Texas; Offshore Energy reported in August 2017 that a Vestas turbine had burned up atop a 140-meter tower at a Denmark test facility; and in October 2017, according to Balkan Green Energy News, a Vestas turbine tower collapsed in Croatia.

A Vestas wind turbine in Iowa owned by MidAmerican Energy caught fire in May 2018, according to Perry News. It had "been in operation less than one year," according to the newspaper.

ReNews.Biz reported that a turbine and blades simply fell off a tower in Thailand in October 2018. "Vestas said a nacelle detached from the tower and fell to the ground together with the blades," reported ReNews.Biz. "TV pictures have shown a wrecked turbine at the foot of a relatively unscathed tower." It was another incident involving a wind project that had "only very recently been completed and commissioned."

A Vestas turbine in Denmark caught fire in January 2019. A TV station reported the fire spread to buildings at a nearby farm where dozens of bull calves were kept, but that none of the livestock were injured. The website featured a photo of the turbine ablaze, with the Vestas logo still visible.

A blade from a Vestas turbine in Ohio snapped off in September 2020, according to the account in Windpower Monthly. The following month in October 2020, according to ReNews.Biz, a blade fell off a "recently-commissioned" Vestas turbine in Australia. And Windpower Monthly reported the November 2020 collapse of a "newly installed" Vestas turbine tower in Sweden.

And in October 2021, Mercury Energy reported a fire had destroyed one of its Vestas turbines at the Tararua Wind Farm New Zealand. According to the *New Zealand Herald*, Mercury had just purchased Tararua and the Vestas turbine from another energy firm in August 2021.

Notes

[1] Curiously, as of January 2024, the pair of ReNews.Biz page addresses, each referencing the original headlines from the dramatic story, redirected to benign and unrelated ReNews.Biz reports from May and June of 2019. A request for clarification sent to ReNews.Biz in early January was acknowledged but not answered before CRC posted this analysis. Beyond the two, now oddly discarded, ReNews.Biz reports, any other original reporting naming Vestas as the maker of the turbine in the Dutch fire is (at a minimum) difficult to locate.

As noted, a Vestas logo is clearly visible in multiple online videos and photos purporting to be from the incident. There are still some secondary media accounts online that mention the original ReNews.Biz reports. National Wind Watch, a watchdog group that is skeptical of wind energy, reproduced the entire text of the November 2013 ReNews.Biz report: "Dutch Investigate Deadly Turbine Fire."

https://capitalresearch.org/article/wind-turbines-produce-drama-cash-and-some-electricity-part-3/

In the next installment, wind turbines compare unfavourability with carbon-free nuclear power.

Wind Turbines Produce Drama, Cash, and Some Electricity: Support for Anti-Nuclear Nonprofits



by Ken Braun
February 27, 2024

Danish Wind Turbines Produce Drama, Climate-Left Cash . . . and Some Electricity (full series)
Big Trouble at Biglow Canyon | "Unexpected"
"Extraordinarily Rare" | Support for Anti-Nuclear Nonprofits

Relative Unreliability

As noted earlier, all the major turbine makers have recently reported financial challenges linked to unanticipated reliability issues. The assertion that these dozens of comprehensive and frequently dangerous failures represent "very rare" incidents for Vestas should be weighed against what each those calamitous turbines can produce.

In a comparison of needless drama produced per kilowatt hour, how do wind turbines stack up?

Not well. According to a January 2024 estimate from the Massachusetts Institute of Technology Climate Portal, nearly 800 average-sized wind turbines are needed to match the electricity output of just one average output (900MW capacity) carbon-free nuclear reactor.

The report also calculates how much environment gets torn up by all those turbines:

When it comes to land use, nuclear plants take up as little as 10 hectares per terawatt-hour of electricity produced per year, while wind uses about 100 hectares, measuring just the area taken up by turbines. (This rises to an astounding 10,000 hectares if you include all the land covered by a wind farm, but most of this space is open land and can be used for ranching or farming.)

For environmentalists who wish to reduce carbon emissions while preserving the environment, the choice between nuclear and wind energy (or solar, also a large land hog) should be a no-brainer.

Support for Anti-Nuclear Nonprofits

But as these supposedly "very rare" disasters have hit Vestas turbines over the past two decades, the wind machine maker has been supporting and partnering with nonprofits that oppose nuclear energy.

In 2011, the World Wildlife Fund (WWF) announced it was partnering with the Vestas "WindMade" campaign.

"The new label in the WindMade family will recognize a wide variety of renewable energy sources, including wind, solar, and geothermal, as well as hydro power and biomass from approved certification schemes," crowed WWF in a news release.

Missing from this formula is nuclear energy. According to Our World in Data, nuclear reactors provided more of the planet's carbon-free power in 2022 than any other source except hydroelectric dams. And nuclear was the overwhelming carbon-free power champion in the United States in 2022, kicking out *three times* more electricity than American hydro dams and more than the *combined total* for wind, solar, geothermal, and biomass.

WWF is anything but a champion of nuclear power. Throughout 2020 and 2021 the climate alarmist nonprofit repeatedly opposed attempts by the European Parliament to include nuclear power as part of the EU's sustainable energy taxonomy.

Whether its agreement with Vestas translated into direct support isn't clear, but WWF isn't starving either. In its recent IRS filings the U.S. affiliate of WWF reported revenue of $381.6 million for 2022 and $408.3 million for 2021.

Like all 501(c)(3) educational nonprofits, WWF should be entitled to donor privacy and is not legally required to disclose the names of donors. But some occasionally do so voluntarily.

The 2015 and 2016 annual reports from the Rocky Mountain Institute (RMI) both thank Vestas for donations in the "$100,000–499,000" giving range. RMI has quietly become one of America's largest climate policy nonprofits, with annual reported revenue since 2021 exceeding $115 million. RMI founder Amory Lovins has been a strident opponent of nuclear power for almost half a century.

It is not clear when or if Vestas continued this support for RMI, though RMI's 2022 annual report credited 13 "anonymous" donors giving at least $100,000 each, with four of those giving more than $1 million each.[2]

A May 2016 Rocky Mountain Institute report on its Renewable Energy Buyer's Alliance noted a collaboration between RMI and Vestas:

Finally, looking beyond the value chain, we engaged manufacturers, including turbine producer Vestas, and transmission-line developers such as Clean Line Energy, that are helping to improve the grid so that more wind and solar can be transmitted easily and reliably from where the wind blows and the sun shines to where customers need it.

A 2017 annual report from the Australian affiliate of Friends of the Earth credits Vestas Australia in its list of "donors and supporters," but does not disclose a giving level. IRS filings by the U.S. affiliate showed revenue exceeding $17.6 million for both 2021 and 2022.

For at least 40 years Friends of the Earth (FoE) has been one of the Earth's most adamant enemies of nuclear power. In 2023, FoE's American affiliate filed lawsuits in an effort to close California's Diablo Canyon nuclear plant. This put FoE far to the kooky left of even California's stridently lefty Gov. Gavin Newsom (D), who wisely and successfully intervened to keep the carbon-free energy facility open.

Diablo Canyon has a generating capacity of 2,240 megawatts. Using the aforementioned estimate from the Massachusetts Institute of Technology (nearly 800 wind turbines needed for every 900 MW of nuclear capacity), this would make Diablo Canyon the equal of *more than 1,900 wind turbines*. In 2022, according to the U.S. Department of Energy, Diablo Canyon all by itself produced 17.6 terawatt hours of electricity, 20 percent more than the combined output of every wind turbine in the state of California.

Using the MIT estimate of a 10,000 hectare field needed for each terawatt hour of annual wind energy production, a wind turbine facility producing 17.6 terawatt hours would scatter turbines across a 176,000 hectare field.

That would mean using 679 square miles to accomplish what Diablo Canyon does with 1.5 square miles. To put 679 square miles in perspective, imagine covering an area twice the size of the very windy Rocky Mountain National Park with wind turbines.

Why is there all this evidence that Vestas reliably and repeatedly works with and supports so many powerful, stridently anti-nuclear, climate nonprofits?

There may be nuanced and complex answers to this question.

But the simple answer is probably the correct one.

https://capitalresearch.org/article/wind-turbines-produce-drama-cash-and-some-electricity-part-4/

Notes

[2] This detail regarding anonymous donors was also referenced in "Climate Alarmists Hoover Up Corporate Welfare," an October 4, 2023, CRC analysis that looked more closely at Rocky Mountain Institute donors: "In the 2022 annual report alone, 13 "anonymous" donors are also credited with giving $100,000 or more—four gave more than $1 million. Given what is known of the named donors, it is reasonable to conclude that some of the 13 have also benefited directly from the IRA corporate welfare for weather-dependent power and storage."

In a development that may be merely correlation, but could also be causation, the Rocky Mountain Institute's 2023 annual report appeared after the online posting of the passage quoted above. But this latest RMI annual report did not itemize the number of anonymous donors at each giving level. RMI had publicly disclosed this statistic regarding anonymous giving in every previous annual report since at least 2007.

From: Kathryn McCullough
Sent: Wednesday, December 24, 2025 4:17 PM
To: CLARK Christopher * ODOE
Subject: Exhibt #2 NOI PDF
Attachments: Biglow Canyon Solar Fire Issues NOI Exhibit #2.docx

---

From: Kathryn McCullough
Sent: Thursday, January 1, 2026 7:35 AM
To: CLARK Christopher * ODOE
Subject: Wildlife
Attachments: Exhibit 3 Biglow NOI.pdf

Exhibit 3

Exhibit P: Fish and Wildlife Habitats and Species

Mammalian species affected by solar panels. The February 2025 study reports 11 bird species and 5 bat species in the Biglow project.

Where are the turkeys, quail, and pheasant? Where are the antelope, deer, cougar, elk, coyotes, foxes, badgers, rabbits, gophers, squirrels, voles, and other creatures we have in the area? I have included photos I have taken of some of the animals in or near the project boundaries.

This report is incomplete and appears to apply only to some birds and bats. **This report is for wind towers, not solar. 217 pages of bats and birds, as well as a lizard species and a turtle species.**

Especially with the increased fire risk, all of these animals need to be included.

Even Fish and Wildlife agrees:

Kathy,

Completely agree that we should be taking fire into greater account in our mitigation policy, and that topic is on the list for consideration when the policy gets reviewed in the future. The agency hasn't reviewed the mitigation policy for quite some time, with all the proposed development we are just trying to keep up with the requests for project review.

Jeremy Thompson
John Day Watershed Manager
Oregon Department of Fish and Wildlife
73471 Mytinger Lane
Pendleton, Oregon, 97801
O- 541 318 7966 C- 541 980 8524
Jeremy.L.Thompson@odfw.oregon.gov

Exhibit 3

Exhibit P: Fish and Wildlife Habitats and Species
Attachment 5: Wildlife species occurring in the Solar Components vicinity

Mammalian species affected by solar panels. The February 2025 study reports 11 bird species and 5 bat species in the Biglow project.

Where are the turkeys? Where are the cougar, elk, coyotes, foxes, badgers, jack rabbits, gophers, voles, raccoons, and other mammals we have in the area?

The photos below were taken in or near the project boundary.

This report is incomplete and appears to apply only to birds and bats. Attachment 5 has some of the animals listed, but not specifics. **This report is for wind towers, not solar. 217 pages of bats and birds, as well as a lizard species and a turtle species. Mammals need the same level of study and notation as birds do, as we have quite a diversity here.**

Hundreds of acres of solar panels will change the habitat considerably. I am asking for a more comprehensive evaluation of how solar will impact all of our mammals.

Especially with the increased fire risk, this is an important amendment.

Fish and Wildlife:

Kathy,

Completely agree that we should be taking fire into greater account in our mitigation policy, and that topic is on the list for consideration when the policy gets reviewed in the future. The agency hasn't reviewed the mitigation policy for quite some time, with all the proposed development we are just trying to keep up with the requests for project review.

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Jeremy.L.Thompson@odfw.oregon.gov

Common Name*	Scientific Name
Birds	
American crow	*Corvus brachyrhynchos*
American goldfinch	*Spinus tristis*
Barn swallow	*Hirundo rustica*
California quail	*Callipepla californica*
Common raven	*Corvus corax*
European starling	*Sturnus vulgaris*
Great horned owl	*Bubo virginianus*
Horned lark	*Eremophila alpestris*
House wren	*Troglodytes aedon*
Loggerhead shrike*	*Lanius ludovicianus*
Mourning dove	*Zenaida macroura*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-necked pheasant	*Phasianus colchicus*
Song sparrow	*Melospiza melodia*
Turkey vulture	*Cathartes aura*
Western meadowlark	*Sturnella neglecta*
Western wood pewee	*Contopus sordidulus*
Mammals	
Grey squirrel	*Sciurus carolinensis*
Mountain cottontail	*Sylvilagus nuttallii*
Mule deer	*Odocoileus hemionus*
Porcupine	*Erethizon dorsatum*
Pronghorn	*Antilocapra americana*
Invertebrates	
Damselfly	NA
Dragonfly	NA
*ODFW Sensitive Species. See Attachment 1. NA = Not Applicable, unable to identify to species level.	









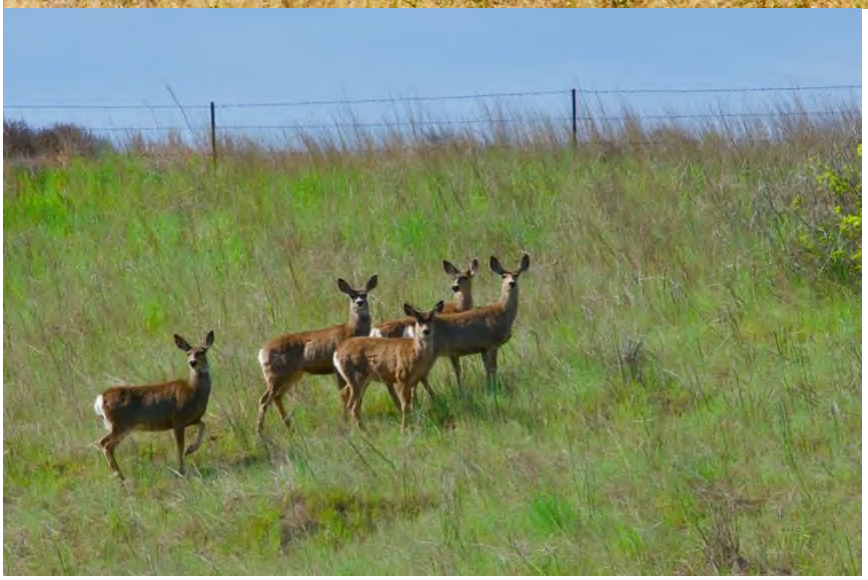








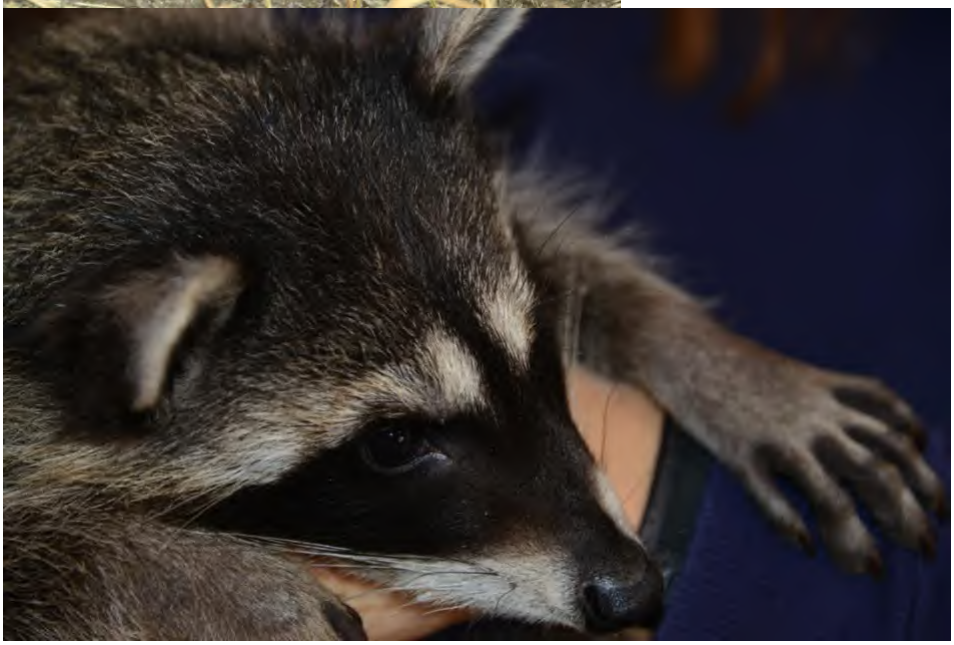












PGE doesn't even let its personnel go to a fire near Biglow to help us fight it.

The Wildfire Mitigation and Risk document produced for PGE by Tetra Tech is a joke. It is a ridiculous cut-and-paste, ultimately proving or saying nothing. Why didn't they use actual temperature data from Biglow? Or NOAA?

Our temperatures are much higher than the climate normal data indicates. Winds are powerfully strong. My intention is to demonstrate how fire-prone we are and to secure real mitigation and written assurances if we cannot obtain a hold-harmless clause for:

Fire started accidentally by BrightNight/PGE
or
Fire accidentally started by us, either at our house or while farming west of PGE's solar.

Will PGE/BrightNight be paying for our insurance if they start a fire and push us into a higher, unaffordable insurance bracket? This is a terrible place for a solar farm.

I have highlighted my primary concerns in their 225 page report. I will summarize them here:

I think what is missing is the definition of fallow. We do chemical fallow, ie, we spray to kill the weeds, but we do not turn over the dirt. That is why the Substation Fire of 2018 could not be stopped. High winds, high temperatures, and low humidity as well as a fuel source (crop and chemical fallow) kept it going. The only time there is bare dirt is right after the ground is seeded in the fall, not a high fire risk time.

The Substation Fire of July 2018: Impact of Weather on Fire Behavior
The combination of high temperatures, low humidity, and strong winds created a volatile environment. This led to:

- Rapid fire growth, with the fire spreading over 18 miles in just a few days.
- Increased difficulty for firefighters in controlling the blaze.

The weather conditions during the Substation Fire exemplified how environmental factors can exacerbate wildfire risks, particularly in regions experiencing drought and high temperatures.

The high burn probability is much higher than 66%, but 66% is very high, especially in an area that already has 6-10 fires in a normal year! And no paid fire department - volunteer only.

Note: Moderate to high for months!!!! What is PGE going to do to preserve our "Right to Farm"? They have verbally assured us that they will just go after our insurance, not us, but

once they go through our $5 million of insurance, no one will ever insure us again. MODERATE TO HIGH! WE NEED ASSURANCES.

Page 10: Highlighted high fire risk is TRUE: After further analysis, most of the area within the Solar
Micrositing Area that is categorized with an average flame length of 0 feet above can be more
accurately categorized to represent wildfire risk with average flame lengths of either 4 to 8 feet or 0
to 4 feet, with only a small portion remaining with an average flame length of 0 feet.
Maybe… hopefully… eight feet is high!

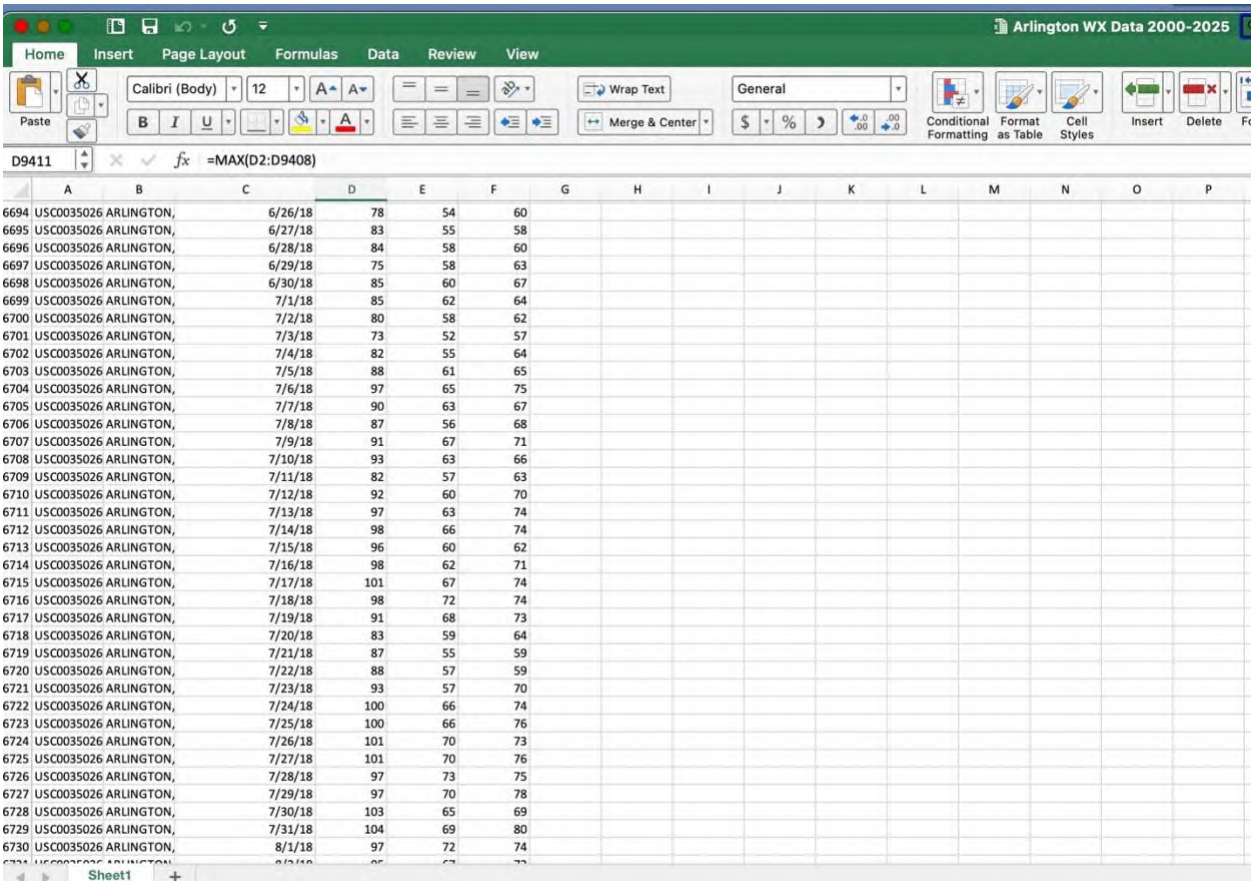
We need to see this re-evaluation of risks. Lithium-ion batteries continue to pose a significant fire risk in areas with high temperatures.

Climate normals are statistical models that effectively lower the high temperatures that we experience over 100 degrees Fahrenheit into the 70s or 80s. This is a poor model for our purposes of fire mitigation and risk. See the attachment of actual temperatures. Even though Arlington (on the river, 18 miles away) is not the best choice for a temperature chart in Sherman County, the 117 degree high noted does provide some authenticity.

Biglow Canyon Wind Farm RFA 4

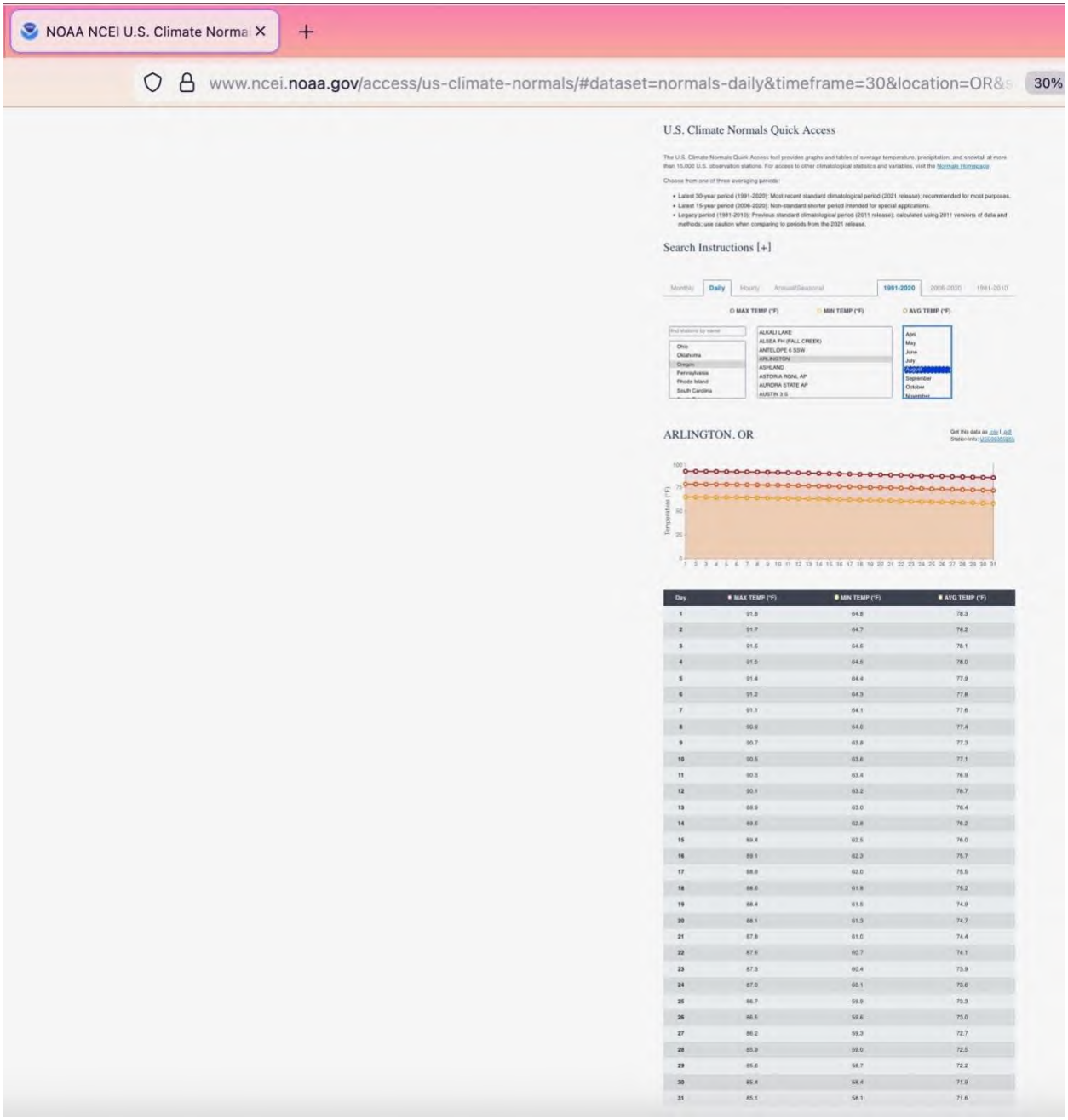
Page 4 wide risk assessment of wildfire as "high" probability and identifies many areas in the county as "conducive for large and fast-moving wildfires" due to high winds typical for regional dry conditions and terrain. The plan identifies risk factors for starting wildfires in the county as highways, railroads, lighting, power lines, debris burning, and equipment.

3.0 Conclusion
Per the data reviewed and presented here, wildfire risk and consequences of fire in the Solar Micrositing Area are typical for the vegetation type and fire regime encountered in Sherman County. Within the Solar Micrositing Area and wildfire analysis area, assets that could currently be impacted include BCWF infrastructure, residential structures, agricultural areas and farming operations, and roads. If a wildfire did ignite near those assets, they could be at risk. It is anticipated that, due to the moderate to very high hazard to potential structures, high burn probability, moderate expected intensity as measured by average flame length, fuels, weather, and topography, post-construction overall fire risk would be moderate to high.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
6694	USC0035026	ARLINGTON,	6/26/18	78	54	60										
6695	USC0035026	ARLINGTON,	6/27/18	83	55	58										
6696	USC0035026	ARLINGTON,	6/28/18	84	58	60										
6697	USC0035026	ARLINGTON,	6/29/18	75	58	63										
6698	USC0035026	ARLINGTON,	6/30/18	85	60	67										
6699	USC0035026	ARLINGTON,	7/1/18	85	62	64										
6700	USC0035026	ARLINGTON,	7/2/18	80	58	62										
6701	USC0035026	ARLINGTON,	7/3/18	73	52	57										
6702	USC0035026	ARLINGTON,	7/4/18	82	55	64										
6703	USC0035026	ARLINGTON,	7/5/18	88	61	65										
6704	USC0035026	ARLINGTON,	7/6/18	97	65	75										
6705	USC0035026	ARLINGTON,	7/7/18	90	63	67										
6706	USC0035026	ARLINGTON,	7/8/18	87	56	68										
6707	USC0035026	ARLINGTON,	7/9/18	91	67	71										
6708	USC0035026	ARLINGTON,	7/10/18	93	63	66										
6709	USC0035026	ARLINGTON,	7/11/18	82	57	63										
6710	USC0035026	ARLINGTON,	7/12/18	92	60	70										
6711	USC0035026	ARLINGTON,	7/13/18	97	63	74										
6712	USC0035026	ARLINGTON,	7/14/18	98	66	74										
6713	USC0035026	ARLINGTON,	7/15/18	96	60	62										
6714	USC0035026	ARLINGTON,	7/16/18	98	62	71										
6715	USC0035026	ARLINGTON,	7/17/18	101	67	74										
6716	USC0035026	ARLINGTON,	7/18/18	98	72	74										
6717	USC0035026	ARLINGTON,	7/19/18	91	68	73										
6718	USC0035026	ARLINGTON,	7/20/18	83	59	64										
6719	USC0035026	ARLINGTON,	7/21/18	87	55	59										
6720	USC0035026	ARLINGTON,	7/22/18	88	57	59										
6721	USC0035026	ARLINGTON,	7/23/18	93	57	70										
6722	USC0035026	ARLINGTON,	7/24/18	100	66	74										
6723	USC0035026	ARLINGTON,	7/25/18	100	66	76										
6724	USC0035026	ARLINGTON,	7/26/18	101	70	73										
6725	USC0035026	ARLINGTON,	7/27/18	101	70	76										
6726	USC0035026	ARLINGTON,	7/28/18	97	73	75										
6727	USC0035026	ARLINGTON,	7/29/18	97	70	78										
6728	USC0035026	ARLINGTON,	7/30/18	103	65	69										
6729	USC0035026	ARLINGTON,	7/31/18	104	69	80										
6730	USC0035026	ARLINGTON,	8/1/18	97	72	74										

NOTE THE EXTREMELY HIGH TEMPERATURES IN JULY.
117 DEGREES IS THE HIGHEST NOTED IN ARLINGTON, EVER, BUT WE HAVE SEEN 120 DEGREES MANY TIMES! JUNE OF 2021 IS WHEN THE VINYL SIDING ON THE WEST SIDE OF OUR HOUSE *MELTED*!



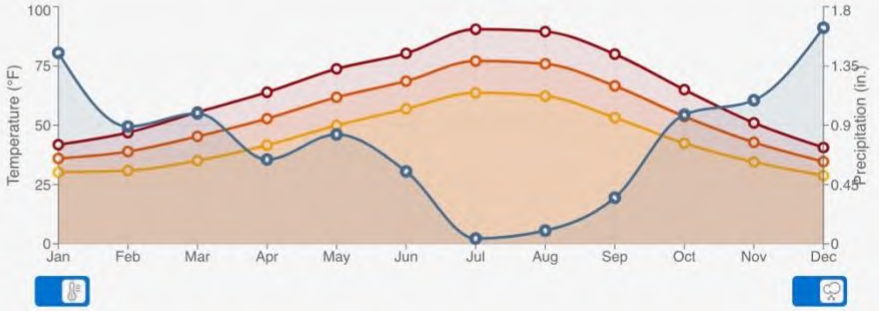
Day	MAX TEMP (°F)	MIN TEMP (°F)	AVG TEMP (°F)
1	91.8	64.8	78.3
2	91.7	64.7	78.2
3	91.6	64.6	78.1
4	91.5	64.5	78.0
5	91.4	64.4	77.9
6	91.2	64.3	77.8
7	91.1	64.1	77.6
8	90.9	64.0	77.4
9	90.7	63.8	77.3
10	90.5	63.6	77.1
11	90.3	63.4	76.9
12	90.1	63.2	76.7
13	89.9	63.0	76.4
14	89.6	62.8	76.2
15	89.4	62.5	76.0
16	89.1	62.3	75.7
17	88.8	62.0	75.5
18	88.6	61.8	75.2
19	88.4	61.5	74.9
20	88.1	61.3	74.7
21	87.8	61.0	74.4
22	87.6	60.7	74.1
23	87.3	60.4	73.9
24	87.0	60.1	73.6
25	86.7	59.9	73.3
26	86.5	59.6	73.0
27	86.2	59.3	72.7
28	85.9	59.0	72.5
29	85.6	58.7	72.2
30	85.4	58.4	71.9
31	85.1	58.1	71.6

NOAA NCEI U.S. Climate Norma ×

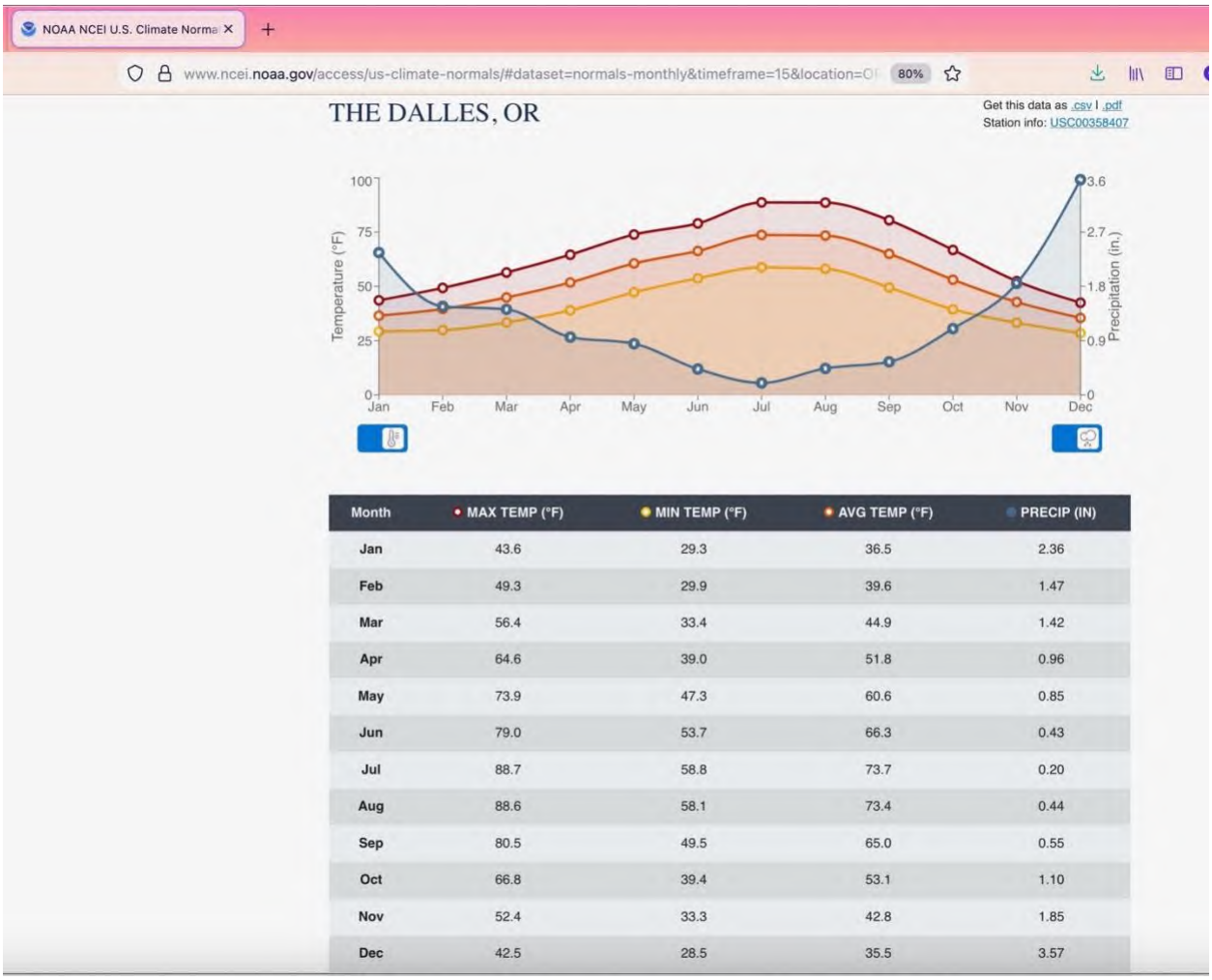
www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=15&location=OR 80%

ARLINGTON, OR

Get this data as .csv | .pdf
Station info: USC00350265



Month	MAX TEMP (°F)	MIN TEMP (°F)	AVG TEMP (°F)	PRECIP (IN)
Jan	41.8	30.2	36.0	1.45
Feb	46.9	30.9	38.9	0.89
Mar	55.5	35.1	45.3	0.99
Apr	63.9	41.6	52.8	0.64
May	73.8	49.9	61.8	0.83
Jun	80.3	56.9	68.6	0.55
Jul	90.5	63.7	77.1	0.04
Aug	89.5	62.3	75.9	0.10
Sep	80.0	53.2	66.6	0.35
Oct	65.0	42.4	53.7	0.98
Nov	51.0	34.5	42.8	1.09
Dec	40.6	28.8	34.7	1.64



Month	MAX TEMP (°F)	MIN TEMP (°F)	AVG TEMP (°F)	PRECIP (IN)
Jan	43.6	29.3	36.5	2.36
Feb	49.3	29.9	39.6	1.47
Mar	56.4	33.4	44.9	1.42
Apr	64.6	39.0	51.8	0.96
May	73.9	47.3	60.6	0.85
Jun	79.0	53.7	66.3	0.43
Jul	88.7	58.8	73.7	0.20
Aug	88.6	58.1	73.4	0.44
Sep	80.5	49.5	65.0	0.55
Oct	66.8	39.4	53.1	1.10
Nov	52.4	33.3	42.8	1.85
Dec	42.5	28.5	35.5	3.57

Exhibit V

Wildfire Prevention and Risk Mitigation

Biglow Canyon Wind Farm
February 2025

Prepared for

Portland General Electric Company

Prepared by

TETRA TECH

2.1.1 Topography

The wildfire analysis area is generally bounded by Interstate 84 to the north, the John Day River to the east, Highway 206 to the south, and Highway 97 to the west.

Elevations within the wildfire analysis area are between -12 and 600 meters. The majority (99 percent) of the wildfire analysis area has slopes that range from 0 to 25 degrees (Table V-1; Figure V-1). As shown on Figure V-1, slopes in the northern portion of the Solar Micrositing Area and wildfire analysis area increase to 25 to 50 degrees. This portion of the wildfire analysis area borders the John Day River.

Table V-1. Slope

Slope (degrees)	Percent of Wildfire Analysis Area	Acres of Wildfire Analysis Area	Percent of Solar Micrositing Area	Acres in Solar Micrositing Area
0-25	99	11,185	100	3,977
25-50	1	72	0	3
50-75	0	0	0	0
Total	**100**	**11,256**	**100**	**3,980**
Note: All quantities may not result in 100 percent due to rounding adjustments.				

2.1.2 Vegetation

As discuss ation and special status wildlife surveys were performed in June by ositing Area (Exhibit P, Attachment P-1). The Survey Area cover ire Solar Micrositing Area and additional lands that have since been ing Area. Most of the analysis area is Category 6, which includes A t types that are dominated by Non-irrigated Cropland subtypes b d and Developed subtypes. Additionally, Category 4, 3, and 2 habi nt in the analysis area.

I think what is missing is the definition of fallow. We do chemical fallow, ie. we spray to kill the weeds but we do not turn over the dirt. That is why the Substation Fire of 2018 could not be stopped. High winds, high temperatures, and low humidity as well as a fuel source (crop and chemical fallow) kept it going. The only time there is bare dirt is

The broad vegetation type) are derived from data from the Communit P) Planning Tool (Oregon Explorer 2018). Fuel model groups wit nsist of agriculture, grass with small amounts of fine, dead fuel, shrubs, urban, and barren. As shown on Figure V-2 and described below in Table V-2, the majority of the vegetation within the Solar Micrositing Area is Fuel Model (FM) 102 – Low Load, dry climate grass (55 percent) and FM 93 – agricultural (29 percent). Within the wildfire analysis area, the most prominent FMs are also FM 102 (53 percent) and FM 93 (36 percent). A further discussion of FMs is provided in Section 2.2.2.

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Total	**100**	**11,256**	**100**	**3,980**

Note: All quantities may not result in 100 percent due to rounding adjustments.

2.1.2 Vegetation

As discuss ation and special status wildlife surveys were performed in June by ositing Area (Exhibit P, Attachment P-1). The Survey Area cover ire Solar Micrositing Area and additional lands that have since been ing Area. Most of the analysis area is Category 6, which includes A t types that are dominated by Non-irrigated Cropland subtypes b d and Developed subtypes. Additionally, Category 4, 3, and 2 habi nt in the analysis area.

to kill the weeds but we do not turn over the dirt. That is why the Substation Fire of 2018 could not be stopped. High winds, high temperatures, and low humidity as well as a fuel source (crop and chemical fallow) kept it going. The only time there is bare dirt is right after the ground is seeded in the fall, not a high fire risk time.

The broad vegetation type) are derived from data from the Communit P) Planning Tool (Oregon Explorer 2018). Fuel model groups wit nsist of agriculture, grass with small amounts of fine, dead fuel, shrubs, urban, and barren. As shown on Figure V-2 and described below in Table V-2, the majority of the vegetation within the Solar Micrositing Area is Fuel Model (FM) 102 – Low Load, dry climate grass (55 percent) and FM 93 – agricultural (29 percent). Within the wildfire analysis area, the most prominent FMs are also FM 102 (53 percent) and FM 93 (36 percent). A further discussion of FMs is provided in Section 2.2.2.

122	6	719	12	494
161	0	3	0	1
182	0	3	0	0
183	0	1	0	0
Total	**99**	**11,256**	**98**	**3,979**
Note: All quantities may not result in 100 percent due to rounding adjustments.				

FM 102 and FM 104 more accurately represent wildfire risk of the agricultural areas within the Solar Micrositing Area that include dryland wheat. FM 102 (low load, dry climate grass) is an FM in which grass is the primary carrier of fire and that uses a dynamic transfer of herb fuel load from live to dead (NWCG 2024). This represents approximately 55 percent of the Solar Micrositing Area within FM 93 from Table V-3 above. FM 104 also uses dynamic transfer of herb fuel load from live to dead. The primary carrier of fire is continuous, dry-climate grass (NWCG 2024). This FM represents approximately 13 percent of the Solar Micrositing Area.

The areas that are fallowed and only contain stubble more accurately r
the Solar Micrositing Area as FM 1. FM 1 (short grass) includes annual
cured fine herbaceous fuels, and stubble with very little shrub or timbe
1 represents 13 percent of the Solar Micrositing Area within FM 93 fro
left as fallowed.

The small portion of areas that are tilled (and not simply fallowed) ren
are considered NB (NWCG 2021) and are associated with one landown
their land every summer.

The increased wildfire risk also likely applies to the areas in the wildfi
appear to be irrigated. Therefore, it is possible the wildfire risk is slightly higher in the wildfire analysis area than is represented in Table V-2 and Figure V-2 because the NB agricultural fields (FM 93) could be fallowed or dryland wheat agriculture, which are burnable.

The Substation Fire of July 2018: Impact of Weather on Fire Behavior
The combination of high temperatures, low humidity, and strong winds created a volatile environment. This led to:
- Rapid fire growth, with the fire spreading over 18 miles in just a few days.
- Increased difficulty for firefighters in controlling the

2.1.3 Existing Infrastructure

The BCWF is an operational wind power facility that includes 217 wind turbines, three meteorological towers, collector lines, a Facility substation, transmission lines, O&M buildings, and access roads. Paved roads within the wildfire analysis area generally include Herin Lane, Emigrant Springs Lane, N Klondike Road, Medler Lane, Old Wasco Heppner Highway, and Klondike Road. There are many unnamed gravel turbine string roads within the wildfire analysis area that are currently in use for the BCWF. There are no hazardous liquid pipelines or gas transmission pipelines within 10 miles of the wildfire analysis area (NPMS 2024).

121	1	77	0	6
122	6	719	12	494
161	0	3	0	1
182	0	3	0	0
183	0	1	0	0
Total	**99**	**11,256**	**98**	**3,979**
Note: All quantities may not result in 100 percent due to rounding adjustments.				

FM 102 and FM 104 more accurately represent wildfire risk of the agricultural areas within the Solar Micrositing Area that include dryland wheat. FM 102 (low load, dry climate grass) is an FM in which grass is the primary carrier of fire and that uses a dynamic transfer of herb fuel load from live to dead (NWCG 2024). This represents approximately 55 percent of the Solar Micrositing Area within FM 93 from Table V-3 above. FM 104 also uses dynamic transfer of herb fuel load from live to dead. The primary carrier of fire is continuous, dry-climate grass (NWCG 2024). This FM represents approximately 13 percent of the Solar Micrositing Area.

The areas that are fallowed and only contain stubble more accurately r
the Solar Micrositing Area as FM 1. FM 1 (short grass) includes annual
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miles in just a few days.
- Increased difficulty for firefighters in controlling the blaze.

The weather conditions during the Substation Fire exemplified how environmental factors can exacerbate wildfire risks, particularly in regions experiencing drought and high temperatures.

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The BCWF is an operational wind power facility that includes 217 wind turbines, three meteorological towers, collector lines, a Facility substation, transmission lines, O&M buildings, and access roads. Paved roads within the wildfire analysis area generally include Herin Lane, Emigrant Springs Lane, N Klondike Road, Medler Lane, Old Wasco Heppner Highway, and Klondike Road. There are many unnamed gravel turbine string roads within the wildfire analysis area that are currently in use for the BCWF. There are no hazardous liquid pipelines or gas transmission pipelines within 10 miles of the wildfire analysis area (NPMS 2024).

As shown on RFA 4 Division 27 Figure 4, RFA 4 is within 10 miles of multiple renewable energy projects, including Klondike III Wind Project, Golden Hills Wind Project, Leaning Juniper IIA Wind Power Facility, and Summit Ridge Renewable Energy Facility.

2.1.4 Climate

The area has a warmer, arid climate. Climate data were used for Arlington, Oregon, which is located approximately 18 miles east of the Solar Micrositing Area. Based on available monthly normals of climate data between 1991 and 2020 for Arlington, the driest months on average are June, July, and August (NOAA 2024a). These months have average monthly precipitation rates of 0.48 inch (June), 0.10 inch (July), and 0.15 inch (August). July, August, and September are the hottest months of the year with average temperatures of 76.3 degrees Fahrenheit (°F) (July), 75.5 °F (August), and 66.5 °F (September). The total averag annual precipitation for Arlington is 9.3 inches per year (NOAA 2024a), which is indicative of ditionally, Arlington receives approximately 5.3 inches of s the coldest month (January) having approximately 2.0 inches of s um temperature of 40.8 °F, and an average daily minimum temp AA 2024a).

This is from 25 years ago! NOAA 2024a explains climate normal... and 18 miles away.

Table V-4. Summary of M nd Precipitation at Arlington, OR

Month	Maximu	erature (°F)	Precipitation (inch)
January			1.47
February	46.9	38.7	0.98
March	55.6	45.6	0.83
April	63.7	52.8	0.61
May	73.2	61.7	0.75
June	79.7	68.2	0.48
July	89.5	76.3	0.10
August	88.9	75.5	0.15
September	80.0	66.5	0.33
October	65.5	53.7	0.81
November	50.4	42.4	1.13
December	41.1	35.5	1.66
Source: NOAA 2024a			

2.1.5 Burn Probability

Burn probability is the likelihood of a wildfire greater than 250 acres burning a given location based on wildfire simulation modeling. This is an annual burn probability, adjusted to be consistent with the historical annual area burned. The burn probability classes range from non-burnable (a

risk as moderate burn probability, either as Moderate (1-in-5,000 to 1-in-1,000) or Moderate to High (1-in1,000 to 1-in-500), with only a small portion remaining as burn probability of 0. Table V-6 shows the refined analysis for consideration that more accurately reflects the burn probability within the Solar Micrositing Area that takes into account the landowner's agricultural practices.

Table V-6. Refined Burn Probability Within Solar Micrositing Area for Consideration

Burn Probability	Percent of Wildfire Analysis Area	Acres of Wildfire Analysis Area	Percent of Solar Micrositing Area	Acres in Solar Micrositing Area
0	4	456	3	112
0 - 0.0001 Low (<= 1-in-10,000)	0	0	0	0
0.0001 - 0.0002 Low - Moderate (1-in-10,000 to 1-in-5,000)	0	4		
0.0002 - 0.001 Moderate (1-in-5,000 to 1-in-1,000)	21	235		
0.001 - 0.002 Moderate - High (1-in-1,000 to 1-in-500)	19	218		
0.002 - 0.01 High (1-in-500 to 1-in-100)	0	0		
0.01 - 0.02 High – Very High (1-in-100 to 1-in-50)	56	625		
0.02 - 0.04 Very High (1-in-50 to 1-in-25)	0	0		
Total	**100**	**11,255**	**101**	**3,981**
Note: All quantities may not result in 100 percent due to rounding adjustments.				

The high burn probability is much higher than 66%, but 66% is very high, especially in an area that already has 6-10 fires in a normal year! And no paid fire department - volunteer only.

Based on the refined analysis, the area categorized with a burn probability of 0 was reduced from 32 percent to 3 percent of the Solar Micrositing Area. Although typically areas of cultivated crops are given a burn probability of 0, there is a portion of the area in dryland wheat that is left fallow in alternating years. Therefore, it is more accurately represented by Moderate burn probability (1-in-1,000 to 1-in-500) and Moderate-High burn probability (1-in-1,000 to 1-in-500). Overall, 66 percent of the Solar Micrositing Area still primarily has a High to Very High (1-in-100 to 1-in-50) burn probability.

2.2 Seasonal Fire Risk – OAR 345-022-0115(1)(a)(B)

OAR 345-022-0115(1)(a)(B) Seasonal wildfire risk, based on factors that are expected to remain fixed for multiple months but may be dynamic throughout the year, including but not limited to, cumulative precipitation and fuel moisture content;

Response: Seasonal wildfire risk was assessed based on factors that are anticipated to remain consistent for several months but may vary throughout the year and over time. These factors include annual and monthly cumulative precipitation levels, weather advisories (including fuel moisture content data), and average flame length (average length of flames expected during a fire given local fuel and weather conditions). The seasonal wildfire risk within the Solar Micrositing Area and wildfire analysis area is low for most of the year, but moderate to high in the summer months based on the warmer arid climate, moderate average flame lengths, and low average rainfall during the summer months.

2.2.1 Precipitation

See Section 2.1.4 and Table V-4 for a discussion of precipitation within the wildfire analysis area.

2.2.2 Fuel Moisture Content

Fuel moisture content is a primary variable when observing wildfire behavior. Fuel moisture content "is a measure (vegetation) available to a fire and is expressed as a percen ic fuel" (NOAA 2024b). Fuel moisture content varies with weather, periods. The higher the fuel moisture content, the greater d opagate. Living plants and dead fuels respond differently to weather g processes of dead fuels is such that the moisture content of th weather changes. These moisture contents are influenced by pre urface temperatures, wind, cloudiness, as well as by fuel factors compactness, and arrangement. Fuel moisture content with l Solar Micrositing Area is dependent on current weather cond easonal weather patterns.

Note: Moderate to high for months!!!! What is PGE going to do to preserve our "Right to Farm"? They have verbally assured us that they will just go after our insurance, not us, but once they go through our $5 million of insurance, no one will ever insure us again. MODERATE TO HIGH! WE NEED ASSURANCES.

Fuel moisture varies with vegetation type. For instance, annual grasses are highly flammable whereas broadleaf vegetation is less flammable (USFS 1970). Additionally, live evergreen trees and shrubs can burn despite having a moisture content of over 100 percent.

Fuel model groups within the wildfire analysis area consist of grass, grass/shrub, agricultural, urban/developed, bare ground, broadleaf litter, and conifer litter. As shown on Figure V-2 and described above in Table V-2, the majority of the vegetation within the Solar Micrositing Area is FM 102 – Low Load, dry climate grass (55 percent) and FM 93 – agricultural (29 percent). Within the wildfire analysis area, the most prominent fuel models are also FM 102 (53 percent) and FM 93 (36 percent). The primary carrier of fire in FM 102 is grass and small amounts of dead fuel. If there are shrubs present, they typically do not affect fire behavior. Additionally, the primary carrier of fire in FM 93 is grass (Scott and Burgan 2005). However, as noted in Section 2.1.2 and Table V-3, FM 102 and FM 104 more accurately represent wildfire risk of the agricultural areas within the Solar Micrositing Area that include dryland wheat, and FM 1 more accurately represents wildfire risk for areas that are fallowed and only contain stubble.

of an Independent Evaluator's Report, review of stakeholder comments, and ongoing participation in WMP public workshops and stakeholder engagement. The Oregon PUC Order 24-232 (Attachment V-3) includes direction for actions for future WMPs, including 24 recommended actions for PGE to take for the 2025 and 2026 WMP updates, as detailed in Attachment A of Order No. 24-232 (Attachment V-3).

If construction of the Solar Components in RFA 4 proceeds, the following annual update for the WMP will include a re-evaluation of risks considering the new solar and battery energy storage system components. However, the Certificate Holder has created a construction WMP (Attachment V-1) to satisfy OAR 345-022-0115(1)(b).

3.0 Conclusion

Per the data reviewed and presented here, wildfire risk and consequences of fire in the Solar Micrositing Area are typical for the vegetation type and fire regime encountered in Sherman County. Within the Solar Micrositing Area and wildfire analysis area, assets that could currently be impacted include BCWF infrastructure, residential structures, agricultural areas and farming operations, and roads. If a wildfire did ignite near those assets, they could be at risk. It is anticipated that, due to the moderate to very high hazard to potential structures, high burn probability, moderate expected intensity as measured by average flame length, fuels, weather, and topography, post-construction overall fire risk would be moderate to high.

We need to see this re-evaluation of risks. Lithium-ion batteries continue to pose a significant fire risk in areas with high temperatures.

4.0 References

CBI. 2020. Wildfire Risk Assessment Data Layer Descriptions Spreadsheet. DataLayerDescriptions_04_01_2019.Xlsx. Conservation Biology Institute. Available online at: https://databasin.org/datasets/31cc2ca6bebe4efab3b139c50dd79722/

NOAA (National Oceanic and Atmospheric Administration). 2024a. U.S. Climate Normals Quick Access. Station: Arlington Station USC00350265. https://www.ncei.noaa.gov/access/us-climate-normals/#dataset=normals-monthly&timeframe=30&location=OR&station=USC00350265

NOAA. 2024b. Dead Fuel Moisture. Available online at: https://www.ncei.noaa.gov/access/monitoring/dyk/deadfuelmoisture#:~:text=Fuel%20moisture%20is%20a%20measure,content%20would%20be%20zero%20percent

NPMS (National Pipeline Mapping System). 2024. NPMS Public Viewer. https://pvnpms.phmsa.dot.gov/PublicViewer/

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NPMS (National Pipeline Mapping System). 2024. NPMS Public View https://pvnpms.phmsa.dot.gov/PublicViewer/

NPS (National Parks Service). 2019. Arid and Semi-arid Region Land https://www.nps.gov/subjects/geology/arid-landforms.htm#:~:text=Arid%20regions%20by%20definiti 0of%20rain%20per%20year.

Oregon Explorer. 2018. Oregon CWPP Planning Tool.

Climate normals are statistical models that effectively lower the high temperatures that we experience over 100 degrees Fahrenheit into the 70s or 80s. This is a poor model for our purposes of fire mitigation and risk. See the attachment of actual temperatures. Even though Arlington (on the river, 18 miles away) is not the best

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Oregon Explorer. 2018. Oregon CWPP Planning Tool.

experience over 100 degrees Fahrenheit into the 70s or 80s. This is a poor model for our purposes of fire mitigation and risk. See the attachment of actual temperatures. Even though Arlington (on the river, 18 miles away) is not the best choice for a temperature chart in Sherman County, the 117 degree high noted does provide some authenticity.

From: Kathryn McCullough
Sent: Monday, January 5, 2026 1:01 PM
To: CLARK Christopher * ODOE
Subject: NOI #4
Attachments: The Wildfire Mitigation and Risk document produced for PGE by Tetra Tech is a joke.pdf

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Categories: Tracked To Dynamics 365

Thanks, Chris.

IS the PDF clear enough? I noticed the screenshots I sent you are blurry when I look at them now…

Kathy

PGE doesn't even let its personnel go to a fire near Biglow to help us fight it.

The Wildfire Mitigation and Risk document produced for PGE by Tetra Tech is a joke. It is a
ridiculous cut-and-paste, ultimately proving or saying nothing. Why didn't they use actual
temperature data from Biglow? Or NOAA?

Our temperatures are much higher than the climate normal data indicates. Winds are
powerfully strong. My intention is to demonstrate how fire-prone we are and to secure real
mitigation and written assurances if we cannot obtain a hold-harmless clause for:

Fire started accidentally by BrightNight/PGE
or
Fire accidentally started by us, either at our house or while farming west of PGE's solar.

Will PGE/BrightNight be paying for our insurance if they start a fire and push us into a higher,
Unaffordable insurance bracket?

WE ARE ALL VOLUNTEERS. This is a terrible place for a solar farm.

I have highlighted my primary concerns in their 225 page report. I will summarize them here.

I flew 747s (820,000 pounds on takeoff, 650,000 pounds max landing) with passengers and freight across Asia, Europe, and the US for over 17 years. Passenger planes were not allowed to carry lithium-ion batteries as cargo because they are too dangerous, and thermal runaways are real. We were trained annually to fight fires in our fire training room with PPE protection. However, even our Class D extinguishers could not put out battery fires. UPS 6 out of Dubai is our poster child. The flight crashed 26 minutes after the fire warning. The plane experienced a catastrophic fire that severely damaged its control systems.

I can guarantee that neither I, my husband, nor my son will be fighting fires inside a solar facility. Even with training, it's too risky. I will also encourage other farmers not to get involved.

That leaves PGE responsible for providing fire training to its employees. Biglow was built in 2007, and PGE has never helped us fight fires around the facility.

So, how do we recruit trained volunteers, assuming other farmers and residents feel the same way? Do PGE or Sherman County guarantee their livelihoods if they get injured or killed? Do PGE or Sherman County give them huge bonuses for their willingness to step up and fight a solar fire?

Our fire departments are all volunteer. BLM and others distribute some funds after major fires. The county has built new firehalls and added firetrucks, so the equipment and trucks are ready to go. But who operates them?

I am not concerned about BrightNight's initial five-year period. My concern is if they sell, run out of tax credits (2032), or PGE takes over as planned at year six.

PGE's safety record is weak at Biglow. They've been fortunate, with so many parts falling, including a "blade" liberation in February 2022, not to have killed someone. At 90 MPH dropping from 265 feet, even a small piece of fiberglass or a bolt can cause serious harm or death, according to the Oregon Department of Energy.

When we turned over doors, discs, and pieces we found in the fields over the years, we assumed they had to report to someone. They didn't. So over 25 incidents were never reported. This is negligent or willful on their part.

So how can we trust them with solar? The blade fell four years ago, and the towers are in worse shape now. Finally, they've bought the parts to fix the original Phase 1 towers and hired 34 more technicians. It will take years to get them operational again. Now the Siemens towers are facing issues after years of neglect and cost-cutting.

PGE should not be allowed to pivot to solar until the wind towers are repaired. This is too risky a project for PGE to take on.

However, if they do somehow get approval from ODOE/EFSC, here are problems that need to be addressed, at a minimum:

Mitigations:

- **Reinforced Containers**: BrightNight should use metal containers or fiberglass with steel reinforcements to resist turbine debris impacts.
- **Wind Barriers**: Install windbreaks (e.g., berms, fences) around BESS to reduce debris and ember spread.
- **Backup Power**: Ensure multiple generators/solar-powered cooling for PSPS, preventing overheating in 40°C heat.
- **Fire Training**: Train local firefighters for BESS fires, addressing rural response gaps.

Conclusion: Modular containers are designed to withstand fires and high winds, but Sherman County's unique risks—ferocious winds, turbine debris, and limited fire response—require enhanced protections to ensure safety.

BESS: **BESS** stands for **Battery Energy Storage System**. It refers to a system that stores electrical energy, typically from renewable sources like solar or wind, in batteries for later use. In the context of BrightNight's project in Sherman County, Oregon, the BESS is the **100-acre lithium-ion phosphate (LFP) battery storage** facility designed to store energy generated by the 1900 acre solar farm, integrated with the Biglow Canyon Wind Farm's infrastructure. These systems use modular containers (often fiberglass or metal, like NEMA 4X enclosures) to house batteries, along with cooling systems, Battery Management Systems (BMS), and fire suppression to manage energy and mitigate risks like overheating or fires.

The unique hazards of lithium-ion battery fires—toxic fumes (e.g., hydrogen fluoride), thermal runaway, and the ineffectiveness of water-based firefighting—combined with Sherman County's ferocious winds and rural setting, make this a high-risk task for volunteers. Recruiting trained volunteers, ensuring their safety, and addressing financial protections for injury or death are critical, especially in light of the Biglow Canyon Wind Farm's maintenance failures and the state's lax oversight.

1. Challenges of Recruiting Volunteers for Solar Facility Fires
Hazards of Lithium-Ion BESS Fires:

- **Toxic Fumes**: Lithium-ion (LFP) battery fires release hydrogen fluoride, carbon monoxide, and other gases, requiring specialized personal protective equipment (PPE) like self-contained breathing apparatus (SCBA).

- **Thermal Runaway**: Fires can reach 500–1,000°C, with re-ignition risks, making containment difficult. Water can exacerbate fires by spreading lithium or causing explosions, necessitating foam, dry chemical, or controlled burnouts.
- **Sherman County Conditions**: Winds (20–30 mph, gusts to 60–80 mph) can spread flames and embers, complicating firefighting. Dry vegetation (tumbleweeds, grass) increases wildfire risks.
- **Rural Limitations**: Sherman County's volunteer fire departments (e.g., North Sherman County RFPD) have limited personnel (typically 10–20 volunteers per station), equipment, and training for specialized fires, unlike urban departments.

Community Reluctance:

- **Personal Risk**: Farmers and residents may refuse to fight BESS fires due to health risks (inhalation, burns) and potential fatality, even with training.
- **Economic Concerns**: Volunteers, often farmers or small business owners, rely on their livelihoods. Injury or death could devastate families in a county with a median household income of ~$60,000 (2021 data).
- **Trust Issues**: Biglow's maintenance failures (12 turbine pieces dropped in the last year, 40 Vestas turbines offline) and Oregon's weak oversight (no penalties for PGE's non-reporting) erode confidence in renewable projects, make residents wary of risking their lives for BrightNight's BESS.

Recruitment Barriers:

- **Limited Pool**: Sherman County's population (~1,800) restricts volunteer numbers. Many are already committed to regular firefighting, farming, or other jobs.
- **Training Demands**: Lithium-ion fire training requires specialized courses (e.g., NFPA 855-compliant, hazmat certification), costing $500–$2,000 per person, plus time away from work.
- **Retention**: Without financial protections or incentives, volunteers may drop out, especially after witnessing Biglow's safety lapses or learning of incidents like the Moss Landing fire (2025).

2. Strategies to Recruit Trained Volunteers

To recruit and retain volunteers for BESS fire response in Sherman County, despite community reluctance, a multi-faceted approach is needed, balancing training, safety, and incentives. Here are actionable strategies:

1. Establish a Specialized BESS Fire Response Team:

- **Model**: Create a dedicated **Sherman County BESS Response Unit** within existing fire districts (e.g., North Sherman or Moro RFPD), trained specifically for lithium-ion fires.
- **Training Program**:
    - Partner with organizations like the **National Fire Protection Association (NFPA)** or **International Association of Fire Fighters (IAFF)** to provide NFPA 855-compliant training, covering:
        - Lithium-ion fire behavior (thermal runaway, toxic gases).
        - Use of foam, dry chemical, or CO2 suppressants.
        - SCBA and hazmat PPE operation.
        - Controlled burnout strategies to avoid water use.
    - Contract trainers from urban departments (e.g., Portland Fire & Rescue) or private firms (e.g., Fire & Risk Alliance), with costs (~$20,000–$50,000 for 10–15 volunteers) funded by BrightNight or PGE.
    - Conduct annual drills at BrightNight's BESS site, simulating windy conditions, to build confidence.
- **Recruitment**:
    - Target younger residents (18–40) with firefighting interest, offering flexible training schedules to accommodate farming.
    - Engage community groups (e.g., Sherman County Farm Bureau) to identify candidates, emphasizing BESS safety as a community benefit.
    - Use social media and town halls (e.g., Wasco or Rufus) to promote the unit, highlighting protections and incentives (below).

2. Partner with Regional Fire Departments:

- **Mutual Aid Agreements**: Coordinate with neighboring counties (Gilliam, Wasco) or urban centers (The Dalles, ~30 miles away) to provide backup for BESS fires. Their departments may have hazmat-trained personnel.
- **State Support**: Request Oregon State Fire Marshal (OSFM) deploy its **Hazardous Materials Response Teams** (13 statewide) for major BESS incidents, supplementing local volunteers.
- **Funding**: Secure grants from OSFM's **Community Risk Reduction Program** or FEMA's **Assistance to Firefighters Grant** (~$50,000–$100,000) to train regional teams, reducing Sherman County's burden.

3. Engage BrightNight and PGE:

- **Corporate Responsibility**: Require BrightNight to fund and organize training as a condition of EFSC approval, citing their community commitment (jobs, tax revenue).

PGE, as Biglow's operator, should co-fund due to their maintenance failures increasing local distrust.

- **On-Site Support**: Mandate BrightNight maintain a small, trained BESS response team (2–3 staff) on-site, equipped with foam suppressants and SCBA, to initiate response before volunteers arrive.
- **Community Liaison**: BrightNight should appoint a fire safety coordinator (contact Maribeth Sawchuk, maribeth@brightnightpower.com) to work with residents, ensuring transparency about BESS risks and training plans.

4. Address Community Fears:

- **Education**: Host workshops explaining LFP battery safety (lower fire risk than Moss Landing's NMC) and NFPA 855 protections (gas venting, modular spacing), reducing perceptions of danger.
- **Transparency**: Share BrightNight's BESS specs (e.g., LFP, cooling systems) and fire response plans at public hearings, addressing concerns.
- **Opt-Out Respect**: Acknowledge residents like your family who refuse to fight BESS fires, focusing recruitment on willing volunteers to avoid community tension.

3. Financial Protections and Incentives for Volunteers

To ensure volunteers' livelihoods are protected and incentivize participation, Sherman County must address the risks of injury or death in BESS firefighting. Here are proposed solutions:

1. Insurance and Compensation Guarantees:

- **Disability and Life Insurance**:
  - **Policy**: Provide comprehensive insurance for BESS response volunteers, covering:
    - **Disability**: Full income replacement (e.g., $60,000/year, based on county median) for permanent injuries preventing work.
    - **Death**: $500,000–$1M payout to families, ensuring financial security.
    - **Medical Costs**: All BESS-related injuries (e.g., burns, inhalation) covered, including long-term care for toxic exposure.
  - **Funding**: BrightNight and PGE fund policies (~$5,000–$10,000/year per volunteer for 10–15 volunteers), leveraging ITC savings or Biglow's tax revenue ($12.8M in 2020).
  - **Model**: Oregon's **Volunteer Firefighters' Insurance Program** (ORS 243.950) offers a framework, but BESS-specific policies need higher coverage due to risks.

- **Workers' Compensation**:
  - Extend Oregon's **SAIF Corporation** coverage to volunteers, ensuring medical and wage benefits for BESS injuries. BrightNight/PGE should cover premiums (~$2,000/year per volunteer).
  - Include long-term monitoring for hydrogen fluoride exposure, as seen in Moss Landing's aftermath.

2. Bonuses and Incentives:

- **Hazard Pay**:
  - Offer **$500–$1,000 per BESS fire call**, reflecting the high risk and specialized skills, funded by BrightNight/PGE.
  - Compare to urban hazmat firefighters' pay (~$100/hour for incidents), adjusted for rural volunteers.
- **Annual Stipends**:
  - Provide **$2,000–$5,000/year** for active BESS unit members, covering training time and readiness, encouraging retention.
  - Fund via Sherman County's tax revenue from BrightNight or PGE's Biglow operations.
- **Tax Benefits**:
  - Advocate for state tax credits (e.g., $1,000/year) for BESS volunteers, modeled on Oregon's **Volunteer Firefighter Tax Credit** (up to $250, ORS 315.622).
  - BrightNight could sponsor additional local tax relief for volunteers' families.
- **Equipment Support**:
  - Supply volunteers with personal SCBA, foam kits, and hazmat suits (~$10,000 per volunteer), maintained by BrightNight to reduce financial burden.

3. Livelihood Protections:

- **Job Security**: Partner with local employers (e.g., farms, Northwest Grain Growers, MCGG) to guarantee volunteers' jobs during training or recovery from injuries, using BrightNight's community ties.
- **Family Support**: Offer counseling and financial planning for volunteers' families, funded by BrightNight, to address fears of loss, as your family feels.
- **Legal Protections**: Ensure volunteers are not liable for BESS fire outcomes (e.g., environmental damage), with BrightNight/PGE indemnifying them.

4. Community Fund:

- **BESS Safety Fund**: Create a $1M–$2M fund, seeded by BrightNight/PGE and replenished by BESS revenue, to cover:
  - Emergency payouts for injured/killed volunteers' families.
  - Training and equipment upgrades.
  - Community wildfire prevention (e.g., vegetation control).
- **Administration**: Managed by Sherman County commissioners with resident oversight (e.g., a board including farmers like Kevin and Colt McCullough), ensuring fairness.

Feasibility:

- **BrightNight's Role**: As a community-focused developer, BrightNight can fund training and protections via ITC savings ($10M–$20M for a 200–400 MWh BESS) or operational revenue.
- **PGE's Responsibility**: PGE's Biglow failures (40% maintenance cut, 3,400 gallons of oil leaked) justify their contribution, using overhaul funds ($156M planned) or tax revenue.
- **State Support**: Oregon's RPS budget and OSFM grants can subsidize costs, reducing local burden.
- **Precedent**: California's **PG&E Wildfire Mitigation Fund** ($300M) supports rural fire training; Oregon could adopt a similar model for BESS risks.

4. Addressing Community Reluctance

Given reluctance and similar feelings among farmers and residents, recruitment must respect opt-outs while appealing to willing volunteers:

- **Survey Residents**: Conduct a countywide survey (through the Sherman County Extension Service) to gauge interest in BESS firefighting and identify 10–15 candidates.
- **Target Diverse Groups**: Recruit from non-farming residents (e.g., teachers, retirees) and younger volunteers seeking community roles to reduce reliance on farmers.
- **Highlight Protections**: Emphasize insurance, bonuses, and BrightNight's safety measures (LFP, NFPA 855) in recruitment drives to build trust.
- **Alternative Roles**: Offer non-firefighting roles (e.g., logistics, evacuation coordination) for residents like your family to support the response without direct risk.

Moss Battery, Kilwinning, and Warwick have recently had horrific fires, so toxic that mainstream news is not publishing the aftereffects in the community. PG&E and Vistra Corp. are being sued over the Moss Battery fire. Again,this is too risky a project for PGE to take on.

https://www.silive.com/news/2025/12/second-fire-at-upstate-bess-site-shows-these-unsafe-toxic-facilities-must-be-stopped-opinion.html

https://www.bbc.com/news/articles/c5ypp5q79l3o

https://www.singletonschreiber.com/theblog/community-risks-from-the-battery-fire-at-moss-landing-energy-facility

Sincerely,
Captain Kathy McCullough, Northwest Airlines, retired

From:	Kathryn McCullough
Sent:	Tuesday, January 6, 2026 2:00 PM
To:	CLARK Christopher * ODOE
Subject:	NOI #5 Plan for Trained Firefighters in Sherman County
Attachments:	NOI #5 Plan for Trained Firefighters in Sherman County.pdf

Categories: Tracked To Dynamics 365

The unique hazards of lithium-ion battery fires—toxic fumes (e.g., hydrogen fluoride), thermal runaway, and the ineffectiveness of water-based firefighting—combined with Sherman County's ferocious winds and rural setting, make this a high-risk task for volunteers. Recruiting trained volunteers, ensuring their safety, and addressing financial protections for injury or death are critical, especially in light of the Biglow Canyon Wind Farm's maintenance failures and the state's lax oversight.PGE should not be allowed to pivot to solar until the wind towers are repaired. This is too
risky a project for PGE to take on.

From: Kathryn McCullough
Sent: Friday, January 9, 2026 1:36 PM
To: CLARK Christopher * ODOE
Cc: Colton McCullough; Daniel Wilson; JACKMAN Tom * ODOE; ESTERSON Sarah * ODOE
Subject: Re: Question on the Timeline

Categories: Tracked To Dynamics 365

Chris,

Were my comments specific enough in the 5 NOIs I submitted? Do I need to present more facts, statements, or specify more?

I don't think one public hearing is enough, considering the scope of this amendment. It is not even apples and oranges… and there have been so many problems with their wind project. Now they get a green light for solar?

Just the fact that so many pages have been amended in the site certificate makes it difficult for the lay reader.

It looks like there will be fire mitigation during construction, but then PGE comes up with their own mitigation for the solar afterwards? And the weeds can be a foot high? Noxious weeds, not all weeds?

There is so much wrong with this process that I am having trouble voicing all my concerns.

Kathy

> On Jan 9, 2026, at 12:31 PM, CLARK Christopher * ODOE wrote:
>
> Hi Kathy,
>
> This project is an amendment to an existing site certificate so it is not being processed in the same way as an Application for Site Certificate for a new facility under either the regular or expedited rules. Because it is an amendment, the process will follow what is laid out in OAR chapter 345, division 27. Those rules were recently amended, so I don't think we have an updated handout, but I have cc'd Tom Jackman, our rules coordinator, in case you have follow up questions.
>
> Under the amendment rules, there will only be one hearing (next Thursday) and there will not be a contested case proceeding. There is an additional process for anyone who submit comments to continue to participate in the public hearing under OAR 345-027-0367. Under that process, the certificate holder is required to respond in writing to all comments submitted and then the commenters will have an opportunity to reply to those responses. Here is an excerpt from the rule:
>
> ***
>
> (7) Comments – both written and oral – submitted during the public comment period must be made with sufficient specificity to afford the Council, the Department, and the certificate holder an opportunity to respond to the issue(s) raised in the comment.
> (a) To raise an issue with sufficient specificity, a person must in their comment:
> (A) Identify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object;
> (B) Specify the Council standard or other applicable state and local requirements on which their objection is based; and
> (C) Present facts or statements supporting that objection.
> (b) If a comment is not made with sufficient specificity, the Department will not make any revisions to the draft of the final order based on that comment.
>
> (8) All timely comments submitted during the public comment period will be subject to the following process:
> (a) The certificate holder must provide a written response to written and verbal comments on the request for amendment or the proposed order;
> (b) The Department can choose, but is not required to respond to written or verbal comments on the request for amendment or the proposed order;
> (c) The response(s) in (a) can be limited to a statement that the public comment in question does not allow the certificate holder to substantively respond, as the comment fails to meet the sufficient specificity standard as described in (7);
> (d) Reviewing agencies and members of the public may submit written replies to the responses to their own respective comments in (c);
> (e) The certificate holder and Department may submit a sur-reply to the replies described in (d); and
> (f) Participants to the public comment process may request more time to submit their response, reply, and sur-reply to the Council or Council Chair, who shall grant the extension on a showing of good cause.
>
> *****
>
> If you are not satisfied with the outcome of the hearing process, judicial review of the Council's final order would be as provided in ORS 469.403.
>
> Thank you,
>
> **Christopher M. Clark**
> Senior Siting Analyst
> 550 Capitol St. NE | Salem, OR 97301
> P: 503-871-7254
> P (In Oregon): 800-221-8035
> OREGON DEPARTMENT OF ENERGY
> Stay connected!

From: Kathryn McCullough <captainkathymccullough@gmail.com>
Sent: Friday, January 9, 2026 12:17 PM
To: CLARK Christopher * ODOE <christopher.clark@energy.oregon.gov>
Cc: Colton McCullough <mccullloctloc@gmail.com>; Daniel Wilson <Dan.Wilson@pgn.com>
Subject: Question on the Timeline

Chris,

This is our timeline, correct? (Because it is shortened there are only two public meetings?) The first meeting in yellow is the one on January 15, 2026, in Grass Valley?

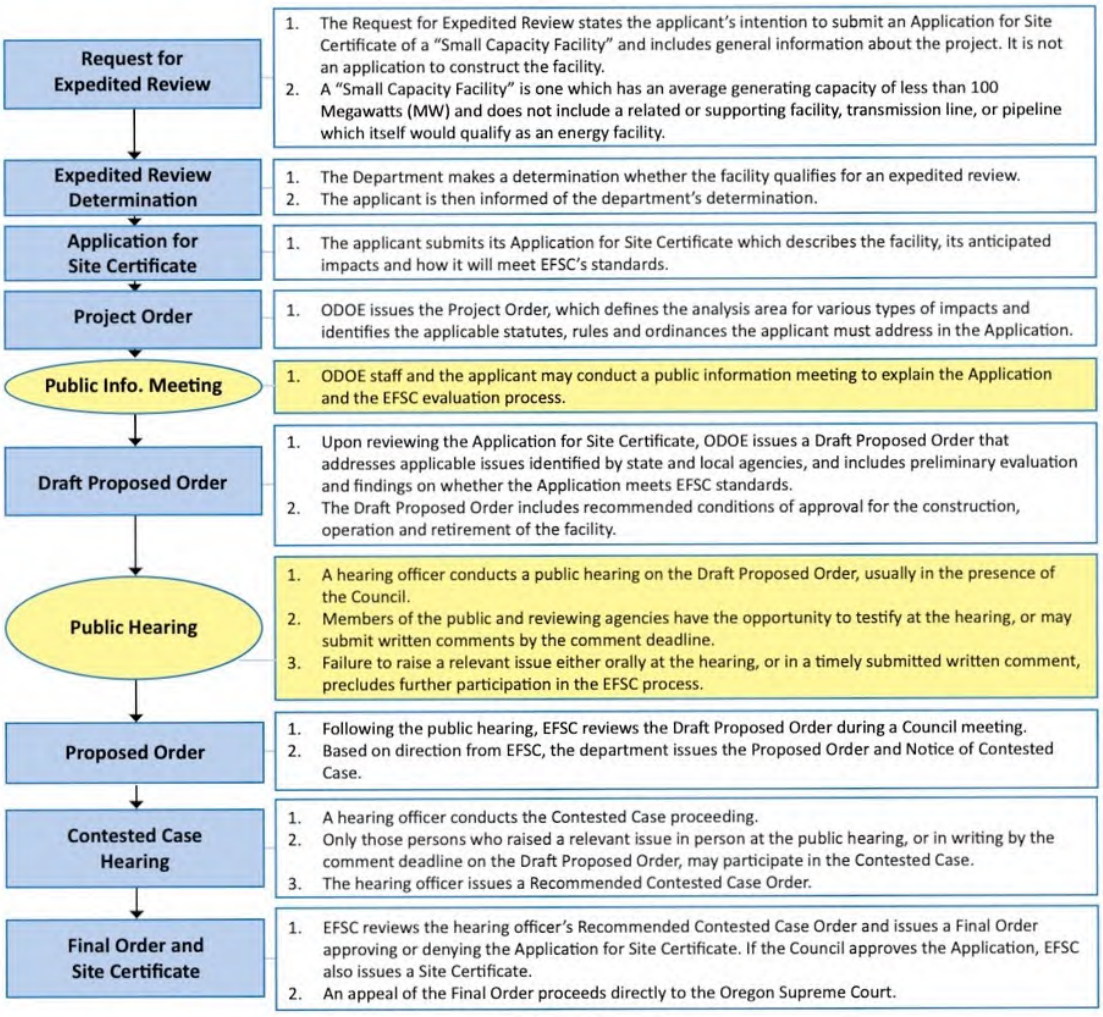
When is the next one scheduled?

If PGE does not address the fire concerns to our satisfaction, is that when it is considered contested?

Kathy

SITING OF ENERGY FACILITIES IN OREGON
EFSC Expedited Review Process Flowchart

The Oregon Department of Energy administers the Energy Facility Siting Council facility siting process, which consolidates state agency and local government regulations into a single review process. State agencies and local governments participate throughout the process. The two yellow stages indicate where public participation is encouraged.



OREGON DEPARTMENT OF ENERGY

Oregon Department of Energy ● 550 Capitol St. NE ● Salem, OR 97301
Direct: 503-378-4040 ● Toll-free in Oregon 1-800-221-8035
www.oregon.gov/energy/facilities-safety/facilities

Mid-Columbia MCEDD
ECONOMIC DEVELOPMENT DISTRICT

January 14, 2026

Oregon Department of Energy
Oregon Energy Facility Siting Council
Attn.: Christopher Clark, Senior Siting Analyst
550 Capitol Street NE
Salem, OR 97301
Christopher.clark@energy.oregon.gov

RE: Biglow Canyon Wind Farm Site Certificate Amendment 4 | Public Comment

Dear Mr. Clark,

Sherman County operates within the Mid-Columbia Economic Development District's boundaries, and the district maintains an ongoing working relationship with the Sherman County Court. Our interest in the proposed project relates to our partnership with the Sherman County Court to assist with the implementation of the Community Investment Plan and Fund.

We understand that PGE is required to develop a mitigation plan for the Goal 3 exception to exclusive farm use land on which the facility is sited.

PGE, Sherman County Court, and Mid-Columbia Economic Development District are collaborating through a memorandum of understanding to execute the Community Investment Plan. Mid-Columbia Economic Development District has been asked and has agreed to administer the Community Investment Fund that will be created as a component of the Community Investment Plan with and for Sherman County Court.

The pending memorandum of understanding between Sherman County, Mid-Columbia Economic Development District, and PGE represents constructive collaboration. Mid-Columbia Economic Development District is pleased to assist Sherman County in this capacity.

Sincerely,

Jessica Metta

Jessica Metta
Executive Director
Mid-Columbia Economic Development District
jessica@mcedd.org

Portland General Electric
121 SW Salmon Street • Portland, Ore. 97204
PortlandGeneral.com

January 14, 2026
Biglow

VIA EMAIL

Christopher Clark, Senior Siting Analyst
Oregon Department of Energy
550 Capitol St. NE 1st Floor
Salem, OR 97301

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Proposed Order

Dear Mr. Clark,

Portland General Electric (PGE; Certificate Holder) submits the following comments in response to the Oregon Department of Energy's (ODOE) Proposed Order (PO) on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate.

The Certificate Holder generally agrees with the findings in the PO and the draft Amended Site Certificate for the RFA 4 and acknowledges the substantial effort undertaken by ODOE staff and participating state agencies reviewing and evaluating the proposed amendment. The Certificate Holder appreciates the collaborative coordination throughout the review process and provides the following comments and requests for consideration. This comment letter addresses requested edits related to corrections or clarifications of the record ahead of the public hearing. PGE anticipates submitting a second comment letter after the hearing that offers additional comments on the PO (and plans) for ODOE's and Council's consideration in the Final Order.

Requested changes to the Proposed Order:

- **Facility Site Location:** The Proposed Order Cover Letter identifies the Facility Site Location being 4.8 miles northeast of the Town of Wasco. The Solar Micrositing Area is 4.8 miles northeast of the Town of Wasco, but the Facility Site Location is 2.5 miles northeast of the Town of Wasco.

- **I.B.1 Energy Facility:** The Certificate Holder requests that the existing operational facility description be updated and provide the following revisions and additions to reflect the facility as built:

  ~~*The wind turbines are located on private land that the certificate holder has leased from the affected landowners.*~~ *The Siemens 2.3 MW turbines are mounted on tubular steel towers with a* ~~*hub*~~ *height of* ~~*280*~~ *262 feet at the hub and* ~~*maximum blade tip*~~ *an overall height of* ~~*445*~~ *413 feet including the turbine blades. The wind turbines are located on private land that the certificate holder has leased from the participating landowners.*

- **I.B.2. Related or Supporting Facilities, Table 1:** The Certificate Holder requests the following revisions to Table 1 be made to accurately reflect the existing facility components as built:

    - *Collector line length, underground: ~~106~~ 75 miles*
    - *Collector line length, overhead: ~~3.9~~ 5 miles*
    - *O&M Building Quantity: ~~2~~3 each*

- **I.D.3 Internal Access Roads:** The Certificate Holder would like to clarify that all new facility access roads will be 16 feet in width.

- **III.B.1 Recommended Amended Condition 3 (CON-OE-01):** The Certificate Holder requests that fax number be removed as a requirement.

- **III.B.1 Table 5:**
    - **Build Transfer Agreement:** The Certificate Holder requests that Table 5 be updated to reflect that a redacted version of the Build Transfer Agreement with confidential terms withheld will be submitted as part of fin.

- **III.D.1 Table 7: General Description of Mapped Soil Units in the Analysis Area -** The Certificate Holder requests revisions to the Area within Solar Micrositing Area to reflect a presence of 0.1% for soil unit: Lickskillet very stony loam, 7 to 40 percent north slopes (ID 16D), to reflect values represented in Exhibit I, Table I-1 of the fRFA4.

- **III.D.1 Vegetation Management and Weed Control:**
    - The Certificate Holder clarifies that, while there is intent to contract the Sherman County Weed Control District to implement measures of the Weed Control Plan, the District may not have sufficient capacity to manage implementation, in which case the Certificate Holder requests that other qualified vendors may be contracted to implement the measures of the Weed Control Plan.

- **III.K.1 Findings of Fact:** The Certificate Holder has conducted outreach to the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Burns Paiute Tribe. The Certificate Holder requests that the following summary of the correspondence with these Tribes be included in this section.
    - The certificate holder represents that no responses *to the October 2024 outreach letters were received*.[255] *On September 4, 2025, the certificate holder again sent informal outreach letters via email to the respective Tribes. On September 5, 2025, the certificate holder received an email response from the CTUIR deferring the project to the CTWSRO. On September 5, 2025, the certificate holder received an email response from the Burns Paiute Tribe acknowledging receipt of the outreach letter and agreeing to further engagement to discuss the project. On September 22, 2025, the certificate holder provided their availability for a meeting with the Burns Paiute Tribe; however, no responses were received to the meeting invitation. On September 11, 2025, the certificate holder received a response from CTWSRO agreeing to further engagement to discuss the project. On November 20, 2025, the certificate holder met with the CTWSRO in person to provide an overview of the*

project and to address any questions or concerns related to natural and cultural resources. The CTWSRO did not express any immediate concerns about the project.

- **IV. A.1 Table 26: Modeled Operational Noise of the Facility, as Amended**
  - The Certificate Holder would like to note that Table 26 *Modeled Operational Noise of the Facility, as Amended* omits NSR 13. This NSR should be included. Acoustic modeling shows that noise would be below the threshold.
  - The Certificate Holder would like to clarify that the source in Table 26 should be RFA4 Exhibit Y, Table Y-6 *and Table Y-7*.

Certificate Holder Requested Changes to the Draft Site Certificate:

- **Section 3.0 (Descriptions), Subsection 3.1 (The Wind Facility), part d. (Operations and Maintenance Building)**
  The Certificate Holder requests that the total square footage of the as built O&M buildings total be changed from 17,500 square feet to 19,500 square feet due to the building added by the Sixth Change Request.

- **GEN-TL-05**
  The Certificate Holder requests that the Department change this recommended amended condition to read:

  > ~~*(119) OAR 345-027-0023(5): If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a pipeline or transmission line, the Council shall specify an approved corridor in the site certificate and shall allow t*~~*The certificate holder* ~~*to*~~*shall construct the* ~~*pipeline or*~~ *230-kV transmission line connecting the Biglow Canyon Substation* ~~*anywhere*~~ *within a 150-foot corridor, as* ~~*presented in Figure 2 of the Amended Site Certificate*~~ *identified in the final site design* ~~*the corridor, subject to the conditions of the site certificate. If the applicant has analyzed more than one corridor in its application for a site certificate, the Council may, subject to the Council's standards, approve more than one corridor*~~.

  This edit will allow for flexibility of the location of the transmission line corridor, rather than requiring that the transmission line be located as shown in Figure 2.

- **PRE-WR-01**
  The Certificate Holder requests that the Department change this condition to read: ~~Prior to construction of any new well,~~ *No later than 30 days after completing construction of any new well*, the certificate holder shall provide the Department a copy of the map, well log and all other information it provided to OWRD pursuant to ORS 537.545 and ORS 537.765 to qualify for an exempt ground water use for any onsite exempt wells.

  The Certificate Holder requests this change because ORS 537.545 and 537.765 require the submission of this information following construction of a new well. A well log cannot be provided prior to construction because it is created during construction.

- **OPR-WR-01**
  The Certificate Holder cannot comply with this requirement to monitor the volume of groundwater used on a daily basis as of the effective date of the site certificate because

the existing well does not have a flow meter and one cannot be installed prior to when the Site Certificate is countersigned. The Certificate Holder requests that this requirement be revised to require monitoring as of the start of construction for the Solar Components.

- **GEN-FW-02** references Condition 63 (should now be GEN-FW-03)

Certificate Holder Requested Changes to Attachment D Comprehensive Solar Revegetation and Soil Management Plan:

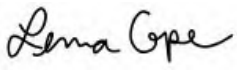
- The Certificate Holder has identified that the suggested revisions provided by ODOE in Attachment D to the Proposed Order would restrict all vegetation removal in Cat 2 habitat from Apr 15 to Sept 1 and would preclude almost all work in those areas, incentivizing grading instead of mowing or drive and crush. Mowing is essential prior to work during the dry season to reduce fire risk. The Certificate Holder requests that the Department make the following changes to Section 5.0 Table 4. Construction Compliance Checklist, During Ground-Disturbing Activities:

    - *Action: To the extent practical, mowing or other vegetation removal activities in Category 2 habitat will be scheduled to occur outside the critical period for ground-nesting birds (April 15 – September 1), to avoid disturbing active nests. If mowing or other vegetation removal activities in Category 2 habitat are necessary between April 15 to September 1, the Certificate Holder shall hire a qualified biologist to conduct a clearance survey for nesting birds prior to vegetation removal. The Certificate Holder shall ensure that active nest sites identified during the clearance survey are flagged and marked as sensitive areas for avoidance on construction maps. ~~On or before April 15 of any year in which construction occurs within Category 2 habitat, all mowing, vegetation removal and/or ground disturbance associated with site preparation must be completed. No mowing, vegetation removal and/or ground disturbance associated with site preparation may occur within Category 2 habitat between April 15 through September 1.~~*

    - *Responsible Party: EPC, Certificate Holder*

PGE respectfully submits these comments for consideration by ODOE and the Energy Facility Siting Council in advance of Council action on the Proposed Order for Request for Amendment 4.

Sincerely,



Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech
Kathleen Campanella, BrightNight

SHERMAN COUNTY, OREGON 2025-0290
R-DEED
Cnt=1 Pgs=14 KRISTI 12/04/2025 10:14:01 AM
$70.00 $11.00 $10.00 $60.00 $15.00 $166.00
I, Kristi Weis, County Clerk for Sherman County, Oregon certify that the instrument identified herein was recorded in the Clerk records.
Kristi Weis - County Clerk

AFTER RECORDING, RETURN TO:
BrightNight Power, LLC
515 North Flagler Drive
Suite 250
West Palm Beach, FL 33401
Attn: Legal

WATER USE AGREEMENT

This Water Use Agreement ("Agreement") is entered into as of December 3, 2025 by and between R & A Scharf, LLC, an Oregon limited liability company ("Grantor") and BIGL bn, LLC, a Delaware limited liability company ("Grantee"). Grantor and Grantee are referred to collectively as "Parties" and individually as a "Party."

RECITALS

A. Grantor and Grantee entered into a certain Option and Land Lease dated August 2, 2024 and amended by a First Amendment to Option and Land Lease dated July 2, 2025 and a First Amendment to Memorandum of Option and Land Lease dated July 2, 2025 (together, the "Lease") providing for Grantee's lease of and easement rights over certain real property owned by Grantor and located in Sherman County in the State of Oregon, more particularly described in the attached Exhibit A ("Grantor Property").

B. A well (the "Well") and other appurtenant facilities including, but are not limited to, pipes, valves, turnouts, meter, electrical and/or other power source(s) (the "Water Facilities") are located on the Grantor Property. Water Right Certificate 57620 is appurtenant to the Grantor Property and allows for irrigation of certain areas of the Grantor Property, using the Well as the point of diversion ("Certificate 57620").

C. Grantor and Grantee wish to enter into an agreement governing Grantee's use of the Well, Water Facilities, and water from the Well for industrial purposes, including but not limited to the construction, operation, and maintenance of a commercial solar energy facility, including an energy storage system and other related or supporting facilities (the "Project") on the Grantor Property.

NOW THEREFORE, in consideration of the mutual covenants set forth below, and for valuable consideration, the receipt of which each of the Parties acknowledge, the Parties agree as follows:

1. Effective Date, Term, and Termination. This Agreement shall become effective upon execution by the Parties ("Effective Date") and shall remain effective for a term of thirty (30) years ("Term"). Grantee shall have the right to extend the Term for two (2) additional periods of five (5) years each by providing written notice of such extension to Grantor at least sixty (60) days prior to the expiration of the previous term. The Parties

may terminate this Agreement by mutual agreement or as otherwise provided under Section 10(b).

2. Grant of Water Use. Grantor hereby grants Grantee an exclusive license to use the Well, the Water Facilities and water from the Well for the construction, operation, and maintenance of the Project, including fire protection water and solar panel washing, as well as domestic use ("Project Water Use"), as follows:

    a. As of the Effective Date, Grantee may use up to five thousand (5,000) gallons per day of exempt groundwater as authorized under ORS 537.545 ("Exempt Use Water") for Project Water Use.

    b. Grantee may use water under Certificate 57620, subject to Section 3 Regulatory Approvals below, for Project Water Use.

    c. For the avoidance of doubt, Grantor and its successors, assigns, agents, lessees, tenants, contractors and subcontractors will not have any use of the Well, Water Facilities, and water from the Well, including water under Certificate 57620 for the Term of this Agreement. Grantor warrants that it has full and clear legal authority to grant the license hereunder and that no other person or entity has a claim to water from the Well, including water under Certificate 57620, for the Term of this Agreement.

3. Regulatory Approvals. The Parties acknowledge that using Certificate 57620 for industrial purposes for the Project will require applying to the Oregon Water Resources Department ("OWRD") for a transfer (the "Transfer Application"). The Transfer Application may include a request to change the character of use of Certificate 57620 from irrigation to industrial use, the authorized place of use to the area covered by the Project, the season of use to year-round use, and the volume of water authorized. Grantee agrees it will not use water from Certificate 57620 for Project Water Use until OWRD issues a final order approving the Transfer Application and issuing a revised water right (the "Transfer Right"). As soon as reasonably practicable following the execution of this Agreement, Grantor shall submit the Transfer Application to OWRD using GSI Water Solutions as its agent. Grantee agrees to pay for all reasonable costs associated with the Transfer Application, including but not limited to OWRD processing fees and the costs associated with GSI Water Solutions' support. Grantor and Grantee agree to cooperate in good faith to gather all of the information required and sign all forms necessary to submit the Transfer Application on behalf of R&A Sharf LLC for the benefit of Grantee. Grantee agrees to comply with all conditions included in a final order approving the Transfer Application or Transfer Right.

4. Regulatory Reporting. Grantor is responsible for submitting a timely claim of beneficial use of the Transfer Right to OWRD, as appropriate, along with a request for a water right certificate, and any on-going reporting required by OWRD in association with the Water Facilities and water usage required during the Term. Grantee will cooperate in good faith to provide Grantor with information required to file a claim of beneficial use for the

Transfer Right or reports to OWRD to the extent that information is in Grantee's possession.

5. Water Quantity. Certificate 57620 allows for the irrigation of three hundred twenty-five and seven-tenths (325.7) acres at a rate of up to sixty-six hundredths (0.66) cubic feet per second ("cfs"). However, based on historical practices on the Grantor Property, only approximately twenty (20) acres have been irrigated in compliance with Certificate 57620. Accordingly, the Parties acknowledge that the Transfer Application may result in a new permit or certificate for the Transfer Right allowing for a reduced quantity of water use corresponding to the use of water on approximately twenty (20) acres at a corresponding rate of approximately for hundredths (0.04) cfs, which equates to about twenty-four thousand (24,000) gallons per day ("Transfer Use Water"). **Grantor bears all risk for any reduction in allowed water use under Certificate 57620 or subsequent transfer orders or certificates as a result of the Transfer Application and hereby releases and waives any claims against Grantee and its successors and assigns associated therewith or other proceedings related to the Project**.

6. Compensation for Water Use. Grantee agrees to compensate Grantor on a yearly basis for the Project Water Use at a flat rate of [redacted] per one thousand (1,000) gallons for all Project Water Use, including Exempt Use Water and Transfer Use Water. The flat rate includes all of Grantor's administrative and operating costs, including electricity, for the Term of this Agreement, except Grantee will install a meter on the Well prior to drawing water from the Well, at its sole cost, to measure water use under this Agreement. Grantor agrees to read the meter once a year and invoice Grantee once a year for the water use of the preceding year using water use data from the meter within sixty (60) days of the anniversary of the Effective Date. Grantee agrees to pay Grantor within sixty (60) days of receiving the annual invoice. The Parties acknowledge that if there is no Project Water Use in any year, Grantee has no obligation to compensate Grantor under this Section 6, except as otherwise provided in Section 7.

7. Forfeiture for Non-Use. Upon issuance of a final order approving the Transfer Application and Transfer Right, Grantee shall be responsible, during the term of this Agreement, for using water consistent with the Transfer Right to prevent forfeiture of the Transfer Right for non-use, including using the maximum rate authorized under the Transfer Right (or the amount of the Transfer Use Water) at least every five (5) years ("Nonforfeiture Action") and/or maintaining the Well and Water Facilities so that they are "ready, willing, and able" to use the maximum rate authorized under the final order. In the unlikely event a Nonforfeiture Action is required, Grantee's payment obligation under Section 6 is estimated at about [redacted] ([24,000 gallons x [redacted]).

8. Decommissioning. Upon decommissioning of the Project, Grantor and Grantee agree to cooperate in good faith to transfer the Water Right back to irrigation use. Grantor will be responsible for all costs and filings associated with this transfer, except that Grantee agrees to pay Grantor the sum of [redacted] within sixty (60) days of execution of this Agreement to account for those future costs.

9. Access Easement. In addition to and in connection with the exclusive license granted in accordance with Section 2, Grantor hereby grants and conveys to Grantee and its successors and assigns an exclusive easement for ingress to and egress from the Water Facilities (located on the Grantor Property), or to extend the Water Facilities as necessary for the Project Water Use, by means of existing roads and lanes, or otherwise by such route or routes as Grantee may construct.

10. Construction, Operation, and Maintenance of the Water Facilities.

    a. During the Term of this Agreement, Grantee agrees to be solely responsible for, the use, improvement, operation, maintenance, and the reasonable repair of the Water Facilities for the Project Water Use, except that Grantee shall have no obligation under this Section if (a) the Project is not constructed, or (b) if this Agreement terminates; or (c) the Water Facilities are (i) damaged by Grantor or a Grantor successor, agent, lessee, tenant, contractor or subcontractor, or (ii) used by Grantor or a Grantor successor, agent, lessee, tenant, contractor or subcontractor in breach of this Agreement, in which case Grantor is responsible for repair and maintenance costs.

    b. If the Well dries up or otherwise stops functioning, as determined by a licensed and bonded well constructor, during the Term, Grantee may notice Grantor of its intent to terminate the Agreement. Within sixty (60) days of such notice, Grantee shall pay Grantor any amount owed under Section 6, at which point this Agreement shall terminate and the Parties shall be relieved of their obligations under the Agreement.

11. Indemnification. Each Party ("Indemnifying Party") agrees to defend, indemnify and hold harmless the other Party and the other Party's officers, directors, employees, representatives, tenants, lessees, agents, contractors mortgagees and agents (collectively, "Indemnified Party") against any and all losses, damages, claims, expenses and liabilities for physical damage to real and personal property and for physical injury to any person, including, without limitation, reasonable attorneys' fees and all other legal expenses, to the extent resulting from or arising out of a breach of this Agreement by an Indemnifying Party. Grantor agrees to indemnify, defend and hold the Grantee harmless from and against any claim, suit, loss, damage, cost, expense, penalty or liability brought by any third party due to or arising out of this Agreement. This indemnification shall not apply to losses, damages, claims, expenses and liabilities to the extent caused by any negligent or intentional act or omission on the part of the Indemnified Party. This indemnification shall survive the expiration or termination of this Agreement. IN NO EVENT WILL EITHER PARTY BE LIABLE UNDER ANY CIRCUMSTANCES TO THE OTHER PARTY FOR SPECIAL, INDIRECT, PUNITIVE, INCIDENTAL, EXEMPLARY OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOST PROFITS, LOSS OF BUSINESS OPPORTUNITY OR OTHER SIMILAR DAMAGES RESULTING FROM OR ARISING OUT OF THIS AGREEMENT, BY STATUTE, IN TORT OR CONTRACT, UNDER ANY INDEMNITY PROVISION OR OTHERWISE.

12. Successors and Assigns. Grantee may freely assign its right to use water under this Agreement, its interest in Certificate 57620 (or subsequent certificates), and/or the easement granted under Section 9 of this Agreement to a third party. The terms, covenants, conditions and restrictions contained in this Agreement shall be enforceable and binding on each Party's assigns, successors, lessees, and purchasers.

13. General Terms.

a. Amendment

This Agreement may be amended only by written agreement by the Parties.

b. Governing Law; Waiver to Jury Trial

This Agreement and the rights of the parties hereunder shall be governed by and construed in accordance with the laws of the State of Oregon, exclusive of conflict or choice of law rules. Each of the Parties knowingly, voluntarily, and intentionally waives the right to a trial by jury in respect of any litigation based on this Agreement, or arising out of, under or in connection with this Agreement. Each of the Parties waives any right to consolidate any action in which a jury trial has been waiver with any other action in which a jury cannot or has not been waived.

c. Waiver.

Neither Party shall be deemed to have waived any provision of this Agreement or any remedy available to it unless such waiver is in writing and signed by the Party against whom the waiver would operate. Any waiver at any time by either Party of its rights with respect to any rights arising in connection with this Agreement shall not be deemed a waiver with respect to any other provision of the Agreement or any subsequent or other matter.

d. Relationship of the Parties.

This Agreement shall not be interpreted or construed to create an association, joint venture, fiduciary relationship or partnership between Grantor and Grantee or to impose any partnership obligation or liability or any trust or agency obligation or relationship upon either Party. Grantor and Grantee shall not have any right, power, or authority to enter into any agreement or undertaking for, or act on behalf of, or to act or be an agent or representative of, or to otherwise bind, the other Party.

e. Corporate Authority

Each Party hereby represents and warrants to the other that each individual executing this Agreement on its behalf is duly authorized to execute and deliver this Agreement on its behalf in accordance with its respective organizational governance documents, and that this Agreement is a legal, valid and binding obligation of such Party, enforceable against it in accordance with its terms.

f. Headings

The captions and paragraph headings used in this Agreement are inserted for convenience of reference only and are not intended to define, limit, or affect the interpretation or construction of any term or provision of this Agreement

g. Entire Agreement

This Agreement constitutes the entire understanding and agreement of the Parties to this Agreement with respect to its subject matter. All prior agreements, understandings, or representations, if any, with respect to this Agreement's subject matter are canceled in their entirety and are of no further force or effect.

[*signatures follow*]

IN WITNESS WHEREOF, the parties have caused this instrument to be executed the day and year first written above.

GRANTOR

R & A Scharf, LLC
an Oregon limited liability company

By: John Scharf
Name: John Scharf
Title: Manager

STATE OF Oregon)
)SS:
COUNTY OF Lincoln)

This instrument was acknowledged before me on November 20th, 2025 by John Scharf as Manager of R & A Scharf, LLC, an Oregon limited liability company.

OFFICIAL STAMP
TIMOTHY ALLEN DOLEZAL
NOTARY PUBLIC - OREGON
COMMISSION NO. 1023926
MY COMMISSION EXPIRES APRIL 21, 2026

Tim Dolezal
(Signature of Notary Public)

My Commission Expires: April 21, 2026

IN WITNESS WHEREOF, the parties have caused this instrument to be executed the day and year first written above.

GRANTEE

BIGL bn, LLC
a Delaware limited liability company

By: _____

Name: David Gil

Title: Authorized Representative

STATE OF FLORIDA)
)SS:
COUNTY OF Palm Beach)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [_] online notarization this on this 3 day of December, 2025, by David Gil, as the Authorized Representative of BIGL bn, LLC, a Delaware limited liability company.

(Seal)

_____
Signature of Notary Public
Print, Type/Stamp Name of Notary

GLENN MARCY LUGOSI
Notary Public
State of Florida
Comm# HH645565
Expires 2/26/2029

Personally known: X
OR Produced Identification: _____
Type of Identification Produced: _____

EXHIBIT A

GRANTOR PROPERTY

Sherman County, Oregon

Parcel 1:

Tax ID Nos: 02N18E0000300, 02N18E0000500, 02N18E0000800 and 02N18E00001800

All of the above listed Tax ID Numbers share in one and the same legal description being described as follows:

The North Half of the Northeast Quarter (N2 NE4), Section 9, Township 2 North, Range 18 East

Lots 2, 3 and 4 and the Southwest Quarter of the Northeast Quarter (SW4 NE4); the South Half of the Northwest Quarter (S2 NW4) and the South Half (S2) of Section 4, all lying within Section 4, Township 2 North, Range 18 East of the Willamette Meridian, Sherman County, Oregon.

EXCEPT those tracts or parcels of land conveyed by James Fox and Emma Fox, husband and wife, Grantors to the United States of America by Deed dated June 8, 1962, recorded June 8, 1962 in book 36 at page 364, Deed Records, Sherman County, Oregon; FURTHER EXCEPTING those tracts or parcels of land conveyed by George L. Fox and Lucille H. Fox, husband and wife, by Deed dated June 27, 1962, recorded June 27, 1962 in Book 36, Page 405, Deed Records, Sherman County, Oregon, FURTHER EXCEPTING those tracts or parcels condemned and taken by the United States of America in that Judgment on the Declaration of Taking and Order for immediate Possession no. 63-380, said Judgment being recorded August 29, 1963 in Book 36 at Page 913, Deed Records, Sherman County, Oregon.

Parcel contains 18.00 acres, more or less (Tax ID No: 02N18E0000300), 11.10 acres, more or less (Tax ID No: 02N18E0000500), 432.29 acres, more or less (Tax ID No: 02N18E0000800) and 4.00 acres, more or less Tax ID No: 02N18E00001800), an aggregate of 465.39 acres, more or less

Leased portion of parcel contains 465.39 acres, more or less

Parcel 2:

Tax ID No: 02N18E00001600

The East Half (E2), Section 8, Township 2 North, Range 18 East

Parcel contains 320.00 acres, more or less

Leased portion of parcel contains 320.00 acres, more or less

Parcel 3:

Tax ID No: 02N18E00001700

The South Half of the Northeast Quarter (S2 NE4), the West Half (W2) and the Southeast Quarter (SE4), Section 9, Township 2 North, Range 18 East

All that part of the Northwest Quarter (NW4) which lies Southwesterly of a traverse line described as follows: beginning at a point North 53 00' 32" East 322.34 feet from the Northwest corner of said Section 10, thence South 51° 32' 31" East 1903.86 feet; thence South 41° 31' 20" East 600 feet to a point lying Easterly of the North-South center line of said section, which point lies North 51° 57' 49" East 3861.38 feet from the Southwest corner of said section, said point being the terminus of the herein described traverse line, Section 10, Township 2 North, Range 18 East

Parcel contains 658.40 acres, more or less

Leased portion of parcel contains 658.40 acres, more or less

Parcel 4:

Tax ID No: 02N18E00003800

The Northeast Quarter (NE4), Section 17, Township 2 North, Range 18 East

Parcel contains 160.00 acres, more or less

Leased portion of parcel contains 160.00 acres, more or less

Parcel 5:

Tax ID No: 02N18E00003900

The West Half (W2) and the Southeast Quarter (SE4) of Section, Section 17, Township 2 North, Range 18 East

EXCEPTING therefrom a strip 40 feet in width, being 20 feet on each side of the center line as described and set forth in that deed to Sherman County, Oregon recorded In Book U, Page 444, Deed records of Sherman County, Oregon.

Parcel contains 473.54 acres, more or less

Leased portion of parcel contains 473.54 acres, more or less

Parcel 6:

Tax ID No: 02N18E00004000

The South Half (S2), Section 18, Township 2 North, Range 18 East and the Northwest Quarter (NW4), Section 19, Township 2 North, Range 18 East

Parcel contains 494.80 acres, more or less

Less and except the approximately 226.45-acre portion of the above-described property as generally depicted below

Leased portion of parcel contains 268.35 acres, more or less

Parcel 7:

Tax ID No: 02N18E00002300

The South Half of the Southeast Quarter (S2 SE4), Section 10, Township 2 North, Range 18 East

ALSO, the South Half of the South Half (S2 S2), Section 11, Township 2 North, Range 18 East,

SAVING AND EXCEPTING THEREFROM the following:

That portion thereof described as Tract 1613 of the John Day Lock and Dam, heretofore conveyed to the United States of America, and particularly described as follows:

Tract 1613, All that portion of the Southeast Quarter (SE4) of Section 11, Township 2 North, Range 18 East, of the Willamette Meridian, Sherman County, State of Oregon, which lies Northeasterly of a traverse line described as follows: Beginning at a point lying Northerly of the North line of the said Southeast Quarter of the Southeast Quarter (SE4 SE4) of Section 11, which point lies North 32°50'51" West, a distance of 1800.21 feet from the Southeast corner of said Section 11; thence South 50°44'39" East a distance of 300.0 feet; thence South 70°53' 10" East a distance of 1100.0 feet to a point lying Easterly of the East line of said Section 11, which point lies North 17°03' 15" East, a distance of 1006.63 feet from the Southeast corner of said Section 11, and said point of being the point of terminus of the above described traverse line. The tract of land above described contains 2.25, acres more or less.

Parcel contains 237.75 acres, more or less

Leased portion of parcel contains 237.75 acres, more or less

Parcel 8:

Tax ID No: 02N18E00003300

The Southwest Quarter of the Southwest Quarter (SW4 SW4), Section 14, Township 2 North, Range 18 East

Parcel contains 40.00 acres, more or less

Leased portion of parcel contains 40.00 acres, more or less

Parcel 9:

Tax ID No: 02N18E00003100

The East Half of the Southeast Quarter (E2 SE4), Section 14, Township 2 North, Range 18 East

Parcel contains 80.00 acres, more or less

Leased portion of parcel contains 80.00 acres, more or less

Parcel 10:

Tax ID No: 02N18E0000900

Lots 1, 2 and 3 and the Southeast Quarter of the Northeast Quarter (SE4 NE4), Section 5, Township 2 North, Range 18 East

Parcel contains 176.85 acres, more or less

Leased portion of parcel contains 176.85 acres, more or less

Parcel 11:

Tax ID No: 02N18E0002900

The East Half of the East Half (E2 E2) of Section 24, Township 2 North, Range 18 East 18 East of the Willamette Meridian in Sherman County, Oregon.

ALSO, all those parts of Government Lots 2 and 8 on the westerly side of the John Day River and the Government Lots 3, 6, 7, 9, 10, 15 and 16 of Section 13, in Township 2 North, Range 18 East of the Willamette Meridian, in Sherman County, Oregon, SAVING AND EXCEPTING therefrom the following:

That portion thereof described as Tract No. 1614-1 of-the John Day Dam and Lock heretofore conveyed to the United States of America, and particularly described as follows:
Tract 1614-1, All that portion of Government Lots 1, 2, 7, 8, and 9 of Section 13, Township 2 North, Range 18 East of the Willamette Meridian, Sherman County, State of Oregon, which lies southwesterly of the center of the main channel of the John Day River and northeasterly of a traverse line described as follows: Beginning at a point lying northerly of the north line of said Section 13, which point lies North 81° 37' 15" East, a distance of 2179.13 feet from the Northwest corner of said Section 13; thence South 56° 52' 26" East, a distance of 704.50 feet; thence South 38° 16' 39" East, a distance of 4045.13 feet to a point lying easterly of the east line of said Section 13, which point lies South 58° 18' 16" East, a distance of 6172.29 feet from the Northwest corner of said Section 13, and said point being the point of terminus of the above described traverse line. The tract of land above described contains 28.46 acres, more or less, of which 2.96 acres lie below the ordinary high water line and within the John Day River.

Parcel contains 469.15 acres, more or less

Leased portion of parcel contains 469.15 acres, more or less

Parcel 12:

Tax ID No: 02N18E00004300

The Northeast Quarter (NE4), Section 19, Township 2 North, Range 18 East of the Willamette Meridian in Sherman County, Oregon.

LESS AND EXCEPT Parcel 1, Partition Plat No. 2007-01, recorded April 16, 2007 as Document No. 070145, Sherman County Plat Records. Situated in the Northeast Quarter (NE4) of Section 19, Township 2 North and Range 18 East of the Willamette Meridian, Sherman County, Oregon, being more particularly described as follows:

Beginning at a 5/8" iron rod with yellow plastic cap stamped "DEA INC" at a point of intersection of the west line of said Northeast Quarter (NE4) of Section 19 and the south right-of-way line of Herin Lane (County Road recorded in Bock "A", Pages 52-55, 90 Sherman County), said point of beginning being North 15° 46' 49" East 10875.00 feet from a ½" iron rod at the southeast corner of Section 25, Township 2 North and Range 17 East, Willamette Meridian: and running thence South 88° 34' 22" East tracing said south right of way line a distance of 942.39 feet; thence South 0° 00' 00" West leaving said south right of way line a distance of 687.45 feet; thence South 90° 00' 00" West 360.00 feet; thence North 00° 00' 00" East 37.56 feet; thence North 45° 00' 00" West 212.13 feet; thence South 90° 00' 00" West 277. 13 feet; thence North 00° 00' 00" East 246.82 feet; thence South 90° 00' 00" West 156.40 feet to said west line of the Northeast Quarter (NE4) of Section 19; thence North 0° 17' 48" East tracing said west line a distance of 276.54 feet to the point of beginning.

Bearings are based on the State Plane Coordinate system of 1983, Oregon North Zone.
Containing 12.000 acres, more or less.

Parcel contains 142.77 acres, more or less

Leased portion of parcel contains 142.77 acres, more or less

Parcel 13:

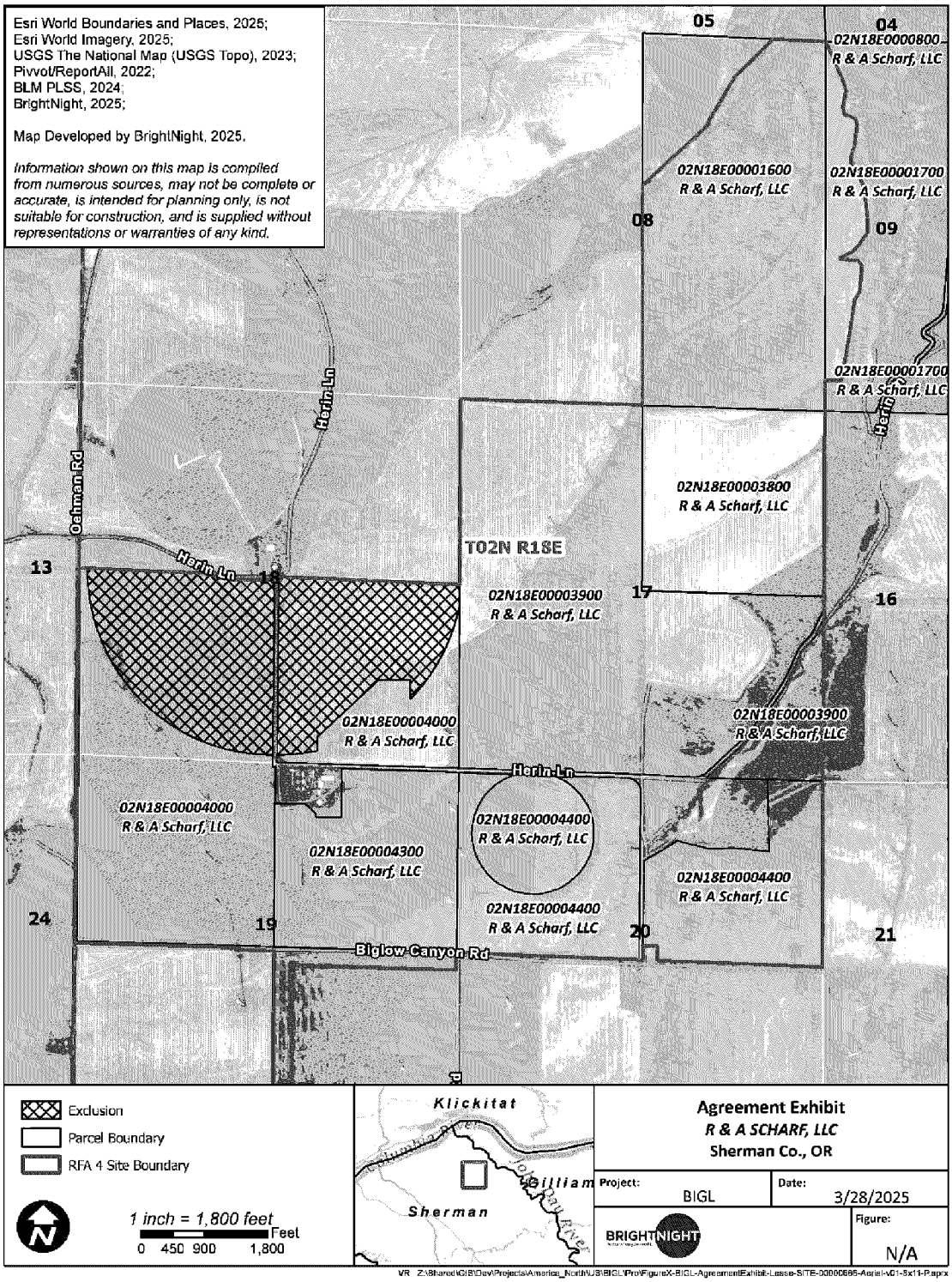
Tax ID No: 02N18E00004400

The North Half (N2), Section 20, Township 2 North, Range 18 East of the Willamette Meridian in Sherman County, Oregon; SAVE AND EXCEPT that certain tract conveyed to School District No. 1, Sherman County, Oregon by deed recorded in Book D, Page 173, Deed Records of Sherman County.

Parcel contains 309.90 acres, more or less

Leased portion of parcel contains 309.90 acres, more or less

The Premises contains 3,802.10 acres, more or less


Esri World Boundaries and Places, 2025;
Esri World Imagery, 2025;
USGS The National Map (USGS Topo), 2023;
PivvotReportAll, 2022;
BLM PLSS, 2024;
BrightNight, 2025;
Map Developed by BrightNight, 2025.
Information shown on this map is compiled from numerous sources, may not be complete or accurate, is intended for planning only, is not suitable for construction, and is supplied without representations or warranties of any kind.
05
04
02N18E00000800
R & A Scharf, LLC
02N18E00001600
R & A Scharf, LLC
02N18E00001700
R & A Scharf, LLC
08
09
02N18E00001700
R & A Scharf, LLC
Herin Ln
Oelman Rd
02N18E00003800
R & A Scharf, LLC
T02N R18E
13
18
17
16
02N18E00003900
R & A Scharf, LLC
02N18E00004000
R & A Scharf, LLC
02N18E00003900
R & A Scharf, LLC
Herin Ln
02N18E00004000
R & A Scharf, LLC
02N18E00004400
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R & A Scharf, LLC
02N18E00004400
R & A Scharf, LLC
24
19
20
21
Biglow Canyon Rd
Exclusion
Parcel Boundary
RFA 4 Site Boundary
1 inch = 1,800 feet
Feet
0 450 900 1,800
Klickitat
Sherman
Gilliam
Agreement Exhibit
R & A SCHARF, LLC
Sherman Co., OR
Project:
BIGL
Date:
3/28/2025
BRIGHTNIGHT
Figure:
N/A

From:	Ziola, Kiana
Sent:	Wednesday, January 14, 2026 11:29 PM
To:	CLARK Christopher * ODOE
Cc:	Lenna Cope; Kathleen Campanella; Albrich, Elaine; Todd Ellwood
Subject:	BIGL RFA 4: Proposed Order Comment Letter
Attachments:	BIGL RFA4_Comments on PO_01142025_clean.pdf; BIGL-Water Use Agreement-R & A Scharf, LLC-00001468 (Recorded 2025-0290).pdf

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Categories: Tracked To Dynamics 365

Hey Chris,

On behalf of the PGE and BrightNight please see the attached comment letter on the Proposed Order for the record ahead of the hearing tomorrow. I've also attached an executed copy of the Scharf water use agreement for the record.

Best,

-

Kiana Ziola | Environmental Planner/Project Manager
Direct **+1 (208) 489-2872** | Mobile **+1 (970) 712-0183** | kiana.ziola@tetratech.com
Tetra Tech | *Leading with Science®* | Environmental Services Division
3380 Americana Terrace, Suite 201 | Boise, ID 83706 | tetratech.com

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TETRA TECH

THE CONFEDERATED TRIBES OF THE WARM SPRINGS RESERVATION OF OREGON

BRANCH OF NATURAL RESOURCES
P.O. Box C, Warm Springs, Oregon 97761
Phone (541) 553-2001

January 15, 2026

Christopher Clark
Senior Siting Analyst
Oregon Department of Energy

Dear Mr. Clark,
I am writing on behalf of the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) in my capacity as Tribal Historic Preservation Officer (THPO) regarding Request for Amendment 4 (RFA4) of the Site Certificate for the Biglow Canyon Wind Farm, and the Department's Proposed Order currently before the Energy Facility Siting Council.

CTWSRO acknowledges receipt of the Proposed Order and appreciates the opportunity to provide comments as part of the public hearing and comment process. The Project area is within the Tribes' ceded lands and an area of ongoing cultural, historical, and archaeological importance to the Confederated Tribes.

CTWSRO has participated in consultation related to the Biglow Solar components proposed under RFA4 and has reviewed the completed cultural resources survey prepared for the applicant. That survey identifies multiple archaeological sites and isolates within the Project footprint and includes clear recommendations intended to ensure compliance with applicable laws, Site Certificate conditions, and Tribal expectations for cultural resource protection.

At this time, CTWSRO wishes to formally flag a concern that recent communications from the applicant and its consultants suggest a narrowing of cultural resource compliance measures that does not appear to align with the recommendations documented in the survey or with the substance of consultation discussions. Specifically, the applicant has characterized archaeological monitoring as limited in scope and duration, focused on a single location, rather than implementing monitoring for all ground-disturbing activities occurring within proximity to recorded cultural resources, as recommended.

The survey also concludes that the current construction plan would result in an adverse effect to archaeological resources. CTWSRO is concerned that this determination, and the associated recommendations for monitoring, inadvertent discovery response, and Tribal involvement, are not being fully reflected in how the applicant is proposing to implement cultural resource protection measures as the Project moves toward construction.

CTWSRO respectfully requests that ODOE and the Energy Facility Siting Council ensure that the final order and conditions of approval clearly require implementation of the full suite of cultural

resource protection measures identified through survey and consultation, and that these measures not be reduced through subsequent project-level interpretation or contractor scoping decisions. Continued consultation with CTWSRO will be essential as construction planning advances. The Confederated Tribes of Warm Springs submit these comments to ensure the consultation record is accurately reflected and that cultural resource compliance for RFA4 remains consistent with Tribal recommendations, Site Certificate obligations, and applicable state and federal requirements.

Thank you for the opportunity to provide comments. Please do not hesitate to contact me if additional clarification or discussion would be helpful.

If you have any questions, please contact Lawrence Squiemphen III at (541) 553-2026 or email at lawrence.squiemphen@ctwsbnr.org.

Sincerely,

Lawrence Squiemphen III
Confederated Tribes of Warm Springs
Tribal Historic Preservation Officer

January 16, 2025
EFSC Chair Condon,

I woke up thinking about your question about the lease. I was thinking farm lease, equipment lease, etc. You meant our lease with PGE? Our lease was actually with Orion Energy, back in 2006. It's not a good lease for the landowner, but wind energy was new back then.

When everything started going wrong with the towers, we learned that PGE had not performed the warranty work on the pitch systems. Stymied and hitting dead ends with every PGE representative I spoke with, I contacted their CEO, Maria Pope. I thought she must not know about the Biglow towers leaking and being turned off at night and on windy days (the plant manager denied it, but we live under them).

She wrote me back and said: "Thank you for your recent emails. Please be assured that Brad Jenkins and the rest of our Biglow Canyon wind operations team have kept me fully informed about your concerns and related issues, and their responses to your prior communications reflect my understanding of our mutual responsibilities and rights – yours and PGE's – in our long-term relationship at the wind farm." She went on to say their arrangement with BPA was their business, and that multiple factors govern whether each turbine within a wind farm is the right resource at any given moment.

I have the whole letter, but I'm trying to get to your point about the lease. We finally engaged a lawyer in 2022, after the blade detached. We decided not to proceed because PGE is a very large company with many lawyers, and our only claim would be clean-up and trespass. (below)

Again, thank you for being on the EFSC council, engaging with us, and listening.

Sincerely,
Kathy and Kevin McCullough

I. PGE Easement – Default
PGE Easement section 7.5(a) includes the following language: "Should any Hazardous Materials (as defined in Applicable Environmental Laws) be discharged on the Property as a result of Grantee's operations and/or activities thereon in violation of such Applicable Environmental Laws, Grantee agrees to clean-up and remove the same, if required by Applicable Environmental Laws and in accordance therewith, at Grantee's sole cost and expense." A failure to clean-up and remove, and a failure to provide the landowner with satisfactory evidence of such clean-up is a default of the PGE Easement Agreement.

J. Private Nuisance
A private nuisance is an invasion of an individual's interest in the use and enjoyment of land. Liability may arise from intentional, negligent, or reckless act or from the operation of an abnormally dangerous activity.[17] The landowners may argue that falling sheet metal and leaking oil adversely affect the use of their land. Because turbine oil is detrimental to crop production and falling sheet metal is detrimental to human health, a nuisance claim seems likely to prevail. Trespass and nuisance claims can be asserted in the same legal action to better ensure at least one theory of recovery will apply to the facts. If the court finds a nuisance or trespass has occurred, the court can issue a permanent injunction requiring the party committing the nuisance to abate it or to prevent a future trespass, which in this case will be through requiring PGE to repair and maintain the turbines.[18]

I am writing you concerning the NOI for the Speedway Energy facility proposed for Sherman County Oregon.

I am a 4th-generation farmer/rancher in Sherman and Wasco Counties, working with my son, who is the 5th generation. Our ranch is in direct proximity to or borders portions of the Bakeoven approved solar (1,270 ac), Daybreak approved solar (1817ac), Sunset approved solar (1817ac), and Yellow Rosebush under review solar (8075ac). We also border the Buckley under-review solar project (7852ac) and the Speedway NOI solar project (14000ac solar with wind, totaling 25000ac).

In addition to these solar projects, Avangrid is leasing property extending east from the Speedway project to the John Day River to develop another solar project, which could easily match the Speedway project in size. Keep in mind the acreage listed above is only the acres to be covered with actual solar panels. The total acres included in these projects and removed from agricultural production are estimated to be greater than 100,000 acres of F-1, exclusive farm use acres, and do not include proposed solar projects in the north end of Sherman County, such as the Biglow solar project. Please keep in mind the total effect of all of these projects combined will have on wildlife, wildfire, the agriculture community, and supporting Ag industries. The precedent set on these individual projects will have far-reaching and permanent consequences.

If all of these projects are allowed to continue to move forward unchecked, I fear a collapse of the ag sector in Sherman County and possibly beyond. Sherman County has always been referred to as “the land of wheat,” grown from river to river. Some on your EFSC council and our CREA group (Community Renewable Energy Association) have been quoted as saying that we “produce low-quality wheat that is undesirable.” As a past president of the Oregon Wheat Growers League (OWGL), I can testify that is completely false and would enjoy a public debate with those members. World wheat consumption has exceeded production five out of the last 6 years.

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As a 5th-generation farm and ranching operation, we are extremely concerned about the viability of our operation should these projects be approved. The loss of this many acres to solar will make it very difficult for local agricultural businesses to survive. We will lose these businesses and their labor force while increasing the cost to those of us remaining in agricultural production.

We have continued to see a decline in mule deer in this region, and fencing off tens of thousands of acres will only accelerate this decline. It will also divert the remaining population of deer, elk, and antelope to the remaining farm and range land, thus damaging crops and range.

According to the U.S. Forest Service (USFS), Sherman County’s risk of wildfires is higher than 98% of counties in the entire United States (wildfirerisk.org). Brookfield claims it can control wildfires on its projects. As a 66-year-old Sherman County native and volunteer firefighter, I will tell you that it is absolutely false.

First of all, once these wildfires are started, typically by dry lightning, they are extinguished by the local farming community and volunteer fire districts using millions of dollars of large-scale farm tillage and industrial equipment, all donated by farmers. Where terrain allows, these fires are stopped by creating fire breaks with tillage equipment or bulldozers and starting backfires. Where terrain prohibits these practices, volunteer foot crews descend into the canyons to extinguish the flames, often at night when winds are light and humidity is up.

Once these solar sites are fenced off, both of these mechanical options will be off the table. The toxic fumes emitted from a burning solar site will prohibit entry and may well prohibit ground crews from engaging the fires downwind. The potential for these fires to grow exponentially is real. The historic Oregon Substation fire that burned from The Dalles, Oregon, across Wasco and Sherman Counties, burning thousands of acres in a matter of hours and taking human life along the way, will not be the last. This entire area is composed of large, deep canyons, and only foot crews and aerial support can combat the fires. I recently served, at Governor Kotek’s pleasure, on the Oregon Wildfire Funding Committee to help come up with new funding mechanisms to fund a shortfall in an ever-increasing firefighting budget. These solar sites will only increase the need for state resources to fight fires once controlled by local funds and

volunteers.

This area is 100% exclusive farm use, and we have historically been able to extinguish fires relatively fast, thus preventing large losses. I carry liability insurance to cover the risk that our farm machinery might accidentally start a fire and spread to neighboring property. If these solar sites are permitted, the potential for catastrophic losses is very probable and real. I cannot afford a policy to cover such exposure. Brookfield has publicly stated that we can't be sued for accidental fires. From past experience, I know this to be absolutely false. They have refused to agree to a hold harmless agreement for historic and ordinary agricultural operations. This refusal tells me that they and/or their insurance companies fully intend to recoup losses any way they can.

These energy companies are being allowed by the Oregon State administration to intrude into an exclusive agricultural-use community, ignore all land-use policies, and extensively change the long-held practices of that area. The Agricultural community needs protection at the state level to safeguard our right to farm and prevent undue hardship from extreme liability exposure. These solar sites will be worth billions of dollars.

Because of the current wildfire risk, our fire insurance has increased substantially to the point that some companies won't even quote a policy for this area anymore. If these solar projects are eventually built, this will only increase the risk level, insurance rates, and insurability.

I find it extremely frustrating that Green Energy companies are being subsidized and given state and federal tax breaks, through enterprise zones, and state and county property tax relief through SIP agreements. These same SIP agreements prohibit reductions in local tax rates. So while we subsidize the energy companies, which are mostly foreign-owned, with our tax dollars, long-standing residents and businesses keep paying more. Everyone involved in these green energy projects is getting extremely rich. Currently, solar companies are paying 10 to 20 times the current rental rates for these farm and ranch acres. They are driving long-standing renters out of their leases and out of business.

I recently flew over Hawaii and noticed that most residential and commercial rooftops and parking lots were covered with solar panels, while very few areas were covered with solar farms. Oregon has plenty of public and private options that don't pose such a high risk and destroy farmland.

I urge you to deny the construction of any proposed solar facility based on its adverse effects on the area's cultural, historic, and scenic values. I further urge you to deny based on the extreme wildfire risk, risk to wildlife, and the devastating economic effects this will have on the current and long-standing "Ag Use" community. If you allow this to continue, it will destroy Sherman County, "The Land of Wheat," forever.

Alan von Borstel

Sent from my iPad

Sherman County Court,

We had two meetings this week, one for Speedway (Brookfield) and one for Biglow (PGE/BrightNight). I believe Joan and Justin were at both, and I appreciated Joan's comments after the Biglow meeting. Thank you for listening! Joe is no longe answering me, so I don't know how he feels about these projects.

The Biglow Project was the first and final meeting, as PGE is piggybacking on its 2006 wind site certificate. They should not be allowed to do this, since wind is an entirely different animal from Solar. No wildlife studies were done (except for birds and bats), and honestly, Tetra Tech provided **2200 pages of information** to read, which PGE and Brookfield are both using to supply us with cut-and-paste information that's too lengthy to plow through. I read as much as I could, and was disheartened by the references to "climate normal" temperature algorithms that claim our temperatures are in the 80s.

I want to address the lies we were told by developers and some speakers.

First of all, Alan von Borstel made very convincing points in Grass Valley at the Speedway meeting. Regarding the 81,000 acres signed up for solar, Brookfield Energy admitted it was using 14,000 of the 25,000 acres. That is a lot of grazing land and fire to fight, especially with the mitigation stating a 12" height for grass under and around solar panels and batteries. They still seem to think we have paid fire departments and just need a few more fire trucks. They will be providing in-person and online training for us! ***What? We will not be fighting their solar fires. They need staff on site during fire season, 24/7, like they have had to do in Gilliam County.***

Oh, and they won't sue us. *Alan said no, but your insurance company will. We can't handle that kind of liability.* And no one will give us a hold harmless clause for farming. Here is the public comment Alan submitted. You can go to the ODOE site and read the rest.

Siting Docket · Customer Self-ServiceSiting Docket · Customer Self-Service

They also claimed that BPA had given them access to the powerlines and that they would be done by 2029. ***What?*** **Another lie?**

Then, at the Biglow EFSC meeting, Ormand Hilderbrand even claimed, "The developer has engaged seriously with the permitting process and has demonstrated a willingness to address environmental considerations." He knows them because he is in CREA. Well, BrightNight has not been great to work with. Contact us, and we will provide a list of promises made and broken. Mr. Hilderbrand also said the land will be better when it comes out of solar in 50 or 60 years. ***How does he know?*** I have data to the contrary, but actually, no one knows. So, more lies.

Meanwhile, we live under Biglow and have seen the horrible job they have done. Four years after the blade dropped, 40-50 towers are still broken every day out of 217. Actually, they are too dangerous to run, so I'm glad they are shut down. It took them 9 months to build Phase 1 in 2007, and it is going to take 4 years to fix it? On top of the four years we have already waited since the blade dropped. Why will solar be any different? They need to get the Phase One Vestas towers running and show 96% power produced before they can build solar.

We really could have used some support from the courts and some truth from our taxpayer lobbying dollars that go to CREA. Balance. Both sides, please.

Finally, we are tired of watching our taxes go up year after year. Either renegotiate the SIPs or stop granting them.

2:31:51 & 3:36:44 for McCullough's part. 2:47:34 for Ormand's. 3:11:18 for Amanda Whitman. (BTW, she has not been contacted in the Conservation Office.) I also highlighted them in the EFSC meeting transcript below.

Chad Higgins also had to weigh in and tell us how great agrivoltaics were in The Valley! Oh, and at 2:18:44, there was a discussion about grasses and how some will stay green year-round (!) and provide a fire break!

These people are delusional. Colt supports (as we do)the ODOE recommendation of 1- 3" maximum during fire season. That we can live with, if it is written into the Site Certificate. But the mechanical failures were in the 2008 Amended Site Certificate, and PGE was never held accountable. In fact, PGE repeatedly stated that they had never had any violations or citations on Biglow! **Because you never reported anything!!!! Their feet were not held to the fire.**

Honestly, the EFSC counsel listened and even called us back up. The EFSC counsel members on ZOOM even questioned whether they had the power to stop Biglow Solar! We are hopeful. However, we could have used some support from the County Court, rather than grandstanding by a CREA representative who is a developer who wants solar on his property.

Sincerely,

Kathy & Kevin McCullough

I am writing you concerning the NOI for the Speedway Energy facility proposed for Sherman County Oregon.

I am a 4th-generation farmer/rancher in Sherman and Wasco Counties, working with my son, who is the 5th generation. Our ranch is in direct proximity to or borders portions of the Bakeoven approved solar (1,270 ac), Daybreak approved solar (1817ac), Sunset approved solar (1817ac), and Yellow Rosebush under review solar (8075ac). We also border the Buckley under-review solar project (7852ac) and the Speedway NOI solar project (14000ac solar with wind, totaling 25000ac).

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Alan von Borstel

Sent from my iPad

0:00
Ready to go.
0:17
Good evening and welcome. I'm Cindy Condan. The time is now 3:32. I would
0:23
like to call the January 15, 2026 meeting of the Energy Facility Sighting Council to order. Mr. Secretary, please
0:31
call the role. Cindy Condan here. Marcy Grail
0:36
here. Kent How here. Richard Develin.
0:49
Richard Delin. Do we know if council member Develin is
0:54
on?
1:00
Hello. Okay. Anyone hear me? Yep. Yeah. Yes, we can hear you. Thank you. Council
1:05
member Delin and Patty Perry here if you can hear me.
1:12
We can. Thank you. Uh Chair Condan, you have a quorum. Thank you, Mr. Secretary. Are there any
1:17
agenda modifications? Chair condan, there are no agenda modifications at this time.
1:23
So, we'll just get a little bit a little bit closer. A little bit closer. How's this? Yep.
1:28
Good. I have the following announcements for council members and anyone addressing the council. Please remember
1:35
to state your name clearly and please do not use the speaker phone feature as it
1:40
will create feedback. Please mute your phones and if you are joining us by phone and receive a phone call, please
1:47
hang out from this call and dial back if after finishing uh in after finishing
1:53
your other call. For those signed in onto the webinar, please do not broadcast your webcam. For agenda item
2:00
C, public comment period, and agenda item F, the Big Low Canyon Amendment for
2:05
public hearing, there are three ways to let us know you are interested in providing comments to the council.
2:12

One, for those in person, please fill out a registration card and submit to Nancy Hatch, who is our administrator.
2:20
Um, two, for those using the WebEx, you will need to use the raise your hand
2:25
feature. Three, for those on the phone only, you will need to press star three,
2:31
which will alert us that you want to speak, and Nancy Patch will unmute you
2:37
as necessary. We will go over these options again during that agenda item.
2:42
If you want to receive future email notifications of council meetings, project milestones or rulemakings
2:49
through our click dimensions program, you can do so by clicking on the link in the agenda or on the council web page.
2:56
Look for the green box on the right hand side of the page that says sign up for emails updates. You are also welcome to
3:04
access the online project mapping tool and any documents by visiting our website. Please note that the audio and
3:11
video of this meeting is being recorded and may be posted to the council's website following the meeting. Energy
3:18
facility sighting council meetings shall be conducted in a respectful and courteous manner where everyone is
3:24
allowed to state their positions at the appropriate times consistent with council rules and procedures. Willful,
3:31
accusatory, offensive, insulting, threatening, insolent, or slanderous comments which disrupt the council
3:38
meeting are not acceptable. Pursuant to Oregon Administrative Rule 345-011-0080,
3:46
any person who engages in unacceptable conduct which disrupts the meeting may
3:51
be expelled. So, first on our agenda is um the
3:57
consent calendar and this is an action item approval of the November 21st, 2025
4:03
meeting minutes. Chair Condan. Yes. Councelor How?
4:09
I move that the council approve the minutes of the November 21, 2025 meeting

4:15
as presented and recommended by staff. Do we have a second online?
4:22
Chair Con and this is Marcy. I second that motion. Thank you, Councelor Gra.
4:29
Madame Chair. Yes. I was not present for this meeting, so I'll be abstaining.
4:36
Thank you, Councelor Develin. Mr. Secretary, you please call the role
4:41
or further vote. Ken Hal, yes.
4:46
Patty Perry, yes. Cindy Condan, yes.
4:52
Marcy Grail, yes.
5:00
Motion carries, Chair Condan. Thank you, counselors. And now for the council secretary report.
5:05
Thank you, Chair Con. Give me one second.
5:16
Uh I'm going to first start with project updates. Um so the first project update
5:21
is the Wellsprings project. So we received the notice of intent for that
5:27
project on January 2nd. Uh the project would be a 750 megawatt solar PV project
5:35
with 500 megawatts of battery storage on approximately 7,365
5:42
acres or 11 square miles. The project location is in Mororrow County, approximately 5 miles northwest
5:49
of the town of Ion. The parent company is Emanate and that's capital M, capital
5:56
N, and then the number eight uh energy development company LLC. Um
6:04
the department's project web page will be live tomorrow. This is a fairly new project. So um project page will be up
6:10
tomorrow. Uh and we anticipate sending the public notice uh of the receipt of
6:16
the notice of intent uh and a comment period by next week as well. That is also a reminder for uh at least state
6:24
employees that Monday is the Martin Luther King Jr. holiday. So we won't be working on Monday, but um we will try to
6:30
get to it after that. This is K. Did you say that was Mororrow

6:35
County? Yeah, that's in Mororrow County. So I mean generally I mean if you can kind of picture where the Borman bombing range
6:41
is. Yeah. And so if you go kind of south of the Borman bombing range kind of south and to the west of it. Um so it's you I
6:48
described it as sort of 5 miles northwest of Ion and that's correct but it's also kind of southwest of the
6:54
Borbin bombing range bill. Thank you. The uh next update is the Sunstone solar
7:03
project. So at the November council meeting, there was a discussion regarding the parent company of the
7:08
Stonestone Solar Project going into bankruptcy. So they were planning on submitting an amendment to split the
7:14
site certificate. They withdrew that. Uh and there was some conversation um that we had kind of uh they explaining kind
7:20
of all of that. Um so as a reminder what that project is, it was approved by council in November of 2024.
7:28
uh includes 1,200 megawws of solar, 1,200 megawatts of battery storage and
7:33
it would be on approximately 9,442 acres or 14.75 square miles. Um that's
7:41
also in Mororrow County. Um on Tuesday, I sent council members an article that
7:48
Amazon won the bid to purchase the facility, although I just found out that I think you need a a login to be able to
7:54
access that. So, my apology. We we'll follow up with that with the the uh the
8:00
information from the article and we'll just copy and paste that and put it into a email so you can see that. But I mean
8:06
again uh Amazon won the bid for that and they are now um I well I don't know if
8:11
now they're the owner but they are essentially going to become the owner. Um but as we discussed at November the
8:17
November meeting just as a reminder um the Sunstone can sell it to them and
8:23
Amazon can buy it but until Amazon comes in and requests and receives approval

8:29
for a site certificate transfer amendment they can't do anything with the project. So again a site certificate
8:36
is functionally a business contract between the state of Oregon FSAC on behalf of the state of Oregon and the
8:42
developer. We currently do not have any business relationship with Amazon for this project. That will have to be
8:48
established first before they can move forward on doing anything related to the site certificate.
8:56
Um, next project is the saddle but energy facility. So, at the December council meeting, I let you know that we
9:02
have received the notice of intent for that project. This would be a 488 megawatt uh wind energy project
9:09
consisting of up to 70 wind turbines uh each up to 698 ft tall. I'll say that
9:16
again. 698 ft tall. Uh there would also be 4 488 megawatts of battery storage.
9:25
The project location is in Gillum County approximately 6 milesi southwest of the city of Arlington. Uh the parent company
9:32
is Brookfield Renewables. they own the Shepherd's Flats facilities.
9:37
Uh so it's kind of in in range geographic range of th of those facilities. Um since the December
9:44
meeting, we have set up a project page. It's available. Uh we've provided public notice and then um we held a public
9:51
information meeting in Condan on Tuesday. Uh and the public comment period on the notice of intent concludes
9:57
on January 30th. Next is the Speedway Energy Facility. So
10:05
like the Saddlebut Energy Facility, at the December council meeting, I let you know that we received the notice of intent for that project. That would be a
10:13
1,400 megawatt solar, PB, and wind project and including 500 megawatts of
10:18
battery storage. The project is located generally southeast and northeast of exactly where
10:25
we're at right now. So, if you look, you know, kind of in these directions of this building, it would be all around

10:31
this building. Maybe not on that side, but but all around where we're exactly at right now. Um, the parent company
10:39
also is Brookfield Renewable, same as the Saddlebut Energy Facility.
10:45
And, uh, we had a public uh, so yeah, we had a public information meeting in this
10:51
room last night. Uh and the notice of intent concludes on January 23rd. So
10:58
this has been a bit of a busy week in terms of meetings and hearings and getting on the road.
11:05
Uh next is the Yellow Rose Bush uh facility. So the Yellow Rosebush energy
11:11
facility. So this would be 800 megawatts of solar PV, 800 megawatts of battery
11:16
storage on approximately 8,000 acres, about 12 square miles. The project
11:22
location is in Wasco and Sherman counties east of the city of Mppen. The developer of Savon LLC, which is a
11:29
division of the Royal Dutch Shell Company. At the November meeting, the council reviewed the draft proposed
11:34
order and all comments that were made uh or that were received and provided direction to staff to make changes in
11:40
the proposed order uh which we did. And uh we issued the proposed order uh and
11:46
included also a notice of opportunity to request to participate in the contested case. That's a mouthful, but I think it
11:52
bears clarifying. Frequently, people say they've asked for a contested case.
11:58
There is a contested case with every application. It is an automatic step in the process. The distinction is if
12:04
anybody requests to participate in it. Um, and we did have two requests to
12:09
participate in the contested case. So, at this point, um, that has gone to the,
12:16
uh, you know, we contract with the office of administrative hearings. they provide a uh a contested case uh or a
12:24
hearing officer uh for us for that and that hearing officer uh will be the one
12:30

that's evaluating those requests for contested case to make sure that they uh justify participation. And so we if
12:38
there wasn't any requests for participation in the contested case, we would have had the council's review of the final decision tonight. Um but that
12:46
will take some time. So, we'll keep you up to date on that and that will certainly be updated in my secretary
12:52
report as well as in the monthly sighting report. Uh, next is the leaning juniper 2A uh
13:00
amendment determination. So on December 21st, the department issued its
13:05
determination. Uh we received a request uh for an amendment determination uh and
13:10
that was that um
13:17
yeah their their request was that they wouldn't have to go through the amendment process. So the changes that they were proposing wouldn't trigger an
13:23
amendment. No. Um and the changes proposed uh included uh a tax equity sale lease
13:31
back transaction with certificate holder and a national financial institution
13:36
under which um that institution would acquire the legal title to certain
13:41
facility equipment as personal property and simultaneously lease that equipment back to the certificate holder under a
13:47
long-term lease. So the department's determination uh was based on an evaluation of Oregon administrative rule
13:54
345 division 27 0350
14:00
and those are the factors where uh an amendment is required and none of those
14:05
factors triggered. We've had this kind of request previously I believe one time and and made the same determination. Um,
14:12
however, because this is a determination, you know, that an amendment is not required, council has
14:18
the opportunity to request that that be brought forth to council as an agenda
14:24
item where you would review it and you could then come to your own conclusion whether you agree or disagree uh with

14:30
that determination.
14:36
Just raised my hand myself. Um, thank you, Secretary Cornet. question about
14:41
that and I am not sure um
14:47
about the review necessary but this is the second time we've had
14:54
something similar come up and I'd like to make sure uh we understand what it as
15:00
these get more complicated in terms of the structure um that we understand kind of the full
15:08
um responsibility associated with it and how it plays out
15:14
over time. I mean, I understand the words that you're using, but I'm not
15:19
sure what it means to us versus what it means to the company itself. So I'm wondering if there's an opportunity to
15:25
do it, not necessarily to review the decision of uh the department, but to
15:31
really understand why the decision was made or how the decision was made uh based on your
15:39
understanding of the risks associated or long-term long-term process for it.
15:44
I hope that makes sense. Yeah, I mean this is something either again this particular one it's totally
15:50
within council's authority to say we want to take a look at this ourselves. Um we want to take a you know review it
15:56
and we would then put it on a future council meeting and then we would provide you know our analysis well their request their analysis our request or
16:04
our determination our analysis to you and you could come up to your own conclusions and and certainly ask us
16:10
more more questions and then the certificate holder more questions about it as well. That's an opportunity. You
16:16
know, you know, we've looked at it. We don't believe that it triggers an amendment as those um rules kind of
16:23
require right now. This is also the second time I believe I'm going to look at Sarah. Yeah, second time that we've
16:28

seen this. We don't know if there's going to be a pattern or not. So, this could also be, you know, outside of this
16:34
specific action. Um this could be determination. I won't say action, I'll
16:40
say determination. Um, we could do this in the future as an information item
16:45
where we explore this sort of outside the context of a request. Um, it's hard to do head nods in the
16:51
room, you know, about whether we we want to do it or not. I know I would like at least anformational
16:57
uh session on it, especially as we're looking at organizational expertise
17:02
uh standard and financial assurance standard. Uh to me that all fits together.
17:09
Councelor How any Secretary Kernet you said you bring it
17:15
to us once you've made your determination. That's what I'm doing now. So the the way the amendment determination process
17:20
works is you know and and a a site certificate holder is not obligated to use this process. It's to their benefit.
17:28
They could make some choice, put it in their annual report and include that as a sort of a facility modification. We
17:35
would then review that and then the risk is that if we determine, oh, that should have been an amendment, well, they've
17:41
already made these changes, they then are forced to come back in. So, it's to their benefit that they, you know,
17:47
frequently choose this method, which is to get some, you know, validation, you
17:53
know, kind of officially that, you know, an amendment is not required. And so, you know, what they do is they they make
17:59
their case. They say, here's the requirements of when an amendment is required. this is what we're proposing.
18:05
You know, presumably they're going to say, "We don't believe this triggers these things." We then review that
18:10

ourselves. And then the requirement is at the next council meeting after we make our determination, I provide this
18:18
update to you. And then again, your ability is to either say, "Yeah, that
18:23
that sounds great." Or if you're like, "We really want to take a look at this ourselves and we want to do the
18:29
evaluation of all of that information." That's absolutely within your authority.
18:36
I myself am fine with the staff evaluation as
18:41
this is Marcy um and I agree with uh council member how I'm fine with the
18:48
staff evaluation as well. And just uh to clarify I'm fine with the
18:56
decision. It's the information that I'm anformational item that I'm asking about
19:04
um not necessarily related to that this project, but how these these structures
19:10
they're different um and how they how they work in a project for both the
19:17
developer and uh the state. So yeah, I mean we could absolutely put
19:24
it on the list for a future council meeting if you want to do it as a as an information item. Yeah, as an information item that
19:31
doesn't hold this uh then that sounds fine to me. Sure. Sorry. Nancy, we turn the heat
19:36
down a little bit. It's starting to get warm right here in here. Councelor Develin or Perry, any any
19:44
thoughts? Yes. Thank you, Chair Condan. I I would be interested
19:53
as you are with the information making it anformational item
20:00
on one of our agendas to just understand a little bit more about that process. I
20:07
totally agree with um you know allowing the
20:13
staff to be able to make those um or the re reviewing body
20:22
uh review uh those requests as appropriate and um I I would just like
20:30
to know how they do that. Councelor Develin,
20:37

I would actually concur with those statements. I would be fine with having a presentation about the process, but I
20:43
mean ultimately uh the process I think should stay at the staff level to make that determination.
20:51
So, so sorry for for the record, Todd Cornet, just for clarification. My understanding was not the amendment determination process and how that
20:57
works, but it was more specifically this specific type of request. Yes.
21:03
The sale lease back. Yes. Yes. Okay. Good.
21:08
Which was the previous one as well with the sale on lease back. So yeah,
21:13
I think we're all in agreement. We'll make a note of that. Nancy, can you put in note of that for a future agenda item? Thank you.
21:22
Okay. Moving on to compliance updates. So um you know as I've indicated before
21:29
the way that the annual reports work is the um so for in this case the 2024
21:35
annual reports every certificate holder has to submit a report annually. The ones that they did for the calendar year
21:41
2024 were have to be submitted most of them by the end of April 2025. So then
21:47
that gives us the you know the time to start working and reviewing those. We're getting to the end of those reviews.
21:53
Didn't quite finish. We've done all of the initial reviews. Uh we've requested
21:58
some additional information from some of the certificate holders um to provide additional information to clarify that
22:04
they meet conditions. We're still waiting to hear some from some back, but we're getting close to concluding those
22:09
which which is great. Having more staff resources is hugely beneficial. Um but I
22:15
do have two quick updates uh on uh two of the Shepherd's Flats facilities.
22:21
So, the Shepherd's Flat Central u again we kind of talked about that Brookfield uh in Gillum County just to the south of
22:31
Arlington. That's a 265 megawatt facility. Uh it's been in operation
22:36

since 2012. And uh with regards to their meeting
22:42
their conditions, I provided an update on uh Shephardd's Plat Central last
22:48
council meeting. It's really these are the same things. There have been sort of persistent issues with weed control and
22:54
reveation management uh since construction or reconstruction of the
22:59
well initial construction of the process or the project and then also following
23:04
the 2019 repower. So they know that we know that they're working on it. We're
23:09
you know being clear with them. So we're looking for more information. Um yes, thank you. I meant to say turn it on
23:17
there. Um, and yeah, that won't be concluded until 2026. Um, it's just, you
23:23
know, we're I know we're in 2026 now, but it'll take a while because there's some pretty significant, you know, sort
23:28
of detailed information has to be evaluated and provided. So, but as I said, they're diligently working on it.
23:34
We're diligently working on it, and we do believe that we can kind of come up to speed on those in 2026.
23:40
um Shepherd's Flat South kind of similar that's a 290 megawatt facility located
23:47
in Gilam and Mororrow counties also operational since 2012. Um the majority of the site is under
23:55
cultivation for wheat production. Um but the site also has had persistent weed control and reveation uh kind of
24:01
management issues. So really the same thing as the the other one. um they are diligently working on it and we do
24:08
expect to have that all concluded um in 2026.
24:15
Okay. Next on my list is um executive order 2529.
24:21
So I brought this up at the I was the last council meeting or the one previous to that. So Governor Cotch issued this
24:28
executive order in November. This order requires the Department of Energy to

24:34
take several d undertake several directives in coordination with other state agencies. Uh and it includes two
24:41
required studies to be submitted to the governor by September 1st of 2026. U and
24:47
these studies are being um led by our PNI division policy and innovation um
24:53
and also us to some degree um and I'll indicate what that means in a second. So for one of the studies um ODOT is
25:00
directed to inventory, assess and analyze barriers to permitting,
25:06
construction and interconnection of clean energy projects and associated infrastructure.
25:12
For the other study, ODO is directed to evaluate and recommend actions to update sighting and permitting processes to
25:17
facilitate deployment of renewable energy, energy storage and grid infrastructure. Those are the mandates
25:24
in the executive order. So, we will be looking we'll be working on this, you know, in the coming months
25:31
and we'll be giving you updates as to uh what we're doing. We will likely be doing some outreach on that as well, but
25:37
again, we will ultimately have to provide a report to the governor by September.
25:44
And then great, next slide. You got it. So, uh we are soon to be entering into
25:50
the short legislative session. So, I've included um on this slide the schedule.
25:56
Again, it's the short session. So, it really isn't very long. That doesn't mean it won't be significant. It just
26:01
means it's short. Um and we do already anticipate there being some legislation
26:07
related to energy facility sighting and maybe energy facility sighting council uh your statutes specifically. Uh but
26:15
you can see you know the session starts on February 2nd and then there are
26:21
always uh deadlines uh or bills basically start to die. So bills have to
26:26

be posted for a work session then they actually have to have a work session and if they don't meet those thresholds then
26:32
they basically just move out. So there always ends up being like some huge volume of bills and it starts narrowing
26:39
down pretty significantly. So you can see the deadlines for the first chamber and then the deadline for the second
26:44
chamber and then March 8th is the constitutional end of session. So it has to be done by then. So like the long
26:51
session um I'll be providing updates in the monthly sighting report and the secretary report the difference is in
26:57
the long session there's a lot more time to sort of understand what's going on
27:03
and see this. And with a short session it's um February and by the time we have
27:08
March it's done anyway. So there won't be much time. So I might be submitting uh information to council outside of the
27:15
monthly sighting report and outside of council secretary report at a council meeting just so you're updated as to
27:21
what kind of legislation relates to you. Um another update
27:29
and you're probably not tracking this but there are now new federal visibil
27:35
visual accessibility requirements. Um and these are applicable to all
27:40
government agencies, state agencies, I believe local governments as well. The purpose of those is to ensure that all
27:47
people including any with any kind of visual limitations can access all websites and digital information. So you
27:54
know you go onto you know a website and if you have sort of visual impairments you may not be able to see that
27:59
information. So now you have pretty sophisticated screen readers and other types of devices that actually can
28:05
provide you know the content to somebody who has you know sort of visual limitations. Um and so we're by by end
28:13

of April we have to be compliant with those federal requirements. Agency is moving forward. We're moving forward. BB
28:19
and Nancy have already been working on templates. Um really this is just a way to kind of make sure that as you're
28:26
going to start to see some variations and some differences uh in the PowerPoint presentations.
28:31
Um you know if we have a a map or a chart or a graph or a screenshot there
28:37
has to be alternative text associated with that because somebody can't necessarily see that the screen reader
28:42
would have to be able to read what that image or what that graph is. So we're
28:47
we're just coming up to speed. um you know but we have until April to figure that out. So again we're already working
28:53
on it but you know just as a you'll start to see those changes and we also
28:58
will need to provide a handout to anybody who submits um slides for the
29:04
council meeting or anybody you know all of our our applicants they will have to submit information digital information
29:10
that meets those requirements as well. Just a question on that. I presume that
29:17
the agency gets support from from a
29:23
resource. You're not doing all of the all of the work
29:29
to get it done. You're not you are doing I mean it's a it's an enterprisewide
29:34
thing. Everybody within the state of Oregon um I'm not sure how much sort of direction and detail is coming out of
29:39
the Department of Administrative Services. My understanding is a lot of state agencies are really sort of having to chart this course by themselves for
29:46
now. I'm sure as anything changes, you know, that sort of change is difficult.
29:51
Likely we'll see probably more consistency in the future, but my understanding is right now it is largely
29:56
um at the individual agency level. Thank you.
30:03

on my list is uh next council meeting that will be February 13th, Friday the
30:09
13th will be in Salem and uh we only need that Friday meeting and um we
30:16
anticipate right now that that would end around 1 p.m. So it won't be a very long meeting
30:23
and I will not be at that meeting. Correct. I'm just going to say I'm not going to I was going to try and make it but I I
30:29
will be absent. I think being out of the country is is a realistic absence.
30:37
Um, and that concludes my secretary report unless any council members have any questions. Madam Chair, any Yes, councelor Delin.
30:45
Madam Chair, just a quick question to the secretary. Um, I was looking in
30:50
previous evenings uh on the website and sometimes you can find things on the
30:57
websites and sometimes you can't. Sometimes they exist, sometimes they don't. But I was trying to look to see
31:04
if there were any cumulative reports from on the compliance side or any
31:10
cumulative reports on I think what we refer to as incident side. What I mean is some way to query like if you had a
31:18
particular applicant before you uh who perhaps had an amendment, not necessarily speaking just about the one
31:25
of the ones we have this today, but where you could actually do a query
31:31
where you could find out what previous compliance reports have shown and
31:36
cumulatively what incidents there have been at that site.
31:42
And if it's not available, that's fine because I I I at this point cannot
31:48
estimate what it would take to actually make it available other than a member just simply making a specific inquiry.
31:57
Yep. Thank Thank you, Council Member Develin. Um uh timing is uh is
32:03
interesting that you ask for this because we just had a compliance meeting today. compliance team is working on
32:08

their presentation for next council meeting. And this is exactly one of the things that we discussed. What are the
32:15
types of things that the council is interested in either being, you know, presented at a council meeting um in the
32:22
the during uh like the monthly sighting report or or in other avenues. I mean,
32:29
so that information is sort of theoretically available. We'd have to conduct the research and then pull it
32:34
all together. So, we don't have it sort of nice and packaged up right now, but it is a good question and this is one of the things I want council to think about
32:41
as the compliance team comes next month. What are you interested in the compliance side? What do you think the
32:47
public is interested in from the compliance side? We have the resources now to be able to spend a lot more time
32:53
and pull that kind of data together. So, your question is, yeah, can we do that? Absolutely. Can we do that, you know,
32:59
could we do that today? No. um you know but this is the kind of stuff will be very helpful to hear about at the next
33:06
council meeting so we can start changing that program to have you know more information available to the council and
33:13
members of the public you know and then also thinking about you know as we've initiated the rule making for compliance
33:19
you know what kind of rule changes you know may or may not relate to some of these questions you know we don't have
33:25
to create rules to do those types of things but um there can be overlap so I
33:30
think it will be helpful to be thinking about that and so I I appreciate the timing of your your question. It was
33:35
literally like three hours ago we we had a similar type of conversation so it was very good timing.
33:41
Thank you. Thank you councelor Develin and just a comment about that. I I think that is
33:47
the next stage in a process that we started I think two years ago to have a

33:53
compliance report every meeting. And so I think all of us are probably getting
33:58
uh more comfortable with okay here are the issues here are the uh projects
34:04
involved and so the logical next step is I think exactly what councelor Develin
34:10
uh is asking about. Yeah, and as I said, now that we have the actual resource, the staffing resources to do that, now
34:16
we have three people, it makes it much easier to do those kinds of projects like with one person, you know,
34:22
scrambling just to try to keep up with everything, the huge volume of work that had to be done on an annual basis was
34:28
was over it's still overwhelming even with three people. But we can start to do these things and as I always say, you
34:35
know, we do three things, you know, within the sighting division. you know, we do the review of applications and
34:40
amendments, we do rulemaking, and we do compliance. And you see the first two, you know, almost every meeting. You
34:47
don't see compliance as much, but it is just as important as the other two. And so, we want to kind of amplify
34:54
that program and provide the information that you want in the way you want it. So, please be thinking about that. And
35:02
the other thing I'll say is I I also think that as we get these compliance
35:07
reports at least it makes me think about well what could could we do at the beginning of the process as we see the
35:13
project start to make sure we have that in place. So no and that's that's tying the compliance team with you know reviews of
35:20
the applications and amendments to ensure that those conditions that are being created are as clear and
35:25
implementable as possible. Yeah, there there's a lot of overlap between, you know, these sort of subprograms within
35:31
the division. That's great. Thank you, counselor Delin.

35:37
Any other questions? Again, I can't see um on the screen, so
35:43
feel free to just speak up. Okay.
35:48
Thank you, C. Thank you. Thank you, Mr. Secretary. And
35:54
now we'll move on in the agenda. We'll have Summit Ridge renewable energy facility notice of intent extension
36:00
request. Sarah Esterson, senior policy advisor. Um and we will review the
36:07
request with the beginning with the presentation from Miss Esterson.
36:14
Good afternoon, Chair Condan, Vice Chair Byer, and members of the council. Um if
36:20
we could go to the next slide, please Nancy. So, let's start with a little background. Summit Ridge Wind LLC, the
36:28
certificate holder, has requested to extend the notice, the expiration date of their notice of intent for the Summit
36:35
Ridge renewable energy facility from January 25th, 2026 to January 25th,
36:41
2027. Um, the Summit Ridge renewable energy facility is a 261 megawatt wind and
36:48
solar facility proposed in Wasco County. for your reference.
36:55
So, um you have rules that apply to an a notice of intent extension request and
37:01
those rules establish your scope of review. Um that scope includes review of two criteria. Um one is a a timely
37:10
criteria and the other is good cause. The timely criteria establishes that a
37:15
request for extension of a notice of intent expiration date must be submitted at least 45 days prior to the expiration
37:23
date. And as I mentioned, they also have to provide or describe um a good cause
37:29
for the extension request. Okay. So let's review the criteria.
37:36
Uh the first criteria of timely. So the NOI expiration date was January 25th,
37:42
2026. The request to extend the expiration date was received on November 24th,
37:48

2025, which was 62 days prior to that deadline. So we are recommending that
37:54
the timely submission criteria is met. And then for good cause um and I said
38:02
certificate holder earlier, I meant applicant. The applicant provided two reasons to justify the extension request
38:09
which are somewhat interrelated. Um, but they've requested more time to allow landowner negotiations primarily due to
38:16
uncertainty and changes in Bonavville Power Administration's uh planning for a
38:22
substation that they the applicant had been planning to interconnect to. So they said they need more time to
38:29
negotiate sighting given changes. And then the the additional reason was that
38:35
um BPA has sort of changed their mind on the funding of the substation but they
38:40
still want an agreement in place so that they can tie in. Uh applicant has
38:46
indicated that they would come to an agreement execute an agreement in late January or February.
38:52
Um and we did ask for some sort of additional description and details so
38:57
that we could evaluate the merits of this representation of landowner negotiation and we feel like they
39:03
provided that upon request. So um now I think next slide please
39:10
Nancy. Um, we are recommending that council um find that criteria have been
39:17
met and that the um NOI expiration date may be extended by one year. And we'll
39:23
now turn it over to you for deliberation and possible decision.
39:28
Council members, any comment, questions?
39:33
Mrs. Marcy, I have none.
39:39
Councelor H. I have none. Um I have um one.
39:46
Um can you go back to the previous slide? Um it's just are do you have a
39:53
feel for the order of um the sufficient time? Does the planning with

40:00
BPA and the negotiation with land owners occur at the same time or do land owners
40:06
want to understand that there is a BPA an agreement with BPA first or vice
40:12
versa? BPA wants to understand that no you have the you have the agreements
40:18
with land owners and you're ready for the interconnect. Do do you haven't I I don't think I know the answer to
40:25
that. Um but in their discussion it they described that there's been like years
40:32
of waiting for BPA to move forward and a decision on this substation and then
40:37
there was significant staff turnover um earlier in the year and then there were
40:43
changes with the substation that necessitated new negotiation with landowner in terms of sighting. Okay.
40:50
So, I can't speak to what the land owners knew to be true before the uncertainty came about.
40:59
An additional question. How many extensions are allowed for the notice of intent? One. Is it just one? Okay. Uh, thank you. If
41:08
there are no other questions or comments, Chair Condan, I move that the council
41:14
find the petition by the applicant to extend the expiration date of the notice of intent for the proposed Summit Ridge
41:21
renewable energy facility was timely submitted and demonstrates good cause for the extension for the reasons
41:28
described in the staff report. I further move that the council approve the extension of the expiration date of the
41:34
notice of intent for the proposed Summit Ridge renewable energy facility by one year for a new expiration date of
41:41
January 25, 2027. We have a second.
41:47
Patty Perry here. I will second that. Thank you, Councelor Perry. Any more
41:53
discussion with that? Secretary Cornette, can you
41:59
call for the vote? Cindy Condan, yes. Richard Delin,
42:09

yes. Yes. Marcy Gra. Yes.
42:14
Ken Hal, yes. Patty Perry, yes.
42:20
Motion carries. Check on them. Thank you. And now to the next item. We have a public comment period. Sorry,
42:27
we're a little bit uh late in that according to the the timeline. Um
42:34
uh this time is reserved for the public to address the council regarding any item within council jurisdiction that is
42:40
not otherwise closed for comment. In the agenda, we have set the amount of time for individual commenters to 7 minutes.
42:48
Nancy, how many comment cards and raised hands on the webinar and phone do we have? At this point, we have one
42:56
commenter in the room, and there are no hands raised yet.
43:02
So, we can go ahead and call Jennifer Miller to go ahead and come on up and make your comments.
43:23
And if you could start with name name and address and spell your name, that'd be great. My name is Jennifer Miller. Uh, boring.
43:30
J E N I F E R M I L L E R. Um, and I live in Hermiston, Oregon.
43:37
And my comments are just really general. I have a letter that I'm reading from and I will hand that over when I'm
43:44
finished so it can be submitted to the records or I'll read you that. Thank you.
43:50
So my name is Jennifer Miller and I'm here representing both myself and Octa Oregon and California Trails
43:55
Association. My comments at this moment, excuse me, are general ones. I would like to ask
44:01
the council to look at projects projects from say a helicopter view. This area of
44:06
eastern Oregon is being covered rapidly by wind, solar and transmission activities. Valuable farmland, farmland,
44:14
and native flora and fauna is being crowded out almost daily. Exclusive farming/sweet fields are being bought or
44:21

signed over for projects with little guard to how our food will be reproduced in the future. Wheat fields, grazing,
44:28
and rural means of making a living are being drastically affected. It seems as
44:33
if the locals have to operate under one set of rules while energy projects get others and there is not much consistency
44:40
in this particular area and I mean this grass valley area of course there are historic trails that need to be
44:46
considered the Barllo road cutoff runs through this area and I do know that this council was addressed last night by
44:51
Wendell Baskins so I'm we're part of the same group and I'm just continuing some of those comments
44:57
um very quickly. Sure. I think only uh Chair Condan was online last night. The other council
45:03
members um didn't didn't hear Mr. Baskin. So, and if that makes you want to change your public comment today, you
45:10
can. But just to make sure you know that the rest of them didn't hear that. That's fine. I was just saying Yeah.
45:17
just so um I'm just saying that um some of the projects that are happening in this area are not I think some of them
45:24
are not knowledgeable that there is the Barlo road cut off and that projects do need to know about that going into you
45:30
know just from the very beginning knowing that this historic trail cut off does exist and it would be really
45:37
helpful if that cutout route could be added to layers on the FPSC project maps so like when we go in and look at things
45:43
we can see where the main historic Oregon Trail is but we also feel that the Barllo Road cutoff needs to be added
45:49
as well because it is also a very historic trail within the site within the boundary of Oregon plus the other 15
45:57
16 major historic trails. Um so we're just I'm asking if that map
46:03

could be added and I know OSU has something to do with the mapping so some kind of coordination perhaps could be
46:11
done to make sure that that cutoff map can be included. Um, I do have two maps
46:16
that were also here last night, but I will submit mine as well so that people today can look at them. Um, and hope
46:24
that that this blue line that's on these maps could be added. So, in conclusion,
46:29
my request is just that a bigger picture is viewed instead of the projects or piece, you know, looking at peace meal.
46:35
Um, the overall overall impact to this whole area is huge. It's just not a series of parcels, but a unique and
46:42
amazing landscape that has its own beauty and and importance.
46:47
Any questions? Thank you for your comments, Miss Miller. Any questions?
46:55
I don't hear anybody, but I do have one. Um, so I'm curious, and I did certainly hear
47:01
the comments last. I am curious if the association
47:06
that you're a part of if you have um commissionation
47:14
or um scheduled meetings with land owners who are all part of a part of
47:20
this process. We often don't know which land owners are impacted until we can look at the
47:26
project on the map. So sometimes we're uh sometimes we don't even know about it
47:31
until it's almost too late that it's even happening. Um, as people are learning more about Octa, the Oregon and
47:39
California Trails Association, some projects are reaching out to us so that we can start working on things ahead of
47:44
time and and trying to create that space where, you know, preservation can be
47:50
worked into the project if at all possible. And so, um, does that answer
47:56
your question? So, so yes and no. Like, we don't always know who owns what. And of course, most projects have
48:03

non-disclosure agreements signed. And so it's hard to know who knows what and who's willing to talk about what. And we
48:11
understand that projects are going to happen. We understand that we need energy. We're just trying to do what we
48:17
can do to save as much as we can while it is possible.
48:23
Thank you. Yeah, I I appreciate that. It's just it kind of um was opaque to me
48:30
about what happens beforehand, what you know, what communication could be done. It would be great if we could get in on
48:37
projects way sooner so that we could look up and then say, "Oh, that's not any threat of the trail." Um that's
48:44
that's that's fine. Like that's not a problem. Or this is going to be a huge visual impact.
48:50
Let's see what we can do about that. or please don't put that transmission line directly along the length of this
48:56
section of the trail. Perhaps cross it instead and parallel it but you know a further distance away so that it's not
49:02
such a big impact. So I mean there's lots of things that we try to do to to
49:08
keep the story alive. Okay, Secretary Cornette. Uh yeah, thank you Chair Con for the
49:13
record. Todd Cornet, um are you signed up to receive our monthly sighting report? Yes. Okay, good. because frankly we usually
49:20
don't even know the details of a project until they submit their notice of intent. So you know whatever has occurred before then we're not even in
49:27
the loop on. So when we get that notice of intent and then we start to put it in the monthly sighting report or we
49:33
provide the notice that's really the first time that we have any indication. But it is important to know that that's the pre-application stage. So
49:40
identifying anything any resources obviously your your your interest is in you know primarily with the with the
49:46
trails but that's the time to do it is during those notice of intent right comment periods right and I'm sure that I mean know it's
49:52

not just the trails I mean like there was a huge native presence in this area for hundreds of years and so that is
49:58
also an important thing right thank you welcome thanks for being here
50:08
Nancy See, sorry. All right. Uh, so at this point there is one person with their hand raised, but
50:14
let me just go ahead and remind everyone how to raise their hand and you see it on the screen in front of you. Um, if
50:21
you are on the webinar, you're going to click on the participant window at the bottom of the screen. You're going to
50:27
push the hand icon and that will raise your hand. When you're finished commenting, you're going to click it again to lower it. If you are on the
50:34
phone, push star three on your keypad to raise your hand and star three again to lower your hand. So, at this moment, I
50:41
will unmute. I have Miss Irene Gilbert. I'm going to go ahead and unmute your mic.
50:47
And you are ready to leave your comment. Okay. Thank you. Thank you for allowing me to speak. Can you hear me?
50:54
Yes. Okay, great. Um, I wanted to comment on a couple of things. One is um as I've
51:00
followed the council over several years, I've noted that the opportunity for the
51:06
public to actually access the council members has become less and less easy
51:11
and available. And um one one thing I sent a a couple of notices a couple of
51:19
information items to specifically to the council regarding the um wildlife
51:25
mitigation plan for because of the exceedences. Basically, I said that I felt that with an error rate, um, doing
51:33
mitigation that was projected to only bring the bat deaths down to 1/100ths of
51:39
a percentage below the threshold of concern, uh, should be of concern to the to the council. and also that um there's
51:48
nothing that I can see in terms of a follow-up uh evaluation or surveys to
51:54
determine whether or not they actually stayed below the 2.5
51:59

standard. So I am concerned about that kind of thing. I also wanted to comment on the decision regarding an amendment
52:05
to the whether or not an amendment was needed due to the sale of the B2
52:10
interest in the um transmission line to a private enterprise. Um issues include
52:19
uh this is a non-energy uh organization which was has never done
52:25
this before. They were created just to uh have this sale.
52:30
um they they don't fall they are not going to fall under the authority of the
52:35
PUC uh because they're not an energy uh company and so there's going to be no
52:41
control over how much they're charging for energy or any of those kinds of things that are controlled that way. um
52:49
the fact that there is no longer going to be um the stated customers and or
52:56
owners that were in the original certificate for public convenience and necessity has resulted in at least three
53:03
appeals of the uh the uh PUC determination that they were not going
53:09
to resend that uh certificate of public convenience and necessity. I'm also
53:14
concerned because Pacific Core is basically wanting to sell this because
53:20
their um financing rating has fallen so much and I'm concerned about the ability
53:27
to access even access any funds from this Shell company if it is needed to
53:33
restore the site. So, lots and lots of concerns that should be of concern to
53:39
the council. Um and the PUC has not approved this sale. Uh they're going to
53:45
have to have full contested cases because of the the substantial impacts
53:51
and the unusual nature of this sale. So to think that the um energy facility
53:58
sighting council does not believe that you should have a full amendment process
54:04
uh really is a real surprise to me and
54:09
frankly I'll be really surprised if there isn't you know some kind of legal

54:14
um response to it just given the fact that it's no longer the same owner. It's
54:21
no longer to the same customers. Um the there's a question about whether or not
54:27
they should even be condemning property to build this. And part of that question
54:33
is related to the fact that these this new company has no experience and and
54:40
nobody's going to control what they do to the customers. So, um I encourage you
54:46
to uh have some more discussion about this and perhaps decide that a decision
54:52
to not provide an amendment isn't the wisest choice given I mean this is a big
55:00
deal, a big deal legally, a big deal um publicly and it's not going to go away.
55:07
So that's my comment about B2. Be careful what you do. Um, and I wanted
55:13
to say I'm sorry to see Katie gone. She was asking questions that needed to be asked, especially since the public has
55:21
such a hard time getting to the council with information. I was really surprised
55:27
to see the email that I sent to the council members returned saying, "We
55:33
aren't taking comments on this." And I'm assuming you never saw my email, but uh to have that kind of a blockade between
55:40
the public and and FSAC, it seems to um
55:46
defeat your entire reason for existing. So, thank you.
55:53
Any questions? Thank you, Miss Gilbert. Any questions
55:58
from the council or comments?
56:07
Thank you very much. Um Nancy, any any more hands raised?
56:18
There are no more hands raised at this time. We'll do a last call. If you'd like to make a comment, please raise
56:23
your hand.
56:40
I think that'll do it for us. So, we will move on. Thank you, Miss Miller. Thank you, Miss Gilbert, for your

56:47
comments. And we'll move on to our next item, which is the state line wind
56:52
project wildlife monitoring and mitigation plan amendment. And this is
56:58
an action item for the council. Christopher Clark, senior sighting analysis, will be guiding us through the
57:04
review. Thank you. Thank you, Chair Condan. Council members, for the record, my name is
57:10
Christopher Clark. I'm a senior sighting analyst with the department. Uh, and I've been assigned to monitor compliance
57:16
for the state line wind project. Um, so Nancy, if I could get the next slide,
57:21
please. Uh so the state line wind project is an operational wind power facility uh
57:29
located in Umatillaa County, Oregon and Walawala County, Washington. Um the council has jurisdiction over the
57:36
components cited in Oregon. Um as shown on the slide, the facility consists of
57:42
three phases um that are separated into two distinct geographic and operational
57:48
units. um those are state line one and two which are the black dots and um the
57:54
vansickle 2 portion of the facility which are the red dots. I'm going to be talking mostly about vansickle 2 today
58:00
um as that's what this mitigation proposal is for. And I also just wanted
58:06
to point out that there's different certificate holders for each of the
58:11
geographic units. Um but both certificate holder LLC's are um
58:16
subsidiaries of Nextera Energy Resources LLC. Um so moving specifically into the
58:24
discussion of Vancicle 2, that portion of the facility includes 43 Seammen's
58:30
2.3 megawatt turbines. Um the council approved the final order on request for
58:37
seven uh in 2022 and that authorized that um the uh turbines which had been
58:44
commissioned in 2009 can be repowered with larger diameter rotors. If I could get the next slide please.
58:52

Um so that repowering was completed uh in 2023, sorry. And then a
58:59
postreppowering fatality monitoring study that was required by the um
59:05
wildlife monitoring and mitigation plan that was included as part of that final order on request for amendment 7 uh
59:11
required one year of postrepowering fatality monitoring uh which was completed between 2023 and 2024.
59:19
Um after the monitoring was complete in April of last year, the certificate holder notified us that there was an
59:25
exceedence of the threshold of concern for bat fatalities. Um and based on the estimation methods
59:33
uh required by the WMP, the report estimated that there were approximately 5.86 bat fatalities per megawatt
59:41
attributable to the facility in the monitor year compared with the threshold of 2.5 fatalities per megawatt. Uh, no
59:48
other thresholds of concern were exceeded. And I did want to note um that all reported bat fatalities were from
59:54
two migratory bat species. That's the Hory bat and silveredhaired bat.
1:00:00
Um, after an opportunity for public comment uh on the monitoring results and
1:00:06
consultation with the Oregon Department of Fish and Wildlife or ODFW, the department notified the certificate
1:00:12
holder that based on the magnitude of the exceedence and the species effective that mitigation was necessary.
1:00:18
We received the mitigation proposal um that is included as attachment one to
1:00:24
your staff report in October. Um, I'll go into the details and that in the next slide, but I did want to remind the
1:00:30
council that the approved wildlife monitoring and mitigation plan authorizes the department to agree to
1:00:35
mitigation actions and changes to the WMP, but it requires us to notify the
1:00:41

council of any agreements. Uh, and the council retains the authority to approve, reject, or modify the actions
1:00:46
or or agreements. Okay. So, uh, any questions so far?
1:00:53
Sorry, going a little fast. Okay. So in the mitigation proposal
1:00:59
itself um the certificate holder proposes to contail curtail operations
1:01:04
of all vanicle 2 turbines for the life of the facility. Cretelment would would occur when wind speeds are below the
1:01:10
manufacturer's recommended cutin speed of 3 meters/s year round and then the
1:01:16
cutin speed would increase to 5 meters/s in July and October and 6 meters per
1:01:21
second in August and September. Um, curtailment essentially means feathering
1:01:26
or breaking turbine blades so that the rotation of the blade slows. Um, I can
1:01:32
go into exactly the definition of curtailment that we've worked out or received from the certificate holder in
1:01:39
a couple slides, but I I just wanted to make sure that was clear. Um and then I wanted to kind of illustrate what this
1:01:45
graph is showing is that um we have studies showing that curtailment is an
1:01:52
effective strategy to reduce bat mortality associated with wind um wind
1:01:58
facility operations and that mortality rates are um or reductions in mortality
1:02:04
rates are positively associated with increased curtailment wind speed. So the more you curtail, the less likely it is
1:02:10
that there will be fatalities. Um I don't uh want to presume myself as
1:02:16
an expert on all the science on this, but um the general idea is that bats are
1:02:21
more active at lower wind speeds um since very windy conditions uh make it harder for them to fly and hunt. So
1:02:28
stopping or slowing blades to um less than dangerous speeds at these low wind
1:02:34
speeds is is a really good strategy to reduce mortality without impacting um
1:02:40

the power production of the wind farm as much as other things might.
1:02:45
Um and then I wanted to point out that the yellow line on this graph is showing
1:02:50
the proposed cutin speed for wind. Um so
1:02:55
if winds are below 3 meters per second year you round it shows the flat part of the line. Um that's when the the wind
1:03:04
turbines would not rotate as quickly. Um that wind speed increases during the months when the most fatalities were
1:03:11
reported. Um those months also coincide with the migration periods for the two
1:03:16
bat species um that are affected.
1:03:25
So this uh proposal was based on the threshold of concern and based on the
1:03:31
statistical analysis provided in a metaanalysis of a number of different
1:03:36
curtailment studies. There's a link to that meta analysis in your staff report. The proposal would be expected to reduce
1:03:43
fatalities to 2.49 fatalities per megawatt per year uh which is just below
1:03:49
the threshold. Um we did consult with our colleagues at ODFW on the review of
1:03:54
the proposal um and whether it would be effective in addressing the concern and
1:03:59
they provided support for curtailment as a strategy to minimize and mitigate bat mortality risks. Uh and they noted that
1:04:06
if this proposal was accepted it would be the first time that curtailment was implemented at an Oregon facility.
1:04:12
Um as I did want to note uh one thing is that there are no uh follow-up
1:04:19
requirements for monitoring of the effectness effectiveness of this proposal but ODFW um outside of the
1:04:25
regulatory process is working to connect an independent researcher with the facility um to conduct a study of
1:04:33
fatalities after curtailment is implemented. Um so based on the comments we received
1:04:41

from ODFW and review of the evidence provided uh the department notified the certificate holder that we agreed with
1:04:46
the proposal in December. Um and if I could get the next slide.
1:04:52
We are still in the process of working with the certificate holder to document the specifics and details of the
1:04:59
agreement as an amendment to the WMP. um specific items that we've discussed
1:05:05
or have resolved so far as the standard for containment, which is that they would um reduce the speeds of turbines
1:05:14
turbine blade rotation to less than one rotation per minute when the 10-minute average of wind speed is below the
1:05:20
applicable cutting speed. Um, we are still working to solidify the reporting
1:05:26
and validation requirements, although they've informed us that their SCAT system can um give a report of whether
1:05:34
or not the contailment was implemented to the minute and that they're working on a way to include that into the annual
1:05:40
compliance report that would be submitted to us um each April. They're also um looking at a way to notify us if
1:05:48
there was a significant failure of the system and curtailment didn't happen when it was supposed to for a prolonged
1:05:53
amount of time. Um the certificate holder also notified us that they
1:05:59
intended for this mitigation proposal to only be implemented from dust to dawn
1:06:04
because it is a proposal uh related to that mitigation. Um, we let them know
1:06:10
that we thought that was a material change since it wasn't specified in the original thing. Although we don't necessarily object to it, we wanted to
1:06:16
talk to our colleagues at ODFW again and make sure there weren't any additional concerns. Um, they're also working on
1:06:24
getting the specifics of what dust to dawn means and how that will be determined. So, um, all that to say on
1:06:31
this slide is that we don't have a red line for you at this time. We thought it

1:06:36
would still be valuable to get additional feedback. Um, if the council's comfortable with uh moving
1:06:42
forward with this information, I think it would still make sense to make a vote. I'll leave that up to you. Um, but
1:06:49
if you have any questions, I'm happy to answer them. Council members, any questions or
1:06:56
comments about the presentation? Councelor H. Yeah, this is Kent. I um great staff
1:07:03
report, good explanation. When I was going through it, it w it's kind of a
1:07:10
what's the word for when it's um not
1:07:16
straightforward in in the way you're thinking in the way I'm thinking anyway.
1:07:21
And so it was like when I was reading the in November to June when the blade
1:07:27
rotation would be limited when the wind speed is below 3 m/s.
1:07:33
I looked that up. That's about 7 miles an hour then the manufacturer is going
1:07:39
to cut the speed of the blade I think is what that means.
1:07:45
Um thank you council member. Ow. Uh, so when the the manufacturer's cutting
1:07:51
speed is the speed at which the um wind has to be blowing for the turbine to
1:07:58
begin producing electricity. Okay. Um so if the wind is not that fast, they
1:08:04
will feather it out of the wind so that the blades don't spin as fast. Okay. Yeah. Okay. So on that graph where when
1:08:12
the winds are higher uh in those months it seemed like it was
1:08:23
it the way it was showing with Nancy. Can you go back to that slide? Yeah. Thank you.
1:08:29
It looks like it allows them to go faster because the line goes up as
1:08:34
opposed to dipping down. Uh, and that just confused me. And it's not you. It's
1:08:41
not the It's just my brain was looking at it um and thinking, okay, I think
1:08:50
what I wanted to do is have it show a reduction in the speed of the blade, but that's showing how much it's going to

1:08:57
reduce the speed of the blade. Council member How, I'd say what the line on the graph represents is how fast
1:09:05
the wind has to be blowing before the turbine starts spinning. Um, it's not
1:09:10
related to the speed of the turbine itself. It's related to the speed of the wind. And once the wind starts blowing,
1:09:19
if it starts for most of the year outside of the migration period, if the
1:09:24
winds at 2.9 m/s based on their meteor meteorological towers,
1:09:30
yeah, the turbines will be stopped from spinning as quickly. Okay. Once it hits 3 m/s or more, they will
1:09:38
feather the the blades back into the wind and it'll start spinning normally.
1:09:43
Okay. And I I do not know how fast those turbine blades go, but it is it is fast
1:09:50
when they are into the wind. So yeah,
1:09:56
Secretary Cornet, so just just for clarification because so to me this graph represents the fatalities.
1:10:03
Is that right? It's a two axis graph. So the axis on the left, the y- axis on the left is the
1:10:09
number of fatalities and that'd be the bar graph and then the wine graph is the cut in speed.
1:10:14
Right. Right. Yeah. And so the you know obviously August, September, October, that's where
1:10:20
the majority or much higher levels of bad fatalities are occurring, right?
1:10:25
And so trying to adjust the cut in speed during those months to a different level
1:10:31
to reduce those fatalities. Is that the the basic concept? That's correct. Yeah. And in the meta
1:10:38
analysis, it it kind of indicates that for each additional meter per second of wind
1:10:44
speed that you allow per certain to continue basically um you get a greater
1:10:50
number of uh le you get fewer and fewer reductions. So bats are still active
1:10:57
above 3.0 meters per second. Um so if you increase it to five or six uh more
1:11:03
bats or less bats will be negatively impacted by the lines. So so the yellow line is the

1:11:09
proposed cut in speed and so theoretically a year from now if you showed this graph
1:11:15
the yellow line would be the same because that's their established cut in speed. Yeah. But if it works as it's
1:11:21
supposed to work, those numbers probably in July, August, September, October.
1:11:27
Yeah. Those should be reduced um below that because those cutting speeds
1:11:32
changed according to that yellow line. Right. Yeah. I knew that's what it all was saying,
1:11:39
but intuitively it it seemed like the
1:11:45
to reduce the wind speed, the graph shouldn't go up. It ought to be reducing
1:11:51
the wind speed, you know, the speed of the blade. But I get it and I think you
1:11:56
did a great job. Okay. Thanks. That's my I'll take full credit for this graph and it made sense in my
1:12:02
brain, but I understand why it's not intuitive. But just can you go back to the graph? I
1:12:07
just want to make sure. And so from November,
1:12:13
well, as it says from November to June, the turbons are basically still
1:12:19
right. All right. Council member Conan, between November and June June, curtailment
1:12:27
would only occur when wind speeds are below 3 meters per second. So that's actually the most they would be
1:12:34
operating. They would be operating most of the time between November and June.
1:12:39
So that's don't that's in higher wind at higher wind speeds.
1:12:44
Yeah. And I don't know exactly where that ceiling is for them. But um they are more active at low wind speeds.
1:12:51
That's correct. Yes. Okay. That helps too. I didn't understand that.
1:12:56
Okay. I think I was kind of thinking about this backwards. too.
1:13:02
So, and I have a question related to curtailment and um is has curtailment
1:13:08

been used in I mean I'm presuming that the Oregon Department of Fish and Wildlife has lots of information about
1:13:15
this issue. Is curtailment used in other states effectively and therefore
1:13:22
this should be meaningful cura curtailment here should be meaningful to
1:13:28
decrease fatalities chair condan yes the I don't know how
1:13:35
often it has been used as a regulatory instrument but the um metaanalysis
1:13:41
provided is actually based on real studies that happened across the United States including including studies I
1:13:47
think in the Northwest but definitely studies that uh included the two species that um are present here were present in
1:13:56
those studies um and they look at both a pre-cretailment study and a
1:14:01
postcretailment study um to a certain extent and then um see how the reductions played out. So I think there
1:14:08
are um I couldn't tell you the exact number of studies but it being a a um
1:14:14
meta analysis it does include several that were conducted over a decade so
1:14:19
empirically supported to be an effective strategy. Yes. Okay. Thank you. And um a final question
1:14:26
for me um on it is given the higher than
1:14:31
anticipated uh fatalities before is there any um mitigation you know post
1:14:36
mitigation you know we've seen contributions to wildlife centers or
1:14:42
whatever to to speak to the over fatalities. Um
1:14:48
when we uh had our initial consultation with ODFW um we kind of asked about that. Uh they
1:14:55
there's two reasons why that sort of compensatory mitigation
1:15:00
um was not preferred and and this sort of operational curtailment that's
1:15:06
actually designed to reduce future fatalities was um the option that we push for and in in what was um proposed.
1:15:15

So there's not a lot of data available about migratory bats. Um there's not a
1:15:21
lot of science on them. So not a lot of studies. Um and biologists don't even know a ton about their migration
1:15:28
patterns. Um so we see them when they show up uh in a fatality study, but it's
1:15:34
hard to kind of estimate what would really help them um as far as um that
1:15:40
sort of mitig compensatory mitigation. And the other thing is where raptors might be able to go to a rehabilitation
1:15:48
study. Um bats are both very small and and I think any interaction they have
1:15:54
with a wind turbine that results in an injury or fatalities is almost always a fatality. So there's not a lot of like
1:16:02
opportunities for rehabilitation of injured bats just because of the nature of how they are affected by the
1:16:09
turbines. Yes. And to be clear, I wasn't suggesting that um I think the
1:16:15
mitigation approach as it is here going forward is much better than a compensatory approach, but it was the
1:16:21
compensatory compensation for the higher than expected that
1:16:27
I I was questioning but just a question. Thank you, Chair Con. One comment on the
1:16:33
thresholds of concern is they are a signpost. So it's, you know, we have
1:16:39
requirements for post construction fatality monitoring often and then if a threshold's exceed is exceeded, it's not
1:16:45
necessarily like they need to meet the threshold like that triggers a
1:16:51
conversation with us and then we see if this is a impact that wasn't considered in the permitting that needs to be
1:16:57
addressed. Um, and that's what we found was the case in this case. A lot of times there will just be another year
1:17:03
monitoring and it'll be found to be an anomaly. So, um, it is, uh, you know, a
1:17:09
little more nuanced than we just need them to get down to 2.5. Okay. Thank you. Any other comments or

1:17:16
questions? Seeing we're hearing none,
1:17:22
Chair Condan, I move that the council approve the proposed amendments to the state line
1:17:28
wind project wildlife monitoring and mitigation plan to curtail turbine operations at the Benickle
1:17:35
2 unit below specified wind speeds to address an exceedence of the threshold
1:17:40
of concern for bat fatalities as presented in the staff report. Thank you, councelor. House
1:17:47
second. Um, we have a second from councelor
1:17:54
de secretary.
1:18:00
Yes, there's Perry seconds the motion.
1:18:05
Oh, we had a second from councelor Dellet. Okay. Thank Thank you, Councelor Perry
1:18:11
and Secretary Cornette that can you please call Patty Perry?
1:18:18
Yes. Richard Delin. Yes.
1:18:24
Kent How? Yes. Cindy Condan. Yes.
1:18:30
Marcy Grill. Yes. Yes. Motion carries. Chair Condan.
1:18:35
Thank you, Secretary Cornette and counselors. Chair Condan. Thank you. Yes,
1:18:40
this is Marcy and Christopher, I just got to tell you, thank you for what you're doing, but I tell you everybody
1:18:47
every year, this is the hardest thing for me to do on FSE. I can the whole bat
1:18:54
thing just wigs me out. So, good on you for getting in there and and pulling it
1:18:59
together for us, Christopher, because if I had to read very much, I don't I don't think I'd be pulling my weight. So,
1:19:04
thanks as always for a great presentation. Yeah. Yes. Thank you.
1:19:11
Is it the picture that wigs you out? The uh when I see you again, I will amuse
1:19:18
you with all my nuance fears and paranoia and all the things bat related.
1:19:23

Bats and rats, all the things just I can't even tell you. I can't look at them on TV without getting the
1:19:30
heebiejibbies. Yes, technical term heebie-jebies. Uh I turn into a 5-year-old child. I just I'm sitting
1:19:36
here with my eyes kind of open like squinting trying to not be a child about it, but Oh, that's a rough one.
1:19:45
Well, thanks for sticking with us. Okay, next item on the agenda is the
1:19:50
Oregon Trail Solar Facility Reveitation and Noxious Weed Plan amendments. It's
1:19:55
an action item and Sarah is with us once again, policy advisor and you'll for a
1:20:02
presentation. Thank you. Thank you. Good evening, Chair Condan, Vice Chair Byer, and members of the
1:20:08
council. Um, so the site certificate for the Oregon Trail Solar Facility
1:20:13
authorizes up to 41 You can go back just one second. It authorizes up to 41
1:20:19
megawatts of a combination of wind and solar power generation components within an approved site located in Gillum
1:20:26
County. The certificate holder is Oregon Trail Solar LLC, which is a wholly owned
1:20:31
subsidiary of Avengrid Power LLC. So for this facility, the
1:20:38
preconstruction and construction is being phased and it's currently in both
1:20:43
phases um with plans to move forward with construction 41 megawatt solar facility
1:20:50
and 20 megawatt battery energy storage system um on Monday.
1:20:56
So as you know as we talk about um compliance that preconstruction compliance is a phase where the
1:21:02
certificate holders required to comply with preconstruction conditions that are established in the site certificate that
1:21:09
you've issued prior to moving forward with construction. And this is a process where the certificate holder is
1:21:15
submitting information to the department for review and approval orurrence.
1:21:20

Mitigation plans are almost always pre-construction requirements that have to be finalized and approved prior to
1:21:27
construction. So in this instance for this facility, we're here to discuss changes related to two mitigation plans,
1:21:34
the reveation and noxious weed plans. So as part of pre-construction compliance
1:21:40
of for this facility for these two plans, the s the certificate holder requested changes that are beyond the
1:21:46
scope of changes contemplated in the draft plan. So, while we're we've reviewed for approval for finalization,
1:21:53
they've requested substantive changes that we want to bring back to um the council for transparency to make sure
1:22:00
that you would agree with these types of changes. And as we've discussed in a couple of meetings over the last year,
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if if not a lot, that mitigation plans do have an amendment clause that allows
1:22:11
for changes to be reviewed outside of the amendment process, but maintains an obligation that we bring it forward to
1:22:18
council for concurrence, modification, or rejection.
1:22:23
Okay. So, let's move into the substantive changes that they that the certificate has proposed. So first um
1:22:31
the reveation plan the reveation plan applies to temporary temporary impacts
1:22:38
to habitat predominantly and then it has general requirements for restoration of
1:22:43
temporary impacts to crop land. So the proposal is to remove all requirements
1:22:49
that apply to temporarily impacted habitat because based on the solar
1:22:54
facility, there really isn't temporary impacts outside the fence line that are
1:22:59
considered habitat. What they have is a little sliver of a collector line that is it has grass land dispersed
1:23:07
throughout other a land in between the patchway facility and active a. So when
1:23:14

if if you look at it on its own, it's grassland that's considered habitat. But when you look at it overall and you
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consider habitat function and value based on consultation with ODFW, we
1:23:27
agree to categorize it as category six, which relieves the obligation to do a
1:23:33
habitat restoration level plan that is within the reveation plan.
1:23:39
Um so just to note general reveitation requirements still apply. You have a
1:23:44
mandatory condition that applies to all temporary impacts and it says you have to restore temporarily impacted land
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commensurate with adjacent lands and then they have an obligation under the
1:23:56
1200 C permit that DEEQ issues. All FSE facilities have to get this permit that
1:24:01
also has a vegetation uh stabilization requirement before they can close that permit out. So while the proposal is to
1:24:09
basically remove this habitat restoration level requirement because there's no real habitat, know that
1:24:15
reveation is still a requirement. Okay. So and then we we are going to
1:24:22
lift the general restoration of crop land temporarily impacted crop land over
1:24:28
into the noxious weed plan. So now we can go over into the noxious weed plan. That noxious weed plan also has um a a
1:24:36
seeding and weed treatment obligation. So you're going to get reveation through the noxious weed plan as well. But the
1:24:44
substantive change here that was beyond finalization requires amendment is that they again want to use sheep grazing as
1:24:51
a vegetation management strategy at this site. Um, you have evaluated this
1:24:56
request for several solar to date, including the Montag Solar, also known as Patchway, as well as Bake Oven and
1:25:03
Daybreak. And as you know, with ODFW coming forward, you received a
1:25:08
presentation a few months ago, their biggest concern with sheep grazing is the potential for disease transmission

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to big game or to um big horn sheep. Um, and so we did consult with the regional
1:25:20
biologist Lindseay Summers at ODFW to confirm whether that disease transmission risk concern existed for
1:25:27
this site and they confirmed that it did not. But they do have a set of best management practices they've recommend
1:25:34
be included in the plan. So that is included in red line and the attachment to for your consideration. but it
1:25:40
includes um doing fence checks to make sure that the the the fence is intact
1:25:46
and that sheep can't escape. Um and that they would be monitoring and reporting to evaluate if there are um big horn
1:25:53
sheep identified or if any of sheep escape from the site should they choose to use it. Um and then we've recommended
1:26:01
that the noxious weed plan make clear that use of sheep grazing and the success thereof is reported annually to
1:26:08
the department as we do want to understand if this is working or what type of problems are occurring and that
1:26:13
they are following through with those ODFW notification elements
1:26:20
and yeah I summarized that on the slide too. Okay. So, those are the substantive
1:26:26
changes proposed that would necessitate an amendment of both the reveation plan and the noxious weed plan. And we are
1:26:32
recommending that council concur with staff and agree that these changes can be incorporated. So, I'll hand it over
1:26:39
to you for deliberation and decision.
1:26:44
Council members, any comments or questions? No questions. This is Marcy.
1:26:54
Thank you. Thank you, Miss Esther, for um the presentation. And I think we
1:27:00
might be ready for a motion. Chair Condan, I move that the council approve the proposed amendments to the
1:27:06

Oregon Trail Solar Project Revitation Plan and the Noxious Weed Plan as presented in the staff report.
1:27:13
Thank you, Councelor. How? Do we have a second?
1:27:19
This is council member Gra. I second the motion. Thank you, councelor Grail. Any
1:27:25
discussion? Secretary Cornett, I think we're ready for a vote.
1:27:32
Richard Delin. Hi. Kent Hal, yes.
1:27:39
RC Gra, yes. Patty Perry,
1:27:44
yes. Cindy Condan. Yes. Motion carries. Chair condan.
1:27:51
Again, thank you Miss Esterson for the presentation. And now we have on the schedule a break.
1:28:00
Um so we'll take a break at this point. And our next agenda item
1:28:06
um is at six o'clock. And so this will be a longer break than our our normal
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break. Sorry about that. We don't have a circus animals or anything. So with us,
1:28:19
we do have some refreshments and um some people to talk to. So thank you very
1:28:25
much. We'll break until 6:00.
1:28:40
Good evening. My name is Cindy Condan. It is now 6 5:59 almost 6:00 and I would
1:28:46
like to call the meeting back from recess and continue on with our next agenda item which is Big Low Canyon
1:28:54
Amendment 4 the public hearing and with us tonight is Chris Clark senior
1:28:59
sighting analyst will provide an overview of the sighting process and the proposed amendment as the hearing
1:29:05
progress and the hearing will progress. Thank you, Chris. You have
1:29:12
Thank you, Chair Condan. Council members, for the record, my name is Chris Clark. I'm a senior sighting analyst with the department, and we are
1:29:19
uh here tonight for the public hearing on propo on the proposed order for request for amendment four of the site
1:29:25
certificate of the Biglo Canyon wind farm. Um I am going to start the

1:29:31
presentation uh tonight with a overview of the um proposed amendment and the
1:29:37
proposed order. I'll then turn it over to our senior sighting analyst Sarah Esther who will be serving as the
1:29:43
presiding officer for tonight's hearing. Um Sarah will give an overview of the hearing process itself and then um open
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the floor to public hearing and oral testimony. Um the order of testimony will be the
1:29:57
certificate will be given an opportunity to speak followed by members of the public and then um the council will have an opportunity to ask clarifying
1:30:03
questions. Um uh to get into the overview of the
1:30:11
proposed order. Uh this project the Biglo Canyon wind farm is an operating
1:30:16
wind power generation facility in Sherman County. Uh the facility includes 217 Vestus and Seaman's turbines and
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related and supporting facilities including a collector substation and an O andM facility. Uh the facility is
1:30:31
located within an approximately 39 square mile site located about 2 milesi from the city of Wasco at its closest
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point. Um, in request for amendment four, the
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certificate holder proposes to construct and operate a 125 megawatt solar
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photovoltaic power generation facility, 500 megawatt hour battery energy storage system or bests and new related or
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supporting facilities uh at the existing site. The proposed facility components
1:31:01
would be located within a proposed solar micro sighting area which is represented by the pink hash outline on this map. Um
1:31:10
the proposed solar micro sighting area includes approximately 1,924
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acres uh which is uh that is located entirely within the
1:31:21
approved site boundary. Um that proposed microighting area is located approximately 4.8 miles northeast of the
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city of Wasco.
1:31:33
This request for amendment is being processed under the amendment rules that were adopted by the council last
1:31:39
October. Um the department received the preliminary application or preliminary
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request for amendment, excuse me, on April 21st, 2025. Uh we com conducted a
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completeness review in coordination with reviewing agencies and after receiving responses to requests for additional
1:31:57
information between July and September of last year and then in a revised amendment request in November, we issued
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a determination that the request was complete on December 5th, 2025.
1:32:08
On December 16th, we issued the proposed order as well as a public notice establishing the common period on the
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proposed order and tonight's hearing. After the close of the public comment period, the certificate holder will be
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required to respond in writing to comments and the department will have the option to respond as well and then
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there will be an opportunity for com commenters to reply to those responses and certificate holder to provide s
1:32:32
replies to those replies. Uh Sarah Esterson will go over this process in more detail during her presentation.
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Um, no later than 21 days after the deadline for sir replies, the department must issue a draft of the final order
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with written analysis of any comments on the proposed order, including analysis of responses and replies and s replies
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and whether we recommend any changes to the proposed order. Um, and then if we recommend any changes, we will include
1:33:00
them in a draft final order which we'll present to the council. The council can review and then um modify, reject or
1:33:07
approve as their final order. Um, if the council grants issuance of an amendment site certificate, uh, the

1:33:14
council will then issue an amended site certificate effective upon execution by the council chair and by the site
1:33:19
certificate holder.
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So this uh request would add new energy facilities to the existing site in the
1:33:33
existing site certificate. Um and for that reason there were a lot of existing conditions in the um approved site
1:33:40
certificate which were applicable to pre-construction and construction phases of the existing facility which while no
1:33:46
longer applicable to the existing facility could be updated and amended to apply to the proposed facility
1:33:52
components. Um some of those conditions particularly mandatory conditions would also apply to both the operation um of
1:33:59
existing and proposed components. Uh to make applicability of the existing and proposed conditions more clear,
1:34:06
departments recommended that the site certificate be reorganized and that all conditions be renumbered with an
1:34:12
identifier that includes phase and standards similar to more recent site certificates. Um but many of those
1:34:17
conditions aren't changing. Uh and some of the conditions that are new or proposed to be amended are very similar
1:34:23
to conditions that um have been imposed or adopted by the council in recent proceedings. So, I'm not going to go
1:34:30
into um the standards which only have those kinds of conditions in them in a
1:34:35
lot of detail during this presentation. Um they are shown on this slide. These standards that I won't cover more here,
1:34:42
but I did want to give the opportunity um to the council to ask questions. Now, if you want um just so you know that
1:34:49
there are findings and conditions associated with all these, I just don't have more in my presentation about them
1:34:55

at this time. Yeah. Is that better?
1:35:04
Okay. Um, I'll hear questions. I'm going to go over some select issues and
1:35:10
conditions in the proposed order. I do know we have a lot of interest tonight, so I will try to keep it brief.
1:35:15
Um for the general standard of review, um the department is recommending that
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the council find that this facility or the request for amendment would comply with the applicable standards and that
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the council approve this. It's part of the general standard review. As far as conditions, um we do have two fairly
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standard conditions for construction deadlines that I did just want to highlight. Um these are similar to what
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the council has done recently, but um given some legislative changes recently, I thought it would be worth um just
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pointing out that our recommended general standards one and two would recommend um that the council uh impose
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construction deadlines that for the beginning of construction, uh construction would be required to start
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within six years after the date the amended site certificate is issued. And then um construction would be required
1:36:06
to complete be completed within three years after the date that construction actually begins. Um this is uh again
1:36:13
consistent with the mandatory condition language that requires the council to set deadlines and with the requirements
1:36:19
of HB 3681 uh which requires the council to give at least six years to the start of
1:36:25
construction. Um but I did want to point out that in the request for amendment the certificate holders indicated that they intend to begin construction in the
1:36:31
second quarter of this year. uh and that construction would take 17 to 19 months.
1:36:39
Okay, moving to organizational expertise. Uh we wanted to highlight that this um project is somewhat unique
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in that the certificate holder which is Portland General Electric Company would construct and operate the solar
1:36:52
components in partnership with a another entity um Big LNLC.
1:36:57
Big L which is a subsidiary of Bright Knight LLC under a build transfer agreement. Um so given this partnership
1:37:07
um we are both looking at the expertise of Coral and General Electric and Brightite. Um Bright Knight as it says
1:37:13
on the slide is based in Florida and has designed and constructed over 6 gawatts of solar and storage projects in the
1:37:19
United States. and that um in the request for amendment, Bright Knight and PG have committed to having stringent
1:37:26
contracting standards to ensure the selected contractors and vendors can adequately support the construction and
1:37:31
operation of facility components proposed in the request for amendment. Um
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to ensure that this happens, uh the department has recommended the council
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adopt and amend several conditions. Recommended amen amended condition one
1:37:48
would require the certificate holder to provide notice of the identity identity and qualifications of all primary
1:37:55
contractors and vendors involved in the construction of the solar facility which is a fairly standard condition and
1:38:01
similar to what is in current condition one. Um the change is that the condition would also require uh PGE to identify
1:38:08
the individuals at big L that will manage and oversee the selected vendors and contractors. So there's an
1:38:14
additional layer of oversight included. Um similarly
1:38:20
recommended amended condition two which currently only applies to construction would require the certificate holder and
1:38:26
big L to contractually require all contractors and subcontractors for the construction uh and operation it should
1:38:33

say on the slide of the solar facility to comply with all applicable laws and regulations uh and the terms and
1:38:39
conditions of the site certificate.
1:38:47
Um, next we just wanted to highlight, and I think this is one of the things you will hear about during the hearing
1:38:53
tonight, is that the existing wind facility has experienced substantial appointment and maintenance issues over
1:38:58
the past few years. Um, and that we have uh been documenting incidents since
1:39:04
2022, including a blade detachment, uh, oil and grease releases, multiple
1:39:09
transformer failures, u multiple turbine door and hatch malfunctions. Um, those
1:39:15
are things that have been reported to the council and your regular compliance reports. Um, they are also things that are being addressed through corrective
1:39:21
action plans and other compliance actions at the site. Um but we have um
1:39:27
given those um issues and the lessons learned identified by the certificate
1:39:32
holder in the request recommended a few additional conditions um new conditions
1:39:38
be imposed uh to enhance the oversight of operations and maintenance activities
1:39:44
at the site. Recommended organizational expertise condition ones and two would
1:39:50
require finalization and implementation of a draft framework operations
1:39:55
maintenance plan prior to and during operations. Um that plan outlines the
1:40:01
operational responsibilities, long-term maintenance protocols, quality assurance processes, environmental compliance
1:40:07
measures, and emergency response and monitoring systems that would be relied upon to safely operate and maintain the
1:40:12
solar components. A version of that draft framework plan that includes
1:40:18
information the department believes will be required to be included prior to operation is included as a C to the
1:40:24
proposed order. Um the additional inquir information requirements included by the

1:40:30
department include things like budgeting, community outreach and reporting protocols.
1:40:37
Recommended organizational expertise condition three would incorporate construction progress reporting
1:40:44
requirements which are established in OAR chapter 345 division 26. Um but
1:40:50
where those reports are typically provided semianually the recommended condition would um increase the
1:40:56
frequency of reporting to every 3 months to allow the department to track uh progress and compliance more closely.
1:41:03
And then recommended and the last bullet should read recommended amended condition for would impose enhanced
1:41:10
incident reporting requirements similar to the requirements provided in OAR chapter 345 division 29.
1:41:22
Moving to land use, we just wanted to highlight um that there are numerous land use conditions uh intended to um
1:41:31
ensure compliance with the uh Sherman County zoning ordinance and other local land use uh criteria. Um but we wanted
1:41:38
to focus on the goal exception and recommended land use condition six, which would be uh implementing part of
1:41:45
that exception request. Um so in the um goal exception request, the
1:41:53
certificate holder provides several reasons uh why the re policy underlying
1:42:00
statewide planning goal three should not apply. And the department recommends that the council grant a goal exception
1:42:05
based on two of those reasons which are locationational dependence uh to uh both
1:42:11
existing in energy infrastructure including transmission and transportation infrastructure a as well
1:42:17
as a rural economic development reason. Um and the council or the department has recommended the council reject proposed
1:42:23
minimal impacts to other resources in consistency with state climate goals and policy reasons.
1:42:29

Um, as part of the local rural economic development benefit reasons, the
1:42:35
certificate holder has represented that it will finalize and implement a draft
1:42:40
community investment plan um, and contribute $1,600
1:42:46
per acre of cultivated land that would be occupied by the solar components to a community investment plan that would be
1:42:52
administered by the Mid Columbia Economic Development District. um recommended land use condition six would
1:42:58
require the um certificate holder to implement those representations
1:43:12
for fish and wildlife habitat. the um
1:43:18
and my apologies for not having the exact number, but um the uh facility would occupy mostly
1:43:27
cultivated farmland, but there would be I think around 24 acres. Um my apologies
1:43:33
again for that not being the exact number of category two um sage brush uh
1:43:40
sage brush shrubland habitat uh and other habitat areas. Um to mitigate for
1:43:47
those impacts, thei recommended fish and wildlife habitat conditions one and two
1:43:52
would require the certificate holder to finalize and implement a draft habitat mitigation plan and provide inkind in
1:44:00
proximity mitigation for habitat impacts. Um this is a pretty standard
1:44:05
approach for mitigation to habitat impacts. And one thing we wanted to flag here is that the habitat mitigation area
1:44:12
that was identified in consultation with the Oregon Department of Fish and Wildlife is a habitat mitigation area
1:44:18
adjacent to the Cardi generation facility in Morrow County. Um, we understand that that site is preferred
1:44:25
because it provides high-quality grassland habitat of a similar kind to the habitat that would be impacted and
1:44:31
is adjacent to other um habitat mitigation areas which would enhance the conservation of value of the habitat
1:44:38

mitigation area. Um
1:44:44
we also have a condition which is fairly similar to um standard conditions uh
1:44:50
requiring seasonal restrictions on construction work near active net sites. Uh and those were uh recommended in
1:44:58
accordance with recommendations from ODFW.
1:45:19
Um, we have several uh public services conditions
1:45:25
that are amended from uh conditions that would be in the existing site
1:45:30
certificate as well as new conditions for public services. Um I want to
1:45:35
highlight in particular recommended amended conditions 74 and 76 and then recommended new public services
1:45:41
conditions 1 and two. Um recommended amended conditions 74 and 76 would
1:45:47
require the certificate holder to demonstrate that an adequate water supply for construction operation has
1:45:52
been secured. Then that all water for construction will be legally obtained. that's similar to the conditions the
1:45:58
council has adopted um in other water constrained areas in the state. Um for
1:46:05
recommended public services conditions one and two, they would require the certificate holder to develop and
1:46:10
implement a construction worker housing plan um to provide strategies to minimize impacts to the local housing
1:46:16
supply. Um that is in part due to the limited nature of RV parking here in Sherman County um and the potential for
1:46:23
um adverse impacts uh if there's not a coordinated effort to to make sure construction workers get to appropriate
1:46:30
housing options.
1:46:35
Um, in addition to organizational expertise, as I mentioned earlier, I think one of the the things the council
1:46:41

will hear a lot about tonight and the thing the council has heard about in uh comments already submitted on the record
1:46:47
is wildfire prevention and risk mitigation. Um, we just wanted to uh
1:46:52
summarize some of the findings in the proposed order. Uh so conditions in in Sherman County are conducive to large
1:46:59
and fastmoving fires um grass fires and the probability of a fire in the
1:47:05
proposed solar microighting area is high particularly in this summer months according to data from the community uh
1:47:11
wildlife the community wildfire protection planning tool um as well as
1:47:16
the Oregon wildfire explorer map data. um areas of elevated fire risk in the
1:47:23
proposed solar microitarian area which are um shown by the darker red areas on
1:47:29
the map on the slide are concentrated around addition add existing residential structures and infrastructure. We also
1:47:37
want to point out that um damage to agricultural lands and um other areas is
1:47:43
is possible. Um you can see in this map too that there are some areas within canyons that um are mapped as having you
1:47:50
know white benefits from fire. Um those are really ecosystem benefits and don't reflect the the hazard of fire spread.
1:48:02
um design features and maintenance standards to reduce wildfire risk that
1:48:08
are discussed both in the um request for amendment as well as the draft
1:48:15
construction wildfire management wildfire mitigation plan that's attached to the proposed order and the proposed
1:48:20
order itself in um orienting arrays adjacent and parallel to existing RS
1:48:26
existing roads for access and fire brakes setting perimeter fences back at least 50 ft f feet from property lines
1:48:33
and facility components 20 ft back from those fences. Installing 20ft service
1:48:38
roads with 10ft vegetation clearance zones on either side. Maintaining 20 foot vegetation clearance areas around

1:48:45
the outside of all perimeter fences. Uh and maintaining 20 foot gravel or compacted soil buffers around the ODM
1:48:52
building uh collector substation and a proposed battery energy storage system.
1:48:59
Um and to show in a little bit more detail inside those areas called uh
1:49:04
vegetation clearance zones and areas within the solar array fence vegetation would be limited to height of 10 to 12
1:49:10
in during the rainy season uh when fires are less likely and then 1 to 3 in during the dry season. Um a minimum
1:49:18
vegetation clearance of 12 in would also be maintained from electrical equipment at all times.
1:49:27
Uh, as far as the conditions, um, wildfire prevention and risk mitigation
1:49:32
conditions one and two would require the certificate holder to develop and implement a construction wildfire
1:49:37
mitigation plan, whereas wildfire prevention risk mitigations conditions three and four um would apply to the
1:49:44
operation of the facility. Um, the certificate holder would be required to develop and implement a operational
1:49:51
wildfire mitigation plan. Um but the condition as recommended would allow the certificate holder to rely on the um
1:49:59
public utility commission reviewed wildfire protection plan or other plans included in the um final order or
1:50:06
approved by the department to satisfy the requirement. Um and I'm highlighting this. I do want to point out that there
1:50:11
is a draft construction wildfire mitigation plan attached to the proposed order. Um but there is not an
1:50:17
operational wildfire mitigation plan at this time. Although some of the um
1:50:23
requirements and vegetation standards have been incorporated into other plans.
1:50:33
Um in particular um vegetation management uh conditions
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would be incorporated into a draft comprehensive revitation and soil management plan which is required under
1:50:47
recommended soil protection conditions 1 to four. Um and then I wanted to just
1:50:52
highlight that the setbacks from the property lines um are uh being
1:50:57
recommended under a land use condition recommended land use condition one.
1:51:05
Okay. Um that concludes my review of uh the things that we thought would be most
1:51:11
important for the council to be aware of and things that the public might be interested in before this. Um, I do want
1:51:16
to go quickly over a review of the comments that we've received to date and then I'll turn things over to Sarah. But
1:51:22
I'll just pause for a second in case there's any questions.
1:51:31
Okay. Um, so I my site is a little out of date. I I put this together at about
1:51:38
noon today, but um, since that time we received one additional comment. So, as of today, the department has received
1:51:44
nine written comments. Six of those comments are from Kathern Mcola. Um, one
1:51:49
of the comments was from the Mid Columbia Economic Development District. Uh, the certificate holder provided
1:51:54
comments and then we also received comments from the Confederated Tribes of the Warm Springs Reservation of Oregon.
1:52:00
Um, I believe uh most of the folks who provided comments are here tonight, so
1:52:06
I'm going to go over what's in there very very briefly. Um I did I do not have a a slide for the Mid Columbia
1:52:12
Economic Development District's comments and I'll just summarize that they explain their um relationship with the
1:52:18
community investment plan and their um their uh partnership in implementing it.
1:52:23
So good comments to review. Um issues raised in comments by Miss
1:52:30
McCulla include concerns about the certificate holders ability to safely operate and maintain the proposed

1:52:35
facility components. Uh and those comments provide documentation of ongoing maintenance issue at the
1:52:41
existing wind facility. Um the comments provide concerns about the certificate holder's ability to maintain vegetation
1:52:47
equipment on site uh in a manner that provides protection from wildfire. Concerns about potential liability for
1:52:54
damages uh to the solar facility from a wildfire arising from farm practices. Um
1:53:02
uh concern over the lack of the operational wildfire mitigation plan. uh a comment that exhibit P which is the
1:53:10
wildlife uh habitat exhibit and the biological assessment in the request do not adequately address impacts to
1:53:16
mammals and other species that could be present at the site such as pong horn and mu deer uh concern and agg and and
1:53:23
concern about the accuracy of a single hearing again I'm summarizing this very quickly there's obviously more detail in
1:53:29
those comments and the commenter herself I believe will be touching on a lot of these topics tonight uh but I just
1:53:35
wanted to give a overview of what was in there. Um the certificate holder um also
1:53:42
provided fairly extensive comments requesting corrections to the facility description, minor corrections to
1:53:48
certain findings and conditions in the site certificate. Um I'm sure you will hear in more detail from them about
1:53:53
those tonight. Um they've requested additional flexibility in transmission corridor sighting under the proposed
1:53:59
recommended condition Gen T05. um request for changes on timing of
1:54:05
compliance with water rights conditions preWR1 and operations WR1 relating to the
1:54:13
timing of providing a well log for new wells and flow meter readings for existing wells um based on when it's
1:54:19
possible to get that information u and request for uh release of the

1:54:25
prohibition on vegetation removal for during critical periods for ground nesting birds um if clearance surveys
1:54:32
are conducted prior to removal. Um, and then I will I don't have a slide
1:54:40
for the comments from the Confederated Tribes of Warm Springs, but um I do think it's important just to raise those that they uh requested
1:54:47
uh specific uh review of a condition related to the scope of when um cultural
1:54:54
resource monitoring would be required. Um they've asked that it be required during all ground uh disturbing
1:55:00
activities, not just in ground disturbing activities within a avoidance buffer.
1:55:06
Um yeah, and so that concludes my presentation. Um and unless there's
1:55:11
questions for me, I will turn it over to the presiding officer to give an overview of the hearing process.
1:55:32
Okay, good evening and welcome. This is the public hearing on the proposed order
1:55:37
on request for site certificate amendment 4 for Biglo Canyon Wind Farm.
1:55:43
I Sarah Esther, senior policy adviser for the Oregon Department of Energy Sighting Division, am serving as the
1:55:49
presiding officer for this hearing. Today is January 15, 2026. The time is
1:55:56
6:27. This public hearing is being held at an
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energy facility sighting council meeting in person here at the Grass Valley Pavilion in Grass Valley, Oregon. This
1:56:09
hearing is also being held via WebEx webinar with a call-in option for those who cannot participate in person or via
1:56:17
webinar. Please note that this hearing is being recorded and the presentations,
1:56:23
written comments, and all verbal testimony are part of the decision record for this amendment request.
1:56:35
Okay. So hopefully you're aware the comment period on the department's proposed order on request for amendment
1:56:42

4 extends through January 30th at 5:00 p.m.
1:56:47
It is important that you know the following information.
1:56:53
A person who contends that the council should reject the request to amend this site certificate or that council and its
1:57:00
final order should reject or revise certain aspects of the department's proposed order must meet the following.
1:57:08
You must comment in person or in write writing prior to the close of the comment period. Again, that January
1:57:14
30th, 2026 5:00 p.m. deadline. You must raise your issue with sufficient
1:57:20
specificity to afford the council, the department, and the certificate holder an adequate opportunity to respond.
1:57:27
To raise an issue with sufficient specificity, you must in your comments identify the recommended findings of
1:57:34
fact, conclusion of law, or conditions of approval that are included in the proposed order to which you object. You
1:57:41
need to specify the council standard or other applicable state or local requirement on which your objection is
1:57:47
based and present facts or statements that support your objection.
1:57:53
If your comment is not made with sufficient specificity, the council will not be able to make changes in its final
1:57:59
order based on your comments.
1:58:07
Okay. So um if if you comment during this comment period which started
1:58:13
December 5th again extends through January 30th you will automatically be part of a subsequent process um which is
1:58:22
designed to further evaluate the issues that you raise. This is a new process for us so it's
1:58:29
going to be interesting. So uh the certificate holder which is Portland General Electric is required to respond
1:58:37
to all comments. The department may respond but the holder is required to
1:58:42

respond to all comments and the so certificate holder and the department
1:58:47
have a deadline of February 13 to respond to your comments. These responses are going to be provided to
1:58:54
you in the same method that you commented. So, if you email your comments and we have your email address,
1:59:00
that's how you're going to receive responses. If you submit your comments in hard copy with a physical address, we
1:59:06
and we don't have an email, we will respond. Certificate holder will respond in writing to your physical address.
1:59:14
If you don't provide an address, no email, no physical address, you will not be able to participate in this
1:59:20
subsequent process. We will have no way to communicate with you and respond.
1:59:25
So, what to expect? Um, so first and foremost, certificate holder and the
1:59:32
department are going to be trying to determine if your comments have been raised with sufficient specificity. So,
1:59:38
I just read through that. Did you identify recommended findings of fact that you have an issue with? Have you
1:59:44
identified a council standard or applicable requirement that you believe is not being met? And have you provided
1:59:50
facts or supporting information to support your objection? If you haven't met any of those, the response is going
1:59:57
to identify that one one or all of those things. If you have provided comments
2:00:02
that meet the sufficient specificity criteria, certificate holder in the department are are going to say that and
2:00:10
we are going to either identify where your issue is believed to be addressed and potentially already resolved within
2:00:17
the proposed order or it's going to provide a resolution to your issue if it's not yet addressed. Um, so it's kind
2:00:25
of a big step. Again, February 13th, you will be getting this response that has all of these words or may not be

2:00:33
familiar with, but that's coming. In the department's response, we plan to provide, you know, helpful information
2:00:40
to help you understand how to navigate through this process. Um, and this, you know, this is intended
2:00:46
to help further evaluate your comments and make sure that we understand and
2:00:52
that we get it right. Um,
2:00:57
okay. So then that's not the end of it. So February 13th, certificate holder and
2:01:03
the department are responding. Then you as a commenter will have an opportunity to reply to those responses and you have
2:01:11
a deadline that's already been established in the department's notice. That deadline is February 27th. So you
2:01:18
don't have to, but you can choose if if the department and or the certificate holder has said your comments were not
2:01:25
raised with sufficient specificity. We don't know what standard your comments are related to. You didn't provide any
2:01:30
facts. You can then take that and identify the council standard and provide facts. Um you can disagree. It's
2:01:39
it's a process designed to sort of continue evaluating those comments.
2:01:45
And then after you respond, if you choose to respond, both certificate holder and department have a final
2:01:51
opportunity to provide sir reply. Um again, ideally it's a resolution. Um we
2:01:58
will see how that works out. I believe our deadline for sir reply is March 6th.
2:02:04
So that's kind of the whole extent of the comment process.
2:02:09
And feel free to ask any of us questions after the meeting. Chris Clark's information will be on a slide later.
2:02:16
You're free to reach out to him at any time and and ask how this is going to work or how it's working once it gets
2:02:22
once that February 13th date uh comes forward.

2:02:28
Okay. So, there are several acceptable means for submitting comments on the record. You can submit comments
2:02:35
electronically through our comment portal. This is a link to our comment portal. Um, if you submit through our
2:02:41
comment portal, you will get an email confirmation that you have submitted comments. So, please make sure you get
2:02:47
that. It is important that you include your contact information and comments you submit on the comment portal so that
2:02:53
you have an opportunity to get a response and further the evaluation.
2:02:58
You can also submit comments in hard copy by mailing to the department's Salem office, 550 Capitol Street
2:03:05
Northeast, Salem, Oregon. Attention, Chris Clark. And of course, you can provide comments verbally tonight. As I
2:03:13
said, this meeting, this hearing is being recorded. We will have the recording transcribed and that
2:03:18
information will be available on our website.
2:03:24
Okay. So, we're almost getting started with your turn. The order tonight will start with an opportunity for the
2:03:31
certificate holder. Then, we'll open it up to members of the council. After
2:03:36
that, I'm sorry. Then we'll open it up to members of the public. And after that, we'll open it up to members of the
2:03:42
council. And then we'll return to the certificate holder. We may establish a time limit on members of the public
2:03:48
depending on how many individuals are interested in commenting tonight.
2:03:53
So, let's go ahead and start with the certificate holder. Is the certificate
2:03:59
holder interested in providing comments?
2:04:21
testing. That sounded good. Okay, great. Uh, good evening everyone. Um, uh, Chair
2:04:28
Condan, members of the council. For the record, my name is Kristen Sharon. I'm vice president for public policy and

2:04:33
resource planning for Portland General Electric. Uh PG is a fully integrated um electric utility that's has a service
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population of um nearly two million Oregonians and twothirds of the state's
2:04:45
economic activity occurs within our service area. Can you hear me all now? That's better. Okay, great. Um as owner
2:04:52
and operator of the Biglo Canyon wind farm, PG has a long-standing history and connection to Sherman County. Uh in
2:04:58
2024, PG Yeah, I can. There we go.
2:05:07
All right, let's try that again. In 2024, PG contributed $7.3 million in
2:05:14
property taxes, about a third of the county's property tax base, helping to support schools, parks, infrastructure.
2:05:20
Sherman County is a very special place, and the opportunity to represent PGE in the community here tonight is not lost
2:05:26
on me. But I'm here today to discuss the the importance of the Biglo Canyon Wind Farm RFA4 site certificate amendment to
2:05:34
PGE's resource portfolio to our customers and to Oregon's clean energy and economic development goals. We
2:05:40
appreciate the Oregon Department of Energy staff recommendation to FSE to approve this amendment. The Big Low
2:05:47
Canyon Wind Farm has supplied clean affordable energy to Oregonians since 2007.
2:05:52
Being one of the first major wind operations in the state, there were learning lessons along the way,
2:05:57
including around maintenance and performance. And since that time that we began Biglo Canyon, we have added
2:06:03
thousands of megawatts of clean energy to our system PG and our partners, including wind farm in southeast
2:06:09
Washington, um a wind farm in Montana, uh a combined wind, solar, and battery
2:06:16
uh here in Oregon. Uh the largest of its scale to uh open in the United States.
2:06:22

Um, but we are committed to continuously improving and upgrading equipment to increase efficiency and reduce costs for
2:06:29
our customers. An ongoing maintenance and overhaul project at Biglo Canyon Wind Farm to continue safe and reliable
2:06:35
plant operations for years to come is well underway as we pursue now adding solar and battery storage to the site.
2:06:42
Through this amendment that we're proposing, the addition of solar and battery storage at the site will help to
2:06:47
optimize clean energy generation and delivery in support of our customers growing electricity,
2:06:55
clean energy, and emissions reductions requirements. As we plan our system, affordability for
2:07:00
customers remains top of mind. And PGE has aggressively pursued federal production and investment tax credits
2:07:06
that have reduced the cost of clean energy projects on our system by at least 20 to 40%. To date, PG and its
2:07:13
partners have secured over a billion dollars in federal tax credits for our clean energy portfolio to the benefit of
2:07:19
our customers. However, recent changes in federal policy will rapidly sunset clean energy tax credits, escalating the
2:07:27
long-term cost of renewable energy and storage and threatening customer affordability and the pace of achieving
2:07:32
the state's clean energy and economic development objectives. An amended site
2:07:37
certificate allows this project to move forward on a timeline that can capture the value of those existing federal tax
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credits while they're still available for our customers before they're phased out, aligning with PGE and the state's
2:07:49
focus on delivering affordable, reliable, and increasingly clean power while acknowledging while achieving the
2:07:55
directives outlined in Governor Cotek's recent executive order to accelerate renewable energy sighting.
2:08:01

Colllocating solar and wind power generation equipment allows us to take advantage of the existing infrastructure
2:08:06
on the site like transmission lines and substations and to reduce the overall impact to the land and to the
2:08:12
environment. Adding solar capacity complements the existing wind capacity since wind and solar typically produce
2:08:18
peak power production at different times of the day. This allows both renewable energy resources to work together to
2:08:24
meet a broader range of our customers energy needs, increasing PGE's overall system reliability and the value of the
2:08:31
site overall to our customers. The addition of battery storage will also provide flexibility to the grid,
2:08:37
allowing energy storage when demand is low and its use when demand is high. The right mix of energy resources in the
2:08:43
right locations can help reduce reliance on fossil fuels and drive a cleaner, more affordable and reliable energy
2:08:49
resource mix. Fiji has already made strong progress toward achieving the state's emissions targets with an
2:08:56
overall resource portfolio that is 45% non-emitting as of the close of 2024.
2:09:02
And this includes um uh projects like the Big Low Canyon wind farm. The site
2:09:08
certificate we're seeking today to add solar and storage will further PG's progress toward meeting our 2030 state
2:09:14
emission targets to identify the least cost least risk portfolio of resources that are needed
2:09:21
to meet our customers current and future energy needs as well as state clean energy requirements as overseen by the
2:09:26
Oregon Public Utility Commission. PG engages in long-term integrated resource planning. In our most recent integrated
2:09:33
resource plan updated in July of 2025, PG identified a need to procure an
2:09:39
additional 4,500 megawatts of clean energy resources. This represents about a 16% increase
2:09:46

since PGE's prior that had been filed only in 2023.
2:09:51
Projects like the proposed addition of 125 megawatts of solar and 125 megawatts
2:09:56
of storage at Biglo are critical contributors to this growing clean energy need.
2:10:02
PG's all source request for proposals is a transparent, regulated, competitive process by which interested developers
2:10:09
submit detailed project proposals for consideration as we plan to meet our customers energy needs. the 1600
2:10:16
megawatts of resources that PG identified on the final short list of projects that resulted from our 2023 all
2:10:22
source request for proposals competitive bidding process included the big low solar project was acknowledged by the
2:10:29
Oregon public utility commission and the projects were selected for their potential to deliver affordable reliable
2:10:35
and cleaner energy by selecting projects through this competitive process verified by an independent evaluator PG
2:10:42
can add high value responsible projects that capture significant federal incentives and reduce costs while
2:10:48
meeting the state's growing energy needs. Given the shortened timeline that now exists to capture tax credits, the
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importance of maintaining a project schedule is paramount. We have partnered with Bright Knight to ensure responsible
2:11:01
and timely delivery of this project that recognizes that this is a critical opportunity in time for Portland
2:11:07
Generals, the state, and Sherman County. The certificate amendment will allow critical energy need and capacity to
2:11:14
meet Oregon's economic development needs and the state's emission targets. So, we urge the energy facility sighting
2:11:21
council to approve the site certificate amendment recommended by staff, thereby maintaining the development schedule
2:11:26
with a final decision in March 2026. And with that, I want to thank you for

2:11:31
your time and I want to hand this over to our project partners at Bright Knight to provide more details on the project
2:11:36
itself as proposed. Thank you, Kristen. And thank you, Chair Condan and members of the council. My
2:11:42
name is Jess Molen. I'm executive vice president of development at Brightnite. I've spent nearly 20 years developing
2:11:49
renewable power projects across the United States. Earlier in my career, I served as a US Air Force pilot, an
2:11:56
experience that continues to shape how I approach complex infrastructure development, balancing creativity and
2:12:02
innovation with discipline, precision, and an unwavering focus on safety and
2:12:07
reliability. Those same principles guide Bright Knight as a company. Bright Knight is developing over 30 gawatts of
2:12:14
clean energy projects nationw nationwide with 11 gawatts located in the Pacific
2:12:19
Northwest. Across our portfolio, we are committed to safety, responsible cost
2:12:25
management, and building durable partnerships with the communities where we operate.
2:12:30
Our team consists of some of the most accomplished energy project development and operation professionals within the
2:12:35
entire industry. The team at Brightonite is like-minded. We want to be part of a company that is a reliable partner and
2:12:43
committed to the communities we invest and operate in and one that has a strong financial backing with leading edge
2:12:49
system design. Our ability to deliver projects responsibly and on schedule is
2:12:54
validated by our backing by investment partners at Goldman Sachs, global infrastructure partners now owned by
2:13:00
Black Rockck and Cordelio Power, providing the financial strength and stability our utility partners and their
2:13:07
customers expect. Optimizing project to projects to
2:13:12

deliver maximum value to customers and communities while minimizing impacts is central to how it operates. We have
2:13:20
taken those lessons learned and built on that track record here with the Biglo solar and energy storage project. You
2:13:26
will hear this evening in detail the innovative planning and design that has gone into this project, the increased
2:13:31
efficiencies and output BigLow will add to the grid and the best-in-class features to improve operational safety
2:13:37
and resilience. Bright Knight is pleased to be here this evening in partnership with PGE to speak with council about the
2:13:44
Biglo solar and storage project and the steps that our teams have taken to develop a thoughtful responsibly cited
2:13:50
project. Thank you. And now we'll bring up the actual experts.
2:14:10
Thank you, Chair Condan and members of the council. We also want to thank the Oregon Department of Energy staff for
2:14:16
their thorough review and the work reflected in the proposed order. For the record, my name is Kathleen Campanella
2:14:22
and I'm senior director of development for Bright Knight and I'm responsible for the development of the Biglo Solar
2:14:28
and Storage Project. I'd like to begin this evening with a simple question. What does it mean to
2:14:34
site a project responsibly? For this project, responsible sighting
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wasn't a single decision or a single mitigation measure.
2:14:48
It's a it's a principle, excuse me for that. It's a principle that affected nearly every aspect of the project's development and engineering. It shaped
2:14:55
where the project is located, how the site boundary was drawn, how impacts
2:15:00
were avoided and minimized, and how remaining impacts are addressed.
2:15:06
I want to briefly summarize that approach and how it is reflected in the department's analysis.
2:15:17
I'll start by discussing collocation. This is a renewable energy project and
2:15:22

by definition it delivers an environmental benefit. But like any infrastructure project, it also has
2:15:29
impacts. Responsible sighting means acknowledging that reality and finding the option with
2:15:36
the least impacts. Collocation is just that. For this
2:15:41
project, it integrates solar and battery storage with the existing Biglo Canyon wind farm, therefore reducing the need
2:15:48
for new transmission lines, new access roads, and disturbing additional land.
2:15:58
Is that good? Another core element of our approach to responsible sighting is community engagement and listening. This allowed
2:16:06
us to better understand and address local concerns, resulting in a design that is responsive
2:16:11
to the community's voice. We participated in dozens of one-on-one conversations with local leaders,
2:16:19
neighboring land owners, agricultural producers, and community members.
2:16:29
Finally, I want to highlight our outreach and coordination with local organizations and public service
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providers, including county departments, agricultural and conservation groups,
2:16:40
economic development entities, and emergency service providers.
2:16:45
These discussions are reflected in project plans and in the conditions of the proposed order that ensure ongoing
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coordination with public service providers. Taken together, these efforts reflect
2:16:57
the same responsible sighting approach I referenced at the outset, anticipating
2:17:02
impacts, engaging early, and responding in a way that aligns with local priorities.
2:17:09
With that, I'll pass it on to Todd to discuss vegetation and wildfire management and project safety
2:17:14
considerations. Thank you, Kathleen. Chair condan, counselors, my name is
2:17:20
Todd Elwood. I'm the senior permitting director for Bright Knight. Bright night and PGE have heard from the
2:17:26

very beginning how important vegetation management and wildfire risk are for this project. We appreciate the input
2:17:32
received from ODO staff, the reviewing agencies, and the community that have all informed the design of the project
2:17:39
and the draft plans before you today. Rather than relying on any single
2:17:44
measure, the project uses an integrated approach. Project design, construction planning, long-term operations, and
2:17:51
community coordination investment all work together to support long-term landscape resilience. The goal is to
2:17:58
reduce ignition risk, limit fuel buildup, support early detection and response, and strengthen regional
2:18:04
wildfire preparedness. The project is designed to reduce risk from the outset. The layout, materials, access roads are
2:18:12
all planned to minimize ignition sources, break up fuel continuity, and create defensible space around solar
2:18:18
panels, the best, the substation, and related infrastructure. The project has
2:18:24
been designed to exceed fire code requirement by maintaining no less than a 20 foot non-combustible buffer around
2:18:30
the perimeter of the site. This cons conservative approach reflects our commitment to fire safety and directly
2:18:36
responds to input received through outreach with local fire agencies and local and neighboring land owners.
2:18:44
Wildfire mitigation is addressed during every phase of the project. There will be dedicated wildfire mitigation plans
2:18:50
for both construction and operations, including equipment standards, weather-based work restrictions, active
2:18:56
monitoring, and coordination with fire agencies and local responders. There will also be e emergency response plans
2:19:02
for each phase of the project and training for all contractors as well as local responders. The project will use
2:19:08

low fuel vegetation. Restoration seed mixes are comprised of native native
2:19:14
grasses and forbes that produce less biomass, cure more slowly, and do not create continuous fine fuels. Our
2:19:21
proposed seed mix will reduce the need for repeated mowing or treatment, which in turn lowers ignition risk from
2:19:28
maintenance activities. We also take a proactive approach to noxious weed prevention. Rapid reveation, clean
2:19:35
equipment practices, and ongoing monitoring help prevent invasive weeds that increase fire risk and reduce land
2:19:41
productivity. Over the long term, vegetation management continues through the operation and ma maintenance plan.
2:19:47
This includes regular inspections, adaptive management, and ongoing fuel load control for the life of the
2:19:53
project. Soil stability and erosion control are also key parts of this strategy. Proper soil handling,
2:20:00
restoration. Proper soil handling and restoration will reduce weed invasion and help
2:20:05
prevent conditions that can worsen wildfire behavior. Reveitation and weed
2:20:10
control contractors will be held to stringent qualification standards. All of these measures help protect adjacent
2:20:16
agricultural and rain uses by reducing the potential for wildfire spread beyond
2:20:21
the project site. Did advance? Um, taken as a whole, our
2:20:29
commitment to a comprehensive management program demonstrates the project will coexist with and not undermine ongoing
2:20:35
agricultural use in the area. As previously mentioned, the use of setbacks and micro sighting also help
2:20:41
ensure the project will be compatible with neighboring farming operations. Brightite has implemented setbacks
2:20:47
buffers and will have three 2,000galon firewater tanks outside the perimeter fence that can be used by by our
2:20:55

neighbors. The proposed order contains numerous conditions to require accountability and long-term
2:21:00
enforcement, and we support staff's recommendations. Thank you for your time, and I'll hand it off to Lena to
2:21:08
discuss goal three.
2:21:30
Chair, are you guys always going to forget the microphone? Chair condan, council members, my name is Lennena Cop.
2:21:36
I am a environmental specialist with Portland General Electric and we wanted to cover a couple things regarding the
2:21:44
um goal three exception and a little bit more information about the community investment plan.
2:21:50
As you heard from Chris's presentation, the staff is recommending that the goal three exception uh be approved based on
2:21:56
the location dependency and the creation of rural economic benefits. As Kathleen
2:22:02
spoke to earlier, colllocating the solar uh facilities with this particular location is very important to take
2:22:09
advantage of the existing transmission lines, surplus capacity on those transmission lines and existing BPA um
2:22:17
substations. The real economic benefits will be realized through the implementation of a
2:22:24
community investment plan um which was developed from extensive community engagement and listening. The plan
2:22:30
includes pre-screening projects identified through outreach such as dryland wheat agrovotayics agricultural
2:22:38
wildfire risk minimization and capacity building funding fund matching for soil
2:22:43
and water conservation district programs for wheat farmers next generation farming innovation and technology
2:22:50
training program and capacity building for wheat growers. So those are the
2:22:55
pre-screen projects included in the community investment plan. The plan also includes provisions for additional
2:23:00

projects to request funding and a local governance structure through the Midcolia Economic Development District.
2:23:08
The analysis of indirect economic impacts uh performed during our amendment preparation indicate that 1600
2:23:15
acres per acre of farmland taken out of production prior to starting construction will be applied to the
2:23:21
fund. This is in addition to the projected $40 million in property tax revenue.
2:23:27
And we also estimate that on average there will be 165 union workers on site each day during the approximately 18
2:23:33
months construction period generating additional spending in the local community.
2:23:39
In addition to staff's acceptance of RFA's location dependency and rural economic benefit
2:23:46
reasons, PG will be advocating for the council to recognize the project's consistency with state climate goals and
2:23:52
policies. As Kristen discussed in her comments, the site amendment to add
2:23:58
solar and storage will further PG's progress towards meeting our 2030 mission targets mandated by the state.
2:24:04
And for that reason, we will be requesting the council recognize an additional reason to support the goal three exception. And we will provide
2:24:10
additional evidence in the written record to support that request.
2:24:22
Okay. I also wanted to touch on operations and maintenance. Uh we know that there are community concerns with
2:24:28
the past maintenance and performance of the Biglo phase 1 wind assets. PG's ongoing maintenance and overall project
2:24:34
has been addressing those concerns and route issues and Dan will be speaking to those in just a moment. But regarding
2:24:40
the solar battery, um, as has been mentioned by previous speakers and the staff's presentation, the proposed order
2:24:47
requires a standalone onm plan to be approved by the department with review and updates if needed on an annual
2:24:54

basis. The onm plan covers ongoing inspection, monitoring, reporting, and
2:24:59
enforcement by the department at a level not previously specified in the existing big site certificate or any site
2:25:05
certificate issued by the council previously. The plan will also integrate commitments
2:25:11
from the other major operational plans such as the comprehensive reveation and
2:25:17
soil management plan and the operational wildfire mitigation plan. The content of all the plans is informed by the
2:25:23
department's involvement in other recent solar and battery projects and addresses the challenges faced at those sites with
2:25:29
the goal to reduce those challenges at future sites. The development and approval of the
2:25:34
plans are mandated by the site certificate and will be reported on for the life of the project at varying
2:25:39
frequencies. In addition to all those improved details and specific requirements, the
2:25:45
department itself has put significant efforts into their compliance program, has additional compliance staff and
2:25:50
retains the authority to inspect the facility and require corrective action if anything is found to not meet the
2:25:56
requirements. And now I will hand it over to Dan.
2:26:01
Thank you, Lena. For the record, my name is Dan Wilson and I'm the director of renewable operations for Portland
2:26:07
General Electric. In addressing the age and the material condition of the Bigalow wind farm at its 18-year age and
2:26:14
after a long period of stable operation, the Bigalow wind farm has shown an
2:26:20
increase in equipment failures over the past four years. And this has signaled a
2:26:25
condition of age related degradation, a trend that we confirmed by benchmarking
2:26:30
against other industry leaders. In direct response, we have implemented a comprehensive and proactive enhancement
2:26:37
plan to secure the asset's future reliability. The key strategic actions include first

2:26:44
to operate and maintain we have hired a new service provider that is an industry
2:26:49
leader for all wind generation. The performance of the service is reviewed by PGE's leadership to ensure top-notch
2:26:56
compliance to the maintenance standards. Second, we have increased inspection frequencies for key components. Third,
2:27:04
we are executing a critical redesign and replacement program for the obsolete and
2:27:09
failureprone V82 pitch systems which have been a primary source of downtime.
2:27:16
Fourth, after completing of the pitch system replacements, we are cleaning the towers, hubs, and blades. In summary,
2:27:24
the wind farm's current condition reflects its age, but we are actively mitigating those risks through a
2:27:31
targeted capital enhancement and maintenance strategy. The centerpiece of this effort, the pitch system overhaul
2:27:38
directly addresses most of the significant historical failure mode positioning an asset of improved
2:27:44
reliability and extended operational life. Thank you very much and we look
2:27:49
forward to hearing from public comments and will return after our closing. Thank you.
2:28:01
Thanks.
2:28:09
Is there a separate presentation that goes on now? Why is it the last slide?
2:28:21
Okay. Okay. Thank you, certificate holder representatives. We'll now move
2:28:27
to members of the public. Nancy, could you confirm how many comment cards we
2:28:32
have? While she's doing that, is there anyone in the room that would like to provide
2:28:38
verbal testimony tonight that has not filled out a comment card? If you could
2:28:43
raise your hand, seeing none. Okay. Five.
2:28:51
And if you are on the webinar or on the phone, could you raise your hand if you're interested in providing uh verbal
2:28:58
testimony

2:29:06
or she can call you do a time limit on five?
2:29:11
Do you want to do a time limit?
2:29:19
Let's
2:29:26
let's do seven. Okay. So, we have eight individuals that are interested in
2:29:31
providing uh testimony and the council an opportunity to provide comments and
2:29:37
questions and the certificate holder can come back. So, we're going to put a 7 minute time limit on your comments. Note
2:29:43
this is you can provide comments all the way through January 30th. Um, can you put a timer on the screen?
2:29:52
Okay. So, will you stand up and wave your hands when your timer goes off?
2:30:00
Okay. So, I'm going to let you call the commenter since you have the cards. Okay. So again, just as a reminder for
2:30:06
any individuals that wish to provide testimony tonight, please state your name, identify if you're representing
2:30:13
anyone other than yourself, and confirm your physical mail or email address or make sure that it's written on the
2:30:19
comment card. Okay, now we'll turn it over to you.
2:30:26
Okay, our first commenter is Kathy McCulla. Come on up, Kathy.
2:30:32
Okay. Okay. And just so you know, go ahead and come on up. I'll start the timer when
2:30:38
you start to present. Um, and then I'll just raise my hand
2:30:44
when you're at one minute left to go.
2:30:51
And then just a note, if you're going to use the pictures as part of your comments, we'll just take photos of
2:30:57
them. So, but we need to do that before you take them away because once you enter them into the record, they're part of the record.
2:31:09
Should I sit down or stand up? I mean, probably sit down standing up
2:31:14

that's going to pick up on Okay, I can talk.
2:31:20
There you go. Um, you closer.
2:31:32
Stand just like this.
2:31:37
Okay. It's a whole lot. Okay. Thanks.
2:31:43
So, pick up the whole thing. You're gonna stand. You need to hook up here. I think I can sit.
2:31:51
Kathy McCulla and I live right under the project about a half mile from the PG building
2:32:00
and I'm a retired 747 captain for Delta
2:32:07
and I'm also a microbiology environmental health graduate from
2:32:12
Colorado State. When this project was first started, you wouldn't have found
2:32:19
anybody more excited about it than I was because to me, these looked like giant
2:32:26
propellers. I loved it. I I wanted clean energy and
2:32:31
wind and we could farm around them. That was the best. It in fact, it helped us.
2:32:37
We got new roads. We got in and out of fields we could never get into before. It was amazing.
2:32:45
We were probably the biggest proponents of this project
2:32:50
until it construction was great. The first
2:32:56
five years, great manager, uh, new equipment, everything was perfect. The
2:33:03
next 10 years, horrible. I mean, horrible. We were picking up
2:33:09
pieces in our field. There were nose cones dropping. They all started leaking, all of them in
2:33:17
phase one. And the culmination was when a blade dropped
2:33:24
February 2022, waking up my husband and my dog. I wasn't home at the time.
2:33:31
This is the blade down here on the ground there. This is our house across
2:33:39
the road. Was really close. It was really loud. We had been complaining for a while because there had been so many
2:33:45
pieces. PGE wouldn't listen to us. They really would not listen and we didn't

2:33:52
know what else to do. I mean, even after the blade fell and PGE got Allight to
2:33:59
come in and start inspecting all the bolts in all 76 of the first Vestus
2:34:04
towers. Nothing changed. All tight came. All tight went uh one
2:34:13
company before them said it was the greasiest mess that they had ever seen and it was unsafe and they quit. They
2:34:19
had to throw their coveralls away after one day. It was it was one of those things that
2:34:26
we knew would happen. We we'd been watching. This is what they still all
2:34:31
look like that they haven't they haven't gotten better. They aren't cleaner. None
2:34:37
of them have. There's one that has the new prototype on it, but four years after the blade drop, nothing has been
2:34:45
fixed. They have all the parts ordered, but nothing is different to us. And in fact, the old
2:34:55
um Brad Jenkins, who was in charge of the project before, lied to the
2:35:01
newspaper and said, "Just because they're dirty outside doesn't mean they're dirty inside."
2:35:07
Well, I have a picture of the inside. It's horrible. The wiring's cracked. It
2:35:15
It's really bad. And And they flat out lied to us.
2:35:21
So, my problem is, how do I trust this company for solar in a county that is so
2:35:30
fireprone, you would not believe it? Our fires, this is under big loaf. This is
2:35:35
one of the fires we've had. We have six to 10 fires a year during harvest and
2:35:40
around the dry season. And they're scary. I mean, they are they they move
2:35:45
fast. My neighbor barely got in the car and out of her house as a wall of flames was coming towards her. We all run to
2:35:53
fight them. We all have water um on the back of our pickups. We have shovels. We
2:35:58
have hose. We have everything like that. But they still move fast. And I mean
2:36:04
fast. There were probably 50 pickups and farmers fighting this fire. And this was
2:36:10

this was a couple years ago. It's just one of the many. And if I trusted PGE
2:36:17
with their with their wind,
2:36:23
I I can't trust them with their solar. I can't trust that I'm safe in my house if
2:36:28
they're not going to be honest.
2:36:35
And if they're going to tell people that we lie, there's a whole new regime at PGE now. I
2:36:43
I admit that because I like Dan. I like the people who are there now.
2:36:49
And I think we're on a different tap. I think we're going a different direction.
2:36:55
But unless it's in the site certificate, they're not going to do anything. And
2:37:01
most of this most of this amendment is construction. Very little of it concerns
2:37:09
actual operation once the construction phase is over. We really need a strong
2:37:15
site certificate. Even with PGE knowing all that, they never reported anything
2:37:22
until I went to the paper and got the Orgonian to write four months after. No,
2:37:28
wait. February is when the blade dropped and I think the paper maybe September
2:37:36
came out and there was no change, nothing. They knew pieces were dropping
2:37:43
and I just I I'm glad they have new maintenance. I really am. Or new, you
2:37:49
know, new people. But we've got to have a strong sight certificate. We could not
2:37:54
get them to give us a holdless clause for farming. So if we accidentally start a fire and it burns into their facility,
2:38:01
that's like a that that's a two billion dollar facility we don't have money for.
2:38:08
The only other thing I was going to say is bright night's got great ideas. I mean for fire and and as 747 captain
2:38:17
lithium ion batteries are scary. They are just plain scary. My my vinyl sighting on my house melted in 2021 to
2:38:26
the west side. That's how hot it gets there. So if you don't have good,
2:38:32

you know, good protection, you're in tr you're in trouble. So this is how they look. They say, "Oh no, they look great.
2:38:38
They're They're white. They're clean. Yes, they are. This is how the transform
2:38:44
boxes look that PGE has under the towers. How am I supposed to think that
2:38:49
the batteries are going to look okay? I I just So, I hope I understand we have
2:38:55
to have this green energy mandated, etc.
2:39:01
Can we get some real teeth in this site certificate? Can we get some real
2:39:08
help out where we are? And if there's a fire,
2:39:14
please don't let them sue us so that we can't farm anymore because we only have
2:39:19
5 million liability. We can't pay for that facility.
2:39:24
We've never started a fire during harvest, but we fight four to six a year. Well, no, six to 10. So, they
2:39:31
happen all the time. One of these days it's going to be our turn. Okay. Thank you so much for your
2:39:38
comments. Appreciate it.
2:39:46
Let's see if I can take it all away. Ask questions whenever you want. You will get a designated time, but you
2:39:53
can ask whenever you want.
2:40:03
All right. So, our next commenter is Kevin McCulla.
2:40:17
Obviously, I'm Kathy's wife or hus Oh, excuse me. Kathy Kathy's husband. Uh,
2:40:25
I farm I farm underneath the the project. PGE has not done what they said
2:40:31
they were going to do and now that we have new management, this is a good thing. But they need to they need to
2:40:38
prove that they can operate this. I don't know why you would give them a certificate to put in a solar farm when
2:40:44
they have not proven that they they can operate what they have. They keep saying
2:40:49

they need more green power. You know how many towers we have sitting every day out of those 217?
2:40:56
40 to 50. Every day. Makes no sense to me why you would be willing to give them
2:41:02
a certificate to build a solar thing until they fix this problem over here.
2:41:07
It's it's bizarre to me. And the other thing is the fires. Like
2:41:12
she just said, it's not if we start a fire, it's when we start a fire. and
2:41:19
your setbacks aren't even close to deep enough to keep us from having to pay,
2:41:25
they're going to sue us and we will no longer be in business.
2:41:30
So, thank you for your time and hopefully you take some of this into
2:41:35
account.
2:41:46
Okay, my next commenter is Colt McCola.
2:41:58
Good evening everyone. Um, should be the last McCulla commenting I think must some that I don't know about. U, my name
2:42:04
is Colton McCulla and I am the current farmer on the land that the proposed project would be built on. As some of
2:42:10
you know from experience and have learned recently, Sherman County is extremely wildfire prone from late May
2:42:16
through October. My main concern with the proposed project is both fire starting within the project and fire
2:42:21
starting outside the project and burning into the project. I farm on nearly every side of the project and potentially in
2:42:27
the middle if approved. Sherman County is agricultural community with the primary crop going being wheat. Wheat is
2:42:33
typically harvested wheat typically wheat harvest typically happens in July and August. This is when the crop dries
2:42:40
out and can be harvested, but it is also when it is most likely to burn. We do a lot to prevent and stop fire from always
2:42:46

having a fire fighting pickup and tractor with a disc in the field to preventive maintenance on our combines
2:42:51
and other equipment to putting fire brakes around houses and other infrastructure to shutting down on days of extreme heat and high wind.
2:42:59
Even taking these precautions, there is no way to eliminate the chance that we will start a fire. As they've said, it's
2:43:05
not if, it's winds. I do my best to prevent fire and will continue to do so, but I am very worried about starting a
2:43:12
fire and having it burn into the solar facility. I carry a large liability policy, but not even close to large
2:43:18
enough if I burn up a solar facility. There is no economical way to carry a large enough policy. I don't want to
2:43:24
lose the farm or have my son lose the farm because we burn solar facility cited in
2:43:31
the middle of wheat fields where seasonal fire risk is extremely high. I have been told that the panels will not
2:43:38
burn and that may or may not be true, but that doesn't mean that they won't be damaged or melted by the heat of the
2:43:44
vegetation burning below them. The best way to reduce the fire risk in the solar project is to reduce the amount of
2:43:50
vegetation available to burn. Under the request for amendment for currently
2:43:56
submitted, it is suggested that the maximum height of the vegetation be 12 in year round. This is far too tall and
2:44:03
would be a significant wildfire risk during fire season. Under the proposed order submitted by ODOE, it is suggested
2:44:10
the vegetation be kept to a maximum height of 12 in during the rainy se November to May and 1 to 3 in during the
2:44:16
dry season June to October for all areas within the solar fence line along with
2:44:22
several other stipulations on page 233 of the proposed order. I strongly support Odoe's suggestions
2:44:29

and feel that it would make the project a safer and far less likely to have a wildfire. The small change in management
2:44:35
practice would drastically reduce the wildfire potential within the solar facility.
2:44:42
From what I can tell, ODOE changes would go under the comprehensive
2:44:47
solar reveation and soil management plan. although redlinined in by ODOE.
2:44:56
If this is the case, I would like to see some other language addressed in that section as it currently states this is
2:45:01
only the plan in the interimm until an operational wildfire management plan is
2:45:07
put in place. It concerns me that there is no operational wild wildfire plan to
2:45:12
be reviewed yet and PGE system wild systemwide wildfire mitigation plan may
2:45:19
be used. PG systemwide wildfire with WMP primarily focuses on power transmission
2:45:25
and some limited information on the generating generating facilities. It is not a sightsp specific plan that
2:45:32
considers specific wildfire risks for a project like this in a location like
2:45:38
here. I would like to see language saying ODOE's vegetation height and
2:45:43
clearances suggestion would be implemented into the operation wildfire mitigation plan and remain a basic
2:45:49
requirement for the life of the operation of the facility if not included into the operational wildfire
2:45:56
mitigation plan. Basically, I want to see the vegetation height suggested by ODOE be a permanent, not easily amended
2:46:03
part of the facility requirement throughout the operation of the project and not be ignored because the operation
2:46:10
wildfire mitigation plan says something different or doesn't specify vegetation height.
2:46:16
My intent of publicly coming is not to show support for or against the project but to ensure the critical wire file
2:46:22
fire preventive strategies are used during building and operation of the project. I would like to see the project

2:46:28
be an asset to fire prevention in the county not a risk. I would like to see see it be a fire break where people know
2:46:34
when the fire gets to the actual project that it is going to be stopped. But there has to be stuff in the site certificate that puts teeth that make
2:46:41
them maintain it to this standard. But if vegetation isn't managed properly, it's not fair to ask the
2:46:48
farmers and community members around the project to take the risk associated with the solar facility. I want the council
2:46:53
to realize that this is this proposed project is being cited in the middle of wheat country that is associated with
2:47:00
very high seasonal fire risk. Setting a standard of vegetation management and making sure that standard is upheld
2:47:06
throughout the operations of the facility would address a large part of the fire concern with the solar budget.
2:47:15
Thank you.
2:47:23
Okay, our next commenter is Mr. Hildebrand.
2:47:34
Greetings. Uh, Orund Hildred is my name and I am not a makulla.
2:47:40
Um, I manage my family's farm which is near
2:47:48
the proposed Bigalow renewable power project and have been involved with
2:47:54
Oregon's environmental and land use issues for years. I am submitting this
2:48:00
pro this statement for the record regarding the Bigalow renewable power project. Um I approach projects like
2:48:08
this with a clear understanding that development has impacts. The question is
2:48:14
not whether impacts exist because they do but whether they are acknowledged,
2:48:20
responsibly mitigated and managed through a rigorous public process.
2:48:27
Even farming has impacts on on our land. You know, some may argue that our land
2:48:34
shouldn't have been put to the plow back in the 1880s, but it was done. Impacts
2:48:39

happen. Um, but
2:48:45
based on my experience, I am confident that the impacts associated with this
2:48:51
project can be addressed appropriately. And I'm confident that after 50 to 70
2:48:57
years of the project being a major solar producer, if we get to that point and we
2:49:02
need to have the land back for agriculture production, it can come back to agriculture production with an
2:49:10
improved soil health. That is critical. I'm a strong believer in clean energy.
2:49:16
I've been a director of the community renewable energy association, Korea, for
2:49:22
many years. Korea is a strong advocate advocate for shaping policy to benefit
2:49:29
rural Oregon and I'm personally have been involved in a development my own renewable energy project wind farm which
2:49:37
is a 9 megawatt 6G 1.5 SLE turbines that
2:49:42
are adjacent to Portland General Electric's Big Low Canyon. I supply
2:49:48
power to over 3,000 homes in the Portland area.
2:49:55
That experience has given me a practical understanding of what responsible project planning looks like, including
2:50:02
the importance of environmental review, mitigation commitments, and ongoing
2:50:07
accountability. You we must hold companies accountable for what they say
2:50:13
they're going to do. The Bigalow project reflects this level of responsibility.
2:50:19
The developer has engaged seriously with the permitting process and has demonstrated a willingness to address
2:50:25
environmental considerations. I have attended several of the discussions myself, including a presentation of the
2:50:32
North Sherman County Fire District that discussed these fire mitigation procedures.
2:50:38
Used to be that we on the east side felt that we had the fire risk to ourselves. Now that you on your west with the
2:50:45

climate change, you had the fire risk too. So I think everybody can appreciate, especially in a rural county
2:50:52
where the land and agriculture, natural resources are deeply inter interconnected, the importance of this
2:50:59
fire mitigation. I also believe it's important to consider projects like this in a broader long-term context. Sherman
2:51:07
Countyy's economy has changed significantly over time and the pressures facing agriculture and rural
2:51:13
communities continue to evolve. We had in 1920s we had over 4,000 people living
2:51:20
in the county. That's more than twice what we have right now. We had hotels in
2:51:26
the towns and restaurants and theaters and I've read even roofers had a golf course. That's all most of that is gone
2:51:34
now. um and primarily due to consolidation of
2:51:40
farms enabling our producers to reduce their production costs and they've done
2:51:45
a damn good job of it. They've really driven down their cost to to compete in
2:51:51
a tight environment and I appreciate people young farmers like Colton coming on because we need them to continue this
2:51:59
into the future but it's going to become tougher. uh our farmers have to
2:52:06
consolidate and they have to become larger and those that don't are not going to be with us anymore. Um and can
2:52:14
anybody doubt that the drive for more that we will see
2:52:20
more capital intensive equipment uh powered by artificial intelligence
2:52:27
that's will continue and further fuel consolidation amongst the farms in
2:52:32
Sherman County. Thoughtfully planned energy projects represent one step in a
2:52:38
more diversified and resilient future. uh one that balances environmental stewardship with an econ economic
2:52:45
stability. In this case, it is true that solar saves farms.
2:52:51

Last month, Governor Cotch issued an executive order to state agencies to move faster on clean energy projects.
2:52:58
And recently, even Representative Bence acknowledged that Oregon will have a
2:53:04
critical short shortfall in energy unless drastic steps are taken,
2:53:10
including expansion of our transmission facilities. The Bigalow The Bigalow
2:53:15
renewable energy project is lowhanging fruit with the existing underutilized
2:53:20
PGE transmission. While recognizing the project is not without impact, I view
2:53:25
the Bigalow renewable project as a positive contribution when evaluated through the established FSE process and
2:53:33
supported by enforcable mitigation measures. Thank you for the opportunity
2:53:39
to provide the statement and for your careful consideration, positive consideration of this these issues as
2:53:46
part of the record. Thank you.
2:53:57
Okay, our next commenter in the room is Chad Higgins.
2:54:11
Audio check. Honorable committee, uh, my name is, uh,
2:54:17
thank you for the opportunity for me to present testimony and comments. My name is Chad Higgins. I'm an associate
2:54:24
professor at Oregon State UN University, and a farmer in Lynn County. My area of
2:54:29
expertise is in integrated farming and energy systems, agricultural sustainability, and egg tech. I spent
2:54:36
more than the past decade working on ways to integrate solar energy production and agricultural practice and
2:54:43
uh mitigate the conflict between the renewable energy and agricultural production so-called agic systems. I'll
2:54:50
keep my testimony um to the agricultural aspects that pertain to goal three. Uh
2:54:56
broadly speaking, I care deeply about agricultural land protection and agree
2:55:01

with the principle that protection of agricultural land is of critical importance. Indeed, my entire research
2:55:07
portfolio and a good part of my life's work has been devoted to serving farmers in local rural communities. There would
2:55:15
be no farms without the land to support them. But farming is an in incredibly
2:55:21
challenging and requires brilliant folks to do it under the current conditions.
2:55:27
It isn't sufficient to simply protect land um as it's only one piece of the puzzle
2:55:33
that makes farming possible. an economically v vigorous agricultural system depends on the land and soil of
2:55:39
course but it also depends on the skilled farmers access to the needed agricultural inputs access to
2:55:46
sufficiently developed agricultural markets and enough regulatory freedom to allow land managers uh to adapt to new
2:55:53
economic uh and resource availability conditions. I'm an advocate for balancing
2:55:59
agricultural land use trade-offs with energy trade-offs wherever possible and I applaud your efforts in doing that in
2:56:06
a uh respectful and sensitive manner. My research on agriboltaic systems has
2:56:12
shown that the benefits of shade to cropping systems most critically depend on the dry soil's fertility. That is
2:56:20
crops generally benefit more in water limiting conditions and with uh the benefit of good soil. This means that
2:56:27
agrialttics are appropriate in some locations and not appropriate in others. Uh note that the proposed project is not
2:56:34
an aggravate project. I will say that the three most common criticisms of my
2:56:39
research are one that I haven't tested any particular crop in a particular region. Uh ported to this uh particular
2:56:47
region it would be you haven't tried say wheat in central Oregon which is true. It's fair criticism. Um, the second
2:56:55

major criticism of my work is that my experimental trials are small compared to proposed commercial projects. That's
2:57:00
also fair. I don't have the money to build a multi-billion dollar large project for my research. They tend to be
2:57:07
uh of the multiple acres size as opposed to multiple thousands of acres. And third is uh I just don't believe you
2:57:14
Chad that this is possible. Um and uh if you are a critical thinker, you first
2:57:19
have to be critical and I take that uh challenge on. Uh these are fair critiques. Even though I endeavor to
2:57:26
perform transferable re transferable research for maximum social benefits, my research team and I have done most of
2:57:32
our work in the Wamut Valley, a location with drastically different hydrarology and soil to here. I will note that we
2:57:39
have done a trial in Madress on irrigated carrot seed production that showed consistent results with all of
2:57:45
our other studies and the carrot seed benefited um from the energy system. But that
2:57:50
trial was limited in scope and it was a not a dryland crop as the situation is
2:57:56
on the point of scaling. Um, I'll I'll take issue and say if I can make it work
2:58:02
profitably at a small scale, economies of scale dictate that it should work at the larger scale because you just turn
2:58:08
the tractor around less. Um, the main point is that more research is
2:58:14
targeted to the local region, specific crops and unique conditions like the
2:58:19
fire risk condition that's unique to this area and so critical here. um more
2:58:24
research would help inform future development in a sustainable way and I uh really support the inclusion of the
2:58:31
competitive research funding to be managed by the economic development district. Um in full disclosure, I will
2:58:38
uh absolutely com enter that competition. Um and my approach would be to work with the community to address

2:58:44
their most precient concerns and questions. But should I not win, I'll applaud anyer because I believe that
2:58:52
that work would strongly uh help the community. Um because it's no secret
2:58:57
that there's many projects proposed for this area. Uh solar sighting tends to be
2:59:04
local in scope as as you know, but when you find a good spot, there tends to be a concentration in that spot as you
2:59:11
know. and um uh Gillum County here, sorry, Sherman County here, I misspoke,
2:59:17
is uh one of those Goldilock zones. Um may the best researcher win. I welcome
2:59:23
the competition. Uh secondly, I do want to say that these projects are longived but ultimately temporary installations.
2:59:30
A natural question that a farmer may ask is what's the agricultural potential of so of the soil at the end of the
2:59:36
project's life? To answer that, my research team in collaboration with soil scientists at OSU are in a third year of
2:59:42
a multi-deadal study where we rest the soil under solar uh panels to see the
2:59:48
change in soil condition. As part of that project, we're monitoring the soil's health annually. And thus far at
2:59:54
this early stage, we've we've observed increased soil carbon and fertility relative to the non-solarized control
3:00:01
under the same management practice. Of course, there are many years of observation ahead of us here, but the preliminary observations are promising.
3:00:08
Finally, I understand if anyone is skeptical of my science, you don't believe that this is possible or that
3:00:15
the benefits are there. Um, but I tr I ask you to believe the evidence of your own eyes and I invite you to come to my
3:00:22
research facilities and tour it for yourself. Anyone here on the committee, anyone in the community, I welcome uh
3:00:28
please come out. I know it's a bit of a drive from here. Um, but I I would hope to make it worth worth your while. I I'm

3:00:35
open to the public the second Tuesday of every month at 1 1 p.m. The location is
3:00:41
the North Wamut Research and Extension Center in Aurora, Oregon. Um,
3:00:46
please come out. Um, you're you're most welcome. Um, and I will answer I'll make myself available to answer any questions
3:00:52
that the committee has or the community has based on my research in these systems. And um, yeah, thank you very
3:00:59
much.
3:01:08
Okay. Anybody in the room that would like to make a comment that has not turned a foreman in? Okay. Go ahead and
3:01:15
step up to the mic. Just be sure to give us your name and your address, please. Thank you. My name is uh Chair Condan,
3:01:22
Secretary Cornett. We uh my name is John Langden and I filled out a form and
3:01:30
mishandled the uh application process. I apologize Sarah. So I do believe Chad
3:01:36
and I do believe Orman that solar saves farms. And so I am a fourth generation
3:01:42
farmer. My address is 30574 Diamond Hill Drive in Harrisburg. I have
3:01:49
some property that has a particular uh interest for solar. So, I've been
3:01:55
approached many many times over the years and that's led me to have solar companies come to us with proposals.
3:02:03
And there's always been a level of understanding and education there. But I got to go to a
3:02:10
uh meeting like the one last night, a letter of intent meeting where I got to see Todd in action. It was pretty
3:02:16
impressive. And in that meeting, I decided that I needed to educate myself on the A and solar world. And so, for
3:02:24
the last 30 months, there's rarely been a day where I me and my partners haven't taken that path. We were at Chad's
3:02:32
facility on Tuesday, and I think that was our 30th tour in 30th month. And and
3:02:37

every time we learn something new. We bring a lot of solar developers, a lot of VIPs. We actually had some
3:02:44
shepherdesses out there last time and our mission is to
3:02:49
learn all we can about a and solar working together, communities, agricultural
3:02:55
systems, agricultural uh neighbors, all of those things together and try to educate myself to be
3:03:02
um qualified to speak to it and help other people whether it's this council
3:03:08
or farmers or developers. So we also
3:03:14
one of my partners likes to travel so we went to Europe. We heard that they do it better over there or they're ahead of
3:03:20
us. So we went to Europe. We've been to a multitude of cu uh countries and saw a lot of different projects. A lot of
3:03:26
those were farm projects. And quite frankly after dozens and dozens of conversations with developers in
3:03:33
multitude of countries, Bright Night is great. They've done a
3:03:39
great job. I've been in multiple conversations with them about vegetation management. One of the things that we've
3:03:44
done in our learning is we've had the opportunity to become vegetation managers. So, we are vegetation managers
3:03:50
in Oregon. The best way to learn something is to go do it. So, we've done that. And we've looked at every system
3:03:57
we can find where agriculture and solar works together in a communities and with farmers and with those systems. And I
3:04:04
can tell you that the conversations with Bright Knight have been as outstanding and as advanced as anyone I've had in
3:04:11
the world. I would trust them with my land. So, what I'm telling you is
3:04:17
these guys seem to be listening to the farmer. Todd and Kathleen have been
3:04:23
I think they're genuinely interested in the community, the farmer, making it work, making it great, and making it a
3:04:29

win-winwin for everybody. And so I would encourage the council to look upon them favorably.
3:04:35
So thank you.
3:04:43
Okay. Anybody else in the room that would like to make a comment?
3:04:49
Okay. Seeing none, we're going to go ahead and move on to the people on the webinar.
3:04:55
Uh just as a reminder, if you are in the webinar um and you would like to raise your hand, at the bottom of the ic or
3:05:01
the main window, excuse me, is a set of icon, click on that participant and you'll see a hand icon. You're going to
3:05:08
click on that to raise your hand and you will click it again to lower your hand after you have commented. If you're on
3:05:14
the phone, press star three on your keypad to raise your hand and then again press star three to lower your hand.
3:05:26
Okay, so our first commenter is Dan Hilderbrand.
3:05:34
Oh no, he lowered his hand. Okay, if you need to, you can raise your hand
3:05:39
again, Dan, if you if that was a mistake. So, we're going to move on to Miss Irene Gilbert.
3:05:49
Okay. All right, let's see.
3:06:00
Okay, Irene, don't touch your button. I'm unmuting you. We're playing a game back and forth right now.
3:06:23
Okay, she's working. All right. Can't get Irene on. So, Dan,
3:06:28
I see your mic is open. You go ahead with your comment. Okay. Thank you. Uh, can you hear me?
3:06:34
Okay. Hello. Can you hear me? Okay.
3:06:41
Yes, we can hear you just fine. Oh, I'm sorry. Okay. Um, I'm representing uh my brother and I, Randy.
3:06:48
Uh, he's the since we inherited the ranch from my father. He's now the general manager of our operation. Uh, we
3:06:56
represent the fourth generation of Hilderbrands farming our ranch. And uh,
3:07:02

it's been a struggle as it always has been since Orman and I grew up on the ranch as kids. our family every year
3:07:09
worrying that we were going to have enough uh yield with with the price of wheat combined together and uh it's
3:07:15
always been a struggle um to to be efficient farmer. Now with the exponential increase in not only
3:07:21
equipment but the inputs of the trimming practices um it's been that much more of
3:07:27
a struggle. Um, the nice thing about this project is going to give us some more flexibility and and continuity as
3:07:33
far as the dependability of uh our e economical strength to keep the farm
3:07:39
going and make a sustainable career rather than a constant financial gamble. Um, approving the Bigalow renewable
3:07:46
project is a decision to keep the farmland in production and diversify the economic base of Eastern Oregon. And uh
3:07:53
we want to be responsible stewards of the of the of the ranch and the and the
3:07:59
farming in general. And this will provide a more predictable revenue stream that we can depend on. And uh
3:08:07
this is not going to replace farming. It's just going to help uh support and diversify it. Um in the past uh
3:08:15
had very very few opportunities to improve. The wind turbines were one of the first ones. A lot of people were
3:08:22
skeptical of the wind turbines and we still do to this day. Um, and one of my
3:08:27
first concerns when I've heard about this is I I was very positive on it. I thought it was a very good uh thing for
3:08:33
us and I went to one of the public uh comment meetings at the Wasco um
3:08:39
activity center there in uh in Wasco and was pretty confident in what I heard
3:08:45
coming from Bright Night and the and where they were going with it and they want to be good in this project and I
3:08:50

really feel um with the input as far as the wildfires go. Yes, we do have them from time to time. It's only in the
3:08:59
summer and it's something that farmers we grew up as kids that's something that you always had to concern yourself with
3:09:05
and it's just something we've grown up with along along with the wind and everything else. Uh the project itself
3:09:12
the 1400 acres represents about according to Randy about 1 half% of the total acreage and uh so it's not going
3:09:20
to replace farming in any of the imagination. Uh originally when Randy
3:09:26
and I were talking about it, he was actually quite skeptical about it. And I said, "Randy, look at it like this. We're not farming wheat farming photons
3:09:33
or electrons coming from the sun. We're just farming something else." Um our dad was behind the wind turbines. My dad and
3:09:40
uh our uncle John Orman's dad uh were very uh strong advocates of it. and I
3:09:45
see what it's done for the county and the uh the income that has helped the entire county, the businesses in Wasco
3:09:52
and Mororrow and surrounding areas. It's been a very beneficial opportunity. And
3:09:57
I had to remind Randy once, I said, Randy, the solar panels are going to look really good outside the windshield or as you're looking at them through the
3:10:04
windshield of your new combine. So, um I think we can look at this as very valuable partnership for everybody and
3:10:11
uh and I think with the wildfire, yes, that is a huge concern. It is a very huge concern. I understand that. Um but
3:10:18
that's something the farmers have always had to fight that about every summer. Um
3:10:25
it's just something that we've always had to learn to live with. If there's any questions, uh, any correspondence
3:10:30
can be directed my and care of my brother Randy at Post Office Box 326, West Oregon.
3:10:40
I'm sorry, Dan. Could you repeat your address for the record? Uh, you can uh almost said email. You
3:10:47

can send any correspondence in care of Randy Hilderbrand, Post Office Box 326, WAS, Oregon 97065.
3:10:55
Thank you. I also one last comment. I do share council member um Royal's uh ick factor
3:11:04
towards the bats and the rat. They're nothing large flying rats. So I stand in solidarity with her and her.
3:11:10
Thank you, sir.
3:11:18
All right. Thank you very much, Miss Philbrand. Uh looks like our next commenter is going to be Amanda Whitman.
3:11:25
Amanda, I'm gonna go ahead and unmute your mic. You are ready to comment.
3:11:30
Can you hear me? Yes, we can hear you. Okay. Hi, I'm Amanda Whitman and I am
3:11:37
the district manager for Sherman County Soil and Water Conservation District. Um, I have lived in Sherman County for
3:11:43
about 16 years now. And one of my concerns is that um no one from this
3:11:49
project has contacted the district as far as conservation issues that would
3:11:55
arise with the construction of this project or um the outcome of the
3:12:02
construction of this project. Um, in the past we have been very involved with the
3:12:07
original wind farm projects in Sherman County and I have noticed um with the
3:12:14
solar that that is not the case. Uh they like to meet with me once and listen to what
3:12:23
I have to say but they're not listening to what I have to say. So that is a concern. Um
3:12:30
we had significant erosion issues with the one solar project that has been um
3:12:36
implemented in this county and there was damage to neighboring uh land from that
3:12:42
project. Um all a lot of this land is prime farmland and it is also highly
3:12:50
erodable land. So no matter how much rainfall we get in the county, we still have major eros erosion issues that go
3:12:58
along with that rain. Um I have asked multiple solar companies
3:13:05
about the long-term effects of solar on our soil and water tributaries

3:13:11
um long-term effects and no one has given me any answers on that. Um, so
3:13:20
there there's a lot of concerns that the district has with these projects, especially these large larger scale
3:13:26
projects that could really affect our wersheds in the county. Um the other
3:13:32
thing as far as fire goes, um we have been working for over a year now with
3:13:39
Natural Resource Conservation Services, NRCS to incorporate a uh fire break um
3:13:47
project in the county to help with these fires that come through our county every year. And I you mentioned that you were
3:13:56
going to put in 20 foot buffers. Um the minimum for NRCS is 30 foot.
3:14:02
Um and that is the absolute minimum that they're suggesting. So it's imperative that I think they
3:14:10
talk to the our part the partners in this about what they are suggesting. Um,
3:14:17
USDA has been active in this county for many years and we know the land. We know
3:14:23
the vegetation. We know how fire moves and I think that's very important.
3:14:30
Another issue is the weeds and annual grasses. We've seen that with other
3:14:35
solar projects and wind farms. There's no um immediate control over weeds. The
3:14:43
Russian thistles in this county, for instance, grow rapidly. Um, they don't
3:14:48
need water. They catch on fire very quickly. So, if we don't have weed and
3:14:55
annual grass control around these projects, it's going to be detrimental.
3:15:00
Um, trying to think what else. I I think um
3:15:07
those are the ma my main concerns. I I did not plan on talking tonight, but I felt like those were a few things that I
3:15:13
needed to bring up. The conservation district has been in this county for 75 years now. We've had um over $2 million
3:15:22
worth of conservation work implemented in this county and a lot of these projects take out those conservation
3:15:29

practices. And then what do we do to fix that? We're going back in time on all of
3:15:36
the work that we've put in to fix our riparian areas. And I know you think it's upland, but upland affects riparian
3:15:44
and the streams and the rivers. So, um, those are my main concerns tonight. And
3:15:50
I will submit a letter before the comment period is over. Thank you.
3:16:00
All right. Thank you, Miss Whitman. All right. Well, I'm going to circle back to Miss Gilbert. I do not see your hand
3:16:07
raised, Miss Gilbert, but if you are interested in commenting, please just raise your hand and that will bring me
3:16:14
Oh, she's got her hand up and she's unmuted. Go ahead, Miss Gilbert. Hello. Are we talking now?
3:16:21
We are talking. Okay. Um, Irene Gilbert, 2310 Adams Avenue, Lrand, Oregon. Um, I'm co-chair
3:16:30
of the STBH group and I've spent quite a bit of time representing the public interest before FSAC. So, I do have a
3:16:37
few I haven't done a thorough review of this, but um I will say that the people who did the presentation did a very
3:16:44
professional uh job and I appreciate that. Um, my concerns rely along the
3:16:50
lines of the fact that this this group has a really poor track record in terms
3:16:56
of compliance or um holding their people accountable for following the uh site
3:17:04
certificate conditions. And specifically, the ones that that really jump out to me are the fire plan and the
3:17:10
noxious weed plan. Um now the statutes require monitoring and mitigation plans
3:17:16
and um what has been happening with these site certificates is that they're
3:17:22
approved with a lack of details regarding what is to be included in the monitoring and mitigation plan and site
3:17:30
certificates are issued but those plans are not finalized until after the public
3:17:35
process has ended. So I based on that I believe there's a really an important
3:17:42

issue in that the the draft plans need to be very detailed very specific and
3:17:49
include the requests that are being made for specific um mitigation methods and I
3:17:57
don't I have not found that to be this the case so far. Um, it becomes even
3:18:02
more important since the Oregon Department of Energy has been making changes to monitoring and mitigation
3:18:09
plans without amendments to site certificates. So, it's making it difficult for uh land owners and the
3:18:16
public to trust that the site certificates are actually going to be complied with. Um, one thing that I'm
3:18:24
really very concerned about is the fact that this site certificate references the use of the public utilities
3:18:31
commission fire uh wildfire plan once the operation of the development begins.
3:18:37
So, you're working on this for the construction period and getting a lot of feedback. But if you're using the PUC um
3:18:46
fire mitigation plan without adding specific local criteria, what ends up
3:18:52
happening is for example, developers rate fire hazard differently oftentimes
3:18:59
than local areas. So, for example, with the B2 transmission line, Idaho Power
3:19:05
found no high-risk areas for fire across any of the five counties that that
3:19:11
transmission line crosses. So, I think it's important that it be more or less
3:19:17
cast in stone that this area will be treated as a high-risisk area in terms of fire. Um the other thing um the the
3:19:26
issue of landowner liability for damages um to their facilities as a result of
3:19:32
fires. Um and I I was glad to hear the last person comment on this 20 ft is not
3:19:38
providing the protection or the mitigation for that risk to the the property owners that are facing the risk
3:19:46
of being sued for damages to the develop to the area. I personally think 30 feet
3:19:52

is not enough. I I would say that in order to issue a site certificate that mitigates for that risk. Um there needs
3:20:00
to be some research into how far do these fires jump when they are in uh
3:20:05
wheat area and assure that the uh the no fire zone is wide enough to actually
3:20:12
provide that. uh the FSAC makes a determination about significance of
3:20:18
impacts and it's not going to be a significant impact but um I just wanted to remind you that that does not exclude
3:20:26
the fact that the developer is supposed to mitigate for all of the all the impacts they are to leave these
3:20:32
agricultural um land owners basically at the same
3:20:38
point as they are going into this by addressing the increased risks that are
3:20:43
created by this development. Certainly, one of those increased risks is that
3:20:48
they could be sued for a fire um that happens on their area jumping into a um
3:20:55
into this new development. I um at any rate, I'm going to spend
3:21:00
some more time looking through these and we'll make some specific comments uh and reference the mitigation and and u plan
3:21:09
statutes which I understand is required for this. But I do think that while it's a good start, this draft, the drafts of
3:21:17
the fire and also the noxious weed plans are not developed to the extent that the
3:21:22
public can have any kind of assurance that you're actually going to be uh
3:21:28
number one implementing mitigation that leaves the the public free of risk of or
3:21:35
addresses the increased risk or that the monitoring is going to be adequate to
3:21:40
asssure long-term protection. action. Um the plans don't address, for instance,
3:21:46
state requirements for weed management. And there's been a lot of concern from
3:21:52
the tribes, from individuals about the level of weeds that are being uh spread
3:21:57
by these renewable energy projects. And I I would really encourage you to

3:22:03
require the developer to comply with the state requirements and to leave the land
3:22:09
owners uh financially free of the consequences of having to go to the
3:22:15
county and and file against a developer because they're failing to manage the weeds according to the state statutes.
3:22:23
Um I guess that's enough for once. I didn't use my seven minutes. I don't believe. Anyway, thank you for your
3:22:29
time. Any questions?
3:22:36
No, there are no questions. Thank you for your comments. All right. So, at this point, I see no
3:22:42
other hands raised. Is there anyone else in the room that would like to provide a comment?
3:22:50
Last call.
3:22:57
Okay. So now we're going to provide an opportunity to members of the council to
3:23:03
ask questions or make any recommendations to staff.
3:23:09
Chair Condan, this is Marcy. Thank you, Marcy.
3:23:16
Uh, first of all, I would like to say uh I wish I had been there in person, but
3:23:21
nonetheless, thank you to everyone who took the time to so clearly state your
3:23:28
concerns. One of the things that I've most appreciated about serving on this council is it has been absolutely
3:23:35
educational for me, not just as an Oregonian, but professionally. Um Sarah
3:23:42
to directly um respond to your your request about you know comments to
3:23:48
staff. I'm well aware of the separation between the Department of Energy and the Oregon
3:23:55
Public Utility Commission, but I strongly um encourage and ask whether
3:24:01
it's just to and I'm happy to do some of my own research, but I'm I'm really
3:24:06
concerned about our limits that I'm aware of that may or may
3:24:13
not align with what can be done elsewhere. So for example like I know we
3:24:19

can't say oh you must have blank number of people or we can't say you must
3:24:24
double whatever the the average you know standards are or exceed minimum
3:24:31
standards but I just I really like to know that there's a way to provide some more assurance to the public. Um it's no
3:24:39
secret I've said it probably every meeting since we've started talking about wildfire. Um, someone mentioned
3:24:45
that PGE's plan um tends to lean towards
3:24:50
trans or I don't know if they said transmission or distribution, but um anyway, I really just am curious if
3:24:56
there are things that we can glean from other areas that can align and help the
3:25:02
public get some of the reassurance they need. And um I would just encourage the
3:25:08
developer to really think about how they can invest to the public to to meet some
3:25:15
of these things because while you as a you know as a developer have a lot of risk, this is their livelihood. This is
3:25:23
their their legacy, their communities as well. So, I believe, you know, I I have
3:25:31
to believe people are operating in good intent, but I really hope that the comments around the noxious weeds and
3:25:38
the wildfires are really, really taken to heart. And lastly, I'll just say that
3:25:43
anyone who's participated over the last couple years has heard this council talk a lot about operational
3:25:51
uh or excuse me, organizational expertise. And I think we heard a lot of comments
3:25:57
directed at that today. So I hope the developer plans to address those things to presside provide reassurance to the
3:26:05
public and to our council. Thank you.
3:26:11
Thank you. Uh councelor Gra. Uh any other comments or questions from
3:26:18
council members? I have a question. Madam Chair,
3:26:24
um I'll be second. Yes. Uh, no. Go ahead, Councelor Delin.

3:26:31
Okay, Madam Chair, um, I don't know if I have a statement or a question. Um, it
3:26:39
seems to me that, you know, some of the things that people are talking about in terms of uh, past performance, there's
3:26:46
actually some agreement on. I mean uh within the statements from staff there was some statements about uh the fact
3:26:55
that the actual performance particularly on the first phase over time has not been what was expected. Obviously some
3:27:03
of the people that are critical of the proposal um are saying that very clearly and even
3:27:11
the applicant is now admitting that some of that performance has been less than desirable.
3:27:18
Now, the problem I have is I don't have an answer for this. I'm not an attorney.
3:27:23
I am not our obviously our um our representative from the attorney
3:27:29
general's office, but we have specific criteria that we view every project in.
3:27:35
And I'm not sure that we can actually apply or create a new criteria that in a sense
3:27:44
tries to enforce perhaps some shortcoming from a past approval or the
3:27:50
performance in a past area. I'm just not sure of that how you would do that or if it if if it even could be done in a
3:27:58
matter that would be um let's say uh where litigation would be limited.
3:28:05
The second thing is I clearly doubt that this body has any authority and I'm not
3:28:12
even sure the legislature would have authority um to limit the liability of various
3:28:18
parties that might be involved in something that would cause damages to another. I mean that's clearly u outside
3:28:26
the purview of of this council. Um, and I not even sure about all the
3:28:32
ramifications of that, if that would even be uh within the legislaturator's
3:28:37
perview on a statutory basis. I just want to put those comments on the record. I I do think the concerns are
3:28:44
real. Um, I do think that uh turbons wear out. Uh

I do believe there have been quite a number of issues with them particularly that sort of uh first phase and I don't know if which generation of turbines that was. I know turbines are actually under an enormous amount of stress over time. It's interesting that one of the speakers is a former 747 pilot and she's
obviously probably aware of the uh metal fatigue in aircraft over time and the
fatigue in the blades of that those turbons. There are significant issues there also and I just wanted to put all that on the record. Uh, I'll be probably thinking about what our actual authorities are, but I clearly
believe people have made some clear and to a large degree some compelling arguments.
3:29:42
Thank you, Councelor Develin. Councelor Perry, do you do you have your hand
3:29:49
raised? I can't see it, but yes, I did. Thank you. Yes, feel free. Yes.
3:29:56
Thank you. I I did have a couple of points and along the same lines as
3:30:02
councelor Deon um was mentioning first of all about the
3:30:09
fire concerns. **It seems like when there's a concern with property owners and developers as a as a planner, you know, there's there's been situations where, you know, a covenant not to sue would be in order, but that's not something that this council has any um purview over.** That's more like uh
3:30:36
like councelor Delin was saying a legal matter between the owners and the
3:30:41
developer to uh work that out on who's responsible for what on the property. But uh on the
3:30:50
other the other uh point I wanted to make was about you know and as a planner I've you
3:30:59
know had situations before where we have a property that you know may have a
3:31:06
violation on it of some sort and then then they want to come in and apply for a land use application to do something
3:31:13
else. And if if there's a violation on the
3:31:18
property, then you wouldn't necessarily want to approve or be able to approve
3:31:25
based on the regulations of that local jurisdiction to to approve
3:31:33
um an a new thing on our property if there is some kind of a compliance
3:31:39
issue. And I'm new to this. I'm not as familiar with the um administrative
3:31:47
rules and the and the sighting standards as our experts are in the staff and and

3:31:54
secretary and our legal office. But I was just uh I guess a question now to
3:32:00
um this the staff uh Chris would **would**
there be some kind of regulation that I may not be aware of that
would prohibit the approval of an amendment to an existing site
certificate when the existing site certificates requirements may or may not
be satisfactory. But in looking through the staff report, it looks like you have addressed
those and with the addition of some additional amendments to the conditions that were
placed on there that would remedy some of that. And I was just wondering if
there was anything that um uh the sighting council needs to
consider on that situation where we have um if if we
look at if if the existing facility is in compliance with everything then there
isn't an issue with um moving forward with looking at specifically this in
relationship to that with the addition of the solar to this sighting
certificate. Um, I just wanted to make sure that that
we're covering all those bases. Thank you.
3:33:32
Thank you, Councelor Perry. And we have Christopher now at the mic.
3:33:38
Thank you, Council Member Perry. For the record, this is Christopher Clark, senior sighting analyst. Um, just since
3:33:44
you called out me specifically, I will respond um with two things. uh one I
3:33:50
think the relevant standard is the organizational expertise standard and so I'll just read that at least in part um
so the standard provides that to issue a site certificate the council must find that the applicant or in this case certificate holder has the organizational expertise to construct operate and retire the proposed facility in compliance with council standards and conditions of the site certificate. I am not aware of a separate rule that would um prohibit the council from
approving a facility if there were a violation in place or or something like
that or a requirement secure. Um I do want to point out though and I think this is important for the record. Uh at this point in time the certificate holder has not been issued any notice of violation or um I maybe can be corrected but even a notice of non-compliance for these issues. um they have been responsive to the department's um requests for corrective action plans and and and things like that. So there there have been a number of compliance issues at the facility and and that is well documented but not violations themselves.
Thank you, Christopher.
3:35:07
Councelor Perry, sorry. Was that a thank you or did you have something further? No, I think we just kind of talked
3:35:14
over each other. I was just thanking Chris for that response. Okay. Thank you very much. Um, and I do
3:35:22

have a question, but I'm wondering if the makullas can come up to the microphones.
3:35:29
Oh, okay. Thank you. Yeah, you can go first. Um, this is Kent and um, tonight we
3:35:36
heard a lot about organizational expertise. Hold on just one second.
3:35:41
Did you Oh, sorry. I thought I had a question of that. No, no, no. Sorry. Um, organizational expertise while or the
noxious weeds and vegetation management, but um, we did hear regarding wildfire a
3:35:59
recommendation from the S SWCD to I think **it was 35 ft and that probably has some science behind it uh, that um, could withstand a challenge or whatever.**
3:36:09
So I think we ought to kind of look into that. That's all. Thank you, councelor. How and now a
3:36:17
question for you. And um I think uh one of the things this meeting has
3:36:22
really brought into focus is our work on compliance. Uh the wildfire um rules are
3:36:30
pretty new to us. I think we're now in our third year of wildfire rules and
3:36:35
working through projects and what's appropriate, what are compliance issues. Um, and every step we go, we we
3:36:44
learn more. But one of the things that is has been very opaque to me and it sounds like you're big supporters of renewable energy and certainly went into this project with um uh great um uh uh enthusiasm enthusiasm. Yes, passion and enthusiasm and um and you it worked well and then then it didn't. And so I am wondering one some of the uh uh issues you have as underlying property owners of the project. You I guess I have operated on the on the um thought that all the underlying property owners have an agreement with the with the developer and in those agreements there are some provisions that we guess asked about here there. simply not not necessarily open to us to we we don't have the authority to do much with it. So could you enlighten just I know some of it is proprietary information but um speak a little bit about the leases and do your lease agreements speak anything speak to anything that you spoke to us about today? What do you think?
3:38:04
If you're looking at me blank, you probably know more. You're talking about the Are you talking about the leases or the soul?
3:38:11
Well, um Okay. Well, right right now it sounds to me I guess the premise for my question is it
3:38:18
sounds like um it's just um a matter of understanding and coming to some
3:38:24
agreement. Sounds like uh the developer has is really now concerned with
3:38:29

compliance. You've certainly suggested that they've been more pro proactive, but in the your agreements with them, right, um does it call for action um of compliance that or are you dependent depending on on us?

We're depending on you because after 10 years of reporting pieces and and our concerns and having them ignore us and lie to us, we don't trust them anymore. And since the blade fell four years ago, there the now more towers are down than ever. And we're just stymied. We don't know. We're not signed up for solar because we would not sign up for them period after what we've seen with the wind. Okay? And it's not really addressed in the lease, but it's in the site certificate.
And no, there are no violations on PGE because they never told you guys.

Hello. Well, and as I see at this meeting, we've talked a lot about it and the last, I don't know, five meetings. Some of these issues have come up and are now being addressed and there seems to be a plan going forward. And I'm wondering if you are aware of that, you know, part of your are you included in those conversations with the developer and Okay. All right. I um you can answer that. Yeah. Well, I Yeah. Yes, we we are. and and the PGE crew that is there now have been very open and coming and talking to us and wanting our opinions on how things are. But it's just we have lack of faith in PG right now. They haven't proven anything to me. They are a disappointment, unfortunately. they need to keep moving forward and figure out how to fix this and then prove to me that this is going to work because they haven't done anything yet other than shut the towers off because they're dangerous. Well, you presented your message well, right? Or at least in in my opinion and I thank you for um for being here um and and sharing one your experience. But I also uh just given the wildfire mitigation risk, if you have um some ideas that um you don't see in the mitigation, the draft mitigation plans uh for construction or that should be there on the solar project um that is now proposed. um um you know the the more detail you can give to us and staff the better it informs us for our decision- making. Okay. And since Colt is actually farming now he's my biggest issue my biggest issue there now. Yeah. My biggest issue is there's no operational wildfire mitigation plan to even look at right now. So, how am I even supposed to comment on something that doesn't even ex I Yeah, I don't have privy to it. So, all I'm going off is what the OdoE is saying that they're they're going to put in in the interimm, but then I'm not going to have any say when it actually comes out. Okay. Um Okay. Thank you.

And it's, you know, I know it's coming. We've heard that and just keep your ear. Okay.
Yes. And just as an aside, even Bright Night hasn't been forthcoming with us. This is like the fourth or fifth representatives that have come through that, you know, that are now the experts. And we were told that the panels weren't going to be within view of our house. And then they were right across the road. So, we just panicked. And the our landlord is the one that got them to move them back.

Everything we've been promised, somebody reneigs on. And it's getting really frustrating because we feel like we're just in a wave that we can't stop. We keep hearing the right things. We just haven't seen them. It's not in writing. Until I see it in writing from now on, I will not believe it. It needs to be put in writing and signed by whoever the proper authority is. And that's what needs to happen. I used to do business on a handshake. Not going to happen ever again. I had really good intentions with PGE and there's their wind project and they kept telling us they're going to do it, but they kept cutting their maintenance budget on the project. How do you how do you I don't know how you run anybody's farm or you do anything. We spend money on our equipment to keep it up and make it work. So, we're not going to be out there intentionally starting fires. Their solution was not to do anything with this new management team. I have great hopes. Well, thank you. Thank you for being here and coming up twice.
3:43:41
Thanks. And having such strong representation. And I'm wondering if um PGE wants to
3:43:48
come come and respond or
3:43:54
you don't have to. It's just our final comment. Okay. Yeah. Okay.
3:44:00
Thank you. Um Yeah. Thanks for listening.
3:44:05
Okay. Yeah. Listen. And and I will say and you've heard from all
3:44:11
of the C Yeah. Every all of the council members spoke today and these are of
3:44:16
real concern to us. The issues that came up today are of concerns with this project, but overall they have been a
3:44:23
real area of focus for us. So, um, thank you for being here for the hearing. And
3:44:29
if there are no more comments from the council, I'll turn this over.
3:44:35
Yes. Thank you very much. Okay. So to close us out, would the certificate holder like to respond to any comments you've received to date or evening,
3:44:53
Chair Condan, um uh members of the council, and folks in the room this evening, thank you very much for your time and energy and for the for the input. Um uh I'll just say two things, then I'll hand it over to Lenna to to to wrap us up here. um in response to what we've heard tonight. So, one um you know, I think to reiterate um we recognize that some of the concerns raised about the operation of the Biglow Canyon Wind Farm do not meet the uh standards for excellence that PGE expects of all of its sites. Um and we are taking appropriate actions. Um we also operate thousands of megawatts of clean energy across this region with an excellent track record of safety and reliability. Uh, with regards to wildfire, let me reiterate the safety and well-being of the communities we serve is paramount and we recognize the existential risk of operating a utility today in the West amidst growing wildfire risk from climate change. We maintain and implement robust wildfire mitigation plans as required by the state um and

submitted to the Oregon Public Utility Commission on a regular basis. Those plans are evaluated by an independent evaluator by the safety staff at the Oregon Public Utility Commission and it is through a very public process with robust stakeholder input. We just submitted our mo most recent wildfire mitigation plan um in December and it is
currently under review. Uh right now we're forecasting about $120 million
annually in wildfire mitigation um investments uh to protect the safety uh
and well-being of the communities we serve. And that includes things that have been discussed tonight such as grid hardening and vegetation management. Uh
situational awareness so think risk modeling as well as the use of like AI panoramic cameras. It includes operational procedures across our system distribution, transmission and generation um and and it includes um the
work that we do with our communities around education and outreach. So wildfire safety is important and we continue to evolve our wildfire mitigation plans um in response to changing technology, improving technology as well as evolving industry best practice and unfortunately the growing risk of wildfire in this region.
3:47:10
Thank you. Thank you. Uh we just want to again uh
3:47:16
say that we appreciate all the comments and people taking the time to review these documents. Come here in person to
3:47:21
provide your testimony. Um we will review all the comments and provide written responses. Um but we do want to
3:47:29
reiterate that the level of detail in the plans and the monitoring, the inspection, the reporting and the
3:47:35
enforcement by the department in these plans is at a much greater level than any previous plan. Um the department
3:47:43
staff and the staff that we have supporting the development of these plans have identified these improvements
3:47:48
to the site certificate and associated plans and they have teeth. We heard
you know we we want teeth and we believe these plans do have that. Um
3:48:00
additionally in the written comment we will be submitting um our communications log with stakeholders into the record to
3:48:06
show our outreach to stakeholders. Okay, with that, thank you again for
3:48:12
your time and get home safe tonight.
3:48:19
Any final comments or questions from council to the certificate holder?
3:48:27
Thank you again, certificate holder. Um, I need to amend one statement that I

3:48:32
previously made about the comment deadline. So, all comments must be
3:48:37
received by January 30th at 5:00 PM. Not submitted by, but received. So, if
3:48:43
you're paper mailing your comments to the department, make sure you've mailed them in a manner that they can be
3:48:48
received by our office on January 30th at 5:00 p.m.
3:48:54
Okay. So, it is now 8:20 p.m. on January 15, 2026, and the public hearing portion
3:49:01
of the comment period on the proposed order for request for amendment four of Biglo Canyon wind farm site certificate
3:49:08
has concluded. I'm going to hand it over to Chair Condan to close the meeting. Chair Condan, if I may.
3:49:15
Secretary Cordet. Yeah, I just want to take the opportunity to thank everybody for coming out tonight. Really appreciate it. Our process is designed to include
3:49:22
public participation, local participation. That's why we're here. It works better if there is good robust
3:49:29
participation. So, I encourage you if you have comments, please do submit those comments. As you've heard from the
3:49:35
council, we take them very seriously. So, please do comment. Thank you.
3:49:40
I want to add my thanks again uh for everyone who came to the hearing tonight and especially those who sat through the
3:49:47
whole the whole meeting tonight. So, thank you. Um, the time is now 8:21 and
3:49:54
the January 15, 2026 meeting of the Energy Facility Siting Council is now
3:49:59
adjourned. Thank you. Thank you. Nice job, Cindy.
3:50:08
Yeah.

Kathy McCullough and I live right under the project, about a half mile from the PG building, and I'm a retired 747 captain for Delta, and I'm also a microbiology and environmental health graduate from Colorado State. When this project was first started, you wouldn't have found anybody more excited about it than I was, because to me, these looked like giant propellers. I loved it. I wanted clean energy and wind … we could farm around them. That was the best. In fact, it helped us. We got new roads. We got in and out of fields we could never get into before. It was amazing. We were probably the biggest proponents of this project until…

Construction was great. The first five years, great manager, new equipment, everything was perfect. The next 10 years, horrible. I mean, horrible. We were picking up pieces in our field. There were nose cones dropping. They all started leaking, all of them in phase one. And the culmination was when a blade dropped February 2022, waking up my husband and my dog. I wasn't home at the time.

This is the blade down here on the ground there. This is our house across the road. Was really close. It was really loud.

We had been complaining for a while because there had been so many pieces. PGE wouldn't listen to us. They really would not listen, and we didn't know what else to do. I mean, even after the blade fell and PGE got Alltite to come in and start inspecting all the bolts in all 76 of the first Vestas towers. Nothing changed. Alltite came. Alltite went. One company before them said it was the greasiest mess that they had ever seen, and it was unsafe and they quit. They had to throw their coveralls away after one day. It was one of those things that we knew would happen. We had been watching.

This is what they still all look like… they haven't they haven't gotten better. They aren't cleaner. None of them have. There's one that has the new prototype on it, but four years after the blade drop, nothing has been fixed. They have all the parts ordered, but nothing is different to us. And in fact, the old (project manager) Brad Jenkins, who was in charge of the project before, lied to the newspaper and said, "Just because they're dirty outside doesn't mean they're dirty inside."

Well, I have a picture of the inside. It's horrible. The wiring's cracked. It It's really bad. And they flat-out lied to us.

So, my problem is, how do I trust this company for solar in a county that is so Fire-prone, you would not believe it? Our fires, this is under BIGLOW.

This is one of the fires we've had. We have six to 10 fires a year during harvest and around the dry season. And they're scary. I mean, they are… they move fast. My neighbor barely got in the car and out of her house as a wall of flames was coming towards her.

We all run to fight them. We all have water on the back of our pickups. We have shovels. We have hoes. We have everything like that. But they still move fast. And I

mean fast. There were probably 50 pickups and farmers fighting this fire. And this was this was a couple years ago. It's just one of the many. And if I trusted PGE with their with their wind, I can't trust them with their solar. I can't trust that I'm safe in my house if they're not going to be honest.

And if they're going to tell people that we lie?

There's a whole new regime at PGE now. I admit that because I like Dan. I like the people who are there now. And I think we're on a different tack. I think we're going a different direction.

But unless it's in the site certificate, they're not going to do anything. And most of this most of this amendment is construction. Very little of it concerns actual operation once the construction phase is over.

We really need a strong site certificate. Even with PGE knowing all that, they never reported anything until I went to the paper and got the Oregonian to write… four months after. No, wait. February is when the blade dropped, and I think the paper may have been September, and there was no change, nothing.

They knew pieces were dropping and I just I I'm glad they have new maintenance. I really am. Or new, you know, new people. But we've got to have a strong site certificate.

We could not get them to give us a holdless clause for farming. So if we accidentally start a fire and it burns into their facility, that's like a that that's a two billion dollar facility we don't have money for.

The only other thing I was going to say is BrightNight's got great ideas. I mean for fire. As 747 captain, lithium ion batteries are scary. They are just plain scary. My vinyl sighting on my house melted in 2021 to the west side. That's how hot it gets there. So if you don't have good, you know, good protection, you're in trouble.

So this is how they look. They say, "Oh no, they look great. They're white. They're clean. Yes, they are. This is how the transformer boxes look that PGE has under the towers. How am I supposed to think that the batteries are going to look okay?

So I hope… I understand we have to have this green energy mandated, etc.
Can we get some real teeth in this site certificate? Can we get some real help out where we are? And if there's a fire, please don't let them sue us so that we can't farm anymore, because we only have $5 million liability. We can't pay for that facility.

We've never started a fire during harvest, but we fight four to six a year. Well, no, six to 10. So, they happen all the time. One of these days it's going to be our turn.

Okay. Thank you so much for your

comments. Appreciate it.

All right. So, our next commenter is Kevin McCullough.

Obviously, I'm Kathy's wife. Oh, excuse me. Kathy's husband.
I farm underneath the the project. PGE has not done what they said
They were going to do, and now that we have new management, this is a good thing.
But they need to prove that they can operate this. I don't know why you would give them a certificate to put in a solar farm when they have not proven that they can operate what they have. They keep saying they need more green power.

You know how many towers we have sitting every day out of those 217?
40 to 50. Every day. Makes no sense to me why you would be willing to give them a certificate to build a solar thing until they fix this problem over here.
It's it's bizarre to me. And the other thing is the fires. Like she just said, it's not if we start a fire, it's when we start a fire, and your setbacks aren't even close to deep enough to keep us from having to pay, they're going to sue us and we will no longer be in business.

So, thank you for your time and hopefully you take some of this into account.

2:41:46
Good evening, everyone. Um, should be the last McCullough commenting.
My name is Colton McCullough and I am the current farmer on the land that the proposed project would be built on.

I'll put Colt's comments on later, but they are on this You Tube:
https://www.youtube.com/watch?v=XEXStXCgWTQ

2:47:34
Greetings. Uh, Ormand Hilderbrand is my name, and I am not a McCullough.
2:47:40
Um, I manage my family's farm which is near
2:47:48
the proposed Bigalow renewable power project and have been involved with
2:47:54
Oregon's environmental and land use issues for years. I am submitting this
2:48:00
pro this statement for the record regarding the Bigalow renewable power project. Um I approach projects like
2:48:08
this with a clear understanding that development has impacts. The question is
2:48:14
not whether impacts exist because they do but whether they are acknowledged,
2:48:20
responsibly mitigated and managed through a rigorous public process.
2:48:27
Even farming has impacts on on our land. You know, some may argue that our land
2:48:34
shouldn't have been put to the plow back in the 1880s, but it was done. Impacts
2:48:39
happen. Um, but
2:48:45
based on my experience, I am confident that the impacts associated with this project can be addressed appropriately. And I'm confident that after 50 to 70 years of the project being a major solar producer, if we get to that point and we need to have the land back for agriculture production, it can come back to agriculture production with an improved soil health. That is critical. I'm a strong believer in clean energy. I've been a director of the community renewable energy association, CREA, for many years. CREA is a strong advocate advocate for shaping policy to benefit
rural Oregon and I'm personally have been involved in a development my own renewable energy project wind farm which
2:49:37
is a 9 megawatt 6G 1.5 SLE turbines that
2:49:42
are adjacent to Portland General Electric's Big Low Canyon. I supply
2:49:48
power to over 3,000 homes in the Portland area.
2:49:55
That experience has given me a practical understanding of what responsible project planning looks like, including
2:50:02
the importance of environmental review, mitigation commitments, and ongoing
2:50:07
accountability. You we must hold companies accountable for what they say

2:50:13
they're going to do. The Biglow project reflects this level of responsibility.
The developer has engaged seriously with the permitting process and has demonstrated a willingness to address environmental considerations. I have attended several of the discussions myself, including a presentation of the North Sherman County Fire District that discussed these fire mitigation procedures. Used to be that we on the east side felt that we had the fire risk to ourselves. Now that you on your west with the climate change, you had the fire risk too. So I think everybody can appreciate, especially in a rural county where the land and agriculture, natural resources are deeply inter interconnected, the importance of this fire mitigation. I also believe it's important to consider projects like this in a broader long-term context. Sherman County's economy has changed significantly over time and the pressures facing agriculture and rural
communities continue to evolve. We had in 1920s we had over 4,000 people living
2:51:20
in the county. That's more than twice what we have right now. We had hotels in
2:51:26
the towns and restaurants and theaters and I've read even roofers had a golf course. That's all most of that is gone
2:51:34
now. um and primarily due to consolidation of
2:51:40
farms enabling our producers to reduce their production costs and they've done
2:51:45
a damn good job of it. They've really driven down their cost to to compete in
2:51:51
a tight environment and I appreciate people young farmers like Colton coming on because we need them to continue this
2:51:59
into the future but it's going to become tougher. uh our farmers have to
2:52:06
consolidate and they have to become larger and those that don't are not going to be with us anymore. Um and can
2:52:14
anybody doubt that the drive for more that we will see
2:52:20
more capital intensive equipment uh powered by artificial intelligence
2:52:27
that's will continue and further fuel consolidation amongst the farms in
2:52:32
Sherman County. Thoughtfully planned energy projects represent one step in a
2:52:38
more diversified and resilient future. uh one that balances environmental stewardship with an econ economic
2:52:45
stability. In this case, it is true that solar saves farms.
2:52:51

Last month, Governor Cotch issued an executive order to state agencies to move faster on clean energy projects.
2:52:58
And recently, even Representative Bence acknowledged that Oregon will have a
2:53:04
critical short shortfall in energy unless drastic steps are taken,
2:53:10
including expansion of our transmission facilities. The Bigalow The Bigalow
2:53:15
renewable energy project is lowhanging fruit with the existing underutilized
2:53:20
PGE transmission. While recognizing the project is not without impact, I view
2:53:25
the Bigalow renewable project as a positive contribution when evaluated through the established FSE process and
2:53:33
supported by enforcable mitigation measures. Thank you for the opportunity
2:53:39
to provide the statement and for your careful consideration, positive consideration of this these issues as
2:53:46
part of the record. Thank you.
2:53:57
Okay, our next commenter in the room is Chad Higgins.

2026-420- Public Comment Detail

Comment Title: I am enclosing a 3 minutes presentation on our fires and how fast they move, created by my neighbor. Exhibit V is fire one the Biglow Site certificate, not Waste.

From: Kathryn McCullough

From email address: captainkathymccullough@gmail.com

Comment Date: 1/21/2026

ASC Exhibit: Exhibit V: Wildfire

Council Standards: ---

Page Number(s): Page 6 E XHIBIT V: WILDFIRE P REVENTION AND RISK MITIGATION Biglow Canyon Wind Farm

Comment Details:

As I told and showed the EFSC committee in Grass Valley on January 15, 2026, our wildfire risk is high, and our fires travel fast. Perhaps this will show how real it is out here! This is the Substation Fire, put together by Whitney Weedman.

Christopher M. Clark
Senior Siting Analyst
550 Capitol St. NE

Salem, OR 97301

Re: Support for the Biglow Renewable Power Project

Dear Christopher,

I am writing in support of the Biglow Renewable Power Project. This project represents a sound business opportunity for our community. I am the fourth generation of my family to farm here in Sherman County. Our farm that was homesteaded in 1896 continues to see financial ups and downs, and in recent years making a profit has become harder. At times it seems unlikely I will be able to pass the operation on to my grandsons.

Wheat prices continue to swing with the market, averaging just over $5.90 per bushel today, not much higher than a decade ago. While the cost of operating farms and maintaining our crops has climbed exponentially. For example a two year old combine to replace my 10-year-old machine would cost me over $500,000.

I've personally witnessed the decline in small family farms in my area. Many blame our changing climate, the cost of farming, and even renewable power projects that use local farmland. But the reality is that the cost of doing business is the culprit. As farmers, we are used to adapting to new challenges. Projects like Biglow provide the stability area farmers need. Lease payments and community mitigation funds will give farmers a reliable source of income that isn't tied to volatile commodity markets. That stability means families can keep farming, and even invest in newer equipment, and support the local economy through jobs and spending. It also means younger generations may see farming as a sustainable career, rather than a constant financial gamble.

Approving the Biglow Renewable Power Project is a decision to keep farmland in production and to diversify the economic base of eastern Oregon. For those of us who depend on farming, it's an opportunity to strengthen our businesses and protect the future of agriculture in this region.

Your consideration would be greatly appreciated.

Respectfully,



Randy Hilderbrand

Randy Hilderbrand
PO Box 326
Wasco, OR 97065

PORTLAND OR RPDC 972
6 JAN 2026 PM 5 L



Christopher M. Clark
Senior Siting Analyst
550 Capitol St. NE
Salem, OR 97301

RECEIVED
JAN 8 RECD
DEPARTMENT OF ENERGY

97301-256799

From: Nick Weis
Sent: Wednesday, January 28, 2026 9:34 AM
To: CLARK Christopher * ODOE
Cc: Kathleen Campanella; kiana.ziola@tetratech.com
Subject: Proposed Order for Biglow Solar

You don't often get email from nickw@shermancountyor.gov. Learn why this is important

Mr. Clark,

As the Sherman County Weed District Supervisor, I have reviewed the Revegetation and Soil Management Plan and have not identified any elements with which I disagree. The only concern I have identified is within the Proposed Order, Section III.N.1, Findings of Fact, on page 233, regarding the specified grass height during the dry season.

The proposed grass height of 1–3 inches does not appear feasible if erosion control is a priority. Additionally, several of the bunchgrass species proposed for planting could be negatively impacted by maintaining vegetation at such a short height. In my professional opinion, allowing a grass height of 4–8 inches during the dry season would better support continued establishment, promote a stronger root system, and result in healthier long-term growth.

Nick Weis
Sherman County Weed District
Supervisor
541-579-3242
nickw@shermancountyor.gov

JERED REID
OSB #112155
jeredwreid@gmail.com

LAUREN M. KAUFFMAN
OSB #203293
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LAW OFFICE OF
JERED REID

Madras Office
35 SE C Street, Suite D
Madras, Oregon 97741
541.475.1111

Prineville Office
545 NE 7th Street
Prineville, Oregon 97754
541.447.3910

January 29, 2025

Christopher Clark, Senior Siting Analyst
Oregon Department of Energy
550 Capitol Street NE
Salem, OR 97301
Christopher.clark@energy.oregon.gov

Re: Biglow Canyon Wind Farm
Public Comment for Site Certification Amendment and Proposed Order
Notice Date: December 16, 2025

Dear Mr. Clark:

This office represents Donald Hilderbrand. Mr. Hilderbrand wishes to provide comment on the proposed Order with changes proposed in Request For Amendment 4 dated December 16, 2025, in which Portland General Electric (certificate holder), seeks approval from the Energy Facility Council to construct and operate (1) 124 MW solar photovoltaic power generation facility occupying up to 1,445 acres; (2) a 500 megawatt-hour Battery Energy Storage System (BESS), and (3) related or supporting facilities, including a 34.5 kilovolt (kV) electrical collection system, collator substation, 600-foot 230-kV transmission line, operations and maintenance building, 10.5 miles of access roads, and perimeter fencing, gates, etc. located on a operational facility located within a 25,000-acre site boundary on private owned land zoned for Exclusive Farm Use, approximatively 2 miles northwest of the Town of Wasco.

Mr. Hilderbrand has an interest in the real property and does not consent to the plan as currently proposed. As he does not wish to have his property as part of this project.

If you have any questions, comments, or concerns, please feel free to contact me.

Much Appreciated,

Jered Reid
Attorney at Law
cc: Client

From: Jered Reid
Sent: Thursday, January 29, 2026 8:21 AM
To: CLARK Christopher * ODOE
Subject: Biglow Canyon Wind Farm
Attachments: Biglow Canyon Wind Farm Comment.pdf

Categories: Tracked To Dynamics 365

You don't often get email from jeredwreid@gmail.com. Learn why this is important

Good Morning Mr. Clark,

Attached please find written comment for the above-referenced project to be included in the record.

Best Regards,



Jered Reid
35 SE C Street, Suite D
Madras, Oregon 97741
Phone: 541.475.1111
Fax: 541.475.1113

2026-454 - Public Comment Detail

Comment Title

From: Kathy McCullough

Comment Date: 1/29/2026

ASC Exhibit: Exhibit B - Proposed Facility Description

Comment:

Page 32-34 in the Request for Amendment 4 for Biglow Canyon Wind Farm: compliance (as well as page 4). Operator has not been forthcoming and compliant. Inspectors were taken to certain clean towers, and falling pieces were never reported until landowners caught them lying and obfuscating.

Suggest Operator (PGE) repair all 76 of the Vestas towers in 2026 before they are allowed to bring in solar.

I know it sounds harsh to say I don't trust PGE and BrightNight, and that they lie, but I do have evidence—the closest to proof I can get.

PGE has been telling us since our meeting in 2017 that they would fix the pitch systems in the 76 Phase 1 Vestas towers. The blade fell in February 2022, four years ago, and the towers are still broken. Now PGE says 17 will be fixed this year, 26 in 2027, and the rest in 2028. Eleven years to fix them, maybe… I'll believe it when I see it. It took less than a year to build them: transmission lines, substation, and all 76 of them!

BrightNight told us they would keep the panels out of view of our yard, at least half a mile away. Then their plan was released. Does this look like it's out of view? Half a mile?



Side yard

BrightNight also said they would use the less-productive ground of Scharf's first. (Scharf's have 4000 acres) Instead, they are putting the 800 acres of panels and batteries on the best farm ground of Scharfs because it is closest to the substation, on flat ground, and cheaper to build. We threw a fit, and Scharfs told BrightNight to move the panels back ½ mile.

These are the two biggest lies we've been told. There are plenty more. These companies act like used car salespeople—they'll sell you a car, tell you how great it is, and then, as soon as you drive off the lot, it falls apart. Actually, they are worse than used car salesmen. $$$ **Companies like BrightNight and Brookfield are here today and gone tomorrow. Won't they and PGE build safer projects if they know there is a hold harmless clause for farmers?**



Front yard

Oh the ground will be better when it comes out of solar 50 years down the road. **How do you know???** "After having ground in CRP for 40 years with no roads or traffic compacting, controlling weeds, and deep-rooted perennial grasses, our soil tests show no significant improvement over our wheat fields. In fact, some of our wheat fields have higher organic matter now that we have gone 100% no till." Alan von Borstel

The agronomic and geographic conditions of the Pacific Northwest have evolved into the only place in the world where soft white wheat is successfully and consistently grown. There is no other place in the WORLD that can grow this class of wheat, making this area very unique. There are no truer words than Oregon's motto, "Oregon wheat feeds the world". Darren Padget

Sincerely, *Kathy McCullough*

2026-455 - **Public Comment Detail**

Organization: Kathy & Kevin McCullough

Submitted by: Kathy McCullough

Email: captainkathymccullough@gmail.com

Zip Code: 97065

Comment Summary:

Falling pieces

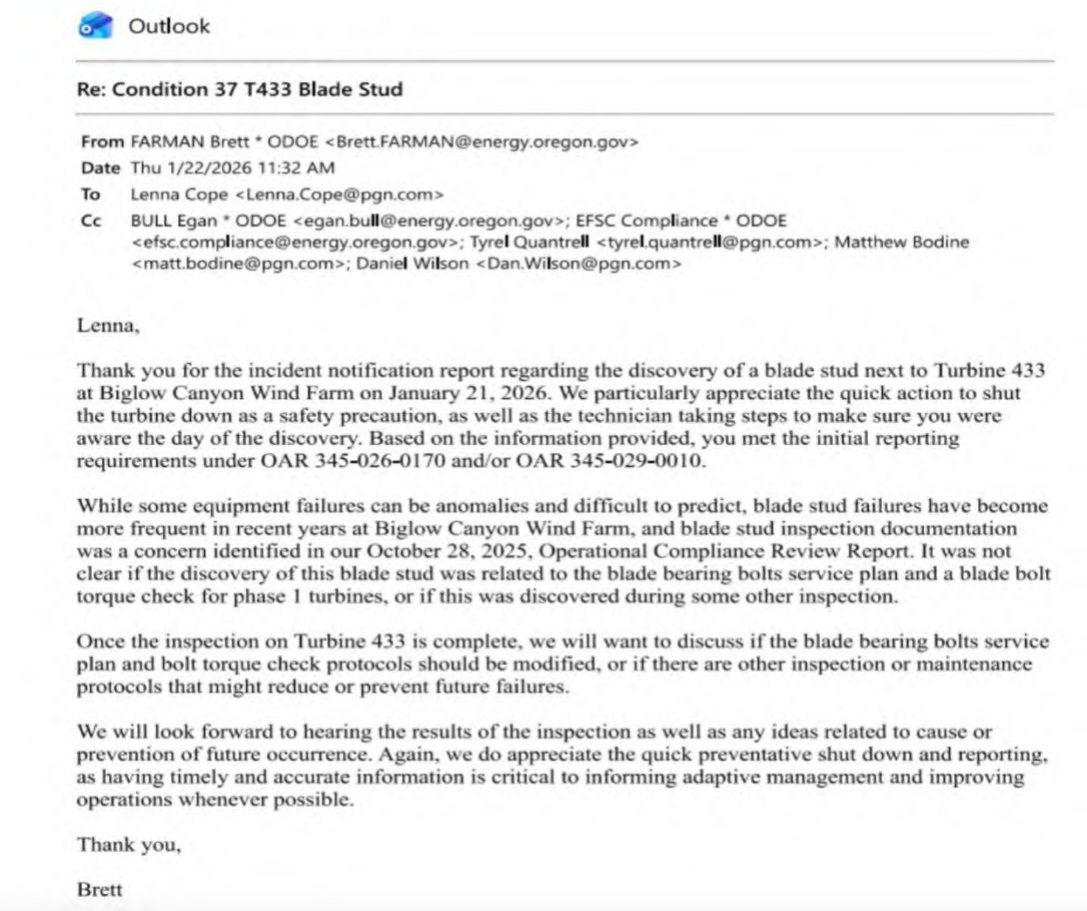
Request for Amendment 4 for Biglow Canyon Wind Farm
Page 23 Long Term Facility Maintenance Plan

4.2.1 Long-term Facility Maintenance Plan
Over the course of more than 15 years of operation at the Existing Facility, the Certificate Holder has encountered technical challenges that have offered valuable insights into both technical and procedural vulnerabilities and informed continuous improvement efforts. The Certificate Holder has implemented targeted improvements specific to the Existing Facility, including changes to internal management structure and personnel, a change in the turbine O&M provider with a newly negotiated contract to mitigate future technical challenges and better align with site-specific performance goals, and improved monitoring of contractor performance. Improved preventative maintenance, robust monitoring, and corrective action planning will be the result of these ongoing changes.

The specific types of technical challenges with the Existing Facility would be unlikely to occur with the Solar Components due to the difference in technology. Lessons learned from more than a decade of wind facility operations at BCWF are being directly integrated into the planning and management of the proposed Solar Components. Past challenges have informed the adoption of more robust preventative maintenance and corrective action protocols, improvements to vendor contracts to ensure the contracts use asset management and equipment health as the measure for vendor performance, stronger consequences for poor performance, and improved quality control and assurance oversight of vendors.

This is my final letter before the end of the comment period.

My husband and I used to walk under the Vestas towers during our evening walks. We can't anymore because they're dangerous to walk under. Now, the Siemens towers are dropping blade stud bolts, with the most recent incident a week ago. Five more are listed below.



Outlook

Re: Condition 37 T433 Blade Stud

From FARMAN Brett * ODOE <Brett.FARMAN@energy.oregon.gov>
Date Thu 1/22/2026 11:32 AM
To Lenna Cope <Lenna.Cope@pgn.com>
Cc BULL Egan * ODOE <egan.bull@energy.oregon.gov>; EFSC Compliance * ODOE <efsc.compliance@energy.oregon.gov>; Tyrel Quantrell <tyrel.quantrell@pgn.com>; Matthew Bodine <matt.bodine@pgn.com>; Daniel Wilson <Dan.Wilson@pgn.com>

Lenna,

Thank you for the incident notification report regarding the discovery of a blade stud next to Turbine 433 at Biglow Canyon Wind Farm on January 21, 2026. We particularly appreciate the quick action to shut the turbine down as a safety precaution, as well as the technician taking steps to make sure you were aware the day of the discovery. Based on the information provided, you met the initial reporting requirements under OAR 345-026-0170 and/or OAR 345-029-0010.

While some equipment failures can be anomalies and difficult to predict, blade stud failures have become more frequent in recent years at Biglow Canyon Wind Farm, and blade stud inspection documentation was a concern identified in our October 28, 2025, Operational Compliance Review Report. It was not clear if the discovery of this blade stud was related to the blade bearing bolts service plan and a blade bolt torque check for phase 1 turbines, or if this was discovered during some other inspection.

Once the inspection on Turbine 433 is complete, we will want to discuss if the blade bearing bolts service plan and bolt torque check protocols should be modified, or if there are other inspection or maintenance protocols that might reduce or prevent future failures.

We will look forward to hearing the results of the inspection as well as any ideas related to cause or prevention of future occurrence. Again, we do appreciate the quick preventative shut down and reporting, as having timely and accurate information is critical to informing adaptive management and improving operations whenever possible.

Thank you,

Brett

I tried to obtain the incidents from the six months prior, but ODOE couldn't find any. I know of at least one large disc that fell from a Siemens into a gully where the guys were farming in October 2025. It isn't mentioned. I can't let my two-year-old grandson play near the wind towers, and he wants to! But it isn't safe. What happened to "peaceful enjoyment"?

The **blade bolts** are obviously a serious problem. **A 20-inch bolt could seriously injure someone near the tower. Still, there have been six bolt-related incidents (including spinner bolts) in the past two years!** *Only six? I suspect more.* PGE must demonstrate it can operate this project safely and effectively. They didn't report **anything** until ODOE instructed them in October 2022, long after the "blade liberation." Allowing them to install solar on the project before all Phase 1 towers are fixed and before the Siemens towers stop dropping bolts is unacceptable.

Kathy & Kevin McCullough

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Saturday, September 7, 2024 3:11 PM
To: KILSDONK Duane * ODOE <Duane.KILSDONK@energy.oregon.gov>; KAUR Amrit * ODOE <Amrit.KAUR@energy.oregon.gov>; WOODS Ash * ODOE <ash.woods@energy.oregon.gov>
Cc: Daniel Wilson <Dan.Wilson@pgn.com>; Jesus Carrera <Jesus.Carrera@pgn.com>
Subject: Biglow Condition 37 - Blade Stud T335 and T356

Duane,

Pursuant to the incident reporting guidance issued by the Oregon Department of Energy on October 27, 2022, and potential applicability of Condition 37 of the Biglow Canyon Wind Farm site certificate, PGE is notifying the Department that on September 5, 2024, while performing monthly inspections, a PGE technician found a blade stud on the ground at Turbine 335 (T335) and a blade stud on the ground at T356; both turbines are Phase 2 Siemens turbines. Blade studs hold the blade to the blade bearing; there are 54 blade studs for each blade. The portions of the blade studs found were approximately 20 inches in length. The blade stud for T335 was found approximately 20 feet from the turbine and an associated washer was also found; the blade stud for T356 was found approximately 13 feet from the turbine. T335 was inspected on September 5 to check for any damage to other components in the hub, any additional broken blade studs, and for any other items at risk of falling from the turbine; there was no additional damage or findings for T335. The same inspection was performed on T356 on September 6; one additional blade stud was found loose, that stud was removed. The turbines will remain out of service until they are engineering evaluated and deemed operationally safe. PGE will be tensioning 100% of the blade studs in Phase 2 and 3, and replacing any blade stud that is damaged or moves more than ½ a turn The effort will be completed by the end of the year. See below for pictures.

Please advise if you have any questions or need additional information.

Thank you.

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 16, 2024 9:09 AM
To: KILSDONK Duane * ODOE; KAUR Amrit * ODOE; EFSC Compliance * ODOE
Subject: Biglow Condition 37 Notification - T28 Blade Bearing Bolt

Follow Up Flag: Follow up
Flag Status: Flagged

Duane,

Pursuant to the incident reporting guidance issued by the Oregon Department of Energy on October 27, 2022, and potential applicability of Condition 37 of the Biglow Canyon Wind Farm site certificate, PGE is notifying the Department that on February 14, 2024 at 12:08 p.m. PGE's maintenance contractor, Vestas, found a broken blade bearing bolt on the ground at Turbine 28 (T28), a Phase 1 Vestas turbine. It was found in the gravel approximately 3 feet from the base of T28. The turbine was inspected and all other bolts were ping tested to confirm there were no other loose or broken bolts. The last annual inspection of T28 was conducted on 11/19/2023. The turbine was last visited on 12/13/2023 and there was not a bolt present on the ground.

Please advise if you have any questions or need additional information.

Thank you.

Lenna Cope, P.E.
Pronouns: she/her
Senior Environmental Specialist | 503-464-2634 | 503-313-5022
portlandgeneral.com | Follow us on social @PortlandGeneral
An Oregon kind of energy.

HATCH Nancy * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 16, 2024 9:09 AM
To: KILSDONK Duane * ODOE; KAUR Amrit * ODOE; EFSC Compliance * ODOE
Subject: Biglow Condition 37 Notification - T28 Blade Bearing Bolt

Follow Up Flag: Follow up
Flag Status: Flagged

Duane,

Pursuant to the incident reporting guidance issued by the Oregon Department of Energy on October 27, 2022, and potential applicability of Condition 37 of the Biglow Canyon Wind Farm site certificate, PGE is notifying the Department that on February 14, 2024 at 12:08 p.m. PGE's maintenance contractor, Vestas, found a broken blade bearing bolt on the ground at Turbine 28 (T28), a Phase 1 Vestas turbine. It was found in the gravel approximately 3 feet from the base of T28. The turbine was inspected and all other bolts were ping tested to confirm there were no other loose or broken bolts. The last annual inspection of T28 was conducted on 11/19/2023. The turbine was last visited on 12/13/2023 and there was not a bolt present on the ground.

Please advise if you have any questions or need additional information.

Thank you.

PGE
Lenna Cope, P.E.
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KILSDONK Duane * ODOE

From: KILSDONK Duane * ODOE
Sent: Tuesday, April 8, 2025 1:56 PM
To: Lenna Cope
Cc: ESTERSON Sarah * ODOE
Subject: RE: Biglow Canyon - Condition 37 Hub Casing Tube Bolt T39

Thank you for the update.
Talk soon.

Duane K.

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Tuesday, April 8, 2025 1:52 PM
To: KILSDONK Duane * ODOE <Duane.KILSDONK@energy.oregon.gov>
Subject: RE: Biglow Canyon - Condition 37 Hub Casing Tube Bolt T39

In preparing for our meeting in a few minutes I realized I never responded to the question below. T39 went back to full operation on December 4, 2024 at 9:11 am.

Lenna Cope, P.E. Senior Environmental Specialist | 503-464-2634

From: KILSDONK Duane * ODOE <Duane.KILSDONK@energy.oregon.gov>
Sent: Thursday, March 20, 2025 1:39 PM
To: Lenna Cope <Lenna.Cope@pgn.com>
Subject: RE: Biglow Canyon - Condition 37 Hub Casing Tube Bolt T39

BWPOPS ODOE's Notification of Closure of Spinner Shell Incident 2024-10-15....

The department considers this closed and no further information is required.

Duane K.

Duane Kilsdonk
Siting Compliance Officer
Pronouns: He|Him|His|Why share pronouns?
550 Capitol St. NE | Salem, OR 97301
P: 503-983-6484
P (In Oregon): 800-221-8035
Stay connected!

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Thursday, October 10, 2024 8:36 AM
To: KILSDONK Duane * ODOE <Duane.KILSDONK@energy.oregon.gov>
Cc: WOODS Ash * ODOE <ash.woods@energy.oregon.gov>; BARTLEY Bibi * ODOE <bibi.bartley@energy.oregon.gov>; Jesus Carrera <Jesus.Carrera@pgn.com>; Daniel Wilson <Dan.Wilson@pgn.com>
Subject: Biglow Condition 37 - T72 Spinner Shell Bolts

Duane,

Pursuant to the incident reporting guidance issued by the Oregon Department of Energy on October 27, 2022, and potential applicability of Condition 37 of the Biglow Canyon Wind Farm site certificate, PGE is notifying the Department that on October 7, 2024 at 10:30 a.m., PGE's road maintenance contractor found four spinner shell bolts at the base of turbine 72 (T72); a Phase 1 Vestas turbine. Spinner bolts hold the shell at the base of the blades that protects the hub. There are three pieces to the spinner shell which are attached to each other, and each section is attached to the nacelle by two bolts for a total of six bolts. The spinner bolts are about six inches long and were found approximately six feet from the turbine. The road maintenance contractor picked up the bolts and placed them at the base of the turbine and notified PGE staff. The turbine was immediately taken out of

service and inspected on 10/7/2024 and all six bolts were found to be missing (the other two bolts have not been located), although the bolts were missing the spinner shell remained in place because the three pieces being attached to each other continued to hold it in place. The bolts were replaced on 10/7/2024 and the turbine was placed back in service.

Please advise if you have any questions or need additional information.

Lenna Cope, P.E.
Pronouns: she/her
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response and monitoring systems (see Attachment 5). Prior to the start of operation, the Certificate Holder will develop an O&M Plan based on this framework to further detail the specific actions required to operate and maintain the Solar Components. Actions described in the O&M Plan Framework include:

- The integration of existing and new technical and site management plans into the solar facility O&M plan;
- Facility roles and responsibilities;
- Preventative maintenance and asset monitoring;
- Compliance, controls, and reporting;
- Emergency preparedness in n;
- Contractor and staff oversight;
- Design and equipment selection; and
- Long-term maintenance and operational continuity, including:
    - Personnel and quality assurance oversight,
    - Budget planning, and
    - Lifecycle management.

The final O&M Plan will be a living document that will be updated throughout the life of the Solar Components to ensure proactive and effective management of the site.

4.3 Applicable Laws and Council Rules – OAR 345-027-0360(1)(b)(B)

OAR 345-027-0360 Preliminary Request for Amendment

- Per Conditions 37 and 81 of the BCWF site certificate, PGE continues to report incidents that occur at our facilities in accordance with guidance issued by ODOE on October 27, 2022. None of these incident reports have resulted in a violation or citation being issued to PGE; however, several of them have required PGE to implement corrective action plans to reduce the likelihood of recurrence. The incidents reported since the beginning of 2022 include a blade detachment, various broken fasteners, failed hatches, an open turbine door, and transformer failures. Corrective actions plans have been implemented to address these issues. PGE meets regularly with ODOE to ensure issues are adequately being addressed.

Despite the issues identified in the section above, the Existing Facility is currently operated in compliance with its respective Site Certificate Conditions and in a manner that protects public health and safety. Given the Certificate Holder's successful expansion of their renewable energy generation portfolio and ability to address issues if they arise, and their demonstrated ability to restore the BCWF to a useful, non-hazardous condition (see Conditions 107 through 109),[14] the Council may conclude that the BCWF, as amended by RFA 4, will continue to comply with OAR 345-022-0010.

5.3.2 BIGL bn, LLC

The BIGL team through its parent company, BrightNight, LLC, has more than 6 gigawatts of experience developing, designing, and constructing solar and storage projects across the United States. Currently, BIGL's global 30+ gigawatt development pipeline has converted to projects under or nearing construction in Arizona and Washington, and under current operations in India.

	On October 10, 2024 PGE notified ODOE via email that four spinner shell bolts were found on the ground from T72. On October 17, 2024 PGE notified ODOE via email that a hub Casing Tube Bolt from T39 was found. On October 18, 2024 PGE notified ODOE via email that there was an oil spill at T434 that resulted from a failed transformer. The transformer dissolved gas analysis was within acceptable range in 2023. The spill cleanup report submitted to DEQ was provided to ODOE on 11/20/2024. There were no unusual events such as earthquakes, extraordinary windstorms, major accidents that had a significant adverse impact on the facility during 2024.
(ii) Reliability and Efficiency of Power Production: For electric power plants, the plant availability and capacity factors for the reporting year. The certificate holder shall describe any equipment failures or plant breakdowns that had a significant impact on those factors and shall describe any actions taken to prevent the recurrence of such problems.	Plant availability for each facility phase was: • 79.7% for phase one • 93.5% for phase two • 89.7% for phase three • 87.4% facility average Total capacity factor for the facility was: • 26.0% facility average See Exhibit 5 supporting documentation for additional information contained in Attachments 1 and 10.

See the availability for Phase 1 in 2024? That was before the towers were shut down for safety. **I.E. Dropping Pieces!** Now, less than one-third of them are running. PGE finally bought all the parts necessary to fix them in December 2025. But they aren't going to fix them until September, and only 17 then. One has been returned to service with the new Pitch System. And the capacity factor? 26%? The project south with less wind was running at 37%! (That's my recollection – you can doublecheck – it Patu Wind) We have good wind. **Biglow should be producing at a 96% facility average. How do I trust them with solar in our fire-prone area?**

2026-456 - **Public Comment Detail**

Comment Title:

From: Justin Scharf

From Email Address: justinscharffarms@gmail.com

Comment Date: 1/30/2026

Comment Details:

Please see attached file for our comments on the site amendment.

Thank you

Stakeholder Statement for the Record

Oregon Energy Facility Siting Council (EFSC)
Oregon Department of Energy
Biglow Renewable Power Project

My name is Justin Scharf. I am a Fourth generation farmer and landowner in Sherman County, Oregon, and I am submitting this statement for the record regarding the Biglow Renewable Power Project on behalf of myself and R&A Scharf LLC.

I want to be clear at the outset that we are a participating landowner in this project. We are also landowners in the Biglow Canyon Wind Farm, a project that our family was early supporters of. I believe it is important for the Council to understand why we chose to participate, and how that decision relates directly to the long-term future of our family farm.

Like many farmers in this community, our primary goal is to keep this land in our family and in agricultural use for future generations. Farming margins are tight, and the financial pressures facing family farms continue to increase. Without new and reliable sources of income, it becomes harder every year to plan for succession, invest in the operation, and ensure that the next generation has the option to continue farming. Diversification is key, and in this area there are limited options for diversifying crops.

Utilizing a portion of our farmland to also produce and sell energy provides that stability. It allows us to diversify the farm's income while the surrounding ground can continue to be farmed. This type of diversification helps us manage risk, maintain the operation, and avoid having to sell or fragment the property in the future.

From our perspective, the project has been planned in a way that respects the land and recognizes that this is working farmland surrounded by additional farms and working farmland. Agriculture remains central to how this land is used, and renewable energy development is being incorporated in a way that supports, not replaces, that use. While a critic might say that any acre of farmland used for solar is an acre not farmed, I'd ask them to consider this: farming yields and efficiency have improved. Due to this, the need for new energy sources is far outpacing the need for additional crop land. Capitalizing on these farming advances means we can allocate some of that land for alternative income generation.

We are aware of pushback on the project, in part, because of past problems on the operation and maintenance of the Biglow Wind Farm. As land owners in that project as well, the concerns are valid when looking back at how problems were handled in the past. We believe that the new management and plan has drastically improved and addressed these shortcomings. It would be a shame to miss out on this opportunity based on past management that is no longer involved.

With the direction the Biglow Wind Farm is now headed, we are confident in the proposal for solar to work in conjunction with the wind farm. With much of the infrastructure and transmission lines already in place it is and ideal place to add solar. Already having energy production will have far less impact than adding solar in an area with no current infrastructure.

There is also concern from neighbors on fire risk surrounding the project. As a volunteer firefighter for nearly thirty years I also understand this concern. High wind, low humidity, and high fuels are nearly unstoppable conditions for a fire. We believe that the plan has done a good job of addressing this danger. Fire lines

around the project, and much lower fuel loads within the project, should make fires in, or approaching, the project controllable.

Our participation in this project is not about changing the character of the land or the community. It is about preserving both. Projects like Biglow give farmers practical tools to remain on the land, pass it on, and continue contributing to Oregon's agricultural economy.

Thank you for the opportunity to submit this statement and for your consideration of these perspectives as part of the record.

2026-460- Public Comment Detail

Comment Title: Oregon Wheat Growers League Comments

From: Thad Eakin

From email address: admin@owgl.org

Comment Date: 1/30/2026

Comment Detail: See Attached.

OREGON WHEAT GROWERS LEAGUE
115 SE 8th Street Pendleton, OR 97801 541.276.7330 www.owgl.org

Christopher Clark, Senior Siting Analyst
Oregon Department of Energy
550 Capitol Street NE
Salem, OR 97301

Re: Biglow Energy Facility

Dear Christopher,

The Oregon Wheat Growers League is a nonprofit trade association supporting the wheat industry throughout the state. We appreciate the opportunity to comment on the proposed order for the Biglow Canyon Energy Facility in Sherman County. Given the scale of the project and potential impacts to the industry, we offer comments for your consideration, with the intent to minimize negative impacts that would reduce viability of the wheat industry overall.

The League supports protection of private property rights and the ability to enhance agricultural land, to the extent it remains compatible with neighboring uses and the ability for the wheat industry to remain viable. In regard to the Biglow Canyon project, we request consideration of the following items:

Overall Impacts: We agree with the statement that "Taking the affected area out of agricultural production would not only have direct impacts [...], but it will also have indirect and induced impacts to the local agricultural economy [...]. Whereas wind projects provide capacity for coexistence of agricultural operations, the proposed industrial solar development would fully remove the capability for wheat production on over 1,000 acres.

Direct Impacts: We disagree with the statement "For direct impacts, the landowner/farmer will experience the loss of direct agricultural production revenue, but this lost revenue will be replaced by revenue received from the Solar Components lease payments." That statement presumes that the landowner and farmer are the same entity. However, land ownership often differs from land management and operations. Those who lease land for agricultural production (wheat producers farming that ground) will experience the loss of agricultural production without support in lost revenue near or long term, nor an alternative space to continue farm operations.

> *We would seek clarification as to the statements attributed to farmers if they are operators or landowners or landowner/operators to best identify the extent of impacts and benefits to each.*

Indirect Impacts: The indirect impact analysis is missing the full extent of indirect impacts. In addition to the areas commonly considered in reviews, one that is unique to agricultural production is assessments. Each bushel of wheat produced is assessed and those funds are collectively used to primarily fund research and market development, as well as grower services through the League. The scale of the acres proposed to be taken out of wheat production, unless mitigated, would have an adverse impact on the ability of the industry to invest in itself and its

long-term sustainability. It would also remove grower-driven decision making around those investments.

As discussed below, we seek to have mitigation plans incorporate wheat grower engagement as the plan shifts investment decision-making from those impacted. We would also seek to ensure the impact model is updated to account for lost assessment revenues.

Ag Mitigation and Community Investment Plan (8.1.3.3): Given the real and substantial impacts to wheat producers and communities, we seek modifications to the proposed ag mitigations to connect resources to those most impacted. Currently, the CIP does not deliver on the statement that it references indicating that the plan will "ensure any negative economic impacts that could result from the decrease in total acres of wheat production in the county will be offset by investments in the local agricultural community." Nor do we think the changes below will be able to ever fully offset given the loss of agricultural land into an industrial use. However, modifications within the ag mitigation plan will better alleviate the challenging impacts with a partial mitigation.

- Administration: The plan should include farmer representative(s) built into the decision-making process. Under the CIP, the Sherman County Court will select what projects would be funded and/or what organizations would be awarded mitigation funds, with Mid-Columbia Economic Development District (MCEDD) as the administrator. While both the County Court and MCEDD are supportive structures, there is no guarantee a wheat producer would be involved under this current structure. The model needs to incorporate *active* dryland wheat farmers. *Proposed: Update the structure to include a representative from the Oregon Wheat Growers League.*
- Farm production: Further consultation with those engaged in market development to understand the long-term markets in domestic and international capacities is needed to clarify statements listed in the market statements. *Proposed: Further outreach to the Oregon Wheat Commission, U.S. Wheat Associates, National Association of Wheat Growers and Northwest Grain Growers.*
- Agrivoltaics: This area is significantly overstated and while research in higher rainfall zones by OSU may have investment purpose, we are concerned that the focus of this effort in dryland systems would not produce meaningful results. *Proposed instead: Similar to how the wheat industry currently conducts research reviews, a producer-led analysis of research proposals would allow research investments to match the growing area most effectively.*
- Weed control: Maintaining weed control should not be a separate ag mitigation effort, but a requirement of the project. The project adds burden to neighboring properties in weed control. Soil disturbed in construction becomes a favorable environment for noxious and invasive species. Farms must actively manage weeds and are heavily adversely impacted by weed banks from neighboring properties. The project should ensure that a weed management plan that can be reasonably enforced is completed outside of ag mitigation efforts. *Proposed: Incorporate weed management to the project requirements, not diminishing ag mitigation funds.*

- Fire: As the state struggles heavily with impacts from wildfire, fire management and response is critical. Similar to weed management, the efforts on addressing fire liability should occur as part of the project plan, not as an ag mitigation. Investments in fire support outside of the project obligations is appropriate, however.

Thank you for the opportunity to provide comment.

Sincerely,
Thad Eakin
Oregon Wheat Growers League President

SHERMAN COUNTY SOIL & WATER CONSERVATION DISTRICT
P. O. BOX 405
MORO, OREGON 97039
PHONE (541) 705-5070
EMAIL: SHERMANCOUNTYSWCD@GMAIL.COM

January 30, 2026

Oregon Department of Energy
Attn: Energy Facility Siting
550 Capitol Street NE
Salem, OR 97031

RE: Proposed Order on Request of Amendment 4 of the Biglow Canyon Wind Farm Site Certificate

To Whom it May Concern,

The Sherman County Soil and Water Conservation District (SWCD) would like to express concerns regarding the proposed amendment to the Biglow Canyon Wind Farm, near Wasco, Oregon, which would expand the facility to include a 125 MW solar photovoltaic power generation facility, particularly as those concerns relate to the surrounding natural resources and environment.

After the construction of a solar project in 2018 that resulted in the catastrophic loss of irreplaceable topsoil, the County saw fit to add Sherman County SWCD to the list of organizations for the renewable energy companies to consult with before proceeding with the construction of their projects. Sherman County SWCD has 75 years of experience in working with the state of Oregon, federal agencies, public interest groups and landowners/operators to implement soil and water conservation practices for the better protection of our natural resources. It was the County's hope that the District's vast experience with the management of local natural resources could also work with renewable energy companies to help them implement practices in their construction and continued management process to help prevent such an environmental failure from happening again in the future.

Since then, the District has enjoyed the privilege of working with these companies as they move forward with their projects. Although we recognize that these companies are now required by the County to meet with us, the District appreciates any cooperative work done to best alleviate our concerns when it comes to the damage to our local environment and natural resources. When it comes to protecting our natural resources, the District believes that being proactive is much better than being reactive.

The District has shared general concerns with the overall volume of current renewable energy projects being proposed in Sherman County in such a short timeline. To our best estimate there are approximately 35,000 acres of green energy projects entering their first phases to be approved to start construction in coming years, with reports of this eventually growing to a total of 81,000 acres. Should the latter acreage be met, this would mean that over 15% of the County would be converted to green energy production not including the large amount of acreage already in production.

Large scale solar facilities installed on agricultural land can pose several risks to soil health and watershed function if not properly sited, designed, and managed. Such risks include disturbance of soil structure, increase compaction, and reduced organic matter. Altered surface conditions associated with solar arrays—including panel rows, access roads, gravel pads, and stormwater infrastructure—can change natural drainage patterns. Concentrated runoff from panel surfaces may increase the velocity and volume of stormwater, leading to rill and gully erosion and increased sediment delivery to nearby streams, ditches, and waterways. Sedimentation can degrade water quality, reduce channel capacity, and negatively affect aquatic habitat downstream.

The conversion of agricultural land to solar facilities may also reduce vegetative cover that normally protects soil and filters runoff. Without adequate ground cover or conservation practices, nutrients, pesticides, and sediments can be transported more readily into surface waters, impacting watershed health.

In addition, long-term maintenance practices such as repeated vehicle traffic and vegetation control can further exacerbate soil compaction and erosion if not carefully managed.

For these reasons, large-scale solar development on agricultural land requires careful planning, site-specific soil and watershed assessments, and the implementation of conservation practices to minimize erosion, protect water quality, and preserve soil function. It is our opinion that this level of increase in such a concentrated area should not be taken lightly. Sherman County's geographical location being bordered by three major rivers and many smaller tributaries raises risk of disaster.

Although our concerns mostly focus on the main natural resource issues that also pertain to other landowners such as soil erosion, weed management, and fire mitigation, to name a few, it should also be noted that there are many unknowns to the public associated with newer solar technology. For example, it is to our knowledge that in the event of a fire, there is increased need for caution for the safety of fire crews due to toxins present in the panels and batteries. One of our concerns is the consequences of panels or batteries being damaged, either by fire or other means, and releasing toxins into the soil and into the waterways. Once toxins enter the waterways, it is too late to stop the damage. Sherman County records a risk of wildfire 98% higher than the counties in the entire United States according to the U.S. Forest Service raising the likelihood of damage occurring.

Even if no damage were to occur, Sherman County SWCD has been repetitively told by the renewable energy companies that their projects will have no measurable effects on the environment and natural resources without any extra steps taken. Sherman County SWCD finds that even with the proper steps taken, it is impossible to construct projects of this size and not have some measurable effect on wildlife, natural plant species, soil, and local watersheds. It is the District's goal to work with these companies to reduce this effect as much as possible knowing that there will be some level of interference in our natural ecosystems.

The District would also like to express that over its 75 years of existence it has had the pleasure of working with a population of involved and dedicated landowners and managers towards natural resource conservation. This population will very clearly be reduced with these projects, as a large area of land and many owners/managers transfers to the management of just a few large renewable energy companies. It is with this knowledge; the District expresses concerns that there are few laws in place and the ones that exist are not readily enforced to hold these companies accountable to managing the land in a way that

protects the environment and natural resources for all in the coming years. It is Sherman County SWCD's wish that as long as these projects exist, the state holds the companies accountable for any mismanagements in controlling weeds, preventing soil erosion, promoting fire prevention, and any other practices that ensure the health of the surrounding community and watersheds.

It is Sherman County SWCD's hope that the state does not rush the addition of solar to the Biglow Wind Farm's amendment and construction before proper natural resource protection management plans can be put in place, in order to prevent the wrecks of the past from happening again. Our hope is to develop a strong working relationship with Portland General Electric and BrightNight Power in order to help them in the effort to maintain our natural resources at a healthy level for the good of all of the community. Thank you for your attention to this matter.

Sincerely,

Amanda Whitman
District Manager
Sherman County Soil and Water Conservation District

From: Energy Siting * ODOE
Sent: Monday, February 2, 2026 8:19 AM
To: CLARK Christopher * ODOE
Subject: FW: Public Comment-Proposed Order on Request of Amendment 4 of the Biglow Canyon Wind Farm Site Certificate
Attachments: SCSWCD_Biglow_Letter_1.30.2026.pdf

Categories: Tracked To Dynamics 365

From: Amanda Whitman <amanda.whitman@shermancountyswcd.com>
Sent: Friday, January 30, 2026 12:53 PM
To: Energy Siting * ODOE <energy.siting@energy.oregon.gov>
Subject: Public Comment-Proposed Order on Request of Amendment 4 of the Biglow Canyon Wind Farm Site Certificate

You don't often get email from amanda.whitman@shermancountyswcd.com. Learn why this is important

Please see the attached letter for Public Comment on the Proposed Order on Request of Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. You may contact me with any questions. Please confirm that you received this public comment.

Thank you,

Amanda Whitman
District Manager
Sherman County SWCD
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Portland General Electric
121 SW Salmon Street • Portland, Ore. 97204
PortlandGeneral.com

January 30, 2026
Biglow

VIA EMAIL

Christopher Clark, Senior Siting Analyst
Oregon Department of Energy
550 Capitol St. NE 1st Floor
Salem, OR 97301

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Proposed Order

Dear Mr. Clark,

Portland General Electric (PGE; Certificate Holder) submits the following comments in response to the Oregon Department of Energy's (ODOE's) Proposed Order on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate.

The Certificate Holder generally agrees with the findings in the Proposed Order and the draft Amended Site Certificate for the RFA 4 and acknowledges the substantial effort undertaken by ODOE staff and participating state agencies reviewing and evaluating the proposed amendment. The Certificate Holder appreciates the collaborative coordination throughout the review process and provides the following comments to clarify the record and support consistent implementation. The Certificate Holder also submits a separate letter specific to the requested Goal 3 exception.

The Certificate Holder provided a letter to ODOE on January 14, 2026, addressing requested edits related to corrections or clarifications of the record for the Proposed Order and associated plans (included as attachments on the Proposed Order) for ODOE's and Council's consideration in the Final Order. This comment letter provides additional clarifications and requested revisions on the Proposed Order and associated plans for consideration in the Final Order.

Certificate Holder's Comments on the Proposed Order:

- **I.D.3 Temporary Construction Areas**
  The Certificate Holder requests clarification and correction of the description of Temporary Construction Areas in the Proposed Order. The Proposed Order states that temporary construction areas would be established "within the perimeter fenceline," which could be interpreted to inaccurately constrain their location. Temporary construction areas may be located anywhere within the approved Solar Micrositing Area, including areas both inside and outside the perimeter fence line, provided they remain within the Solar Micrositing Area. This clarification is consistent with the RFA and ensures construction logistics are not inadvertently limited.

- **I.D.3: Other Proposed Related or Supporting Facilities**
  The Certificate Holder would like to request that the following language in red font be inserted into the paragraph below regarding Perimeter Fencing and Gates:

  > *Each solar array, with any collocated related or supporting facility components, would be enclosed by seven-foot-tall chain-link perimeter fencing with one foot of razor or barbed wire at the top. Alternatively, wire mesh or similar perimeter fencing up to 8 feet in height may be used. Fences would be constructed and grounded in accordance with NESC Rule 110. Vehicle access to the facility would be provided by lockable vehicle gates. Additional gates may be installed for emergency exit or removal of wildlife.*

  This language allows final fencing materials and heights to be determined during the final design process, while remaining consistent with safety and code requirements. This change is also requested for Attachment G Draft Construction Wildfire Mitigation Plan Section 4.1.5.

- **I.D: Table 2 – Solar Facility Component Summary**
  The Certificate Holder submits this comment to clarify an inaccuracy in Table 2 regarding the description of the Solar Micrositing Area. The note in Table 2 currently states:

  > *"The Solar Micrositing Area would occupy approximately 1,445 acres within fenced areas and transmission line corridor. The entire solar facility footprint is considered a permanent disturbance area for the purposes of evaluating and mitigating impacts to resources such as Fish and Wildlife Habitat; however, soil reclamation and weed management is applicable to the solar facility footprint as discussed in applicable section in this order."*

  This description inaccurately depicts the Solar Micrositing Area and conflates the Solar Micrositing Area with the anticipated permanent disturbance footprint. The correct description is as follows:

  > *The approved BCWF site boundary encompasses approximately 25,000 acres and includes all existing and approved BCWF components. The Certificate Holder proposes to modify the use of approximately 1,924 acres within the approved BCWF site boundary (Figure 3) to accommodate the Solar Components. These 1,924 acres comprise the Solar Micrositing Area (also referred to as the RFA 4 Site Boundary), within which construction of the Solar Components may occur.*

  The Solar Micrositing Area represents a conservative estimate of the maximum area required to accommodate development, micrositing flexibility, and temporary construction disturbances, and does not represent the anticipated permanent disturbance footprint. The clarification is provided to ensure the record accurately reflects the scope and purpose of the Solar Micrositing Area and avoids confusion regarding impact evaluation and mitigation.

- **III.B.1 Table 5**
  Reporting: The Certificate Holder supports ODOE's recommendation that regular reporting summarizing performance monitoring results be implemented; however, the Certificate Holder requests that the Department consider changing the identified monthly requirement to a quarterly cadence. Monthly reporting may over-emphasize short-term variability that does not reflect underlying performance trends, while quarterly reporting allows for more meaningful evaluation of system performance and provides sufficient time

for the Certificate Holder and O&M contractors to address identified issues.

- **III.C.1 Amended Condition 68**
  The Certificate Holder supports the intent of amended Condition 68 to avoid dangers to human safety presented by non-seismic hazards, including settlement, landslides, flooding, erosion, and collapsible soils. The Certificate Holder also acknowledges the severe hazard ratings present in portions of the BCWF site boundary.

  The Certificate Holder seeks to clarify that the proposed prohibition on all ground-disturbing activity in areas with slopes exceeding 20 percent, as written, may unnecessarily limit construction flexibility in areas where site-specific conditions can be demonstrated to be stable through engineering analysis.

  Existing slopes exceeding 20 percent are limited in extent and will generally be graded to slopes under 20 percent. Transitions between existing and final grades will be evaluated by the Geotechnical Engineer of Record. A job hazard analysis (JHA) will be implemented during construction.

  The Certificate Holder agrees that development should not occur on slopes exceeding 20 percent unless such development is demonstrated to be safe and appropriate based on site-specific geotechnical evaluation. Accordingly, the Certificate Holder requests clarification to allow ground-disturbing activities on slopes exceeding 20 percent only where reviewed, approved, and designed by the Geotechnical Engineer of Record to address non-seismic hazard risks.

  The Certificate Holder submits the following clarification for the record to maintain the intent of Condition 68 while allowing limited engineering-based flexibility:

  > **Proposed Clarified Condition 68 (CON-SS-03):**
  >
  > *The Certificate Holder shall design, engineer, and construct the solar facility to avoid dangers to human safety presented by non-seismic hazards, including but not limited to settlement, landslides, flooding, erosion, and collapsible soils. Ground-disturbing activities shall be avoided in areas with slopes exceeding 20 percent unless such activities are reviewed and approved by the Geotechnical Engineer of Record and designed to adequately address non-seismic hazard risks.*

- **III.D.1 Vegetation Management and Weed Control**
  The Certificate Holder provides the following clarification to ensure consistent interpretation of buffer area requirements along roads and perimeter fencelines within the Solar Micrositing Area, consistent with typical solar facility vegetation management practices and wildfire risk reduction measures.

  The terms "clear, brush-free area" and "vegetation-clearance area/zone" are used in multiple locations in the Proposed Order and Attachments D and G without consistent definition. To improve the clarity and avoid misinterpretation, the Certificate Holder requests that these terms be replaced with "low-growing, fire-resistant vegetation," or that the documents otherwise clarify that these buffer areas are intended to be maintained with low-growing, fire-resistant vegetation rather than fully devoid of vegetation.

  In addition, the Certificate Holder notes an inconsistency regarding whether the required buffer along the perimeter fenceline is intended to be 10 feet on each side or 20 feet measured along the exterior or interior and requests clarification from ODOE to ensure consistent understanding and implementation of the buffer requirement.

- **Section III.E. Land Use: OAR-345-022-0030**
  The Certificate Holder generally agrees with most of the findings in this section of the Proposed Order but disagrees with some of ODOE's findings under the applicable substantive criteria. Those are discussed in more detail below.

  SCZO Article 5. Conditional Uses; Section 5.2 General Criteria:

  In determining whether or not a Conditional Use proposal shall be approved or denied, it shall be determined that the following criteria are either met or can be met through compliance with specific conditions of approval.

  * * * * *

  - ***SCZO 5.2(5)****. That no approval be granted for any use which is or expected to be found to exceed resource or public facility carrying capacities, or for any use which is found to not be in compliance with air, water, land, and solid waste or noise pollution standards.*

    Certificate Holder Comment: In the Proposed Order, ODOE recommends the Council find that the facility would not exceed resource or public facility carrying capacities and would generally comply with applicable air, water, solid waste, and noise standards. However, ODOE continues that because the facility would trigger a Goal 3 exception under the DLCD acreage thresholds, the facility cannot meet this applicable substantive criterion as it does not meet an applicable "land standard." The Certificate Holder understands ODOE to be concluding that the DLCD Goal 3 acreage threshold in OAR 660-033-0130(38)(k) is a "land standard" within the meaning of the SCZO.

    The applicable substantive criterion in question is a general conditional use criterion, and the "land standards" referenced in it mean substantive standards that impose requirements on a use. The DCLD Goal 3 exception acreage threshold in OAR 660-033-0130(38)(k) is not a "land standard" within the meaning of the applicable substantive criteria – it is a threshold that, if triggered, requires the application of more stringent review criteria under the exceptions test. If ODOE is to interpret the DCLD rules as providing "land standards" within the meaning of this applicable substantive criterion, it should be the high-value and arable land siting standards in OAR 660-033-0130(38)(h) and (i), with which the Certificate Holder demonstrates compliance. The Certificate Holder requests that ODOE reconsider its finding and conclude that the facility, as amended, meets this applicable substantive criterion.

  - ***SZCZO 5.2(6).*** *That no approval be granted for any use violation of this Ordinance.*

    Certificate Holder Comment: In its findings, ODOE notes the facility would trigger a Goal 3 exception under DLCD acreage thresholds and therefore would not meet this applicable substantive criterion.

    This applicable substantive criterion prevents approval of a proposal that results in a "use violation" of the SCZO. The facility, as amended, is a "commercial utility facility" under the SCZO, which is a use allowed subject to conditional use review

and a Goal 3 exception. The fact that the use requires review and approval as a conditional use, and a use triggering a goal exception, does not mean that the proposed project results in a "use violation" of the SCZO. The DLCD solar siting standards are not adopted as part of the SCZO and are not a basis for evaluating compliance with the SCZO under this applicable substantive criterion. For these reasons, the Certificate Holder requests that ODOE reconsider their findings and find the facility, as amended, meets this applicable substantive criterion.

SCZO Section 5.8 Standards Governing Specific Conditional Uses:

A Conditional Use set forth by this Ordinance shall be subject to review by the Planning Commission in accordance with the public hearing requirements set forth in this Ordinance.

* * * * *

- ***SCZO 5.8(20).*** *Non-farm Uses in an F-1 Zone - Non-farm uses, excluding farm related, farm accessory uses, or uses conducted in conjunction with a farm use as a secondary use thereof, may be approved upon a finding that each such use:*

- ***SCZO 5.8(1).*** *Is compatible with farm uses described in [ORS] 215.203(2);*

  Certificate Holder Comment: In its findings, ODOE recommends the Council find that the facility components proposed in RFA4 are not compatible with farm use due to the facility exceeding the Goal 3 exception thresholds in maximum amounts of arable and high-value farmland allowed under OAR 660-033-0130(38)(k), and for this reason cannot be approved without an exception to Statewide Planning Goal 3.

  The Certificate Holder notes that this section of the SCZO allows for non-farm uses in an F-1 zone as long as they are compatible with farm uses described in ORS 215.203(2) (i.e., the employment of land for raising, harvesting, and selling crops for profit.…). The Certificate Holder provided evidence of the facility's compatibility with farm uses in Exhibit K Section 5.2.5.3. Furthermore, as part of the Goal 3 analysis, ODOE found that, subject to compliance with existing and recommended conditions of approval, the construction and operation of the facility components proposed in RFA4 are not expected to result in significant adverse impacts to adjacent farm uses from traffic, dust, noxious weeds, or wildfire, and as such, the facility meets the fourth prong of the Goal 3 exception test requiring that the facility, as amended, be compatible with adjacent uses, which are predominately farm uses (see Proposed Order page 149 Rows 17-25).

  Exceeding the Goal 3 exception acreage thresholds does not in and of itself preclude a facility from being compatible with farm uses. The Certificate Holder demonstrates throughout the record how the facility, as amended, avoids, minimizes, and mitigates for potential adverse impacts to surrounding farm uses and in doing so, complies with the applicable SCZO criteria and the siting standards in OAR 660-033-0130(38)(h) and (i). Therefore, the Certificate Holder maintains that the facility meets this provision in the SCZO. For these reasons, the Certificate Holder requests that ODOE reconsider their findings and conclude that the facility, as amended, meets this applicable substantive criterion.

- ***SCZO 5.8(3)**. Does not materially alter the overall land use pattern of the area;*

  Certificate Holder Comment: ODOE recommends the Council find the facility's conversion of approximately 1,445 acres of cultivated land, including 1,006 acres of high-value farmland, to a non-farm use does have the potential to materially alter the overall land use pattern of the analysis area by reducing the number of tracts available for farmland and potentially affecting the local agricultural economy.

  For purposes of analyzing this applicable substantive criterion, there are four steps: (1) define the area, (2) identify the land use pattern within that area, (3) identify potential impacts from the proposed use, and (4) determine if such potential impacts result in material changes to existing land use patterns. In the Land Use Exhibit K (Section 5.2.5.3) analysis of compliance with this criterion, the Certificate Holder defined the "area" as the portion of Sherman County east of US-97 and north of Grass Valley Canyon. The area is approximately 130 square miles. The overall land use pattern within the area is predominately large tracts of dryland crop production. The Solar Components would occupy two tracts within a 3-square-mile area. This would amount to approximately 2.3 percent of land being removed from production within the overall land use area for the life of the project.

  The facility would not diminish opportunities for farms on surrounding lands and lands in north Sherman County to expand, purchase, or lease farmland. The facility would not diminish the number of tracts or acreage in farm use in a manner that will destabilize the overall character of the study area. The underlying land will remain legally configured, meaning no parcels or tracts will be reduced. The Biglow Agricultural and Fiscal Impact Analysis (Attachment K-2) states that the 2022 agricultural census identified 402,516 acres in farms in Sherman County, occupying approximately 76 percent of the land in the county (USDA 2022, U.S. Census Bureau 2024). The removal of 1,445 acres of cultivated land into nonfarm use represents only 0.36 percent of the total farm acres in the county.

  Further, unlike other non-farm uses like non-farm dwellings that ODOE references, the facility will be decommissioned, retired, and the land will be restored at the end of operations. The participating landowners have the right to choose how to use their land – it is not the responsibility of these landowners to ensure that other farmers have continued opportunity to expand, purchase or lease farmland. Regardless, the Certificate Holder has demonstrated on the record that the facility, as amended, taking into consideration avoidance, minimization, and mitigation, (1) will not result in adverse environmental, economic, social, and energy consequences; (2) will not result in significant adverse impacts to accepted farming practices; and (3) will result in rural local economic benefits through the implementation of a Community Investment Plan. There is substantial evidence in the record to find that the facility, as amended and as conditioned, will not materially alter the overall land use patterns of the area. For these reasons, the Certificate Holder requests the ODOE reconsider its findings.

- **Directly Applicable State Rules and Statues: OAR 660-033-0130(38)(G)**

  Certificate Holder Comment: The entire paragraph of findings under this subsection should be struck. This subsection of the DLCD solar siting rule requires a stability analysis if there are at least 48 acres of solar facilities within a one-mile study area. First, there are no acres of solar facilities within the study area; therefore, subpart (G) is not triggered per the plain language in subpart (G)(i). Second, ODOE states that this rule was intended to apply to a facility less than 12 acres and "does not accurately capture the proposed facilities potential impacts on the stability of the overall land use pattern." ODOE needs to apply the rule as drafted. Moreover, the SCZO already requires the analysis ODOE is attempting to address under subpart (G)(ii), which the Certificate Holder addresses above.

- **III.N.1 Facility Design**
  The Certificate Holder requests the following change to the language in the third bulleted item, as shown in red below:

  - *All perimeter fences will be set back at least 50 feet from all property lines of non-participating landowners. Facility components will be set back at least 20 feet from fences.*

  Perimeter fencelines may abut the property line of the participating landowner, as identified in Land Use Condition 1 (GEN-LU-10). This clarification is requested to ensure alignment in all other references to the 50-foot setback in the Proposed Order and Attachment G Draft Construction Wildfire Mitigation Plan Section 4.1.3 and support final design considerations.

- **III.N.1 Operational WMP, Wildfire Risk Minimization Preventative Actions, Programs, and Procedures**
  The Certificate Holder acknowledges the Department's recommendation to maintain vegetation at a reduced height of 1 to 3 inches during the dry season (June–October) and requests that the vegetation height requirements be set to limit a height of 10 to 12 inches year-round. Based on practical vegetation management considerations, this approach better supports wildfire risk reduction for the following reasons:

  1. Repeated low mowing to such reduced heights would be detrimental to perennial grasses included in the approved seed mix, as repeated damage to bunchgrass crowns would likely result in plant mortality within a few growing seasons.

  2. Extremely low mowing would favor the establishment of annual grasses, thereby increasing fine fuels rather than reducing fire risk.

  3. Low mowing would significantly reduce or eliminate wildlife habitat, particularly for ground-nesting birds and beneficial insects.

  4. Mowing at such low heights at the beginning of the dry season increases the risk of fire ignition due to sparks generated when mowing equipment contacts rocks or hard surfaces.

  5. Maintaining vegetation at a 1- to 3-inch height would substantially increase vegetation management costs without providing commensurate fire-risk reduction benefits.

Certificate Holder's Comments on the Draft Site Certificate:

- **Recommended Land Use Condition 3 (PRE-LU-01)**
  The Certificate Holder has elected to seek a Council determination of compliance with statewide land use planning goals under ORS 469.504(1)(b). Given this election, Sherman County would not have discretionary approval of a CUP or Site Plan, and compliance with applicable sections of the Sherman County Zoning Code (SCZO) is determined by Council and memorialized in the Final Order and Site Certificate. Sherman County, in issuing a CUP or Site Plan under ORS 469.401(3), may adopt conditions from the Site Certificate to have concurrent enforcement authority.

  The Certificate Holder requests that the language in PRE-LU-01 conform to ORS 469.401(3) with the revisions identified in redline below:

  a. *Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department and the Sheman County Planning Commission, an application for Conditional Use Permit pursuant to ORS 469.401(3) ~~meeting the requirements of SCZO Section 5.4(1) and (3).~~*

  b. ~~*The Site Plan required under SCZO 5.4(1) must demonstrate compliance with all applicable local ordinances and site certificate conditions*~~.
  [Final Order on AMD4]

- **PRE-NC-02**
  The Certificate Holder requests that the Department revise this condition to reference the Facility as a whole, rather than the solar facility alone, to align with the Department's requirement that noise compliance be demonstrated through cumulative modeling of the entire Facility. Additionally, the executed easements and/or real covenants apply broadly to the Facility, including any additions, without distinguishing among infrastructure components.

- **OPR-WR-01**
  The Certificate Holder understands that for any onsite wells, the combined water usage shall not exceed 5,000 gallons per day, for domestic use at the Facility's O&M buildings and solar panel and blade-washing activities. The Certificate Holder would like to clarify that this limit applies to all onsite exempt wells.

Certificate Holder's Comments on Attachment C Draft Operations and Maintenance Plan Framework:

- The Certificate Holder requests the following changes to the first bulleted item in Section 3.4.2 PV System:

  - *Routine module inspections and annual infrared/aerial thermal imaging with anomalies detected ~~via SCADA~~ generating corrective work orders ~~within 48 hours~~ according to the final Operations and Maintenance Plan.*

  This change is requested because it is unlikely that SCADA will detect module-level anomalies for work order creation. The Certificate Holder will include protocols for module inspections and corrective actions in the final Operations and Maintenance Plan submitted to ODOE prior to commencing operations of the Biglow Solar facility.

- The Certificate Holder notes that the text in Section 5.0 references the OIM Plan; this

should be changed to O&M Plan.

Certificate Holder's Comments on Attachment G Draft Construction Wildfire Mitigation Plan:

- **Section 4.1.3 Fire Prevention:**

  The Certificate Holder provides the following clarification regarding roadway design within the Solar Micrositing Area to ensure consistency with applicable Oregon Fire Code (OFC) provisions and typical utility-scale solar facility layouts.

  Roads designated for emergency access will be designed and constructed in accordance with the 2022 OFC, including Section 503 and Appendix D (Fire Apparatus Access Roads), which generally require a minimum width of approximately 20 feet. These requirements will apply to all exterior roads and designated emergency access routes intended for firefighting access.

  Within the solar facility fenceline, narrower interior service roads are proposed between panel rows to provide routine operations and maintenance (O&M) access to photovoltaic (PV) arrays. This configuration is typical of utility-scale solar facility design. These interior service roads are not intended or designated for use by fire apparatus or for fire suppression activities and are distinct from OFC fire apparatus access roads. Interior service roads within the solar facility fenceline will be at least 16 feet wide.

  The North Sherman County Fire Department has reviewed the site plans and has not provided comments regarding the widths of roads located within the site fenceline. Areas immediately surrounding O&M buildings, the proposed substation, and the BESS will be graveled and maintained free of vegetation. All exterior and designated emergency access roads will continue to comply with applicable Oregon Fire Code requirements.

- **Section 4.2 Specifications for Fire Protection Equipment:**

  The Certificate Holder requests to remove *Drip Can: 5 gallon capacity* from the list of fire suppression equipment required to be carried in maintenance vehicles and stored on-site at the O&M building. O&M staff are not expected to have experience using this type of equipment and will not be conducting activities requiring the use of drip cans.

Certificate Holder's Comments on Proposed Order Attachments: The Certificate Holder has reviewed the Proposed Order and confirms acceptance of all redline revisions provided on the attachments referenced therein, except where explicitly noted in comment on the record.

The Certificate Holder submits redline with corresponding comments provided to explain the basis for the requested changes to facilitate agency review. The following documents are submitted in redline versions with comments for the following:

- **Attachment D – Draft Comprehensive Revegetation and Solar Management Plan**
- **Attachment F – Draft Habitat Mitigation Plan**

PGE respectfully submits these comments for consideration by ODOE and the Energy Facility Siting Council in advance of Council action on the Proposed Order for Request for Amendment 4.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech
Kathleen Campanella, BrightNight

Comprehensive Solar Revegetation and Soil Management Plan

Biglow Canyon Wind Farm
Request for Amendment 4
~~November~~ January ~~2025~~2026

Prepared for

Portland General Electric Company

Prepared by

Tetra Tech, Inc.

Submitted with RFA 4 November 2025

Amended by the Department December 2025

Revised in response to ODOE comments January 2026 (redline)

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Acronyms and Abbreviations

BCWF or Facility	Biglow Canyon Wind Farm
BIGL	BIGL bn, LLC
Comprehensive Plan	Comprehensive Solar Revegetation and Soil Management Plan
County	Sherman County
EFSC	Energy Facility Siting Council
EMC	Environmental Monitoring Contractor
EPC	Engineering, Procurement, and Construction Contractor
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
ODOE	Oregon Department of Energy
PGE or Certificate Holder	Portland General Electric Company
RC	Revegetation Contractor
RFA	Request for Amendment
WC	Weed Control Contractor

1.0 Introduction

This Comprehensive Solar Revegetation and Soil Management Plan (Comprehensive Plan) has been prepared by Portland General Electric Company (PGE or Certificate Holder) to serve as a primary source of commitments related to revegetation, soil management, dust control, stormwater management, and noxious weed control through the pre-construction, construction, and operations phases for the photovoltaic solar energy generation and battery storage (Solar Components) associated with Request for Amendment (RFA) 4 of the Site Certificate for the Biglow Canyon Wind Farm (BCWF or Facility). PGE will own and operate the Solar Components as a part of the BCWF (together, Amended Facility or Facility), which, to date, have been developed by BIGL bn, LLC (BIGL or Project Developer). BIGL, in its capacity as the project developer, supports PGE in this RFA 4 and may construct and temporarily operate the Solar Components on behalf of PGE under a Build-Transfer Agreement.

For ease of implementation and compliance tracking, this document is structured to identify actionable items by phase and typical sequencing within each phase, with additional details provided as appendices and/or incorporated by reference.

This Comprehensive Plan will be updated, as necessary, in coordination with the Oregon Department of Energy (ODOE) and applicable agencies as specified below prior to construction to reflect the final layout of the Solar Components and additional details only available once an Engineering, Procurement, and Construction Contractor (EPC) has been identified.

1.1 ~~Comprehensive~~ Plan Finalization

Table 1 identifies information that must be incorporated into the Comprehensive Plan before beginning any phase of construction.

Table 1. Action Items for ~~Comprehensive~~ Plan Finalization

Action	Timeframe	Implemented By	Review/ Verification
Notify Department of identity of EMC, EPC, RC, and WC. Provide evidence that each contractor meets the minimum qualifications described in Appendix A.	Plan Finalization	Certificate Holder	ODOE
Update Appendix A, Table A-1 with name and contact information for each contractor.	Plan Finalization	Certificate Holder	ODOE
Update Section 6.0, Table 5 with operations long-term vegetation management details from Public Utility Commission (PUC)-approved vegetation management plan including monitoring for Wildfire Management Plan vegetation criteria.	Prior to Operations	EMC	ODOE
Update Appendix B, Table B-1 with temporary and permanent disturbance acres by habitat subtype.	Plan Finalization	EMC	ODOE

Action	Timeframe	Implemented By	Review/ Verification
Update Appendix B with a Construction Plan and maps based on final design, expected disturbance levels, and sequencing of construction.	Plan Finalization	EMC	ODOE, ODA, ODFW, County
Update Appendix C with approved National Pollutant Discharge Elimination System (NPDES) 1200-C permit and Erosion and Sediment Control Plan (ESCP). Incorporate all stormwater control and treatment best management practices (BMPs) required by the 1200-C permit, and any supplemental BMPs required by this Comprehensive Plan, into ESCP.	Plan Finalization	EPC	ODOE
Update Appendix D with construction dust control measures. Include contact information and procedures for Dust Control Hotline.	Plan Finalization	EPC	ODOE
Update Appendix E with proposed baseline soil compaction sample locations.	Plan Finalization	Certificate Holder	ODOE
Update Appendix F with Final Revegetation methods, as needed, for both temporary and permanent disturbance areas in consultation with ODOE	Plan Finalization	EMC	ODOE
Update Appendix G with timing and treatment methods for each identified weed species of concern after consulting with the Sherman County Weed District.	Plan Finalization	WC & EMC	ODOE and County
Update Appendix G with final noxious weed and vegetation monitoring methods.	Plan Finalization	EMC	ODOE
Notes: EMC = Environmental Monitoring Contractor; EPC = Engineering, Procurement, and Construction Contractor; ODOE = Oregon Department of Energy; WC = Weed Control Contractor; County = Sherman County			

Commented [A1]: ODOE – Is there something specific that needs to be updated? Nothing in Appendix F is flagged for updates. We would prefer to consider this complete unless there is something specific that requires further discussion.

This might be related to the line above that states "Update Section 6.0, Table 5 with operations long-term vegetation management details from PUC-approved vegetation management plan."

Commented [A2]: ODOE - Weed monitoring methods were added and submitted to ODOE with RFA 4. Request that ODOE review and approve, then remove this line.

2.0 Definitions

Definitions applicable to this Comprehensive Plan are provided in Table 2, below.

Table 2. Definitions for the Biglow Canyon Wind Farm

Term	Definition
BCWF; Facility	Biglow Canyon Wind Farm
Habitat Areas	Any undeveloped, non-agricultural areas, including but not limited to areas mapped as grassland, sagebrush shrub-steppe, or riparian habitat, prior to construction of the Solar Components.
Permanent Disturbance Area	Any area permanently occupied by the Solar Components, including all areas within the fence line of a solar array or substation.
Sensitive Soils	Soils that are highly susceptible to erosion from water, fugitive dust propagation, compaction, or other impacts as described in Appendix E.

Term	Definition
Solar Components	Photovoltaic solar energy generation, battery storage, and other components authorized in RFA 4.
Solar Micrositing Area/ RFA 4 Site Boundary	Maximum area where Solar Components may be built or cause temporary disturbance.
Temporary Disturbance Area	Any area that is disturbed during construction of the Solar Components but will not be permanently occupied during operations.
Weed Management Area	Disturbance area associated with the Solar Components and a 10-foot buffer.

3.0 Plan Goals and Management Objectives

This Comprehensive Plan was developed to demonstrate compliance with the terms and conditions of the Site Certificate and other applicable state and local laws and regulations. Specifically, the actions described in this Comprehensive Plan are intended to increase the probability of revegetation success, reduce erosion and dust pollution, protect topsoil for future agricultural use on agricultural land, prevent and address the establishment and spread of noxious weeds, minimize fire risk, and maintain beneficial vegetation at the site.

The BCWF is located on privately owned agricultural land used primarily for dryland wheat production and, to a lesser extent, cattle grazing. The grazed land is grassland, shrub-steppe rangeland, and/or fallow wheat stubble fields. The Solar Micrositing Area also contains important wildlife habitat and movement corridors, particularly along the John Day River and its tributaries. Sensitive soils are present throughout the Solar Micrositing Area, and erosion hazards from wind and water are severe in areas with steep slopes, including canyons and drainages in the northeast portion. To ensure that the area can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the Solar Components, Permanent Disturbance Areas in wildlife habitat will be revegetated for the purposes of soil stabilization to reduce erosion, dust pollution, topsoil depletion, and the potential for invasion by noxious weeds and other invasive plants. Cropland in the Solar Micrositing Area will be returned to landowner control and will not be revegetated by the Certificate Holder.

To minimize impacts to agricultural uses and habitat in Temporary Disturbance Areas, soil disturbance and vegetation removal will be minimized and reasonable efforts will be made to restore vegetation and soils in agricultural and habitat areas to their pre-disturbance condition. Best Management Practices (BMPs) will be implemented to minimize erosion and prevent the introduction or spread of noxious weeds and other invasive plants in both habitat areas and temporarily disturbed developed areas (i.e., existing roads, rock quarries).

4.0 Pre-construction Compliance

Table 3 outlines actions related to revegetation, soil management, dust control, stormwater management, and noxious weed control that must be completed before beginning construction.

Table 3. Pre-construction Compliance Checklist

Action	Timeframe	Implemented By	Review/ Verification
Provide Final Comprehensive Plan to all participating parties.	At least 30 days prior to construction	Certificate Holder	ODOE
Hold a kick-off meeting with the EMC, EPC, County, and ODOE.	At least 14 days prior to construction.	Certificate Holder	ODOE
Collect baseline soil compaction measurements within all anticipated Level 3 and 4 Disturbance Areas (described in Appendix B) ~~Temporary Disturbance Areas~~ using the protocol described in Appendix E. Submit baseline soil compaction measurement results to ODOE.	Prior to construction	EMC	ODOE
Complete installation of stormwater, erosion, and sediment controls as required by the 1200-C permit. See Appendix C.	Prior to construction	EPC	ODOE
Coordinate the construction schedule and sequence with landowners to maintain land in current production and weed control until the last growing season prior to construction~~just prior to construction~~.	Prior to construction	Certificate Holder	ODOE
Conduct on-site Environmental Training with contractors ~~and,~~ construction personnel, and environmental inspector(s), inviting specialty contractors, Oregon Department of Agriculture (ODA), Oregon Department of Fish and Wildlife (ODFW), the County, and ODOE. The training must cover all aspects of this Comprehensive Plan and other requirements applicable to construction, including but not limited to: • Roles and ~~R~~responsibilities • Implementation of avoidance buffers for sensitive resources (e.g., flagging) • Methods for identifying and preventing the spread of noxious and invasive weeds • BMPs for soil protection and erosion control under the 1200-C ~~P~~permit. • Fire prevention practices during construction	Prior to construction	Certificate Holder	ODOE
Provide records demonstrating that all contractor personnel have attended on-site Environmental Training described above.	Prior to construction	Certificate Holder	ODOE
Conduct additional pre-construction noxious weed surveys to identify noxious weeds present within the Solar Components at the time of construction to inform management.	Prior to construction	EMC	ODOE
Provide the Appendix G Weed Control Plan to the Sherman County Weed District for review and concurrence with treatment guidelines.	Prior to construction	Certificate Holder	ODOE

Action	Timeframe	Implemented By	Review/ Verification
Treat noxious weeds within the Weed Management Area in accordance with methods in Appendix G.	Prior to construction	WC	ODOE
Provide evidence that existing noxious weeds have been identified and treated in accordance with methods in Appendix G.	Prior to construction	Certificate Holder	ODOE
Notes: County = Sherman County; EMC = Environmental Monitoring Contractor; EPC = Engineering, Procurement, and Construction Contractor; ODOE = Oregon Department of Energy; RC = Revegetation Contractor; WC = Weed Control Contractor			

5.0 Construction Compliance

Table 4 outlines actions needed for compliance during construction related to revegetation, soil management, dust control, stormwater management, and noxious weed control.

This list includes actions applicable throughout construction as well as actions required as construction nears completion and revegetation commences in preparation for entering the operations phase.

Table 4. Construction Compliance Checklist

Action	Timeframe	Responsible Party	Review/ Verification
During Construction Mobilization			
Provide information about target noxious weed species at the operations and maintenance buildings.	During construction	EPC	EMC & ODOE
Ensure a copy of this Comprehensive Plan and a description of any additional fugitive dust control requirements are available on site.	During construction	EPC	EMC & ODOE
Prominently display Dust Control Hotline signs, providing direct access to the Certificate Holder Site Manager.	During construction	EPC	EMC & ODOE
Flag sensitive environmental resources (e.g., historic, cultural, and archaeological resources; active raptor nests; delineated wetlands and waterways) and noxious weed infestations to alert construction personnel to of avoidance areas or management requirements.	During construction	EMC	ODOE
During Ground-Disturbing Activities			
To the extent practical, mowing or other vegetation removal activities in Category 2 habitat will be scheduled to occur outside the critical period for ground-nesting birds (April 15 – September 1), to avoid disturbing active nests. If mowing or other vegetation removal activities in Category 2 habitat are necessary between April 15 and September 1, the Certificate Holder shall hire a qualified biologist to conduct a clearance survey for nesting birds prior to vegetation removal. The Certificate Holder shall ensure that active nest sites identified during the clearance survey are flagged and marked as sensitive areas for avoidance on construction maps. ~~On or before April 15 of any year in which construction occurs within Category 2 habitat, all mowing, vegetation removal and/or ground disturbance associated with site preparation must be completed. No mowing, vegetation removal and/or ground disturbance associated with site preparation may occur within Category 2 habitat between April 15 through September 1.~~	During construction within Category 2 habitat	EPC, Certificate Holder	EMC & ODOE
In Disturbance Level 3, 4, and 5 areas (described in Appendix B), stockpile excavated soils by soil horizon to replace in the same order and prevent mixing of topsoil and subsoils. Put conserved topsoil back in place prior to revegetation activities.	During construction	EPC	EMC & ODOE
Do not move topsoil and other soils from areas with noxious weeds to areas without noxious weeds; instead, return these soils to their previous location during reclamation activities to reduce the transport of weed seeds, roots, or rhizomes.	During construction	EPC	EMC & ODOE

Commented [A3]: ODOE – Revised to require nesting bird clearance surveys prior to vegetation removal during the specified window. Restricting all vegetation removal in Cat 2 habitat from Apr 15 to Sept 1 would preclude almost all work in those areas and incentivize grading instead of mowing or drive and crush. Mowing is essential prior to work during the dry season to reduce fire risk.

Action	Timeframe	Responsible Party	Review/ Verification
Use appropriate erosion and sediment control practices, as required by the ~~National Pollutant Discharge Elimination System (NPDES)~~ 1200-C permit (Appendix C).	During construction	EPC	EMC & ODOE
Limit vehicle access to designated routes, whether existing roads or newly constructed roads, and the outer limits of construction disturbances per the final design for the Solar Components; limit vehicle traffic in areas with noxious weeds.	During construction	EPC	EMC & ODOE
Require construction vehicles to pass through a wheel wash station at vehicle ingress/egress points each time they enter or exit the Solar Components.	During construction	EPC	EMC & ODOE
Clean vehicles and equipment associated with ground disturbance and movement of topsoil utilizing a mobile wash station after performing work in areas with noxious weeds and prior to performing work in areas without noxious weeds.	During construction	EPC	EMC & ODOE
Implement appropriate BMPs to control any dust generated by construction activities, such as applying water or stabilizers to roads and disturbed soil areas.	During construction	EPC	EMC & ODOE
Maintain records of U.S. Environmental Protection Agency (EPA) Method 22 (ODEQ 2019) monitoring.	During construction	EPC	EMC & ODOE
After grading is complete but prior to installation of Solar Components, apply temporary or permanent soil stabilization, as described in Appendix F.	During construction	RC	EMC & ODOE
Monitor the Weed Management Area for noxious weeds during and after construction and implement control measures as described in Appendix G.	During and following construction	EMC & Certificate Holder	ODOE
Conduct compliance monitoring to ensure that contractors are complying with noxious weed prevention measures in this Comprehensive Plan. Facilitate coordination meetings with ODOE and Sherman County Weed District, train all personnel to maintain tracking sheets, conduct routine check-in calls with the construction team, and document communication with landowners prior to chemical application. Maintain records and provide ODOE with copies of these records annually during construction. If the Certificate Holder contracts with the Sherman County Weed District to perform weed control at the Solar Components, then monitoring records will include a statement that the county agency performed the work.	During construction	EMC	ODOE
If construction extends into the growing season prior to the commercial date of operations and formal post-construction weed monitoring, conduct informal but comprehensive weed surveys to	During construction	EMC	ODOE

Action	Timeframe	Responsible Party	Review/ Verification
inform adaptive management. Weed monitoring may be conducted as part of routine environmental monitoring to be completed at least monthly from April to October.			
Soil Stabilization and Reclamation			
Coordinate with the landowner or farm operator to identify the preferred approach for soil stabilization on agricultural land until routine seeding and tillage resumes. Soil stabilization may include applying unseeded hydromulch or crimping in weed-free straw until seeding can occur. Landowner may choose to assume responsibility for soil stabilization. Agricultural lands will be restored to landowner satisfaction.	During and following construction	Certificate Holder	EMC & ODOE
Meet with ODOE in coordination with ODFW and Sherman County Weed District to review the actual extent and conditions of disturbed areas and confirm the revegetation methods to be implemented.	After each phase of construction is complete and before revegetation	Certificate Holder	ODOE
In areas with noxious weeds where soil was removed, return soils to their previous location during reclamation activities to reduce transport of weed seeds, roots, or rhizomes.	During reclamation	EPC	EMC & ODOE
Treat noxious weeds in the Weed Management Area using methods described in Appendix G and in consultation with the Sherman County Weed District as necessary. No weed treatment will occur in agricultural lands without landowner permission.	Before reclamation and revegetation	WC	EMC & ODOE
Decompact soil by mechanical scarification (tilling or ripping the soil) to an appropriate depth as described in Appendix F. Soil amendment, such as addition of organic matter (compost), may also be necessary to alleviate compaction.	Prior to revegetation	EPC	EMC & ODOE
Complete post-construction soil compaction testing in spring or late fall in accordance with Appendix E. Submit results to ODOE for review and approval.	After reclamation and before revegetation	EMC & Certificate Holder	ODOE
Perform soil preparation prior to seeding using methods described in Appendix F.	Before revegetation	EPC	EMC & ODOE
Prevent conditions favorable for noxious weed germination by revegetating as soon as practicable.	After reclamation	RC	ODOE
Revegetation of Permanent Disturbance Areas			
Following completion of construction phases, seed undeveloped permanent disturbance areas in accordance with methods described in Appendix F.	During revegetation	RC	EMC & ODOE

Action	Timeframe	Responsible Party	Review/ Verification
Revegetation of Agricultural Temporary Disturbance Areas			
~~De-compact agricultural soil by mechanical scarification (tilling or ripping the soil) to an appropriate depth. Soil amendment, such as addition of organic matter (compost), may also be necessary to alleviate compaction.~~	~~During reclamation~~	~~EPC~~	~~EMC & ODOE~~
Coordinate with the landowner or farm operator to identify the preferred approach for revegetating agricultural land. Landowner may choose to assume responsibility for revegetation. Agricultural lands will be restored to landowner satisfaction.	During revegetation, following each construction phase	Certificate Holder, EPC	EMC & ODOE
Report to ODOE on the success of agricultural land restoration efforts; provide evidence that landowner or farm operator is satisfied with restoration.	During & following construction	Certificate Holder	EMC & ODOE
Revegetation of Non-Agricultural Temporary Disturbance Areas			
Reseed areas of temporary disturbance outside of agricultural lands, as described in Appendix F.	During revegetation, following each construction phase	RC	EMC & ODOE
If straw is needed and certified weed-free straw is unavailable, identify a local source of straw and obtain approval for its use by ODOE in consultation with the Sherman County Weed District.	Before revegetation	RC or EPC	ODOE
Consult with ODOE, ODFW, ODA, Sherman County Weed District, and/or the seed supplier to determine the optimal timing for seed application based on climatic conditions of the particular year when construction and revegetation efforts are implemented. Seeding from September to March is typically recommended.	Before revegetation	RC & EMC	ODOE
Stabilize seeded areas to facilitate establishment by applying seedless, certified weed-free hydromulch containing a tackifier or crimped weed-free straw.	During revegetation	RC or EPC	EMC & ODOE
Maintain records of revegetation efforts in all temporary and permanent disturbance areas and update ODOE monthly as revegetation work occurs.	Monthly during revegetation	EMC	ODOE
Notes: EMC = Environmental Monitoring Contractor; EPC = Engineering, Procurement, and Construction Contractor; ODOE = Oregon Department of Energy; RC = Revegetation Contractor; WC = Weed Control Contractor			

Commented [A4]: ODOE - Moved to reclamation header above and made general to encompass agricultural and non-ag lands.

Commented [A5]: ODOE - Added line for seeding agricultural land in coordination with the landowner.

Commented [A6]: ODOE - There are no temporary disturbances to wildlife habitat in the current layout. These will only be implemented if applicable based on final design.

6.0 Operations Compliance

Table 5 summarizes actions needed for compliance during operations related to revegetation, stormwater management, and noxious weed control. This list includes actions applicable throughout operations as well as actions required only initially following construction, for example through the Notice of Termination (NOT) for Coverage under a ~~National Pollutant Discharge Elimination System (~~NPDES~~)~~ Permit. Soil management and dust control measures are not included in Table 5 because they are addressed during prior phases.

Table 5. Operations Compliance Checklist

Action	Timeframe	Responsible Party	Review/ Verification
YEAR 1			
Conduct seasonal monitoring of Permanent Disturbance Areas to visually assess the following: a. Establishment of seeded species; b. Inspection of areas of bare soil for erosion; and c. Presence of noxious weeds.	Initiate within 60 days of the completion of revegetation and conduct once per season in the first year following construction	EMC	ODOE
Inspect and maintain stormwater measures as required in the 1200-C permit.	During operations, prior to achieving NOT for the NPDES	Certificate Holder & EMC	ODOE
Inspect and maintain any permanent stormwater management infrastructure. Inspect project facilities (e.g., roads) for erosion issues.	During operations, after achieving NOT for the NPDES	Certificate Holder	ODOE
YEARS 2 to 6			
Conduct annual ~~quantitative~~ monitoring of Permanent Disturbance Areas to assess whether vegetation meets success criteria (Appendices B and D).	Annually for 5 years in May or June, beginning the first year after revegetation	EMC	ODOE
Monitor revegetated Temporarily Disturbance Areas, unless the landowner converted the area to land uses that preclude meeting revegetation success criteria. To determine if revegetated temporarily disturbed areas are meeting success criteria, compare vegetation for monitoring and reference transects in each of the non-agricultural habitat subtypes that had more than 0.2 acre of temporary disturbance (Appendix B).	Annually for 5 years in May or June, beginning the first year after revegetation	EMC	ODOE
Determine and report on whether success criteria have been met or are trending towards being met (see Appendix F for report content and success criteria) for Temporary and Permanent Disturbance Areas. Final determination of whether the Certificate Holder is in compliance with revegetation obligations will be made by ODOE. Remedial actions and/or additional monitoring for areas may be required in areas that have been determined by ODOE not to have met the success criteria.	Annually for 5 years in May or June, beginning the first year after revegetation and for the life of the Solar Components on a schedule to be determined in consultation with ODOE.	EMC	ODOE
If a revegetated area is damaged by wildfire, develop a plan, subject to ODOE approval, to address the damaged area. Continue to monitor and report on revegetation progress during the remainder of the 5-year period. Report to ODOE within 72 hours of discovery.	During the first ~~five~~ 5 years following revegetation if wildfire occurs.	EMC	ODOE

Commented [A7]: ODOE - Deleted to match Appendix E.

Action	Timeframe	Responsible Party	Review/ Verification
Summarize noxious weed monitoring results in annual reports that describe noxious weeds identified, treatments implemented, treatment efficacy, and recommendations for additional treatments. Submit reports to ODOE, ODA, ODFW, and the County annually. If the Certificate Holder contracts with the Sherman County Weed District to perform weed control at the Solar Components, then no monitoring report needs to be provided except for a statement that the County agency performed the work.	During first 5 years of operations	Certificate Holder & EMC	ODOE
Implement the measures outlined in Appendix F to address vegetation management to reduce wildfire risk.	During ~~o~~operations	EMC	ODOE
Consult with ODOE, ODA, and the Sherman County Weed District to design a long-term weed control plan as needed based on the success of control efforts.	After 5th year of annual monitoring	Certificate Holder	ODOE, ODA, County
Provide records demonstrating that all Facility personnel have been trained on noxious weed control.	Annually during operations	Certificate Holder	ODOE
Monitor as outlined in Appendix G within the Weed Management Area for the life of the Solar Components to assess weed growth and inform noxious weed control measures. Assess the success of noxious weed treatments and document any new noxious weed infestations observed.	During operations	Certificate Holder & EMC	ODOE
Control noxious weeds as described in the long-term weed control plan. Maintain ongoing communication with landowners and the Sherman County Weed District regarding noxious weeds at the Solar Components. Control noxious weeds reported by landowners on a case-by-case basis and prepare a summary of measures taken for that landowner.	During operations	Certificate Holder	ODOE
Consult with the Sherman County Weed District on timing, method, and application rates for each identified weed species of concern, to allow for adaptive weed management given changes in weed control effectiveness from noxious weed species tolerance to herbicide treatment over time. Report the results of the consultation to ODOE within 30 days. Any alternative control methods can be proposed by the Certificate Holder or its contractors, subject to approval by the Sherman County Weed District.	Every fall season during operations	Certificate Holder	ODOE
Notes: EMC = Environmental Monitoring Contractor; NOT = Notice of Termination; NPDES = National Pollutant Discharge Elimination System; ODOE = Oregon Department of Energy; ODFW = Oregon Department of Fish and Wildlife			

Commented [A8]: ODOE - Language for long-term monitoring plan is still in Appendix E. Confirm whether a long-term vegetation management plan is still needed.

7.0 ~~Comprehensive~~ Plan Amendment

This Comprehensive Plan may be amended from time to time by agreement of the Certificate Holder and the Oregon Energy Facility Siting Council (EFSC). Such amendments may be made without amendment of the site certificate. EFSC authorizes ODOE to agree to amendments to this Comprehensive Plan. ODOE shall notify EFSC of all Comprehensive Plan amendments, and EFSC retains the authority to approve, reject, or modify any amendment agreed to by ODOE.

8.0 References

ODEQ (Oregon Department of Environmental Quality). 2019. OAR 340-208-0210 EPA Method 22. https://secure.sos.state.or.us/oard/viewAttachment.action?ruleVrsnRsn=256141

Appendix A. Roles and Qualifications

Roles and Responsibilities

The Certificate Holder is the overall responsible party for construction and operation of the Solar Components and implementation of this Comprehensive Plan. However, the Certificate Holder may use contractors to complete tasks associated with this Comprehensive Plan. Responsible parties and their roles are described in Table A-1. Minimum qualifications for contractors are provided in Table A-2.

Table A-1. Roles and Responsibilities

Responsible Party	Name and Contact Information	Role
Certificate Holder	Portland General Electric Company	Responsible for compliance with all site condition requirements, hiring contractors that meet the minimum qualifications described in Appendix A, and ensuring that all contractors perform work in accordance with the requirements of this Comprehensive Plan.
Engineering, Procurement, and Construction Contractor (EPC)	Name: Contact Person: Address: Phone Email	Responsible for implementing best management practices (BMPs) and other measures specified in the National Pollutant Discharge Elimination System (NPDES) 1200-C permit and this Comprehensive Plan to minimize impacts during construction, as well as for performing restoration and revegetation actions, as identified in this Comprehensive Plan.
Revegetation Contractor (RC)	Name: Contact Person: Address: Phone Email	Responsible for performing revegetation actions during and immediately after construction, as described in this Comprehensive Plan.
Weed Control Contractor (WC)	Name: Contact Person: Address: Phone Email	Responsible for performing weed control actions in the Weed Management Area, as described in this Comprehensive Plan.
Environmental Monitoring Contractor (EMC)	Name: Contact Person: Address: Phone Email	Responsible for conducting environmental monitoring and documenting compliance with aspects of this Comprehensive Plan during and following construction, including conducting revegetation, dust, soil, stormwater, and noxious weed monitoring.

Responsible Party	Name and Contact Information	Role
Oregon Department of Energy (ODOE)	Oregon Department of Energy Compliance Specialist 550 Capitol St. NE Salem, OR 97301 Phone Email	Responsible for providing technical input on proposed BMPs and other measures to minimize impacts and for validating all compliance deliverables described in this Comprehensive Plan. ODOE may utilize contractors to meet its responsibilities under this Comprehensive Plan during some or all phases.
Sherman County (County)	Sherman County Weed Department Nick Weis, Weed District Supervisor 66143 Lone Rock Road Moro, OR 97039 (541) 565-3655 nickw@shermancountyor.gov	Responsible for providing input on weed control and other actions described in this Comprehensive Plan and its implementation as needed. The County will also attend calls with ODOE and other agencies as needed.

Contractor Minimum Qualifications

Table A-2. Contractor Minimum Qualifications

Contractor	Role	Minimum Qualification
Engineering, Procurement, and Construction Contractor (EPC)	Responsible for implementing ~~B~~best ~~M~~management ~~P~~practices (BMPs) and other measures specified in the National Pollutant Discharge Elimination System (NPDES) 1200-C permit and this Comprehensive Plan to minimize impacts during construction, as well as for performing restoration and revegetation actions.	Minimum qualifications for the EPC include: • Experience implementing measures in the NPDES 1200-C permit; • Demonstration of sufficient resources and staffing for anticipated BMP installations and maintenance; and • Experience in coordination with agencies and private landowners.
Revegetation Contractor (RC)	Responsible for performing revegetation actions during and immediately after construction.	The Certificate Holder will ensure that the RC has the following minimum qualifications: • Demonstrated experience in the Columbia Plateau; • Experience in native plant, non-native and invasive plants, and noxious weed identification and management; • Experience in revegetating natural areas; • Experience with site preparation and applicable seeding methods; • Experience in documenting revegetation actions and providing progress reports; • Experience in coordination with agencies and private landowners; and • No recent (within one year) violations on the contractor's record.
Weed Control Contractor (WC)	Responsible for performing weed control prior to, during, and after construction within the disturbance area and a 10-foot buffer (Weed Management Area).	The Certificate Holder will ensure that noxious weed management actions will be conducted by specialists with the following qualifications: • Experience in native plant, non-native and invasive plants, and noxious weed identification in the Columbia Plateau Ecoregion; • Experience in noxious weed mapping; • If chemical control is used, specialists must possess a Commercial or Public Pesticide Applicator License from the Oregon Department of Agriculture or possess an Immediately Supervised Pesticide Trainee License and be supervised by a licensed applicator;

Contractor	Role	Minimum Qualification
		• Training in noxious weed management or Integrated Pest Management with an emphasis in noxious weeds; • Experience in coordination with agencies and private landowners; and • No recent (within one year) violations on the contractor's record.
Environmental Monitoring Contractor (EMC)	Responsible for conducting environmental monitoring and documenting compliance with aspects of this Comprehensive Plan during and following construction, including conducting revegetation, dust, soil, stormwater, and noxious weed monitoring as described below.	Minimum qualifications for the EMC include: • Have an active certification recognized in the 1200-C permit (e.g., Certified Erosion and Sediment Control); • Experience implementing and monitoring measures in the ~~NPDES~~ 1200-C permit; • Experience and knowledge of U.S. Environmental Protection Agency Method 22 (ODEQ 2019) with respect to the general procedures for determining the presence of visible emissions; • Experience in native plant, non-native and invasive plants, and noxious weed identification and management; • Experience in noxious weed mapping; • Training in noxious weed management or Integrated Pest Management with an emphasis in noxious weeds; and • Experience in coordination with agency and private landowners. The EMC will include a qualified botanist or revegetation specialist who will be responsible for monitoring and reporting on revegetation success.

Appendix B. Construction Plan

Disturbance Acreage

Acres of temporary and permanent disturbance to habitat subtypes associated with Solar Component construction and operation are provided in Table B-1.

Table B-1. Acres of Temporary and Permanent Disturbance

ODFW Habitat Category	Habitat Type	Habitat Subt-Type	Temporary Disturbance (acres)	Permanent Disturbance (acres)
1	N/A	N/A	-	-
2	Riparian	Riparian Trees	0.0	0.0
	Shrub-steppe	Sagebrush Shrub-Steppe	0.3	20.7
	Category 2 Subtotal		**0.3**	**20.7**
3	N/A	N/A	-	-
4	Grassland-steppe	Grasslands	0.1	3.0
	Surface Water	Ephemeral Streams	0.0	0.0
	Category 4 Subtotal		**0.1**	**3.0**
5	N/A	N/A	-	-
6	Agriculture	Irrigated Cropland	0.1	52.0
	Agriculture	Non-Irrigated Cropland	9.4	1,365.0
	Developed	Developed	1.0	3.9
	Category 6 Subtotal		**10.5**	**1,420.9**
		Total	**10.9**	**1,444.6**

1. There are no disturbances in surface water habitat types. Refer to Exhibit J of RFA 4 for detailed analysis of disturbances to wetlands and waters.

N/A = not applicable; ODFW = Oregon Department of Fish and Wildlife

Disturbance Levels

Revegetation and soil stabilization needs will be determined by a combination of topography, soil type, disturbance level, and existing vegetative cover.

Disturbance levels will primarily be determined by conditions such as slope, gradient, and existing vegetation. As much as is feasible, use of heavy machinery and soil disturbance should be conducted on dry soil. Disturbance of saturated soil has a much greater risk of compaction and requires more effort to revegetate and control weedy species. Disturbance levels are defined as follows and depicted in Figure B-1:

- *Level 1 – Mowing:* Mowing is used to conserve vegetative resources within a facility. Vegetation will be limited to a height of 12 inches and mowed to no less than 6 inches during construction. Mowing to no less than 6 inches protects perennial grass crowns and allows grasses to regenerate. Depending on facility objectives, vegetation can be allowed to

reach a normal height or kept trimmed to a height between 6 inches and the plant's full height potential. Crushing of vegetation will be minimal and this disturbance level is designed to have a minimal impact on existing vegetation. This method is least likely to result in invasions of undesirable plant species.

- *Level 2 – Overland Drive and Crush:* Disturbance caused by accessing a facility without significantly modifying the landscape. Vegetation is crushed to the ground, but no surface soil is removed so root structures are left intact. Even though vegetation may be damaged or destroyed, the surface soil and seed bank remain in place. Some crushed vegetation will likely sprout after disturbance ceases. These activities would result in minimal to moderate disturbance. This type of disturbance will result in a faster recovery time for vegetation compared to Levels 3 and 4. Soil seed banks remain largely in place, perennial vegetation can grow back, and minimal external efforts are necessary. This method is less likely to result in invasions of undesirable plant species compared to Levels 3 and 4.
- *Level 3 – Clear and Cut:* Disturbance caused by accessing the facility including having to remove all vegetation to improve or provide suitable access for equipment. All vegetation is removed, soils are compacted, and the root zone or soil A-horizon may be disturbed, but no subsurface soil is removed. Clear and cut activities would result in moderate disturbance. This type of disturbance will result in moderate recovery times for vegetation. This method has a moderate risk for invasion of undesirable plant species. An example is imprinting to crush vegetation down into the soil or incidental grading and smoothing of surface soils.
- *Level 4 – Clear and Cut with Soil Removal*: Disturbance is caused by removing all vegetation in the impact zone, soils are compacted, and surface soil- and subsoil are displaced. These activities result in heavy disturbance. This type of disturbance results in an extensive recovery time for vegetation, and is most likely to lead to invasions of undesirable plant species, which can result in lengthy and expensive control efforts. Includes disc-and-roll construction and other traditional construction methods where soils are disturbed and no vegetation is left intact. This category includes all work requiring the segregation and replacement of topsoil.
- *Level 5 – Development Footprint*: Disturbance is caused by removing all vegetation and covering the area surface with gravel, concrete, or other vegetation-free surfaces, or where the intended function of a specific area necessitates it remain unvegetated. This disturbance level includes roads, graveled lots, fire breaks, utility pole pads, and the areas underlying any component installed on a foundation. This level does not include vegetated areas under solar arrays. This type of disturbance will result in a complete loss of vegetation and will be required to be monitored and kept free of noxious weeds and other vegetation for the life of the facility.

Maps showing the expected disturbance levels in Temporary and Permanent Disturbance Areas in relation to existing vegetation type, habitat type, and areas with sensitive soils are provided in Figure B-1 below.

<<INSERT DISTURBANCE LEVEL MAPS HERE>>

Figure B-1. Disturbance Levels in Temporary and Permanent Disturbance Areas in Relation to Existing Vegetation Type, Habitat Type, and Areas with Sensitive Soils

Appendix C. 1200-C Permit and Erosion and Sediment Control Plan

Appendix D. Fugitive Dust Control Plan

To manage fugitive dust from construction, the Certificate Holder and its contractors will generally follow the Dust Control Plan Flow Chart (Figure D-1).

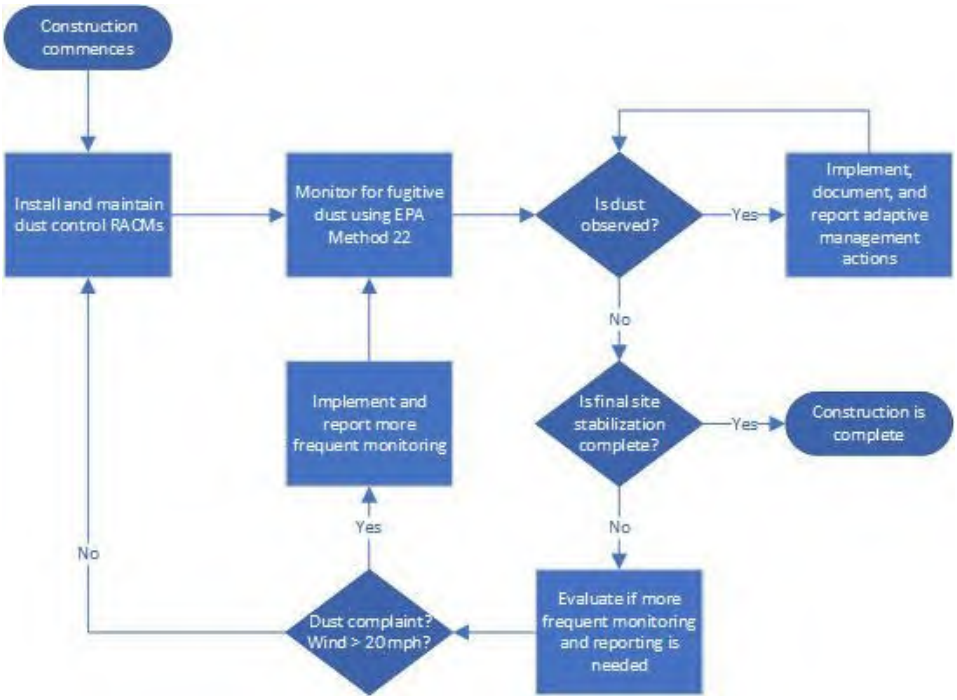


Figure D-1. Dust Control Plan Flow Chart

Fugitive Dust Monitoring and Reasonable Available Control Measures (RACMs)

The visual monitoring required by the 1200-C permit must occur at least once every 14 calendar days. However, because Oregon Administrative Rule (OAR) 340-208-0210 restricts visible fugitive emissions on a continuous standard to a maximum of **18 seconds in any 6-minute period**, and because fugitive dust emissions may provide an immediate public safety concern, this Comprehensive ~~p~~Plan requires that fugitive dust be monitored and controlled on an ongoing basis (Table D-1).

Monitoring for fugitive dust emissions shall include:

- Use of U.S. Environmental Protection Agency (EPA) Method 22 (ODEQ 2019), as specified in OAR 340-208-0210, **at least once per day during the dry season, during peak construction activities.**

- The observation shall be performed during times of peak construction activity at the downwind facility boundary.
- Recording of observations in a fugitive dust inspection log that is kept on site and shall be kept digitally, described below.

Triggers for additional, more frequent monitoring will include:

- Observation of visible fugitive dust emissions by the Environmental Inspector, contractor(s), agency, or Certificate Holder staff,
- Wind speeds or gusts greater than 20 miles per hour, or
- Receipt of complaints or concerns through the Project Dust Control Hotline or other means.

Table D-1. Fugitive Dust Sources and Reasonable Available Control Measures (RACMs)

Construction Phase	RACM(s)	Supplemental RACM(s)
All Phases of Construction	Daily fugitive dust monitoring and record keeping.	Increase frequency of monitoring.
	Prominent display of Dust Control Hotline signs, providing direct access to the Environmental Inspector.	If established, proactive engagement with Community Action Council.
	Worker Environmental Awareness Program training for all construction employees.	Additional trainings and refreshers for employees.
	Maintain stockpile of best management practices (BMPs) on site, including sufficient palliatives for a single treatment of all access roads and sufficient palliatives, mulch, and/or hydromulch for a minimum of 25 percent of the total disturbed area, and machinery for application.	Increase stockpile of palliatives, mulch, and/or hydromulch and add additional BMPs.
	Documentation and reporting of adaptive management actions.	Development and submittal of revised Fugitive Dust Control Plan.
Facility Access	Install and maintain stabilized construction entrances at ingress/egress locations and restrict traffic to these locations.	Add additional construction entrance BMPs (e.g., wheel wash).
	Daily sweeping up of sediment from paved surfaces utilizing vacuum sweeper with high efficiency particulate air (HEPA) filtration.	Increase sweeper frequency.
	Access roads shall be graveled.	Road maintenance and reapplication of gravel.
	Access roads will be stabilized with water or palliative sufficient to eliminate visible and sustained dust from vehicular travel and wind erosion. Reapply stabilization as necessary to maintain dust-free condition.	If water is unavailable or ineffective, or if water use is limited by any agency or regulation, access roads will be stabilized with longer-lasting palliatives.
	Restrict construction traffic to established and stabilized access routes.	Install fencing or barricades to prevent traffic outside of established routes.

Construction Phase	RACM(s)	Supplemental RACM(s)
	Limit traffic speeds to 15 miles per hour on stabilized unpaved roads within the facility as long as such speeds do not create significant visible dust emissions. Traffic speed signs shall be displayed prominently at all entrances and exits.	Limit traffic speeds within the facility to 5 or 10 miles per hour.
	Minimize disturbance areas and soil exposure to the maximum extent feasible.	Limit work to a portion of the disturbed area until all disturbed areas receive temporary or final stabilization.
	When wind speeds or gusts exceed 15 miles per hour, minimize new disturbances to the extent possible and/or mobilize additional water trucks or palliatives to minimize fugitive dust from exposed surfaces.	Stop all ground disturbing activities and apply additional dust control measures until measures are effective or wind speeds slow and fugitive emissions stop.
	Separate and cover or otherwise stabilize topsoil to preserve it until it is replaced during revegetation.	Increase maintenance frequency for topsoil cover/stabilization. Combine methods, such as mulch plus tackifier.
	Stabilize exposed soils within the timeframes established in the 1200-C permit. Stabilize exposed soils in stages based on soil conditions and weather.	Stabilize exposed soils more frequently, even if additional work is anticipated within the timeframe established in the 1200-C permit. Reapply stabilization measures following any additional disturbances.
	Temporarily stabilize exposed surfaces to prohibit significant and sustained visible fugitive dust from wind erosion. Utilize BMPs such as mulch, hydromulch with or without seeds, tackifier, spreading stone or gravel, and trackwalking.	Combine stabilization methods, such as mulch plus tackifier, or trackwalking plus hydromulch. Increase frequency of maintenance of stabilization.
	Seed exposed surfaces during the appropriate season with approved temporary or permanent seed mixes.	Reapply seed to newly disturbed areas or areas with poor germination. Use temporary seeding even if additional work is anticipated before final stabilization. Use irrigation to enhance seeding success.
Removing and Hauling Sand, Soil, or Other Loose Materials	Gate seals should be tight on dump trucks. Soil load shall be kept below 6 inches of the freeboard of the truck. Drop heights shall be minimized when loaders dump soil into trucks. Gate seals will be checked and tight on dump trucks. All trucks on highways must be fully covered and secured.	Cover haul trucks with a tarp or other suitable cover.

Fugitive Dust Reporting

A dust inspection log shall be completed after each dust inspection. Log records shall be kept digitally and included in construction monitoring reports as described in Appendix E of this Comprehensive Plan. This log shall include all information required in EPA Method 22. Photos and/or video taken during the observation period to document conditions shall be available

digitally to the Oregon Department of Energy upon request. Any documented exceedance events shall include a detailed explanation of RACMs implemented for corrective action and the results of subsequent monitoring demonstrating fugitive dust has returned to below exceedance thresholds.

Appendix E. ~~Construction~~ Environmental Monitoring Methods

The Environmental Monitoring Contractor (EMC) will be present during construction activities that involve ground disturbance, grading, weed treatments, vegetation removal, and high traffic volumes and is responsible for monitoring and recording construction activity to ensure compliance with this Comprehensive Plan.

In addition, the EMC will:

- Assist contractor(s) for the direction of water trucks, civil activities, and road maintenance to reduce fugitive dust and erosion issues.
- Identify when reasonably available and best available control measures are not adequate, as designated in Appendix D.
- Maintain dust inspection and noxious weed logs and reporting designated in this Comprehensive Plan.

Specific protocols and requirements for testing and monitoring to be performed prior to and during construction and revegetation efforts are described in the sections that follow.

Soil Compaction Testing

~~*Sampling*~~ *Monitoring Protocol*

The EMC will conduct pre- and post-construction ~~field measurements of subsurface~~ soil compaction testing in all anticipated Level 3 and 4 Disturbance Areas, and any areas consisting of soils with low ~~S~~soil ~~C~~compaction ~~R~~resistance (e.g., Lickskillet very stony loam (16D) and Lickskillet-Rock outcrop complex [18E] soils). If disturbance level maps are not available at the time of pre-construction sampling, ~~Portland General Electric Company (~~the Certificate Holder~~)~~ may choose to base sample~~ing~~ locations on the overall anticipated disturbance area (i.e., regardless of level of disturbance). Soil compaction sample locations will be evenly distributed across the disturbance area at a rate of 1 sample per 50 acres. ~~Proposed s~~Soil ~~s~~ample locations were stratified by soil type to ensure a minimum of three sample locations in each soil type and a representative density of sample locations in major soil types. Additionally, sample locations were selected to avoid infrastructure such as inverters and roads where revegetation will not occur. Sample~~ing~~ locations are identified in Figure E-1, below.

Soil compaction measurements will be collected at all sample~~ing~~ locations prior to ground disturbing activities and again at the same locations post reclamation but prior to revegetation.

[to be inserted at plan finalization]

Figure E-1. Soil Compaction Sample Locations

Test Methods

Soil Compaction Testing will be conducted using the following standard methods (NRCS 2020; Duiker 2025):

- The surveyor will measure soil resistance using a penetrometer.
- Resistance will be measured at 3-inch intervals to 12 inches or until the meter goes above 300 pounds per square inch (3, 6, 9, and 12 inches if soils allow).
- Measurements will be conducted in conditions favorable to soil testing (e.g., non-saturated or frozen soils).

Results

Testing results will be provided to the Oregon Department of Energy (ODOE) prior to construction and after reclamation but before revegetation.

Baseline Vegetation Conditions

Prior to construction of the Solar Components, the EMC will conduct pre-construction habitat surveys for all temporary disturbance areas. Data collected will include:

- Vascular plant species present;
- Native/non-native species present;
- Percent cover of dominant species; and
- Percent cover of state and county listed noxious weeds.

Revegetation Monitoring

The Certificate Holder will monitor revegetated areas as described below, unless the landowner converted an area to a use that precludes meeting revegetation success criteria such as cropland. The Certificate Holder should coordinate grazing timing and intensity with the landowner so that it does not preclude revegetation success. Revegetated areas will be monitored by a qualified investigator in May or June- annually for 5 years, beginning the first year after seeding.

Temporary Disturbance Areas

Reference and Revegetation Transects

Establish 50-meter reference and revegetation transects for each temporarily disturbed wildlife habitat subtype and category with more than 0.5 acres of temporary disturbance as described below. Establish one reference transect for every temporarily disturbed wildlife habitat subtype and category. Reference transects are intended to be representative of baseline conditions for the revegetation effort.

Establish revegetation transects randomly in every wildlife habitat subtype and category that will be temporarily disturbed by construction using existing habitat mapping. Transect locations and/or lengths may need to be adjusted to account for linear features whose disturbance footprint may be too narrow or too short to meaningfully place a transect. Determine the number of transects as follows:

- Less than 0.5 acres of temporary disturbance = 0 transects
- 0.3 to 5 acres of temporary disturbance = 1 transect
- 6 to 10 acres of temporary disturbance = 2 transects
- For each additional 10 acres of disturbance, one additional transect will be added (e.g., 11-20 acres of disturbance = 3 transects, 21-30 acres = 4 transects, etc.)

Temporary Disturbance Area Monitoring Methods

Vegetation will be measured quantitatively using the line-point intercept (LPI) method combined with a belt transect to document species richness and sagebrush density, where necessary (Elzinga et al. 1998; MacKinnon et al. 2011). The LPI method is described in detail in the *Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Volume I* (Herrick et al. 2021). The surveyor will drop a narrow pin perpendicular to the ground at 1-meter intervals along a 50-meter transect and record up to four plant species that intercept the pin in order of interception as well as the soil surface type (bare ground, litter, rock, moss, or biotic crust) where the pin touches the ground. Once all 50 points have been collected, the surveyor will walk back along the transect and record any species within 1 meter on either side of the transect that were not documented at a point. The surveyor will take a photo from the transect start point, looking down the length of the transect. For transects in sagebrush shrub-steppe habitat, the surveyor will record the number of sagebrush individuals by size class (i.e., less than 1 foot tall, between 1 and 2 feet tall, greater than 2 feet tall) occurring within 1 meter on either side of the 50-meter transect.

Following field surveys, foliar cover will be determined by multiplying the number of top hits for each species by two. Cover of bare ground will be determined by counting every point in which bare ground was recorded as a surface type and no plants were intercepted and multiply this number by two. Species richness will be determined by counting all the unique species that were recorded at a point or along the belt transect.

~~*Revegetated*~~ *Permanent Disturbance Areas*

Following implementation of revegetation efforts, the Certificate Holder will monitor revegetated permanent disturbance areas as described below. Revegetated areas will be monitored by a qualified investigator annually for 5 years, beginning the first year after seeding. If success criteria are met in the first 5 years, then long-term vegetation monitoring will be determined in consultation with ODOE~~. Long-term monitoring of vegetation will be conducted~~ to document and manage vegetation to reduce wildfire risk.

The Certificate Holder will monitor Permanent Disturbance Areas to assess the following:

- Dominant species composition;
- Relative cover of desirable and undesirable forbs and grasses;
- Percent cover of bare soil;
- Degree of erosion;

- Presence of noxious weeds; and
- Qualitative assessment of overall vigor of vegetation within revegetated areas.

The ~~Environmental Monitoring Contractor (~~EMC~~)~~ will monitor revegetated Permanent Disturbance Areas with a meander survey beginning within 60 days of the completion of initial revegetation. During the meander survey, the EMC will walk in revegetated Permanent Disturbance Areas and document the assessment items listed above using photos and spatial data collection. Areas of erosion and significant patches of bare soil will be mapped and photographed. The EMC will record dominant species, overall percent cover of forbs and grasses, and general notes about plant vigor.

Monitoring will be conducted at least once per season during the first year following construction. After the first complete year of monitoring, the Certificate Holder will consult with ODOE to determine if the monitoring cycle can be reduced based on revegetation progress. After ~~five~~ 5 years of monitoring, the Certificate Holder will design a long-term monitoring plan in consultation with ODOE.

Commented [A9]: ODOE - Developing a long term vegetation monitoring plan was removed from the compliance table. Confirm that a long-term veg plan is still needed.

Revegetation Monitoring Reports

Revegetation monitoring reports will be prepared and submitted to ODOE annually for ~~five~~ 5 years following revegetation. The first monitoring report will include a detailed description and timeline of revegetation methods that were implemented including species, amounts, and locations of seed applications and dates revegetation work was performed. Annual monitoring reports will include:

a. Geographic information system (GIS) maps of revegetated areas and disturbance levels;
b. Monitoring methods;
c. Local climatic data (i.e., precipitation, temperature) for the monitoring month and year and percent deviation from the historical average;
d. Results of monitoring efforts;
e. Photos of transects and representative overview photos of revegetated areas;
f. Assessment of whether revegetated areas are trending toward meeting success criteria;
g. Assessment of factors impacting the ability of revegetated areas to trend towards meeting the success criteria; and
h. Recommendations for remedial actions, if any. If applicable, provide recommendations for reseeding, weed control, or other remedial measures for areas (either permanently or temporarily disturbed) that are not showing progress toward meeting success criteria. Include adaptive management measures taken in the next monitoring report.

~~Long term monitoring of vegetation will be conducted to document and manage vegetation to reduce wildfire risk.~~

Commented [A10]: ODOE - Moved sentence to Permanent Disturbance Area monitoring section.

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Appendix F. Revegetation and Soil Stabilization Methods

Soil Stabilization

- The Engineering, Procurement, and Construction Contractor (EPC) will use appropriate erosion and sediment control practices (i.e., seeded or unseeded hydromulch, tackifier, weed-free erosion control blankets, weed-free or locally sourced straw mulch) to maintain topsoil during construction in Temporary and Permanent Disturbance Areas.
- After grading is complete but prior to installation of Solar Components, apply temporary or permanent soil stabilization.
- If seeding is used for temporary soil stabilization, seed areas with less than 70 percent vegetative cover with a non-invasive, non-persistent cover crop such as winter wheat or sterile triticale.
- Select cover crop based on the time of year; for example, winter wheat or sterile triticale can be seeded from fall to early spring while peas should be seeded in spring. Tillage radish and sunflowers can be seeded in spring to reduce compaction but are not suitable options for soil stability.

Soil Reclamation

In areas where soil is removed during construction, the following measures will be taken where appropriate:

- During construction, excavated topsoil will be stockpiled separately from subsoil and replaced in proper order with topsoil on the surface to maintain soil productivity. Stockpiled soil will be put back in place prior to revegetation activities.
- Topsoil and other soils from noxious weed infested areas will not be moved outside infested areas and will be returned to their previous location during reclamation activities to eliminate the transport of weed seeds, roots, or rhizomes. Noxious weed occurrences will be flagged and monitored for compliance.

Site Preparation

- Ensure that soils from weed infested areas are treated with a post- or pre-emergent herbicide as needed prior to initiation of revegetation efforts, depending on site-specific conditions.
- Prior to final regrade and revegetation efforts, any weeds that have grown during periods of construction dormancy should be treated as described in Appendix G.
- Perform site preparation using methods described below. Consider site-specific factors including slope, soil type, size of area, and erosion potential when determining methods.
  - Soil Roughening: Also known as imprinting, tracking, or track walking, soil roughening is a temporary erosion control practice and seedbed preparation technique implemented when grading a slope (EPA 2021). This technique involves creating grooved soil surface with depressions running parallel to the hill contour to promote

seed germination and provide moderate erosion control while vegetation is established. Tracking with heavy equipment may compact the soil and inhibit root penetration; this can be mitigated by using lighter-weight equipment and not tracking saturated soil. Soil roughening should be done prior to applying hydromulch, straw mulch, or installing erosion BMPs. Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth (ODOT 2023).

- Deep Tilling: Reduce soil compaction by fracturing restrictive soil layers in areas where compaction levels inhibit plant growth (NRCS 2022). Deep tillage is only suitable in areas outside of solar arrays and where solar infrastructure is not present (i.e., temporary roads) and should be conducted after construction and prior to revegetation when soil moisture is at 30-50 percent of field capacity.
- Decompaction: Where soil compaction testing in areas with Level 3 and 4 disturbance demonstrates that soils are compacted greater than 300 pounds per square inch (psi), then remediation activities may be completed in those areas prior to the construction contractor moving to a new location or offsite as described in Table F-1. Areas with intact vegetation (typically in areas with Level 1 or 2 disturbance) will not be decompacted to avoid additional soil disturbance and erosion risk. Locations where baseline monitoring indicated that soils were compacted more than 300 psi prior to construction will only be decompacted as needed based on field assessment of likely vegetation success (see Table F-1).~~or as necessary to create a uniform seedbed,~~
    - Remediation activities may include mechanical scarification (e.g., tilling or ripping the soil) to an appropriate depth to reduce the potential effects of compaction, to maintain soil productivity, and reduce the potential for erosion on compacted soils. Dry soils should be decompacted using an agricultural disc, soil ripper, or similar equipment~~mechanically scarify soils when dry using an agricultural disc, soil ripper, or similar equipment to an appropriate depth to maintain soil productivity, reduce the potential for erosion~~.

- Prepare salvaged topsoil into a firm, fine-textured seedbed before seeding or planting (ODOT 2023). Loosen the top 1 to 2 inches of the soil surface by shallow tilling with a disc, followed by harrow or drag if necessary and where feasible with construction equipment. If soil is assessed as too soft by the Revegetation Contractor or the Environmental Monitoring Contractor (EMC), firm with a roller or cultipacker.

Table F-1. Decompaction Actions by Disturbance Level

Disturbance Level	Baseline Soil Compaction Level	
	Under 300 psi	Over 300 psi
1 – Mowing	If intact, living vegetation present, then no action; confirm vegetation success in next growing season. If bare soil, revegetate as described in the following section.	If intact, living vegetation present, then no action; confirm vegetation success in next growing season. If bare soil, decompact prior to revegetation.
2 – Overland Drive and Crush	If intact, living vegetation present, then no action; confirm vegetation success in next growing season. If bare soil, revegetate as described in the following section	If intact, living vegetation present, then no action; confirm vegetation success in next growing season. If bare soil, decompact prior to revegetation.
3 – Clear and Cut	Revegetate as described in the following section.	Decompact prior to revegetation.
4 – Clear and Cut with Soil Removal	Revegetate as described in the following section.	Decompact prior to revegetation.

Revegetation Methods

- The Certificate Holder will restore temporarily disturbed areas by re-establishing slope, surface stability, and drainage features, as needed, followed by soil preparation and seeding as described below.
- Revegetation will begin as soon as feasible after completion of each construction phase. Seeding and planting will be done in a timely manner and in the appropriate season to facilitate germination and establishment of seeded species.
- Following seeding, stabilize seeded areas to facilitate establishment by applying seedless, certified weed-free hydromulch containing a tackifier or crimped weed-free straw.
- Cropland outside the Solar Components fenceline will be returned to landowner control and will not be revegetated by the Certificate Holder.
- Revegetation methods for each disturbance level were developed to tailor revegetation to specific conditions (Table F-2).

Table F-2. Revegetation Methods by Disturbance Level

Disturbance Level	Soil Reclamation	Site Preparation	Seeding
1 – Mowing	No soil disturbance. Retain existing vegetation to prevent erosion.	Weed control.	Seed if necessary to achieve success criteria.
2 – Overland Drive and Crush	No soil disturbance. Retain existing vegetation and implement erosion control practices.	Weed control.	Seed if necessary to achieve success criteria.
3 – Clear and Cut	Track or decompact soil as necessary. Implement erosion control practices.	Weed control. Seed cover crop if necessary to stabilize soil. Prepare firm, fine-textured seedbed prior to seeding.	Required
4 – Clear and Cut with Soil Removal	Stockpile topsoil separately from subsoil and stabilize during construction. Regrade and replace subsoil then topsoil prior to seeding. Track or decompact soil as necessary. Implement erosion control practices.	Weed control. Regrade and add soil amendments if necessary. Seed cover crop if necessary to stabilize soil. Prepare firm, fine-textured seedbed prior to seeding.	Required

Seed Mix and Shrub Planting

A low-growing seed mix was developed for revegetation of Temporary Disturbance Areas and Permanent Disturbance Areas within the Solar Micrositing Area (Table F-~~1~~3).

Table F-~~1~~3. Seed Mix for Revegetation of Disturbed Areas

Growth Habit	Common Name	Scientific Name	Pounds of pure live seed/acre[1]
Grasses			
	Squirreltail	*Elymus elymoides*	~~2.3~~3.5
	Thurber's needlegrass	*Eriocoma thurberiana*	~~6.8~~4.4
	Idaho fescue	*Festuca idahoensis*	~~1.5~~2.1
	Sandberg bluegrass	*Poa secunda* ssp. *secunda*	~~0.9~~2.1
Forbs (choose 3 or 4 depending on seed availability)			
	Common yarrow	*Achillea millefolium*	0.1
	Oregon sunshine	*Eriophyllum lanatum*	0.1
	Fleabane	*Erigeron filifolius* or *E. pumilus*	0.1
	Wooly plantain	*Plantago patagonica*	0.2
	Clover	*Trifolium macrocephalum ~~or T. repens~~*	0.1
Total			**12**

Note: The species and seeding rates included in this table are a recommendation. Substitutions can be made through consultation with ODOE.

1. Pounds of pure live seed per acre listed for drill seeding and imprint seeding. Double drill seeding rate for broadcast seeding and multiply by 2.5 for hydroseeding.

Commented [A11]: ODOE - Reduced to 10% of mix due to height and increased other grasses. Thurber's needlegrass has large seed, so by weight it looks like more of the mix than it is.

Commented [A12]: ODOE - Removed because this species prefers wetter and cooler habitats unless irrigated.

Seeding Methods

Four common seed application methods that may be used for revegetation include broadcast seeding, drill seeding, imprint seeding, and hydroseeding; each of these are discussed further below. Other seeding methods may be proposed for review and approval prior to revegetation efforts.

Broadcast Seeding

Broadcast seeding is the application of seed directly to the ground surface. This method may be chosen for areas with shallow and rocky soils, and the type of broadcast spreader would depend on the size of the area to be seeded and the terrain.

In this method, the seed mix would be broadcast at 24 pounds of pure live seed per acre, or twice the recommended rate for drill seeding. When feasible, due to the seasonality of when planting can occur, the entire area will be seeded after grading is complete but before placement of solar components, providing more flexibility in seed application. In those instances where seeding occurs prior to installation of components, follow-up seeding will occur in areas temporarily disturbed by installation and any areas that are deficient in vegetation from the first round of seeding. Immediately following seed application, hydromulch or certified weed-free straw would be applied. Broadcast seeding will not be employed if winds exceed 5 miles per hour. If certified weed-free straw is unavailable, the Certificate Holder or EPC will identify a local source of straw. The local

source of the straw will be approved by the Sherman County Weed District and the Oregon Department of Fish and Wildlife (ODFW) prior to purchase. This straw will either be crimped into the ground or applied with a tackifier.

Drill Seeding

Drill seeding can be used for large areas with deep soils and moderate to gentle terrain to accommodate mechanical equipment. This method provides the advantage of planting the seed at a uniform depth and may provide better soil to seed contact. Using a range seed drill, seeds will be sown at 12 pounds pure live seed per acre or according to application rates recommended by the seed supplier. Drill seeding will be difficult after solar components have been installed, so it will primarily be used if seeding occurs after grading is complete but before components are installed, or in areas that were temporarily disturbed during construction that do not have any permanent infrastructure (e.g., temporary access roads, laydown areas).

Imprint Seeding

Imprint seeding is a no-till drill seeding method used to restore grasslands in areas with low annual precipitation. Seeds will be sown at 12 pounds pure live seed per acre or according to application rates recommended by the seed supplier. The seeder consists of a heavy metal drum roller with V-shaped, angled teeth and a seed agitator box. The teeth create V-shaped troughs with a depth of 4-7 inches to collect rainwater. The rolling drum presses the seed into the soil, insuring good seed-to-soil contact. The troughs collect rainwater for seed germination and seedling growth. Imprint seeders can be used on steep slopes and do not require seed bed preparation before seeding. Seeding can occur on soils with light to moderate vegetative cover, with the vegetation acting as a mulch, preventing soil erosion until seedlings are established. Imprint seeders do not work well in areas with shrubs or heavy vegetation cover. Heavily compacted soils may need to be ripped or de-compacted before seeding. The seeding rate for this method should be the same as for broadcast seeding.

Hydroseeding

Hydroseeding is most applicable for areas where drill or broadcast seeding machinery cannot access; this usually includes steep slopes or narrow terrain but can be used in all terrains. Soil bed preparation is also crucial for growth success and frequently includes tracking perpendicular to the slope to create micro conditions for seed. Flat grading and compaction are not recommended. Seeding rates increase by 30 to 50 percent of broadcast seeding rates (i.e., 30 pounds pure live seed per acre) per consultation with the seed supplier and ODFW. Prior to hydroseeding, the tackifier will be reviewed and approved in consultation with the Oregon Department of Energy (ODOE). Fertilizer should not be used when hydroseeding wildlife habitat.

Revegetation Records

The EMC will maintain records of revegetation efforts in all temporary and permanent disturbance areas and update ODOE monthly as revegetation work occurs. Revegetation records will include:

a. Date construction phase was completed;

b. Acreage of each disturbance level;

c. Description and photos of the affected area;

d. Date revegetation was initiated;

e. Description of the revegetation effort, including methods and timing;

f. Supporting figures representing the location, acres affected, and pre-disturbance condition of the revegetation area; and

g. Confirmation from the landowner that temporary disturbances in cropland have been satisfactorily restored.

Success Criteria for Temporary Disturbance Areas

Commented [A13]: ODOE – There are no temporary disturbances to wildlife habitat in the current layout. These will only be utilized if applicable based on final design.

Reclamation of Temporary Disturbance Areas on agricultural lands will be considered complete after the land is returned to farm operations and landowners provide written confirmation that they are satisfied that any impacts to soil productivity have been addressed. The Certificate Holder will provide evidence that landowners are satisfied after one crop cycle.

In non-agricultural areas, the Certificate Holder will make reasonable efforts to restore vegetation and soils ~~in agricultural and~~ wildlife habitat areas to their pre-disturbance condition.

a. **Native Shrubs**: Average density of sagebrush on revegetation transects in areas planted with sagebrush should be at least 50 percent of the reference transect within 5 years.

b. **Native and Desirable Forbs**: Cover of native and desirable (i.e., non-native species included in the seed mix) forbs, averaged across revegetation transects by habitat subtype and category, will be at least 75 percent of reference transects for the corresponding habitat subtype within 5 years.

c. **Native and Desirable Grasses**: Cover and richness of native and desirable (i.e., non-native species included in the seed mix) grass species, averaged across revegetation transects by habitat subtype and category, will be at least 85 percent of reference transects for the corresponding habitat subtype within 5 years.

d. **Noxious Weeds**: Presence and cover of noxious weeds on revegetation transects is 75 percent or less than that of the reference transect for the corresponding habitat subtype.

~~Prohibition on Use of Domestic Sheep and Goats for Vegetation Management~~

Commented [A14]: ODOE - Moved this new section under Vegetation Management for Permanent Disturbance header

~~The certificate holder may not keep or use domestic sheep, goats, or other livestock at the solar facility for vegetation control or other purposes without written approval from the Department.~~

~~Any request to use domestic sheep, goats, or other livestock at the solar facility must be accompanied by a description of practices and controls that will be implemented to prevent zoonotic disease transmission to wild sheep populations. The Department may impose additional requirements to prevent zoonotic disease transmission based on consultation with ODFW.~~

Vegetation Management ~~Objectives~~ for Permanent Disturbance Areas

During operation of the Solar Components, vegetation under the solar panels will be managed to minimize fire risk and erosion by maintaining low growing vegetation.

Prohibition on Use of Domestic Sheep and Goats for Vegetation Management

The Certificate Holder may not keep or use domestic sheep, goats, or other livestock at the Facility for vegetation control or other purposes without written approval from ODOE. Any request to use domestic sheep, goats, or other livestock at the Facility must be accompanied by a description of practices and controls that will be implemented to prevent zoonotic disease transmission to wild sheep populations. ODOE may impose additional requirements to prevent zoonotic disease transmission based on consultation with ODFW. This prohibition does not apply to landowners grazing livestock outside the Solar Components in accordance with their leases.

Commented [A15]: ODOE - Added clarification for landowner grazing not affiliated with the Facility.

Success Criteria for Permanent Disturbance Areas

The Certificate Holder will establish uniform (i.e., evenly distributed, without large bare areas) perennial, non-invasive vegetation that provides 70 percent or more cover on all exposed areas within the Solar Components in compliance with the soil protection standard (Oregon Administrative Rule [OAR] 345-022-0022); National Pollutant Discharge Elimination System 1200-C permit requirements; and Sherman County requirements.

Integrated Vegetation Management ~~Measures~~

To support reclamation success and reduce wildfire risk throughout all phases (i.e., both construction and operations) of the Solar Components, vegetation management will be implemented consistent with the draft Construction Wildfire Mitigation Plan and anticipated Operations Wildfire Management Plan. In the interim, while those plans are being finalized, this section establishes the minimum vegetation management and fire prevention requirements that will apply during construction and operation of the Solar Components. Vegetation will be managed in accordance with the applicable provisions of the 2025 Oregon Fire Code, Section 1205.5.1 (Oregon State Fire Marshall 2025):

> *"A clear brush free area of 10 feet shall be required around the perimeter of the ground-mounted photovoltaic arrays or as determined by the fire code official. A maintained vegetative surface or noncombustible base, approved by the fire code official, shall be installed and maintained under the photovoltaic arrays and associated electrical equipment installations."*

These measures are intended to minimize ignition potential, maintain defensible space, support consistent vegetation control, and outline inspection practices that will contribute to long-term fire resiliency. At a minimum, the following criteria will be met:

a. **Vegetation Height and Clearance**
   - Vegetation within and adjacent to the Solar Components will be maintained at a height of less than 12 inches, with a minimum vertical clearance of 12 inches from all electrical and mechanical equipment.

- Vegetation exceeding this height will be mowed or removed prior to local Oregon Department of Forestry(ODF)- or County-issued fire restrictions.
- At no time shall vegetation come into contact with electrical infrastructure, inverters, or cable runs.
- Vegetation height will be maintained by mowing or other vegetation management techniques. Grazing by sheep or goats is prohibited without written approval from ODOE.
- A minimum 20-foot non-combustible buffer will be maintained around the interior or exterior perimeter of fenced areas, and gravel or compacted soil surfaces will be maintained beneath and around all inverter skids, the collector substation, O&M building, and meteorological towers.

Commented [A16]: ODOE - Deleted because this is repeated in the "Designated Noncombustible Areas" section.

b. **Fuel and Debris Management**

- Vegetation and debris removed from the Facility will be disposed of off-site and will not be stored or burned on-site.
- The Certificate Holder and contractors will prevent accumulation of combustible materials or "burn piles."
- Inspections will ensure that fence lines, service roads, and work areas remain clear of dry vegetation, woody debris, or stored materials that could create fuel continuity during fire season.
- All newly constructed or maintained service roads within the Solar Micrositing Area will maintain a minimum 16-foot width of graveled, all-weather surface to facilitate emergency response access.

c. **Designated Noncombustible Areas**

- All-weather service roads will be compacted soil or gravel and maintained in good condition.
- A 20-foot non-vegetated perimeter buffer will be maintained around the Solar Components and around substations and control operations and maintenance buildings.
- Parking and laydown areas will consist of compacted soil, gravel, or other non-combustible material to reduce ignition potential from vehicles and equipment.
- Areas immediately surrounding electrical equipment, transformers, and battery energy storage system (BESS) enclosures will remain vegetation-free and will be maintained as graveled or earthen surfaces.

d. **Standards and Continuous Improvement:** Vegetation management and fire prevention measures will be reviewed annually to ensure continued compliance with applicable codes and evolving best practices, including:

- North American Electric Reliability Corporation (NERC) FAC-003-0 – Vegetation Management Standard for Transmission Lines
- Oregon Fire Code and National Fire Protection Association (NFPA) Standards relevant to energy facilities
- OAR Chapter 477 and 629-043 – ODF Fire Prevention Standards
- OAR 860-024 – Public Utility Commission (PUC) Electrical Safety Standards

- American Clean Power (ACP) and Avian Power Line Interaction Committee (APLIC) industry best practices

The Certificate Holder will evaluate new technologies, standards, and operational lessons learned each year to incorporate applicable improvements into this Comprehensive Plan or the future Operations Wildfire Management Plan.

References

EPA (Environmental Protection Agency). 2021. Stormwater Best Management Practice, Soil Roughening. December 2021. EPA-832-F-21-028JJ. https://www.epa.gov/system/files/documents/2021-11/bmp-soil-roughening.pdf.

NRCS (Natural Resource Conservation Service). 2022. Deep Tillage Conservation Practice Standard, Code 324. November 2022. https://www.nrcs.usda.gov/sites/default/files/2022-11/324-NHCP-CPS-Deep-Tillage.pdf.

ODOT (Oregon Department of Transportation). 2023. Erosion Control Manual, Guidelines for Developing and Implementing Erosion and Sediment Controls. Salem, Oregon. April 2023. https://www.oregon.gov/odot/GeoEnvironmental/Docs_Environmental/Erosion_Control_Manual.pdf.

Oregon State Fire Marshall. 2025. 2025 Oregon Fire Code, Section 1205.5.1. https://codes.iccsafe.org/content/ORFC2025P1.

Appendix G. Weed Control Plan

Regulatory Framework

The Oregon Department of Agriculture (ODA) and Sherman County Weed District maintain lists and classifications of noxious weeds. Although not all listed noxious weeds occur in the vicinity of the Solar Micrositing Area, the Certificate Holder and its contractors should be aware of the entire list while monitoring and controlling weeds.

State of Oregon

In Oregon, a noxious weed is defined under Oregon Revised Statutes (ORS) 569.175 as "a terrestrial, aquatic, or marine plant designated by the State Weed Board under ORS 569.615 as among those representing the greatest public menace and as a top priority for action by weed control programs." Noxious weeds have been declared by ORS 569.350 as a menace to public welfare, and control of these plants is the responsibility of private landowners and operators, as well as county, state, and federal governments.

The Oregon State Weed Board (OSWB) was created by ODA under ORS 569.600. OSWB provides recommendations for noxious weed control at the state level and is responsible for updating the State Noxious Weed List. The OSWB and the ODA classify noxious weeds in Oregon in accordance with the ODA Noxious Weed Classification System; there are three designations under the State's system:

- **A-Listed Weed:** A weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states makes future occurrence in Oregon seem imminent.
  - **Recommended Action:** Focus on prevention of new infestations through vector control, certification programs, education, outreach and surveys. New and existing infestations are prioritized for eradication or intensive control when and where found. Regionally focused, species-specific Statewide Management Strategies for A-listed weeds may be developed as necessary.
- **B-Listed Weed:** A weed of economic importance that is regionally abundant but may have limited distribution in some counties.
  - **Recommended Action:** Limited to intensive control at the state, county, or regional level as determined on a site-specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.
- **T-Designated Weed:** A designated group of weed species selected from the B list as a focus for prevention and control by the Noxious Weed Control Program. T-designated noxious weeds are determined by the Oregon State Weed Board and management actions are prioritized and informed by species-specific T-List Statewide Management Strategies created and maintained by the ODA. Action against these weeds will receive priority in accordance with the recommendations of the Statewide Management Strategy.

Sherman County

The Sherman County noxious weed list and protocol were developed by the Sherman County Weed District. Sherman County defines weeds of significance with six classes:

- **A Class:** High priority. Any noxious weed which greatly endangers the overall economic well-being of the County and has a small enough distribution where eradication is possible.
- **B Class:** Moderate priority. A noxious weed which is well established in the County and has known negative impacts, but due to its distribution, eradication is not feasible.
- **C Class:** Low priority. A noxious weed which is widespread throughout the County and has known economic impacts.
- **Q Class**: Questionable list. A newly detected weed which may have some importance, but more information is needed to determine its impact on agriculture. There is only one Q Class weed currently: hairy willow herb (*Epilobium hirsutum*).
- **T Class:** Targeted list. A noxious weed from any Class that the Sherman County Weed Control Board wishes to focus efforts and resources on. This list is reviewed annually.
- **W Class:** Watch list. Any noxious weed that may occur in neighboring counties, the State or similar environments as the County, and could potentially endanger the overall economic well-being of the County. Once detected, these weeds shall be moved to the appropriate list.

Noxious Weeds Identified at the Solar Components

Noxious weeds identified within the Solar Micrositing Area on July 9 and 10, 2024, are listed in Table G-1. Twelve listed noxious weeds were documented, including 8 ODA-listed noxious weeds and 12 Sherman County listed noxious weeds. Eight of the noxious weeds observed were state and/or County "B" listed weeds. One species, rush skeletonweed (*Chondrilla juncea*), is an "A" Class Weed in Sherman County and a state "T"-designated weed, meaning that ODA targeted this species for prevention and control.

In addition to noxious weeds, cheatgrass (*Bromus tectorum*), an invasive annual grass, was identified in grassland habitats within the Solar Micrositing Area. While cheatgrass is not a listed noxious weed, it and other invasive annual grasses can adversely impact habitat and increase fire risk.

Table G-1. Noxious Weeds Observed During Surveys in 2024

Scientific Name	Common Name	ODA Status[1]	Sherman County Status[1]	Frequency[2]
Aegilops cylindrica	jointed goatgrass	B	C	Infrequently observed.
Centaurea diffusa	diffuse knapweed	B*	B	Several small to medium-sized populations observed.
Chondrilla juncea	rush skeletonweed	B (T)*	A (T)	Frequently observed in non-cultivated areas.

Scientific Name	Common Name	ODA Status[1]	Sherman County Status[1]	Frequency[2]
Cirsium arvense	Canada thistle	B*	B (T)	One observation made.
Cirsium vulgare	bull thistle	B*	C	Observed in two locations.
Convolvulus arvensis	field bindweed	B	B	Many small to large populations observed.
Conyza canadensis	horseweed	Not listed	C	Commonly observed.
Lactuca serriola	prickly lettuce	Not listed	C	Frequently observed.
Onopordum acanthium	Scotch thistle	B	B (T)	Several observations made.
Rhaponticum (Acroptilon) repens	Russian knapweed	B*	B	One observation made.
Salsola tragus	Russian thistle	Not listed	C	Frequently observed.
Secale cereale	cereal rye	Not listed	C	Frequently observed.

1. Species marked with a (*) are targeted for biocontrol.
2. Patch/observation sizes are as follows: small = less than 0.1 acre, medium = 0.1 to 1.0 acre, large = greater than 1 acre.

Management Objectives

Management objectives shall be based on the classification status of a species and frequency of observations (Tables G-1 and G-2). Classification status will be determined based on the ~~higher~~ highest status identified by the State or County Weed List unless recommended otherwise by the County. Management objectives for unlisted species will be determined on a case-by-case basis based on need for control (e.g., fire control, etc.)

Table G-2. Management Objectives

Weed Classifications	Years		
	~~1-5~~0	~~1-6-20~~	~~20~~6+
A, A(T) or B(T)	~~Eradication~~ Begin control ~~P~~prior to ~~C~~construction and continue throughout construction.	Intensive ~~C~~control with the goal to~~,~~ ~~E~~eradicate~~ion~~ within first 5 years of operations. Prevent new infestations.	Intensive ~~C~~control and eradication for life of ~~F~~Facility. Prevent new infestations.
B	Begin control prior to construction on a case-by-case basis and continue throughout construction.~~Eradication Prior to Construction~~	Intensive control on a case-by-case basis with the goal to eradicate within first 5 years of operations. Prevent new infestations.~~Monitoring and Management to prevent new populations/spread of existing populations.~~	Monitor ~~ing~~ and ~~M~~management to prevent new populations or ~~/~~spread of existing populations.
C	Monitor~~ing~~ and ~~Management~~ manage to prevent new populations or ~~/~~spread of existing populations.	Monitor~~ing~~ and ~~Management~~ manage to prevent new populations~~/~~ or spread of existing populations.	Monitor~~ing~~ and ~~Management~~ manage to prevent new populations~~/~~ or spread of existing populations.

Commented [A17]: ODOE – Revised table to make pre-construction treatment objectives more obvious.

Weed Classifications	Years		
	1-50	1-6-20	206+
Invasive Annual Grasses	Monitoring and Mmanagement to minimize wildfire risk.	Monitoring and Mmanagement to minimize wildfire risk.	Monitoring and Mmanagement to minimize wildfire risk.

Commented [A17]: ODOE – Revised table to make pre-construction treatment objectives more obvious.

Weed Control Methods

Noxious weed control methods for the Weed Management Area (i.e., the disturbance area associated with the Solar Components plus a 10-foot buffer) described in this Comprehensive Plan were developed utilizing information from the ODA Noxious Weed Control Program and the Sherman County Weed District. Management of noxious weeds will be considered throughout all stages of construction and operation of the Solar Components and will include:

- **Prevention:** Implementing measures to prevent the spread of noxious weeds during construction, operation, and maintenance activities.
- **Treatment:** Treating noxious weed populations with their appropriate control methods, at appropriate time intervals.
- **Monitoring:** Assessing noxious weed changes within the Weed Management Area over time and ensuring that legacy as well as new weed populations are not increasing their distribution.

Portland General Electric Company's (the Certificate Holder) objective is to prevent the introduction of new noxious weed populations and spread of existing noxious weed populations. The methods described above in this Comprehensive Plan and supplemented below will be implemented to minimize the spread of noxious weeds during construction activities. New noxious weeds detected within the Weed Management Area during post-construction revegetation will be considered a result of construction activities and will be controlled accordingly.

Biological Control

Biological control involves the use of prescribed insects, fungi, and livestock to control noxious weeds to achieve management objectives. Biological control methods are typically targeted to a specific species or plant to control its persistence. They are also used for maintenance in targeted areas for vegetation management control in height and density that includes mitigating fire risk and erosion. Biological control is environmentally friendly and should be the first consideration when applicable.

Mechanical Treatment

Mechanical treatment will be the preferred method of treatment for existing noxious weed populations where appropriate within the Weed Management Area. Mechanical control methods rely on removal of plants, seed heads, and/or cutting roots with a shovel or other hand tools or equipment that can be used to remove, mow, or disc noxious weed populations. Hand removal of plants is also included under this treatment method. Mechanical methods are useful for smaller,

isolated populations of noxious weeds in areas of sensitive habitats. Additionally, hand removal of small infestations can minimize soil disturbance, allowing desirable species to remain and limiting conditions favorable for noxious weeds.

Some rhizomatous plants can spread by discing or tillage. For example, rush skeletonweed, which has been identified within the Solar Micrositing Area (Appendix E), can reproduce vegetatively from small segments of root, and discing or tilling can facilitate the spread of this species. As such, implementation of discing will be species-specific and avoided in areas where it will be counter-productive.

If discing is employed in areas that will be revegetated following construction, subsequent seeding will be conducted to re-establish desirable vegetative cover that will stabilize the soils and slow the potential re-invasion of noxious weeds. Discing, tilling, or other mechanical treatments that disturb the soil surface within native habitats will also be avoided in favor of herbicide application, which is an effective means of reducing the size of noxious weed populations as well as preventing the establishment of new infestations.

Chemical Treatment

Chemical control can effectively remove noxious weeds through use of selective herbicides. The specific herbicide used, and the timing of application will be chosen based on the specific noxious weed being treated, as appropriate herbicides differ between species and types of plants (i.e., dicots such as rush skeletonweed versus monocots such as jointed goatgrass).

Herbicides will be applied to identified, treatable, noxious weed infestations. The Certificate Holder or their contractors will coordinate with the Sherman County Weed District to determine which populations are treatable and will notify landowners of proposed herbicide use on their lands prior to application. If a noxious weed population is deemed to be untreatable (e.g., too widespread and established in an area to successfully control), the Certificate Holder will implement the applicable prevention measures discussed in this Comprehensive Plan, subject to approval by the Oregon Department of Energy (ODOE) and the Sherman County Weed District.

Apply only herbicides approved by the U.S. Environmental Protection Agency (EPA) and ODA; annually check the status of herbicide approval (e.g., confirming herbicides are approved for use by the EPA and ODA).

Herbicide application will be performed within the appropriate season to achieve desired results, as approved by ODOE and the Sherman County Weed District. No weed treatment will occur in agricultural lands without landowner permission.

Herbicide Application and Handling

Hand application methods (e.g., backpack spraying) may be used in roadless areas or in rough terrain. Vehicle-mounted sprayers (e.g., handgun, boom, and injector) will be used mainly in open areas that are readily accessible by vehicle. Calibration checks of equipment will be conducted prior to spraying activities, as well as periodically throughout use, to ensure that appropriate application rates are achieved.

Herbicides will be transported with the following stipulations:

- Only the quantity needed for that day's work will be transported.
- Concentrate will be transported in approved containers only, and in a manner that will prevent spilling, stored separately from food, clothing, and safety equipment.
- Mixing will be done at a distance greater than 200 feet from open or flowing water, wetlands, or other sensitive species' habitat. No herbicides will be applied at these areas unless authorized by the appropriate regulatory agencies.
- All herbicide equipment and containers will be inspected daily for leaks.
- Herbicide use will be in accordance with all manufacturer's label recommendations and warnings.
- Apply herbicide under appropriate conditions (i.e., not when wind velocity exceeds 15 miles per hour for granular application, or exceeds 10 miles per hour for liquid applications; snow or ice covers the foliage of target species; or adverse weather conditions are forecasted within the next few days).

Herbicide Spills and Cleanups

All appropriate precautions will be taken to avoid herbicide spills. In the event of a spill, cleanup will be immediate. Contractors will keep spill kits in their vehicles to allow for quick and effective response to spills. Items included in the spill kit will be:

- Protective clothing and gloves;
- Adsorptive clay, "kitty litter," or other commercial adsorbent;
- Plastic bags and a bucket;
- A shovel;
- A fiber brush and screw-in handle;
- A dustpan;
- Caution tape;
- Highway flares (use on existing hard-top roads only); and
- Detergent.

Response to an herbicide spill will vary with the size and location of the spill, but general procedures include:

- Stopping the leak;
- Containing the spilled material;
- Traffic control;
- Dressing the clean-up team in protective clothing;

- Cleaning up and removing the spilled herbicide, as well as the contaminated adsorptive material and soil; and
- Transporting spilled herbicide and contaminated material to an authorized disposal site.

Herbicide Spill Reporting

All herbicide contractors will have readily available copies of the appropriate material safety data sheets for the herbicides used at their disposal and will keep copies of the safety data sheets in the application vehicle. If an herbicide spill of any size occurs, the appropriate agency and spill coordinators will be notified promptly. In case of a spill into wetlands and waterbodies, the appropriate federal, state, and county agencies will be notified immediately. All herbicide spills equal to or greater than 200 pounds or 25 gallons of pesticide residue will be reported to the Oregon Emergency Response System in accordance with applicable laws and requirements (Oregon Administrative Rules 340-142-0050). The Certificate Holder, BIGL bn, LLC (BIGL or Project Developer), or the Environmental Monitoring Contractor (EMC) will report all herbicide spills to ODOE by phone or email within 72 hours with follow-up reporting as appropriate.

Special Considerations

Special consideration will be provided to perennial, intermittent, and ephemeral streams/draws during treatment activities. No herbicide will be sprayed where the drift can enter standing water or saturated soil. It will be the herbicide applicators' responsibility to ensure that no herbicide or drift enters standing water, regardless of the season when the herbicide is applied. Similar considerations will be made when in proximity to agricultural fields.

Weed Monitoring and Reporting

Weed inspections will occur within the Weed Management Area through visual inspection of the site while driving or walking. During the construction phase, ~~construction staff~~the EMC will conduct periodic monitoring of noxious weeds. Noxious weeds observed during construction will be treated with mechanical or chemical treatments or other best management practices, as applicable. If construction extends into the growing season prior to the commercial date of operations and formal post-construction weed monitoring, the EMC will conduct informal but comprehensive weed surveys to inform adaptive management. In addition, weed monitoring may be conducted by the EMC as part of routine construction environmental monitoring monthly from April to October.

The EMC will conduct annual post-construction noxious weed monitoring within the Weed Management Area starting the first growing season after construction to map the extent of all noxious weed occurrences and identify areas for treatment. Results will be summarized in annual monitoring reports that describe treatments performed, treatment efficacy, recommendations to improve efficacy (if necessary), and any new noxious weed occurrences. Reports will be submitted to ODOE, ODFW, and the County annually. The Certificate Holder will be responsible for treating all noxious weeds observed within the Weed Management Area.

Based on the success of control efforts after the second year of monitoring, the Certificate Holder will consult with ODOE and the Sherman County Weed District to determine if the monitoring cycle

can be reduced for Year 3 through Year 5. After 5 years of monitoring, the Certificate Holder will design a long-term weed control plan in consultation with ODOE and the Sherman County Weed District . The Certificate Holder will maintain ongoing communication with individual landowners, the Sherman County Weed District, and ODOE regarding noxious weeds within the Weed Management Area. Landowners may also contact the Certificate Holder directly to report the presence of noxious weeds related to Solar Component activity. The Certificate Holder will control reported noxious weeds on a case-by-case basis and prepare a summary of measures taken for that landowner. During the operational period of the Solar Components, the Certificate Holder will control noxious weeds as described in the long-term weed control plan. The Certificate Holder will report the investigator's findings and recommendations regarding weed control in the Solar Component's annual report required by Oregon Administrative Rule 345-026-0080.

Treatment Plan

Table G-3, below, provides a treatment plan for noxious and invasive weeds (listed by ODA and Sherman County) in the Weed Management Area, including management objectives and treatment guidelines. This table will be updated in each year's annual monitoring report. Specific herbicide application rates will be determined in consultation with the Sherman County Weed District and the Weed Control Contractor.

Table G-3. Treatment Plan for Noxious and Invasive Weeds

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
Aegilops cylindrica	jointed goatgrass	B/C	Infrequently observed.	Monitor~~ing~~ and ~~Management~~ manage to prevent new populations~~/~~ or spread of existing populations	Mechanical: Timing is critical, mow after flowering but before seeds reach soft boot stage. Early mowing will result in new tiller growth. Requires multiple mowings throughout the growing season over several years. **Chemical:** Apply to actively growing plants in late winter or spring before flowering or pre-emergent herbicide in fall. Biocontrol: None
Centaurea diffusa	diffuse knapweed	B/B	Several small to medium-sized populations observed.	Monitor and manage to prevent new populations or ~~Monitoring and Management to prevent new populations/~~spread of existing populations	Mechanical: Manually remove entire plant, including taproot, prior to flowering. Chemical: Apply to actively growing plants in fall or spring from rosette to bolting stage. **Biocontrol:** Agents include several seed feeding flies and weevils and a root-boring beetle.
Chondrilla juncea	rush skeletonweed	B (T)/A(T)	Frequently observed in non-cultivated areas.	Intensive ~~C~~control, ~~E~~eradication within first 5 years of ~~Operation~~operations. Prevent new populations.	Mechanical: Regenerates from root fragments. Manually remove entire plant, including taproot, prior to flowering. Will require multiple efforts during the growing season for more than one year. **Chemical:** Apply to rosettes in the spring immediately before or during bolting. Biocontrol: Agents include a gall midge, gall mite, rust fungus, and root-mining moth
Cirsium arvense	Canada thistle	B/B(T)	One observation made.	Begin control prior to construction and continue throughout construction. Intensive control with the goal to eradicate within first 5 years of operations. ~~Eradication Prior to~~	Mechanical: Not recommended, rhizomatous. **Chemical:** Apply from rosette to bud stage to actively growing thistle in spring or in fall with select chemicals only. Biocontrol: Four approved agents; stem weevil, seed head weevil, crown weevil, and stem gall fly.

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
				~~Construction.~~ Prevent new populations.	
Cirsium vulgare	bull thistle	B/C	Observed in two locations.	Begin control prior to construction and continue throughout construction. Intensive control with the goal to eradicate within first 5 years of operations.~~Eradication Prior to Construction~~. Prevent new populations.	**Mechanical:** Till or pull prior to flowering. Cut off root below soil surface. Chemical: Treat rosettes in fall or spring. Biocontrol: Seed head gall fly, not effective for individuals but can reduce overall population.
Convolvulus arvensis	field bindweed	B/B	Many small to large populations observed.	Monitor and manage to prevent new populations or ~~Monitoring and Management to prevent new populations/~~spread of existing populations.	Mechanical: Not recommended, bindweed has extensive root systems and can spread by seed and root fragments. **Chemical**: Apply to rapidly growing plants in spring or summer, prior to flowering. Plants should not be under drought stress at time of application. Biocontrol: Two approved agents; a moth and mite.
Conyza canadensis	horseweed	Not listed/C	Commonly observed.	Monitor and manage to prevent new populations or ~~Monitoring and Management to prevent new populations/~~spread of existing populations.	**Mechanical**: Mow or pull prior to flowering. Chemical: Apply to rapidly growing plants prior to flowering. Biocontrol: Unknown
Lactuca serriola	prickly lettuce	Not listed/C	Frequently observed.	Monitor and manage to prevent new populations or ~~Monitoring and Management to prevent new populations/~~spread of existing populations.	Mechanical: Graze, till, or pull prior to flowering. Mowing not considered effective due to robust regrowth. **Chemical:** Apply to rapidly growing plants in spring prior to flowering. Biocontrol: None
Onopordum acanthium	Scotch thistle	B/B(T)	Several observations made.	Intensive ~~C~~control, ~~E~~eradication within first 5 years of ~~O~~operations.	**Mechanical:** Pull prior to flowering, cut off root below soil surface. Tilling will control emerged plants but stimulate germination. Follow up tilling

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
					with herbicide application to treat seedlings. Sheep and goats will eat young plants and flower heads. Chemical: Treat from rosette to bolting stage in fall or spring. Most effective on small rosettes. Biocontrol: None
Rhaponticum (Acroptilon) repens	Russian knapweed	B/B	One observation made.	Begin control prior to construction and continue throughout construction. Intensive control with the goal to eradicate within first 5 years of operations~~Eradication Prior to Construction~~. Prevent new populations.	**Mechanical:** Manually remove entire plant, including taproot, prior to flowering. Chemical: Apply to actively growing plants in fall or in spring from rosette to bolting stage. Biocontrol: Gall nematode available.
Salsola tragus	Russian thistle	Not listed/C	Frequently observed.	Monitor and manage to prevent new populations or ~~Monitoring and Management to prevent new populations/~~spread of existing populations.	Mechanical: Hand pulling effective for small populations. Mow just before flower maturation or repeatedly mow younger plants. **Chemical:** Treat young, rapidly growing plants from seedling to mid-rosette stage in spring or fall. Most effective on smaller plants. Preemergence also effective. Many populations are herbicide resistant in the inland northwest, consult with local herbicide applicator or county weed manager. Biocontrol: Leaf mining and stem boring moths have provided poor control.
Secale cereale	cereal rye	Not listed/C	Frequently observed.	Monitor and manage to prevent new populations or ~~Monitoring and Management to prevent new populations/~~spread of existing populations.	**Mechanical**: Repeated mowing in spring prior to seed set or tillage combined with herbicide application in fallow fields. Hand pull prior to seed set. Chemical: Treat prior to seed set. Herbicide more effective if applied one year after mowing to reduce thatch buildup. Biocontrol: None

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
Invasive annual grasses such as cheatgrass (*Bromus tectorum*)		Not listed	Common in grassland habitat.	Monitor and manage to minimize wildfire risk.	Mechanical: Repeated mowing (every 3 weeks) to 2 inches in spring can eliminate seed production in areas where herbicide application is unacceptable. **Chemical:** Apply pre-emergent herbicide prior to germination. Post emergent in fall or early spring/ summer to rapidly growing plants prior to seed set. Biocontrol: None
Sources: Becerra-Alvarez 2025, DiTomaso et al. 2013, ODA 2025. 1. Preferred treatment method in bold.					

Commented [A18]: ODOE - Added invasive annual grass treatment to treatment plan in response to addition of management objectives in Table G-2.

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Biglow Solar Project
Draft Habitat Mitigation Plan

Biglow Canyon Wind Farm
Request for Amendment 4
~~November~~ January 2026~~5~~

Prepared for

Portland General Electric Company

~~Amended by DepartmentODOE December 2025~~

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Figure 1. Habitat Mitigation Area

1.0 Introduction

This draft Habitat Mitigation Plan (HMP) was submitted by the Portland General Electric Company (PGE or Certificate Holder) for the photovoltaic solar energy generation and battery storage (Solar Components) at the Biglow Canyon Wind Farm (BCWF or Existing Facility). Located approximately 4.5 miles northeast of Wasco in Sherman County, Oregon, BCWF currently consists of 217 wind turbines, with a peak generating capacity of 450 megawatts (MW).

The Solar Micrositing Area identified as part of Request for Amendment (RFA) 4 is approximately 1,924 acres and provides an estimate of the maximum area needed for development, micrositing, and temporary disturbances from the Solar Components during construction, rather than the anticipated disturbance footprint. The permanent disturbance area impacted by the Solar Components is approximately 1,445 acres.

PGE will own and operate the Solar Components as a part of the BCWF (together, Facility), which, to date, have been developed by BIGL bn, LLC (BIGL). BIGL, in its capacity as the project developer, supports PGE in this RFA 4 and may construct and temporarily operate the Solar Components on behalf of PGE under a Build-Transfer Agreement.

The Certificate Holder's goal is to preserve and maintain in-kind habitat in the Columbia Plateau Ecoregion to achieve a net benefit to Category 2 habitat, and no net loss of Category 4 habitat through the measures described in this ~~draft Habitat Mitigation Plan (~~HMP~~)~~.

2.0 Finalization of the HMP (PRE-FW-01)

Fish and Wildlife Habitat Condition 1 requires finalization of the draft HMP, stating the following:

> *Prior to construction of a phase or component of the solar facility, as applicable, the certificate holder shall submit a final Habitat Mitigation Plan substantially similar to Final Order on RFA4 Attachment F, base-d on the finalization requirements included in Section 2.0 of the plan. The final plan must be submitted for review and approval by the Department, in consultation with ODFW.*

The HMP must be finalized prior to construction, based on the estimated permanent habitat impacts associated with the facility, component or phase, as applicable. Final review and approval of the ~~plan~~HMP has been delegated by the Council under ORS 469.402 to the Department. The Department, in consultation with the Oregon Department of Fish and Wildlife (ODFW), will review the final HMP based on the following scope:

1. **Final habitat and impact assessment.** Based on final design/layout, update tabular summaries of temporary and permanent disturbance estimates (acres).
    a. Table 2. Temporary and Permanent Impacts by Habitat Category and Habitat Subtype,
    b. Table 3. Calculating Mitigation for Permanent Impacts, and

c. Table 4. Calculating Mitigation for Temporary Impacts

2. **Execute legal instrument.** Obtain and submit to ~~the Department~~ODOE a copy of the conservation easement or legal instrument securing the Habitat Mitigation Area (HMA) ~~site~~ for conservation purposes as outlined in this HMP:
   a. The term of the conservation easement or legal instrument will be for the life of the ~~s~~Solar ~~facility~~Components;
   b. The terms of the conservation easement or legal instrument will be binding upon the landowner, heirs, or successors and would run with the land if property is sold;
3. The conservation easement or legal instrument will identify restricted uses that have the potential to diminish wildlife habitat functions and value, including but not limited to grazing; grading, mowing, blading or expansion of impervious surfaces or access road networks; division of the Property. **Identify/map baseline condition/~~reference~~monitoring sites and enhancement action areas.** Map baseline habitat conditions of the HMA. Propose number and location of monitoring ~~and references~~ sites for noxious weeds and shrub-planting. Submit habitat mapping and monitoring ~~reference~~ site locations to ODOE and ODFW for review and approval.
   a. Provide baseline habitat maps, photographs and maps/GIS data for proposed monitoring ~~reference~~ sites at the HMA with a description of the weed and vegetative cover.
      i. Baseline monitoring plot photo points within the HMA, include 1) a minimum of five permanent photo points distributed to show general vegetation status throughout the HMA, and 2) additional photo points as needed to monitor success of noxious weed control and shrub-planting;
4. **Finalize enhancement actions and success criteria in Section 6.2.1, 6.2.2 and 6.2.3.** Based on the baseline assessment completed under Sub(3) above:
   a. Provide maps/GIS data of weed treatment and shrub-planting areas.
   ~~a.~~b. Determine sagebrush planting density.
   ~~b.~~c. Finalize the success criteria for weed treatment and shrub planting.
      i. Success criteria for weed treatment must represent a ~~%~~percent increase in native vegetation cover and ~~%~~percent decrease in invasive cover ~~of~~at monitoring sites compared to ~~reference site~~baseline.
      ii. Shrub planting will be considered successful when sagebrush density in enhancement areas is 50 percent of planting density (i.e., 50 percent survival of sagebrush planted at 300 plants per acre) ~~Success criteria for shrubs shall be based on a minimum 50% density of monitoring to reference sites~~ at 5 years.
   ~~c.~~d. Propose restoration methods in the event of fire which at a minimum include post-burn seeding and noxious weed control.
   ~~d.~~e. ~~The Department~~ODOE and ODFW must evaluate whether the combined enhancement actions satisfy the Category 2 mitigation goal of a net benefit in habitat quality. If the HMA has minimal need or opportunity for the enhancement actions as currently proposed, additional actions may be identified/required.

Commented [A1]: ODOE – Removed reference sites because they are not appropriate to measure enhancement actions within the HMA. Success should be measured compared to baseline for mitigation to show uplift has been provided over baseline rather than compared to adjacent property conditions.

Reference sites within the HMA would not make sense because weeds should be treated wherever found and there is no existing sagebrush habitat with the HMA to use as a target density.

Commented [A2]: ODOE – Revised shrub success criteria to tier to planting density. There is no sagebrush habitat within the HMA to compare with monitoring sites.

5. **Finalize Implementation Schedule.** Provide an implementation schedule for habitat enhancement actions and monitoring.
6. **Finalize Monitoring Protocols and Survey Methods.** Submit final proposed monitoring protocol and survey methods to monitor~~ing~~ and evaluat~~e~~ing the success of enhancement actions.

Approval of the final HMP will be based on review by ODOE~~the Department~~, in consultation with ODFW, based on the adequacy of ~~the~~ information provided to address the steps/requirements listed above.

3.0 Habitat Categories and Habitat Types

A habitat survey was conducted as part of RFA4 to verify habitat subtypes and habitat categories of all areas to be affected by the Facility. The ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0025) provides a framework to categorize habitats based on type, quality, availability, and usefulness/importance to wildlife, and establishes mitigation goals and implementation standards for each. Table 1 defines each of the six habitat category types as presented in the ODFW Habitat Mitigation Policy.

Table 1. Habitat Categorization Types

Category Type	Definition[1]	Mitigation Goal
1	Irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique assemblage.	The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.
2	Essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage.	The mitigation goal if impacts are unavoidable is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.
3	Essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited either on a physiographic province or site-specific basis, depending on the individual species or population.	The mitigation goal is no net loss of either habitat quantity or quality.
4	Important habitat for fish and wildlife species.	The mitigation goal is no net loss of either habitat quantity or quality.
5	Habitat for fish and wildlife having high potential to become either essential or important habitat.	The mitigation goal, if impacts are unavoidable, is to provide a net benefit in habitat quantity or quality.
6	Habitat that has low potential to become essential or important habitat for fish and wildlife.	The mitigation goal is to minimize impacts.

1. Source: OAR 635-415-0025.

4.0 Temporary and Permanent Impacts

Impacts may be permanent or temporary. Permanent impacts are defined as those impacts that will exist for the life of the Solar Components. Temporary impacts are those impacts that will last for a time less than the life of the Solar Components. The duration of temporary impacts to habitat will vary by habitat subtype. For example, the recovery period for agricultural areas that were temporarily disturbed could be as short as 1 to 3 years, grasslands generally recover within 3 to 7 years, and shrublands may require 10 to 50 years to recover (with the longer recovery periods associated with disturbances in mature sagebrush [*Artemisia* sp.] habitats). The Certificate Holder will restore temporary impacts consistent with the Comprehensive Solar Revegetation and Soil Management Plan (Final Order on RFA4, Attachment D).

As described in Exhibit P, there are no impacts to Category 1 habitat within the Solar Micrositing Area. Category 2 habitat occurs in the Solar Micrositing Area and will be impacted by the Solar Components (Table 2). Category 2 habitat within the Solar Micrositing Area is associated with Shrub-steppe~~;~~: Sagebrush Shrub-steppe habitat along Biglow Canyon and Riparian: Riparian Tree habitat to a lesser extent. Category 4 and 6 habitat will also be impacted by the Solar Components, while Category 3 and 5 habitat ~~were not identified in the Solar Micrositing Area~~will not be impacted.

Table 2 shows the acres of permanent and temporary impacts in each habitat category by habitat subtype for the Solar Components.

Table 2. Temporary and Permanent Impacts by Habitat Category and Habitat Subtype

Habitat Category	Habitat Subtype	Impact (acres)	
		Temporary	Permanent
2	Riparian Trees	<0.1	<0.1
	Sagebrush Shrub-Steppe	0.3	20.7
Category 2 Subtotal		**0.3**	**20.7**
4	Grassland-steppe	0.1	3.0
	Ephemeral Streams	<0.1	<0.1
Category 4 Subtotal		**0.1**	**3.0**
6	Irrigated Cropland	0.1	52.0
	Non-Irrigated Cropland	9.4	1,365.0
	Developed	1.0	3.9
Category 6 Subtotal		**10.5**	**1,420.9**
Grand Total		**10.9**	**1,444.6**

Note: Totals in this table may not sum correctly due to rounding; "--" = no impact; <0.1 = greater than zero but less than 0.05 acre.

5.0 Methods for Calculating Mitigation

Solar Component impacts, as determined based on the Solar Micrositing Area, would result in a mitigation need of 45 acres, including 44.4 acres of mitigation for permanent impacts (41.4 acres of Category- 2 and 3.0 acres of Category 4 habitat (Table 3) and 0.6 acres of mitigation for temporary ~~temporal~~ impacts (0.6 acres of Category 2 and <0.1 acres of Category 4~~; Table 3 and Table 4~~(Table 4).[1] The actual acres of temporary and permanent impacts and the associated mitigation requirements will be confirmed following construction. The Certificate Holder is not proposing compensatory mitigation under the ODFW Fish and Wildlife Habitat Mitigation Policy for impacts to Category 6 habitat.

Table 3. Calculating Mitigation for Permanent Impacts

Habitat Category	Impact Acres	Mitigation Ratio[1]	Mitigation Need	Mitigation Description
Category 2	20.7	2:1	41.4	The mitigation goal for Category 2 habitat is "no net loss" and "net benefit." Accordingly, mitigation for permanent impacts on Category 2 habitat needs to demonstrate a net benefit in quality or quantity.
Category 4	3.0	1:1	3.0	The mitigation goal for Category 4 habitat is "no net loss" in quantity or quality. During a site visit on January 10, 2025, ODFW recommended that impacts on Upland Tree habitat types should be mitigated within grassland or shrubland habitat types.
Category 6	1,420.9	0:1	--	The mitigation goal for impacts on Category 6 habitat is minimization; no compensatory mitigation proposed.
Grand Total	**1,444.6**	**--**	**44.4**	--

1. Acres mitigation per acres impacted.
Note: Totals in this table may not sum correctly due to rounding.

Table 4. Calculating Mitigation for Temporaryal Impacts

Habitat Category	Habitat Subtype	Impact Acres	Mitigation Ratio[1]	Mitigation Need	Mitigation Description
Category 2	~~PWCA:~~ Riparian Trees	<0.1	2:1	<0.1	The mitigation goal for Category 2 habitat is "no net loss" and "net benefit." Accordingly, mitigation for permanent

[1] Temporary impacts to some habitat subtypes results in ~~T~~temporal loss ~~refers to loss~~ of habitat function and values from the time an impact occurs to the time when the restored habitat provides a pre-impact level of habitat function. Sagebrush steppe and riparian tree habitat subtypes ~~is~~are reasonably expected to require a longer restoration timeframe (5+ years) and therefore would be expected to result in temporal loss requiring compensatory mitigation beyond the Certificate Holder's revegetation obligation.

Habitat Category	Habitat Subtype	Impact Acres	Mitigation Ratio[1]	Mitigation Need	Mitigation Description
	~~PWCA:~~ Sagebrush Shrub-steppe	0.3	2:1	0.6	impacts on Category 2 habitat needs to demonstrate a net benefit in quality or quantity.
Category 4	Grassland-steppe	0.1	0:1	--	The mitigation goal for Category 4 habitat is "no net loss" in quantity or quality. The proposed mitigation ratio would result in a lesser amount of acreage of mitigation than what is impacted by the Solar Components. Combined with restoration of temporary disturbances, the proposed mitigation ratio is intended to account for the temporary loss of habitat functionality and meet the "no net loss" goal. Temporary disturbances to Category 4 Grassland-steppe are not mitigated beyond restoration.
	Ephemeral Streams	<0.1	1:1	<0.1	
Category 6	Agriculture, Developed	10.5	0:1	--	The mitigation goal for impacts on Category 6 habitat is minimization; no compensatory mitigation proposed.
Grand Total		**10.9**	**--**	**0.6**	--
1. Acres mitigation per acres impacted.					
Note: Totals in this table may not sum correctly due to rounding. "--" = no impact; <0.1 = greater than zero but less than 0.05 acres.					

6.0 Biglow Canyon Wind Farm Habitat Mitigation Area

The ~~Habitat Mitigation Area (~~HMA~~)~~ is the area where the Certificate Holder is proposing to perform enhancement and preservation actions that are in addition to the revegetation of areas of temporary disturbance associated with the Biglow Solar Project. The HMA must be large enough and have the characteristics to meet the standards set in the ODFW Fish and Wildlife Habitat Mitigation Policy~~OAR 635-415-0025~~.

According to ODFW standards, areas appropriate for mitigation of Category 2 habitat impacts must provide "in-kind" mitigation that creates similar structure and function to that being disturbed, be "in-proximity" to the Solar Components, and have potential for habitat enhancement. The Certificate Holder identified 78 acres for the HMA located within 880 acres of land owned by the Certificate Holder adjacent to the Carty Generating Facility in Morrow County (Figure 1). The Certificate Holder identified an area larger than its mitigation need ~~(need is 45 acres)~~ to allow for flexibility in management of the HMA. The Certificate Holder discussed the location of the HMA with ODFW and received assurance that the mitigation goals of "in-kind" and "in-proximity" can be met.

6.1 Habitat Assessment and Mitigation Accounting

The Certificate Holder identified 78 acres of suitable in-kind and in-proximity habitat within an 880-acre parcel. The HMA is adjacent to the existing PGE-owned Conservation Area and a conservation area maintained by The Nature Conservancy (South Farm Conservation Area; Figure 1). The habitat mapped within the HMA includes rabbitbrush shrubland and broom snakeweed shrubland (Figure 1). The HMA is dominated by Sandberg's bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and intermittent areas of needle-and-thread grass (*Hesperostipa comata*), as well as cheatgrass (*Bromus tectorum*). There are also occasional occurrences of green rabbitbrush (*Chrysothamnus viscidiflorus*), gray rabbitbrush (*Ericameria nauseosa*), big sagebrush (*Artemisia tridentata*), fiddleneck (*Amsinckia menziesii*), and yarrow (*Achillea millefolium*).

The HMA is within a PWCA connector (ODFW 2023).[2] The HMA also contains Category 1 and Category 2 habitat associated with Washington ground squirrel (*Urocitellus washingtoni*) colonies that are immediately adjacent to the HMA.

The Certificate Holder plans to mitigate for the habitats impacted by placing a conservation easement on the appropriate acreage and by providing habitat uplift through the habitat enhancement and monitoring activities described below.

6.2 Habitat Enhancement Actions

Based on the acres of impact and mitigation need identified in Tables 2, 3, and 4, the Certificate Holder identified 78 acres available to fulfill the mitigation need for Solar Component impacts, subject to confirmation of impacts following construction. The objectives of habitat enhancement and restoration are to protect habitat within the mitigation area from degradation and improve the habitat quality of the mitigation area. The Certificate Holder shall initiate the habitat enhancement actions for the Facility before beginning operation of the Solar Components. The Certificate Holder shall restrict uses of the mitigation area that are inconsistent with the goal of no net loss and net benefit of Category 2 habitat and no net loss of Category 4 habitat as designated in the conservation easement. The Certificate Holder shall implement habitat enhancement actions as described in this ~~Plan~~ HMP and as specified in the Site Certificate. Enhancement actions and monitoring procedures are detailed below and will be finalized in this HMP prior to construction. Besides legal protection

[2] The Oregon Conservation Strategy (ODFW 2025) defines PWCA "regions" as the combined top one percent of connectivity priorities across all 54 Oregon Connectivity Assessment and Mapping Project (OCAMP) species' connectivity models. Regions are large, contiguous areas and represent the highest-value habitat for facilitating species movement throughout the state. PWCA "connectors" are then described as pathways that provide the best available habitat for facilitating movement between regions. Connectors may pass through high-quality habitat in intact, relatively undisturbed parts of the landscape, as well as the best remaining marginal habitat in developed or degraded areas. The Solar Components impact a PWCA region along Biglow Canyon.

to ensure no development, enhancement actions for the HMA include those detailed in the following subsections.

6.2.1 Restoration and Enhancement Actions in the Event of Fire

The final HMP must include a description of enhancement actions to be implemented at the HMA if the site is damaged from fire or fire suppression efforts (e.g., vehicular disturbance or chemical application). At a minimum, the enhancement actions must include a plan for seeding and noxious weed treatment, and coordination of the final measures to be implemented after the fire or fire suppression activities.

6.2.2 Noxious Weed Prevention, Inventory, and Control

Weeds will be controlled as needed to maintain and enhance habitat quality within the mitigation area, with the goal of working toward eradication of targeted noxious weeds or, if eradication is not practical, decreasing their abundance to minimize impacts on native plant communities. Weeds known to occur within the HMA include rush skeletonweed (*Chondrilla juncea*), knapweed (*Centaurea* spp.), and yellow starthistle (*Centaurea solstitialis*).

The final HMP will identify the weed management practices including schedule and treatment, consistent with an integrated weed management approach, using an appropriate combination of inventory, prevention (such as best management practices to prevent weed establishment), and control methods (such as hand pulling, mowing, biological control, and/or herbicides). The Certificate Holder shall obtain ODFW's approval prior to the use of pesticides. Controlling weeds in the HMA should promote growth of native vegetation.

6.2.3 Access Control

The Certificate Holder will monitor and control access to the HMA and will post informative signs depicting the area(s) as "protected" and including natural resources information as appropriate for the life of the Facility. Primary access to the PGE property is controlled by a gate off Tower Road north of the Carty Generating Station (currently used by PGE and The Nature Conservancy), the gated entrance to the Boardman Plant, and a gated road from Ione to the south. The Nature Conservancy and Three Mile Canyon Farms may occasionally use the two-track access crossing PGE's property to access the Farm's conservation area. Approved access to the site is currently limited to such occasional approved use of access roads and PGE's general operational needs. No livestock grazing is currently occurring on the site, and grazing would be a restricted use identified in the conservation easement, as established in Section 2.0 of this ~~Plan~~HMP. Periodic monitoring will be conducted to evaluate the effectiveness of access control measures and signage maintenance needs.

6.2.4 Sagebrush Plantings

To mitigate for temporal and permanent impacts to Category 2 sagebrush habitat, the Certificate Holder will plant sagebrush seedlings in the HMA, focusing on enhancing and expanding remnant stands of shrubs that were impacted by past wildfires. Planting density will be determined in this HMP prior to construction.

The success of sagebrush planting will be based on an evaluation of the monitoring to reference sites, where the monitoring sites demonstrate an average density of 50 percent of the density of the reference site within 5 years of planting. Density (plant counts) will be measured within macroplots, quadrats, and/or belt transects randomly located within the enhancement area.

Commented [A3]: ODOE – Deleted as this is redundant with Section 6.3.

6.3 HMA Enhancement Monitoring

The Certificate Holder will use a qualified investigator (botanist, wildlife biologist, or revegetation specialist) to conduct monitoring at the HMA. The purpose of this monitoring is to evaluate on an ongoing basis the protection of habitat quality and the results of enhancement actions.

The investigator will visit the HMA after each growing season for the first five years post planting/weed treatment. If success is achieved at year five, monitoring may be reduced to every fifth year thereafter (in years divisible by five, unless otherwise specified for specific measures) for the life of the Facility.

Monitoring methods and frequency will be established in the final HMP, as established in Section 2.0 of this Plan. Monitoring activity shall include an assessment of the following:

1. General quality of vegetation cover (dominant species, structural age, etc.), as determined by ocular estimates, measurements, and photo points;
2. Success of weed control efforts:
    a. Weed control efforts at the HMA will be considered successful when native plant cover within monitoring sites is greater than the reference sitebaseline, and invasive cover within monitoring sites is less than baselinethe reference site. The final success criteria should be a %percent increase and % decrease value, following evaluation of baseline conditions at the referencemonitoring sites.
    b. Annual inventories will be conducted on the HMA to identify new weed infestations, the status of existing infestations, and the progress of weed control efforts in eradicating or reducing infestations.
    c. Weed inventories will be conducted on foot. Detailed information on weed infestations will be collected, including, but not limited to, data on species, location, growth form, infestation size, and weed cover class (an ocular estimate of the percentage of the ground covered or concealed by weeds in a specific infestation area). In addition, the surveyor will identify potential weed control strategies for

each infestation, as well as constraints that could limit the effectiveness of weed control efforts.

d. Results from the surveys will be incorporated into a ~~geographic information system~~GIS database and provided to the Department with the Monitoring Report. Weed infestations will also be photographed over time to document progress of weed control efforts.

3. Sagebrush planting will be considered successful when sagebrush density in enhancement areas is 50 percent of planting density (i.e., 50 percent survival of sagebrush planted at 300 plants per acre) ~~Success of sagebrush plantings will be based on an evaluation of the monitoring to reference sites, where the monitoring sites demonstrate an average density of 50 percent of the density of the reference site~~ within 5 years of planting. Density (plant counts) will be measured within macroplots, quadrats, and/or belt transects randomly located within the enhancement area.
4. Success of remedial actions to restore habitat quality in damaged areas (such as managed weed infestations, fire damage, and any necessary seeding/planting areas), as determined by vegetation cover (ocular estimate) and photo points (see below);
5. Photos taken from established monitoring positions (photo points) within the HMA, including 1) a minimum of five permanent photo points distributed to show general vegetation status throughout the HMA, and 2) additional photo points as needed to monitor success of significant enhancement activities, such as managed weed infestations and/or any necessary seeding/planting areas;
6. Incidental wildlife occurring within the HMA (counts concurrent with all other monitoring work);
7. Environmental factors found on site during monitoring activities and annual summary records (such as precipitation); and
8. Surveys of resident special status wildlife species (Washington ground squirrel) that have been documented during previous monitoring or survey efforts within the HMA, using existing protocols approved by ODFW.

7.0 Data Reporting

The Certificate Holder will submit a report including wildlife and habitat monitoring data and analysis to the ~~Oregon Department of Energy (~~ODOE~~)~~ and ODFW during each monitoring year according to the schedule in Table 5. The Certificate Holder will notify the U.S. Fish and Wildlife Service and ODFW within one business day if any federal or state endangered or threatened species are killed or injured on the facility site or within the HMA. The Certificate Holder may include the reporting of wildlife monitoring data and analysis in the report required under OAR 345-026-0080 or submit this information as a separate document concurrently with the submittal of the report. In addition, the Certificate Holder will provide ODOE with any data or

record generated by the investigators in carrying out this Plan upon request by ODOE.

Table 5. Schedule of Monitoring

Task	Schedule
General HMA Monitoring	During the first, third, and fifth years after Solar Component construction, and otherwise every fifth year thereafter for the life of the Facility.
Washington Ground Squirrel Monitoring	
General Weed Inventory, Control and Monitoring Activity for HMA	Every year for the first 5 years following implementation of initial enhancement; long-term monitoring frequency to be determined after year 5.
HMA Sagebrush Habitat Monitoring	Every year for the first 5 years following implementation of initial enhancement; long-term monitoring frequency to be determined after year 5.

8.0 Amendment of the HMP

This HMP may be amended from time to time by agreement of the Certificate Holder and the Energy Facility Siting Council (EFSC), or ODOE, acting within its delegated authority of EFSC under ORS 469.402. Such amendments may be made without amendment of the site certificate. EFSC authorizes ODOE to agree to amendments to this HMP. ODOE shall notify EFSC of all amendments, and EFSC retains the authority to approve, reject, or modify any amendment of this plan agreed to by ODOE.

9.0 References

ODFW (Oregon Department of Fish and Wildlife). 2023. Priority Wildlife Connectivity Areas Web Map. Oregon Department of Fish and Wildlife. Salem, Oregon. https://experience.arcgis.com/experience/6979b6598f904951bd0af1821e1595f1/

ODFW. 2025. Priority Wildlife Connectivity Areas. https://oregonconservationstrategy.org/success-story/priority-wildlife-connectivity-areas-pwcas/ (Accessed August 8, 2025).

Figure

From:	Lenna Cope
Sent:	Friday, January 30, 2026 4:31 PM
To:	CLARK Christopher * ODOE
Cc:	Chris Bozzini; Kathleen Campanella; Ziola, Kiana
Subject:	PGE Comments to the Proposed Order on RFA4 of the BCWF Site Certificate
Attachments:	BIGL RFA4_Comment Letter to ODOE_01302026.pdf; BCWF RFA4_Goal 3 Comment Letter_01302026.pdf

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Categories: Tracked To Dynamics 365

Mr. Clark,

Please find attached PGE's comments in response to the Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. Two attachments associated with our Goal 3 Comment Letter will be uploaded to a SharePoint site for you to download. That link will be shared shortly. The attachments will be PGE's 2023 Clean Energy Plan/Integrated Resource Plan Update and PGE's 2024 ESG Report.

Thank you.

Lenna Cope, P.E.
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January 30, 2026
Biglow

VIA EMAIL

Christopher Clark, Senior Siting Analyst
Oregon Department of Energy
550 Capitol St. NE 1st Floor
Salem, OR 97301

Re: Biglow Canyon Request for Amendment 4 – Proposed Order Goal 3 Exception

Dear Mr. Clark,

Portland General Electric (PGE; Certificate Holder) submits the following comments in response to the Oregon Department of Energy's (ODOE) Proposed Order on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate. This letter is specific to the findings related to the requested Goal 3 exception.

In the Proposed Order, ODOE disregarded two of the reasons the Certificate Holder presented to justify the requested Goal 3 exception. The Certificate Holder respectfully requests that ODOE reconsider its recommended findings. This letter provides revised proposed findings and evidence for ODOE's consideration.

- **Proposed Reason: Minimal Impacts to Other Resources Protected by Council Standards**

  Certificate Holder Comment:
  The Certificate Holder maintains that the Solar Micrositing Area is sited to avoid sensitive environmental features, including Washington ground squirrel (*Urocitellus washingtoni*) occupied habitat, FEMA 100-year floodplains, U.S. Fish and Wildlife Service-designated critical habitat, ODFW-designated big game winter ranges, and wetlands and waters.

  The Solar Components avoid almost all impacts to ODFW wildlife habitats (Category 1-Category 5), with only 1.6 percent (23.7 acres) of the approximately 1,445 acres of permanent impact area impacting ODFW classified wildlife habitats. The remaining 98.4 percent, or 1,420.9 acres, are considered ODFW Category 6 habitat, which is either developed or agricultural land that has little habitat value (see Exhibit P, Table P-6).

The Certificate Holder maintains that this is an exceptionally low amount of habitat impacts, particularly when compared to other solar developments approved for a Goal 3 Exception by EFSC. In fact, the proposed Solar Micrositing Area has less Category 2-5 habitat than any other solar facility that has been granted a Goal 3 exception, in part due to the "minimal impacts on other resources protected by Council standards" reason.

See the table below listing the permanent impacts (in acres) approved for West End Solar, Madras Solar, and Sunstone Solar compared to the proposed Solar Micrositing Area.

Permanent Disturbance Acreage Comparison

Project	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5	Subtotal Cat 2-5
Biglow RFA 4	0	20.7	0	3	0	23.7
West End Solar Project	0	0	20	139	161	320
Madras Solar Energy Facility	0	0	0	270.18	0	270.18
Sunstone Solar Project	0	<0.1	0	17.9	18.5	36.5

Compared to previous Goal 3 exceptions approved by Council, as noted in the table above, the anticipated impacts to 23.7 acres of Category 2 through 4 habitats described in RFA 4 represent an exceptionally low amount of habitat impact.

Furthermore, for the approximately 23.7 acres of land within the Solar Micrositing Area classified as ODFW wildlife habitat categories 2 through 4, permanent habitat loss will be mitigated according to ODFW Habitat Mitigation Policy goals and standards, as described in the Solar Micrositing Area HMP (see Attachment P-2 to Exhibit P). For these reasons, the Certificate Holder requests that ODOE reconsider its findings and conclude that this reason supports the Goal 3 exception request.

With respect to cultural resources, disturbance will not occur within 20 meters of any NRHP-eligible, -listed, or unevaluated cultural resources. If disturbance is planned within an avoidance buffer, the Certificate holder will consult with the Council and Tribes, and an archaeological or Tribal monitor must be present. All impacts to significant cultural resources will be avoided through Solar Components design.

- **Proposed Reason: Directly Furthers Oregon's Clean Energy Directives and Goals**

Certificate Holder Comment:

The Certificate Holder presents a revised analysis to demonstrate why a Goal 3 exception is justified because the facility, as amended, directly furthers Oregon's clean energy directives and goals.

Before presenting the reason, the Certificate Holder reiterates its earlier argument that the Council has broad discretion and authority to determine "reasons" warranting a goal exception under ORS 469.504. ODOE argues that consistency with State climate goals and policies is not an appropriate reason to justify an exception to Statewide Planning Goal 3 because "neither the State Energy Policy in ORS 469.010 or ORS 469.310 suggest that the Council should grant an exception to the State's goals to preserve agricultural

lands, particularly highly productive farmlands, for farm use based on the general need for new sources of renewable energy to meet other state "goals." The Certificate Holder maintains that the State Energy Policies in ORS 469.010 or ORS 469.310 also do not suggest the Council should not grant an exception to Goal 3 based on the need for new sources of renewable energy. Furthermore, as noted in RFA4 Exhibit K, the Certificate Holder respectfully submits that previous Land Use Board of Appeals (LUBA) decisions do not prohibit Council from considering Oregon's goals and policies that relate to the acceleration of Oregon's clean energy transition in a justification as to why the state policy embodied in Goal 3 should not apply.

The Certificate Holder maintains that the Council has the discretion and authority to balance the policies that are embedded in the goal for which an exception is sought, with its policy directive in ORS 469.010, other statewide planning goal policies and objectives, and other policy reasons that the Council determines warrant the requested exception. The legislature granted the Council such discretion when it adopted a different goal exception test in ORS 469.504 than the ORS 197 test[1]. The Certificate Holder encourages the Council to exercise its discretion to further Oregon's clean energy directive and goals.

The Certificate Holder requests that Council acknowledge, for purposes of this analysis, that Oregon's clean energy directives and goals include the following:

House Bill 2021 (ORS 469A.400-469A.475)

This bill requires retail electricity providers including PGE to reduce greenhouse gas emissions associated with electricity sold to Oregon customers by at least 80% below a baseline by 2030; 90% below the baseline by 2035; and 100% below the baseline by 2040. PGE is required to demonstrate continued progress towards these emissions targets and submit a plan for compliance with these emissions targets in its Clean Energy Plan and Integrated Resource Plan, filed with the Oregon Public Utility Commission.

Senate Bill 1547 (ORS 469A.005-469A.210)

Among other provisions, this bill mandates that large investor-owned utilities, including PGE, eliminate coal-fired electricity from their Oregon portfolios by 2030 and doubles the Renewable Portfolio Standard (RPS) to 50% by 2040, with interim targets of 35% clean by 2030 and 45% by 2035. The RPS targets must be met with qualifying resources, which include utility-scale solar facilities. PGE must describe its plan for meeting the RPS requirements as part of its Integrated Resource Plan filed with the Oregon Public Utility Commission.

Executive Order 20-04

Consistent with the minimum GHG reduction goals set forth in ORS 468A.205(1)(c), the Executive Order establishes science-based GHG emissions reduction goals and calls for the State of Oregon to reduce its GHG emissions (1) at least 45 percent below

[1] The Oregon Supreme Court recognized that the legislature intentionally omitted the more stringent alternative analysis test from the EFSC test. *Save Our Rural Oregon v. Energy Facility Siting Council*, 339 Or 353, 372 (2005).

1990 emissions levels by 2035; and (2) at least 80 percent below 1990 emissions levels by 2050. The order mandated state agencies, including the Oregon Department of Energy (ODOE), to exercise any and all authority and discretion vested in them by law to help facilitate Oregon's achievement of the GHG emissions reduction goals; prioritize and expedite any processes and procedures that could accelerate reductions in GHG emissions; and consider and integrate climate change, climate change impacts and the state's GHG emissions reductions goals into their planning, budget, investments, and policy making decisions.

Recognizing the urgency of, and the hurdles to, furthering Oregon's clean energy directives and goals, including the legally required mandates of HB 2021 and SB 1547, Governor Tina Kotek issued two executive orders: Executive Order 25-25 *Accelerating Wind and Solar Energy Development in Advance of Elimination of Federal Clean Energy Tax Credits* (EO 25-25), and Executive Order 25-29 *Reducing Greenhouse Gas Emissions and Advancing Oregon's Clean Energy Future* (EO 25-29). These executive orders make clear the priority of the State to support investment in clean energy infrastructure to support utilities' transition from fossil fuels to meet HB 2021 and SB 1547 requirements.

These executive orders make clear that ODOE and the Council need to take aggressive steps to recognize and give weight to Oregon's clean energy directives and goals.

The facility, as amended, directly furthers Oregon's clean energy directives and goals and there is concrete evidence the Council may rely on when making its decision, including the following:

- To identify the least-cost, least-risk portfolio of resources needed to meet our customers' current and future energy needs and state clean energy requirements as overseen by the Oregon Public Utility Commission, PGE engages in long-term integrated resource planning and public engagement, as required by the Oregon Public Utility Commission. PGE's Integrated Resource Plan (IRP) and Clean Energy Plan (CEP) model the utility's energy needs, customer demand, and path to compliance with all state energy and emissions requirements, including HB 2021 and SB 1547.
- In PGE's 2023 CEP/IRP[2]and 2025 updates to the CEP/IRP[3], PGE models and describes its strategy for making continuous progress toward emissions targets and meeting RPS requirements, by adding significant quantities of non-emitting resources like wind, solar, and batteries to meet growing customer electricity demand and replace fossil fuels in the electricity mix.
- In PGE's most recent Integrated Resource Plan update in July 2025, PGE identified a need to procure an additional 4,629 MW of clean energy resources. This represented an increase of 16% since PGE's prior IRP filed in 2023. For reference, PGE currently has 3,600 MW of generation on its system. These identified needs in PGE's 2023 IRP, which were acknowledged by the OPUC, require PGE to add

[2] Portland General Electric 2023 Clean Energy Plan and Integrated Resource Plan, June 30, 2023

[3] Portland General Electric 2023 Clean Energy Plan and Integrated Resource Plan Update, August 15, 2025

renewable energy resources at an unprecedented pace, while maintaining reliability and affordability for customers.

- Projects like the proposed addition of 125 MW solar and 125 MW storage at Biglow are critical contributions to this growing clean energy need.
- The ability to integrate renewable energy resources to serve Oregon retail customers is limited by the current transmission infrastructure. Projects must be sited where transmission is available to serve PGE loads in Oregon.
- Multiple studies and analyses have identified transmission constraints and permitting and siting as significant contributors to regional challenges in meeting growing energy demands, particularly with clean resources. Recent studies include preliminary results of the upcoming Ninth Northwest Regional Power Plan[4] by the Northwest Power and Conservation Council and Phase 1 of the Resource Adequacy and the Energy Transition in the Pacific Northwest Study by Energy and Environmental Economics, Inc. (E3)[5].
- Co-locating solar and wind power generation equipment at the BCWF site allows PGE to take advantage of the existing infrastructure on the site, like transmission lines and substations, and to reduce the overall impact to the land and to the environment. The addition of solar and battery at the BCWF site will help to optimize clean energy generation and delivery in support of PGE's growing electricity, clean energy and emissions reductions requirements.
- Adding solar capacity complements the existing wind capacity since wind and solar typically produce peak power production at different times of the day. This allows both renewable energy resources to work together to meet a broader range of our customers' energy needs, increasing PGE's overall system reliability and the value of the site overall to our customers.
- The addition of battery storage will also provide flexibility to the grid, allowing energy storage when demand is low and its use when demand is high. The right mix of energy resources in the right locations can help reduce reliance on fossil fuels and drive a cleaner, more affordable, and reliable energy resource mix.
- PGE has already made strong progress towards achieving the state's emissions targets, with an overall resource portfolio that is 45 percent non-emitting as of the close of 2024; this includes projects like the Biglow Canyon Wind Farm. The BCWF RFA4 will further PGE's progress toward meeting its 2030 state emission targets.
- The upcoming expiration of the federal clean energy tax credits will escalate the long-term cost of renewable energy and storage, threatening customer affordability and the pace of achieving the state's clean energy and economic development objectives. Therefore, the RFA4 is a timely request, and approval to amend the site certificate will allow the facility to move forward on a timeline that can capture the value of those existing federal tax credits while still available for PGE's customers, aligning with PGE's

[4] Northwest Power and Conservation Council Power Plan Update, January 6, 2026

[5] Summary of the 2025 Long-term Resource Adequacy Meeting, Washington Utilities and Transportation Commission and the Washington State Department of Commerce, November 19, 2025

and the state's focus on delivering affordable, reliable, and increasingly clean power while achieving the directives in EO 25-25 and EO 25-29.

- Consistent with PGE's 2023 IRP Action Plan, as acknowledged by the OPUC, PGE issued an all-source request for proposals (2023 RFP) to identify the least-cost, least-risk portfolio of resources that are needed to meet our customers' current and future energy needs, as well as state clean energy requirements. PGE's all-source request for proposals is a transparent, regulated, competitive process by which interested developers submit detailed project proposals for consideration as we plan to meet our customers' energy needs.
- The 1,600 megawatts of resources that PGE identified on the final short list of projects that resulted from our 2023 all-source request for proposals competitive bidding process, including the Biglow Solar Project, was acknowledged by the OPUC, and the projects were selected for their potential to deliver affordable, reliable, and cleaner energy.
- By selecting projects through this competitive process verified by an independent evaluator, PGE can add high-value, responsible projects that capture significant federal incentives and reduce costs while meeting the state's growing energy needs.
- Given the shortened timeline that now exists to capture tax credits, the importance of maintaining a project schedule is paramount. PGE has partnered with BrightNight to ensure responsible and timely delivery of this project that recognizes that this is a critical opportunity in time for Portland General customers, the state, and Sherman County. The certificate amendment will allow critical energy need and capacity to meet Oregon's economic development goals and the state's emission targets.

The Certificate Holder requests that Council acknowledge, for purposes of this Goal 3 exception analysis, that Oregon's clean energy directives and goals are furthered by this site certificate amendment.

Sincerely,



Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech
Kathleen Campanella, BrightNight



Portland General Electric

2023 Clean Energy Plan and Integrated Resource Plan Update

This document was updated on August 15, 2025 pursuant to an errata filing.

This document contains forward-looking statements, including those regarding implementation of our business plans, technology transitions, our business, strategies and financial performance, our offerings of new services, and other statements that are not historical fact, and actual results could differ materially from these forward-looking statements. Risk factors that could cause actual results to differ are set forth in the "Risk Factors" section, as well as other sections of our Annual Report on Form 10-K, available on our website at investors.portlandgeneral.com/financial information/sec-filings, as well as, or in addition to, other filings with the SEC. All forward-looking statements are based on management's estimates, projections, and assumptions as of the date of filing, and we undertake no obligation to update any such statements.

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This document is based on the best available information at the time it was prepared but is subject to change without notice.

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Integrated Resource Planning
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Introduction

Portland General Electric Company (PGE or Company) submits this 2023 Clean Energy Plan and Integrated Resource Plan Update to inform the Oregon Public Utility Commission (OPUC or Commission) of the Company's actions since acknowledgment of the 2023 Integrated Resource Plan (IRP). The OPUC's Order 24-096 acknowledged, with conditions, PGE's 2023 IRP on April 18, 2024. Additionally, the Commission directed PGE to update PGE's Clean Energy Plan (CEP) in PGE's subsequent CEP/IRP Update.

An IRP Update addresses specific inputs that may have changed since the most recent IRP was acknowledged, without attempting to fully revise the IRP. This IRP Update refreshes the analysis filed with the 2023 IRP and provides status reports on actions and requirements associated with the Commission Order.

PGE does not propose modification to the acknowledged 2023 IRP Action Plan and PGE is not requesting acknowledgement of the 2023 CEP/IRP Update. We continue to find that the recommended Action Plan is in the long-term interest of our customers, providing the best path forward to ensure system reliability and continued progress toward delivering a clean, affordable energy future for Oregon.

The 2023 IRP Action Plan proposed conducting one or more RFPs to meet the Company's carbon-free energy and capacity needs through 2028. Negotiations from PGE's 2023 RFP Final Shortlist are ongoing, and PGE has requested approval of the proposed 2025 RFP. Procuring resources through these solicitations will aid PGE's ongoing efforts to demonstrate continual progress for HB 2021 and will enable PGE to address the portfolio's forecasted reliability needs.

Reliability and affordability remain the foundation of PGE's role in supporting customers and Oregon's economy. The Company's CEP/IRP demonstrates how PGE can achieve our responsibilities to deliver affordable services for our customers while maintaining progress to meet HB 2021 emissions targets.

PGE recognizes the importance of stakeholder engagement and dialogue regarding the Company's resource plans. This Update has benefited from monthly participation in PGE's IRP roundtables since the acknowledgment of the 2023 IRP. PGE looks forward to continued engagement with the Commission and stakeholders in upcoming meetings and in response to the 2023 CEP/IRP Update as filed.

Chapter 1. CEP Update

1.1 Overview

House Bill (HB) 2021 is a transformative public policy that has set Portland General Electric (PGE) on a path toward decarbonizing the power supply for Oregon retail customers.[1] PGE has engaged in robust planning, analysis, stakeholder and community engagement to inform its approach to decarbonization and to demonstrate progress toward the specific greenhouse gas (GHG) emissions targets detailed in HB 2021. Throughout the planning process, PGE remains committed to balancing affordability for customers, the reliability of the grid, and emissions reduction.

The inaugural Clean Energy Plan (CEP), filed in 2023 with the Integrated Resource Plan (IRP) was an important first step in charting a course toward emissions targets in 2030, 2035 and 2040 that balances affordability and reliability for customers. PGE has furthered this work through the continued stakeholder and community engagement and monthly roundtables that have informed this Update. PGE will continue to learn and adapt strategies as customers' needs, the market, and technologies evolve.

This chapter summarizes the results of updated modeling and portfolio analysis which form the basis of this CEP Update and details the Company's progress toward HB 2021 emissions targets.

CEP Update: Key Highlights

- PGE is not requesting Oregon Public Utility Commission acknowledgement of this Update and maintains its Commission-acknowledged Action Plan.
- PGE continues to identify a significant need to procure non-emitting resources and capacity to keep pace with new customer demands, system reliability, and to make progress toward emissions targets.
- PGE is working to continue to reduce emissions and maintaining reliable service by replacing emitting generation and market purchases with non-emitting energy and capacity resources.
- Uncertainties regarding the ability to meet emissions targets at prices that are affordable for customers on the timelines specified by HB 2021 have grown, due to factors outside PGE and its customers' control. These factors include lengthy permitting and siting processes and likely changes to federal policies including tax incentives which are anticipated to significantly increase the costs of new clean resources and tariffs that impact supply-chain availability and costs.
- Transmission is a significant factor impacting the economics and timing of resource additions. Transmission solutions are integral to maintaining reliability and providing long-term pathways for decarbonized power supply. The constraints limiting transmission expansion will drive a greater role for customer-sited

[1] House Bill (HB) 2021 codified as ORS 469A.400 to 469A.475, effective 09/25/2021.

resources such as demand response (DR), energy efficiency (EE), distributed solar/storage and community-based renewable energy (CBRE) resources, highlighting the importance of PGE's efforts to improve utilization of these resources through a virtual power plant (VPP).

- Updated analysis, based on what is currently known, finds 2030 emissions targets can be met by technologies and resources that are currently known and commercially available, though costs have increased and the timing of resource additions may be constrained based on what is commercially available in the market. While the costs presented as part of this modeling exercise do not represent actual changes to customer prices, the analysis is suggestive that, on a planning basis, system costs are likely to increase significantly in order to comply with HB 2021.
- Decarbonization pathways to 2040 will require further technological advancement of non-emitting resources and transmission to meet the region's energy and capacity needs.

PGE must continue to operate its existing portfolio efficiently and seek to procure the best combination of resources that balances costs, risks and maintains safe and reliable service for customers. As detailed in the inaugural Clean Energy Plan, decarbonizing PGE customer's power supply will require resource acquisition and integration at a significant pace and scale. The planning environment has evolved significantly since the original filing. Some of the planning changes, including changes to federal policy, resource cost increases, significant industrial load growth, and long-lead time for transmission expansion, all present challenges to the pace and affordability of PGE's path to emissions targets. Other changes to the planning environment, including progress on regional energy market development, regional resource adequacy sharing frameworks, and active state policy regarding large industrial customers and fair cost allocation provide important tools for PGE to most efficiently meet PGE customers resource needs at the lowest cost possible. External factors that affect critical dependencies are further described in **Section 1.5**.

Electricity is a critical service for local communities and the economy. Customers already rely on the utility for their essential electricity needs. Looking to the future, customer reliance on electricity will increase as they electrify their vehicles, homes and businesses. Our local industrial customers, who are advancing national interest through pursuit of advanced semi-conductor manufacturing, information technologies and artificial intelligence capabilities, need abundant and reliable service. Working to serve this industrial growth with fair cost allocation supports our local economy and has the opportunity to lower the average cost of service. Providing electrical service for all of PGE's customers with increasingly fewer emissions will require significant new investment in energy resources and distribution and transmission infrastructure to prepare for the smart, clean energy grid of the future. While PGE faces some significant changes in the planning environment, PGE's commitment to energy access, affordability, and an increasingly non-emitting electricity supply is steadfast.

PGE will continue to actively manage costs for customers throughout the transition to an energy mix while working to reduce emissions. This includes careful and inclusive planning through

PGE's Clean Energy Plan, Integrated Resource Plan, and Distribution System Plan processes, competitive procurement through Requests for Proposals (RFPs) for resources, joining the California Independent System Operator's (CAISO) Extended Day-Ahead Market (EDAM), as well as continuous efforts to improve operational efficiency, safety, and system and equipment reliability. PGE has actively pursued federal and state grant funding and tax credit opportunities to offset investment costs and support key decarbonization initiatives on behalf of customers, including infrastructure upgrades, though the future of many of those programs and grants is now in jeopardy due to the change in federal policy. PGE also supports efforts to connect customers with the unprecedented federal tax incentives and rebates available, ranging from electric vehicles to heat pumps to rooftop solar. PGE will continue to leverage available tools to prioritize affordability. Some recent examples are further described in **Section 1.4.1 Annual goals**.

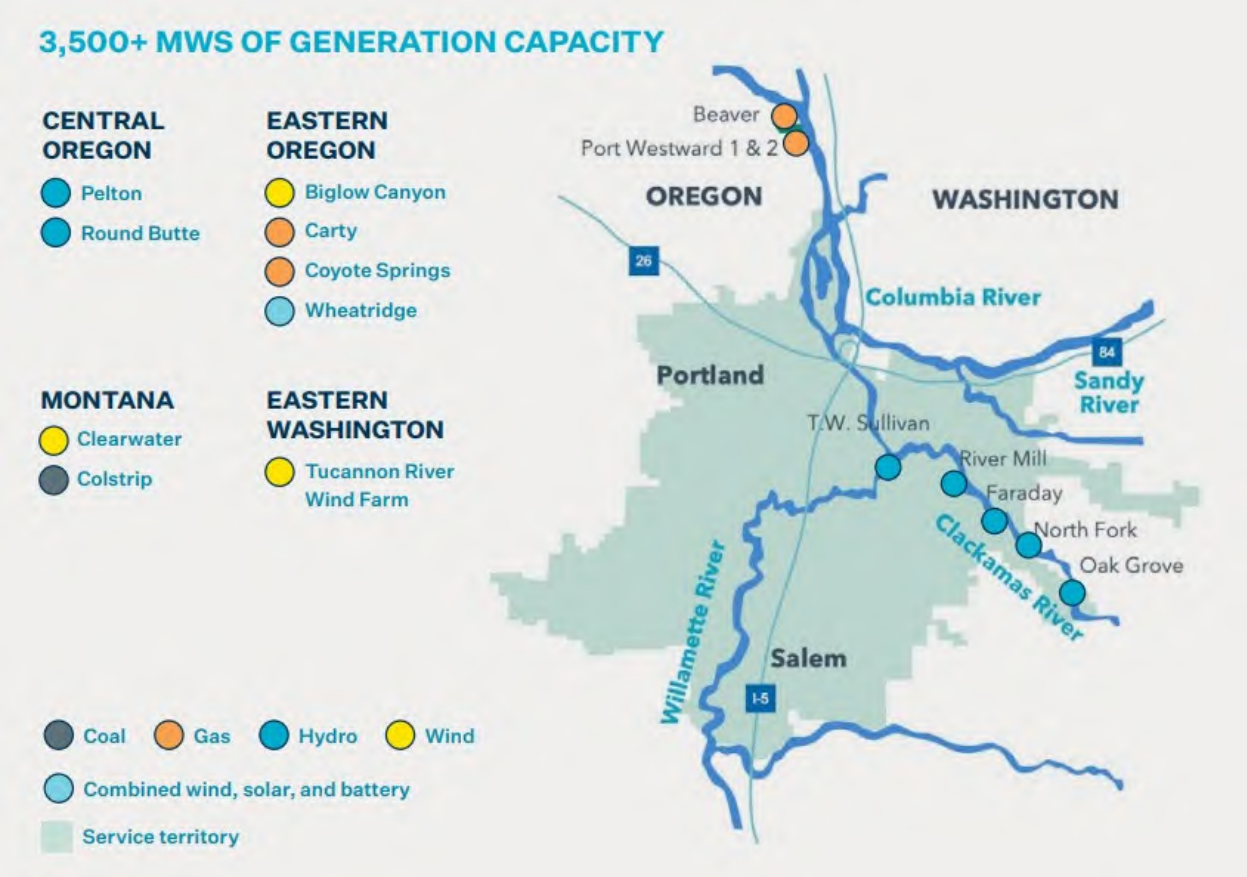
1.2 Historical emissions trends and resource mix

PGE customers include some of the world's most sophisticated corporate renewable energy buyers and local municipalities with ambitious climate action goals. Portland, Beaverton, Multnomah County, Hillsboro, Salem and many other municipalities have developed climate action plans that encourage finding new and innovative ways to reduce the carbon intensity of electricity service, while also supporting electrification efforts, fostering economic development and modernizing the grid to enhance resilience to extreme weather. Many companies in PGE's service territory have publicly adopted ambitious clean energy or emissions goals, including Oregon Health and Science University, Nike, Intel, STACK Infrastructure, Daimler and others. As large electricity buyers, they look to PGE to support their decarbonization efforts.

PGE supports customers' climate and sustainability goals by decarbonizing the electricity supply and offering innovative voluntary programs that enable customers to go further and faster. PGE offers programs for large businesses, cities and counties that match their electricity needs with new renewable energy facilities in the region. Convenient options are also available for small business and residential customers to support clean energy development by purchasing renewable energy certificates from energy generation throughout the U.S. In 2021, PGE became the first utility in North America to sign The Climate Pledge to achieve net zero emissions across company operations (Scope 1, 2 and 3 emissions) by 2040, ten years ahead of the United Nations' Paris Agreement. PGE then collaborated with state lawmakers and stakeholders to pass Oregon's 100 percent Clean Electricity Law (HB 2021) to establish emissions targets for electric utilities in Oregon.

PGE meets the growing clean energy demands of customers with a diverse mix of generation facilities shown in **Figure 1**, owned in whole or in part, or through contract. Today, PGE's generation portfolio consists of seven hydroelectric facilities, five natural gas facilities, three wind facilities, one combined wind/solar/ battery facility and a partial ownership stake in an out-of-state coal facility. PGE previously announced the acquisition of 475 MW of new battery storage projects, of which 275 MW achieved commercial operations in December 2024 with the remaining 200 MW scheduled for service in mid-2025.

Figure 1. PGE generation portfolio



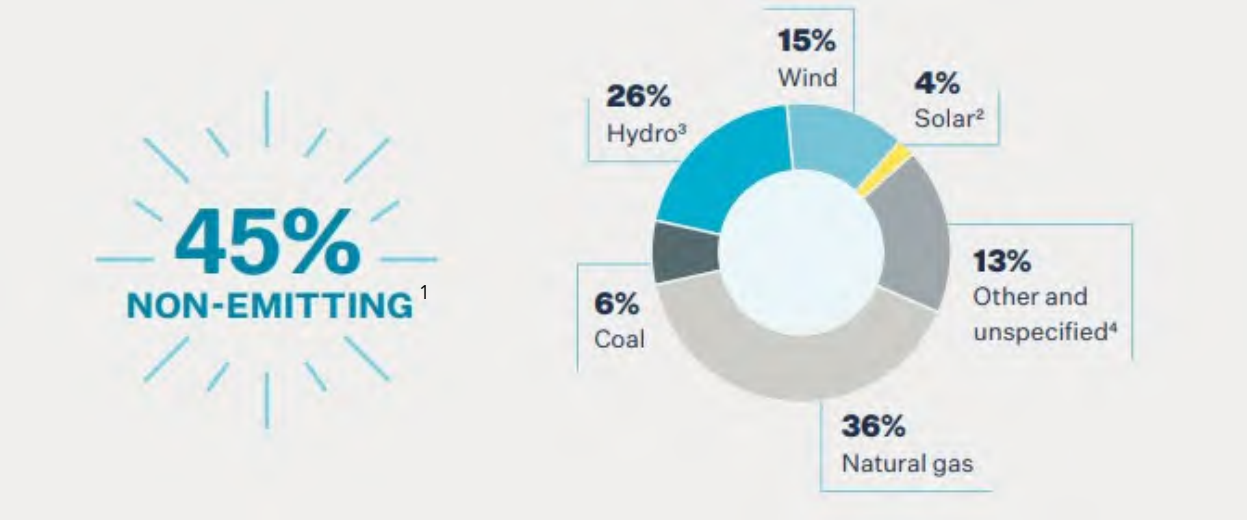
Customer-sited resources, including rooftop solar, batteries and standby generation play an increasingly critical role in the resource portfolio. For example, customer-sited rooftop solar generation contributed an additional 264,826 MWh of non-emitting energy in PGE service territory in 2024. PGE manages the output of owned power plants in conjunction with available power supplies on the wholesale market to deliver power to customers at the lowest possible price. PGE actively coordinates with transmission providers like the Bonneville Power Administration and other utilities and energy suppliers across the region, to secure transmission access and additional power on contract for customers. PGE also owns major transmission rights to the Pacific Intertie and participates in the CAISO Energy Imbalance Market (EIM) and the soon-to-be established EDAM. These options provide additional flexibility to buy and sell power and to access a more diverse and increasingly clean mix of generating resources.

In 2024, PGE made strong progress toward advancing a resource mix for total system load that is increasingly clean. The percentage of total load comprised by non-emitting resources grew from 35 percent in 2023 to 45 percent in 2024. As a result, the carbon intensity of the total power supply declined to 0.27 MMTCO2e per MWh in 2024, despite load growth. While natural gas remains the largest component of the generating mix and provides much-needed capacity to meet resource adequacy and reliability requirements – hydropower, wind and utility-scale solar continue to grow on the system, in addition to customer sited renewable energy resources like rooftop solar. Wind output alone grew by 56 percent, reaching record breaking levels of wind

generation on the system in 2024 primarily due to the addition of the Clearwater Wind facility in Montana. Not only does this facility have a high energy output rate, but it also generates power when other wind resources closer to home in Oregon and Washington are less productive. This exemplifies the importance of resource diversity in the portfolio – and is a critical decarbonization strategy.

Unspecified emissions are reported as part of annual GHG reporting to the Oregon Department of Environmental Quality (ODEQ) when the underlying source of generation for energy purchased from the market, including from CAISO's Energy Imbalance Market, is unknown or not otherwise specified in a contract. Following best practice and ODEQ rules, an emissions rate is assigned to unspecified purchases in recognition that the power pool in Western states still includes fossil fuel generation. Throughout 2024, PGE reduced emissions from unspecified sources, from 16 percent of the resource mix in 2023 to 14 percent in 2024. As Western states decarbonize and energy markets such as CAISO adopt more precise mechanisms for tracking and reporting the carbon content of resources dispatched and allocated through energy markets, emissions associated with unspecified purchases should continue to decline. **Figure 2** summarizes PGE's total system resource mix for 2024.

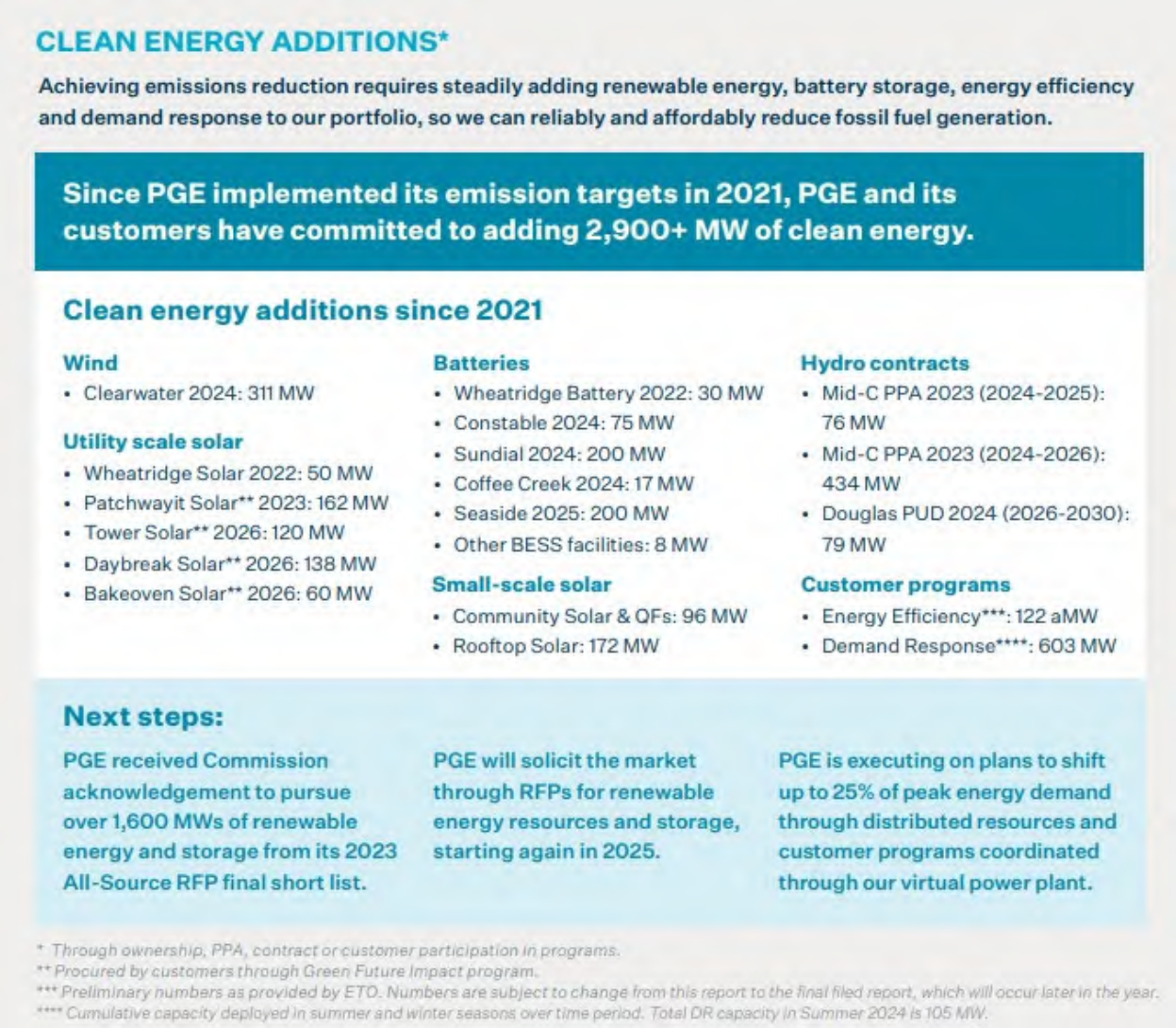
Figure 2. PGE total system resource mix



1. Percentages above represent 2024 resource mix from PGE's total load, inclusive of wholesale volumes.
2. Represents owned and contracted solar resources, does not include the 264,826 MWh of customer owned rooftop resources.
3. Hydro amounts include purchases from Bonneville Power Administration, which may have an immaterial amount of emissions associated with them, per ODEQ rules.
4. Unspecified is purchased power for which a specific generating resource is not defined and could be any of the generation types (e.g., wind, hydro, gas)

PGE recently concluded the largest open-application request for proposal (RFP) for clean energy resources to augment the portfolio to date and has applied to return to the market with another RFP in 2025. This and subsequent RFPs will be necessary to meet customers' energy needs and work towards PGE's emissions targets. PGE's steady progress in procuring clean energy and investing in grid-edge technologies and customer programs will reduce reliance on fossil fuels and drive a cleaner resource mix in the coming years. Additions since 2021 are shown in in **Figure 3**.

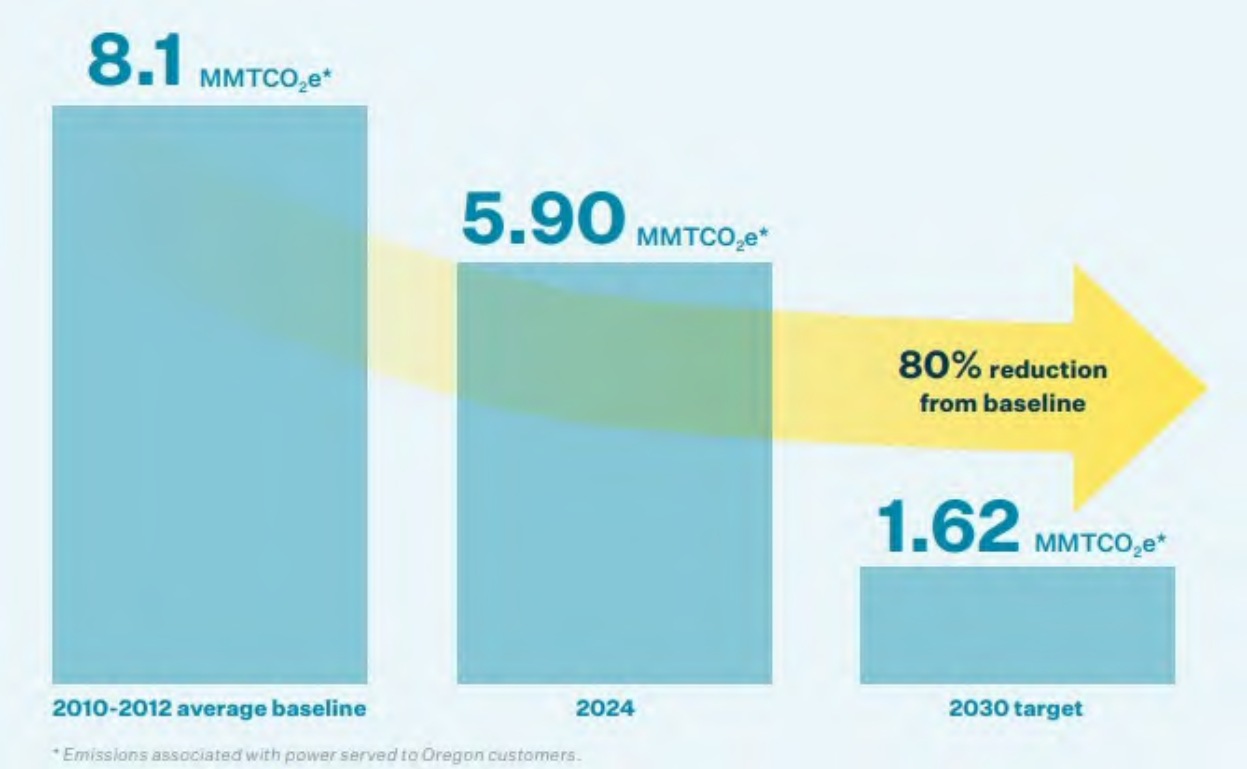
Figure 3. Clean Energy Additions



As shown in **Figure 4**, preliminary estimates subject to ODEQ final approval of emissions associated with power served to Oregon customers in 2024 equated to approximately 5.90 million metric tons of CO_2e.[2] This is a 10 percent decrease in retail emissions reported in 2023, largely driven by additional hydropower and the addition of the Clearwater Wind facility. It also represents a 27 percent reduction in baseline emissions established for HB 2021 compliance.

[2] The 2024 emissions estimate is preliminary pending reporting and third-party verification, as required by the Oregon Department of Environmental Quality (ODEQ).

Figure 4. 2024 GHG emissions in context



Like most utilities, PGE's emissions are driven by the fossil fuels combusted to generate electricity. PGE is actively planning and executing strategies for a balanced transition from thermal generation to increasingly cleaner generation sources while providing reliable energy service that can affordably meet customers' energy needs. Year-to-year variations in reported emissions may be driven by changes in economic factors that affect load or changes in weather that affect hydro conditions, renewable capacity and peak energy needs, that are increasingly hard to forecast. This is discussed further in **Section 1.4.2 GHG emissions**.

Achieving emissions reduction requires steadily adding, to the extent available, renewable energy, battery storage, energy efficiency and demand response to the portfolio to reliably and affordably reduce fossil fuel generation. Customer-sited resources, including rooftop solar, batteries and standby generation play an increasingly critical role in the overall resource portfolio as PGE decarbonizes.

In 2023, PGE published its combined Clean Energy Plan and Integrated Resource Plan, a twenty-year roadmap for meeting customer energy needs at the lowest possible costs while transitioning from fossil fuel generation. PGE demonstrated a potential path toward the 80 percent emissions reduction target in 2030 that involves resources and technologies that are economically and technically feasible in the region today. No single technology right now can replace the role of natural gas generation in the electric power system. Clean energy of all types – including customer rooftop solar generation, community-scale microgrids that combine batteries and solar, utility-scale wind, batteries – energy efficiency and demand response

programs and customer dispatchable standby generation will all be needed to replace the energy and backstop capacity that natural gas currently provides. Looking ahead to deeper decarbonization targets in 2035 and beyond, PGE anticipates the need for access to a broader geographic diversity of resources and technologies to replace fossil fuels on the grid. This will require solutions to current regional transmission constraints and adopting future non-emitting technologies as they become cost-effective. This could include green hydrogen, offshore wind, nuclear, long-duration storage and carbon capture and storage.

When the Legislature passed HB 2021 in 2021, PGE was anticipating flat to minimal load growth, consistent with trends for the electric sector across the country. Since the passage of HB 2021, PGE and the region are forecasting significant industrial load growth, led primarily by the expansion of data centers, AI technologies, and advanced manufacturing. HB 2021 targets are absolute emissions targets, not carbon intensity targets, and are unforgiving of the load growth forecasted for the region and PGE's service territory.

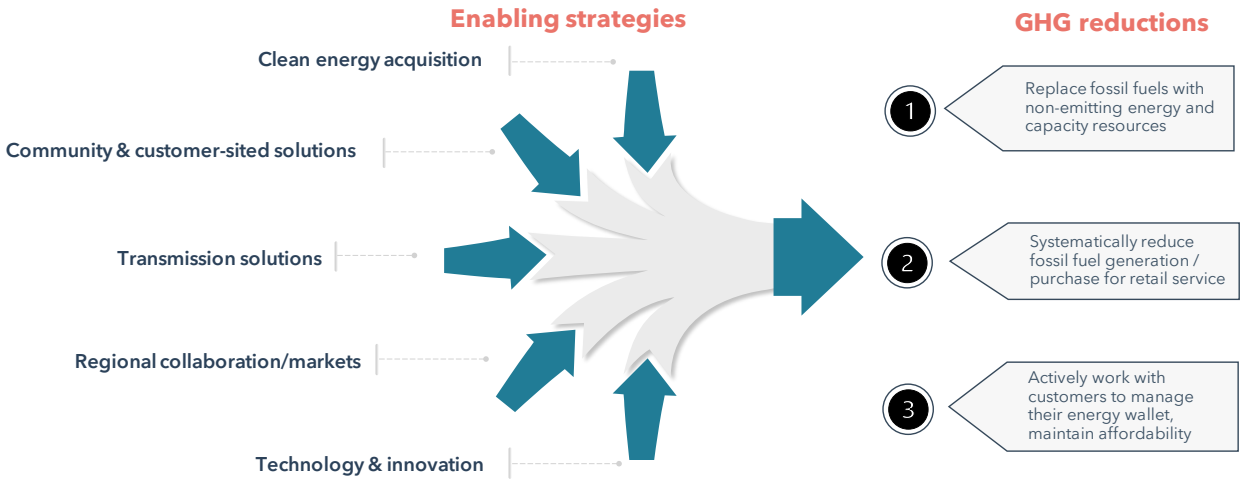
This CEP/IRP Update reflects a significant increase in need for procurement of new generation and storage capacity to keep pace with new customer demand as well as to make progress toward emissions targets. The utility is also considering ways to allocate relevant costs fairly to customers that have a high demand for electricity, such as new data centers. Mitigating residential and small commercial customer price impacts and maintaining reliability are core priorities as PGE decarbonizes its power supply while keeping all customer prices as low as possible.

PGE's decarbonization planning centers on customers' needs and investments in new non-emitting resources and the grid that make progress toward the HB 2021 emissions targets for 2030, 2035 and 2040. At the highest level, the approach to reducing emissions involves:

- Increasing purchase and integration of non-emitting energy and capacity resources.
- Systematically reducing the generation and purchase of fossil fuels for Oregon retail customer load.
- Actively working with customers to help them manage their energy use and total energy expenditures.

This approach is bolstered with key, enabling strategies to be able to deliver a reliable, affordable, clean energy supply, displayed in **Figure 5**.

Figure 5. Decarbonization strategies



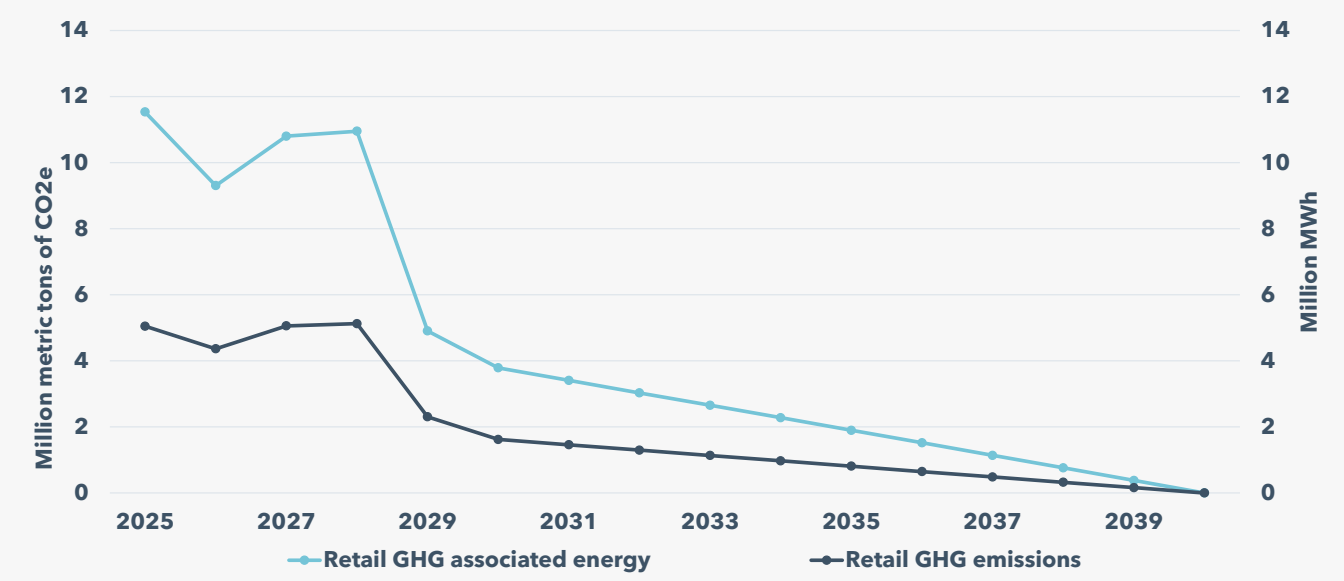
This high-level approach to decarbonization involves gradually reducing fossil fuel generation and purchases for Oregon retail customers and replacing it with non-emitting energy resources and capacity, as well as key enabling strategies to facilitate a reliable and affordable transition. The IRP estimates PGE's energy and capacity needs subject to HB 2021 emissions constraints. It creates a Preferred Portfolio of resources to meet those needs and details an Action Plan to guide the company's procurement and related resource actions over the next 2-4 years.

1.3 Pathways to emissions targets

One of the CEP's primary objectives is to detail a path to compliance with the HB 2021 targets. It shows that the Preferred Portfolio and Action Plan that PGE has developed in its IRP are consistent with steps the company could take in the near-term to make progress toward the emissions targets in 2030, 2035 and 2040, according to the best methods available at the time of analysis. Moreover, the CEP describes how the company will demonstrate continual progress toward those targets. This section summarizes how strategies to decarbonize, resource needs and the Action Plan inform a path to the emissions targets that balance affordability and reliability for customers.

Updated data and analysis described in **Section 3.5.1 HB 2021** result in an updated emission reduction glidepath also presented here in **Figure 6**.

Figure 6. GHG emissions and energy associated with serving Oregon retail load (Reference Case)



PGE's glidepath identifies expected thermal generation and market purchases with associated emissions retained for retail load. Since the 2023 CEP/IRP, PGE has updated the earliest available resource addition year to 2029. This means that while PGE continues to add customer sited non-emitting resources like distributed solar in every year, large utility scale projects are assumed unavailable for addition until the beginning of 2029 due to the considerable time required to procure and construct such resources. One important exception is the assumed addition of solar and storage resources that PGE is working to acquire through the 2023 RFP. While 2023 RFP procurement is not yet finalized, PGE forecasts for this CEP proxy resources shown in **Table 1**, added to the portfolio on January 1, 2028. This is further described in **Chapter 5 Resource options** and **Chapter 6 Resource plan**.

PGE is planning for accelerated procurement through RFPs between now and 2030. PGE has initiated the regulatory process in 2025 to conduct an RFP, which is expected to continue to seek non-emitting resources to meet needs that remain after the 2023 RFP process has concluded. PGE aims to issue this 2025 RFP to market over the summer, with negotiations likely in winter 2026 and possible resource online dates from 2029 to 2032. However, actual procurement from this 2025 RFP is yet unknown and therefore not included in this analysis.

Additional programs are offered by PGE to acquire clean energy outside the RFP processes. For example, the Green Future Impact program enables interested businesses and cities to drive procurement of new renewable energy facilities to directly support their load needs.

Progress toward the HB 2021 emissions targets will require investment and be driven by integrating additional non-emitting resources into PGE's system. The Preferred Portfolio represents the best set of incremental resource additions that balance cost and risk for customers while making progress toward HB 2021 emissions targets. External factors will challenge the pace and scale of PGE's transformation, but ultimately, resource acquisition can

enable the replacement fossil fuel generation and purchases with non-emitting alternatives to support emissions reductions toward HB 2021 targets. Beyond achieving emissions reductions, new large loads, reliability needs, and broader economic trends also impact costs.

PGE seeks to acquire and integrate non-emitting resources, resulting in declining reported emissions associated with serving retail load, under average weather and other conditions. The realities of market procurement, transmission and system integration may lead to step-changes in resources becoming available to PGE customers, resulting in non-linear emissions reductions into the future toward the HB 2021 targets. Work to further develop the virtual power plant (VPP) to enhance utilization of distributed energy resources (DERs) and community-based renewable energy (CBRE) resources will also continue in parallel over this time frame.

Figure 7 details the incremental resource actions by year between now and 2035. The figure also includes PGE's existing portfolio of resources, including proxy assumptions for the 2023 RFP (actual procurement not yet known), and declining GHG-emitting energy retained to serve retail load.

Figure 7. Preferred Portfolio resource pathway through 2035

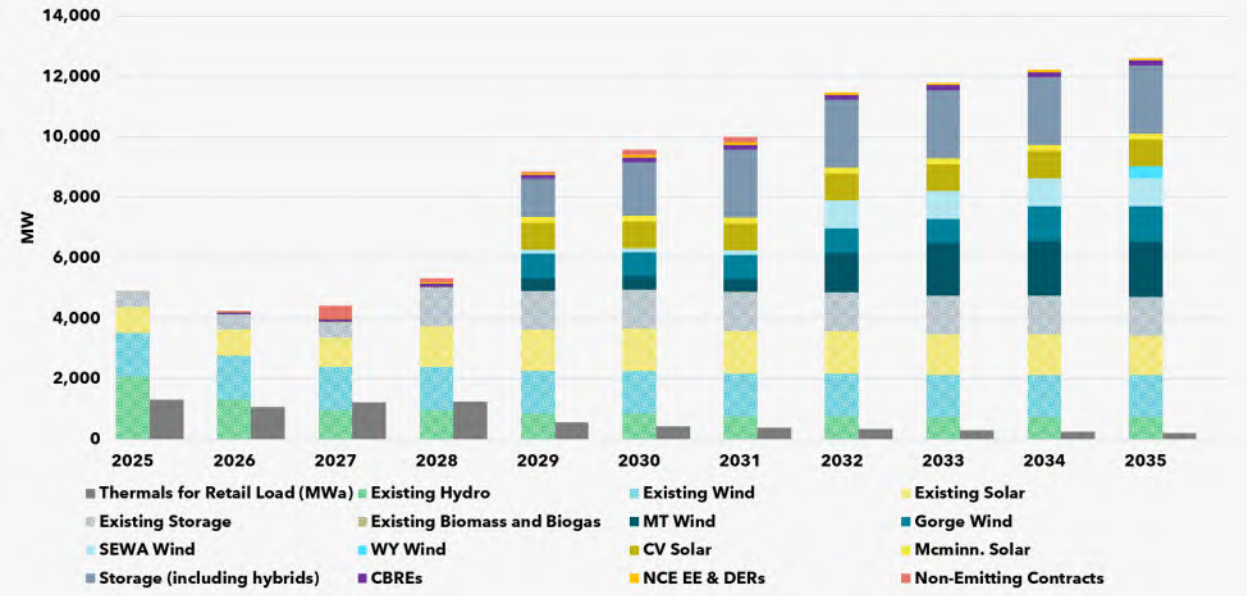


Figure 8 shows the Preferred Portfolio incremental resource additions through 2030 along with changes to PGE's existing portfolio of resources for a view of total generating capacity. The capacity of existing thermals shown in **Figure 8** does not reflect emissions target-driven reductions in emitting energy retained for retail load. After accounting for changes (reductions) to the existing mix, total capacity in the portfolio grows by roughly 1.5x in these five years to add sufficient capacity to maintain resource adequacy in light of forecasted load growth with a focus on clean energy to also meet the 2030 HB 2021 emissions target. Most of these resources are added in the model in 2029, as shown in **Figure 7** and **Table 1**, though external factors such as transmission access and RFP procurement processes and associated timelines continue to be significant factors impacting the economics and timing of actual changes to PGE's system.

Figure 8. Total resource changes from 2025 to 2030

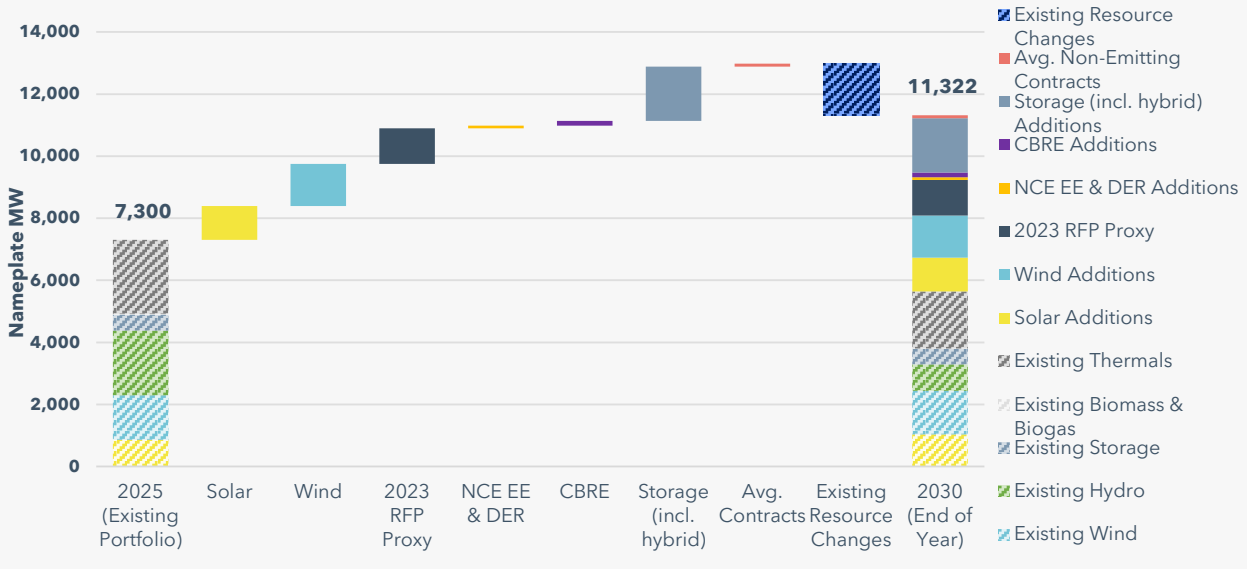


Table 1 provides a summary of total resource actions from 2025 through 2030 as cumulative buildout within this timeframe. The analysis demonstrates the ability to meet the 2030 target using resources that are currently known and have been commercially available. Between now and 2030, PGE's thermal fleet is assumed to dispatch economically, as it does presently, to meet resource adequacy and cost-minimization for PGE's customers and the region.

Table 1. Cumulative resource buildout of the Preferred Portfolio 2026-2030 (MW)

Resource	2026	2027	2028	2029	2030
Wind	0	0	0	1362	1362
Solar (including hybrids)	0	0	0	1089	1089
Storage (including hybrids)	0	0	0	1250	1750
CBREs	66	85	110	133	155
NCE EE (MWa)	0	21	38	58	68
NCE DERs	3	8	12	13	15
Transmission	0	0	0	0	0
Non-Emitting Contracts	16	422	120	33	190
Cost-effective EE (MWa)	104	138	173	208	245
Cost-effective DR	142	172	199	225	248
2023 RFP Proxy Solar (incl. hybrids)	0	0	375	375	375
2023 RFP Proxy Storage (incl. hybrids)	0	0	775	775	775

As PGE adds non-emitting energy and capacity resources, it anticipates systematically reducing the amount of thermal output from natural gas and coal for Oregon retail load to meet emissions targets (see **Figure 27**).

The market for thermal generation is increasingly constrained across the West, with clean energy or GHG requirements in place in almost every state in the Western Interconnect. Thermal generation sold into the Western Interconnect may be subject to the GHG or clean energy requirements of other states. For example, fossil fuel energy exported to California and Washington incurs direct carbon pricing obligations. Public policies such as these, and the massive buildout of non-emitting resources anticipated across the region, lowers economically dispatched thermal output in forward modeling post-2030.

Two key planning needs become apparent when looking beyond 2030 to the 90 percent emissions reduction requirement in 2035 and the zero-emission requirement by 2040. First, there is a need for additional dispatchable non-emitting resources to be developed and available to us in the region to meet resource adequacy needs. In this analysis, the model leverages transmission to access proxy non-emitting resources from around the West to meet reliability needs that increase after 2030 (see **Table 30**). Second, part of the capacity needs leading into 2040 could potentially be offset by existing thermal plants if they were to transition to non-emitting fuels or carbon capture by 2040. It is possible that if supplies become commercially available sooner, PGE's thermal fleet could combust hydrogen or an alternative low-carbon fuel sooner. Almost all of PGE's existing thermal fleet is capable of combusting a blend of hydrogen or renewable natural gas. Informed by least-cost and least-risk planning, the current Preferred Portfolio relies on new non-emitting resources rather than changes at existing thermal plants to reduce emissions.

As described in **Chapter 6 Resource plan**, IRP portfolio analysis determines the best combinations of resource technologies and quantities to meet energy and capacity needs under different scenarios. This informs the creation of the Preferred Portfolio, the company's Action Plan, and a path to HB 2021 emissions targets. The insights gleaned from the construction and comparison of different portfolios informed the creation of PGE's Preferred Portfolio and a balanced path to HB 2021 emissions targets, specifically finding that:

- On a planning basis, system costs are likely to increase in order to reliably meet load growth as well as to comply with HB 2021.
- External factors such as federal policy changes, transmission access, and RFP procurement processes and associated timelines continue to be significant factors impacting the economics and timing of non-emitting resource additions to PGE's system.
- Regional coordination is important for managing costs, as indicated by the portfolio sensitivity analyses focused on resource adequacy and non-emitting market purchases.

PGE's 2023 CEP/IRP Action Plan remains robust, and therefore, PGE is not requesting modifications or seeking acknowledgment of this Update. Updated analysis described throughout this report suggests resource need has increased, driven mainly by growing demand and the need to maintain resource adequacy. The Action Plan referenced in **Chapter 7** remains the best set of near-term resource options for the company to consider in reliably building towards HB 2021's emissions targets while minimizing costs. With uncertainties in the planning

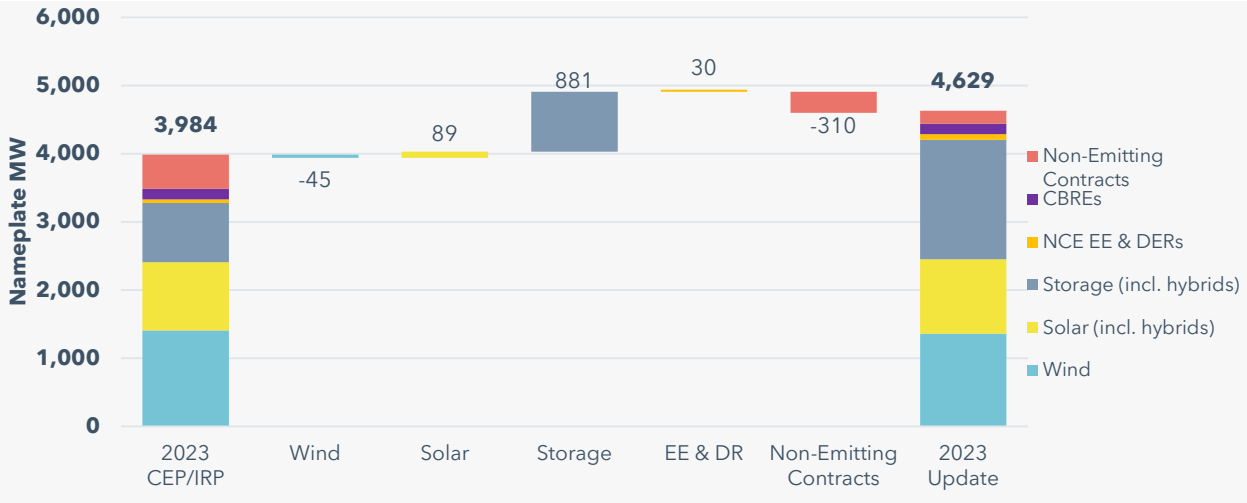
environment, rapidly changing policy landscape, and results of current and future procurement processes, the Action Plan will be reviewed and refined in the 2026 IRP.

1.4 Progress in the CEP Update

This Update includes a range of model assumption refinements aimed at refreshing PGE's planning analytics and incorporating feedback and staff direction from LC 80 Order 24-096. Some key refinements to analysis include changes to supply-side resource costs and options, electricity price forecast, capacity contribution values, and significant developments in transmission planning.

These changes lead to important implications for resource planning further described in this report. For example, updated resource economic assumptions show significantly higher prices in some years, affecting the evaluation and selection of resources in portfolio analysis. The reduced capacity contribution of storage resources (particularly in winter) highlights a critical planning challenge regarding the interaction between storage and energy resources in a system with growing demand and thus energy deficits. Refinements to transmission options included in modeling now reflect more realistic estimates of project timelines, achievable capacity, and market access benefits. These changes highlight the growing urgency of PGE's transmission needs as the company works toward decarbonization goals while facing anticipated increasing load growth and system constraints. **Figure 9** compares the resource additions in the updated Preferred Portfolio to data presented in the 2023 CEP/IRP for model year 2030. Growing demand and updates to supply-side resource costs are main drivers in the differences of model additions, which is broken out by resource type.

Figure 9. Cumulative resource additions through 2030 in the updated Preferred Portfolio compared to 2023 CEP/IRP



As the forward-looking planning environment evolves, PGE is still able to demonstrate measurable impacts and progress across the same metrics that were presented in the 2023

CEP.[3] PGE will measure progress toward HB 2021 emissions targets in a variety of ways, such as in megawatts of non-emitting resources added to the system, in addition to tons of emissions reductions. Measuring progress with multiple metrics is important for two key reasons. First, emissions reductions are predicated on adding non-emitting resources and capacity to reduce thermal generation and purchases for meeting load and resource adequacy requirements. Second, emissions associated with retail sales reported to ODEQ between now and 2030 will exhibit year-to year variation, due to factors like weather that impacts hydro conditions, renewable capacity and peak loads or other events that the utility could not reasonably forecast or control.

1.4.1 Annual goals

HB 2021 does not explicitly set GHG limits for years prior to 2030. ORS 469A.415 (4)(e) states that electric utilities, like PGE, must demonstrate continual progress towards meeting clean energy targets in a Clean Energy Plan (CEP). HB 2021 did not define progress as actual annual emissions reductions. PGE interprets this progress as planned actions to gradually replace fossil fuel resources with non-emitting ones, aiming to meet the 2030, 2035, and 2040 emissions targets. Concurrently with the IRP Action Plan, PGE's decarbonization strategy is multi-faceted to support reliable and affordable power through clean energy procurement, customer-sited solutions, technology and innovation, and regional solutions to resource adequacy.

Since the 2023 CEP/IRP, PGE has continued to make progress in acquiring clean energy resources and investing in advanced grid technologies and customer programs to reduce reliance on fossil fuels and meet future emissions targets.

On customer programs, 122 MWa have been saved from energy efficiency measures since 2021. Demand response capacity totaled 105 MW in 2024. Customer actions reduced record load by more than 90 MW at the hottest time of the day during an August 2023 heat wave, avoiding outages and increasingly volatile power market purchases during extreme weather events. PGE is executing on plans to shift up to 25 percent of peak energy demand through resources including distributed resources and customer programs coordinated through the virtual power plant. Additionally, customer-sited rooftop solar additions increased in 2023 and 2024.

Importantly, PGE is conducting a request for offers (RFO) for CBRE resources, informed by engagement with and input from community representatives, PGE's CBIAG, potential bidders, and Oregon Public Utility Commission (OPUC) Staff. Since CBRE is a new type of resource acquisition, PGE has been providing information and exploring appropriate regulatory treatment through regular updates to OPUC Staff. The RFO is open through November, with three rounds of evaluation. More details and results anticipated in 2026.

PGE has also expanded utility-scale clean energy and capacity resources. In part due to the 2021 RFP, PGE expanded the resource and geographic diversity of the non-emitting resource portfolio

[3] In the Matter of Public Utility Commission of Oregon, House Bill 2021 Investigation into Clean Energy Plans, Docket No. UM 2225, Order No. 22-390 (Oct 25, 2022), Attachment #1 at Topic #8, available at https://apps.puc.state.or.us/orders/2022ords/22-390.pdf.

when the 311 MW Clearwater Wind facility in Montana began generating test energy in 2023, coming fully online in early 2024. PGE procured 492 MW of new battery storage in 2024, the largest acquisition by a utility outside of California, including the 75 MW Constable Battery Energy Storage System. PGE also executed, renewed and extended three cooperative agreements for hydropower from regional public utility districts, included here as part of the baseline portfolio. In November 2024, the OPUC acknowledged the shortlist of projects from a 2023 RFP that was filed shortly after the 2023 CEP.[4] PGE ranked the final shortlist of up to 1,600 MWs of renewable energy into two groups, prioritized based on performance in the scoring evaluation, representing the optimal intersection of value to customers at least-cost and least-risk. A follow-on RFP has been initiated in 2025 to continue to address needs.

PGE continues to investigate transmission actions, a critical need to meet growing demand, maintain system reliability, and further support decarbonization while balancing costs and risks. In late 2023, PGE and the Confederated Tribes of Warm Springs (CTWS) received a $250 million grant from the U.S. Department of Energy (DOE) to enhance the Bethel-Round Butte line and support imported power. PGE broadly continues to leverage federal, state, and local funds to support clean energy and efficiency initiatives. For example, PGE is currently working with the City of Portland and $40,000 in grant funding for installing electric vehicle chargers. Other avenues to help lower costs and increase system reliability are also moving forward. In 2024, PGE announced its intent to join the California Independent System Operator's (CAISO) Extended Day-Ahead Market (EDAM), expected to begin operations in 2026. Participation will provide access to more clean energy resources from across the West.

PGE's 2024 Environmental, Social and Governance Report shares further information about the company's commitment to sustainability along with information about strategic projects that illustrate progress in advancing a sustainable future and commitment to the community. To read the full 2024 Report, "Advancing Toward a Clean Energy Future," visit www.portlandgeneral.com/sustainability.

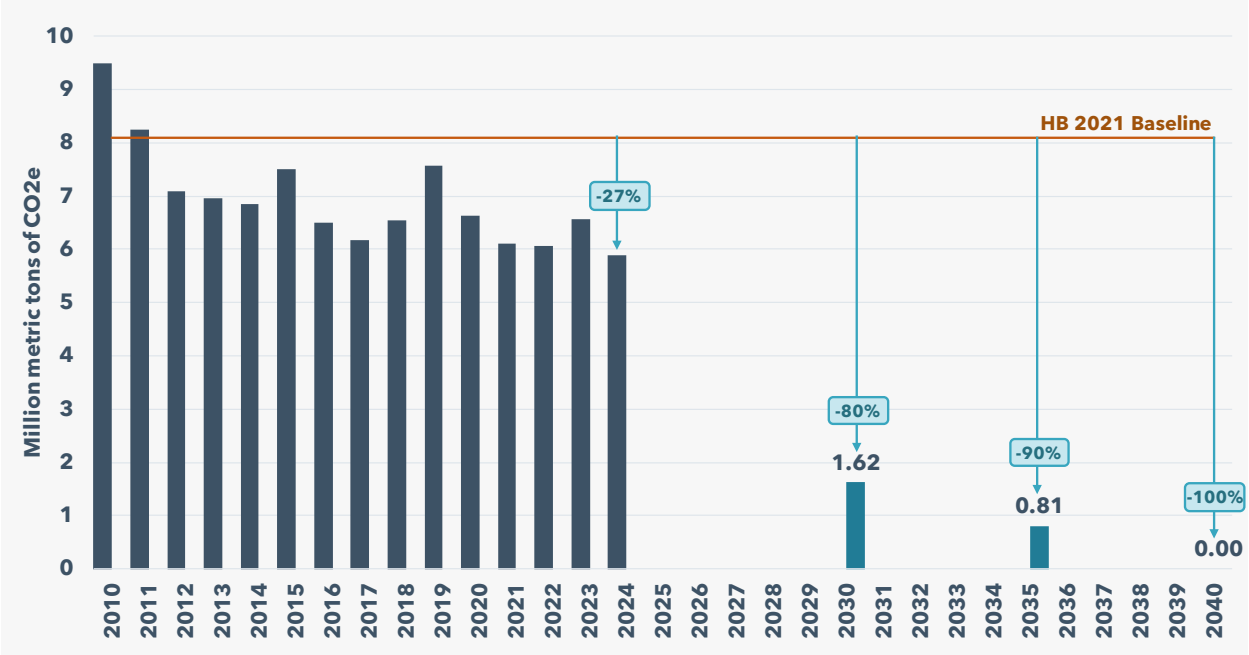
To examine the optimal progress toward the 2030 emissions target in portfolio analysis, PGE analyzed various GHG glidepaths in the 2023 CEP/IRP. Ultimately, the Preferred Portfolio that informed the Action Plan was constructed in a way that minimized the costs and risk of new resource acquisitions and maximized the provision of community benefits by thoroughly investigating key decision points with the potential to impact costs. This included selecting a linear GHG-emissions reduction pathway that met HB 2021 requirements while mitigating costs relative to more aggressive pathways and reducing risks compared to less-aggressive pathways. Choices that minimize cost or risk were also made regarding additional DERs, the inclusion of CBRE resources and opportunities to expand transmission availability. For more information, see Chapter 11 Portfolio analysis in the 2023 CEP/IRP.

[4] In the Matter of Public Utility Commission of Oregon, PGE Request for Waiver of 2023 RFP Process, Docket No. UM 2274, Order No. 24-425 (Nov 25, 2024), available at https://apps.puc.state.or.us/orders/2024ords/24-425.pdf.

1.4.2 GHG emissions

GHG emissions from generation and power purchases fluctuate year to year, often due to variations in economic conditions, temperature, wind/solar conditions, water conditions and other external factors. For example, higher-than-expected temperatures can increase the need for mechanical cooling (air conditioning), which increases demand and the emissions associated with serving that retail electrical load.[5] Water conditions can change hydroelectric power availability, with low water years, such as 2023, increasing reliance on GHG emitting generation. An increase or decrease in macroeconomic activity can alter energy demand and the emissions associated with serving retail load. **Figure 10** demonstrates the variability of year-to-year reported emissions, with a declining trend from 2010 through 2024.

Figure 10. Historical emissions for Oregon retail load service and HB 2021 targets



Due to these annual GHG variations, the OPUC has stated that utilities should "achieve the 2030 and 2035 clean energy targets under typical or expected weather and hydro conditions…".[6] This implies that emissions may be higher or lower than the targets due to variability, but under average conditions meet the targets.

The IRP assumes future load growth after cost-effective energy efficiency and distributed energy resources (DERs) are acquired and incorporated into PGE's system. Therefore, emissions reductions occur due to non-emitting resource procurement displacing coal or gas generation

[5] Since non-emitting resources dispatch first, an increase in load above the expected basis would likely be met by gas, coal or market purchases.

[6] In the Matter of Public Utility Commission of Oregon, House Bill 2021 Investigation into Clean Energy Plans, Docket No. UM 2225, Order No. 22-446 (Nov 14, 2022), Appendix A at 31, available at https://apps.puc.state.or.us/orders/2022ords/22-446.pdf.

(as opposed to reductions from net demand reduction). In actual reporting, the non-linear historical GHG decline seen in **Figure 10** is due to various factors, including but not limited to:

- Weather variations: for example, the same power system will produce different emission levels in a mild temperature year vs. an extreme temperature year, such as 2023.
- Procurement timelines: GHG emissions decline when PGE acquires additional non-emitting energy. These acquisitions will occur in blocks and may lead to staircase-like GHG reductions over time. However, while each portion of resource procurement may lead to a 'blocky' reduction of GHG emissions, from a portfolio perspective, balancing regulatory, operational, financial and resource procurement risks points to the advantages of continual acquisition of non-emitting resources over time. Achieving continual emissions reductions will necessitate procurement of non-emitting resources throughout the decade, which is likely to provide the best opportunity to add resources that offer an optimal combination of geographic location, resource characteristics, technological advancements and access to needed transmission rights.
- Unexpected economic conditions impacting loads: higher or lower than expected load may impact GHG emissions. Higher loads could arrive from faster-than-expected industrial growth (potentially from large data centers) and/or faster-than-expected electrification.

ORS 469A.420(4)(a) requires PGE to provide the OPUC with its two most recent annual emissions reports that have been filed with the Oregon Department of Environmental Quality (ODEQ) reflecting emissions associated with retail sales. Information from these reports for years 2022 and 2023 as well as reports going back to 2010 is available on ODEQ's website[7] and is shown in **Figure 10**. At the close of 2022, PGE disclosed emissions of 6.0 million metric tons of CO_2e, a 25 percent reduction in baseline emissions from power served to Oregon retail customers. Emissions associated with power served to Oregon retail customers in 2023 equated to approximately 6.6 million metric tons of CO_2e. This is an increase from the amount reported in 2022, largely driven by the low hydropower and wind output seen throughout the region and in PGE's service territory. Throughout 2023, PGE reduced emissions from unspecified sources, which represented roughly 17 percent of the retail resource mix in 2023, compared to 21 percent in 2022. Data for 2024 show further emissions decreases to 5.9 million metric tons of CO_2e.

For the CEP Update, PGE is required to compare any GHG emissions reports filed with ODEQ since the CEP with the emissions forecast in the CEP.[8] Reported emissions for 2023 and 2024 are roughly 11 percent higher than those forecasted for retail sales for those same years in the 2023 CEP/IRP. The retail sales emissions forecast for planning assumes average conditions. As described above, actual weather and temperature conditions for these years were considered to

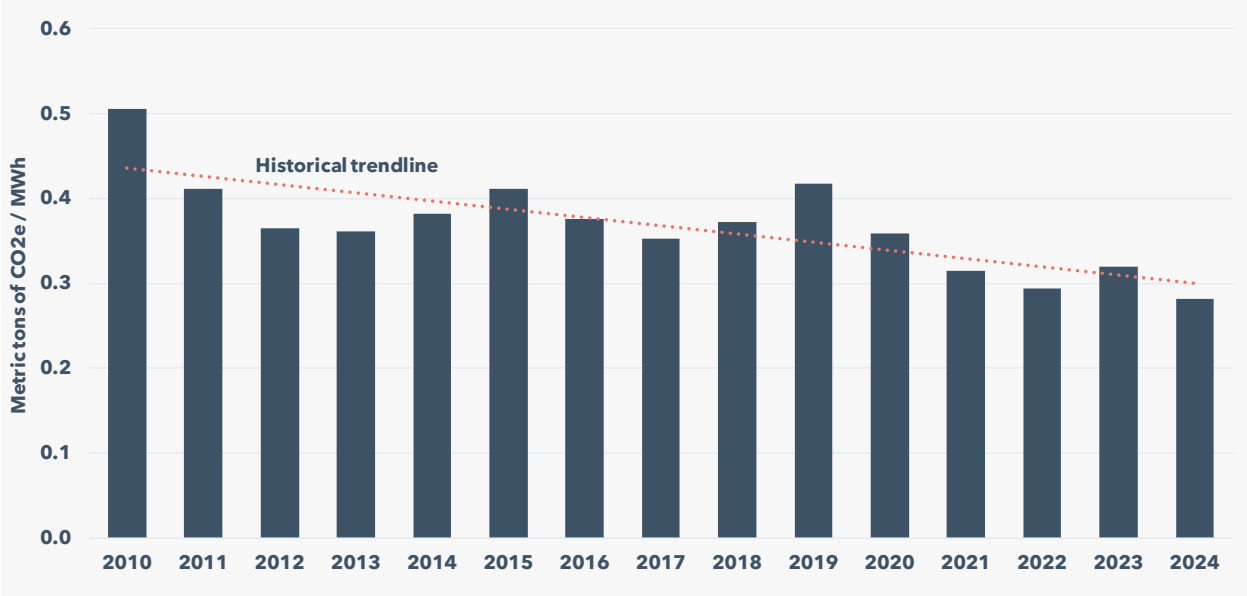
[7] ODEQ, Greenhouse Gas Emissions Reported to DEQ, available at: https://www.oregon.gov/deq/ghgp/Pages/GHG-Emissions.aspx.
[8] In the Matter of Public Utility Commission of Oregon, House Bill 2021 Investigation into Clean Energy Plans, Docket No. UM 2225, Order No. 22-390 (Oct 25, 2022), Attachment #1 at Topic #8, available at https://apps.puc.state.or.us/orders/2022ords/22-390.pdf.

be above average, resulting in greater reliance on emitting resources than was forecast. Relatedly, HB 2021 does not explicitly set GHG limits for years other than the target years of 2030, 2035 and 2040. ORS 469A.415 (4)(e) states that electric utilities, like PGE, must demonstrate continual progress towards meeting clean energy targets in a CEP. HB 2021 did not define progress as actual annual emissions reductions. However, PGE has been making progress toward decarbonization and 2024 emissions are 27 percent below HB 2021's 2010-2012 average baseline level of emissions.

1.4.3 GHG emissions intensity

Because of the correlation between retail load and emissions, GHG emissions intensity, defined as metric tons of CO_2e per megawatt hour (MWh), is a useful decarbonization metric as it normalizes changes in load to better account for the resource mix that is serving that load. **Figure 11** shows PGE's Oregon retail GHG intensity from year 2010 through 2024. In 2024, PGE made strong progress toward advancing a resource mix that is increasingly clean, resulting in a decline in the carbon intensity of the retail power supply despite anticipated load growth. While GHG intensity provides useful information, HB 2021 requires an absolute reduction in utility GHG emissions, not a decrease in GHG intensity.

Figure 11. Historical GHG intensity for Oregon retail load service



1.4.4 Average electric rates for Oregon customers

HB 2021 does not set requirements relating to electricity rates nor does PGE present information on rates in the CEP or IRP due to the disconnect from this forward-looking planning document from actual rates, which are based on real investment decisions. Some $/MWh prices aligning with total costs represented in the IRP are included in **Section 6.2.1 Yearly cost estimates**. These yearly price impacts do not represent actual customer rates as they only focus on planned

generation and transmission expansion cost changes and do not incorporate any other cost changes across PGE. The metric can still be indicative for evaluating options to decarbonize.

1.4.5 Community impacts and benefits

PGE has supported Oregon communities with reliable, affordable and safe power for over 130 years. While many things have changed over that time, PGE's core responsibility to power Oregon homes and businesses has not. It has become increasingly apparent that climate change poses significant risks to the electric sector across all regions of the country. Extreme weather and natural disasters threaten utility infrastructure, contribute to energy market volatility and render the balancing of energy supply and demand more challenging. Climate change has been witnessed first-hand at PGE in the form of record-breaking winter and summer energy peaks, damaging and disruptive storms, and increasing wildfire risk.

PGE's commitment to equity is important across all areas of the business, but especially when it comes to the disproportionate impacts of climate change on vulnerable communities. PGE aims to decarbonize the system in ways that can benefit communities disproportionately impacted by climate change, as required by HB 2021. In the 2023 CEP/IRP, Chapter 7 (Community benefits indicators (CBIs) and community-based renewable energy) described efforts to apply an equity lens to resource and decarbonization planning. Chapter 14 Community equity lens described efforts throughout PGE's planning process to create an inclusive process in which all communities served can participate and be heard.

For the 2023 CEP/IRP, PGE conducted a CBRE potential study and incorporated the results into portfolio analysis to assess the contributions of these resources toward meeting the system requirements and providing community benefits.[9] CBRE resource potential and associated CBIs are included in portfolio analysis to understand the implications that their relative costs, system benefits and CBIs have on various metrics considered within the planning framework and across various portfolio options. In 2024, PGE engaged Resource Innovations (formerly Cadeo) to conduct research into CBIs. Based on this research and stakeholder feedback, PGE refined its approach to how CBIs are considered in analysis as well as expanded the list of CBIs which is further discussed in **Section 5.5 Community benefits indicators (CBIs)**.

Integration of CBIs provides an opportunity for PGE to extend resource planning to include the values and priorities of the communities PGE serves. CBIs have evolved into an analytical framework for addressing resilience, equity, environmental impact, public health, and economic development, ensuring that resource planning considers benefits that are tangible, measurable, and equitable.

By analyzing CBIs within the IRP, PGE can account for community benefits in quantifiable ways to inform resource portfolio decisions. Proxy metrics are used for CBIs that are difficult to quantify, monetize, or lack sufficient data. Outside the IRP analysis, informational CBIs provide a critical

[9] Incorporating CBIs and CBREs into PGE's overall portfolio planning process was described in the 2023 CEP/IRP Chapter 11, Portfolio analysis. The approach to CBI development, including informational CBIs not included in IRP portfolio analysis, was described in Section 7.1, Community benefits indicators.

mechanism for establishing baselines and tracking progress toward achievement of other CBIs based on program delivery and performance.

The challenges identified—including data gaps, proxy metric limitations, and diverse stakeholder priorities—highlight the need for continued research, collaboration, and refinement. Through expanded and continued stakeholder engagement, localized data development, and the adoption of advanced methodologies, PGE is well-positioned to continue to address these challenges and further enhance the impact of CBIs.

1.5 High-level opportunities, potential barriers, critical dependencies

PGE's critical barriers to long-term decarbonization efforts are the same as those faced throughout the industry and global economy. Major barriers include the pace of development for commercially available non-emitting generation technologies, the availability of transmission to access renewable resources, affordability constraints, supply chain disruptions, and permitting and regional interconnection limitations. Solutions will depend on regional cooperation between utilities and jurisdictions, federal policy and financial support.

Current uncertainties in the future of federal policies, tariffs, and supportive tax incentives for renewable energy will meaningfully impact the affordability of PGE's clean energy transition. Further, tariffs on imported goods can impact materials supply chains, slowing timelines and increasing costs of new clean resource buildout. There is much uncertainty about the anticipated cost impacts of final tariffs on solar and energy storage components imported into the United States, but it is likely that the cost of power and energy storage will rise. Procurement delays, supply chain constraints, increased uncertainties in available transmission inventory, siting challenges and operational risks associated with adding large quantities of resources in a short period of time can also delay PGE's timeline.

PGE faces additional procurement challenges related to unresolved exposure to wildfire risk. To achieve the resource procurement targets related to HB 2021, and our customer's reliability needs, PGE must procure multiple gigawatts of new clean resources. The capital investments necessary to construct and commission such resources are significant. Wildfire risk is growing in Oregon, threatening the safety of the communities we serve, as well as utility assets and the overall financial health of the utility. This risk is reflected in higher capital costs, which drive up the costs of clean energy projects. While PGE anticipates working with Independent Power Producers under multiple commercial structures (e.g., Power Purchase Agreements), PGE will likely face barriers to secure low-cost contracts given the perceived risk of utility financial losses related to wildfire. This challenge is not easily resolved; despite successfully accomplishing robust wildfire mitigation that protects human safety, business partners are forced to increase prices to recognize the unresolved financial exposure that PGE presents as counterparty.

Any significant change in statutes, rules or guidelines that would require PGE to alter its strategy or restrict optionality in the pursuit of non-emitting resources could delay emissions reductions or threaten reliability and affordability for customers. Relatedly, load growth forecasts continue to increase, further impacting PGE's ability to swiftly decarbonize given existing technologies, costs, and the imperative to maintain a reliably system.

PGE will be ready to continue to adapt strategies accordingly and will continue to engage regulators, stakeholders, and communities in the next full CEP/IRP. This engagement will be in part informed by forthcoming Commission direction in UM 2273 on the planning requirements relating to HB 2021's cost cap provisions. Moreover, in light of many changes to the federal policy landscape, the broader macroeconomic environment, Oregon's economy, and unanticipated load growth that is outpacing the integration of renewables and storage technologies, it is likely that policy makers and stakeholder will initiate discussions soon on the appropriateness of Oregon's clean energy policies and whether changes or additional supports are necessary. There will be critical junctures on the way to 2030, 2035 and 2040 emissions targets that may require material changes in decarbonization pathways analyses. Resource needs for reliability and the pace of acquisition of non-emitting energy and capacity will be tracked closely and if PGE has concerns around maintaining reliable operations or if there are delays beyond the utility's control, adjustments to the implementation approach will be needed to overcome timeline, affordability, reliability, or other constraints. At the same time, if new technologies or transmission options on- and off-system do not materialize, PGE will likely not be able to access the diverse resources the system needs to decarbonize and maintain reliability. Successful solutions depend on regional coordination and cooperation, as well as on federal, state, or local tax credits and other support for siting and permitting resources and evolving grid strategies.

To execute on a long-term plan, the quantities of non-emitting resources estimated to be available on the market need to be actualized as well as cost-effective. New transmission is needed to gain access to off-system resources or reliability of the system is at risk. Nearer the 2040 target and an absolute zero emissions requirement, new technologies that can replicate thermal generation dispatchable capacity, such as advanced nuclear, hydrogen or carbon capture and storage will be needed across the region to support decarbonization and resource adequacy.

1.6 Acknowledged Actions, Order requirements and other updates

Along with the CEP updates provided in **Section 1.4**, the Update addresses Actions and Requirements that were stipulated in the OPUC's Acknowledgement Order, Order 24-096.[10] This section provides a summary of how the Actions and Requirements were addressed and where that information can be found in this Update. The information and analysis that has been updated from the 2023 CEP/IRP is also summarized as well as those which remain unchanged in this filing.

Table 2 provides a summary of the Actions and Requirements and the location where additional details can be found.

[10] In the Matter of Public Utility Commission of Oregon, PGE 2023 CEP and IRP, Docket No. LC 80, Order No. 24-096 (Apr 18, 2024), pp.18-22 and Appendix A, Attachment 1, pp.26-27, available at https://apps.puc.state.or.us/orders/2024ords/24-096.pdf.

Table 2. Actions and Requirements crosswalk

Action/Requirement	Applicable Section(s)
A. Conditions and Direction Related to PGE's Action Plan	
Staff Recommendation 1: CBRE Actions	Acquisition of CBREs is discussed in **Section 7.1.2.** Additional information regarding PGE's CBRE activities is available on PGE's website at: https://portlandgeneral.com/about/who-we-are/resource-planning/cbre-procuring-clean-energy
Staff Recommendation 2: Energy/Capacity Actions – Long lead-time resource RFI …before issuing its next utility-scale RFP, PGE file a proposal to develop a long lead-time resource RFI… facilitate a workshop on the RFI findings, and allow sufficient time for stakeholder review of its RFI before proposing its next steps.	PGE's RFI results are discussed in **Section 5.6**; findings from the RFI were presented at a Roundtable: https://assets.ctfassets.net/416ywc1laqmd/2GF5BwVt9cR1MXtEpn6fli/e719ec6879183abd984928db360fe410/RFI_slides_jdg_web_1197.pdf
Staff Recommendation 3: • PGE shall conduct hourly production cost simulation of its preferred portfolio under the Reference Case in a manner that separately tracks hourly purchases and hourly sales. PGE will use this analysis to revise its GHG emissions forecast and to revise its submission to DEQ. • PGE shall update the Preferred Portfolio accordingly and provide a brief narrative explanation of the key planning insights derived from this exercise.	**Appendix D** outlines the steps that PGE has taken to update its GHG emissions forecasting to incorporate hourly analysis of its energy and emissions accounting. **Section 6.2.2** discusses hourly energy and emissions accounting results. PGE resubmitted the forecast for DEQ review in June 2025 prior to the filing date for this Update.
Transmission Analysis and Alternatives …we require a more complete analysis of the need and evaluation of the full range of available transmission solutions than was provided here, including non-wires alternatives when appropriate. PGE will need to present a risk-informed, cost-benefit analysis of all available transmission solutions for the 2030 time frame, including factors such as the associated timeline and cost risks, anticipated rate impacts, and the presence of longer-term or broader regional benefits.	**Sections 4.5 and 4.6** discusses transmission options for Portfolio Analysis.
B. Direction for Future Planning	

Action/Requirement	Applicable Section(s)
Staff Recommendation 4: Customer Actions and Guidance for Avoided Cost Update …direct PGE to work with Staff to propose a new method for calculating avoided costs in docket UM 1893… we direct PGE to collaborate with Staff and ETO to modernize the approach to long-term energy efficiency planning to use the best currently available information on energy efficiency and technical potential in future IRP and CEP updates.	PGE actively participated in the UM 1893 docket. PGE delivered this presentation on Redeveloping Avoided Costs for Energy Efficiency https://edocs.puc.state.or.us/efdocs/HAH/um1893hah329014025.pdf The Order adopting energy efficiency avoided cost data for use by Energy Trust is available here https://apps.puc.state.or.us/orders/2025ords/25-017.pdf Discussion of updates to the IRP price forecast as it relates to the UM 1893 docket is included in **Section 5.1.4**.
Staff Recommendation 5: Direct PGE in the next CEP/IRP Update to include an SSR compliance assessment. The SSR analysis should state the projected SSR compliance position broken out by relevant resource types and outline the actions the Company plans to take to fill any identified SSR shortfalls.	PGE's Small Scale Renewables Plan is discussed in **Section 6.4**.
Staff Recommendation 6 - Improved Engagement: …direct PGE to collaborate with Staff, stakeholders, peer utilities, and the CBIAGs in a dedicated collaborative to develop clear, actionable improvements to community and stakeholder engagement in subsequent CEP/IRPs.	PGE provided an update on improvements to community and stakeholder engagement in subsequent IRPs and CEPs here https://edocs.puc.state.or.us/efdocs/HAD/lc80had335791056.pdf
Staff Recommendation 7 – CBI by Next Update: …PGE must demonstrate development of CBIs … we expect that some set of informational-only metrics be developed in time to be included with PGE's next RFP. If PGE cannot develop such metrics by its next CEP/IRP update, PGE must provide a detailed explanation of the barriers and constraints, along with a proposal for how and when PGE and its community stakeholders will be able to address them.	PGE has advanced the integration of CBIs into resource planning processes. Development, refinement, and application of CBIs is discussed in **Section 5.5**.
Staff Recommendation 8 – Report on Federal Incentives with Next Update: PGE should provide as much visibility into future opportunities as possible.	**Appendix A** provides an update on PGE's federal grant funding.

Action/Requirement	Applicable Section(s)
Staff Recommendation 9 - QF Renewals and Success Rates: …direct PGE to recalculate its IRP inputs using an assumption of 75 percent for QF renewals and the QF success rate for Schedule 202 projects. However, we read this narrowly and clarify that the avoided cost pricing inputs are not material to the IRP itself, but to the avoided cost price filing. We stress that the pricing inputs must be corrected due to their impact on the avoided cost price filing and decline to adopt PGE's recommendation to instead incorporate this change through an update.	**Appendix C** provides updated analysis for QFs.

Table 3 identifies the components of the 2023 CEP/IRP that were updated in this Update.

Table 3. Updated components of the 2023 CEP/IRP

Updated Component	Applicable Section(s)
Market development	**Section 2.2**
Transmission coordination	**Section 2.3**
Semiconductor and datacenter growth	**Section 2.4**
Load forecast	**Section 3.1**
2023 RFP	**Section 3.2**
Energy needs	**Section 3.3**
Capacity needs	**Section 3.4**
Regulatory-driven needs	**Section 3.5**
Transmission options and strategy	**Section 4.6**
Supply-side resource economics	**Section 5.1.2**
Demand Response forecast and economics	**Section 5.2**
Energy efficiency forecast and economics	**Section 5.3**
Small scale renewable (SSR) resources	**Section 5.4, 6.4**
CBIs	**Section 5.5, 6.5**
Long lead time resources	**Section 5.6**
Portfolio analysis	**Section 6.1**
Hourly energy accounting	**Section 6.2.2**
Preferred portfolio	**Section 6.2**
Resource Net Costs	**Section 5.1.9**
Federal funding opportunities	**Appendix A**
Non-emitting energy market (Brattle)	**Appendix F**

PGE's 2023 IRP Update does not revisit or update all analyses contained in the 2023 CEP/IRP. Instead, the 2023 CEP/IRP Update focuses on components that have the most impact on PGE's resource plan. The decision to forego updates in these following areas is driven by prioritization of critical elements that have a more direct impact on PGE's IRP outcomes. **Table 4** lists components that PGE will not be updating along with their corresponding location in the 2023 CEP/IRP.

Table 4. Components of the 2023 CEP/IRP not changed in this Update

2023 CEP/IRP Component	2023 CEP/IRP Location
Flexibility analysis	Section 6.8
Resiliency Chapter	Chapter 13
Tuned ELCCs	Appendix K
Market capacity study	Appendix G
Economics of CBREs	Section 8.3
CBRE Potential	Section 7.2
Utility vs PPA analysis	Section 8.6

Chapter 2. Planning environment

PGE's long-term planning adapts to evolving laws, policies, technological advancements, economic conditions, and climate change impacts. These factors influence resource economics, customer prices, community benefits, and ultimately shape PGE's resource decisions to serve its customers effectively. This chapter explores the broader planning context influencing the overall resource strategy to meet customers' energy needs reliably while keeping prices as low as possible and achieving emissions reduction requirements.

Key Highlights

- Under the new Federal Administration, the EPA is reconsidering the powerplant emission limit final rules established on April 25, 2024, under Section 111 of the Clean Air Act. The details of this and other policy changes at the federal level remain uncertain, though Congress is actively evaluating proposals that would remove federal tax incentives for new non-emitting generation and storage resources. The analysis in this Update mainly contemplates current known final rules, with the exception of sensitivity analyses that exclude tax credits, further described in **Section 6.6 Federal tax credit availability scenarios**.
- PGE has signed an implementation agreement for CAISO's Extended Day-Ahead Market (EDAM) go-live in October 2026.
- PGE is currently developing regional alignment on Resource Adequacy planning standards as a precursor for a regional reliability program.
- The Western Transmission Expansion Coalition's (WestTEC) West-Wide Transmission Study Project represents a new regional effort to address transmission constraints.
- Large industrial customer growth is expected to increase regional electric demand across the Western Interconnection.

Developments Since 2023 IRP

The planning environment has evolved significantly since the 2023 CEP/IRP filing, with changes to federal regulations and policies, progress on market design implementation, and increased focus on regional transmission planning. Additionally, this Update addresses the challenge and opportunity of unprecedented industrial load growth, highlighting PGE's regulatory efforts to ensure appropriate cost allocation for large customer connections.

Strategic Implications

Load growth for industrial customers is expected to significantly increase the quantity of generation, storage and transmission resources required to maintain system reliability and reduce emissions. Change in Oregon ratemaking policy also creates an opportunity to equitably serve large industrial customers while building infrastructure that supports reliability for all customers. Other opportunities to maximize the efficiency of PGE's resource portfolio are advancing through participation in EDAM and regional resource adequacy frameworks. The change in federal administration creates considerable near-term uncertainty regarding tax credit support for clean energy resources.

Staff Recommendations Incorporated

This section addresses Staff Recommendation 8 referenced in LC 80 Order No. 24-096, which directs PGE to include a report on federal incentive implementation and its key impact on the company's Action Plan.[11]

2.1 EPA powerplant rules

When planning for PGE's customer needs, PGE must monitor trends that impact the Western Interconnect of the North American power system. One important trend relates to federal policy and regulations imposing compliance requirements on thermal generation resources. For example, on April 8, 2025, President Trump granted a two-year compliance exemption for various affected facilities subject to the Mercury and Air Toxics Standards, including the Colstrip facility in Montana for which PGE has partial ownership. Pursuant to section 112 of the Clean Air Act, these rules set emissions limits for filterable particulate matter for coal-based generating units.

The implementation of these and other rules is undergoing significant challenges under the current Administration and is being targeted for reconsideration by the United States Environmental Protection Agency (EPA). Additionally, several states and industry groups have filed lawsuits against them in federal court. These challenges and agency reconsideration actions will take time, and the outcomes remain uncertain. PGE will continue to evaluate EPA rules to assess the impact they may have on PGE resource plans.

2.2 Market development

Regional market integration offers PGE and other western utilities opportunities to lower costs, enhance reliability, and integrate diverse resources through the efficient use of existing resources. To maximize the use of existing transmission infrastructure and benefit from least cost resources available in a regional energy market, PGE has elected to participate in CAISO's EDAM. As a separate effort to address regional resource adequacy challenges, PGE has

[11] OPUC. Acknowledgement of 2023 Integrated Resource Plan and Clean Energy Plan. Docket No. LC 80, December 14, 2023. Retrieved from https://edocs.puc.state.or.us/efdocs/HAU/lc80hau325590032.pdf.

engaged in the Western Resource Adequacy Program (WRAP), led by the Western Power Pool (WPP). The WRAP has established a region-wide approach for assessing and addressing resource adequacy with future opportunities for providing operating efficiencies, diversity, and sharing of pooled resources.

The combination of a regional resource adequacy program such as WRAP, which will facilitate capacity adequacy for each participant, and EDAM, which will enable the most efficient economic dispatch of all resources to meet load, is expected to support delivery of reliable power at the lowest possible cost for customers.

2.2.1 CAISO's Extended Day Ahead Market

PGE currently participates in the Western Energy Imbalance Market (WEIM) for dispatch optimization inside the hour, which is operated by the CAISO and supports over 80 percent of the load in the Western Interconnection. The WEIM lowers energy costs for customers, enhances reliability through wide area visibility and integrated generation dispatch, and supports renewable resource integration. The WEIM has proven to be a critical tool for maintaining reliability during extreme weather events, brining energy from areas of surplus to those experiencing peak events. Since joining the WEIM in 2017, PGE has supported the development of regional solutions that enhance reliability, promote clean energy, and incrementally advance western markets to lower costs for customers.[12]

Based on PGE's day-ahead market comparative analysis, PGE selected EDAM as the preferred market choice to maximize the benefits of a day-ahead market for PGE's customers. The benefits of participation are outlined in an informational filing titled Comparative Analysis of CAISO's EDAM and SPP's Markets.[13] In addition, PGE has identified a review of markets access assumptions to determine the impact of EDAM on the expansion in market capacity as an item for review in the 2026 CEP/IRP. On July 2, 2024, PGE signed an implementation agreement with CAISO for participation in EDAM with market go-live in October 2026. This day-ahead market complements PGE's participation in the current bi-lateral market, in which PGE already operates. PGE considers dual participation to be necessary until there is greater market participation in EDAM across Western Electricity Coordinating Council (WECC) market participants. Additionally, on April 3, 2025, PGE filed revisions to its Open Access Transmission Tariff (OATT) for EDAM participation with the Federal Energy Regulatory Commission (FERC).[14]

EDAM leverages CAISO's existing day-ahead market, cost efficiently building on the successful WEIM platform. EDAM offers a cost-effective, incremental option that builds upon the successes

[12] For example, PGE has chaired the WEIM Regional Issues Forum, and is co-chair of the West-wide Governance Pathways Initiative.
[13] Portland General Electric. (2024, March 21). Comparative analysis of the CAISO's EDAM and the SPP's markets: PGE informational filing on commitment to the California Independent System Operator's extended day-ahead market (OPUC Docket No. LC 80). Oregon Public Utility Commission. https://edocs.puc.state.or.us/efdocs/HAH/lc80hah327479040.pdf
[14]Federal Energy Regulatory Commission. (2025, April 3). Portland General Electric Company submits tariff filing per 35.13(a)(2)(iii): Revisions to Portland General Elec. OATT to implement EDAM to be effective 6/2/2025 (ER25-1868) [Filing Type: 10; Document Accession No. 20250403-5095]. https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250403-5095

and proven economic benefits of WEIM, while maximizing the value of PGE's existing investments in market software and communication systems to join the only currently operating day-ahead market in the West. With over 50 percent of the load in the western interconnection current committed to or leaning towards EDAM, the market offers a contiguous transmission footprint with significant resource diversity and transfer capacity. This contiguous footprint allows the EDAM to better optimize the diverse resources, including wind, solar, hydro, and thermal resources. The EDAM offers a robust platform for continued market evolution for PGE.

EDAM optimizes all supply and demand across the market footprint while respecting transmission limitations to produce optimized day-ahead schedules. All generation and load within a participating EDAM Balancing Authority Area (BAA) must either economically bid or self-schedule in the market. These transactions are then re-optimized in the existing WEIM sub-hourly 15- and 5-minute markets. EDAM requires participants to demonstrate sufficient energy, capacity, flexibility, and transmission on a day-ahead basis, consistent with forecasted demand.

The EDAM transmission framework is designed to maximize transmission availability while respecting the OATT rights and legacy contracts of participants. The transmission availability within the EDAM design seeks to maximize the amount of transmission capability made available to the market across a variety of transmission service arrangements. Prior to the day-ahead market run, each EDAM Entity will identify the firm and conditional firm transmission capacity that can be made available to support reliable transfers. Any additional unsold firm available transfer capability (ATC) will be made available to support transfers between EDAM BAA's. The transmission service provider maintains the responsibility to plan and operate the transmission system within the BAA and administer cost allocation in accordance with the OATT.

EDAM accounts for the costs arising from state GHG accounting and reduction policies that price GHG. CAISO has convened a regional stakeholder process to modify the GHG framework to account for a non-priced GHG-capped state policy. PGE is actively participating in this process with Oregon regulatory agencies to develop an emissions report which may enable GHG attribution for EDAM and WEIM market purchases under HB 2021 reporting requirements.

The benefits of EDAM are expected to grow following the expansion of the market footprint. With an eye to the potential for future expansion, the market is revisiting its governance model. EDAM has adopted a joint authority governance model informed by the regional West-wide Governance Pathways Initiative that includes oversight roles for state commissions through the Body of State Regulators and for stakeholders though the Regional Issues Forum. Notably, the West-wide Governance Pathways Initiative aims to develop and establish a new and independent entity with an independent governance structure capable of overseeing an expansive suite of West-wide wholesale electricity markets and related functions. Senate Bill 540 was recently introduced in the California legislature to enable California investor-owned utility participation in this new regional organization. For more information on the West-wide Governance Pathways Initiative, please visit the Western Interstate Energy Board website.[15]

[15] Western Interstate Energy Board. https://www.westernenergyboard.org/wwgpi/

As PGE moves towards participation in EDAM, several regulatory and procedural milestones are required prior to go-live. The first major step is a tariff filing that is currently pending with FERC[16] PGE will also need to file with FERC for Market-Based Rates (MBR) to ensure that no single market participant has market power. Finally, PGE must demonstrate to FERC that it meets the Readiness Criteria established in the CAISO tariff. Details on these filings and other EDAM implementation milestones can be found on the WEIM website[17]. It is also likely that a tariff update with the OPUC will be required to enable some programs to be adequately represented in EDAM.

For more information on CAISO's EDAM, please visit the CAISO website.[18]

2.2.2 Western Resource Adequacy Program (WRAP)

WRAP is an industry-initiated and led resource adequacy planning standard and compliance framework designed to meet the growing resource adequacy challenge and enhance reliability in the region. On April 16, 2024, in docket AR 660, the OPUC adopted new resource adequacy (RA) rules which mirror the WRAP program requirements in many ways. Participation in the state RA program is mandatory for IOUs and ESSs that do not voluntarily participate in WRAP.

The WRAP is a planning standard and compliance framework that seeks to take advantage of and maximize regional diversity in resources and load to enhance reliability for all customers across the WRAP footprint. The program experienced numerous delays since FERC initially approved the tariff in early 2023. First scheduled to become binding Summer 2025, participants expressed concern in their ability to meet capacity requirements due to supply chain issues and increases in peak-load driven by electrification and data centers. [19,20] In September 2024, a revised transition plan was accepted by the Western Power Pool Board of Directors and the program is now scheduled to be binding beginning Winter 2027-2028. Although the regional RA planning standard established by WRAP will not become binding until Winter 2027-2028 at the earliest, it is a first step towards a common reliability planning standard. As the region moves to align with the WRAP planning standard, PGE continues to explore options to operationalize this planning standard to achieve enhanced reliability through diversity sharing.

In addition to WRAP, in UM 2143, the OPUC adopted Staff recommendation to open a formal rulemaking on resource adequacy. The OPUC then adopted new rules in Docket AR 660 requiring electric companies and electric service suppliers to provide a Binding Forward

[16] Federal Energy Regulatory Commission. (2025). Portland General Electric Company submits tariff filing per 35.13(a)(2)(iii): Revisions to Portland General Elec. OATT to implement EDAM to be effective 6/2/2025 (FERC Docket No. ER25-1868) [Filing Type: 10]. https://elibrary.ferc.gov
[17] California Independent System Operator. (n.d.). Extended Day-Ahead Market Implementation and Onboarding. Western Energy Imbalance Market. Retrieved June 3, 2025, from https://www.westerneim.com/Pages/ExtendedDayAheadMarketImplementation.aspx
[18] California Independent System Operator. Western Energy Markets: Extended Day-Ahead Market (EDAM). CAISO, 2024, https://www.westerneim.com/Pages/ExtendedDayAheadMarket.aspx.
[19] FERC Order Accepting Proposed Tariff re Northwest Power Pool under ER22-2762. Feb. 10, 2023
[20] WRAP Participant Letter, April 24, 2024

Showing consistent with state program requirements.[21] The company believes that the reliability challenges facing PGE and the greater Western region warrant the continued development of State RA rules, especially considering recent delays in the WRAP. The efficiencies presented by the pooling of resources will be an important tool to address PGE's future capacity needs at lowest costs.

As a result of UM 2143 and AR 600, PGE has modified its resource adequacy modeling under the 'State RA Requirements' scenario. This method uses WRAP standards instead of using the PGE resource adequacy method in portfolio analysis. Results of this analysis are presented in **Section 6.3.5 State RA requirements**.

2.2.3 Hydroelectric Contract Availability and Competition

PGE is facing increased competition for existing resources such as Mid-Columbia hydroelectric power and BPA marketed Federal hydroelectric power, driven by rising demand from data centers and growing Public Utility Districts (PUDs) loads. This heightened competition is raising market prices, and as a result, PGE must pay higher contract rates to secure access to carbon-free, dispatchable, and highly flexible resources – ultimately impacting the cost of delivering reliable, clean energy to our customers.

2.3 Transmission coordination

This section describes the Western Transmission Expansion Coalition (WestTEC) effort and how this effort will help PGE pursue cost-effective transmission projects. As of March 2025, the WestTEC effort is in the study phase. Therefore, the information discussed here is the most up-to-date as of finalization of this 2023 CEP/IRP Update.

2.3.1 Western Transmission Expansion Coalition (WestTEC)

The objective of the Western Transmission Expansion Coalition (WestTEC) West-Wide Transmission Study Project (Project) is to produce an actionable 10-year and 20-year transmission study based on transmission portfolios that enhance Western reliability while also considering economic efficiencies and state policy goals.[22]

WestTEC includes collaboration between diverse sectors of the energy industry, states, and tribes. The project will address interregional and interstate transmission needs spanning the Western Interconnection, including the collective footprint of the existing three regional planning organizations for the West (NorthernGrid, the California Independent System Operator, and WestConnect) as well as interties with Canadian Provinces.

The goal of the 10-year and 20-year transmission study is to provide a high quality, high confidence foundation for future transmission build decisions and actions that can be

[21] Oregon Public Utility Commission. (2023, September 22). Order No. 23-340: UM 2143/AR 660 – Staff's recommendation adopted [Docket No. UM 2143; signed by Commissioners Megan Decker, Letha Tawney, and Mark Thompson]. https://apps.puc.state.or.us/orders/2023ords/23-340.pdf

[22] Western Transmission Expansion Coalition. (2024, July 19). Study plan (Draft V4). Western Power Pool. https://www.westernpowerpool.org/private-media/documents/WestTEC_Study_Plan_Draft_V4.pdf

undertaken by the industry. WestTEC uses an independent consultant to focus on identifying interregional and interstate transmission expansion solutions that are based on an assessment of the consolidated and coordinated needs of western utilities, not just a single utility or regional planning organization. Consistent with methodologies identified in FERC Order No. 1920 (**Appendix H.2 FERC Order 1920 process**), WestTEC measures important regional transmission benefits including production cost savings, reduced congestion, and mitigation of extreme weather events.[23] Following the completion of the WestTEC studies, specific transmission solutions will be available for study in the IRP.

The WestTEC 10-year horizon transmission study will be complete in August 2025 and the 20-year horizon transmission study will be complete in September 2026. Given that the first study will not be completed until August 2025, nearer term transmission projects will not go through the Project.

For additional details on scheduled transmission projects, see **Section 4.2 PGE transmission projects.** The transmission options modeled in the 2023 CEP/IRP Update are described in **Section 4.6 Transmission options for portfolio analysis**. The cumulative transmission buildout selected in the Preferred Portfolio is presented in **Section 6.2 Preferred Portfolio**.

2.4 Industrial load growth

This section outlines the general trends in electricity demand, with a particular focus on the Pacific Northwest and the role of large industrial customers, such as data centers and semiconductor producers, in driving this demand as well as the regulatory and policy responses in Oregon.

2.4.1 General trends in electricity demand across the Western Interconnection

While the western interconnection has historically seen modest growth in electricity demand, recent developments signal a period of rapid expansion, particularly in industrial sectors such as technology and manufacturing. Several key factors are contributing to this shift including the transportation electrification, manufacturing, and building electrification. A significant driver of industrial load growth is the expansion of data centers. These facilities provide cloud storage, computing power, and digital infrastructure and require significant electricity to power servers, cool buildings, and maintain continuous operations.

2.4.2 Industrial load growth in the Pacific Northwest

The Pacific Northwest is particularly attractive to large industrial customers due to its cooler climate, which reduces cooling costs, proximity to the Trans-Pacific Submarine Cables that terminate in Hillsboro, and access to abundant renewable energy from hydropower, wind, and solar sources—leading to relatively lower electricity costs. Due to these factors, the region has seen significant recent investment. The Oregon CHIPS Act (SB 4) provides state funding and regulatory support to strengthen Oregon's semiconductor industry by aligning with the federal

[23] FERC Order No. 1920, issued on May 13, 2024 and FERC Order No. 1920-A, issued on November 21, 2024.

CHIPS and Science Act. It streamlines permitting and invests in site development to help Oregon compete for federal semiconductor manufacturing incentives.[24]

Industrial load growth presents substantial opportunity and benefit for PGE's customers. PGE's service of industrial load growth includes infrastructure that supports reliability for all customers. Additional benefits may accrue to all customers should large industrial backup generation or other resources tied to these customers be made available for grid reliability and flexibility. As noted below, PGE is also actively involved on several fronts to ensure that costs to serve the rapid industrial load growth is appropriately allocated to the customers driving the expense.

2.4.3 Regulatory and policy responses to large customer demand growth

The 2025 Legislature enacted House Bill 3546, requiring the creation of a separate rate class for large energy use facilities and allocating the costs of serving these large energy use facilities in a manner that is equal or proportional to the cost of serving the class.[25] The bill also requires utilities to enter contracts to serve certain large energy use facilities.

PGE has revised its tariff to provide for appropriate cost allocation to the growing large industrial customers including through the addition of new study fees, minimum demand charges, and deposits, aiming to prevent stranded assets and incentivize large customers to invest in grid resiliency. PGE's revised tariff also includes provisions to mitigate cost-shifting risks, particularly for distribution and transmission investments, while providing that costs are appropriately allocated, and large customers pay for the cost to connect and serve their energy needs.[26] Whether these changes remain in place or are revised as well as implementation of HB 3546 are issues under consideration by OPUC in a pending docket, UM 2377, creating uncertainty regarding industrial load cost allocation, particularly with data centers.[27] This leads to uncertainty in the cost forecasts in the IRP.

In UM 2024, OPUC is reviewing Oregon's Direct Access Program, which allows large customers to contract directly with third-party electricity service suppliers. In UM 2024, OPUC is conducting a holistic review of the Direct Access Program. The review includes but is not limited to transition adjustment charges, election windows for customers to opt into the DA program, default pricing for Direct Access customers, and all load serving entities (including energy service suppliers and utilities) resource adequacy.

The impacts of large customer industrial load growth are evaluated within the Update as a scenario within portfolio analysis. A detailed description of the results of this scenario can be found in **Section 6.3.3 Large industrial customer growth**.

[24] Oregon State Legislature. (2023). Oregon CHIPS Act, S.B. 4, 82nd Leg., 2023 Regular Sess. https://olis.oregonlegislature.gov/liz/2023R1/Measures/Overview/SB4
[25] As of this publication, the bill awaits the Governor's signature.
[26] UE 430, Investigation into PGE's New Load Connection Costs.
[27] UM 2377, PUC Investigation of Rule C and I, Marginal Cost Study Treatment.

2.5 Federal administration changes

There has been a change in the Federal Administration since the 2023 CEP/IRP. During its first 100 days in 2025, the Trump Administration has taken a range of actions aimed at energy independence and deregulation, the full impacts of which are uncertain but likely to delay and increase the cost of renewable energy development and roll back environmental regulations. Due to uncertainties or lack of new final rules, most anticipated changes are not incorporated into this analysis.

2.5.1 Tax credit policy

The Inflation Reduction Act (IRA) of 2022 authorized approximately $270 billion in energy security and climate resilience investments, with a central focus on enhancing and expanding tax-based incentives for clean energy deployment.[28] A cornerstone of the IRA was the long-term extension and modernization of the Investment Tax Credit (ITC) and the Production Tax Credit (PTC), which had historically faced repeated expirations and short-term renewals that constrained planning and investment.[29] The IRA extended these credits for projects that begin construction before January 1, 2033, and transitions to a technology-neutral credit regime beginning in 2025. On a forward going basis, the IRA awards tax incentives based on the emissions profile of the generation source rather than technology type.[30] The IRA introduced tax credit transferability allowing eligible taxpayers to transfer all or part of certain tax credits to unrelated parties in exchange for cash, creating a new market for credit buyers and sellers.[31] This provision aimed to simplify financing, reduce dependence on complex tax equity structures, and make clean energy investment more accessible to a broader set of developers, utilities, and nonprofit entities.

While the Inflation Reduction Act (IRA) of 2022 provides funding and tax credits (including the ITC and PTC) through at least 2032, the current administration has introduced significant uncertainty regarding the future of the IRA and its provisions. In the executive order issued on January 20, 2025, the administration placed an immediate pause on the disbursements of funds appropriated through the IRA.[32] Federal Judges have issued orders requiring the administration to resume IRA funding, but the effect on the overall policy environment has been chilling to clean energy development, with potential modifications to key provisions affecting the stability and predictability of clean energy investments.[33] Congress is also working to phase out and condition many IRA tax credits, including the 45Y and 48E tax credits that provide significant value for PGE customers as PGE invests in clean energy. The outcome if this legislative effort is not yet known.

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[28] Inflation Reduction Act of 2022, Pub. L. No. 117-169, Title I, Subtitle D.
[29] IRC § 48 (ITC) and IRC § 45 (PTC), as amended by IRA §§ 13102 and 13101
[30] IRC §§ 45Y and 48E, created by IRA §§ 13701 and 13702
[31] IRC § 6418
[32] Executive Order 14154, "Unleashing American Energy" (January 20, 2025), https://www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/.
[33] *State of New York v. Trump*, Case 1:25-cv-00039-JJM-PAS, D.R.I., (February 10, 2025), https://storage.courtlistener.com/recap/gov.uscourts.rid.58912/gov.uscourts.rid.58912.96.0_6.pdf. *Woonasquatucket River Watershed Council v. Department of Agriculture*, Case 1:25-cv-00097-MSM-PAS, D.R.I., (April 15, 2025), https://storage.courtlistener.com/recap/gov.uscourts.rid.59116/gov.uscourts.rid.59116.45.0.pdf.

In response to this shifting policy landscape, PGE's IRP Update includes portfolio sensitivity analysis assessing the impacts of reverting to a pre-IRA planning environment. The details regarding the design of this scenario are introduced in **Section 5.1.3 Tax credit sensitivities** and results of the scenario analysis are provided in **Section 6.6 Federal tax credit availability scenarios**.

2.5.2 Grant funding

PGE and joint applicants were awarded USDOE grant funding in 2024 through the Grid Resilience and Innovation Partnerships (GRIP) Program to support some transmission projects. There is uncertainty whether these federal dollars will be fully awarded or not as payments were paused by the time of this Update publication. The analysis assumes this funding is awarded to support the selected projects described in **Section 4.6 Transmission options for portfolio analysis**. Further, **Appendix A Federal grant funding** details grants awarded to PGE. The delivery of these grants remains uncertain due to developing policy priorities at the Federal Administration.

2.5.3 BPA

Federal Administration changes have impacted BPA processes and workforce. The Transmission Service Request Study and Expansion Process (TSEP) to evaluate and address transmission service requests has been paused. Significant workforce reductions and current rehiring processes may impact operations, load service, and resource procurement.

On September 30, 2028, the existing settlement of the Residential Exchange Program (REP) is set to expire. PGE is still in active conversation and negotiation with BPA to make sure PGE customers receive an equitable share of the benefits of the Federal system. There is significant uncertainty associated with the impact of the expiration of the existing REP settlement and the level of REP benefits that BPA will make available to PGE's residential and eligible small farm customers. However, the OPUC has estimated that removal of the existing REP benefits that customers currently receive through the BPA REP program would create a cost impact to customers equivalent to around a 3.6 percent rate increase.

The ultimate implications of changes at BPA are uncertain but have the potential to impact day to day grid operations and slow regional transmission investment and development necessary for reliability and growth. This Update does not contemplate these complications.

Chapter 3. System needs

This chapter quantifies the drivers of energy and capacity needs in the 2023 CEP/IRP Update. The analyses described below provide the foundational metrics for addressing resource adequacy, decarbonization objectives and other policy requirements while minimizing long-term costs and risks. Previous modeling approaches for evaluating PGE's demand, supply, and policy requirements were described in the 2023 CEP/IRP's Chapter 6 – Resource needs and in the 2023 CEP/IRP Addendum, Chapter 2 – Need changes.[34,35] Additionally, this chapter discusses the 2023 Request for Proposal (RFP) results and the competitive bidding process initiated following the 2023 CEP/IRP.

Key Highlights

- Twenty-year average annual growth rates are estimated at 2.8 percent annually, a 1.2 percentage point increase from the 2023 CEP/IRP Addendum forecast. Growth is driven primarily by unprecedented industrial sector expansion, especially in semiconductor manufacturing and data centers.
- Resources assumed to be added following the conclusion of the 2023 RFP reduce long term capacity needs and make important contributions to addressing near-term capacity deficits.
- PGE continues to procure resources as part of the 2025 RFP. Such resource additions are likely to enter the system approximately 2029, limiting near-term emissions reductions.
- Monthly assessment of PGE's long-term energy need increases resource need relative to annual energy accounting.

Developments Since 2023 IRP

Since the 2023 IRP, PGE updated its load forecast methodology, shifting from a dual-horizon econometric analysis to an econometric model which spans the entire planning horizon and incorporates recent hourly demand data. This adjustment better captures current trends, including rapid industrial growth and changing residential energy use patterns post-COVID-19. Monthly energy need analysis was introduced to reflect the variability in renewable energy generation more accurately. Additionally, forecasts for distributed energy resources (DER) have been refined, further impacting projected energy and capacity needs.

Strategic Implications

The updated forecasting methods and revised growth projections underscore the urgency and scale of PGE's resource planning efforts. The significant industrial sector

[34] 2023 CEP/IRP
[35] 2023 CEP/IRP Addendum: System Needs and Portfolio Analysis Refresh

expansion necessitates timely resource procurement and infrastructure development to manage unprecedented demand increases.

Staff Recommendations Incorporated

This section discusses IRP Updates which incorporate Staff Recommendations #3, #5, and #9 from Order No. 24-096. Recommendation #3 is advanced by representing non-emitting resource needs in a more granular accounting of PGE's forecasted emission through the quantification and incorporation of monthly energy needs in portfolio modeling. Recommendation #5 is addressed by explicitly accounting for Small-Scale Resource need in the IRP modeling. Lastly, Recommendation #9 is incorporated by assuming 75 percent renewal rate of QF resources in IRP inputs for capacity and energy.

3.1 Econometric load forecast

PGE customer's load forecasts have grown since the 2023 CEP/IRP filing which is demonstrated in this section's discussion of the PGE's May 2024 load forecast. The Addendum to PGE's 2023 CEP/IRP increased the load forecast from the initial filing and, unless noted, comparisons to the 2023 CEP/IRP refer to the Addendum.[36] PGE's load forecast includes two methodological changes to the Energy and Peak Forecasts which account for current trends and differences compared to the previous filing.[37] Additionally, PGE presents a high and low load forecast which include wider bounds in the near term to reflect increased uncertainty in industrial segment growth. Load forecasts exclude direct-access customers, consistent with 2023 CEP/IRP – Section 6.1.1 and in response to Order No. 07-022, IRP Guideline 9.[38]

The industrial segment is expected to be the focus of growth in PGE's service area due to the semiconductor industry and data centers. As **Section 2.4.2 Industrial load growth in the Pacific Northwest** describes, PGE's service area has experienced a dramatic increase in semiconductor and data center investment, a segment that is positioned to grow dramatically as cloud computing and AI demands increase. As this growth is unprecedented, the pace and scale of the electricity demand required to serve these needs introduces increased uncertainty in the outlook.

Forecasts of distributed energy resources (DERs), including rooftop solar, transportation and building electrification, are additional to the underlying econometric load forecast (base forecast). The energy and peak load impact of DERs, further referred to as electrification, are

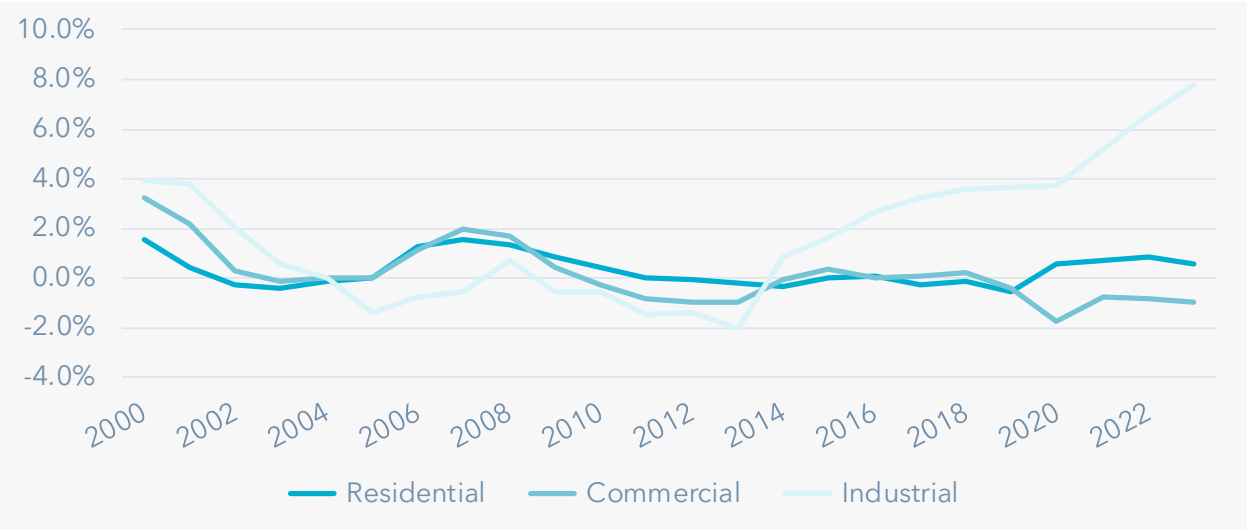
[37] May 2024 Forecasts are the vintage used in the 2023 CEP/IRP Update. More recent vintages are not used as load forecasts are one of the furthest upstream inputs in the modeling process. The Sept. 2024 forecast estimates suggest a nominal change in average energy deliveries and seasonal peak loads across the planning horizon, and more recent forecasts are not expected to materially change the 2023 CEP/IRP Update's final recommendations.
[38] In the Matter of Public Utility Commission of Oregon, Investigation Into Integrated Resource Planning, Docket No. UM 1056, Order No. 07-002 (Jan 8, 2007) at 19, available at: https://apps.puc.state.or.us/orders/2007ords/07-002.pdf

estimated in PGE's AdopDER model, as discussed in **Section 5.2.2 Cost-effective demand response**. In the sections below, electrification forecasts from AdopDER are combined with results from the base forecast to provide a more complete forecast of energy and peak load estimates across the planning horizon. Resource need representations presented in **Sections 3.3 Energy need** and **Section 3.4 Capacity need** also consider the cumulative load forecasted for both PGE's base service area demand and the incremental impact of electrification.

3.1.1 Energy forecast

Recent years have marked a period of meaningful change in how PGE's customers use energy. **Figure 12** shows energy deliveries growth by customer class presented using a five-year rolling average growth rate. Across the past decade the industrial segment has offset relatively flat energy usage in the residential and commercial segments due to growth in high-tech and data center sectors. Growth from these sectors is estimated to account for approximately 75 percent of load growth between 2025-2030 (**Figure 17**), 50 percent of 2030 seasonal capacity need, and 30 percent of portfolio resources in 2030 (**Section 6.3.3 Large industrial customer growth**). Increased growth in industrial energy deliveries is expected to continue as Oregon's semiconductor industry grows and data center demand from cloud and AI uses expands. This rapid load growth presents economic opportunities for the region and is driving new policy and planning considerations to ensure PGE's system remains reliable and affordable in the face of unprecedented change. As part of these new considerations, the 2023 CEP/IRP Update includes a new model structure for PGE's energy deliveries forecast that allows for direct incorporation of individual large customer load growth projections.

Figure 12. Five-year average growth rates by class



3.1.1.1 Energy Forecast Methodological Changes

PGE's updated energy deliveries forecast includes two primary components: econometric forecast models by rate schedule and customer specific forecasts for a selection of large

customers. As part of the 2023 CEP/IRP Update, the Company revised the econometric forecast model.

The econometric portion of PGE's model ties energy deliveries to macro-economic drivers, primarily residential building permits and employment. PGE's residential models segment customers by dwelling type and estimates both usage per customer and customer count. The commercial models are segmented by rate schedule and energy deliveries are estimated directly.

A key update to the econometric model is that PGE no longer splits its forecast into two horizons as it has in the past (1–5-year vs long term). A single set of regression models now span the full horizon of the 20-year CEP/IRP planning horizon. **Table 5** summarizes the groupings used for the econometric regression models.

Table 5. Structure of regression models

Dependent Variable	Model Groups
Usage Per Customer	Residential Single Family, Multi Family and Manufactured Home
New Connect	Single Family, Multi Family and Manufactured Home
Monthly Energy Deliveries	Non-residential Rate Schedules: 32, 38, 83, 85, 89 Other Residential Misc. Schedules: Irrigation, Area Lighting, Street Lighting and Traffic Signals

3.1.1.2 Large customer forecast

Consistent with the 2023 CEP/IRP, the large customer forecast is an individual forecast for a subset of large customers with high energy intensity, such as large non-residential customers on Rate 89, and 90.[39] These customers can experience stepwise changes in operations which are often communicated by the customer to PGE but are not easily predicted by reliance on regional macroeconomic drivers. Information used to develop these forecasts includes customer requests, segment industry reports, historic load-ramps, and comparisons to like customers. The state legislature and OPUC are actively discussing policy regarding industrial customer cost allocation as part of HB 3546 and UM 2377.[40,41] These efforts will further refine methods for differentiating large customer load in future planning cycles.

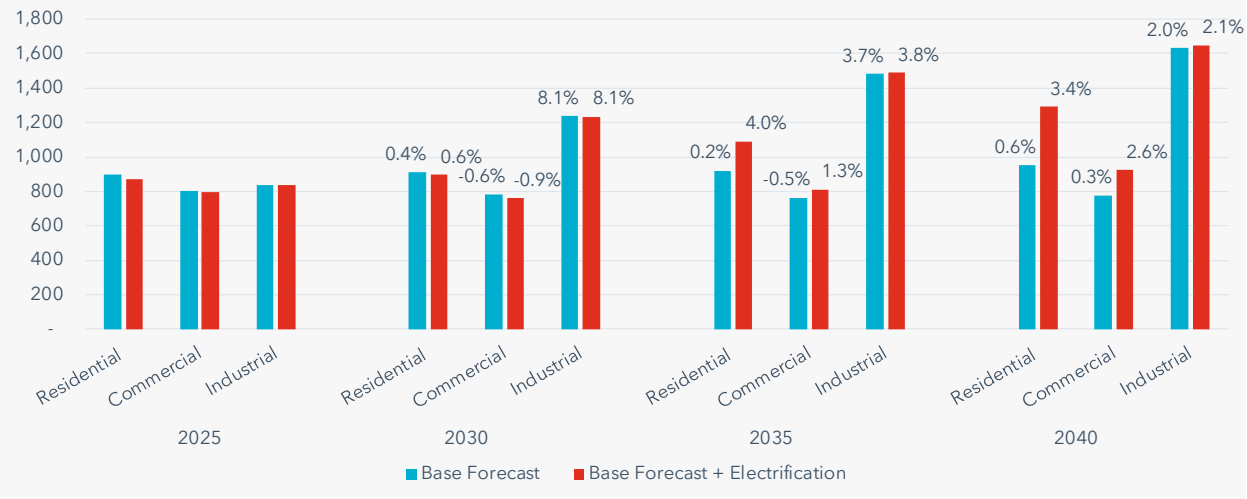
3.1.1.3 Resulting Energy Forecast

PGE's average growth rate for energy over the next 20 years is forecasted to be 1.9 percent, not including the impacts of electrification. This growth rate increases to 2.8 percent after including

[39] https://portlandgeneral.com/about/info/rates-and-regulatory/tariff
[40] Oregon HB 3546
[41] UM 2377

electrification estimates from PGE's AdopDER model.[42] Both the residential and commercial sectors are expected to remain relatively flat through 2030, with energy efficiency mostly offsetting customer growth in the near-term. After 2030, demand from non-industrial customers grows with increased electrification. The industrial sector is forecast to grow rapidly, driven primarily by semiconductor and data center sector growth. **Figure 13** shows the magnitude of customer class load at five-year increments and growth rates associated with the preceding five-year period. Industrial total usage is forecasted to surpass the residential and commercial sectors by 2030.

Figure 13. Energy forecast at five-year increments, with annual average growth rates



3.1.1.4 Energy High and Low Forecasts

PGE creates high and low load forecasts to account for different economic futures. The health of Oregon's economy impacts PGE's load growth, with residential driven by population and commercial driven by employment. In addition to the population and employment scenarios, PGE accounted for different large customer growth futures. The industrial sector has the widest bounds, accounting for the increased uncertainty in this sector. **Table 6** presents a growth rate summary comparing PGE's reference, high and low load forecasts for the base forecast and including the effects of electrification as estimated in AdopDER.

PGE notes that strong demand for industrial load service contributes to the uncertainty of the load forecast. PGE has received service requests from many large industrial customers whose requested load service is not included in the Reference case load forecast. PGE's choice to exclude many of these industrial requests is supported by PGE's judgement on the maturity of these requests and the absence of commitments from such customers. Ongoing policy discussions regarding the fair allocation of system costs to such customers discussed in **Section 2.4.3** contributes to the uncertainty of PGE's industrial load forecast. PGE's High load forecast

[42] AdopDER provides electrification estimates for residential and non-residential segments. Non-residential electrification estimates are weighted 90/10 (commercial/industrial) as most programs are targeted to commercial customers.

partially captures the potential of still stronger industrial service demand to be further assessed following these policy determinations.

Table 6. High, reference, and low forecasts

	High		Reference		Low	
	Base	Base + Electrification	Base	Base + Electrification	Base	Base + Electrification
Total Energy	3.31%	4.11%	1.94%	2.87%	0.58%	1.12%
Residential	1.02%	2.65%	0.44%	2.25%	-0.15%	0.71%
Commercial	0.50%	1.78%	-0.05%	1.13%	-0.75%	-0.06%
Industrial	7.48%	7.55%	5.14%	5.22%	2.87%	2.94%

3.1.1.5 IRP Update Comparison to 2023 CEP/IRP

Table 7 shows twenty-year average annual growth rates by customer segment for the 2030 CEP/IRP Update compared against the previous 2023 CEP/IRP and Addendum: System Need and Portfolio Analysis Refresh filings. The May 2024 update resulted in an increase in forecasted annual growth rates, from 1.6 percent in the filed addendum to 1.9 percent. The residential and commercial sectors both saw moderate decreases in forecasted growth prior to the inclusion of electrification. After including electrification, estimates for residential and commercial sectors grew by an additional 1.8 and 1.1 percentage points, respectively. The industrial sector increased from the Addendum estimate of 3.9 percent to 5.1 percent in the May 2024 Forecast, prior to electrification. Overall, the five-year forecast remained consistent with the prior update while the long-term growth rate saw an increase. This increase is primarily driven by the methodology update presented in **Section 3.1.1.1 Energy Forecast Methodological Changes**.

Figure 14 presents a graphical comparison of the forecast vintages including a segment build of the most recent, May 2024 load forecast.

Figure 14. Comparison across load forecast vintages

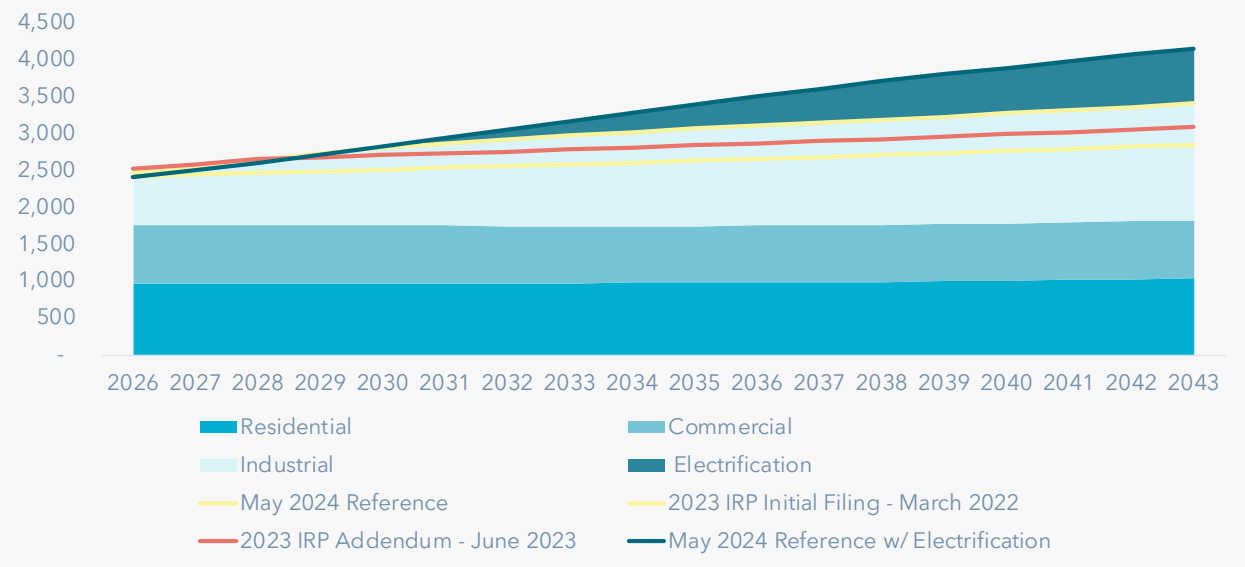


Table 7 presents a tabular growth rate summary comparison of the forecast vintages.

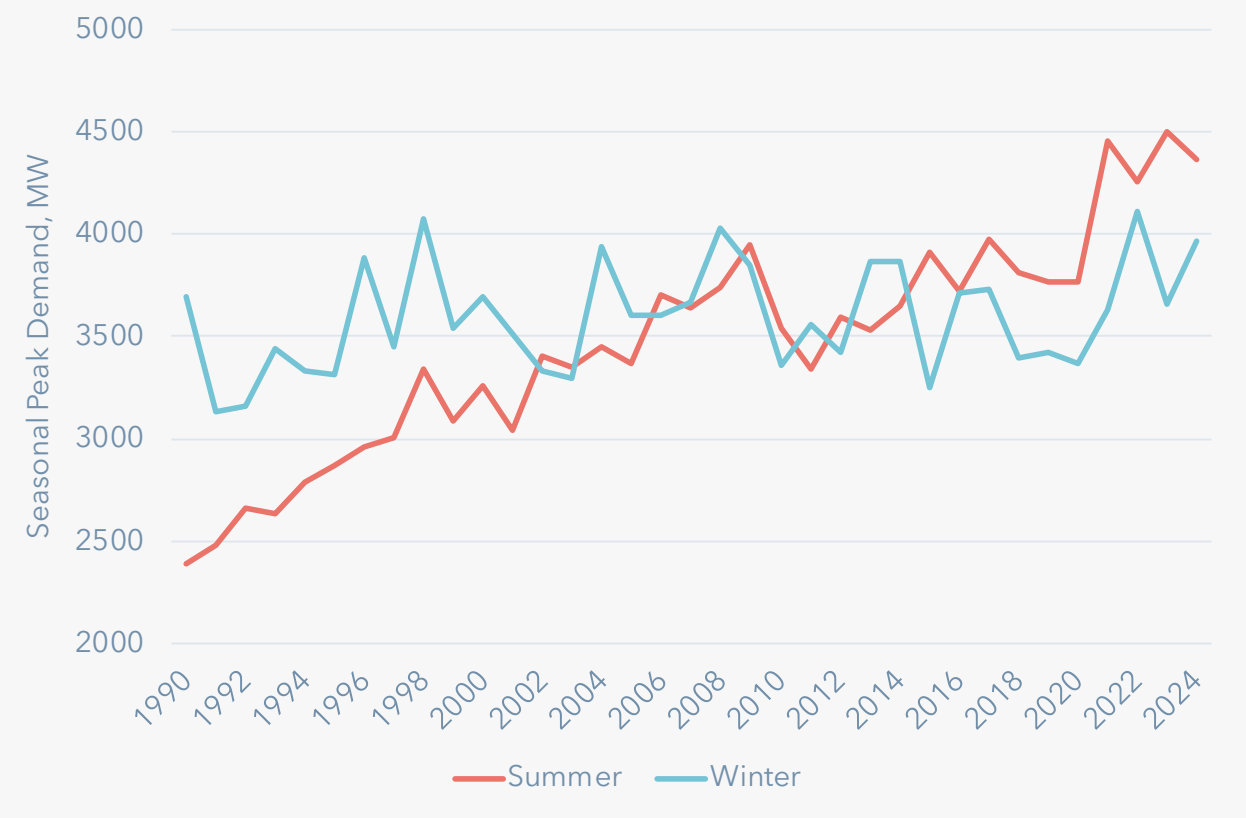
Table 7. Twenty-year average annual growth rates

	2023 CEP/IRP (March 2022)	2023 CEP/IRP Addendum (June 2023)	May 2024 Reference	May 2024 Reference + Electrification
Total Energy	1.2%	1.6%	1.9%	2.8%
Residential	0.5%	0.6%	0.4%	2.2%
Commercial	0.0%	0.0%	-0.1%	1.1%
Industrial	3.5%	3.9%	5.1%	5.2%

3.1.2 Seasonal peak demand forecast

In addition to increased industrial deliveries, PGE has also experienced persistent increases in its summer system peak demand. **Figure 15** presents the historical net system peak demand for the PGE service area from 1990-2024 for both the winter and summer seasons.

Figure 15. Actual seasonal net system peak demand, in MW



Recent events, such as wildfire smoke in 2020, the heat dome of 2021, increased AC saturations, and the rise in work-from-home have led to shifts in the utilization of home cooling systems.

To address these trends, PGE updated the peak demand forecast methodology. In addition to capturing recent trends, this methodology also allows for changes in load shape as the industrial class grows at an accelerated rate.

3.1.2.1 Peak Forecast Methodological Changes

In the 2023 CEP/IRP, PGE utilized a monthly regression model that related the single-hour peak demand to average monthly demand. This model trained with one observation per month, using historical data back to 2000. This resulted in few observations for training a summer peak event given the short nature of Oregon's summers. Further, these training observations reflected periods in time where the saturation and utilization of air conditioning in the home was less prevalent. Using this method, the temperature inputs used to forecast seasonal peak demand were based on a simple average of 15 years of peak day events.

For the May 2024 forecast, PGE updated its peak demand model with a focus on better capturing recent response to warm summer temperatures. The updated peak demand model uses hourly data by customer class – residential, commercial, and industrial – for 2019-2023 to better capture current usage trends during peak events. By using hourly data, the training set includes more cooling and heating events and can better capture the impact of weather on usage. The fixed effect model includes various weather variables, rooftop solar capacity, and

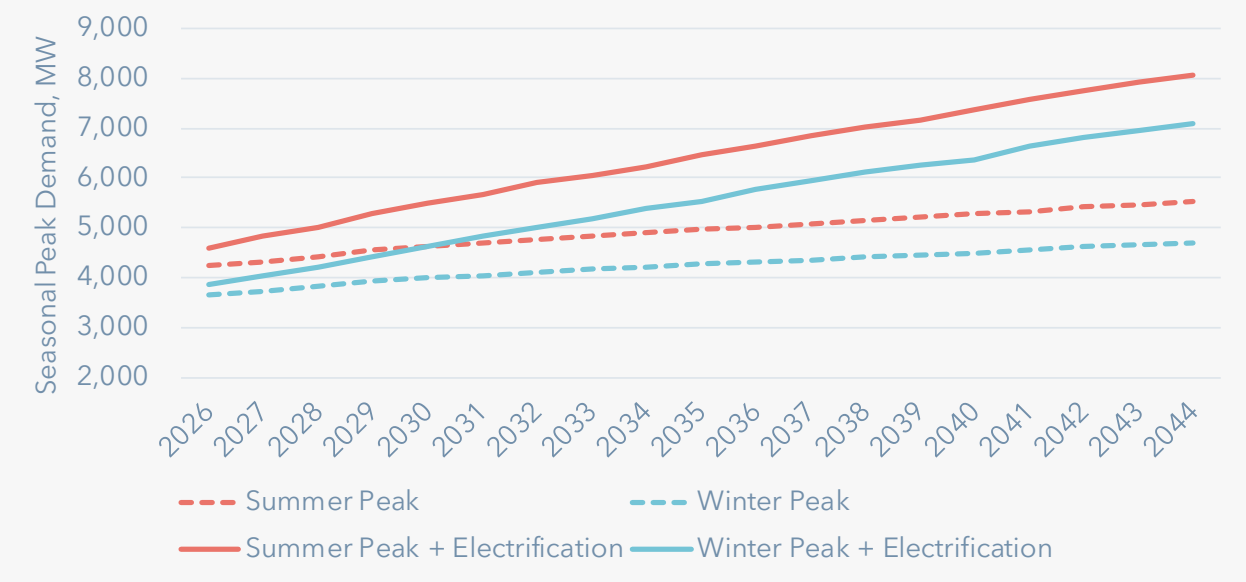
indicator variables to control for monthly, day of the week, extreme weather and COVID-19 impacts as explanatory variables.[43]

To develop the peak demand forecast, weather year simulations are created using historical hourly weather data for the period 2008-2023 with shifted day of week start to reflect 105 total simulations. These simulations are scaled by class to the average monthly energy forecast to capture growth. The expected seasonal peaks reflect the average system peak across the simulations in the given season. Probabilistic outputs were also created based on the standard deviation of simulated peak. This approach allows for data to feed directly into the Sequoia model, as described in **Section 3.4.2 Changes to modeling capacity need**.

3.1.2.2 Resulting Peak Forecast

PGE's base forecast average growth rate over the next 20 years is forecasted to be 1.5 percent for the summer peak and 1.4 percent for the winter peak, as shown in **Table 8**. After including the peak load impacts of electrification, average growth rates increase to 3.3 percent and 3.4 percent for summer and winter, respectively. **Figure 16** shows the trajectory of PGE's forecasted seasonal peak demand forecasts for the summer and winter seasons with and without electrification.

Figure 16. Forecasted seasonal peak demand, in MW



3.1.2.3 Peak High and Low Forecasts

PGE creates a high and low peak forecasts that correspond with the high and low load forecasts. In each scenario, the growth is front weighted to the five-year horizon, corresponding with the higher forecasted growth rate in the short-term. **Table 8** shows a comparison of the growth rate

[43] Weather variables include heating degree hours (HDH), cooling degree hours (CDH), and lagged HDH and CDH. HDH and CDH were calculated based using the observed temperature at each hour compared to a set base temperature (such as 65°F) with HDH being total degrees below set point and CDH being total degrees above.

of seasonal peak demand across the reference, high and low load forecasts both with and without the effects of electrification.

Table 8. Forecast twenty-year average growth rates

	High		Reference		Low	
	Base	Base + Electrification	Base	Base + Electrification	Base	Base + Electrification
Summer Peak	2.6%	4.2%	1.5%	3.3%	0.4%	1.8%
Winter Peak	2.5%	4.4%	1.4%	3.4%	0.3%	2.0%

3.1.2.4 IRP Update Comparison to Previous Filings

The May 2024 update reflected an increase in the peak forecast for both the summer and winter peak.[44] This increase is driven by the increased forecasted load growth as well as the updated methodology described in **Section 3.1.2.1 Peak Forecast Methodological Changes**. Though the peak forecasted growth rate has increased, it remains lower than the forecasted energy annual growth rate. **Table 9** shows a comparison of the growth rate of seasonal peak demand across the forecast vintages, including effects from electrification as estimated in AdopDER.

Table 9. Forecast peak 19 year (2026-2044) average annual growth rates

	2023 CEP/IRP (March 2022)	2023 CEP/IRP Addendum (June 2023)	May 2024 Reference	May 2024 Reference + Electrification
Summer Peak	0.7%	0.9%	1.5%	3.2%
Winter Peak	0.7%	0.8%	1.4%	3.5%

3.1.3 Load forecasts – excluding large customer load

To provide transparency into the drivers of PGE's resource need, additional analysis was performed to disaggregate large industrial load from PGE's forecast. As described in **Section 3.1.1.2 Large customer forecast**, semiconductor and data center loads are responsible for significant increases in PGE's forecast.[45]

3.1.3.1 Methodology: Excluding load from large customers

PGE's econometric load forecast methodology includes three core modeling elements: a monthly forecast of energy deliveries by rate schedule, a monthly forecast of large customer

[44] May 2024 Load Forecast Update discussed in Jul. 11, 2024 CEP/IRP Roundtable 24-3

[45] Similar segmentation was not performed in PGE's AdopDER model for electrification forecasts. It is assumed that all electrification in the industrial segment is associated to non-large customer projects.

usage, and an hourly simulation which creates the peak demand output. To isolate the impact of growth from large industrial load, PGE focuses on the large customer forecast, holding all customers who are projected to add at least 30 MW of load in coming years at levels consistent with PGE's forecasted values for 2025. This categorization by size is consistent with Category 3 large non-residential customers in PGE's proposed modification to its tariff filed in Advice No. 24-38/UE 430.

This approach does not attempt to capture the nuance associated with timing of individual customer load growth but instead selects a point in time and illustrates the magnitude of forecasted growth associated with large customer projects thereafter based on PGE's May 2024 Reference case Load Forecast.[46]

3.1.3.2 Resulting forecast – excluding large customer load

Removing growth associated with large customer load after 2025 results in lower energy deliveries and seasonal peak demand forecasts. The twenty-year average annual growth rate for the May 2024 Reference total energy forecast is estimated to reduce from 1.9 percent to 0.1 percent, prior to electrification. After including electrification, forecasts that exclude large customer load estimate a 1.3 percentage point reduction in the total energy twenty-year average annual growth rate, as shown in **Table 10**.

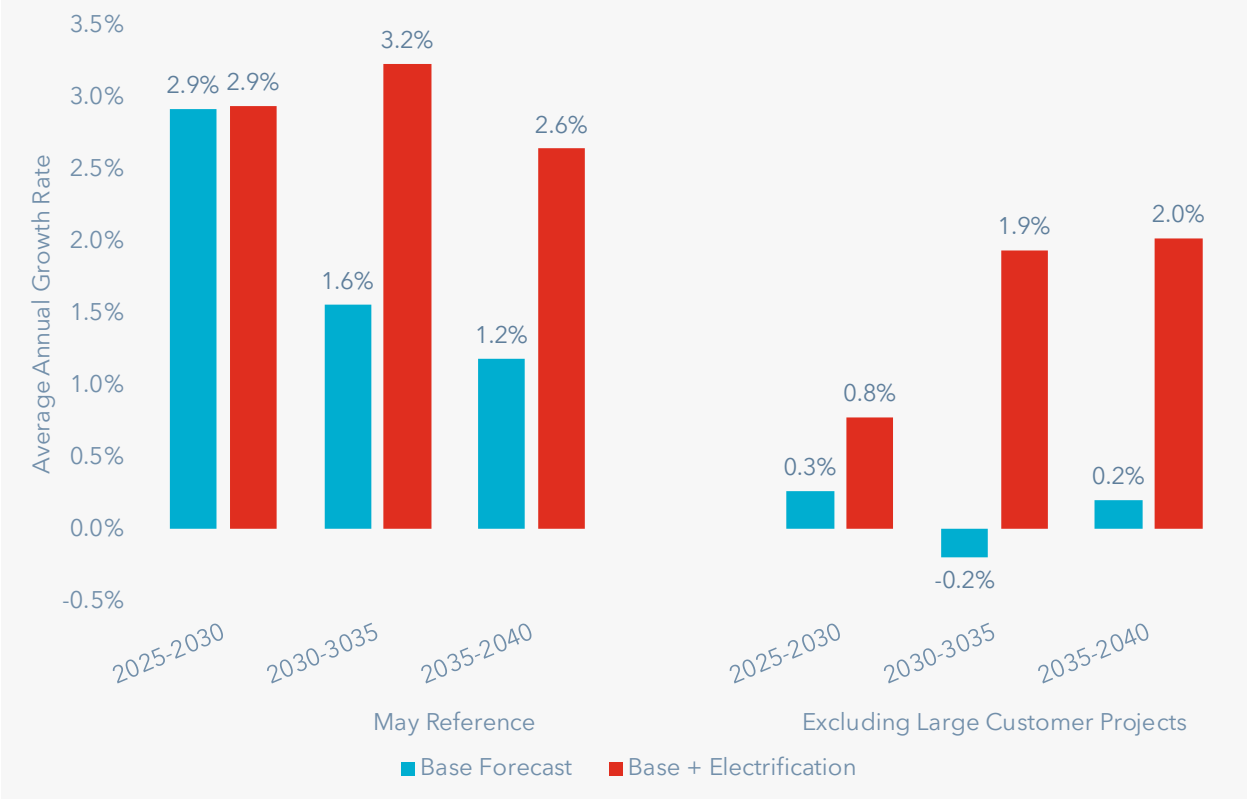
Table 10. Twenty-year average annual growth rate comparison, Excluding Large Customer Projects

	May 2024 Reference	May 2024 Reference + Electrification	May 2024 Reference, Excluding Large Customer Projects	May 2024 Reference + Electrification, Excluding Large Customer Projects
Total Energy	1.9%	2.8%	0.1%	1.5%
Summer Peak	1.5%	3.2%	0.3%	2.3%
Winter Peak	1.4%	3.5%	0.2%	2.5%

The reductions in load estimates from forecasts that exclude large customer load is greatest in the near term where line of sight to large customer load is most certain and growth is expected to be greater. **Figure 17** compares the five-year average annual growth rates consistent with the May 2024 Reference load forecast and the forecast which excludes large customer load, with and without electrification. These estimates suggest large customer load comprises the majority of PGE growth prior to 2030, after which electrification in the residential and commercial segments begins to account for an increasing share of forecasted growth.

[46] This methodology is forward looking and does not differentiate existing large loads.

Figure 17. Comparison of annual average growth rates for energy forecast at 5-year increments



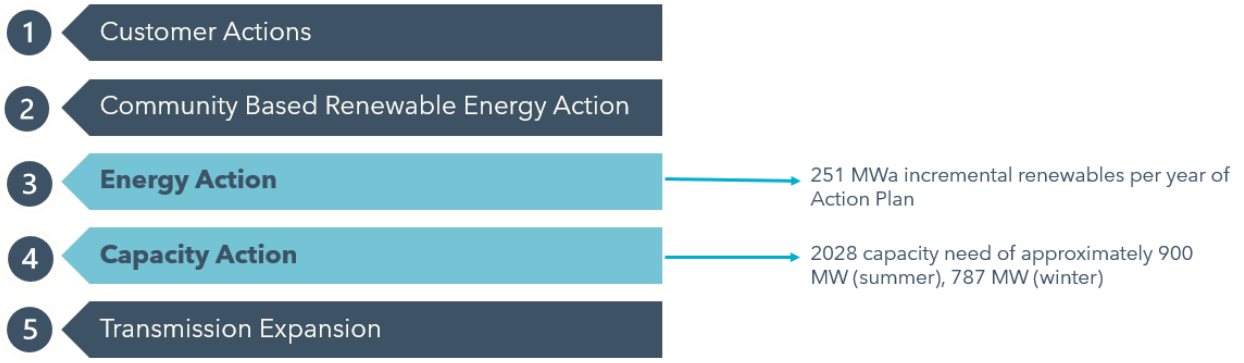
3.2 2023 RFP results

3.2.1 Target and need

In the 2023 RFP, PGE pursued non-emitting resources to facilitate a reliable energy supply for the service area while reducing the greenhouse gas emissions associated with energy generated to serve customers. PGE's 2023 CEP/IRP found that the company has a need for additional capacity resources beginning in 2026, with an additional capacity need in 2028. Further, the 2023 CEP/IRP Action Plan identified that procuring additional energy resources is needed to support the reduction of greenhouse gas emissions within PGE's portfolio. The 2023 RFP was designed and approved, subject to conditions, to seek resources to address these needs within a 2025-2027 commercial online date (COD) window, consistent with PGE's 2023 CEP/IRP Action Plan.[47] PGE's 2023 CEP/IRP Action Plan items are shown in **Figure 18**, with the targets for energy and capacity actions targeted by the 2023 RFP shown in light blue.

[47] See Order No. 24-011, as modified by Order Nos. 24-024 and 24-085.

Figure 18. PGE's 2023 CEP/IRP Action Plan, and associated targets for 2023 RFP[48]



As shown above, the 2023 CEP/IRP Action Plan included both a capacity and energy action: the capacity action identified a need in 2028 of 905 MW in summer and 787 MW in winter.[49] The response from the market to the 2023 CEP/RFP was robust, and PGE's final shortlist included 361 MW of capacity contribution from renewable resources, plus an additional 695 MW of capacity contribution from dispatchable capacity options in the form of lithium-ion battery storage. In the RFP, PGE sought the identified capacity needs entirely from non-emitting resources and has identified resources which, after contemplating the latest IRP capacity modeling updates, reduce PGE's 2028 capacity need to 0 MW and 195 MW for summer and winter, respectively. Because negotiations are ongoing, there is still uncertainty in which resources will become part of PGE's portfolio.

PGE evaluated the costs, risks, and benefits of renewable procurement volumes to make progress toward the identified energy action outlined in PGE's 2023 CEP/IRP Action Plan. While PGE saw a robust response to the 2023 RFP, the total number of renewable energy resources recommended for procurement based on customer value was not sufficient to fully address PGE's 2025-2027 energy action as described in the Action Plan in the 2023 CEP/IRP. Where the 2023 CEP/IRP recommended 753 MWa of renewable energy acquisition, the total generation available from of renewable options on PGE's initial shortlist for this RFP was approximately 350 MWa. PGE's final shortlist Group A, which identified 96 MWa of renewable energy resources and 775 MW of lithium-ion batteries, and Group B, which identified 885 MW of lithium-ion batteries, included projects that are likely to represent least-cost, least-risk for customers.[50] PGE continues to negotiate with the remaining Group A projects and aims to finalize contracts over the course of 2025.

PGE did not include four unique renewable projects on the final shortlist, which together represented an additional 1,000 MW of resources. The primary reason these projects were not included in the final shortlist was their anticipated impact to customer affordability. PGE is continuing to actively seek additional clean energy resources from the market that offer reliability

[48] See PGE's Request for Acknowledgment of the Final Shortlist of Bidders, p. 5
[49] See PGE Response to Staff's Round 2 Comments and Recommendations, p.42
[50] On December 12, 2024, one of the projects in Group A notified PGE that it was withdrawing from commercial negotiations.

and efficiency at the lowest costs to customers. PGE is currently advancing the 2025 All-Source RFP to seek additional non-emitting energy and capacity resources. PGE plans to issue the RFP to the market in the third quarter 2025 and compile a final shortlist in early 2026.[51]

3.2.2 2023 RFP proxy

On November 25, 2024, the OPUC acknowledged, subject to conditions, PGE's 2023 RFP final shortlist of bids.[52] PGE commenced commercial negotiations to acquire resources from the final shortlist Group A.[53] The final shortlist Group A consists of four projects with the following general characteristics:

1. Hybrid 250 MW solar & 250 MW battery
2. Hybrid 125 MW solar & 125 MW battery
3. Standalone 400 MW battery
4. Standalone 41 MW solar

Because negotiations for project acquisition are ongoing, there is still uncertainty in which resources will become part of PGE's portfolio. To account for the expected addition of resources to the portfolio, PGE's models include a proxy set of resources that represents an informed estimate of the quantity of resource acquisitions from the 2023 RFP. The RFP proxy serves as a placeholder for the resources in PGE's modeled portfolio.

The RFP proxy represents the energy and capacity benefits contributed to PGE's portfolio by the expected resources from the final shortlist so they can be accounted for in calculation of energy need, capacity need, and proxy resource ELCCs. The RFP proxy used in IRP Update modeling consists of 375 MW of solar/battery hybrid resources and 400 MW of standalone 4-hr battery storage, representing Group A resources.[54] Since identifying the resources in the final shortlist Group A, the 41 MW standalone solar project withdrew from commercial negotiations and energy and capacity are not included in the RFP proxy.[55] Subsequent to the final definition of modeling assumptions in the Update, the 250 MW solar & 250 MW battery hybrid project also withdrew from commercial negotiations. Because modeling was already underway, the energy and capacity of the 250 MW solar & 250 MW battery hybrid is included in the RFP proxy. The updated needs in 2028 with the inclusion of the RFP Proxy are 0 MW and 195 MW for summer and winter, respectively.

[51] Docket No: UM 2371
[52] OPUC Docket No. UM 2274 Final Order available here: https://apps.puc.state.or.us/orders/2024ords/24-425.pdf
[53] The shortlist is bifurcated into an A group and a B group of resources. The RFP proxy is based on the resources in group A only and references to the final shortlist in this section refer to group A resources only. PGE's decision on whether to pursue group B bids will depend upon the outcomes of commercial negotiations for group A bids.
[54] Final shortlist Group B resources are not included in the RFP proxy.
[55] On December 12, 2024, the 41 MW standalone solar project notified PGE that it was withdrawing from commercial negotiations.

3.3 Energy need

Energy need is the difference between PGE's forecasted load (demand) and the supply of energy available to serve load from existing owned and contracted resources in the baseline portfolio, defined in terms of average Megawatts (MWa). Energy need is an important input to portfolio analysis as one of the main drivers of the need for new resource additions. This section describes the energy need forecast used for portfolio analysis, calculated with the most up to date information available at the time of analysis.

PGE presented an annual energy position forecast in the 2023 CEP/IRP and subsequently updated it in the 2023 CEP/IRP Addendum.[56] The Addendum incorporated an updated load forecast and changes to the baseline portfolio that occurred after the writing of the 2023 CEP/IRP. The net effect of updates made to the annual energy position from the 2023 CEP/IRP to the Addendum were to increase PGE's energy need.

PGE has incorporated additional updates into modeling since the Addendum, which has led to another update to PGE's forecasted energy need. Modeling updates incorporated into IRP Update that impact annual energy need include an updated load forecast (**Section 3.1 Econometric load forecast**), updated forecasts of cost-effective DERs (**Section 5.2.1 Passive DERs**) and EE (**Section 5.3 Energy efficiency**), and updates to PGE's baseline resource portfolio. The load forecast used in the Update includes higher energy demand compared to the forecast from the IRP Addendum. Updated forecasts of cost-effective DERs and EE have increased since the IRP Addendum. These resources offset energy usage and reduce the quantity of load to be served, decreasing annual energy load resource balance.

Updates to the baseline portfolio since the Addendum include the RFP proxy, the addition of new contracts and an updated Qualifying Facilities (QF) forecast. The three new hydro contracts in the base portfolio include one with Grant PUD from 2024-2026 and two with Douglas PUD, one spanning 2024-2025 and one from 2026-2030.[57] Additionally, included in this update is a new contract with Calpine for a 250 MW share of the Hermiston combined-cycle natural gas plant in Hermiston, OR from 2025 through 2029.[58] Baseline portfolio updates have increased the quantity of energy in PGE's portfolio, decreasing annual energy need.

The incremental impact of each of the updates and resulting 2030 Reference Case needs are shown in **Figure 19**. In 2030, the increase in annual energy in PGE's baseline portfolio and increased EE and DERs outweigh the increased need associated with the new load forecast and other modeling updates, resulting in a decrease in PGE's annual energy load-resource balance from 1307 MWa to 1204 MWa. PGE's annual energy load-resource balance, including Reference, Low, and High need futures, is shown for the 20-year planning horizon in **Figure 20**.

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[56] 2023 CEP/IRP and Addendum to the 2023 CEP/IRP

[57] Hydro contract details available in PGE 2024 10k filing, page 15.

[58] Consistent with the methodology used in the 2023 CEP/IRP, the quantity of emitting energy retained to serve PGE's load is limited to quantities that are compliant with HB 2021 GHG emissions targets based on the linear GHG reduction glidepath. The quantity of energy retained from the Calpine project is determined by the IGHG model. The impact of Calpine on PGE's retained quantity of emitting energy is described in **Section 3.5.1 HB 2021**.

Figure 19. Incremental impacts of updates on 2030 Reference Case energy need

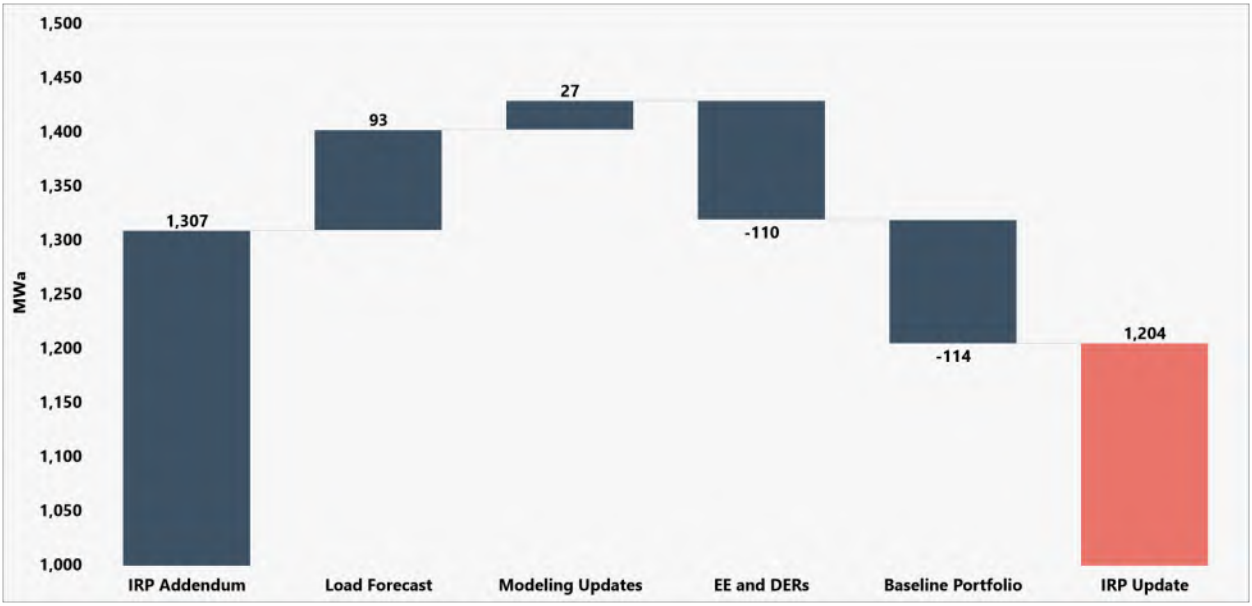
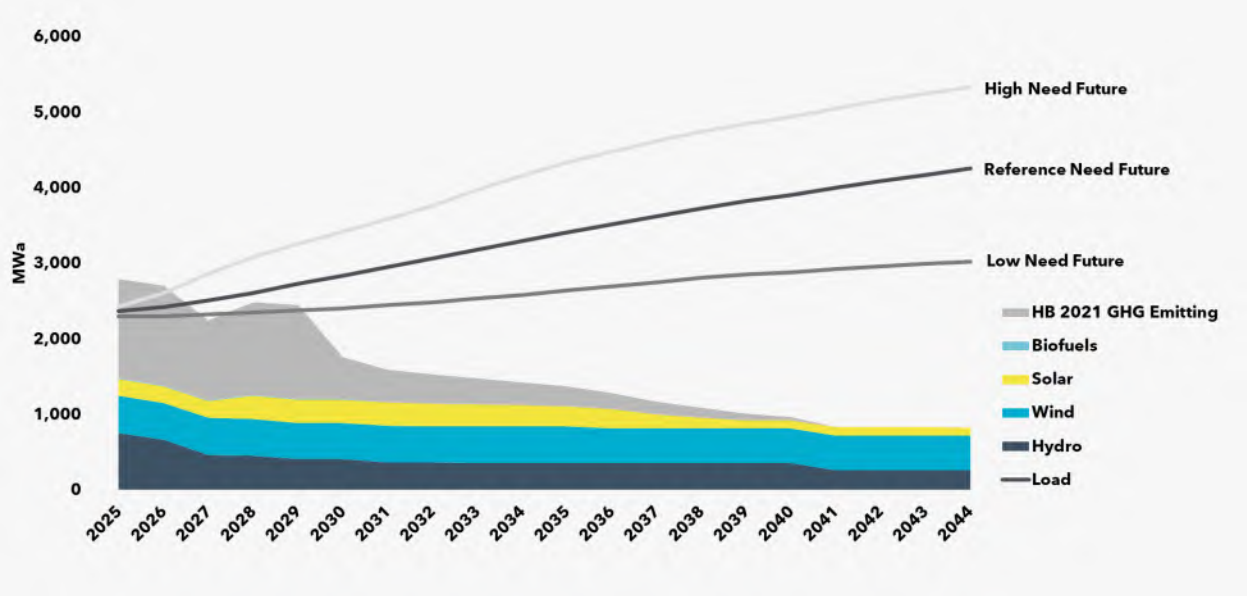


Figure 20. Annual energy-load resource balance from 2025 through 2044

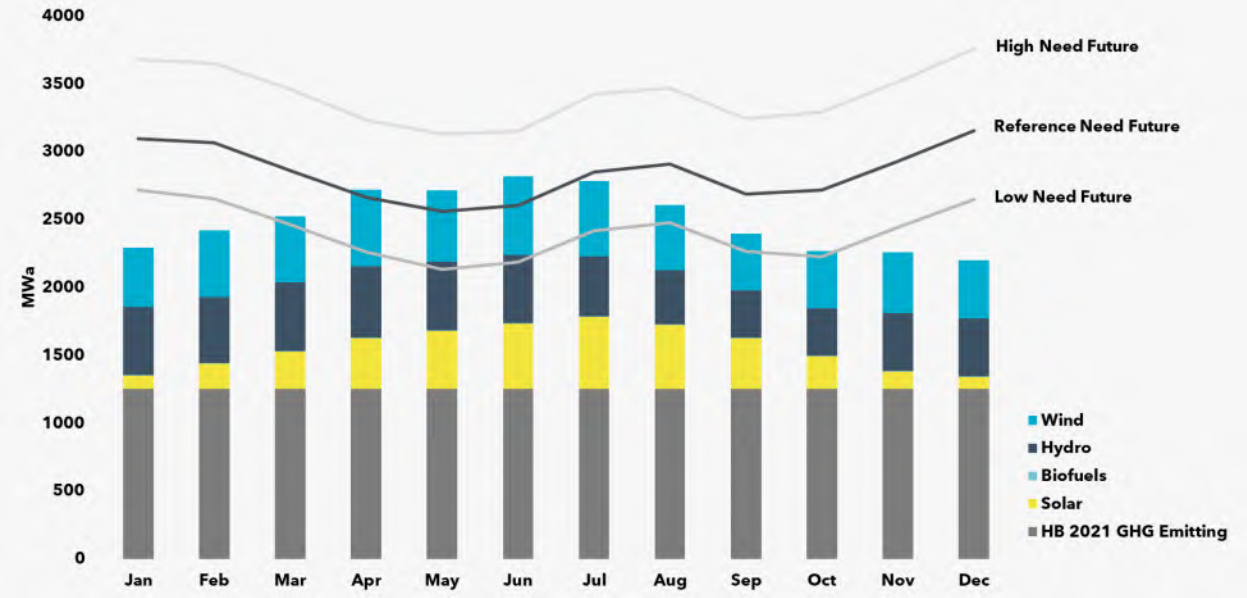


The gap between load and the stacked area of annual energy from PGE's baseline portfolio retained to serve retail load under HB 2021-compliant assumptions in **Figure 20** represents the minimum energy need remaining to be filled by incremental resource additions in portfolio analysis. For this Update PGE has calculated a monthly energy-load resource balance to further inform the magnitude of PGE's energy need. Because load and energy generation from renewable resources are both influenced by weather and the presence or absence of sunshine and wind, there are distinct seasonal patterns to energy supply and demand. PGE's load tends to

peak in the summer and winter when temperatures are very hot or cold and is lower during the mild temperatures of the spring and fall. Solar facilities produce the most energy in the summer and the least in the winter. Patterns of wind production are less predictable than solar but still display seasonality that varies by location. On average, the wind in PGE's baseline portfolio tends to produce the most in the spring and early summer. Hydro generation is also seasonal, with peak generation coinciding with spring runoff.

These dynamics in load and expected resource generation are shown for 2028 in **Figure 21**. The quantity of energy from renewable resources is calculated using monthly average capacity factors, which represents the percent of the time that a facility is expected to be generating throughout any given month. Energy from dispatchable sources cannot be allocated using static average capacity factors like non-dispatchable resources because the timing of their generation is determined by economic and operational decision making, so in **Figure 21** they are depicted as flat across each month of the year.[59]

Figure 21. 2028 monthly load-resource balance

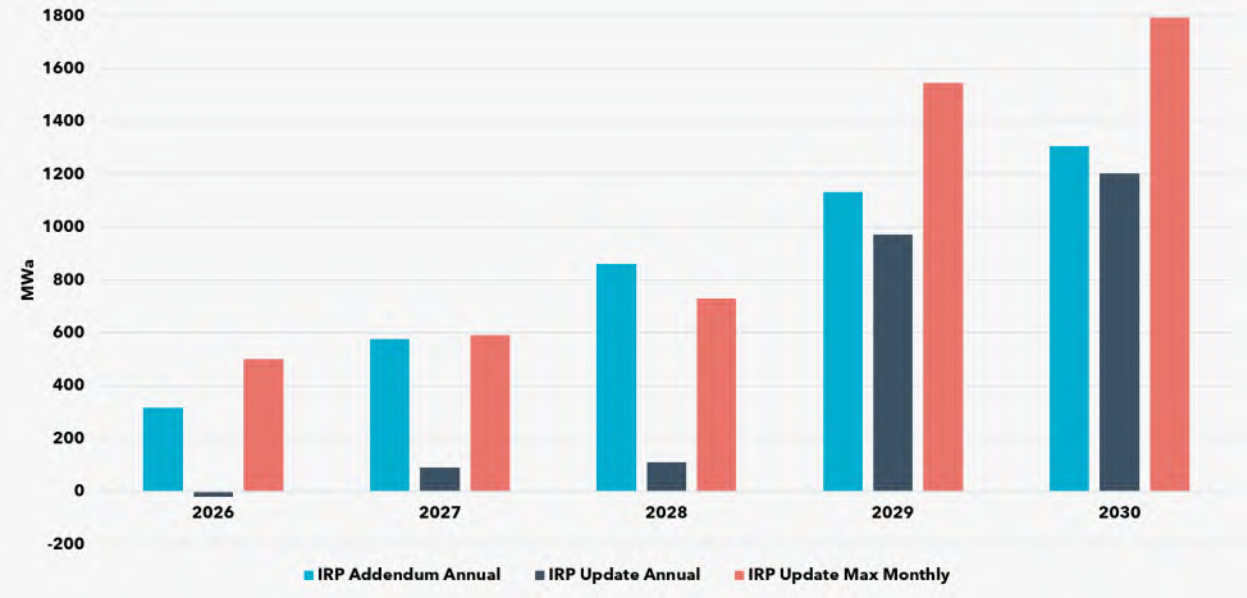


Seasonal dynamics can have important implications for resource planning and influence the optimal quantity and mix of resources in the portfolio. The magnitude of energy need in a given month may exceed the energy need on average across the year, increasing the quantity of resources needed. The timing of energy need throughout the year may be more correlated with some resource options than others, impacting which resources most optimally meet energy needs. Monthly energy-load resource balance accounting enables PGE to capture and consider seasonal variations in resource planning.

[59] The monthly allocation of energy from dispatchable sources is accounted for in portfolio analysis and is discussed in **Section 6.1.2 Energy need**.

The Update relies upon monthly energy needs to inform portfolio analysis. Resources are added to portfolios to ensure that each portfolio is forecasted to achieve monthly energy load resource balance. **Figure 22** compares PGE's annual energy load resource balance to the monthly energy load resource balance that is incorporated into PGE's portfolio analysis. Consistent with the above figure, this comparison assumes that energy from dispatchable sources is evenly distributed throughout the year, while PGE's portfolio analysis methodology allows dispatchable energy to be allocated throughout the year to minimize maximum monthly energy needs consistent with comprehensive portfolio economics. PGE's choice of incorporating monthly energy needs into portfolio analysis is responsive to Staff's condition, adopted by the OPUC in the 2023 CEP/IRP which expressed concern the previous filings reliance on annual energy metrics to demonstrate continual progress toward PGE's HB 2021 emissions targets.[60] By incorporating monthly energy needs into portfolio analysis, PGE's IRP Update better represents the seasonal aspects of PGE's decarbonized energy needs. Additional analysis which directly assesses the ability of the Preferred Portfolio to meet emissions targets on at an hourly granularity is discussed in **Section 6.2.2 Hourly energy and emissions accounting results**.

Figure 22. Comparison of Annual to Monthly Energy Need



3.4 Capacity need

Capacity need estimates the effective capacity, expressed in MW, required to achieve a resource-adequate portfolio. These estimates come from PGE's resource adequacy model, Sequoia. Sequoia estimates capacity need under a "1 day in 10 years" reliability metric, interpreted as 2.4 loss of load hours (LOLH) annually. PGE first developed Sequoia during the

[60] Staff Recommendation #3 from IRP Acknowledgement Order 24-096. Available here: https://apps.puc.state.or.us/orders/2024ords/24-096.pdf

2019 IRP Update.[61] The following section discusses the 2023 CEP/IRP Update need across the planning horizon, describes the effect of model updates made since PGE's CEP/IRP Addendum: System Need & Portfolio Refresh, and compares capacity need across different need futures that capture supply and demand uncertainty.

3.4.1 Seasonal need – reference case

The 2023 CEP/IRP Update estimates capacity need in summer (April-September) and winter (October-March). **Figure 23** shows PGE's seasonal capacity need across the 20-year planning horizon compared to capacity need previously estimated in Addendum filing.[62] PGE's near-term capacity need decreased since the addendum because of supply side additions, namely bilateral contracts, and resource additions modeled by the RFP Proxy. The updated summer capacity need is estimated at 47 MW in 2026. This capacity need grows to 485 MW in 2027 with the expiration of Grant PUD hydro contracts, then drops to 0 MW in 2028 as RFP Proxy Resources enter the modeled supply stack. In 2027, a winter capacity need of 159 MW is estimated and is expected to continuously grow.

PGE notes sources of uncertainty in short-term capacity need estimates. PGE's Econometric Load Forecast represent average expected outcomes and include a range of possible values. The 2023 CEP/IRP Update represents uncertainty in load forecasts by modeling different need futures, which could decrease or increase short-term need significantly (**Figure 23**). Another source of uncertainty relates to PGE's supply portfolio. Absent executed agreements, the 2023 CEP/IRP Update includes RFP Proxy resources assuming a January 1, 2028 commercial operations date. Resources may reach commercial operations before or after the assumed date. PGE can address remaining short-term need through commercial agreements to access existing resources. Structured or bilateral contracts can be agreed upon to provide capacity from existing resources. Additionally, regional sharing mechanisms from state resource adequacy requirements may provide additional capacity.[63]

Looking beyond the short-term, capacity needs in both seasons increase significantly in 2030 due to the exit of Colstrip and expiration of the Calpine contract. Capacity need grows steadily until 2040 where it is assumed all gas plants exit the portfolio, resulting in an approximately 2 GW increase in need.[64]

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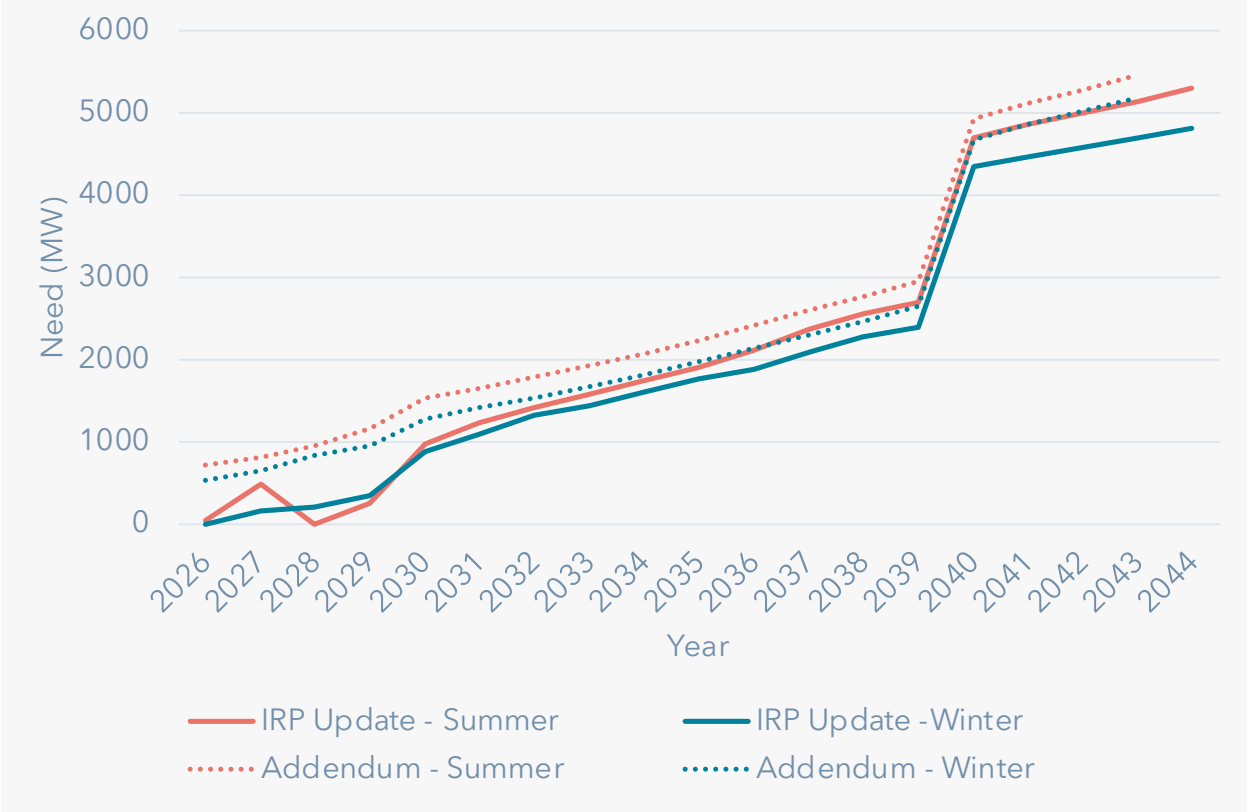
[61] The following resources provide descriptions of Sequoia from past roundtables and filings: 2019 IRP Update Sequoia overview - Appendix K; 2023 CEP/IRP Sequoia overview – Appendix H.3; May 2021 CEP/IRP Roundtable; March 2022 CEP/IRP Roundtable; January 2023 CEP/IRP Roundtable; August 2024 CEP/IRP Roundtable

[62] PGE's 2023 CEP/IRP Addendum: System Need & Portfolio Refresh

[63] OPUC Docket AR 660 – Resource Adequacy Rules

[64] Due to infeasibility of model solutions in Sequoia for years with a very high need and little dispatchable resources, out of model adjustments were made to extrapolate latter years in the planning horizon. Infeasible years for the reference and high need futures are 2041-2044, and 2044 for the low need future. The average annual growth rate of need for 3 years prior to the greatest feasible year for each season and need future are used to extrapolate need. The average annual growth rate used to extrapolate need is approximately 8%, 6% and 4% for reference, high and low need futures, respectively.

Figure 23. 2023 CEP/IRP Update Capacity Need – Reference Case



3.4.2 Changes to modeling capacity need

The 2023 CEP/IRP Update includes multiple changes to Sequoia as part of refreshing PGE's capacity need estimates. The updates include methodological and other input related changes that aim to improve the representation of Sequoia's assessment of demand and supply in PGE's system. **Figure 24** and **Figure 25** display the incremental effect of major updates affecting PGE's capacity need estimates for both summer and winter, respectively. The incremental changes in capacity need depicted depend on the order in which updates are sequenced, while the final capacity need does not.[65] Updates were ordered to show methodological effects first, followed by changes in input assumptions. Updated capacity need in 2028 shows a net decrease for both summer and winter.

3.4.2.1 Updated analysis period

As part of the 2023 CEP/IRP Update, Sequoia was updated to allow modeling of the most recent 30 years of historical load and generation data, shifting the analysis period from 1992-2021 to 1994-2023. This shift in analysis period allows Sequoia to model more recent weather effects on

[65] For example, the 155 MW increase and 57 MW decrease of summer and winter capacity need resulting from Load Updates, respectively, are relative to the changes which resulted from the "Updated Analysis Period" vintage of Sequoia modeled prior. Reordering these changes would not alter the 0 MW summer and 195 MW winter capacity needs for 2028.

load and variable energy resources. This change in methodology results in a 46 MW increase in summer need and 14 MW increase in winter need.[66]

3.4.2.2 Load forecast updates

Two updates to load forecasts used in Sequoia are included in the 2023 CEP/IRP Update. First, PGE's Corporate Load Forecasts (CLF) hourly historical simulation is used in place of the previous historical simulation. Second, the load forecast version is updated from May 2023 to May 2024. As part of the 2023 CEP/IRP Update, PGE's CLF developed a historical simulation of hourly load (**Section 3.1 Econometric load forecast**). This simulation replaced the previous approach which scaled historical weather-dependent load to approximate forecasted monthly peak and average energy for future years. Scaling the weather-dependent load shape required a linear estimation which aimed to represent future load shapes, a process which was less precise and irreproducible iteration-to-iteration. The new CLF approach produces the hourly historical simulation necessary for Sequoia, resulting in a more efficient and reproducible method. Lastly, forecasts used to estimate load were updated from May 2023 to May 2024. In total, these load forecast updates result in a 57 MW decrease in winter capacity need and a 155 MW increase in summer capacity need for 2028.

3.4.2.3 Supply-side updates

The various supply-side updates that are part of the 2023 CEP/IRP Update (**Section 3.3 Energy need**), resulted in a 313 MW, 218 MW and 615 MW reduction in summer need for new contracts in the base portfolio, revised DER estimates, and RFP Proxy Resources, respectively. In winter, the supply-side updates resulted in a 335 MW, 91MW and 162 MW reduction in capacity need from new contracts in the base portfolio, revised DER estimates, and RFP Proxy Resources, respectively.

[66] Reference **Appendix B Sequoia methodological update** for additional detail.

Figure 24. Incremental Changes to Capacity Need - Summer 2028 Reference Case

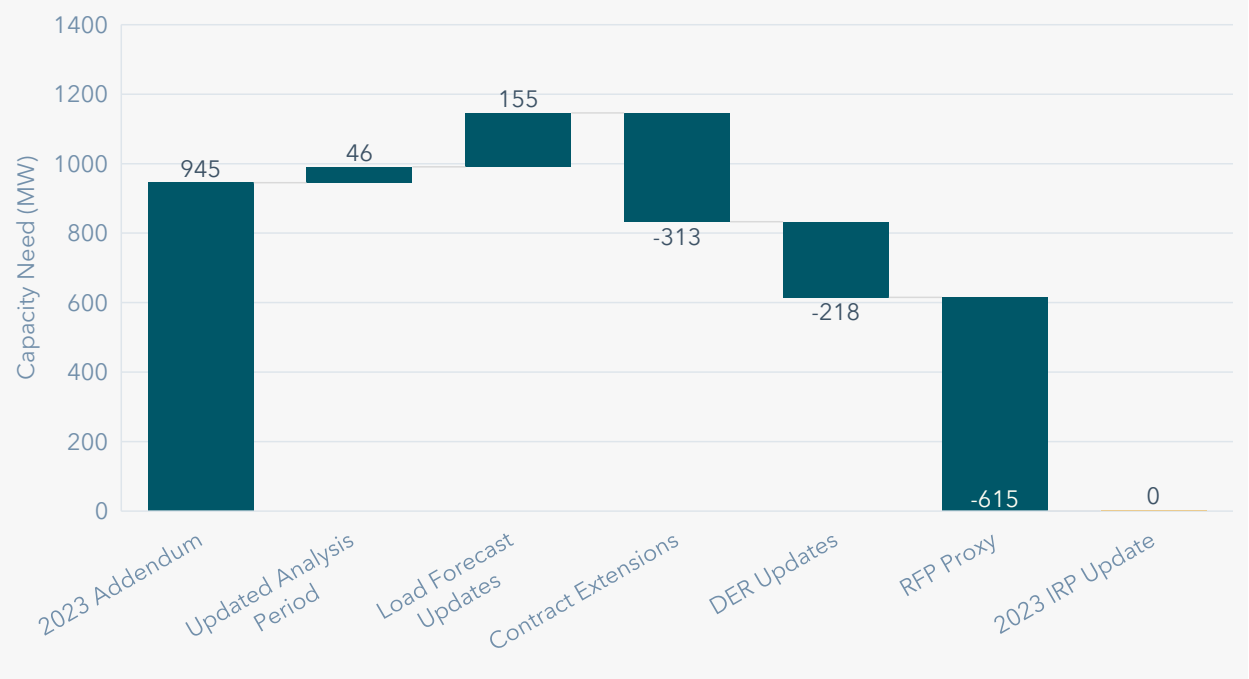
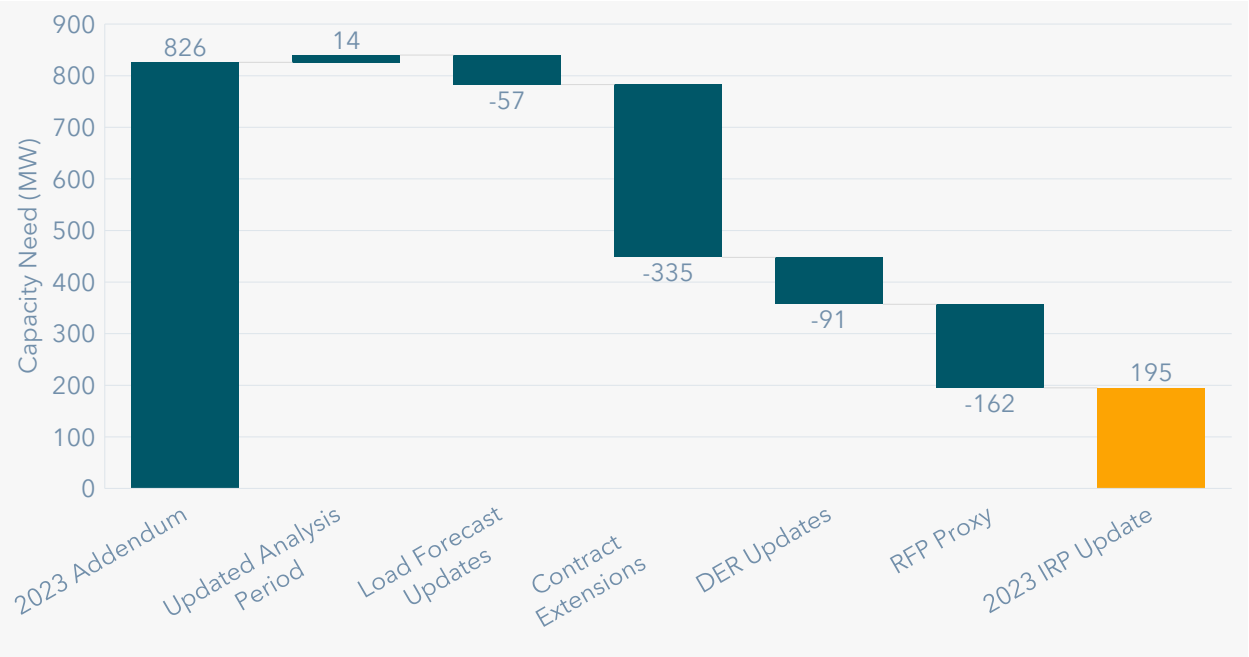


Figure 25. Incremental Changes to Capacity Need - Winter 2028 Reference Case

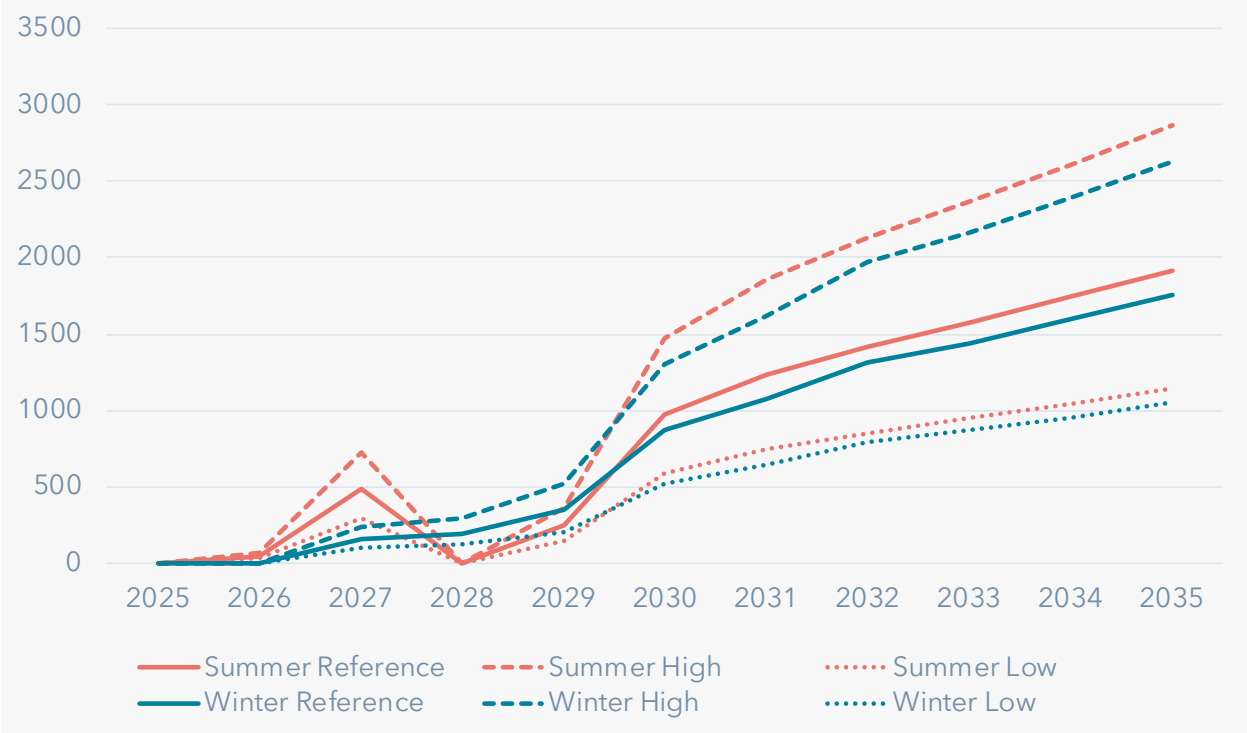


3.4.3 Capacity need under different futures

The 2023 CEP/IRP Update models capacity need across low and high need futures to capture uncertainty in both supply and demand side variables. **Figure 26** shows the capacity needs of the low and high need futures and the Reference Case. The figure suggests the different futures

approximate a uniform shift of reference case needs, resulting in 0 MW of need prior to 2030 in both seasons, except summer 2027. The high need future results in approximately 700 MW more need on average in each season for years 2030-2035.

Figure 26. Capacity need under different need futures: 2026-2035



3.5 State policy requirements

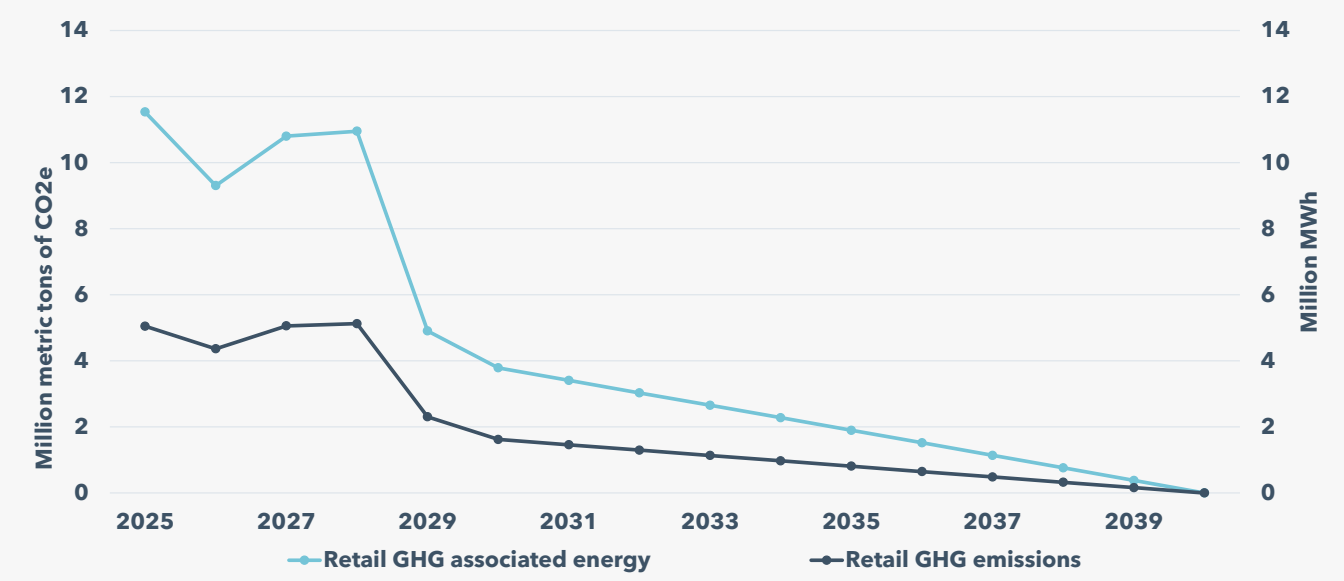
This section describes how State policy requirements are imposed through the utility regulatory framework and updates PGE made to reflect these constraints as part of the 2023 CEP/IRP Update.

3.5.1 HB 2021

The 2023 CEP/IRP was the first resource plan published by PGE that addressed the requirements of HB 2021. The emissions targets of HB 2021 remain unchanged from the 2023 CEP/IRP Update; compliance with these requirements is incorporated as the default assumption in modeling, including the creation of the Preferred Portfolio and the Action Plan. More details on modeling specifics can be found in those chapters of this document.

PGE continues to rely on a linear GHG reduction glidepath to inform the modeling as it was found to provide the best combination of cost, risk, and rate of emissions reduction amongst a variety of glidepaths tested in the Appendix I C-level analysis of the 2023 CEP/IRP. The impact of this glidepath is a limit of the thermal generation and market purchases with associated emissions retained for retail load. Updated data and analysis described in Chapter 3 inform an updated emission reduction glidepath presented in **Figure 27**.

Figure 27. GHG emissions & energy associated with serving Oregon retail load (Reference Case)



The 2023 RFP procurement results are not yet final but could add resources by the beginning of 2028. While further resource procurement will allow for more portfolio additions, these are unlikely to come online before the beginning of 2029 due to the time needed for procurement processes and construction timelines. Consequently, all current resources are necessary to meet demand and maintain reliability until 2029. Modeling does not include any additional non-emitting resources until the beginning of 2029 at the earliest. This situation limits the near-term emissions reductions achievable by PGE over the next three years. As a result, the updated emissions glidepath in the near-term reflects emissions levels more consistent with recent history given inability to alter the current generating mix prior to 2029.

PGE is accelerating procurement through RFPs between now and 2030. PGE has requested approval of its 2025 RFP in Docket UM 2371 to continue to seek resources to meet needs that remain after the conclusion of the 2023 RFP. Possible resource procurements from the 2025 RFP are presently unknown and therefore not included in this analysis.

Figure 28. Total (retail + wholesale) GHG emissions under the adjusted linear reduction glidepath (Reference Case)

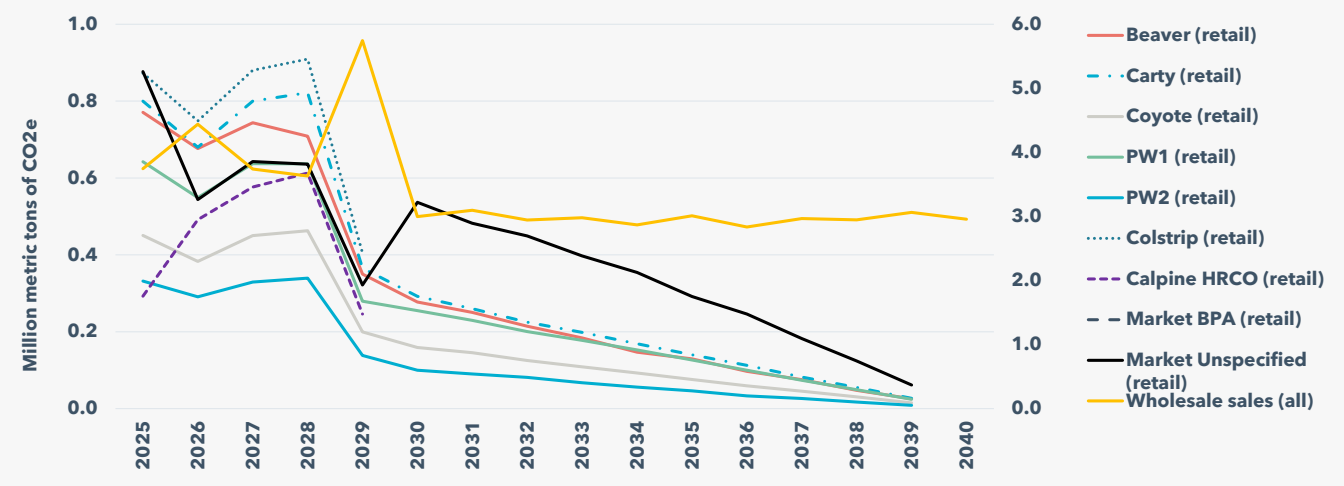


Figure 28 reflects GHG emissions projections from thermal generation and market purchases under the updated decarbonization glidepath. The lines specific to individual resources show retail GHG emissions. The specified wholesale sales category captures GHG emissions from sales from all sources not accounted for in retail sales that in the Update forecast support customer affordability through reduced net-variable power costs and reflect ongoing participation in the wholesale market to support reliability of the regional power system.

To achieve the HB 2021 emissions target in 2030, integration of non-emitting resources onto PGE's system will enable a systematic reduction in fossil fuels serving Oregon retail load and subsequent GHG reductions. As non-emitting energy and capacity resources are added, the amount of thermal output from natural gas and coal for Oregon retail load is reduced to meet the emissions targets. The market for thermal generation is increasingly constrained across the West, with clean energy or GHG requirements in place in almost every state in the Western Interconnection. Thermal generation sold into the Western Interconnection is therefore increasingly subject to the GHG or clean energy requirements of other states. For example, fossil fuel energy exported to California and Washington incurs direct carbon pricing obligations. These policies, and dramatic addition of non-emitting resources anticipated across the region, contribute to reducing the quantity of economically dispatched thermal output in PGE's forecasts.

3.5.2 RPS obligation

RPS requirements were included in the 2023 CEP/IRP and will continue to be accounted for in portfolio analysis in the 2023 CEP/IRP Update. PGE's RPS obligation, which is a function of the forecasted load, has been updated to reflect the updated load forecast used in the Update. Updated RPS requirements are shown in **Table 11**. The Preferred Portfolio's compliance with RPS requirements is demonstrated in **Section 6.2 Preferred Portfolio**.

Table 11. Updated RPS obligations Reference need future

Year	RPS requirement (% of retail sales)	RPS requirement (MWa)
2025	27%	482
2030	35%	748
2035	45%	1155
2040	50%	1470

This filing has not made any updates to assumptions regarding the Company's REC bank since the 2023 CEP/IRP. In Order No. 24-096, the OPUC directed PGE to provide a more detailed RPS analysis in the next CEP/IRP, and PGE intends to include this analysis and broader REC strategy in the 2026 plan.[67]

3.5.3 Small scale renewables standard

Following Commission direction, this Update will explicitly account for Oregon's small-scale renewable (SSR) requirement in its modeling.[68] The SSR requirement that, starting in 2030, 10 percent of aggregate electric capacity in PGE's portfolio be composed of renewable facilities 20 MW or smaller in size is incorporated into portfolio analysis. In this update, PGE has added a new constraint and a new SSR proxy resource option in ROSE-E to ensure that the Preferred Portfolio is compliant with SSR requirements. The SSR proxy resource option is described in **Section 5.4 SSR resource**. The quantity of resources forecasted to be required to meet the 10 percent requirement, which is dependent on the quantity of resources added in the Preferred Portfolio, is presented and discussed in **Section 6.4 Small scale renewables plan**.

[67] Direction for future planning on RECs can be found on page 22 of the final order, available at: https://apps.puc.state.or.us/orders/2024ords/24-096.pdf.
[68] The SSR requirement is included based on Commission direction in the LC 80 final order. See page 11 at: https://apps.puc.state.or.us/orders/2024ords/24-096.pdf.

Chapter 4. Transmission landscape

PGE owns transmission assets and holds transmission contract rights for reliable delivery of electricity from generation resources to load. Additional transmission rights will be required for PGE to access more diverse resources, decarbonize, and maintain adequacy. However, there is a limited amount of existing transmission available for future resources to use. This chapter provides an update on relevant evolving topics discussed more fully in the 2023 CEP/IRP and provides an overview of PGE's current transmission environment, projects in PGE's system planning, and options in IRP modeling.

Key Highlights

- The transmission system serving PGE customers is highly constrained, with limited existing transmission available for future resources, particularly on BPA's system which supports limited resource additions prior to further transmission upgrades.
- The North of Pearl (NOPE) flowgate has emerged as a significant constraint since August 2023, creating operational challenges that could be exacerbated by ongoing regional trends that are causing increasing south to north flows near Portland. Multiple projects are required to address reliability risks related to this flowgate.
- Transmission plays an essential role to access diverse generation resources that are unavailable within PGE's service territory. Several transmission projects in various stages of development have been identified to help PGE access new renewable resources from diverse geographic areas.

Developments Since 2023 IRP

This Update reflects significant developments in PGE's transmission planning since the 2023 CEP/IRP. The North of Pearl flowgate, which BPA established in August 2023, has created operational constraints during periods of renewable resource imports from California and the desert southwest across PGE's service territory. For the Bethel-Round Butte (also known as Warm Springs Power Pathway) project, PGE and the Confederated Tribes of Warm Springs have successfully secured a $250 million Grid Resilience and Innovation Partnerships (GRIP) Program grant, enabling survey work to begin. PGE has further refined additional transmission options in the modeling based on third-party analyses from Energy Strategies and Energy GPS, reflecting more realistic estimates of project timelines, achievable capacity, and market access benefits.

Strategic Implications

These changes highlight the growing urgency of PGE's transmission needs as the company works toward decarbonization goals while facing increasing load growth and system constraints. The emergence of the North of Pearl flowgate creates new operational challenges that will require collaborative solutions with BPA. The GRIP funding for the Bethel-Round Butte project improves its economics and solidifies its role as a valuable upgrade. Overall, the refined analysis of transmission options, further described in **Section 4.6 Transmission options for portfolio analysis,** provides a clearer picture of the timing and benefits of various projects, which will inform PGE's strategy for planning sufficient transmission capacity to access diverse resource zones and potentially lower cost markets.

Staff Recommendations Incorporated

The Update addresses several conditions from LC 80 Order 24-096. Broadly, the Update refined and expanded analysis of transmission and local resources as alternatives to large-scale transmission expansion. PGE has conducted a more comprehensive analysis of transmission constraints and potential solutions as supported by third party analysis. The company has expanded its evaluation of transmission options beyond BPA's system to include potential projects that would access more diverse climate zones, responding to stakeholder concerns about transmission development matching the urgency of PGE's needs. The update also reflects PGE's continued assessment of the Bethel-Round Butte 500 kV upgrade, which was identified by the OPUC as a project to study for increasing PGE's import capability.

4.1 Transmission and regulatory environment

PGE-owned and contracted-for generating resources to serve load are both directly connected to PGE's transmission system and remote to PGE's system. PGE's transmission portfolio – comprised of PGE-owned assets and held transmission rights – is designed to ensure reliable delivery of electricity from this broad array of generation resources to load. Variable energy resources that generate non-emitting electricity will need to be added to meet growing load and decarbonize towards the targets of HB 2021. Increasingly these resources are expected to be developed in new geographic areas, with their delivery to PGE's system requiring expanded transmission infrastructure and growing interconnectedness in the West.

4.1.1 Regulatory environment

As a vertically integrated investor-owned utility that is regulated by the Federal Energy Regulatory Commission (FERC), PGE is obligated by FERC to functionally separate its Transmission Function (PGET) from its Merchant function (PGEM). PGET is required to plan and operate PGE's transmission system in a non-discriminatory manner that provides open access to all transmission customers, including PGEM. This means PGET cannot unduly preference PGEM and, by extension, the retail customers that PGEM serves. PGET's transmission customers include

PGEM, Oregon-defined Electricity Service Supplier (ESS) customers, BPA, and transmission customers who utilize PGE's transmission system to transmit power across the region.

PGEM is responsible for purchasing transmission rights – on PGET's transmission facilities and other regional providers – to deliver power to PGE's service area to meet PGE's load obligations. PGEM holds extensive rights on PGET's transmission system, as well as the BPA transmission system, the largest transmission provider in the Pacific Northwest.

Consistent with Federal requirements, PGE must plan and build its transmission system to meet the needs of all PGET transmission customers, including PGEM, ESS customers, and all other transmission customers.[69] Transmission customers typically utilize PGE's transmission system to serve load contained within PGET's system footprint or to transfer power through PGET's system to other transmission systems.

Transmission customers who serve load located within PGE's Balancing Authority Area (BAA) generally use a transmission service called Network Integration Transmission Service (NITS). Transmission customers who move power through PGET's transmission system for delivery to a point on another transmission system typically use Point-to-Point (PTP) transmission service. For PGET to develop its transmission plans for most NITS customers, with the State of Oregon-defined Electric Service Supplier (ESS) customers being the exception, PGE uses the ten-year load-and-resource (L&R) forecasts supplied by NITS customers along with PTP transmission service commitments and requests. ESS customers are not currently obligated to designate generation resources to serve their loads because they are allowed to take a secondary form of NITS service under Oregon law.

PGET uses the NITS customers' L&R forecasts and the best available information, including transmission service requests, generation interconnection requests, and information from neighboring transmission providers' transmission planning and construction activities, to determine the need and timing for investments in the transmission system. The bulk of PGET's NITS customer-driven needs comes from PGEM, which supplies energy and capacity for PGE's retail customers. Oregon's HB 2021 is central to PGE's strategy and the resource decisions of PGET's transmission customers, including PGEM, resulting in the need to develop new transmission system investment and deployment plans. The 2025 L&R letter from PGEM to PGET documents the expectation that PGEM's future resource needs will change, given the need to meet growing load and comply with HB 2021. PGET works with its customers, including PGEM, to plan the PGET transmission system to maintain reliable service as its customers' resource mixes change over the next several years.

While PGE's transmission customers, except ESSs, are required to provide annual L&R forecasts looking ten years into the future, transmission development in the West requires lengthy planning, rights-of-way (ROW) acquisition, permitting, and construction timelines that often take years. As such, PGET cannot rely solely on the L&R forecasts to plan future transmission investments and must plan its transmission system on a longer time horizon.

[69] Such as the principles of FERC Order Nos. 890 and 1000 and requirements of PGE's FERC-approved open access transmission tariff (OATT).

4.1.2 PGE's transmission system

PGE's transmission system serves roughly half of Oregon's population and powers approximately two-thirds of Oregon's commercial and industrial activity. It is highly integrated with other transmission systems in the west due to the highly networked nature of the regional transmission system.

The PGE service area is a compact area located primarily in Oregon's Willamette Valley. PGE owns and operates its transmission system and BAA to deliver energy to retail customers while also providing transmission service to other wholesale transmission customers as required by FERC and in accordance with PGET's OATT. Most of PGE's existing, owned transmission assets are within the PGE service area. PGE also owns transmission assets in central and southern Oregon and Montana. PGE is obligated to plan, build, and operate the transmission system in a manner that reliably delivers power to serve customer load and the needs of PGET's OATT transmission customers.

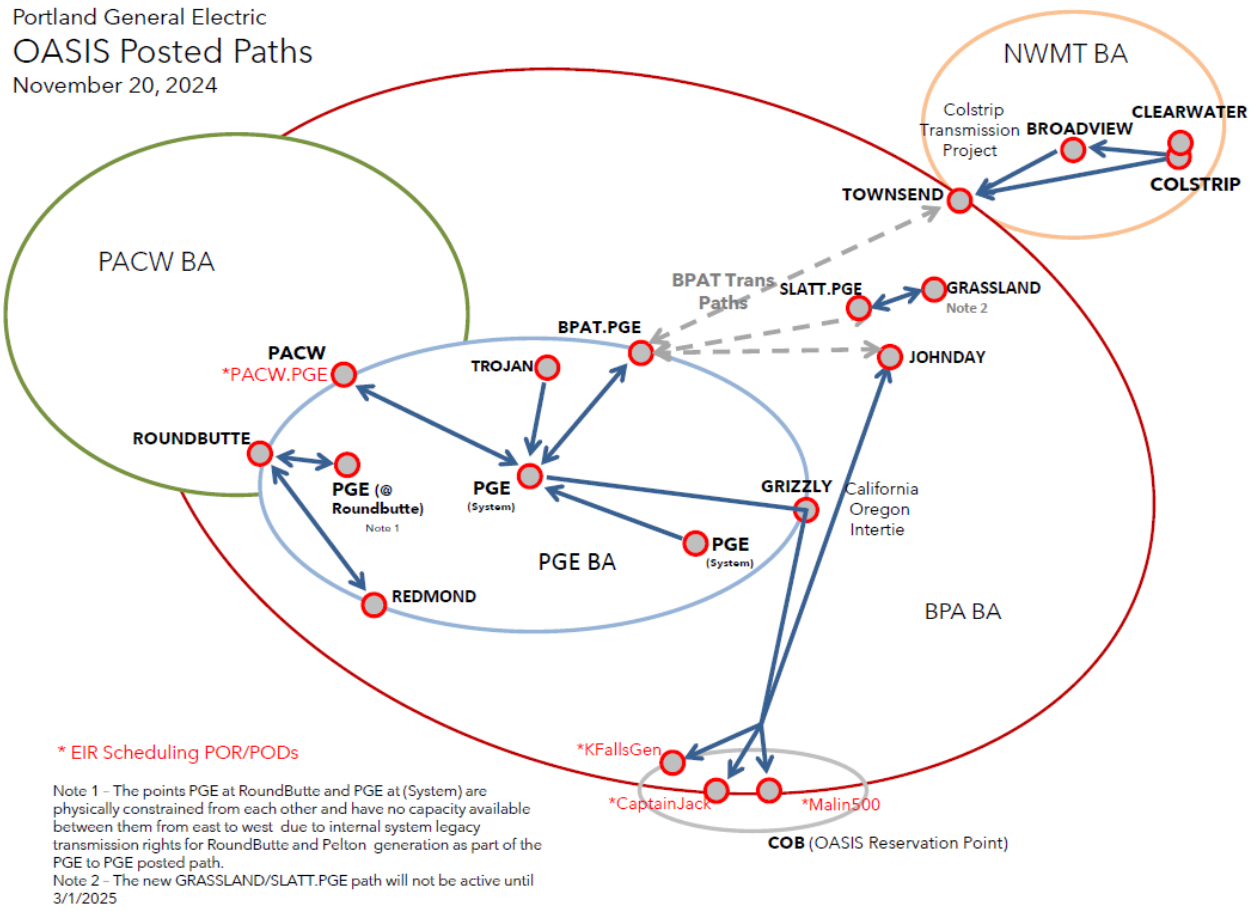
The PGE transmission system has 268 miles of 500 kV, 334 miles of 230 kV, and 559 miles of 115 kV lines, 454 circuit miles of 57 kV lines, and includes 176 substations and switching stations.[70]

4.1.3 Transmission system topology

PGE's transmission system (**Figure 29**) is highly interconnected with and exists almost entirely within the footprint of BPA. PGE is also interconnected to the western part of PacifiCorp's system, albeit with a much smaller transfer capability than PGE's interface with BPA. PGE's interface with PacifiCorp is primarily used to meet obligations within the Energy Imbalance Market (EIM). PGE is a co-owner of the Colstrip Transmission System, two 500 kV transmission circuits in Montana that runs between Colstrip and BPA's system in western Montana. Additionally, PGE owns one of the three 500 kV circuits in central Oregon that comprise the Northwest AC Intertie (NWACI), which is part of the California-Oregon Intertie, that connects Oregon to California. PGE jointly owns NWACI with BPA and PacifiCorp, and it is operated by BPA.

[70] An asset reclassification of PGE's 57 kV assets as transmission has been approved by the OPUC and is currently under review with FERC.

Figure 29. Oasis posted paths



4.1.3.1 BPA and Pacific Northwest transmission system

BPA is a federal power marketing administration (PMA) that operates approximately 75 percent of the transmission in the Pacific Northwest, consisting of more than 15,000 miles of high-voltage transmission lines. BPA operates transmission in Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah and Wyoming.[71]

4.1.3.2 PGE and BPA

PGE's system is largely surrounded by BPA's transmission system. PGE has long relied on BPA transmission to deliver energy from throughout the west to serve PGE load. PGE currently holds over 4000 MW of long-term firm transmission under contract with BPA. The rights held on BPA's system deliver energy from discrete points, either on BPA's system or from the edge of BPA's system to PGE. These rights are known as point-to-point transmission rights and the points of receipt and delivery are set in perpetuity. This means that if a resource that would normally utilize

[71] BPA transmission system: https://www.bpa.gov/-/media/Aep/about/publications/maps/bpa-transmissionlines-and-facilities.pdf.

certain rights is unavailable, the unused transmission rights cannot be used to access different points on BPA's system. As discussed by BPA and stakeholders throughout BPA's recent Transmission Study and Expansion Processes (TSEP), BPA's system is effectively fully subscribed, and incremental transmission requests are unlikely to be granted until the early to mid-2030s, pending significant upgrades. Additionally, BPA has recently announced a pause to their TSEP process entirely while they attempt to develop reforms to their transmission service request process. As such, future transmission planning and procurement activity recommended throughout this chapter is a way to expand and diversify transmission options as the energy associated with serving load is decarbonized. It is important to recognize that the identification and development of transmission solutions are long-lead-time activities that often take longer than the Action Plan window time horizon of the IRP. Given this dynamic, it is necessary to engage in transmission planning and development on a forward-looking basis beyond the Action Plan window. See the description of the West-Wide Transmission Study Project (**Section 2.3.1 Western Transmission Expansion Coalition (WestTEC)**), a 10-year and 20-year transmission study addressing interregional and interstate transmission needs spanning the Western Interconnection.

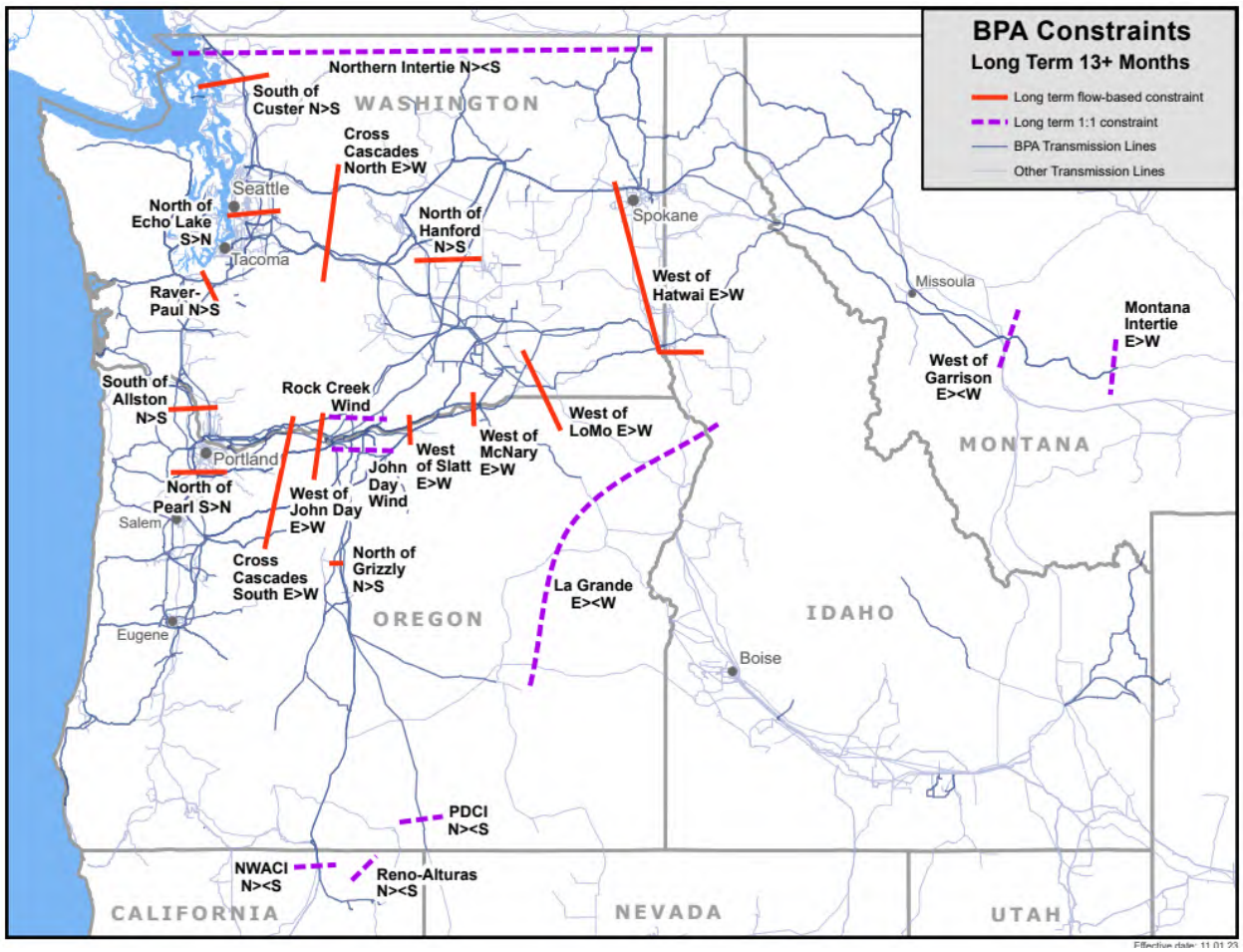
4.1.3.3 Paths and flowgates

To get to PGE's system, power generated or purchased from remote locations must travel through different paths and flowgates on the region's transmission system. A flowgate is a collection of transmission lines and facilities that collectively start in a geographically similar area and terminate in a different geographically similar area. These flowgates are typically operated by BPA and are shown in **Figure 30**. The flowgates that currently have the most significant impact on PGEM's transmission rights portfolio are North of Pearl, South of Allston, Raver Paul, West of John Day, and Cross Cascades South, all of which are constrained, with little or no ATC.

Flowgates are used by BPA as a way to monitor flow through areas of constraint on their system. Conceptually, when managed appropriately, the establishment of flowgates allows for a transmission provider to monitor system flows and take action to mitigate system constraints in the real-time operations horizon. Congestion at flowgates can be caused by different reasons including:

- Localized high loads at the receiving end of a flowgate in excess of flowgate capacity,
- Localized concentration of generation resources at the sending end of a flowgate trying in excess of flowgate capacity, and
- Flow-though, also known as loop flow, where far-flung regional load and generation dispatch scenarios create flows in excess of transmission capacity.

Figure 30. BPA Constraints[72]



The following summarizes the most significant flowgates and paths affecting energy delivery from remote resources to PGE's service area.

- The North of Pearl flowgate was instituted in August 2023 and has presented PGE with challenging operational scenarios since. The flowgate generally exists between the Wilsonville and Sherwood areas, SW of Portland. It is most constrained during periods of high renewable resource production in California and the desert southwest when it is also cool in the Pacific Northwest. Much less frequently, high Portland area loads can also contribute to high flows on North of Pearl. Further explanation of the North of Pearl flowgate will be described below.
- Some amount of energy from the majority of PGE's generating resources flows across the constrained South of Allston flowgate. This flowgate is most constrained during heavy summer and heavy winter loading periods. The South of Allston flowgate is a collection of several electrically parallel transmission lines that route from north to south just north of the

[72] Source: https://www.bpa.gov/-/media/Aep/transmission/atc-methodology/atc-long-term-constraints-11-1-23.pdf.

Portland metro area. Historically, the South of Allston flowgate was most constrained in the summer months.

- A large portion of the energy flowing from PGE's remote resources flows across the West of Cross Cascades South (WOCS) flowgate. Additionally, depending on the resource location, energy will flow across the West of John Day flowgate and the Raver-Paul flowgate. The WOCS flowgate is typically most constrained during heavy winter loading, while the West of John Day and Raver-Paul flowgates are typically most constrained during heavy spring and summer loading. PGE's Bethel-Round Butte 230 kV transmission line is part of the WOCS path.

Energy from PGE's resources in Montana first flow over the West of Garrison flowgate before reaching several other flowgates on the way to PGE's load in the Willamette Valley.

4.1.3.4 North of Pearl

The North of Pearl (NOPE) flowgate consists of a combination of BPA and PGE lines that run between BPA's Pearl substation in Wilsonville, OR to PGE's Sherwood substation in Sherwood, OR. The flowgate is comprised of BPA's Pearl-Keeler 500kV line, the Pearl BPA-Sherwood #1 & #2 230kV lines, and the McLoughlin-Pearl BPA-Sherwood 230kV line. The flowgate was instituted on August 11, 2023, a few days prior to a heatwave that blanketed much of the PNW. The NOPE flowgate was originally intended to be enabled in November 2023, prior to the winter operating season, but was expedited by BPA with the extreme heat that occurred in August 2023.

The NOPE flowgate was originally enabled for the purposes of monitoring south-to-north (S-N) flows through the Portland area. Previously, S-N flows were monitored as part of the South of Allston flowgate, but in a S-N flow pattern. BPA eventually shifted the focal point for monitoring S-N flows from the South of Allston flowgate to the more appropriate NOPE location. The South of Allston S-N flowgate was retired in early 2024.

During spring of 2024 and 2025, there have been several occasions where the North of Pearl flowgate reached S-N transmission flow levels near the upper limits of the flowgate limit high renewable resource imports from California and the desert southwest and low hydro generation output from British Columbia. Additionally, unscheduled energy flows have been observed coming into the Pacific Northwest and through PGE's service territory. These unscheduled flows, and the load and resource dispatch patterns several hundreds of miles away from PGE's system in either direction, have caused BPA to take real-time mitigation actions that included: sending congestion signals to the EIM marketplace that dispatched PGE Port Westward gas resources unexpectedly, halting short-term firm transmission sales, stopping all hourly redirects on BPA's system, and curtailing approximately 4000 MWs of transmission schedules across the region. If these scenarios had happened at higher local Portland area load levels, BPA curtailment of firm transmission schedules could have resulted in reliability concerns for PGE.

As PGE anticipates significant load growth into the future from the semiconductor and data center industrial sectors, much of the forecasted growth will locate in the Beaverton/Hillsboro area on the west side of PGE's service territory. Existing constraints north of the NOPE flowgate will limit industrial growth here. Additionally, it is expected that solar deployments will continue

in California and the desert southwest, further exacerbating the NOPE flowgate constraint. PGE and BPA are collaboratively planning how to address the NOPE constraint. Constraint mitigation will require a combination of new and upgraded transmission facilities as well as new operational scenarios that are currently being evaluated.

4.2 PGE transmission projects

Various FERC and NERC compliance and regulatory obligations require that PGE develop, engineer, procure, and construct PGET-owned transmission projects. Transmission projects can develop as a result of NERC reliability obligations, be driven by transmission or interconnection customer actions, result in response to state policy actions, load growth, and resource forecasts and requests by PGET's network transmission service customers.

Key transmission projects placed in service in 2024 include:

- A new 1.7 mile 230 kV transmission line between BPA's Keeler substation and PGE's Horizon substation, both located in Hillsboro, Oregon.
- The Evergreen Substation, a new bulk substation located in Hillsboro, Oregon that facilitates the interconnection of PGE's Constable Battery Energy Storage Facility, as well as the ability to serve new load in Washington County.

PGE revisits transmission plans and projects on a specific time cadence, with those in **Table 12** representing current plans. Future needs will continue to be evaluated over time. For the Near-Term and Long-Term Planning Horizon, PGE has identified transmission projects which will be needed to maintain compliance with the NERC TPL-001-5 standard. Each project has identified a completion date and any long lead time items that are required as a part of the work. Any construction phases which need to be scheduled are also identified and assessed to ensure that the reliability to the Bulk Electric System is not compromised during each phase of a project.

Table 12. Transmission Projects

Project Name	Anticipated In Service Date
Bethel-Round Butte 230kV Fixed Series Capacitor Project	2027 March
Bethel-Round Butte 500kV Project	2032 November
Blue Lake (Sundial) 230kV Battery Project	2025 June
Grassland 500kV Breaker Addition	2026 July
Harborton-Trojan #3 and #4 230kV	2033 May
Horizon-Keeler #1 & #2 230kV 4000A Upgrades	2029 April
Horizon-Keeler #1 230kV Reconductor Project	2026 May
Horizon-Keeler BPA #2 230 kV Project	2024 May
Jefferson Solar Project	2027 March
Madras Solar Project	2027 March
Memorial Substation Project	2025 July

Project Name	Anticipated In Service Date
Monitor Rebuild Project	2026 April
Pearl BPA-Sherwood 230 kV Project	2026 June
Reconductor Murrayhill-Sherwood 1&2	2027 May
Reconductor Murrayhill-St Marys #1, construct new Murrayhill-St Marys #2 section to create Sherwood-St Marys	2028 Q1
Reconfigure Murrayhill-Sherwood, Murrayhill-St Marys, Sherwood-St Marys	2028 Q1
Rivergate (Seaside) 230kV Battery Project	2025 June
Sherwood 115kV Project	2028 June
Shute and Sunset Facility Upgrades Project	2026 April
St Marys 115kV Breaker Replacement Project	2028 August
Sunset 115kV Bus Split Project	2027 April
Tonquin Substation Project	2026 December
Willamette Valley Resiliency Project (3 parts)	2035 May (latest part)
Hillsboro 500kV Expansion (Arden/Harrington)	2030 May

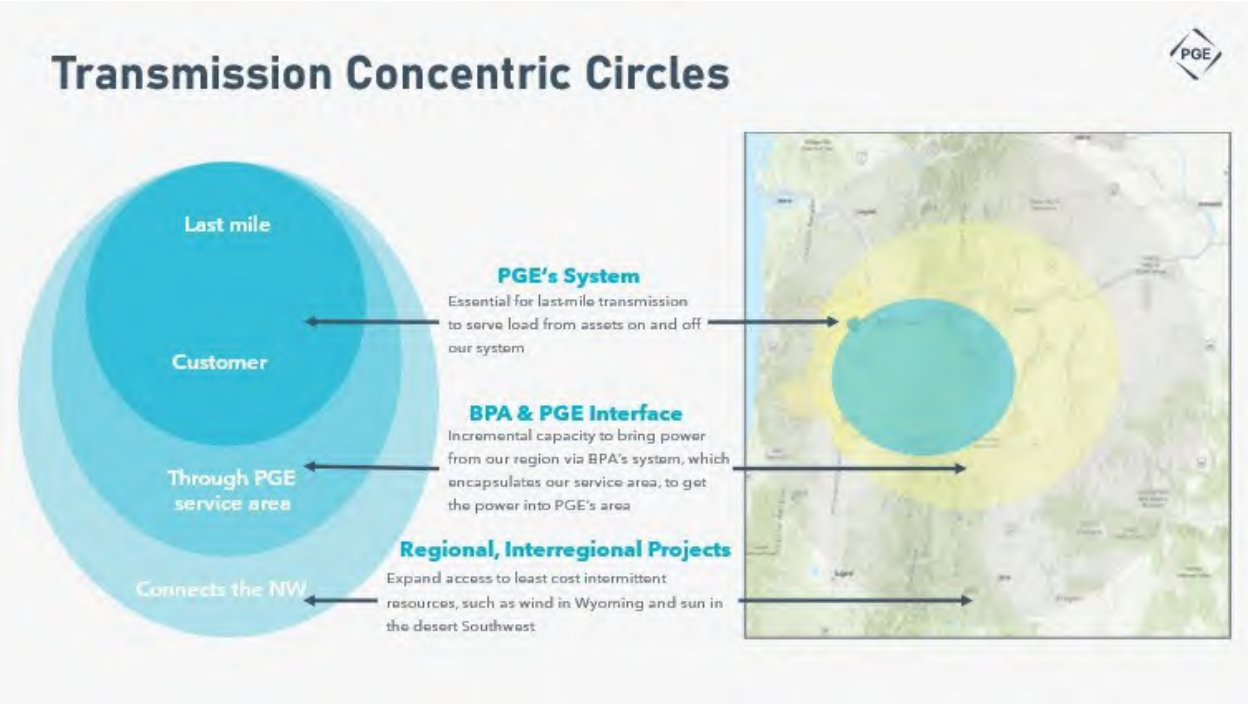
4.3 Transmission strategy/outlook

PGE will deploy a portfolio of strategies to meet future transmission needs and intends to explore expanding transmission access through the acquisition of rights on third-party systems, equity investment in regional projects as they are constructed, and PGE-developed projects, including upgrades of existing assets. PGE is also exploring Grid Enhancing Technologies (GETs), including actively putting in dynamic line ratings, with some of these projects utilizing advanced conductor and capacity enhancements. These different avenues of transmission expansion will allow PGE to optimize for the least cost and least risk plan to meet future needs and will continue to be discussed in the next full IRP.

4.3.1 Concentric circles of transmission

As PGE assesses strategies to meet load growth obligations and decarbonization goals and HB 2021 requirements, PGE must ensure transmission capacity is available from geographically diverse resources. Often, delivering energy to PGE's system requires multiple segments of transmission lines. Because PGE's network load is centralized in a compact service area, instead of dispersed out in multiple areas of load, PGE utilizes a concentric circle model to contemplate available transmission options, displayed below in **Figure 31**.

Figure 31. PGE Transmission Concentric Circles



4.3.1.1 PGE's system

The inner most circle in the model, 'Circle One', is predominantly used to move power through PGE's system for the purposes of safely and reliably serving PGE network load. It is important to remember that PGE network load includes PGE retail customer loads and also the loads of ESS customers and other transmission customers. PGE performs a series of annual transmission planning and reliability assessments. As Circle One on the system is planned, not only must PGE network load be accounted for, but also the potential for energy to flow through PGE's system enroute to other utilities in the western interconnection. These routine transmission planning efforts identify the projects necessary to reliably and safely serve PGE load, accounting for transmission service requested through PGE's service territory, and accounting for the impact regional resource dispatch patterns can have on PGE's transmission system.

4.3.1.2 Connecting PNW to PGE's transmission system

'Circle Two' in the model connects PGE's service territory to BPA's system and the rest of the PNW transmission system. Because PGE's service area is so concentrated in the northern Willamette Valley and new non-emitting generation resources will be generally located in remote geographic locations, PGE must determine how to best enable resources to reach the system. An example of Circle Two transmission would be transmission that enables energy to cross the Cascades enroute to PGE or adds additional capacity to the South of Allston flow gate flowing from north of the Portland Metro area.

4.3.1.3 Connecting the PNW to other regions

'Circle Three', the outer most circle, connects the PNW to other resource rich regions like the Dakotas and eastern interconnection, Rocky Mountains, and the Desert Southwest. Projects that connect multiple regions are often proposed and developed by large independent transmission companies who can more easily absorb the additional risk these large ambitious projects carry.

4.3.1.4 Grid Enhancing Technologies (GETs)

GETs are solutions that aid in the optimization of existing grid infrastructure. These technologies help PGE more effectively manage power flow for the aim of increasing capacity, efficiency and reliability on the system and to reduce the need for more costly grid expansion. The categories below detail GETs in use and planned for PGE's service area.

Dynamic Line Ratings (DLRs)

PGE is integrating DLRs beginning 2025 through partnership with the Electric Power Research Institute (EPRI) and BPA. DLRs are a method for determining available transfer capability of transmission lines utilizing real-time data to account for weather. DLRs can increase real-time capacities under favorable weather conditions (lower ambient temperature, higher wind speeds, and cloud shadowing) and derate capacities when weather is unfavorable. This additional operational flexibility is intended to help with reducing overloads due to unplanned outages or allow for better certainty of planned outages and system impacts. An impact analysis will be studied in 2025 and refined as the DLR system goes in-service and real time performance data becomes available over the second half of 2025.

Conductor Coating Technologies

PGE is integrating heat-dissipating overhead conductor coating technologies that reduce power loss and increase power carrying capacity. PGE's first use of the coating is for the 1.5 mile Horizon-Keeler #1 230 kV reconductor project is expected begin construction in 2026.

Topology Optimization

PGE utilizes switching of circuit breakers on the existing system to optimize power flow. PGE operations teams have long used this tool to more effectively change system flows as an alternative to costly options such as generation redispatch. PGE is upgrading a 230kV circuit breaker at the McLoughlin substation in 2025 to support this topology optimization practice.

Advanced Conductors

PGE is working with EPRI and other utilities on the Grid Enhancing Technologies for a Smart Energy Transition (GET SET) initiative to design and construct high temperature Aluminum Conductor Steel Supported (ACSS) lines in the territory. PGE has utilized ACSS conductors since 2006 to help ensure efficient power transmission and mechanical reliability across long-distance transmission lines and these new high temperature low sag conductors are already integrated in PGE's transmission planning studies.

4.3.2 Existing PGE projects/local transmission plan

*Refers to the inner circle in **Figure 31.***

To address the needs identified during PGE's transmission planning assessments, a local transmission plan is developed that identifies the portfolio of projects to meet the needs of PGE's customers and to maintain and operate a safe, resilient, and reliable system. Historically, PGE has focused on planning within the inner circle for reliable and load service-driven transmission given PGE's unique geographic footprint within BPA's system. This was primarily because BPA traditionally had ample ATC on their transmission system that PGE has been able to leverage to transfer new remote generation resources to PGE's system. With the recognition that ATC inventories on BPA's system have been fully allocated, and that changes in resource dispatch patterns have created a paradigm shift in regional flow patterns on the west-wide transmission system, PGE's transmission planning and strategy have necessarily evolved from an approach based primarily on reliability and load service to a more proactive approach that aligns with future load service needs (described in **Chapter 3 System needs**) as PGE decarbonizes. It is important to recognize the significant transmission planning and project development efforts already underway that are necessary for reliable load service and proper cost allocation within PGE's load service area. PGE's local transmission plan has identified more than 20 projects, discussed in **Section 4.2 PGE transmission projects**.

4.3.3 BPA projects important to PGE

*Refers to all circles in **Figure 31.***

PGE's and BPA's transmission systems are highly interconnected, both in PGE's service area and around Oregon and the PNW. Because of the highly networked nature of PGE's transmission systems, PGE has been collaboratively working with BPA to ensure BPA has sufficient system reinforcements planned that, in concert with PGE's planned transmission projects, will enable PGE to reliably serve load. As a result of this collaborative system planning, PGE and BPA have identified a suite of projects, both joint PGE-BPA projects and BPA-only projects as shown in **Table 13**, necessary for the safe and reliable operation of the region's transmissions system. Several joint projects are inflight that will help address the NOPE flowgate constraint. In addition to joint projects, BPA has identified several projects that only involve work to their infrastructure that will have significant impact for PGE and its customers. Several of them are currently in-flight or in the scoping phase.

Table 13. PGE-BPA and BPA-only Transmission Projects

PGE-BPA Transmission Projects	BPA-only Transmission Projects
Pearl-Sherwood-McLoughlin Bifurcation & Reconductor	Big Eddy-Chemawa Upgrade (Evolving Grid 1.0)
N. of Sherwood Reconductor	Keeler Transformer Bank Addition (Evolving Grid 1.0)
Horizon-Keeler #1 reconductor	Pearl-Keeler 500kV #2 (Evolving Grid 2.0)
Horizon-Keeler 4000A upgrades	North of Marion Upgrades (Evolving Grid 2.0)
Ross-Rivergate (BPA Evolving Grid 1.0 Project)	Ostrander-Pearl #1 Line Upgrade (Evolving Grid 2.0)
Harborton 230 kV Rearrangement	
Willamette Valley Resiliency Project	

Figure 32. PGE-BPA transmission projects

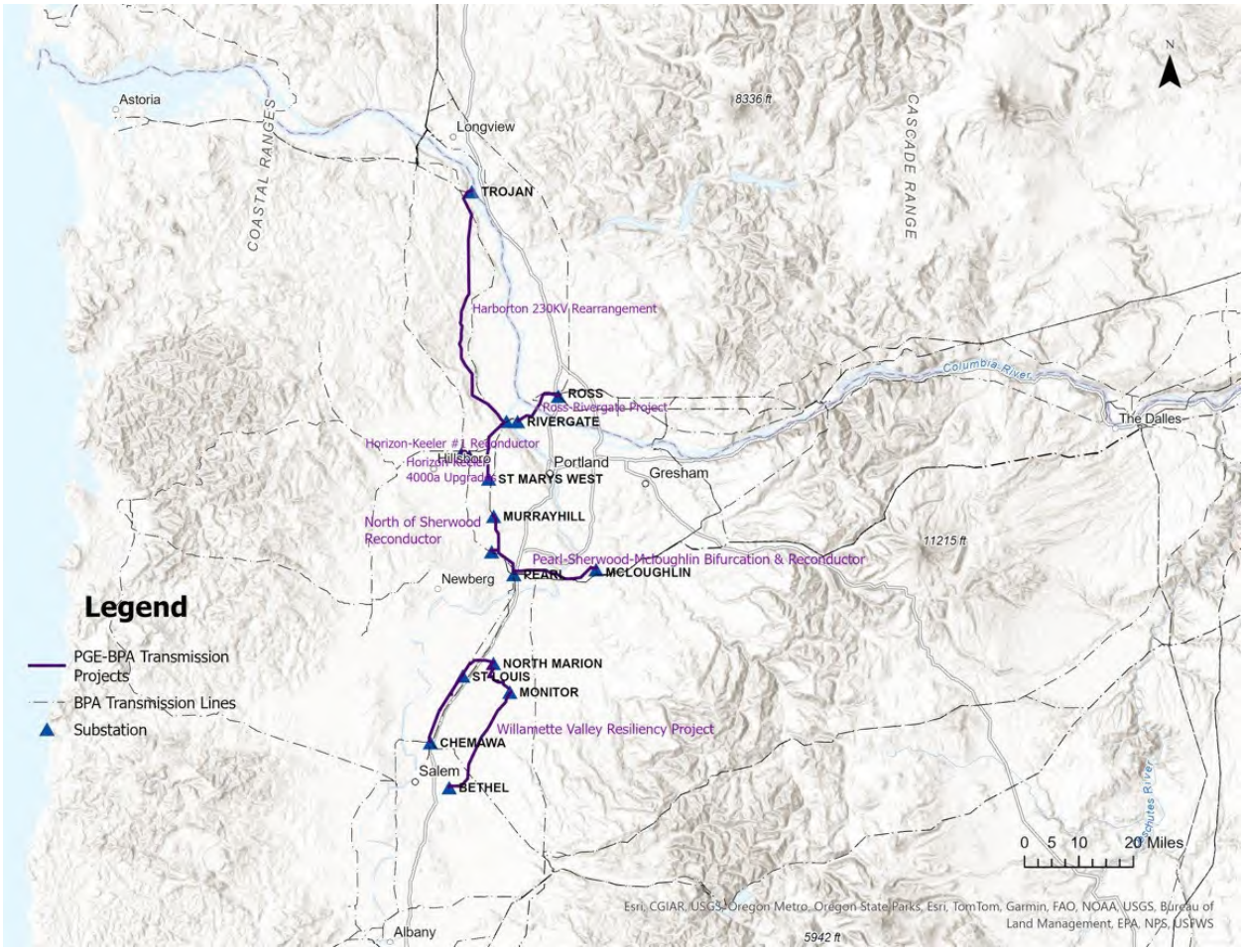
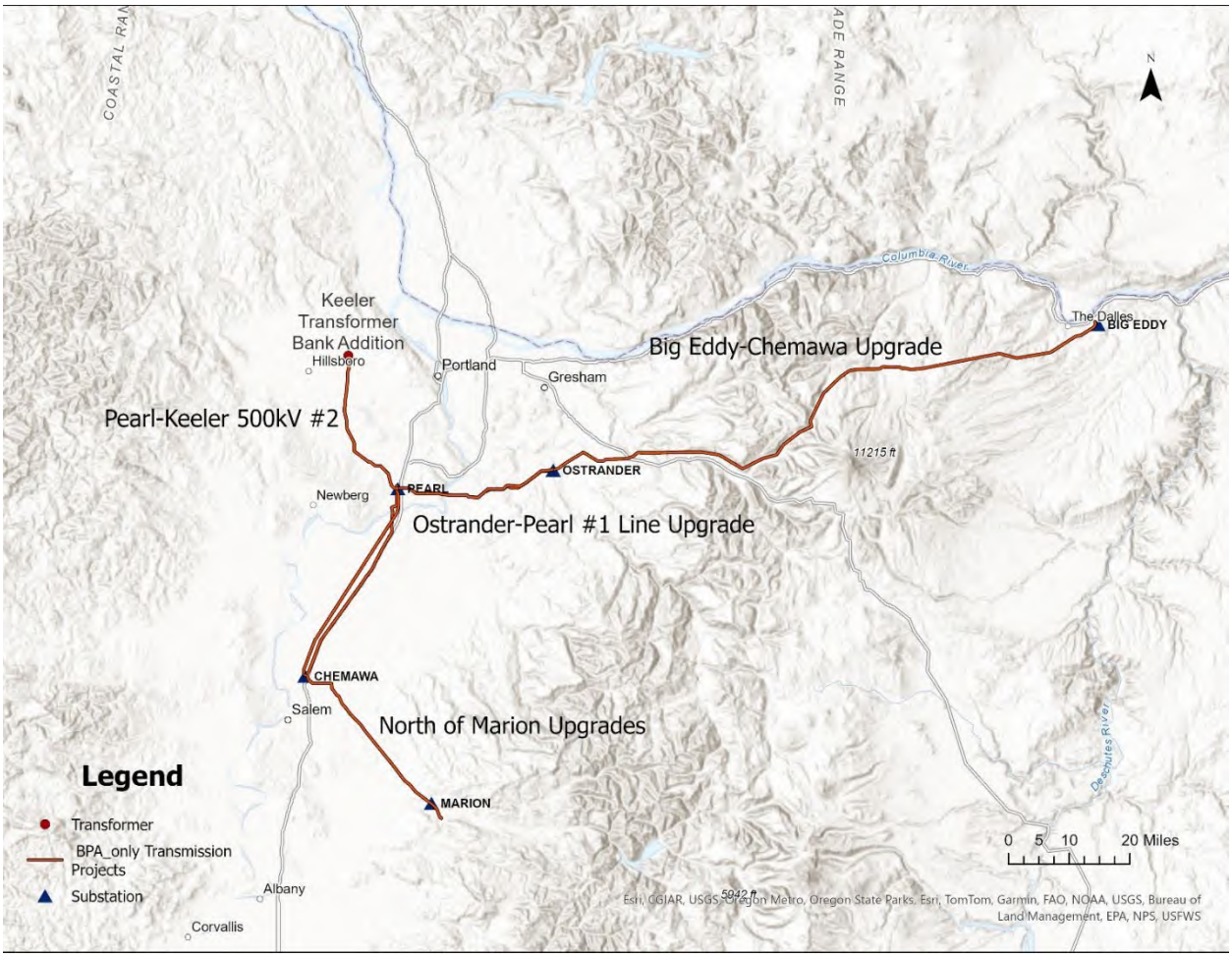


Figure 33. BPA-only transmission projects



4.4 Assessment of available BPA point-to-point transmission

Limitations on the region's transmission system constrain PGE's ability to access Pacific Northwest (PNW) renewable resources. For the 2023 CEP/IRP, PGE conducted a study of transmission service requests directed toward PGE in BPA's Transmission Study Request (TSR) Study and Expansion Process (TSEP) reports in order to estimate the quantity of transmission currently available. As part of the transmission-related assumptions and modeling in the 2023 CEP/IRP, PGE included these estimates of available capacity on BPA's transmission system as a resource build constraint in portfolio analysis. The total ATC available in the 2023 CEP/IRP was 1818 MW.[73]

PGE has refreshed these estimates for the Update with the most up-to-date data available. The updated values, shown in **Table 14**, are included as constraints on resource additions in portfolio analysis.[74] The total ATC has increased by 688 MW compared to the 2023 CEP/IRP to

[73] See Appendix H.7 of the filed 2023 CEP/IRP.
[74] The updated numbers and methodology were described by PGE in the October 2024 Roundtable Meeting. Available here:

2506 MW. Total ATC determines the quantity of resources that can be added to PGE's portfolio without incurring the costs associated with transmission upgrades or expansion (as described in **Section 4.6 Transmission options for portfolio analysis**).

Regional transmission constraints in the 2023 CEP/IRP required that each MW of new renewable resource had 1 MW of associated transmission capacity. In the Update, this assumption has been updated, with each MW of transmission capacity now allowing access to 1.33 MW of renewable resources (requiring that 75 percent of new resources have associated transmission rights).[75] This increases the quantity of accessible resources from 2506 MW to 3341 MW. Excluding offshore wind, which has additional constraints that push earliest COD in portfolio analysis out to 2036, this results in access to 2451 MW of off-system renewables prior to the first available transmission upgrade option in 2032. Transmission availability is identified by transmission zones, with the transmission zone associated with each proxy resource identified in **Table 15**.

Table 14. Transmission ATC by resource zone

Transmission Zone	Long-Term Firm	Conditional Firm	Total ATC
Christmas Valley	201	466	667
Gorge	179	418	667
McMinnville	45	105	150
Montana	96	224	320
Offshore	201	467	668
SE Washington	31	73	104
Total	753	1753	2506

https://assets.ctfassets.net/416ywc1laqmd/6Gv0U2lLocu2YCSnHv4JRP/43c13f8b70898a4476a4655f5f783fd4/IRP_Roundtable_October_24-6.pdf#page=23

[75] This modeling change was discussed in PGE's January 2025 Roundtable. Link: https://assets.ctfassets.net/416ywc1laqmd/7rqJJm9XGJaw6HPuh9Oz4L/7e071838b5f9cdfd7a9d9185b1fe0b53/CEP_IRP_Roundtable_January_25-1-74-.pdf#page=8

Table 15. Transmission zones of proxy resources

Transmission Zone	Proxy Resources
Christmas Valley	Christmas Valley Solar Christmas Valley Hybrids
Gorge	Gorge Wind Wasco Solar
McMinnville	McMinnville Solar McMinnville Hybrids
Montana	Montana Wind
Offshore	Offshore Wind
SE Washington	Southeast Washington Wind

4.5 Third-party assessment of PGE regional transmission options

In response to Staff comments on the transmission action item and modeling from LC 80 Order 24-096, PGE contracted with two third-party consultants to more thoroughly evaluate viable transmission options and their modeled benefits.

First, PGE contracted with Energy Strategies to assess transmission options identified by PGE, their general viability and any alternative, related CODs, and firm MW access assumptions.[76] Three key categories of changes resulted from Energy Strategies' analysis, which were incorporated as seven transmission options into PGE's modeling as discussed in **Section 4.6 Transmission options for portfolio analysis**:

1. Two alternative projects were identified to replace PGE's options of TransWest Express for accessing Wyoming Wind Proxy Resources and Western Bounty for access to Nevada Solar Proxy Resources. Energy Strategies proposed these alternatives due to policy, price, and timeline risks with WesternBounty and TransWest Express.
2. CODs were adjusted outward into the future based on Energy Strategies' understanding of project statuses and best estimates of completion timelines.
3. MW access assumptions were adjusted downward to account for Energy Strategies' assessment of ATC and rights on the identified transmission paths.

Second, PGE contracted with Energy GPS to conduct a market liquidity analysis for energy markets adjacent to the Pacific Northwest.[77] This analysis developed an understanding of the added benefit that a given transmission project may provide through its connection to a broader but nearby market. To estimate the additional market access benefits of a transmission project, Energy GPS analyzed correlations in PGE's hours of greatest load with high load hours in CAISO, Desert Southwest (DSW), Midcontinent ISO (MISO) North, and Southwest Power Pool (SPP) North

[76] PGE's January 2025 Roundtable - Transmission Options. See also **Appendix J Transmission options study**.
[77] PGE's November 2024 Roundtable - Transmission - Step 3 - Market Access.

markets. The analysis resulted in two key conclusions, which PGE incorporated into each modeled transmission option's market access benefits:

1. It is reasonable to assume transmission to SPP North or MISO North can provide access to energy and capacity during critical hours for both summer and winter.
2. It is reasonable to assume transmission to DSW or CAISO markets can provide access to energy and capacity during critical hours during winter.

4.6 Transmission options for portfolio analysis

The transmission necessary to reach resource rich geographical locations can often rely on multiple segments of transmission infrastructure to reach from generation site to where demand is located. PGE continues to analyze and explore all publicly known transmission project opportunities in the west that could be useful in serving PGE loads but generally do not directly connect to PGE. PGE identified a list of potential transmission projects within the BPA-PGE interface (Concentric Circle 2, as described in **Section 4.3.1 Concentric circles of transmission**) and greater region (Concentric Circle 3). These projects would provide access to proxy BPA resources such as Gorge Wind and Christmas Valley Solar, and proxy interregional resources such as North Dakota Wind and Nevada Solar. The resulting list provides known possibilities that may allow PGE to expand access to off-system renewable resources and markets. PGE continues to conduct analysis of these projects and will update this assessment in the 2026 CEP/IRP.

The remainder of this section describes project specific details of options modeled in the 2023 CEP/IRP Update based on Energy Strategies' analysis and the assumptions used in modeling transmission options.

Figure 34 illustrates the transmission options recommended for study by Energy Strategies.

Figure 34. Overview of PGE Transmission Options



4.6.1 Bethel-Round Butte upgrade

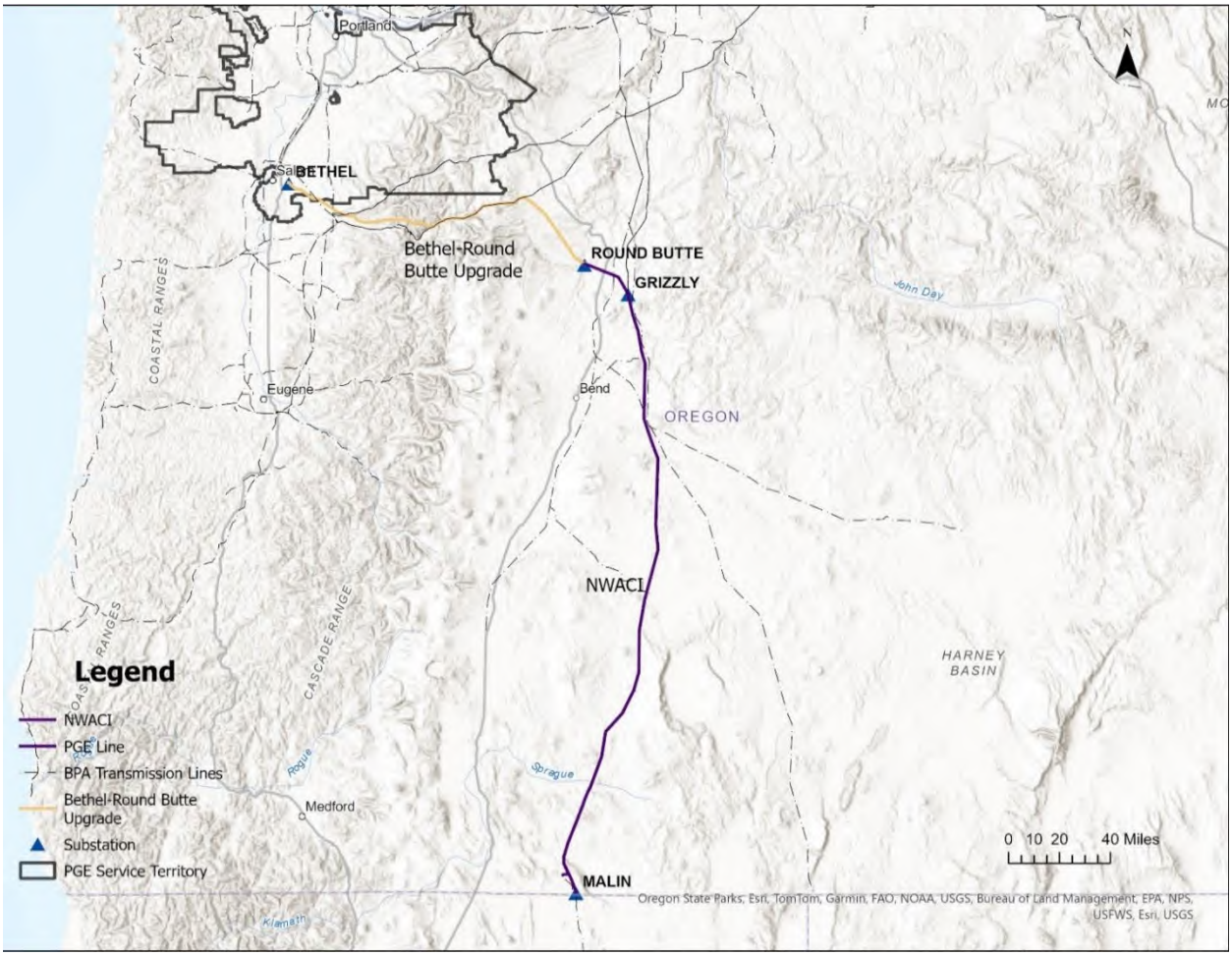
Bethel-Round Butte transmission project is a 98-mile 230 kV line upgrade running between PGE's Bethel and Round-Butte substations at the south-east edge of PGE's service territory. The project plans to rebuild the existing transmission line from 230 kV to 500 kV and build a second 500 kV line, enabling up to 3000 MW of additional resources from the BPA-PGE interface, or Concentric Circle 2 (**Section 4.3.1 Concentric circles of transmission**), to reach PGE's service territory. Resources within the BPA-PGE interface include: Wind Gorge, Wind SE WA, Solar CV, Solar MCMN, Solar Wasco, CV hybrids, and MCMN hybrids, and are resources that are assumed accessible by way of one wheel across BPA transmission infrastructure. Additionally, the project would increase access through the California Oregon Border (COB) to the CAISO market of 600 MW in winter.[78] The estimated commercial operation date (COD) for the upgraded line is 2032.

[78] PGE's November Roundtable - Transmission - Step 3 - Market Access.

The 2023 CEP/IRP characterized the Bethel-Round Butte transmission option as a valuable upgrade to the PGE system, necessary to integrate the scale of non-emitting resources required to offset fossil fuels.

In partnership with The Confederated Tribes of Warm Springs (CTWS), an application was submitted to the USDOE for a Grid Resilience and Innovation Partnerships (GRIP) Program grant for the Bethel-Round Butte upgrade. The GRIP application was successful, and a $250 million award was made to PGE's partners, the CTWS. The CTWS and PGE are currently in the process of developing the project.

Figure 35. Bethel-Round Butte Upgrade

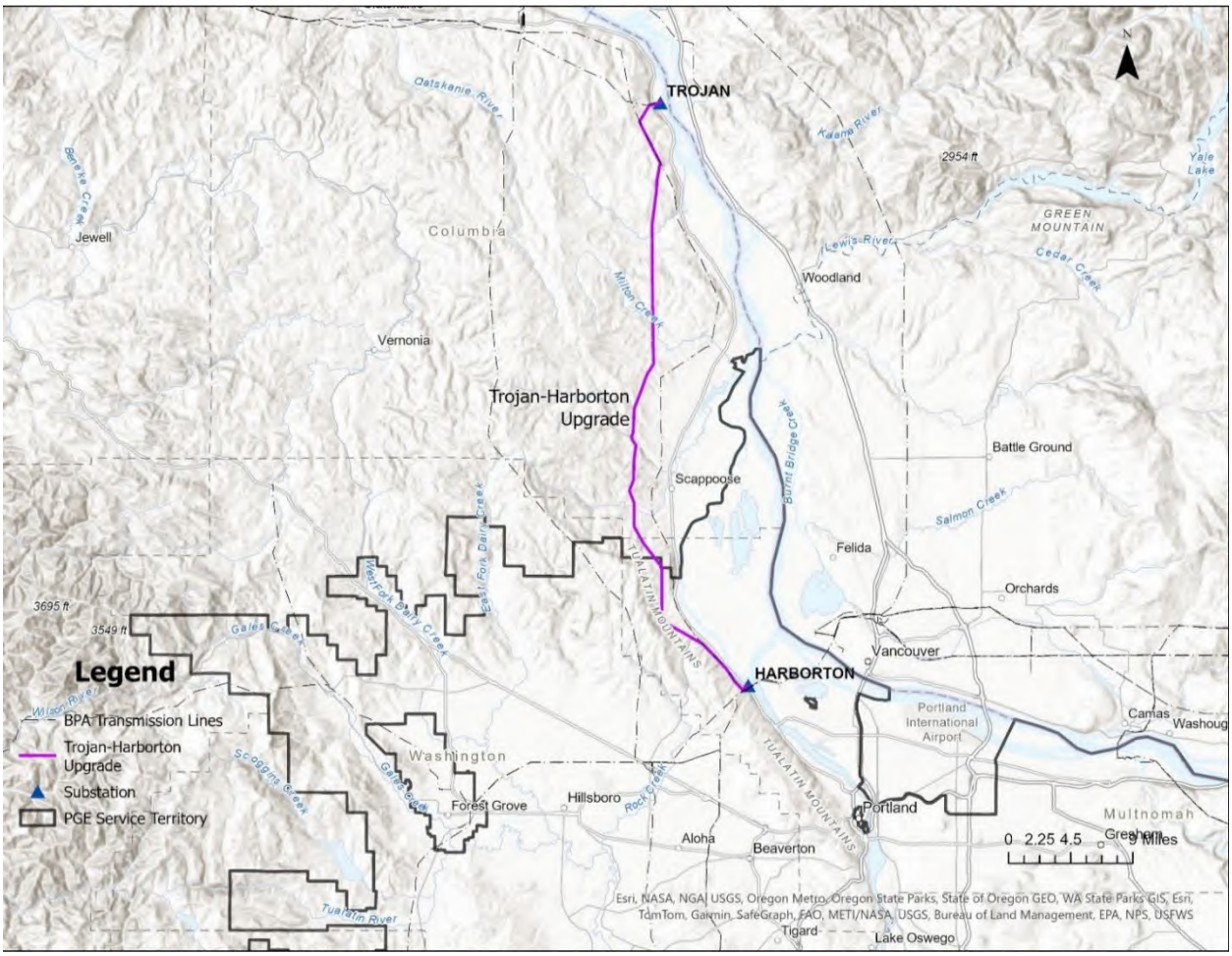


4.6.2 Harborton-Trojan upgrade

Harborton-Trojan Upgrade is a 34-mile 230 kV transmission option between these two PGE substations at the north-west edge of PGE's service territory. The project would run parallel to two existing PGE transmission lines, in service since the 1970s. PGE currently owns the right-of-way (ROW) necessary to complete this upgrade. The project is estimated to enable up to 800 MW from resources within the BPA-PGE interface to reach PGE customers, subject to cooperative

study and agreement with other South of Allston path owners, BPA and PacifiCorp. The anticipated COD of the project is 2035. It is assumed that the Harborton-Trojan option will provide no additional market-access benefits.[79]

Figure 36. Harborton-Trojan Upgrade



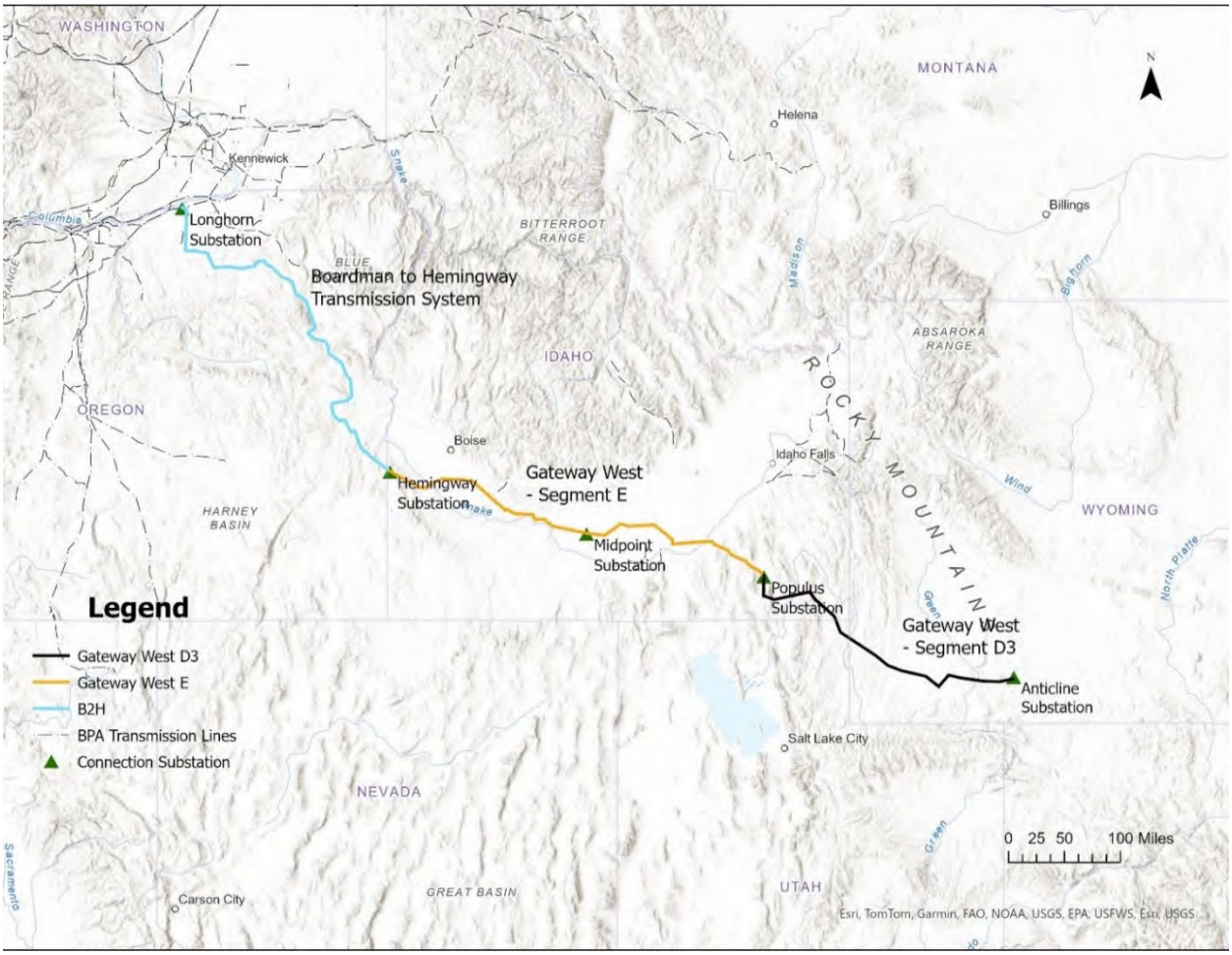
4.6.3 Gateway + B2H + Longhorn (Gateway)

The Gateway transmission option is modeled as the preferred path to access Wyoming Wind proxy resources. The Gateway option begins in western Wyoming, traversing 200 miles from Anticline to Populus substation along the Gateway West D-3 leg. The second segment covers 500 miles on Gateway West E segment where it terminates in Hemingway and then traverses 270 miles along the Boardman to Hemingway (B2H) leg. Finally, Longhorn to PGE is identified as a viable wheel to bring the energy to PGE service territory. The Gateway transmission option is estimated to provide up to 400 MW of capacity for Wyoming Wind by 2035. The 2035 COD reflects the expected timeline for new BPA Transmission Service Requests (TSRs) on the Longhorn to PGE leg. Additionally, Gateway is assumed to provide an additional 400 MW of

[79] PGE's November Roundtable - Transmission - Step 3 - Market Access.

market access during winter.[80] Securing firm transmission access for the Gateway option in the 2030's is uncertain due to competition with Pacific Power and Idaho Power Company and the required timely granting of transmission service requests.

Figure 37. Gateway Transmission Option



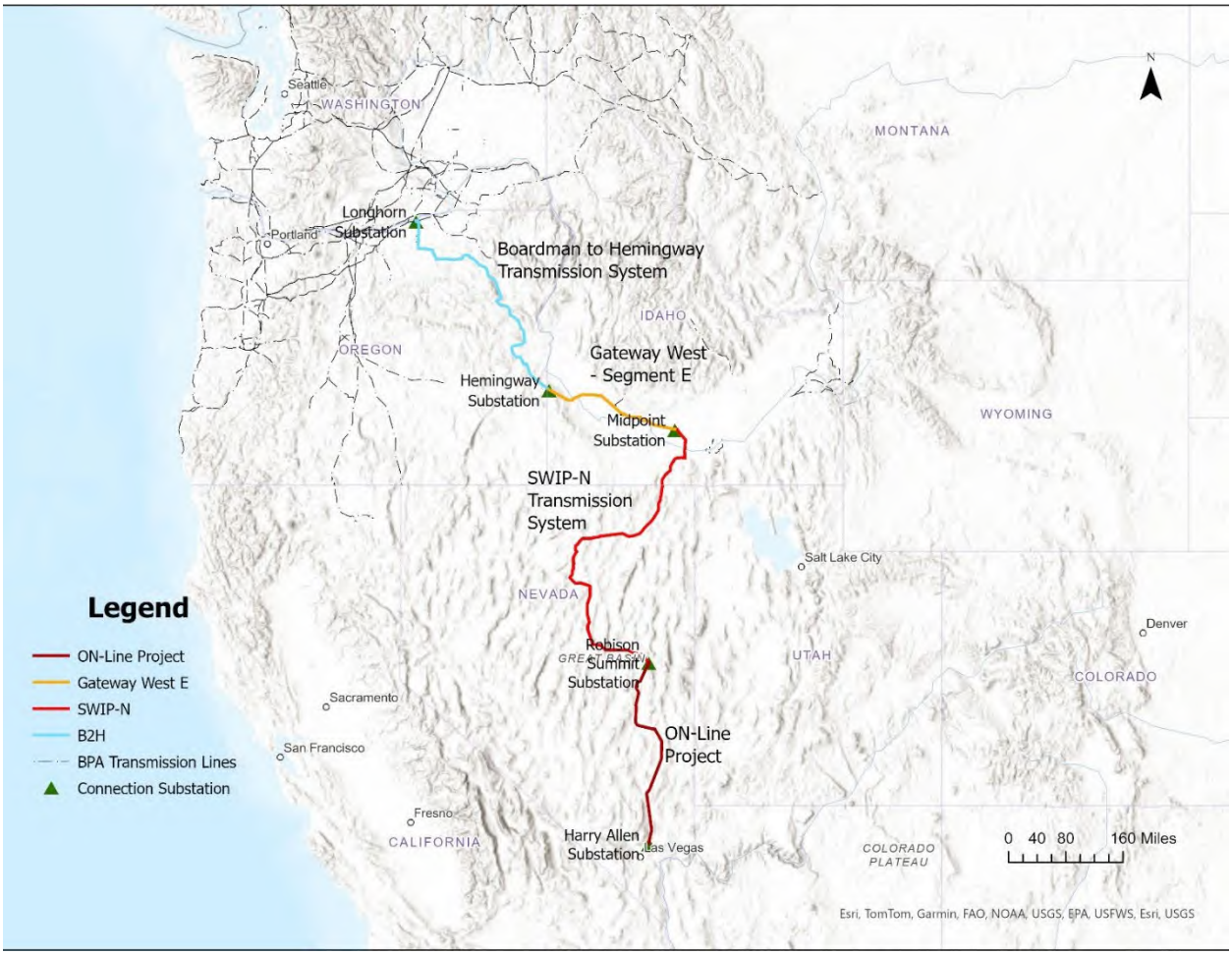
4.6.4 NVE + SWIP-N + Gateway + B2H + Longhorn (SWIP-N)

The SWIP-N transmission option includes approximately 673 miles of AC segments along the Southwest Intertie Project – North, Gateway West 8, and Boardman to Hemingway transmission projects. The option is composed of five segments, two of which are modeled as wheels. The first segment is represented as one wheel that captures PGE's need to move energy across the existing or committed NVE projects (Desert Link, ON-Line, Greenlink West, Greenlink North). Next, the option traverses the 275-mile Southwest Intertie Project – North project, then passes 128 miles along Gateway West 8 leg. The SWIP-N option utilizes the Boardman to Hemingway segment and a Longhorn to PGE wheel to bring energy to the PGE service territory. SWIP-N is estimated to provide capacity up to 400 MW of Nevada Solar by 2035 and an additional 400 MW

[80] PGE's November Roundtable - Transmission - Step 3 - Market Access.

of market access in winter.[81] The 2035 COD reflects the expected timeline for new BPA TSRs on Longhorn to PGE leg.

Figure 38. SWIP-N Transmission Option



4.6.5 North Plains Connector

The North Plains Connector (NPC) option includes a 412-mile 500kV HVDC incremental line segment and two additional wheels to reach PGE.[82] PGE has signed a non-binding memorandum of understanding with the developers of this line for a 20 percent stake (600 MW) in the 3000 MW line. Following PGE's MOU, on August 6, 2024, the US Department of Energy (USDOE) selected the NPC, in partnership with the State of Montana, for a $700 million GRIP grant. Pending the outcome of development and execution of definitive agreements, this significant GRIP grant is modeled to buy down the development costs for participation in the NPC project. Additionally, this grant apportioned $70 million for the upgrade of the Colstrip Transmission System (CTS).

[81] PGE's November Roundtable - Transmission - Step 3 - Market Access
[82] The tariff charges incurred to transit both CTS and the Montana Intertie (Townsend-Garrison) are assumed equivalent to the rate of a BPA PTP+SCD wheel.

The NPC would allow PGE to utilize 270 MW of existing firm transmission to replace generation from Colstrip Units 3 & 4 with energy from some of the highest capacity factor renewable resources estimated as part of the 2023 CEP/IRP Update (Table 20). Further, the NPC connects to the Southwest Power Pool (SPP), and the Mid-Continent Independent System Operator (MISO) Zone 1 Market, where historical data suggests a surplus of supply during approximately 80 percent of PGE's highest demand hours.[83] As such, the NPC is a valuable transmission option for addressing PGE's winter reliability challenges as discussed in **Section 6.2.3 Preferred Portfolio resource adequacy testing**.

The NPC option is modeled to provide capacity up to 600 MW of North Dakota Wind proxy resource by 2038. This COD reflects expected timing to receive requested BPA and Northwestern (NWMT) TSRs. Six hundred MW represents what is assumed commercially available and aligns with PGE's existing transmission rights of 270 MW on CTS plus approximately 300 MW of firm and short-term rights on Northwestern path associated to PGE's Clearwater project. In addition, PGE has submitted TSRs for an additional 720 MW across BPA's and NWMT's system. Access to the benefits associated with the assumed 600 MW of potential capacity on this line requires that at least some of the additional submitted TSRs be approved. If submitted TSRs do not come to fruition, PGE's access to the capacity of the line would be only the current 270 MW of PGE's rights along the CTS. The 270 MW of firm transmission access across the CTS are available with the exit of Colstrip Units 3 & 4, assumed after 2029.[84] However, modeled access to these resources is not captured from 2030 to 2037. The NPC is modeled to provide access to an additional 600 MW of both summer and winter market access through its connection to the Eastern Interconnection, the SPP and MISO Zone 1.

[83] PGE's November Roundtable - Transmission - Step 3 - Market Access
[84] PGE's November Roundtable - Transmission - Step 3 - Market Access

Figure 39. North Plains Connector



4.6.6 NVE + Greenlink 3 + Cpt. Jack to Grizzly + BRB upgrade (Greenlink)

The Greenlink transmission option includes 300 miles of additional AC circuits, and one wheel along Nevada Energy (NVE) infrastructure. The Greenlink option is modeled with four line segments from generation site to PGE's service territory. The first segment is comprised of one wheel that captures PGE's need to move energy across the existing or committed NVE projects (Desert Link, ON-Line, Greenlink West, Greenlink North). Second, the path incurs 300 miles of incremental costs from Ft. Churchill substation in eastern Nevada to the Captain Jack substation near Path 66 at COB. Energy is then moved from Captain Jack to the Grizzly Substation, a point along the Northwest AC Intertie (NWACI) and adjacent to PGE's transmission footprint, using existing PGE rights. Finally, the path assumes the Bethel-Round Butte Upgrade is in place to bring the energy to PGE's service territory. The Greenlink option is estimated to provide PGE up to 627 MW of proxy solar resources from Nevada with an expected availability date of 2035. The COD reflects estimated timing of the Greenlink 3 segment from Fort Churchill to Captain Jack. Further, an additional 627 MW of market access in the winter is assumed.[85]

[85] PGE's November Roundtable - Transmission - Step 3 - Market Access.

Figure 40. Greenlink Transmission Option

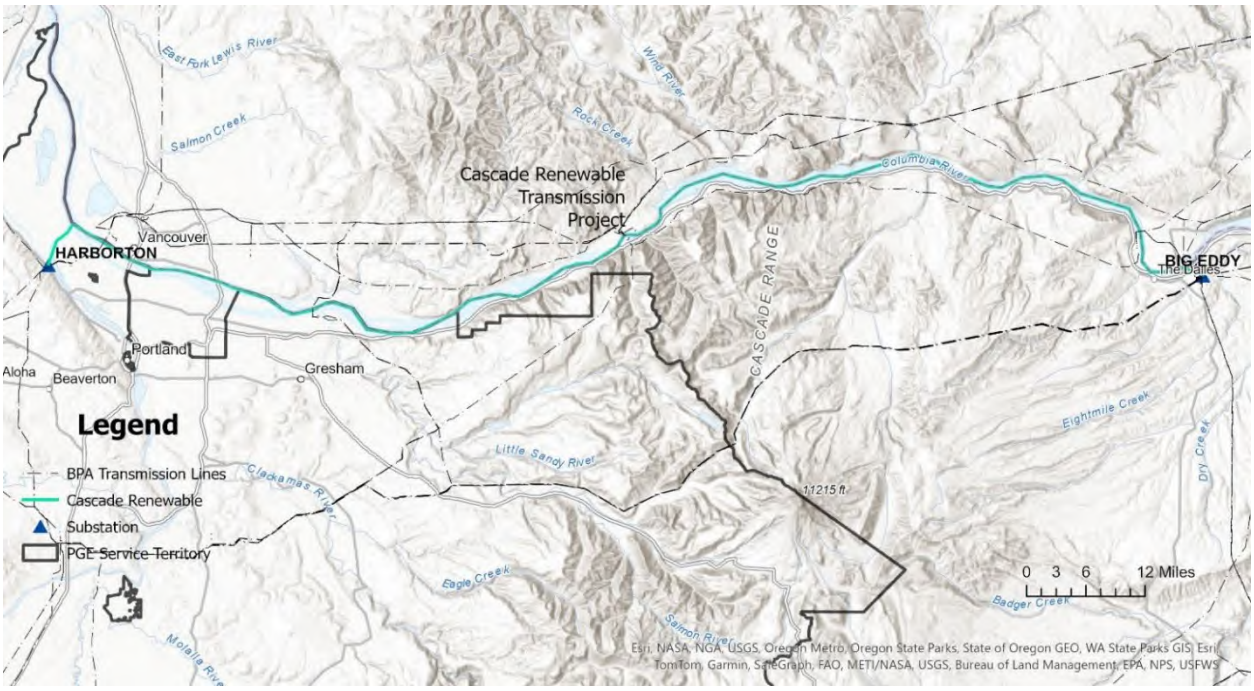


4.6.7 Cascade Renewable Transmission project

The Cascade Renewable Transmission Project (CRT) is an underwater HVDC transmission option of 100 miles that would route from BPA's Big Eddy substation near The Dalles, OR to PGE's Harborton Substation in NW Portland. The project is modeled as one incremental line of additional transmission. The project would allow up to 1100 MW of new east-west transmission capacity for PGE to access off-system proxy resources in the Pacific Northwest, such as Christmas Valley Solar and Southeast Washington Wind. The project will require additional BPA and PGE transmission expansion for PGE to access these benefits and is estimated available by 2038. Additionally, The CRT is assumed to provide no additional market access benefits.[86] PGE is not currently participating in CRT.

[86] PGE's November Roundtable - Transmission - Step 3 - Market Access.

Figure 41. Cascade Renewable Transmission Project



4.6.8 Transmission options summary

Table 16 provides a summary of the seven transmission options discussed above and their assumptions used for portfolio analysis.[87] PGE will continue to review and refine these options as part of the 2026 CEP/IRP.

Table 16. Transmission options

Project	COD[88]	Generation Resource	MW Available to PGE	Summer Market Access (% of MW Avail.)	Winter Market Access (% of MW Avail.)	Real-Levelized Cost ($/kW-mo)
Bethel-Round Butte	2032	BPA Resources	3000	0%	20%[89]	$ 5.52
Harborton-Trojan	2035	BPA Resources	800	0%	0%	$ 5.61
Gateway	2035	Wyoming Wind	400	0%	100%	$ 8.17

[87] BPA Generation resources refer to all Proxy Resources located within Concentric Circle 2 (**Section 4.3.1 Concentric circles of transmission**), including: Wind Gorge, Wind SE WA, Solar CV, Solar MCMN, Solar Wasco, CV hybrids, and MCMN hybrids.
[88] Project Commercial Operation Dates (CODs) represent the greatest COD for the underlying transmission segments.
[89] Assumed equivalent to PGE's existing rights at the California Oregon Border (COB).

Project	COD[88]	Generation Resource	MW Available to PGE	Summer Market Access (% of MW Avail.)	Winter Market Access (% of MW Avail.)	Real-Levelized Cost ($/kW-mo)
SWIP-N	2035	Nevada Solar	400	0%	100%	$ 9.56
North Plains Connector	2038	Montana & North Dakota Wind	600	100%	100%	$ 9.83
Greenlink	2035	Nevada Solar	627	0%	100%	$ 9.98
Cascade Renewable Tx Project	2038	BPA Resources	1100	0%	0%	$ 12.13

4.6.9 Transmission cost assumptions

The U.S. Department of Energy (DOE) "National Transmission Planning Study" and data from the GRIP are the primary sources used to calculate cost estimates for both AC and DC transmission options. All AC options are modeled as 500 kV single-circuit lines estimated at $2,048,670/mi and all DC options are modeled as 500kV HVDC circuits estimated at $4,600,000/mi.[90,91] Additionally, the DOE study provides terrain multipliers for AC options that are used to scale per mile estimates.[92] Federal cost share of GRIP awards was then subtracted from the estimated cost of a transmission option, where applicable.[93] These assumptions along with a project's estimated transfer capacity are used to derive costs for incremental transmission lines, those uncommitted projects that would require PGE ownership. Costs estimated are based on publicly available data and should be interpreted as a general estimate of the direct cost of line construction and do not account for additional development costs such as profit, balance of plant, permitting, procurement, and overheads.

Some transmission options required existing energized or committed projects to bring (wheel) energy home to PGE's service territory. Additional costs to wheel energy for such segments are included in the total cost for an option. The assumed rate for a wheel is $1.96 /kW-mo, based on BPA Point-to-Point Scheduling, System Control and Dispatch (PTP + SCD) costs for 2024. Lastly,

[90] U.S. Department of Energy. *The National Transmission Planning Study*. Ch 3. p.127.
[91] U.S. Department of Energy. The National Transmission Planning Study. Ch 3. p.70.
[92] Terrain multipliers are not identified for HVDC projects. Public information on project specific costs for HVDC options was used to calculate terrain multipliers for those HVDC projects.
[93] https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program-projects.

all projects are assumed to carry a $4.81 /kW-mo real-levelized cost for operations and maintenance in 2024 dollars.

Chapter 5. Resource options

There are many resource options to be considered as PGE makes the energy transition to a decarbonized system. For analysis, PGE identifies all technologically and commercially feasible generation resource options. The economics of resources represent a crucial element of dynamics within IRP analyses for evaluating the characteristics of resources that could plausibly be deployed in the region. This chapter describes relevant costs and benefits associated with each resource assessed in this analysis update. These dynamics drive the decisions in portfolio analysis for evaluating resource options, optimizing for costs and benefits. Resource comparisons that can occur outside portfolio analysis are also visualized on a net cost basis.

Key Highlights

- Resource costs have increased, primarily driven by fixed costs in the current planning environment, with different resources providing disparate benefits in either energy generation, capacity, or storage capabilities. The potential effect of a reduction in tax credits is investigated.
- The inclusion of non-cost-effective Distributed Energy Resources (DERs) provides insight into how these resources can play an enhanced role in a decarbonized future.
- Community Benefits Indicator (CBIs) assumptions have been expanded and refined to better incorporate stakeholder feedback and provide measurable metrics across resilience, health, environmental impacts, energy equity, and economic impacts.

Developments Since 2023 IRP

This Update includes several key changes to resource economic assumptions including updated financial parameters; an adjusted electricity price forecast methodology incorporating forward price curves through 2028; updated supply-side resource costs; and refined capacity contribution values evaluated for 2030 using the Sequoia model. Further, portfolio sensitivity analysis considers current uncertainties regarding federal-level policies, including analysis without clean energy tax credits.

Additionally, the Update incorporates a new North Dakota wind resource option enabled by potential participation in the North Plains Connector transmission project and pushes back the earliest assumed availability for Oregon offshore wind to 2036 due to delays in the BOEM lease auction process.

Strategic Implications

These changes lead to several important implications for resource planning. The updated electricity price forecast shows significantly higher prices between 2025-2029, affecting the economic evaluation of resources. The reduced capacity contribution of

storage resources (particularly in winter) highlights a critical planning challenge regarding the interaction between storage and energy resources in a system with significant energy deficits. Importantly, the availability of federal clean energy tax credits has meaningful impacts on resource costs discussed in this chapter as well as total portfolio costs discussed in **Chapter 6**.

The North Dakota wind resource provides a new geographic diversity option, which is potentially valuable for addressing seasonal needs. Further, the updated CBIs framework provides a more comprehensive method for evaluating community benefits in resource decisions.

Staff Recommendations Incorporated

The Update addresses multiple Staff recommendations from LC 80 Order 24-096. For CBRE actions (Staff recommendation #1), PGE added a Small-Scale Renewable (SSR) proxy resource to model compliance with the 10 percent requirement. Regarding energy efficiency, PGE collaborated with Energy Trust of Oregon to develop guiding principles for complementary funding and establish funding targets with reporting requirements (Staff recommendation #4). On energy/capacity actions, PGE conducted a Request for Information (RFI) for long lead-time resources (Staff recommendation #2) and presented findings in 2024.[94] PGE also advanced CBI integration into resource planning and expanded RECs discussion through stakeholder engagement (Staff recommendations #6 and #7).

5.1 Resource economics

PGE's resource planning conclusions regarding best available generation technology and forecasted costs are driven by resource cost and performance assumptions. The candidate supply-side resources considered for portfolio construction in this Update are the same as those evaluated in PGE's 2023 CEP/IRP except for two changes that are discussed below. This section provides revisions to several key components of resource economics. Some of these updates result from updates to inputs, financial assumptions, and resource costs. These values flow into the portfolio analysis presented in **Chapter 6 Resource plan**.

5.1.1 PGE financial parameters

This Update uses revised financial parameters as of June 2024, which are summarized in **Table 17**.[95]

[94] PGE RFI Key Insights presentation, December 2024, https://assets.ctfassets.net/416ywc1laqmd/2GF5BwVt9cR1MXtEpn6fli/e719ec6879183abd984928db360fe410/RFI_slides_jdg_web_1197.pdf.

[95] Given the lead time for analysis, June 2024 represents the most recent financial parameter snapshot practicably possible for inclusion.

Table 17. 2025 IRP Update Financial Parameters

Component	Value
Composite Income Tax Rate	27.50%
Incremental Cost of Long-term Debt	5.79%
Long-term Debt Share of Capital Structure	50.00%
Common Equity Return	9.50%
Common Equity Share of Capital Structure	50.00%
Weighted Cost of Capital	7.65%
Weighted After-Tax Cost of Capital	6.85%
Long-Term General Inflation	2.04%

5.1.2 Supply-side resource costs

As mentioned above, the incremental supply-side resources considered in this Update are generally consistent with those evaluated in PGE's 2023 CEP/IRP. National Renewable Energy Laboratory (NREL) and Energy Information Administration (EIA) research still serves as the source for resource cost and performance parameter information. In this Update, PGE is generally using supply-side resource information from two sources:

- The NREL 2024 Annual Technology Baseline (ATB) updated in July 2024.[96]
- The EIA-commissioned Sargent & Lundy report, "Capital Cost and Performance Characteristics for Utility-Scale Electric Power Generating Technologies" released January 2024.[97]

These two reports represent the most recent updates from NREL and EIA, respectively, at the time of PGE's analysis in this Update. **Table 18** provides a summary of these assumptions by resource. Additional resources that PGE views as potentially available post-2030 are discussed below in **Section 5.6 Long lead-time resources**.

Table 18. Supply-side resource assumptions for portfolio construction - 2028 COD (2025$)

Resource	CF / RTE (%)	O/N Capital[98] ($/kW)		Fixed Costs[99] ($/kW-yr)	LCOE[100] ($/MWh)	
		IRP	Update		IRP	Update
Wind Gorge	44%	1,609	1,643	118	28	31

[96] NREL (National Renewable Energy Laboratory). 2024. 2024 Annual Technology Baseline. Golden, CO: National Renewable Energy Laboratory, https://atb.nrel.gov/.
[97] https://www.eia.gov/analysis/studies/powerplants/capitalcost/pdf/capital_cost_AEO2025.pdf.
[98] Overnight capital – is the upfront cost to construct the resources without consideration for the cost of funds during construction, includes interconnection costs but does not include the cost of incremental transmission unless otherwise noted.
[99] Real levelized fixed cost – is the annualized fixed cost (capital and operating) of the resource across the assumed economic life, in constant year dollars.
[100] Levelized cost of energy – is the annualized cost of the resource on a per MWh generated basis.

Resource	CF / RTE (%)	O/N Capital[98] ($/kW) IRP	O/N Capital[98] ($/kW) Update	Fixed Costs[99] ($/kW-yr)	LCOE[100] ($/MWh) IRP	LCOE[100] ($/MWh) Update
Wind MT	42%	1,560	1,531	136	32	36
Wind SE WA	42%	1,597	1,604	118	30	33
Wind WY[101]	44%	-	1,531	103	125	338
Wind ND[102]	41%	-	1,560	143	-	371
Solar Christmas Valley (CV)	27%	1,269	1,453	145	42	62
Solar McMinnville (MCMN)	21%	1,324	1,491	146	60	78
Solar Wasco	25%	1,269	1,453	145	45	65
Solar Mead[103]	32%	1,269	1,503	155	184	389
CV hybrid 1	-	2,278	2,912	280	212	112
CV hybrid 2	-	1,772	2,182	215	131	84
MCMN hybrid 1	-	2,329	2,982	285	303	146
MCMN hybrid 2	-	1,824	2,236	219	192	109
2-hour battery	86%	800	990	94		
4-hour battery	86%	1,212	1,617	153		

A pattern of increased costs for resources is observable in **Table 18**. Overnight capital costs have increased for nearly all resource technologies. Forecasted capital costs for storage resource have increased by over 30 percent which contributes to higher portfolio costs as analyzed in the Preferred Portfolio described in **Section 6.2**. Resource costs for solar resources have also increased significantly while increases in costs for wind resources is more modest.

Cost increases across generation and storage technologies may be driven by many factors including macro-economic concerns related to inflation, disrupted supply chains, and strong demand. The resource cost assumptions do not directly consider emerging issues such as federal policy uncertainties, variations in the macroeconomic environment (e.g., inflation, recessions), or the status of international trade agreements (e.g., duties or tariffs). Instead, a range of potential resource cost outcomes, including low-, reference-, and high-cost cases, are considered in portfolio construction.

5.1.2.1 Resource-specific updates

1. Onshore wind

A North Dakota-sited wind resource is added to the set of resources considered in portfolio construction for this Update. PGE's potential participation in the North Plains Connector (NPC)

[101] LCOE includes the cost of incremental transmission.
[102] LCOE includes the cost of incremental transmission.
[103] LCOE includes the cost of incremental transmission.

transmission project enables access to this resource. See the discussion of the NPC in **Section 4.6.5 North Plains Connector**. This resource is located near the eastern terminus of the NPC. Overnight capital cost estimates are based on EIA research. PGE's analysis assumes an earliest availability date of 2032. Other onshore wind resources in this Update are consistent with those considered in PGE's 2023 CEP/IRP.

2. Offshore wind

On September 27, 2024, the Bureau of Ocean Energy Management (BOEM) announced a delay in the auction for potential lease areas offshore Oregon due to "insufficient bidder interest at this time."[104] Just one of the five qualified companies indicated bidding interest in the planned auction. The auction for two lease areas was planned for October 15, 2024. As a result of these delays in the lease auction process, the earliest assumed availability for Oregon offshore wind is moved to 2036 (from 2032 in PGE's 2023 CEP/IRP) due to this delay in development opportunity.

5.1.3 Tax credit sensitivities

The Reference Case in this 2023 CEP/IRP Update assumes the same tax credit environment for generation and energy storage resources as described in PGE's 2023 CEP/IRP.[105] This environment was shaped by the federal governments passage of the Inflation Reduction Act (IRA) in 2022. Key assumptions for modeling include:

- Tax credits continue across the analysis period for modeling purposes. This assumption removes the possibility of tax credit expiration influencing the portfolio construction process.
- Non-emitting generating resources qualify for 100 percent of the production- or investment-based tax credits (PTC and ITC, respectively).
- Standalone storage resources qualify for 100 percent of the investment-based tax credit without the need for normalization.
- Tax credits are assumed to be fully monetized in the year they are generated.

To help understand the potential impact on resource economics of changes to this set of assumptions, two sensitivities are considered:

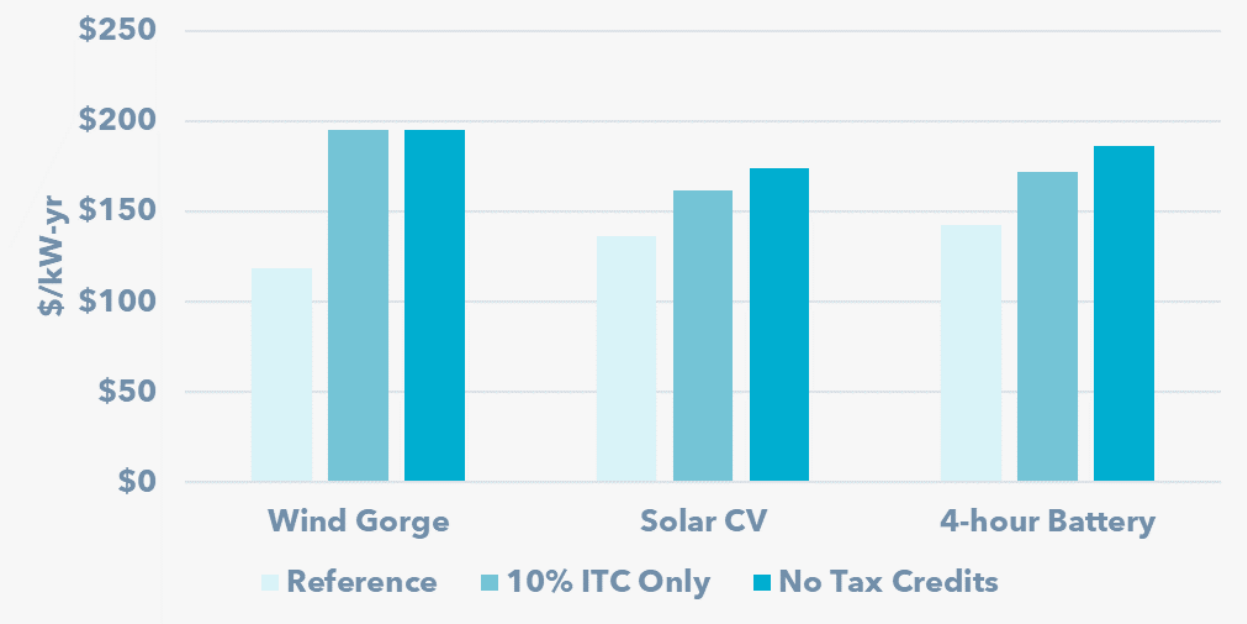
1. Federal tax credit policy reverts to a roughly "pre-IRA" state:
    a. The PTC is not available for new non-emitting generating resources, and
    b. The ITC is available at a rate of ten percent for solar and energy storage resources.
2. Federal policy removes tax credits entirely for new non-emitting generating and energy storage resources that are placed in service after December 31, 2028.

Resource costs relative to the Reference Case in both scenarios as summarized below in **Figure 42**. The sensitivities assume that credits continue to be fully monetized when generated for

[104] https://www.boem.gov/newsroom/press-releases/boem-postpones-oregon-offshore-wind-energy-auction.
[105] Tax credits are discussed in Section 2.1 and 8.1.6 of the 2023 CEP/IRP (see pages 42 and 173).

purposes of determining resource costs. Removing the PTC as modeled from a generic wind resource results in an approximately 64 percent increase in the cost of that resource on a real-levelized basis. Reducing the ITC to ten percent increases solar and battery storage resource costs by approximately 19-20 percent; removing the ITC entirely results in a further ten percent increase in costs for these resources. This analysis assumes wind resources are not eligible for the ITC and, thus, the resource cost is unchanged in the "10 percent ITC Only" and "No Tax Credit" sensitivities.

Figure 42. Tax credit scenario real-levelized costs 2030 COD (2025$/kW-year)



As is observed in **Figure 42**, the availability of federal tax credits has a significant impact on the assumed cost of generation and storage resources. Specifically, without the availability of federal tax credits through 2035 generation costs are expected to increase by as much as 64 percent and storage resources by 30 percent. The customer cost increases associated with changing these assumptions are significant and analyzed further in **Section 6.6 Federal tax credit availability scenarios**.

5.1.4 Electricity price forecast

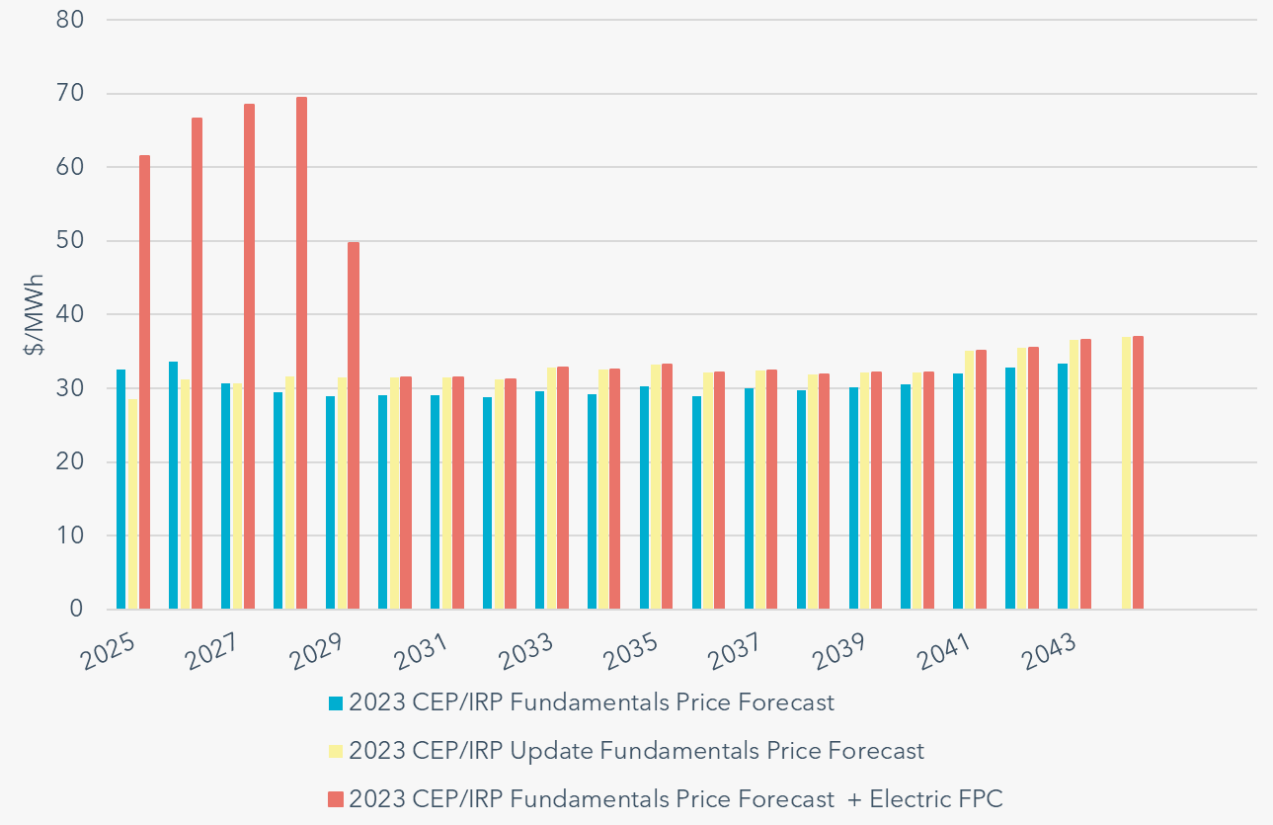
OPUC Staff provided feedback on the 2023 CEP/IRP regarding the PGE electricity price forecast, which is used in the calculation of energy efficiency avoided cost data.[106] Between 2025 and 2029, the PGE electricity forward price curve (FPC) was significantly higher than PGE's fundamental price forecast. The fundamental price forecast is produced by PGE's IRP team in Aurora using forecasted supply and demand conditions across the WECC. The FPC used by IRP

[106] Public Utility Commission of Oregon. (2024, April 30). Staff report: Request for approval of energy efficiency avoided cost data to be used by Energy Trust (Docket No. UM 1893). https://edocs.puc.state.or.us/efdocs/HAU/um1893hau328091055.pdf

is the same as produced for the 2025 AUT. Staff recommended that the Energy Trust of Oregon use a blended price when calculating the avoided costs of energy efficiency.

In response, PGE adjusted the methodology used in the electricity price forecast for this Update to align with Staff's recommendation in UM 1893. For the years 2025 through 2028, the PGE electricity FPC replaces the long-term fundamentals price forecast. After 2029, the IRP electricity price forecast is based on the fundamentals forecast. In 2029, the price forecast is calculated as the hourly average blend of the two forecasts for each of the 39 price futures. **Figure 43** shows the results of incorporating the FPC into the IRP price forecast compared to the fundamentals price forecast in the 2023 CEP/IRP and the 2023 CEP/IRP Update.

Figure 43. Reference IRP Price Forecasts from 2025 – 2044



5.1.5 Supply-side resource energy value

PGE uses Aurora to estimate the energy value of dispatching existing generating resources, contracts, and candidate new resources using electricity prices and associated risk variable inputs from each price future.

The Reference case energy value and range of outcomes across the simulated price futures for each resource are summarized in **Table 19**. These values are levelized across each resource's economic life, for resources with 2028 commercial operation dates.

Table 19. New resource option energy values (2028 COD)[107]

Resource	Levelized energy value (2025$/MWh) Reference case	Range
Solar CV	$23.51	$15.36 - $34.54
Solar MCMN	$22.52	$14.77 - $33.12
Solar Wasco	$22.03	$14.45 - $32.41
Wind Gorge	$27.70	$17.91 - $41.19
Wind MT	$32.53	$20.81 - $47.98
Wind SE WA	$30.03	$19.28 - $44.41
Wind ND	$31.05	$19.98 - $45.86
CV hybrid 1	$28.72	$18.96 - $40.70
CV hybrid 2	$26.00	$18.02 - $37.87
MCMN hybrid 1	$29.33	$19.47 - $41.34
MCMN hybrid 2	$25.81	$17.97 - $37.47

Energy values presented here for a 2028 COD are higher on average than those in the 2023 CEP/IRP by roughly 10 percent to 35 percent, depending on the resource. This is driven in part by the upward change in the electricity price forecast for early model years, as described in **Section 5.1.4 Electricity price forecast**.

5.1.6 Resource capacity contribution

Resource capacity contribution values were discussed in Section 10.5 of PGE's 2023 CEP/IRP. Please also see the related discussion in **Section 3.4 Capacity need** of this Update. The effective load-carrying capability (ELCC) identifies the percentage of a resource's nameplate capacity that can be depended upon when planning for resource adequacy. For example, the 100 MW nameplate capacity of a 4-hour battery may have an ELCC of 22 percent in the winter. This means that the 100 MW nameplate capacity of a 4-hour battery contributes 22 MW (100 * 0.22) towards reducing system capacity needs. If the starting system has a winter capacity need of 200 MW, after adding a 100 MW 4-hour battery, the new capacity need will be 178 MW (200 MW of need, less 22 MW of capacity).

For this Update, the capacity contributions of resources summarized in **Table 20** are evaluated in the year 2030 using Sequoia. The analysis uses the same snapshot of loads and resources as used for the updated capacity need assessment discussed in **Section 3.4 Capacity need**. Since the publication of the 2023 CEP/IRP, model updates were made to Sequoia including load forecasts, QF assumptions, and RFP proxy additions (**Section 3.4.2 Changes to modeling capacity need**). These updates reduced the 2026 capacity need, the year ELCCs were evaluated

[107] Ranges reflect upward and downward semi-deviations around the Reference Case across the market price futures.

in the 2023 CEP/IRP, to 47 MW in summer and 0 MW in winter. 2030 was elected as a representative year with sufficient need to test the capacity contributions of proxy resources for the 2023 CEP/IRP Update. Additionally, as part of the 2023 CEP/IRP Update it is assumed that proxy resources will acquire firm transmission equal to 75 percent of the nameplate capacity. This change reflects an attempt to align transmission modeling assumptions with state resource adequacy requirement (e.g. WRAP) and future modeling.[108]

A major finding of the Update is the reduction in ELCCs of storage resources. The cause of this reduction is due in part to an additional 775 MW of storage resources in the system with the RFP Proxy.[109] Second, the ELCC of storage resources is dependent on the amount of energy in the system, for which the 2030 base energy system has a significant energy deficit and is pronounced in winter as discussed in **Section 3.3 Energy need**. PGE considers the unique planning challenge presented by the interactions between storage and energy to be a priority item for review in future integrated resource plans. **Section 6.2.3 Preferred Portfolio resource adequacy testing** expands on the current planning framework, the concern it presents in Preferred Portfolio results, and approaches to address these concerns as part of the 2023 CEP/IRP Update and future planning efforts. Additionally, long-duration storage (LDS) was not assumed available for portfolio expansion due to the lack of commercially proven projects, as such the ELCCs for this resource are not included below. However, **Section 6.2.3 Preferred Portfolio resource adequacy testing** provides a preliminary view of the benefit LDS could provide to PGE's system and motivates further analysis of this and other emergent technology as part of the 2026 CEP/IRP.

Table 20. ELCC values for portfolio construction in year 2030, incremental 100 MW nameplate

	Summer		Winter	
Resource	Firm	Conditional Firm	Firm	Conditional Firm
Wind Gorge	40%	34%	28%	28%
Wind MT	24%	17%	58%	55%
Wind SE WA	17%	13%	43%	39%
Wind WY	32%	20%	59%	51%
Wind ND	30%	19%	54%	51%
Solar CV	23%	10%	21%	21%
Solar MCMN	26%	13%	21%	11%
Solar Wasco	27%	13%	18%	18%
Solar Mead	14%	10%	30%	30%
CV hybrid 1	76%	50%	36%	36%
CV hybrid 2	56%	34%	25%	26%

[108] See LC 80 - Attachment 2. Staff Expectations for Future IRP–Transmission Modeling, and UM 2274 SMM Condition 5.
[109] Analysis of the change in storage resource ELCCs discussed in Jan. 8th 2025 CEP/IRP Roundtable 25-1.

MCMN hybrid 1	80%	57%	32%	32%
MCMN hybrid 2	61%	34%	28%	28%
2-hour battery	31%		14%	
4-hour battery	46%		22%	

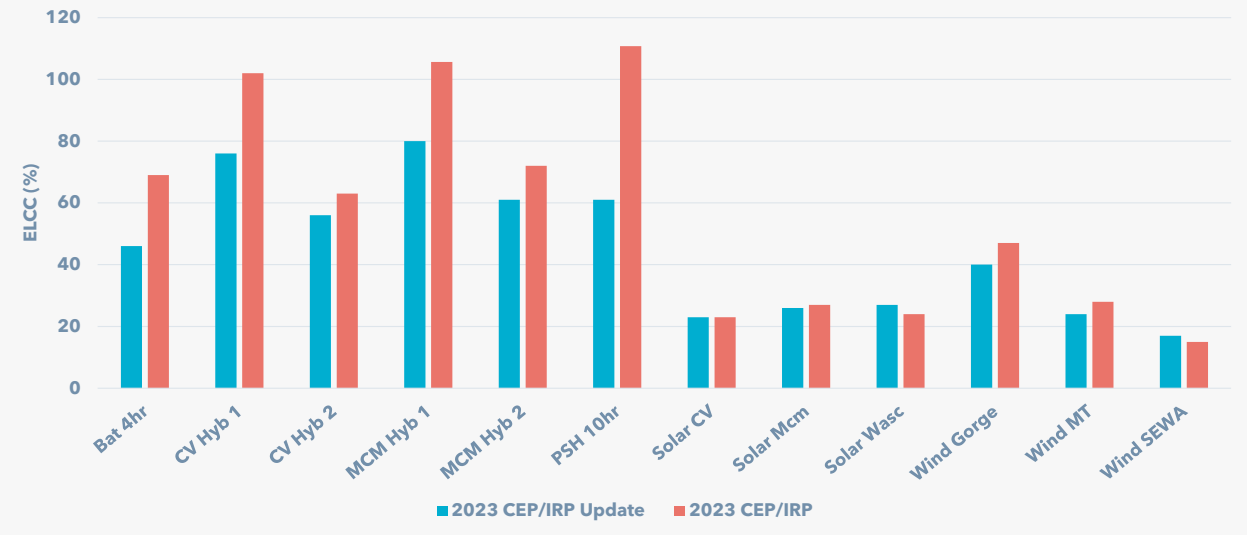
5.1.7 Comparison of resource capacity contribution to 2023 CEP/IRP

As discussed in the section above, the updates that PGE made to resource adequacy modeling, including changes to the underlying portfolio, have resulted in updated proxy resource capacity contributions. These changes can have important impacts on portfolio analysis. To understand the potential key drivers of changes in portfolio outcomes from the 2023 CEP/IRP, this section provides a comparison between the updated ELCCs and those from the 2023 CEP/IRP. Comparisons between ELCCs from the 2023 CEP/IRP and this Update for Summer and Winter are shown in **Figure 44** and **Figure 45**.

Figure 44 shows that generally Summer ELCCs for Proxy resources have decreased since the 2023 CEP/IRP. This decrease is attributed to the assumed 75 percent transmission availability assumption, discussed in the section above, and due to the additional storage and solar resources modeled in the system as part of the 2023 RFP Proxy resource discussed in **Section 3.2.2 2023 RFP proxy**.

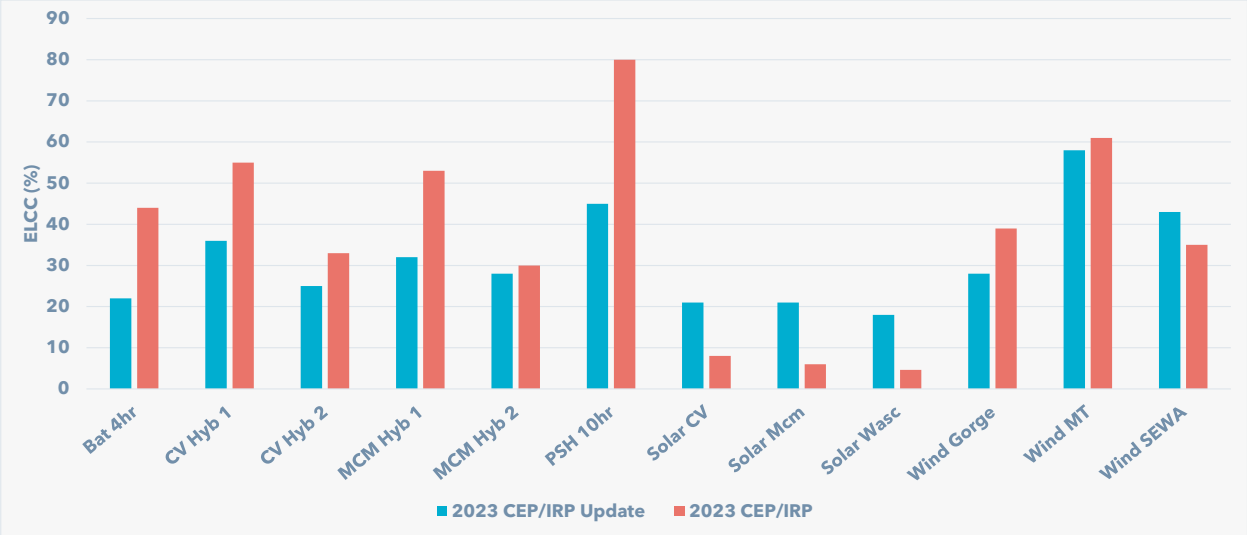
Figure 45 shows the same general trend of lower ELCCs exists in Winter. However, there is a modest increase in the value of solar proxy resources, attributed to the added benefit that midday energy plays in decreasing the likelihood that winter reliability events span across the AM and PM peaks.[110]

Figure 44. Select ELCC Comparison – Summer, Firm Transmission



[110] See **Section 6.2.3.1 Energy sensitivity adequacy assessment of Preferred Portfolio** for more discussion on the value of energy in meeting winter reliability challenges.

Figure 45. Select ELCC Comparison – Winter, Firm Transmission



5.1.8 Resource capacity value

The capacity value is a theoretical construct that uses the net cost of capacity and a resource's capacity contribution to derive a dollar value.

Using the $237/kw-yr described in **Section 6.7 Net cost of capacity resources** as the cost of capacity, with the same approach as in PGE's 2023 CEP/IRP, the capacity value of a resource at (nameplate) is:

$$Capacity\ value\ of\ resource\ A\ =\ Capacity\ contribution\ of\ resource\ A\ (ELCC\ \%)\ *\ \$237/kW-yr$$

While not used directly for portfolio analysis in this Update, the resulting capacity value is useful for the purpose of comparing resources or for calculating the administratively determined avoided cost payments for resources procured outside of competitive or negotiated processes. This value has increased meaningfully compared to the 2023 CEP/IRP driven mainly by updated assumptions regarding higher fixed costs as well as increased capacity which reduced ELCCs. This net cost of capacity value is an illustrative metric and is not directly included in portfolio analysis.

Table 21 and **Table 22** summarize the capacity values of resources considered in this Update. For capacity resources in **Table 21**, the ELCC and corresponding capacity value ($/kW-yr.) indicate the amount of capacity required of each resource to provide an incremental 100 MW of capacity contribution to the portfolio. Emergent technologies, such as LDS, geothermal, hydrogen storage, nuclear, etc. are not detailed below due to a current lack of commercially proven projects. As noted above, **Section 6.2.3 Preferred Portfolio resource adequacy testing** suggests these resources may be valuable additions in PGE's portfolio due to winter reliability challenges and motivates the need for a more thorough analysis of such emergent technologies in the 2026 CEP/IRP.

Table 21. Capacity Resource ELCCs and Capacity Values

Resource	Annual ELCC 100 MW capacity contribution	Capacity value (2025$/kW-yr.)
4-hour battery	32%	76
6-hour battery	43%	101
Wind SE WA	12%	29
Solar CV	16%	37
CV hybrid 1	55%	129
MCMN hybrid 1	55%	131

For energy resources in **Table 22**, the ELCC and corresponding capacity value ($/MWh) are shown corresponding to 100-megawatt average (MWa) addition sizes after accounting for the corresponding levelized capacity factors. The ELCC values reflect the effects of the declining marginal ELCC curves.[111]

Table 22. Energy Resource ELCCs and Capacity Values

Resource	Annual ELCC 100 MWa energy addition	Capacity value (2025$/MWh)
Wind MT	35%	23
Wind Gorge	33%	20
Wind SE WA	18%	11
Solar CV	19%	19
Solar Wasco	17%	18
Solar MCMN	17%	22

5.1.9 Resource net cost

This section provides an overview of updates to Section 10.8 of PGE's 2023 CEP/IRP on resource net cost; combining a resource's cost, energy value, flexibility value, and capacity value results in the "net cost". As discussed in Section 10.8.1 and 10.8.2 of PGE's 2023 CEP/IRP, the net cost of capacity and energy resources can be a useful tool for comparing resources on similar terms, though these results are not used directly in portfolio analysis. The net costs displayed in this section are based on the formula in **Section 5.1.9 Resource net cost** above. Based on these illustrative results, the portfolio analysis in **Chapter 6 Resource plan** meets capacity needs more economically with energy resources in select years.

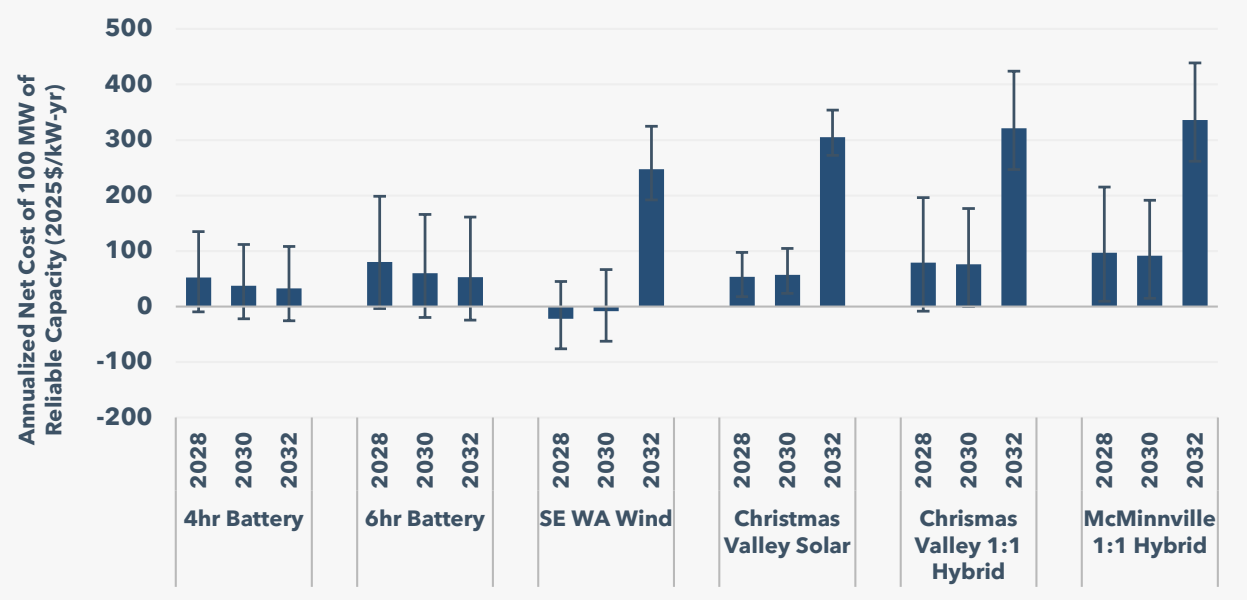
5.1.9.1 Net cost – capacity resources

Figure 46 illustrates the net cost in $/kW-yr of providing 100 MW capacity contribution to the portfolio from various select resources. From this snapshot, standalone batteries appear to be

[111] The annual ELCCs shown in this table are calculated with the average of the seasonal ELCC and are for informational purposes and meant to be directional indicators of capacity value. The actual value of capacity is estimated within portfolio analysis and is dependent on seasonal ELCCs.

the least-cost means to provide capacity to the portfolio in the near-term. These net cost of capacity values represent the total cost less energy, flexibility, and capacity contribution values. Negative net costs imply the given resource for that COD is less expensive than the portfolio-blended cost of capacity described in **Section 6.7 Net cost of capacity resources**. However, in reality, the resource may not yet be available given transmission constraints. Broadly, the relative net costs highlight the order of selection. For example, with transmission constraints beginning in 2032 for some resources, based on the information in **Figure 46**, a model adding capacity while minimizing cost would select battery resources before any of the transmission expansion options.

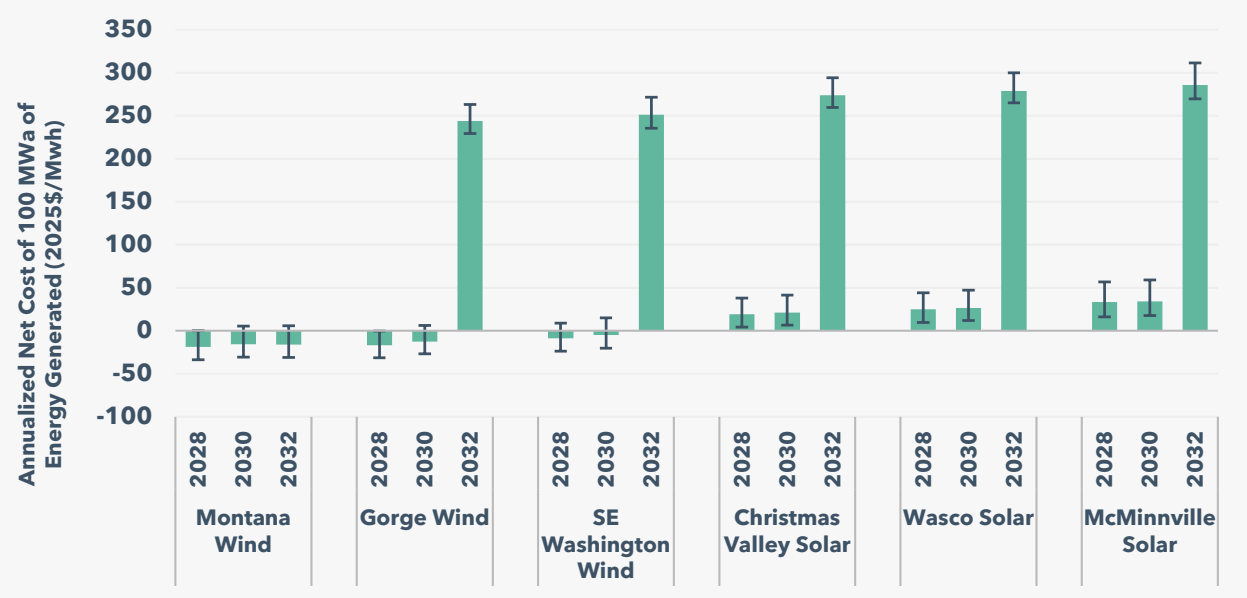
Figure 46. Net cost of 100 MW of capacity contribution by COD



5.1.9.2 Net cost – energy resources

Similarly, **Figure 47** summarizes the net cost in $/MWh of 100 MWa incremental energy contribution to the portfolio from a selection of variable energy resources. These net cost of energy values represent the levelized cost of energy less energy, flexibility, and capacity contribution values. Given the CODs shown, these net costs do not begin to include transmission access and associated costs until 2032 for select resources. This meaningfully increases costs in later years once transmission access is deemed available and this premium highlights why distribution-connected resources may become increasingly cost-competitive in a model, despite having higher fixed costs than their supply-side counterparts.

Figure 47. Net cost of 100 MWa generation by COD



While net costs of new resources provide helpful insights for understanding the economic tradeoffs between specific resource actions, this simplistic view of resource economics neglects risks associated with future uncertainties and potential interactions between resources and constraints. These are more thoroughly investigated through portfolio analyses described in **Chapter 6 Resource plan**.

5.2 Distributed energy resources (DERs)

PGE develops a forecast of DER adoption and hourly load impact on a regular basis. This DER forecast provides insights on how much market-based DER adoption will impact both PGE's bulk and distribution systems. It also informs how much cost-effective demand response can be made available to shape and shift load on the bulk system. As such, the DER forecast informs PGE's planning processes, including its Distribution System Plan (DSP) and the IRP. This section provides a brief description of the approach used and results from the DER forecast.

The DER forecast uses PGE's AdopDER software to model the adoption of over 60 DER technologies and technology combinations. The software uses a current, point-in-time snapshot of data from PGE systems that describes the characteristics of each PGE service point: building type and vintage, heating and cooling system, vehicle weight class(es) and fuel(s), and interconnected solar PV and storage. AdopDER also accounts for customer growth across PGE's service territory to simulate the eligibility, adoption, and load impacts for each DER over a 20-year forecast horizon through calendar year 2044.

From this starting point, AdopDER simulates both the market adoption of passive DERs and expected customer participation in current and future demand response programs—representing achievable potential within a potential study framework. For this update to PGE's 2023 CEP/IRP, three adoption scenarios (reference, high, and low) were modeled using varying inputs such as

cost assumptions, adoption trends, and policy signals. The outputs reflect how DER deployment is shaped by evolving market, regulatory, and customer dynamics.

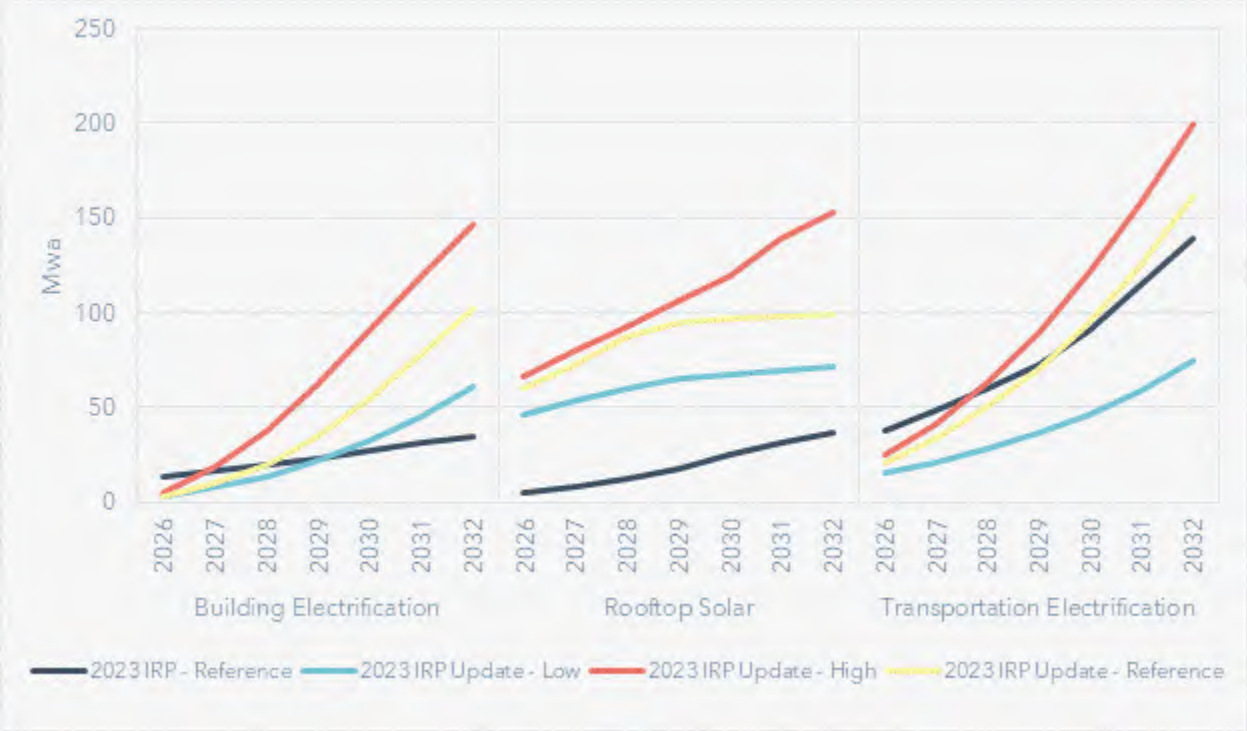
AdopDER calculates cost-effectiveness metrics for each demand response resource and modeling of these resources in the IRP is handled in distinct ways depending on whether a resource is deemed to be cost-effective, or non-cost-effective, in AdopDER. Cost-effective measures are assumed to be adopted, with their capacity benefits reducing PGE's forecasted capacity need. Measures deemed to be non-cost-effective in AdopDER are made available in portfolio analysis, competing on an economic basis for selection against supply-side resource options. To consider the potential of the entire demand response supply curve, the IRP Action Plan sets a demand response target that includes all of the cost-effective measure and any additional non-cost-effective resources identified through portfolio analysis.

This Update reflects the best available DER forecasts at the time of analysis, including results from the August 2024 AdopDER run. AdopDER is a dynamic tool, and its outputs are sensitive to underlying assumptions—such as changes in federal and state policy, economic conditions, and regional adoption patterns. These inputs are continually refined as new data becomes available. All DER forecasts are currently being updated as of May 2025 and will be incorporated into the forthcoming Transportation Electrification Plan, Distributed Systems Plan, and Flexible Load Multi-Year Plan.

5.2.1 Passive DERs

Passive DERs are represented in IRP modeling using three categories: distributed solar (PV), transportation electrification (TE) and building electrification (BE). These cost-effective DER shapes are not incorporated into the PGE load forecast regression as outlined in **Section 3.1 Econometric load forecast**. **Figure 48** shows the reference case values from the 2023 CEP/IRP are included shows the passive DER shapes by category by year (2026-2032) for the low, base and high case scenarios used in the 2023 CEP/IRP Update.

Figure 48. Passive DER shapes by category by year



5.2.1.1 Distributed solar (PV)

The annual adoption of distributed solar PV is projected to experience significant growth through the late 2020s before leveling off in the early 2030s. Multiple factors drive this growth trajectory: decreasing technology costs, rapid technological advancements, supportive state policies, and increasing customer environmental awareness. However, this trend is anticipated to begin to flatten for two primary reasons. First, key financial incentives like the Residential Clean Energy Credit and Investment Tax Credit—currently stimulating adoption—will gradually phase down after 2032, with credit percentages decreasing to 26 percent in 2033 and 22 percent in 2034, before potentially being eliminated. Second, as residential customers continue to drive the majority of distributed solar PV adoption, the diminishing availability of suitable rooftops will create a natural constraint on future growth as the most optimal installation sites become saturated. The results from the AdopDER forecast for Distribute PV do not consider risks associated with the more rapid phasing out of tax credits as discussed in **Section 2.5 Federal administration changes**.

5.2.1.2 Transportation electrification (TE)

The transportation electrification policy assumptions include the impact of the 2022 Advanced Clean Cars II rule for light-duty vehicles, which requires that auto manufacturers meet 100 percent of the market share of new vehicles with zero-emission battery electric and plug-in

hybrid electric models by 2035.[112] Similarly, medium- and heavy-duty vehicles follow the 2021 Advanced Clean Truck rules, which set aggressive electrification targets for this vehicle segment.[113] The DER forecast also accounts for PGE customers and their known fleet electrification plans (i.e., a customer has plans to electrify 100 percent of its fleet by year 2028).

In the 2023 CEP/IRP Update forecast, PGE expects a total of 270,000 light-duty battery electric vehicles by 2030, predominantly in the residential sector, and approximately 80,000 medium and heavy-duty battery electric vehicles. From these vehicle estimates, PGE expects the annual transportation electrification load to achieve 95 MWa by 2030.

Gross transportation electrification load does not account for the potential impact of associated demand response programs such as time-of-use or managed charging programs. These impacts are instead captured under Demand Response or Flexible Load resources (e.g., direct load control programs).

5.2.1.3 Building electrification (BE)

Building electrification has significant potential to both decarbonize the economy and increase the amount of electric load that PGE needs to serve its customers' needs. In the DER forecast, fuel switching from fossil fuels to electric space heating, water heating, and/or cooking technologies in existing buildings and the new construction sector drives the building electrification forecast. The rate at which these customers electrify their end-use systems includes the expected impact of the 2022 Inflation Reduction Act legislation.

Like transportation electrification, gross building electrification load across varying adoption scenarios, not accounting for the potential impact of associated demand response and direct load control programs.

5.2.2 Cost-effective demand response

Cost-Effective (CE) DER resources are included in PGE's assessment of system need. **Section 3.4 Capacity need** details PGE's approach to estimating system need for the 2023 CEP/IRP Update using PGE's resource adequacy assessment model, Sequoia. As part of estimating system need, Sequoia utilizes estimates from PGE's AdopDER model. AdopDER simulates market adoption of passive DERs and the expected participation of customers in current and potential demand response programs.[114] AdopDER accounts for key site-level factors such as access to garage parking, breaker space and equipment turnover to determine the technical, achievable, and economic potential. Twenty CE DER resources are modeled as part of the 2023 CEP/IRP Update, the same number as used in the 2023 CEP/IRP. Two inputs from AdopDER are used to estimate

[112] Final rule amendments to OAR Chapter 340, Division 257 adopted by the Oregon Environmental Quality Commission in Order DEQ 23-2022 (December 19, 2022), https://www.oregon.gov/deq/rulemaking/Documents/DEQ232022.pdf.
[113] Final rule amendments to OAR Chapter 340, Division 257 adopted by the Oregon Environmental Quality Commission in Order DEQ 17-2021 (November 17, 2021), https://records.sos.state.or.us/ORSOSWebDrawer/Recordhtml/8581405.
[114] For more information on AdopDER reference 2023 CEP/IRP Chapter 6.2 - Distributed Energy Resource (DER) impact on load

the hourly effect of each CE DER in Sequoia: hourly shape and program size by month. Hourly shapes are scaled across the planning horizon based on program size, resulting in estimated hourly contributions of each CE DER resource which grow with forecasted increases in program participation. Further, CE DER contributions are estimated for the three need futures (Low/Reference/High) used in the 2023 CEP/IRP Update. **Table 23** provides a summary of program size of CE DER resources in the 2030 Reference need future. In total, there are 1269 MW of capacity from CE DER resources on average in 2030, a 181 MW net increase in capacity from the 2023 CEP/IRP Addendum: System Need and Portfolio Analysis Refresh. The largest change in program participation is in the Rooftop Solar program, which is estimated at 668 MW of capacity on average in 2030, a 165 MW increase from the estimates used in the 2023 CEP/IRP Addendum.

Table 23. Monthly Average Program Size of CE DER Resources – 2030 Reference Case (MW)

Program	2023 CEP/IRP Update	2023 CEP/IRP Addendum	2023 CEP/IRP
Rooftop Solar	668	503	206
Building Electrification	96	51	33
Light Duty EV	95	149	101
Energy Partner Curtailment (Summer)	92	52	52
Smart Thermostat (Summer)	76	65	65
Energy Partner Curtailment (Winter)	68	46	46
Time-of-Use (Summer)	41	30	30
Smart Thermostat (Winter)	39	35	35
Time-of-Use (Winter)	23	15	15
Peak-time Rebates (Summer)	22	43	43
Peak-time Rebates (Winter)	18	28	28
Multi-Family Water Heater (Winter)	18	41	41
Multi-Family Water Heater (Summer)	10	26	26
Utility Controlled Storage (Commercial)	3	3	3
Utility Controlled Storage (Residential)	0	0	0
Customer Controlled Storage	0	0	0
EV Load Control (Winter)	0	0	0
EV Load Control (Summer)	0	0	0
Customer Controlled Storage	0	0	0
Utility Controlled Storage w/ PV	0	0	0
Total	**1269**	**1087**	**724**

Lastly, PGE adjusted AdopDER estimates of program size for years 2025-2026 to align values with PGE's Multi-Year Plan (MYP) forecasts for mature CE DER programs: Smart Thermostat, Peak-time Rebates, Time-of-Use, Energy Partner Curtailment, and Multi-family Water Heater.[115] The MYP provides more accurate short-term forecasts of eligible program adoption compared to AdopDER's bottom-up, locational approach. PGE aligned the AdopDER near-term forecasts with MW impacts from MYP to ensure consistency across all planning deliverables.

5.2.2.1 Dispatchable Stand-by Generation (DSG)

PGE's DSG program provides a valuable reliability benefit. The contingency reserves these customer-sited resources supply in the form of operating reserves free-up PGE's generating resources to serve load. Additionally, DSG resources can provide ancillary services in the form of frequency and demand response. This program was estimated to have little to no growth in the 2023 CEP/IRP and 2023 CEP/IRP Update, growing from approximately 109 MW in 2025 to 113 MW by 2030. However, more recent analysis of load growth from the industrial segment and data centers is expected to increase program participation by 120 MW.[116] Including growth from data centers as well as other C&I customers, the DSG program is expected to have 300 MW of nameplate enrollment by 2030. In anticipation of growth in the DSG PGE's rate Schedule 200 was updated to ensure customers are at least cost-neutral to participate, increasing the likelihood of enrollments and the ability of this program to avert situations that could lead to power quality problems for the power supply in the local region.[117]

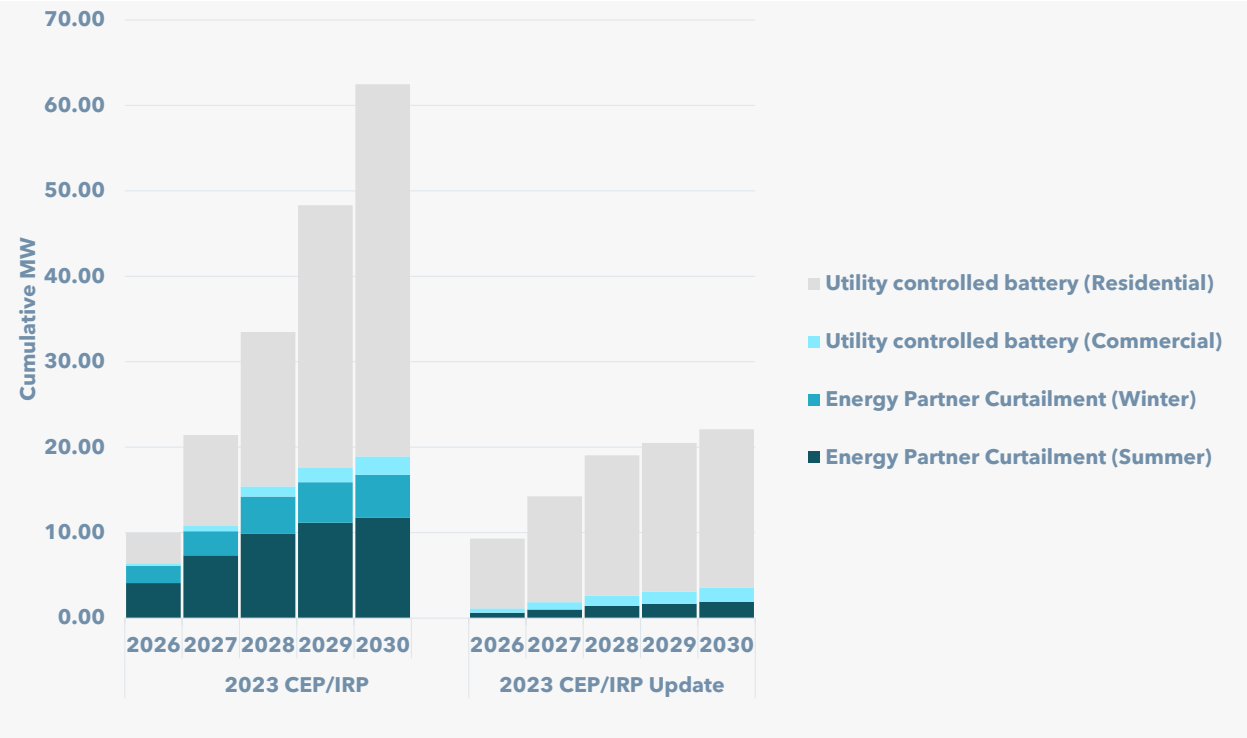
5.2.3 Non-cost-effective demand response

The 2023 CEP/IRP Update includes updated quantity and cost assumptions for four bundles of non-cost-effective (NCE) DER resources. Updated values result from the August 2024 run of PGE's AdopDER model, used to forecast metrics for NCE DERs.[118,119] The four bundles are groupings of the same site-level measures as used in the 2023 CEP/IRP described in Section 8.2 - Additional distributed energy resources and Section 8.2.2 – Additional demand response. Each bundle represents similar DER programs based on dispatch characteristics and costs. **Figure 49** compares the available quantities of NCE DER resources in the 2023 CEP/IRP Update to those used in the 2023 CEP/IRP. The cumulative total quantity of NCE DER resources decreased by 40.39 MW in 2030, due largely to a 57 percent reduction in forecasted adoption of utility-controlled battery in the residential segment. The large reduction in residential utility-controlled battery is due to a slower adoption trend for these resource as estimated in the August 2024

[115] Flexible Load Multi-Year Plan 2025-2026
[116] OPUC Staff Report Docket No. Adv 1705 - Updates Schedule 200 Dispatchable Standby Generation to increase the Aid in Construction Allowance. These more recent estimates of DSG program size were not incorporated in the 2023 CEP/IRP Update due to timing in the analysis process. Estimates will be reviewed as part of the 2026 CEP/IRP planning cycle.
[117] PGE Rate Schedule 200
[118] For a more detailed discussion of AdopDER reference: 2023 CEP/IRP's Section 6.2 – Distributed Energy (DER) impact on Load
[119] These updates do not take into account UM 2141 updates approved after August 2024 (i.e., Feb. 2025 approvals)

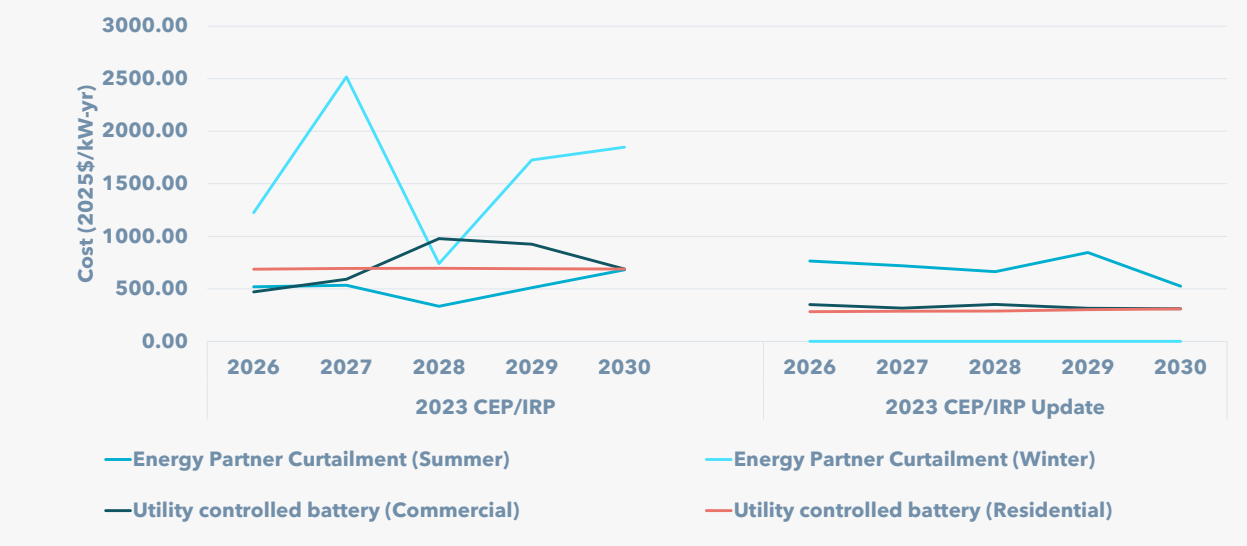
AdopDER run. Further, capacity from winter NCE Energy Partner Curtailment resources is non-existent in the 2024 AdopDER run, as the smart thermostat and cold storage curtailment programs previously bundled within are now considered cost-effective.

Figure 49. NCE DER Quantities Available in 2023 CEP/IRP and 2023 CEP/IRP Update



Cost assumptions were updated as part of the revised AdopDER results. Fixed costs for these NCE DER resources reflect weighted average site-level costs, including customer acquisition costs, upfront incentives, and upfront participation costs. Ongoing costs were also revised and included as variable costs for customers, incentives, and participants. **Figure 50** displays a comparison of costs from the 2023 CEP/IRP to values used in the 2023 CEP/IRP Update. Average costs across 2026-2030 for utility-controlled batteries in both commercial and residential segments decreased by approximately $380 /kW-yr, while average costs across the same period increased by $180 /kW-yr for summer Energy Partner Curtailment resources. Winter Energy Partner Curtailment costs are no longer reported as the estimated quantity available in the 2023 CEP/IRP Update is 0 MW, as described above.

Figure 50. Comparison of Updated NCE DER Costs (2025$/kW-yr)



5.3 Energy efficiency

PGE relies on the Energy Trust of Oregon (ETO) to identify energy efficiency measures available in the IRP using its resource assessment modeling tool. This modeling tool uses a cost-effectiveness screen on energy efficiency potential to forecast two metrics: (1) Cost-Effective (CE) energy efficiency measures and (2) Non-Cost-Effective (NCE) energy efficiency measures. The CE energy efficiency measures are incorporated into PGE's IRP load forecast and assumed to be acquired in IRP portfolio analysis. The NCE energy efficiency measures are incorporated into IRP's portfolio analysis and are considered as incremental resource additions based upon the aggregation of energy efficiency measures into discrete bins.

5.3.1 Cost-effective energy efficiency

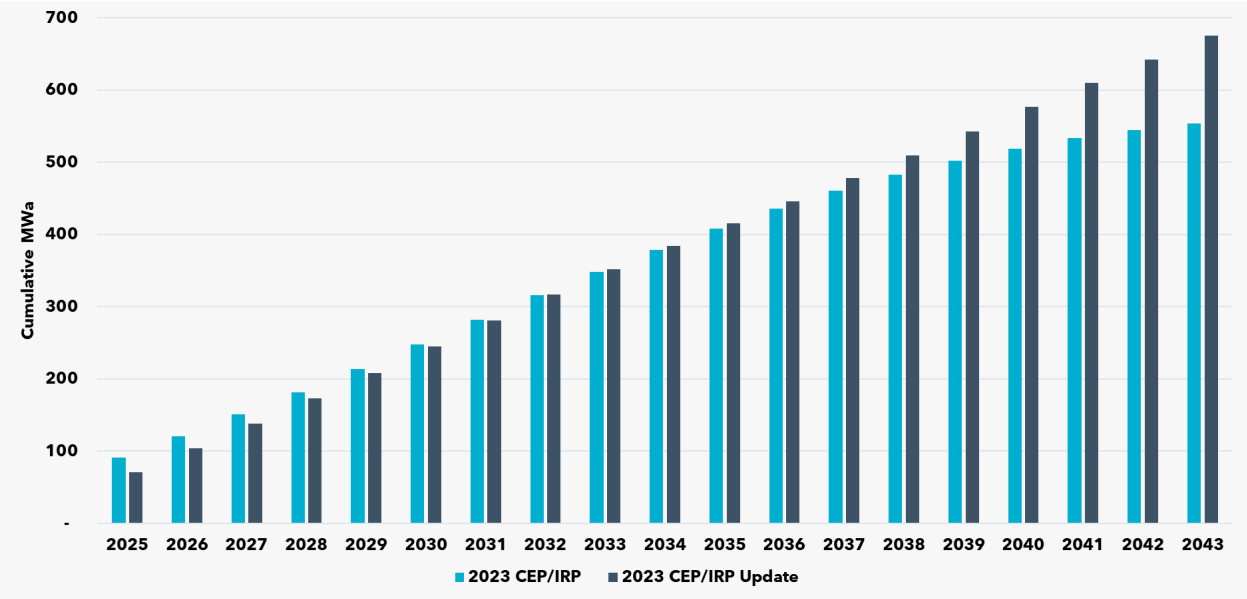
PGE receives a list of Cost-Effective (CE) Energy Efficiency measures that the ETO has found to pass its cost-effectiveness screening. The screening involves using a benefit-cost ratio to determine if the present value of benefits is equal to or exceeds the present value of the costs of the measure being evaluated. The CE Energy Efficiency forecasts are incorporated into the IRP load forecast as independent, or explanatory, variables in PGE's load forecast regression models.[120] For details on the CE achievable potential by end use and sector and final savings projections for CE energy efficiency measures, see the 2025 Resource Assessment Model provided by the Energy Trust of Oregon in **Appendix E**.

For this Update PGE incorporated an updated forecast of CE EE from the ETO. As shown in **Figure 51**, cumulative quantities of CE EE are forecast to be slightly lower through 2031 than in the 2023 CEP/IRP. Beyond 2031, CE EE quantities are increased relative to the 2023 CEP/IRP forecast, although the differences are relatively small until the late 2030's. By 2043, the updated

[120] The Energy Efficiency Savings forecast shared by the Energy Trust in November of 2023 was used as an input to the May 2024 load forecast.

forecast identifies 122 MWa more CE EE than was incorporated in modeling in the 2023 CEP/IRP. The main drivers of this increased potential CE EE savings are described in the 2025 Resource Assessment Model provided by the Energy Trust of Oregon in **Appendix E.**

Figure 51. Cost-effective energy efficiency in the 2023 CEP/IRP and IRP Update



5.3.2 Non-cost-effective energy efficiency

For PGE's 2023 CEP/IRP update, the ETO provides PGE with savings and levelized cost data for energy efficiency measures that do not pass the cost-effectiveness screening in the Resource Assessment Model. A summary of the ETO energy efficiency measures in the 2025 Resource Assessment Model provided by the Energy Trust of Oregon can be found in **Appendix E**. These Non-Cost Effective (NCE) measures are incorporated into IRP modeling via the PGE bundling methodology as candidate resources in Portfolio Analysis.

5.3.3 Bundling of NCE energy efficiency measures

PGE adopted a similar process as the Northwest Power and Conservation Council and aggregated measures into discrete bundles (or 'bins') based on the measures' levelized costs. Within these five bins the NCE energy efficiency measures are organized based on the rank of the measure's levelized cost. The bin ranges are generated by creating megawatt-average thresholds across the cumulative megawatt-average of total NCE potential. In the 2023 CEP/IRP, the bin ranges were established by prioritizing bins that contained at least 10 megawatt-average per bin. In the 2023 CEP/IRP update, the bin shapes prioritize aggregation according to average fixed cost. In portfolio analysis, the analysis of any given bin will assess the next set of potential energy efficiency measures that share similar cost structures rather than assessing the next 10 megawatt-average of the cumulative NCE potential.

From these bin shapes, PGE is able to calculate the maximum potential NCE energy efficiency savings by year. Updated bin shapes are summarized in **Table 24**. PGE then calculates costs,

capacity factors, ELCCs and energy values for each bin shape with which to characterize the NCE energy efficiency as resources available for selection in portfolio analysis.

Table 24. Cumulative NCE EE potential by Bin (MWa) through 2030

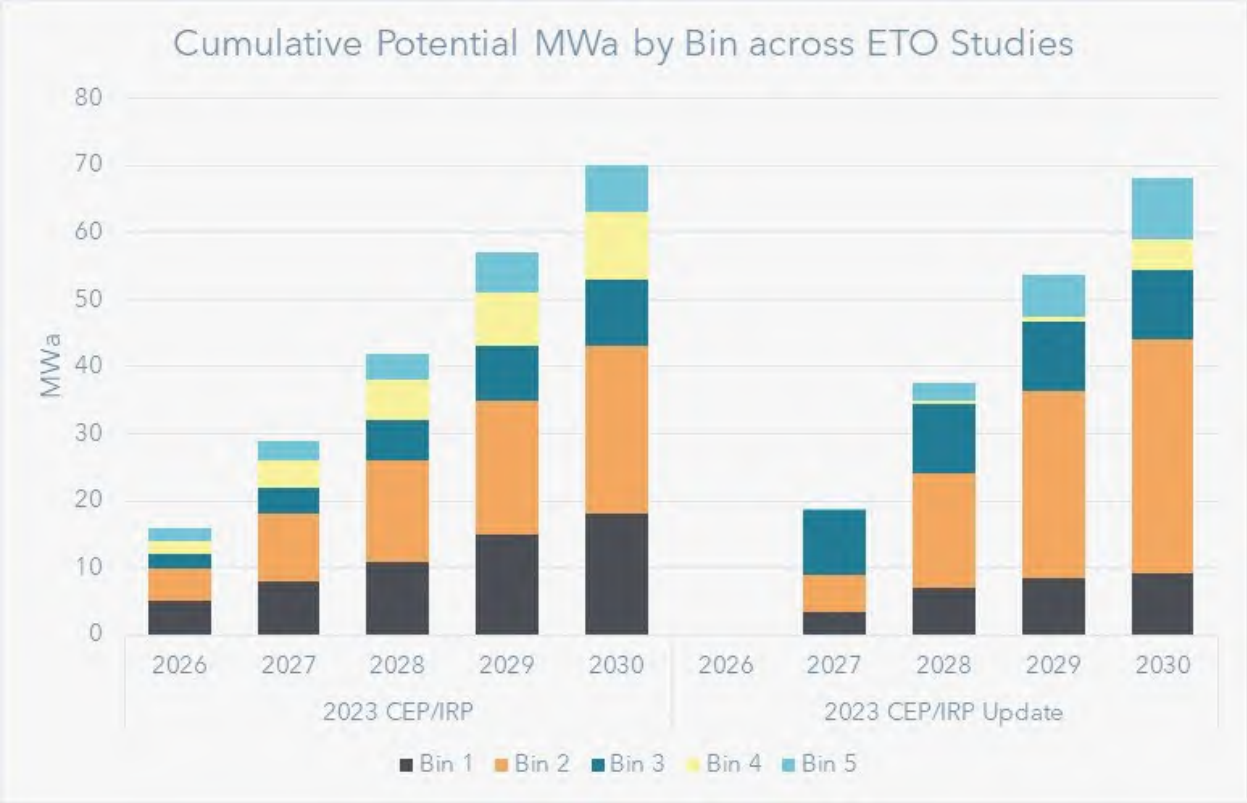
Year	Bin 1	Bin 2	Bin 3	Bin 4	Bin 5
2026	0.0	0.0	0.0	0.0	0.0
2027	3.5	5.5	9.5	0.1	0.2
2028	7.0	17.0	10.4	0.6	2.7
2029	8.6	27.8	10.4	0.7	6.2
2030	9.1	34.9	10.4	4.6	9.1

5.3.4 Comparing NCE energy efficiency in 2023 CEP/IRP to the 2023 CEP/IRP Update

The total cumulative megawatt-average of NCE energy efficiency expected by 2030 changes little between the 2023 CEP/IRP and the 2023 CEP/IRP Update, falling from 70 megawatt-average to 68.1 megawatt-average across all five bins, as summarized in **Figure 52**. The bin sizes differ between filings as the changes in the fixed costs for each NCE energy efficiency measure led to resorting across the five bins.[121]

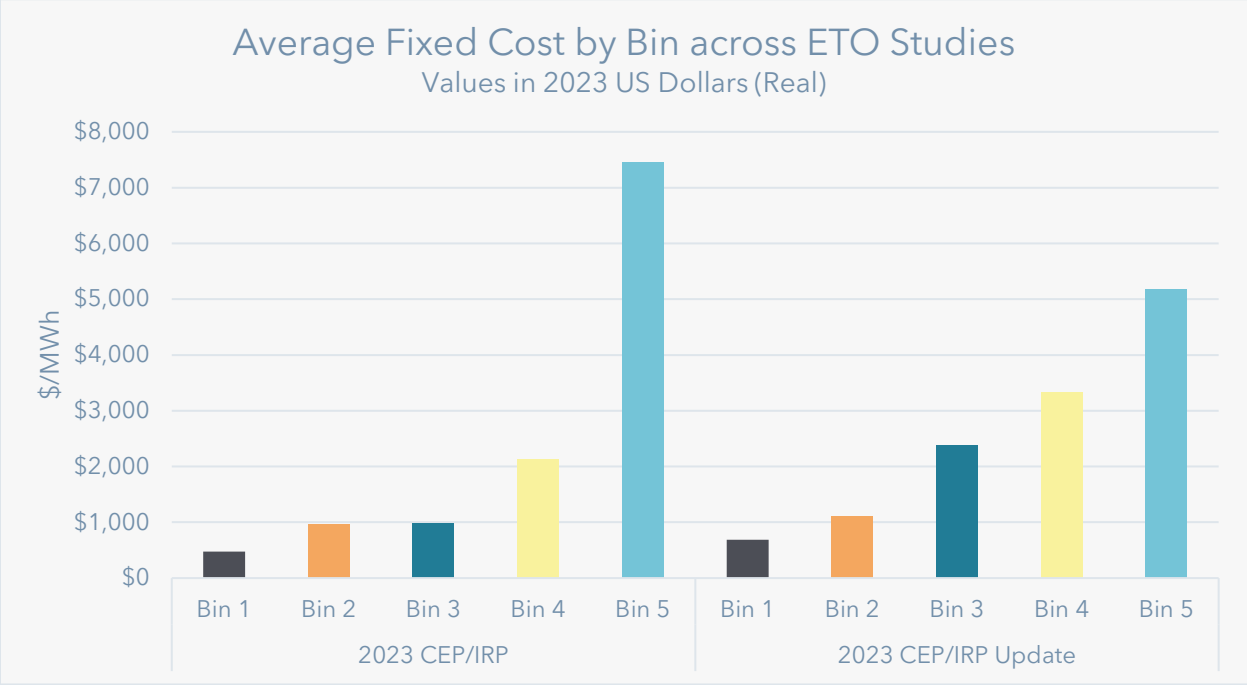
[121] In the 2023 CEP/IRP PGE was able to create roughly 10 MWa bins by aggregating programs with similar levelized costs. In the CEP/IRP Update PGE prioritized keeping bins of similar costs, which resulted in differences in MWa bin size.

Figure 52. Comparison of the Potential MWa by Bin between the 2023 CEP/IRP and the 2023 CEP/IRP Update



There is an increase in the average fixed costs for all bins, except Bin 5, as average levelized costs increased 37.2 percent over all measures, as depicted in **Figure 53**. The increases in average fixed costs are due to rising costs of EE equipment driven by inflation, changes in supply chain, post-COVID effects, and increased avoided costs, making measures that were on the margin now cost-effective. This removes lower cost measures from the list of NCE measures.

Figure 53. Comparison of the Average Fixed Cost by Bin between the 2023 CEP/IRP and the 2023 CEP/IRP Update expressed in real $ (2023)



5.3.5 Energy efficiency program and policy

This section provides an update on near-term commitments to address costs and implementation challenges present in the accelerated procurement of the Energy Efficiency identified in the 2023 CEP/IRP.[122] Those commitments include:

- Supporting Energy Trust of Oregon's development of guiding principles to actively consider utility rate impacts,
- Supporting Energy Trust of Oregon's creation of a mechanism to set targets for outside funding and requirements for regular reporting,
- Supporting Energy Trust of Oregon's formalization of the divisions of labor and funding allocations established between Energy Trust of Oregon and other entities,
- Exploring the co-deployment of flexible load and EE programs with near-term focus on how these programs can help customers participating in PGE's Income Qualified Bill Discount, and
- Continued collaboration on program demonstration in the PGE testbed and measure development that includes complementary funding.

This Update represents an articulation of PGE's understanding of the feasibility of new cost recovery mechanisms, pathways for co-deployment informed by stakeholder feedback and the

[122] OPUC. Acknowledgement of 2023 Integrated Resource Plan and Clean Energy Plan. Docket No. LC 80, December 14, 2023, Page 9. Retrieved from https://edocs.puc.state.or.us/efdocs/HAU/lc80hau325590032.pdf.

stage of readiness achieved by Energy Trust of Oregon. Some dependencies that may impact the progress on commitments made, and perhaps the Need Futures presented, include the revision to the Energy Trust of Oregon Grant Agreement, the timing and magnitude of public sector funding, changes made to avoided cost methodology on UM 1893, and Energy Trust's ability to engage and formalize roles with other public sector entities.

5.3.5.1 Utility rate impacts

Energy Trust has recently increased its focus on leveraging customer funding paid through rates with other, complementary funding sources to enable deeper retrofits, increase savings, reach more customers, and deliver overall greater value. PGE worked with Energy Trust in 2024 to refine and articulate principles for complementary funding.

Energy Trust will align its investments with Oregon's decarbonization policies by following guidance from the OPUC and supporting customer fuel choices with high-efficiency equipment incentives. They will address fuel-switch constraints and ensure efficient use of resources to advance state policy objectives. Additionally, Energy Trust may administer programs promoting clean air and decarbonization with separate funding if it aligns with their vision and purpose.

Defining leveraging, braiding and co-funding

The term "leveraging" is used loosely to cover a broad range of complementary funding strategies that bring additional, public-sector funds to support Energy Trust projects, programs, and activities. "Braiding," "co-funding," "layering" or "stacking" funding streams is a process for using multiple sources of funding to support a common program or project that results in energy savings or generation.

This complementary funding is expected to contribute through the following efforts:

- Enable: Braiding dollars for deferred maintenance overcomes a barrier to participation.
- Amplify: Energy Trust delivery infrastructure and multi-utility funding model produces economies of scale by an order of magnitude ($1 ratepayer: $10 taxpayer).
- Offset: Braiding dollars improves cost-effectiveness by reducing the incremental measure cost.

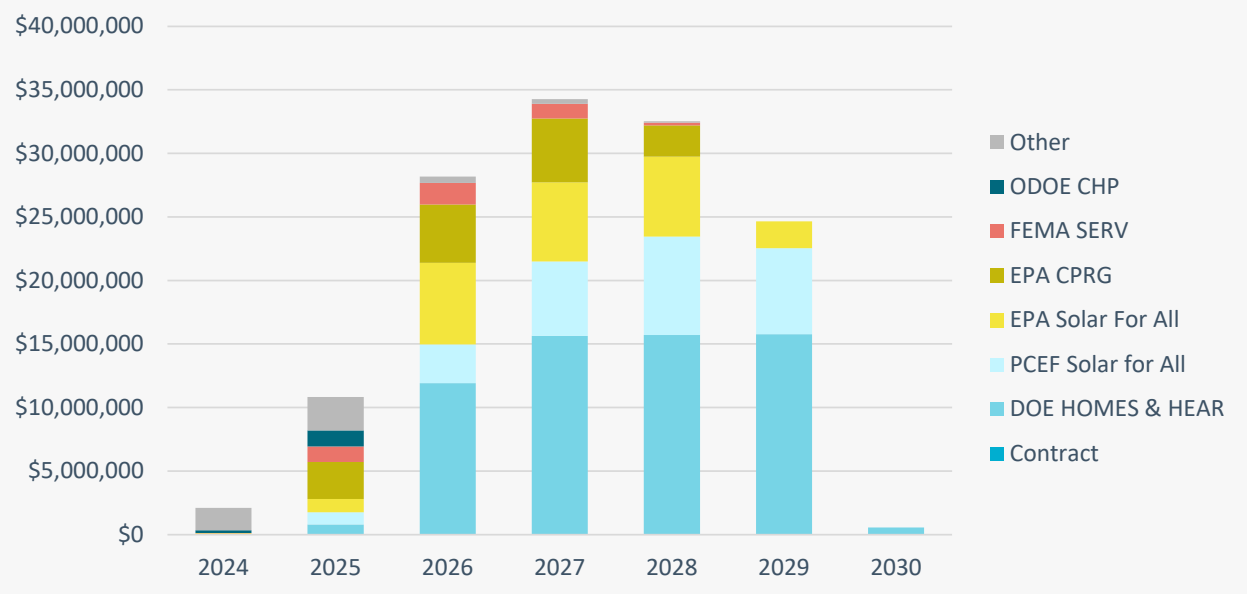
Guiding principles for leveraging funds

Energy Trust has stated that it will prioritize leveraged funding to increase energy savings and generation, improve equitable access to services, stretch customer dollars, and fill unmet customer needs. They also committed to minimizing program confusion, strengthening stakeholder relationships, ensuring continuous customer support, and enhancing contractor effectiveness. Leveraged funding examples include co-funding heat pump installations, provided it results in greater benefits for customers.

5.3.5.2 ETO funding allocation

In 2025, Energy Trust will be developing a complementary funding strategy as a component of the 2026-2030 multiyear plan. This component of the multi-year plan will outline strategies to leverage other funding in support of multiyear program strategies to achieve energy targets. Current estimates provided by ETO, across all utility funders not just PGE, are shown in **Figure 54**, though exact timing and amounts may be subject to change.

Figure 54. Estimated Energy Trust Complementary Funding Revenue by Year, Contract



PGE customers benefit from the leveraging of taxpayer dollars. Given that public sector grants and rebates fund the same end-use improvements it is important to establish an understanding of the roles and responsibilities across funding administrators and implementers so as not to duplicate efforts. This sorting and defining of roles is currently happening at the funding opportunity or contract level for Energy Trust. For example, for EPA Solar For All, this is described in the role of partners within that agreement.

5.3.5.3 Co-Deployment of Flexible Load and EE programs

Action Planning with Energy Trust of Oregon

As a result of legislative direction in HB 3141 (2021), codified as ORS 757.746(e), Energy Trust of Oregon was required to, "with public utilities, jointly develop public utility specific budgets, action plans and agreements that detail the entity's public utility-specific action plan (USAP), resources, including coordinated activities that require joint investment and deployment." Also, per the legislation, "Each action plan must reflect stakeholder feedback gathered through a public process managed by the entity and the relevant public utility as overseen by the commission." This statutory direction required modification to Energy Trust's current budget development process, with more utility-specific coordination.

In June of 2022, following a series of work sessions with OPUC, Energy Trust, utility funders and customer advocates, a Budget Process Coordination and Action Plan Memorandum (the "HB 3141 Budget Coordination Memo") was formed. This memorandum represented a joint planning framework that articulated stepwise activities to support annual budget and utility-specific action planning.

Building on this plan development process the Energy Trust and PGE propose evolving from a two-year cycle to a multi-year (2026-2030) time horizon and from an activity-based plan to an outcomes-based co-deployment framework. Doing so affords the two organizations the opportunity to better maximize value for shared customers, accelerate procurement as determined in the PGE Integrated Resource Plan in compliance with HB 2021, as well as align based on organizational and program readiness.

Co-Deployment

Co-deployment with the Energy Trust encompasses a shared strategy, with common marketing, outreach, and messaging, to efficiently deliver complementary energy services to shared customers. Through co-deployment of complementary services, customers benefit from behind-the-scenes coordination with streamlined participation and total delivery cost reduction for all customers. To start, co-deployment will include targeting priority high energy burdened customers with services that lead to meaningful bill reduction and advance the shared objective of reducing energy burden. The timing of this effort is aligned with implementation of HB 2475 through the OPUC docket UM 2211, with the goal of reducing energy burden and the anticipated availability of public sector funding. Co-deployed services will initially consist of existing, feasible offerings provided by each organization today. Over time, additional services and deployment forms or pathways will be added to the framework as each organization is ready to bring in more services to market. The framework will evolve to focus on different configurations of candidate screening and more targeted delivery.

Co-deployment may take a variety of forms and pathways:

- Community outreach: Shared program marketing collateral and tabling events together
- Co-funding: A methodological approach in which PGE provides complementary funding for flex value (e.g., residential thermostats)
- Bill reduction: Referral of IQBD customers to increase EE program participation (also provides flex potential for future co-funding opportunities)
- Solar+ storage: Aligning PGE smart battery roadmap with the U.S. Environmental Protection Agency Greenhouse Gas Reduction Fund Solar for All grant funding timing
- Pilot to program: Ensuring that tested collaboration yields a hand-off to product and measure development.

5.4 SSR resource

A new proxy supply-side resource was added to represent the range of small-scale renewable (SSR) resources that may be available to help PGE meet Oregon's ten percent small-scale

renewable requirement. The inclusion of a SSR resource allows the requirement that starts in 2030 to be accounted for in portfolio analysis.

The ten percent requirement uses only one metric (i.e., 20 MW or less in size) and does not incorporate community benefits.[123] The purpose of the SSR proxy resource is strictly to analyze compliance with the ten percent requirement; consequently PGE chose to design the resource to represent projects on the upper end of the 20 MW size limit, which are less costly than smaller community-scale projects. Smaller-scale projects are already considered in portfolio analysis through the lens of CBREs.

Due to limited suitable locations within PGE's service territory to site a 20 MW renewable energy facility, the resource is assumed to be off-system. The resource cost and performance parameters of the SSR resource are based on the Christmas Valley solar proxy resource. The performance characteristics match those of the Christmas Valley solar resource. This means having the same generation profile and resulting capacity factors and energy value. The cost characteristics are scaled to account for the fact that smaller projects benefit less from economies of scale than larger projects and therefore can be expected to be more costly on a per-unit basis. In order to account for this size-cost dynamic, the $/kW fixed costs of the SSR resource are inflated by eight percent above the fixed costs of the Christmas Valley solar resource, the fixed costs of which are based on an assumed 100 MW DC project size. Analysis in Berkeley Lab's "2024 Utility-Scale Solar, 2024 Edition" report is used to estimate a cost premium associated with smaller-scale resources. In the report, projects between 5-20 MW DC were found to have a weighted mean capex cost of $1.28/W, while projects between 50-100 MW DC had eight percent lower capex costs, with a weighted mean of $1.18/W.[124]

5.5 Community benefits indicators (CBIs)

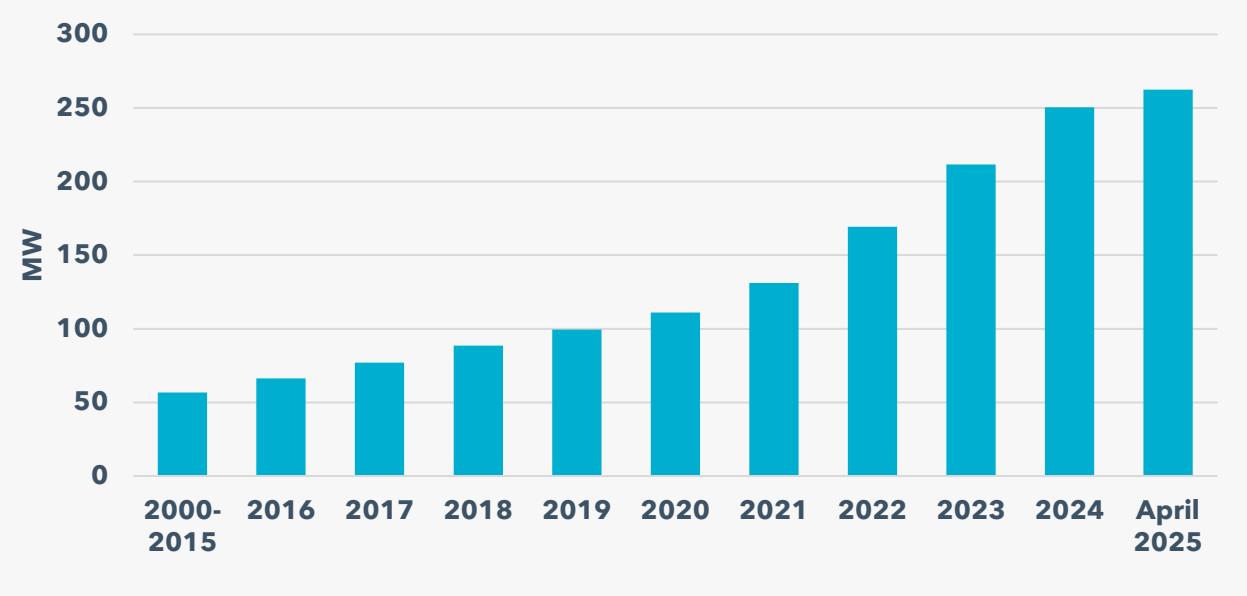
PGE has taken steps to advance the integration of community benefits indicators (CBIs) into resource planning processes, consistent with regulatory directives and community stakeholder priorities. This chapter provides an update on the development, refinement, and application of CBIs since the 2023 CEP/IRP. As guided by OPUC Order 22-390 and stakeholder input,[125] PGE has expanded its CBI framework to encompass measurable and impactful metrics across resilience, health and community well-being, environmental impacts, energy equity, and economic impacts. This update aims to share key developments, preliminary findings, and the roadmap for future efforts.

For example, PGE has long supported customer-sited resources connecting to the power grid. **Figure 55** shows rooftop solar installations have grown roughly four-fold in the past decade.

[123] While SSR resources can be CBRE's, they are not required to provide the community benefits that distinguish CBRE's from other small-scale resources. The SSR proxy resource therefore does not include any assumption of provision of community benefits beyond what would be provided by larger utility-scale resources.
[124] Berkeley Lab's "2024 Utility-Scale Solar, 2024 Edition" report can be found at http://utilityscalesolar.lbl.gov.
[125] This order, along with valuable stakeholder input, has guided PGE's approach to Community benefits indicators Oregon Public Utility Commission. (2022). Order No. 22-390 in Docket No. LC 73. Retrieved from https://apps.puc.state.or.us/orders/2022ords/22-390.pdf.

Community-based renewable energy is just a part of what PGE will quantify and track toward CBIs.

Figure 55. Cumulative Installed Rooftop Solar PV Capacity (MW)



5.5.1 Background and regulatory framework

OPUC Order 22-390 provided guidance on CBIs and their application to CEP/IRP analysis and established five CBI topic areas that must be included: health and community well-being; resilience; environmental impacts; energy equity; and economic impacts.[126] The Order also required that these topics should include at least one metric of each of three CBI categories. In 2023, PGE filed its first CEP as part of the IRP, including a set of CBIs responsive to these three CBI categories:

1. **Portfolio CBIs (pCBI)**: the CEP included a proxy value for all CBRE, set at 1 MW of CBRE equal to 1 unit of community benefit, reflecting an unspecified set of benefits associated with a hypothetical CBRE
2. **Resource CBIs (rCBI)**: PGE utilized a ten percent adder to reduce the levelized cost of CBRE projects, reflecting an approximation of the associated community benefit value of CBREs within the resource portfolio comparison process
3. **Informational CBIs (iCBI):** PGE identified a set of six iCBI and associated metrics, based on community engagement efforts and stakeholder feedback

In April 2024, OPUC issued Order 24-096, which identified the following required actions:

[126] Oregon Public Utility Commission. (2022). In the Matter of PORTLAND GENERAL ELECTRIC COMPANY, 2019 Integrated Resource Plan (Order No. 22-390). Retrieved from https://apps.puc.state.or.us/orders/2022ords/22-390.pdf

"PGE must demonstrate development of CBIs to assist in our understanding tradeoffs between cost, risk, and community benefit, and when evaluating procurement decisions.

"PGE must develop a set of informational-only metrics by its next CEP/IRP or provide a detailed explanation of barriers, constraints, and a proposal for resolution." [127]

5.5.2 Advancing CBI methodologies and integrating to the IRP

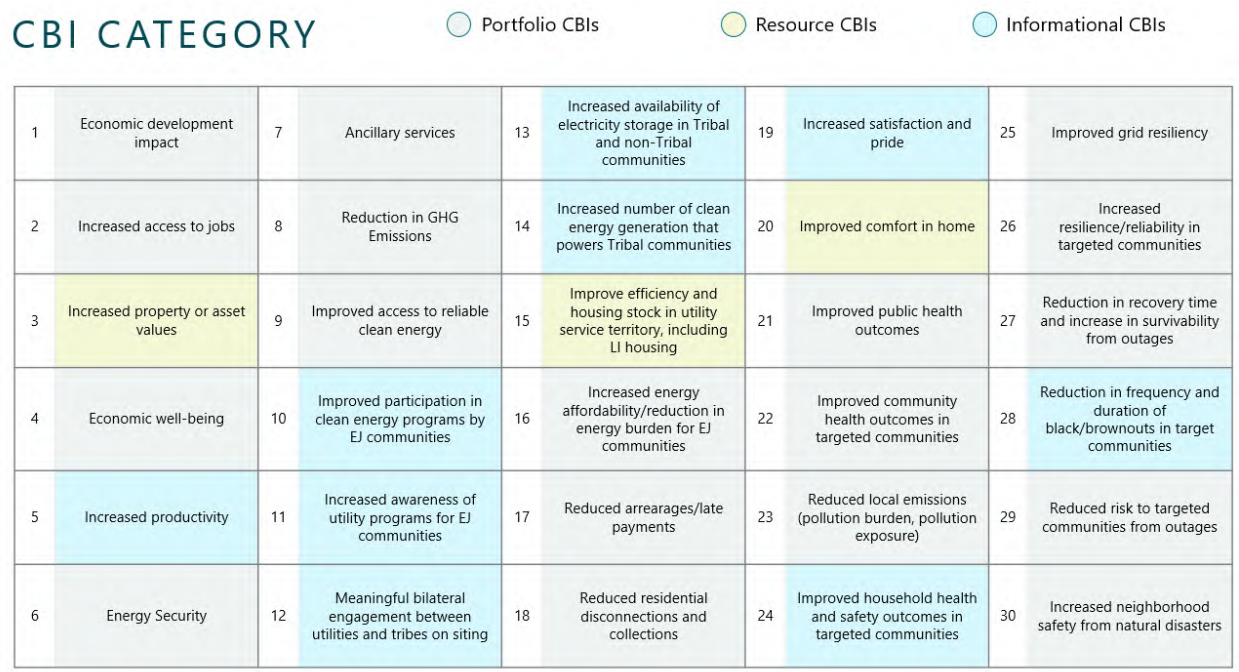
5.5.2.1 Updated CBI approach

In 2024, PGE engaged Cadeo (now Resource Innovations) to conduct research into CBIs. Based on this research and stakeholder feedback, PGE refined its approach to CBI as follows:

1. Expanded CBI List: PGE incorporated a list of 30 CBIs that was developed by Cadeo, characterized by their applicability to specific resources, monetizable value, and alignment with OPUC categories (see **Figure 56**). For more detail on how Cadeo developed this list, please see **Appendix G**.
2. Valuation Methods: Cadeo's research into monetizable CBIs has developed a method to include five pCBI categories to align and comply with OPUC requirements. For rCBIs, Cadeo reviewed several studies which they then used to quantify percentage adjustments which would reduce the levelized cost of capacity for several specific resource bundles.
3. Stakeholder Collaboration: PGE Engagement with the IRP Roundtable, OPUC Staff, and the Community Benefits and Impacts Advisory Group (CBIAG) has informed revisions to CBI metrics and methodologies. The CBIAG provided valuable feedback on the CBI framework, suggesting improvements and identifying areas for future exploration. Affordability emerged as a key concern, particularly regarding the impact of investment costs on customer rates, especially for those with higher energy burdens.
4. Integration Strategies: PGE research proposed four distinct approaches to incorporate CBIs into IRP modeling, ranging from proxy indicators to direct cost adjustments.

[127] Oregon Public Utility Commission. (2023). Docket No. LC 80, Order 240-096: PORTLAND GENERAL ELECTRIC COMPANY 2023 Integrated Resource Plan. Retrieved from https://apps.puc.state.or.us/edockets/DocketNoLayout.asp?DocketID=23636

Figure 56. List of CBIs by Category



1	Economic development impact	7	Ancillary services	13	Increased availability of electricity storage in Tribal and non-Tribal communities	19	Increased satisfaction and pride	25	Improved grid resiliency
2	Increased access to jobs	8	Reduction in GHG Emissions	14	Increased number of clean energy generation that powers Tribal communities	20	Improved comfort in home	26	Increased resilience/reliability in targeted communities
3	Increased property or asset values	9	Improved access to reliable clean energy	15	Improve efficiency and housing stock in utility service territory, including LI housing	21	Improved public health outcomes	27	Reduction in recovery time and increase in survivability from outages
4	Economic well-being	10	Improved participation in clean energy programs by EJ communities	16	Increased energy affordability/reduction in energy burden for EJ communities	22	Improved community health outcomes in targeted communities	28	Reduction in frequency and duration of black/brownouts in target communities
5	Increased productivity	11	Increased awareness of utility programs for EJ communities	17	Reduced arrearages/late payments	23	Reduced local emissions (pollution burden, pollution exposure)	29	Reduced risk to targeted communities from outages
6	Energy Security	12	Meaningful bilateral engagement between utilities and tribes on siting	18	Reduced residential disconnections and collections	24	Improved household health and safety outcomes in targeted communities	30	Increased neighborhood safety from natural disasters

5.5.2.2 Integrating CBIs into IRP modeling

Following CBI discussions and direction from UM 2225 and LC 80, PGE has utilized the same structured pathways to integrate CBIs into IRP processes:

Resource CBIs highlight the localized benefits of individual projects:

- rCBIs can be used to adjust levelized costs of specific resources. For instance, the economic and health benefits of solar panels and energy efficiency measures are quantified and incorporated into resource cost comparisons.
- These adjustments could be used to influence the cost-minimization portfolio analysis towards the selection of resources that maximize community benefits.

Portfolio CBIs reflect the cumulative benefits of resource portfolios, with emphasis on economic, environmental, and equity impacts.

- pCBIs are determined by the quantities of resources selected in portfolio analysis.
- Portfolios with higher pCBI values could be identified as higher performing in portfolio analysis (based on their broader community benefits).

Informational CBIs

- iCBIs may be used as tracking tools to monitor long-term impacts, such as the percentage of low-income households benefiting from clean energy programs, quality job creation, and increased resiliency within Tribal and energy-burdened communities.

In the initial use of Resource CBIs, a direct adjustment was applied to the levelized cost of specific energy resources to account for measurable participant benefits. While research identified a set of eight core benefit categories with the potential for monetization, only those substantiated by secondary data sources were included: property value increases and comfort improvements. Due to limited primary research on benefit valuation for specific resource types within PGE jurisdiction, this analysis relied on secondary sources and adapted benefit metrics for IRP application. PGE caveats that these benefits accrue to the participant not directly to the community (and therefore supports further refinement of this framework through planning and acquisition efforts). The assumption underlying the application of these benefits is that these participant benefits, when aggregated in a local setting, result in a community benefit. This initial assessment and application of these first rCBIs were integrated into IRP evaluations as percentage reductions to resource costs.

Examples of **rCBI Application** include the reduction of resources costs to account for:

- **Community-based renewable energy** (**CBRE) Solar** if qualified by providing tangible and resilience benefits to community is based on a 6.8 percent increase in property values, reflecting benefits tied to behind-the-meter installations for residential customers.
- **Energy efficiency (EE)**, to reflect monetization of comfort benefits at $62 per project annually for low-income households and $42 for non-low-income households.
- **Curtailment programs (Battery Storage)** based on a 2.3 percent increase in property values for residential batteries enrolled in curtailable Summer/Winter programs.

Table 25 summarizes selected rCBI applications.

Table 25. Assumed rCBI Applications

CBI	Resource Category	% Reduction to Levelized Cost	CBI Benefit Metric	Source	IRP Application Assumptions
Property Value	CBRE Solar	**269%**	6.8% increase in property value	Zillow 2024	Assumes 5 kW residential solar install; applicable to behind the meter projects; dependent on ownership structure (i.e., assumes value occurring at time of sale for home/property owner)
Property Value	Demand Response	**64%**	2.3% increase in property value	Zillow 2024	Assumes applicability for 5kW residential battery, assumes behind the meter installation
Property Value	EE	**45%**	0.5% increase in property	LBNL 2022	Applicable for home performance projects (e.g., HPwES, whole-house weatherization); reflecting Residential study.
Comfort (Shell)	EE	**10.6% LI; 7.2% non-LI**	$62/project (LI); $42/project (non-LI)	EmPOWER Maryland (2023)	Applicable for projects with shell measures (insulation, air sealing); benefit accrue annually over measure lifetime

CBI	Resource Category	% Reduction to Levelized Cost	CBI Benefit Metric	Source	IRP Application Assumptions
Comfort (HVAC)	EE	**5%**	Average of $30/project (3%) and $100/project (7%)	MA Residential NEI Study (2023); EmPOWER Maryland (2023)	Applicable for HVAC replacements using heat pumps; benefits accrue annually over measure lifetime; assuming 2000 kWh annually, 18-year EUL, and project cost of $15,000.

The rCBI benefits PGE was able to identify and quantify required two key conditions: (1) access to existing research with adaptable, quantified benefits; and (2) available data across all applicable resources for a given benefit. This consistency requirement is key for maintaining balanced resource comparisons, as including monetized benefits with the levelized costs for only some eligible resources would create an uneven evaluation framework. The approach prioritized consistency, meaning CBIs through the rCBI pathway were only applied when complete data existed across all applicable resources. Otherwise, associated benefits are considered within the pCBI approach.

Portfolio CBIs: Proxy-based Benefits

Portfolio CBIs represent those benefits which are more challenging to quantify or monetize, or that may have insufficient available data for all eligible resources (and thus present an imbalance if included for some but not all resources). For this update PGE attempted to assign these benefits to resource bundles in line with the economic, equity, health, resilience, and environmental categories laid out in OPUC guidance. PGE applied pCBIs as proxy values at the backend of the IRP modeling sequence after resource bundles were established, to characterize and identify bundles that likely accrue specific CBI benefits. PGE then considers these CBIs as part of the scorecard approach for portfolio selection.

Examples of **pCBI Application**:

- **Economic Impacts**: Included economic development, increased access to jobs, economic well-being, increased property value, and increased productivity. Economic impact benefits are identified for a wider range of resources, not limited to demand response and CBREs. This includes supply-side resources as potential economic development and job creation opportunities exist across various resource categories.
- **Energy Equity**: Benefits such as improved affordability and reduced arrearages were assigned to CBRE, energy efficiency (EE), and demand response (DR) (specifically time-of-use rates), applicable to resources targeting disadvantaged communities and those with highest likelihood of yielding bill impacts.
- **Health and Well-being**: Proxy values for improved indoor air quality and household safety were applied to weatherization and HVAC measures.
- **Environmental Impacts**: Emissions reductions were reflected across CBRE and demand-side

resources to account for their role in mitigating climate change. In the development of the IRP, the availability of pCBIs remains limited for many resource options under consideration. While pCBIs have been identified for certain distributed energy resources, such as community-based renewables and energy efficiency programs—where benefits like energy equity, local economic development, and resilience can be reasonably quantified—many supply-side resources lack studies or assessments that would inform the application of pCBI benefit.

This is primarily due to the complexity of attributing broad community benefits to large-scale generation and transmission assets, as well as the absence of standardized methodologies for quantifying their indirect social and environmental impacts.[128] **Table 26** highlights how the five topic areas for pCBIs were mapped to resource bundles, this table excludes resources such as out-of-state wind and others that do not have associated pCBIs.

Table 26. pCBI Mapping

Resource Bundle	Economic Impacts	Energy Equity	Health/ Well-being	Resilience	Environmental Impacts
CBRE Solar	✓	✓		✓	✓
Energy Efficiency	✓	✓	✓	✓	✓
Demand Response	✓	✓		✓	✓
CBRE Microgrids	✓	✓	✓	✓	✓
Battery	✓	✓			
CBRE Hydro	✓	✓		✓	✓
Gas Turbine	✓				
CV Hybrid	✓				
Wind - PGE territory	✓				
Solar - PGE territory	✓				

There are detailed applicability requirements for all CBIs, therefore resource-specific applicability must be carefully considered. These requirements relate to factors including measure characteristics, program design, geographic targeting, and baseline conditions. For

[128] These results are consistent with PGE's statements in UM 2225 about the inability to create useful and rigorous estimates of community benefits indicators to be applied in IRP analysis.

example, CBIs unlocked through energy efficiency often relate to specific measures, such as weatherization or HVAC improvements. When IRP resource bundles include various end-uses and technologies, these CBIs may only apply to a subset of the energy savings. Additionally, some CBIs focused on equity outcomes require geographic considerations, such as savings occurring within locations designated as environmental justice or tribal communities. Other CBIs aimed at achieving customer-level economic impacts related to energy affordability will be contingent upon resources that can achieve higher levels of bill savings.

5.5.3 Challenges and next steps

PGE faces several challenges integrating CBIs into its IRP process. One significant issue is the limited availability of jurisdiction-specific studies to substantiate the valuation for certain CBIs. Local conditions such as weather, the characteristics of the residence, customer awareness, power generation mix and location, distribution grid infrastructure status, and more can influence the valuation of different types of benefits. PGE has identified a need for further primary research to reflect these local conditions and policy goals and looks forward to engaging with stakeholders on the method, scope, and objectives of this research. The company is conducting a CBRE Request for Offer (RFO) through November 2025, which serves as a valuable tool for market research on project costs and CBIs. The insights gained from this process, including evaluations by CBIAG and engagement with OPUC Staff, should be incorporated into future resource planning updates to demonstrate PGE's commitment to understanding and valuing community benefits.

Another challenge lies in the limitations of proxy metrics, which require a balance between precision and usability. These metrics must be refined to ensure they provide meaningful insights while remaining practical for use in resource planning.

PGE has identified the need for further research to fully capture the benefits of Distributed Energy Resources (DERs), particularly for those DR resources not associated with EE. This may include considering the development of a cost-test model that could potentially incorporate identified community benefits. The process may involve examining recent research methodologies for quantifying benefits. New York State Energy Research and Development Authority's (NYSERDA) Community Adder program was reviewed for concept insights, finding additional incentives for community solar projects benefiting disadvantaged communities.[129] In consideration of the principles outlined in HB 2021, PGE aims to evaluate potential strategies for improving clean energy accessibility, assess projects that may provide benefits to disadvantaged communities, and pursue clean energy and equity objectives, while maintaining a focus on meeting load requirements and striving for cost-effective solutions for customers.[130]

[129] NYSERDA. *Community Adder* webpage. Retrieved from https://www.nyserda.ny.gov/All-Programs/NY-Sun/Contractors/Dashboards-and-incentives/Community-Adder.
[130] Oregon House Bill 2021, Section 1(3)(a), 2021 Regular Session. https://olis.oregonlegislature.gov/liz/2021R1/Downloads/MeasureDocument/HB2021/Enrolled.

5.5.4 Conclusion

Integration of CBIs provides an opportunity for PGE to extend resource planning to include the values and priorities of the communities PGE serves. CBIs offer a means by which to quantify benefits such as resilience, equity, environmental impact, public health, and economic development.

The challenges identified—including data gaps, proxy metric limitations, and diverse stakeholder priorities—highlight the need for continued research, collaboration, and refinement. As detailed earlier in the section, PGE believes continued stakeholder engagement, localized data development, and the adoption of advanced methodologies are necessary to overcome these challenges and enhance the impact of CBIs.

5.6 Long lead-time resources

This section provides an updated summary of Chapter 8.5 of the 2023 CEP/IRP regarding potential future resource options that PGE considered, including new generation and transmission expansion to other regions.

5.6.1 Post-2030 resource options

In 2024, in response to docket LC 80, PGE enacted a "Request for Information" (RFI), reaching out to WECC market participants to better understand post-2030 regional resource availability.[131] Using a comprehensive questionnaire distributed amongst a variety of developer communities and trade organizations, PGE gathered information on producers across key production regions in the WECC market and included a public/stakeholder workshop on these findings in late 2024.[132] That work has granted some insights that are relevant to post-2030 resourcing and is referenced in this section of the Update.

5.6.2 Hydrogen and ammonia

Included in the Inflation Reduction Act is a new 45V Clean Hydrogen Production Tax Credit (10-year duration). The tax credit provides up to $3.00/kg of hydrogen produced based on the emission intensity of the energy used to produce hydrogen. The law lays out a series of qualifying conditions in order to receive the credit, including a calculation of the lifecycle GHG emissions of the electricity, the age of the producing asset, and other considerations. Section 45V may yet serve as an additional incentive to the implementation of green hydrogen applications.

The federal government established a multi-billion-dollar grant for green hydrogen hub development nationally, with Oregon's Pacific Northwester Hydrogen Association receiving up

[131] Staff Report, recommendation #2, filed December 14, 2023, https://edocs.puc.state.or.us/efdocs/HAU/lc80hau325590032.pdf.
[132] PGE RFI Key Insights presentation, December 2024, https://assets.ctfassets.net/416ywc1laqmd/2GF5BwVt9cR1MXtEpn6fli/e719ec6879183abd984928db360fe410/RFI_slides_jdg_web_1197.pdf.

to $1 billion for four DOE-defined development phases spanning nine years. PGE has participated in this consortium to identify an opportunity to make this additional incentive available for customers, though there is currently some uncertainty of funding under the new Trump Administration.

5.6.3 Nuclear

In Oregon, Measure 7 prohibits the construction of a new nuclear power plant in the state without a federal long-term nuclear waste repository and a statewide popular vote. However, there is growing national interest in nuclear power as a non-emitting resource with active projects appearing in neighboring states.

In their 2021 IRP, PacifiCorp identified a sodium cooled fast reactor nuclear power plant with molten salt storage as a demonstration of the commercialization of this new, potentially safer, nuclear technology. Construction on the plant began in 2024, in conjunction with TerraPower, and incorporates a storage unit that will allow the production of 500 MW for short durations, with an anticipated online date in 2030. In PacifiCorp's 2023 CEP/IRP, the company announced two other nuclear power plants to be built in Utah, on the sites of soon-to-be-retired coal plants, both to be natrium plants producing 500 MW each. However, PacifiCorp communicated its intention to pull back on these two new plants in an IRP revision in mid-2024.

In Washington, small modular reactor (SMR) projects have also moved forward as Energy Northwest has partnered with X-energy to design a program of 12 small plants, each producing 80 MW. As of Q4 2024, Amazon Web Services agreed to partner on four advanced SMRs, generating 320 MW on the Columbia River, with the plants expected to enter service in the early 2030s. Once partnerships and funding are found for the other eight SMRs, 640 MW of nuclear power may come online in Washington.

It remains to be seen if next generation nuclear technology can lower the cost, safety, and political hurdles faced by traditional nuclear power.

5.6.4 Geothermal

PGE's 2024 RFI gained information on few geothermal projects developing inside Oregon. The projects utilize experimental technology and are expected to enter service in 2030-onward. The projects together will generate approximately 75 MW of continuous non-carbon-emitting power, a sizeable addition to Oregon's current geothermal operations, but a very small fraction of the total potential geothermal energy available in the State.

Future improvements in drilling technologies will result in reduced development time and costs. Developments in EGS stimulation technology and higher success rates will also reduce costs and development timelines.

5.6.5 Post-2030 wind/solar generation

PGE's 2024 RFI reflected a potential 6 GW of wind and solar projects at various stages of development, to come online between 2030-2034. Of these 6 GW, ~2,7 GW are being produced

in Oregon, primarily in the form of wind projects with varying degrees of feasibility. With another 3.1 GW in neighboring states, also mostly in the form of wind projects (although some 300 MW of Nevada stand-alone solar are also coming online).

5.6.6 Long-term hybrid resources

The 2024 PGE RFI produced information about future hybrid projects coming online in 2030 and after. According to the RFI, some 4 GW of hybrid projects are to come online between 2032-2034: 2.5 GW in Oregon, incorporating both wind and solar resources; and the other 1.5 GW in neighboring markets. In particular, 1 GW of solar + storage units coming online in Nevada, access to which could be improved through transmission expansions options discussed in **Chapter 4**.

5.6.7 Long-duration storage

Long Duration Energy Storage (LDES) is defined as any electricity storage with greater than six hours of duration. In early 2025, the U.S. Department of Energy's (DOE) Office of Electricity announced a Notice of Funding Opportunity for up to $8 million seeking to accelerate energy storage manufacturing through pre-production design innovations to ultimately scale this technology faster to meet the nation's growing energy storage needs.

Currently lithium-ion batteries are the most common storage options on the market, but other chemical storage options include flow batteries. Longer duration batteries may soon be more widely available.

Another potential technology for longer-duration storage relies on pumped air/iron-air storage, wherein energy expended in oxidation and de-oxidation constitutes a storage technology. Organized in large battery packs, this technology permits 100+ hours of storage in testing environments and is demonstrably cost-effective when compared to lithium-ion battery storage technology. Form Energy, a company founded in 2017, is pioneering this technology across the United States.[133] For example, Great River Energy, a Minnesota Utility, is working to develop a multiday iron air battery.

As more variable energy resources are expected to arrive on both the PGE system and the greater Western Interconnection, there may be increased opportunities to use storage to shift energy from oversupply hours to hours of greater need and value.

[133] https://formenergy.com/form-energy-secures-405m-in-series-f-financing-to-expand-iron-air-battery-business-and-operations/.

Chapter 6. Resource plan

This report updates PGE's comprehensive and robust 2023 CEP/IRP portfolio analysis. The analysis presented in this chapter incorporates updates to key inputs and advancements to PGE's modeling capabilities. The portfolio analysis in the 2023 CEP/IRP identified a Preferred Portfolio based on the insights gained from the evaluation of transmission need, GHG glidepaths, the role for additional EE and DERs, CBRE's, emerging technologies, and optimization assumptions. Portfolio analysis in this Update carries forward those insights where applicable, while updating key inputs and incorporating modeling advancements to determine a new Preferred Portfolio.

This portfolio analysis incorporates PGE's most recently available forecasts of energy and capacity needs and updated resource cost information. This analysis incorporates updated characterization of the state of the existing transmission system and a comprehensive set of options to increase transmission access through upgrades or expansion. PGE also incorporated modeling advancements to GHG emissions accounting, granularity of energy accounting, and CBI reporting.

The updated modeling inputs and methods were used to inform the creation of a new Preferred Portfolio, which is described in detail in **Section 6.2 Preferred Portfolio**. The Preferred Portfolio is analyzed from multiple angles to consider annual cost impacts, resource adequacy, hourly emissions reporting, and SSR compliance. Multiple sensitivities are conducted on the Preferred Portfolio, exploring key topics of interest regarding large industrial customer growth, resource adequacy planning assumptions, the availability of federal tax credits, and the availability of non-emitting market purchases for hourly emission accounting.

Key Highlights

- The updated Preferred Portfolio demonstrates a least-cost, least-risk approach to meeting resource adequacy needs while decarbonizing in accordance with HB 2021, including 1362 MW of wind, 1089 MW of solar, 1750 MW of storage, 83 MW of NCE EE and DERs, and 155 MW of community-based renewable energy (CBRE) resources by 2030.
- Hourly emissions analysis confirms the Preferred Portfolio can comply with HB 2021 emissions limits in 2030, with thermal generation concentrated in winter months when non-emitting energy is scarce.
- Resource adequacy testing reveals winter adequacy challenges requiring substantial storage resources, suggesting the need to identify different capacity resources better suited to meet ongoing winter capacity needs.

Developments Since 2023 IRP

The 2023 IRP Update incorporates significant methodology improvements including: monthly energy accounting (versus annual in 2023 IRP), updated resource cost information, comprehensive transmission upgrade options, enhanced GHG emissions

accounting, and greater CBI reporting granularity. An expansive set of portfolio sensitivities were developed to explore key planning questions that have increased in prominence since the filing of the 2023 CEP/IRP.

Strategic Implications

The analysis reveals the critical importance of transmission options for meeting system needs, with all seven transmission options being added between 2032-2038, unlocking 6927 MW of off-system renewables. Winter adequacy challenges are more precisely identified, showing short-duration storage has limited effectiveness in winter capacity needs (seven percent ELCC) compared to summer (53 percent ELCC), highlighting the need for alternative capacity resources with greater energy storage capability or on-demand production.

Staff Recommendations Incorporated

The Update directly addresses Order 24-096 directives through updates to portfolio analysis. PGE addresses Staff Recommendation #3 by conducting hourly production cost simulation of the Preferred Portfolio to separately track hourly purchases and sales. Resulting GHG emissions impacts better demonstrates HB 2021 compliance and reveals key planning insights while allowing PGE to revise GHG emissions forecasts accordingly and provide narrative explanations of key planning insights from this exercise. Additionally, Staff Recommendation #5 is addressed through the inclusion of an SSR compliance analysis, in which PGE's compliance position is identified and potential cost impacts of compliance are considered using a SSR proxy resource in portfolio analysis.

6.1 Portfolio analysis design and scoring

PGE evaluated portfolios using the capacity expansion model, ROSE-E, over a 20-year time horizon from 2025 through 2044. Portfolios must satisfy all the constraints described in the sections that follow throughout the analysis timeline using the addition of available resources at the minimum possible cost. Portfolios are analyzed across 351 future scenarios representing combinations of conditions for need, price, and technology costs.[134] Where not otherwise stated, inputs, assumptions and methods are consistent with those described in the 2023 CEP/IRP.[135]

6.1.1 GHG emissions

PGE enforces compliance with HB 2021 GHG emissions targets in ROSE-E for the Preferred Portfolio and all scenarios except the 'Reliability Needs Only' analysis. Emissions decline according to the linear GHG glidepath described in **Section 3.5.1 HB 2021**.

[134] [39 Price] x [3 Need] x [3 Technology Cost] = 351 Future Scenarios
[135] See Chapter 11 Portfolio Analysis of the 2023 CEP/IRP, available here: https://edocs.puc.state.or.us/efdocs/HTB/lc80htb8430.pdf

6.1.2 Energy need

In the 2023 CEP/IRP, PGE required portfolios to meet energy needs on an annual basis, ensuring portfolios had sufficient energy on average throughout each year. For the first time in this Update, portfolio analysis uses a more-detailed monthly energy accounting to establish energy need, ensuring that portfolio add sufficient resources to meet projected energy needs in every month of the planning horizon. PGE's annual and monthly energy-load resource balances are presented in **Section 3.3 Energy need**.

Monthly energy accounting allows the interactions between seasonal variation in PGE's load and existing portfolio, and the generation profiles of proxy resources to be accounted for in resource selection. These seasonal dynamics can influence the optimal quantity and mix of resources in the portfolio. By increasing the granularity of accounting of energy-load resource balance from annual to monthly, ROSE-E is able to make more-optimal resource selections.

To incorporate monthly variation in energy from dispatchable sources, the monthly allocation of GHG-emitting energy is determined within ROSE-E by co-optimizing it with the selection of new resource additions. ROSE-E receives the maximum annual generation by each emitting source as an input from PGE's Intermediary GHG model (IGHG) and allocates that energy across the months of each year in a manner that minimizes the costs of new resource additions.

6.1.3 Capacity need

PGE updated forecasted summer and winter capacity needs for this analysis and they are described in **Section 3.4 Capacity need**. Portfolios are constrained to meet PGE's resource adequacy requirements in summer and winter every year. Capacity needs must be met through the addition of new proxy resources, as determined by their estimated ELCC. Proxy resource ELCCs are described in **Section 5.1.6 Resource capacity contribution**.[136] As a backstop source of capacity when the capacity from available resources is not sufficient to meet need, the model has access to a perfect capacity-fill resource (100 percent ELCC in summer and winter) to meet needs on a year-to-year basis.

6.1.4 Resource availability

ROSE-E has access to a variety of resource types to meet energy and capacity needs. These resources include renewables, storage, CBREs, distributed energy resources (DERs), and energy efficiency (EE). The variety of proxy resource types available for selection in portfolio analysis are described in **Chapter 5 Resource options**. To account for the time required for procurement through a request for proposals (RFP) process, the earliest that traditional supply-side resources can be added to the portfolio is 2029. The timing and available quantity of off-system resources is also a function of transmission availability, as described in **Section 6.1.5.1 Transmission constraints**. There is also a 500 MW annual limit on the addition of batteries to smooth the

[136] The State RA Requirements scenario relies on different capacity needs and proxy resource capacity contributions.

cadence of resource additions and prevent the model from relying on very large additions of storage in certain years.

CBREs and non-cost-effective (NCE) DERs and EE are available for selection beginning in 2026. Quantities available for selection of NCE demand response and energy efficiency have been updated for the Update and are described in **Section 5.2.3 Non-cost-effective demand response** and **Section 5.3.2 Non-cost-effective energy efficiency**. The quantity of CBRE's available for selection is unchanged from the 2023 CEP/IRP.[137] Prior to 2029, energy and capacity-fill resources are also available on an annual basis to allow the model to meet PGE's energy and capacity needs until sufficient quantities of supply-side resources become available for addition to the portfolio.

6.1.5 Transmission constraints and options

Assumptions about transmission represent one of the most impactful determinants of resource availability in portfolio analysis. These elements were incorporated into PGE's portfolio analysis for the first time in the 2023 CEP/IRP. This Update includes updated assumptions regarding constraints on the existing transmission system and the options to increase transmission capacity through upgrades and expansion. Off-system renewable resources must have associated transmission to be added to PGE's portfolio in ROSE-E. Transmission capacity can come from either estimated available regional transmission capacity (described in **Section 6.1.5.1 Transmission constraints**), or investment in additional transmission options (described in **Section 6.1.5.2 Transmission options**).

6.1.5.1 Transmission constraints

PGE's estimates of existing regional transmission availability are described in **Section 4.4 Assessment of available BPA point-to-point transmission**. Prior to 2032, when the first transmission option becomes available, the total quantity of off-system renewables available to be added to PGE's portfolio is limited to 2451 MW based on the quantity of available regional transmission capacity.

6.1.5.2 Transmission options

As part of a holistic transmission study for the Update, PGE has developed an updated set of options for transmission upgrades and expansion. The updated and expanded set of options includes three transmission upgrade options and four transmission expansion options. The quantity, timing, cost, and type of resource accessed are described in detail in **Section 4.6 Transmission options for portfolio analysis**. Both transmission upgrades and expansion increase the quantity of resources available for selection in ROSE-E. In portfolio analysis the two types of transmission actions allow access to additional resources in different ways. Transmission upgrades increase the capacity of PNW renewable resources that PGE can access across the

[137] See Chapter 7 of the 2023 CEP/IRP. Available here: https://edocs.puc.state.or.us/efdocs/HTB/lc80htb8430.pdf. PGE plans to update information about the cost and availability of CBRE resources for the 2026 CEP/IRP, leveraging information gained through the CBRE RFO described in **Section 7.1.2 CBRE action**.

regional transmission system. Transmission expansion options allow access to renewable resources and capacity markets outside of the PNW. Resources accessed through either transmission upgrades or expansion incur the cost of both the resource itself and the transmission required to deliver the energy to PGE's system.

6.1.6 Portfolio scoring

Portfolios are evaluated based on the traditional scoring metrics described in **Table 27** and the portfolio community benefits indicator (pCBI) metrics described in **Table 28**. The traditional scoring metrics for cost, variability and severity are the same that were used in the 2023 CEP/IRP and continue to provide valuable insights that ensure the Preferred Portfolio and Action Plan represent the best combination of cost and risks.

Table 27. Traditional portfolio scoring metrics

Metric	Description	Units
Cost	Net present value of revenue requirement (NPVRR), calculated for each of the 351 future scenarios for the analysis timeline (2025-2044). IRP costs consist of only those associated with existing and incremental generating resources (including associated transmission costs) and do not include other PGE costs (e.g. administrative costs, wildfire costs, etc.).	Million 2025$
Variability	Semi-deviation of NPVRR across all futures, relative to the Reference Case. This metric captures the potential variation in cost outcomes across futures, considering only futures in which NPVRR exceeds the Reference Case. Portfolios with low variability scores tend to provide more cost certainty and lessen the customer's impacts of higher-than-expected cost conditions.	Million 2025$
Severity	The tail value at risk (TailVAR) at the 90th percentile of the NPVRR across futures. This metric measures the potential magnitude of very high-cost outcomes across all futures. Portfolios with low severity scores tend to have less costly worst-case scenarios for customer cost impacts.	Million 2025$

The pCBI scoring metrics represent a substantially more thorough and detailed approach to measuring the level of community benefits provided by each portfolio than has been used in the past. pCBIs are unitless indicators that accrue for each MW of eligible resource that is added in a portfolio. A detailed description of the pCBI development, including a mapping of which proxy resources generate each of the pCBIs, is provided in **Section 5.5 Community benefits indicators (CBIs)**. Scoring outcomes for pCBIs of each portfolio analyzed are described in **Section 6.5 Portfolio CBIs.**

Table 28. Portfolio Community benefits indicator (pCBI) metrics

Metric	Description
pCBI 1 Economic Impacts	Economic development, increased access to jobs, economic well-being, increased productivity
pCBI 2 Energy Equity	Improved awareness and access to clean energy programs by environmental justice and tribal communities; increased affordability; increased efficiency of housing stock; reduced arrearages and disconnections
pCBI 3 Health and Community Wellbeing	Increased comfort; improved public health outcomes, particularly for environmental justice communities; reduced local emissions; improved home health and safety (including indoor air quality)
pCBI 4 Resilience / Reliability	Improved grid resiliency; increased resilience/reliability in environmental justice communities, including reduced recovery time and frequency of outages
pCBI 5 Environmental Impacts	Reduced air emissions, including CO_2 and criteria pollutants

6.2 Preferred Portfolio

PGE's updated Preferred Portfolio demonstrates the least-cost, least-risk, set of resources needed to meet resource adequacy needs while decarbonizing in accordance with HB 2021 through the year 2044. **Table 29** shows the optimized resource additions made in ROSE-E as well as cost-effective quantities of EE and DERs and the 2023 RFP proxy, through the year 2030. The supply-side energy and capacity resources added in ROSE-E represent generalizations of resources that may become available for acquisition through an RFP process in which actual projects will be compared on the basis of project-specific costs and benefits. Near-term non-emitting and capacity contracts represent opportunities that PGE could pursue through bilateral contract negotiations.

Optimized resource additions through 2030 include 1362 MW of wind, 1089 MW of solar, 1750 MW of storage, 83 MW of NCE EE and DERs, and 155 MW of CBREs. The 2030 resource mix also includes 190 MW of non-emitting contracts. This 4629 MW of incremental resource additions made through 2030 represents a 16 percent increase compared to the 3984 MW of resource additions in the final 2023 IRP Preferred Portfolio.[138] The bulk of the increase in 2030 resource additions is comprised of storage, which has roughly doubled compared to the 869 MW (including hybrid storage) in the 2023 CEP/IRP final Preferred Portfolio. The increase in storage additions is largely driven by a decrease in PGE's calculated capacity contribution of those resources. As described in **Section 5.1.7 Comparison of resource capacity contribution to**

[138] The final Preferred Portfolio from the 2023 CEP/IRP was published in PGE's response to Staff Round 2 Comments. Updated resource need reporting conventions introduce some complexities when comparing current projections of resource need to past disclosures. The comparison made here uses the updated convention of identifying hybrid storage separately for the calculation of total resource need for both portfolios. PGE's response to Staff Round 2 Comments is available here: https://edocs.puc.state.or.us/efdocs/HAC/lc80hac154444.pdf

2023 CEP/IRP, the ELCC of the 4-hr battery proxy resource has decreased by 33 percent in summer and 50 percent in winter compared to the 2023 CEP/IRP.

The selection of 68 MWa of NCE EE in optimized portfolio construction highlights the potential for accelerated procurement of EE to lower portfolio costs in a transmission-constrained planning environment over the long-term. However, as discussed in Section 11.4 of the 2023 CEP/IRP, including additional quantities of EE in the portfolio has the potential to create near-term customer cost impacts because of unique policy factors associated with these resources. Unlike other assets, additional EE is not financed or securitized, which can increase near-term cost impacts relative to other resource options. As discussed in **Section 5.3.5 Energy efficiency program and policy**, PGE is committed to working with Energy Trust of Oregon on multiple potential avenues to address the cost and implementation challenges associated with accelerated procurement of EE.

Notably, this first year of transmission availability in 2032 is five years later than the 2027 date of first-available transmission option in the 2023 CEP/IRP. The reliance on some non-emitting contracts through 2031 highlights the impact of transmission constraints on off-system resource additions prior to the first opportunity for transmission upgrades in 2032.

Table 29. Cumulative resource buildout of the Preferred Portfolio 2026-2030 (MW)

Resource	2026	2027	2028	2029	2030
Wind	0	0	0	1362	1362
Solar (including hybrids)	0	0	0	1089	1089
Storage (including hybrids)	0	0	0	1250	1750
CBREs	66	85	110	133	155
NCE EE (MWa)	0	21	38	58	68
NCE DERs	3	8	12	13	15
Transmission	0	0	0	0	0
Non-Emitting Contracts*	16	422	120	33	190
Cost-effective EE (MWa)	104	138	173	208	245
Cost-effective DR	142	172	199	225	248
2023 RFP Proxy Solar (including hybrids)	0	0	375	375	375
2023 RFP Proxy Storage (including hybrids)	0	0	775	775	775

*** Values for contracts are annual, not cumulative.**

Post-2030 results show that all seven transmission options are added to the portfolio between 2032 and 2038, unlocking access to the energy and capacity of 6927 MW of off-system

renewables (**Table 30**).[139] The addition of all 6927 MW of transmission options illustrates the importance of evaluating and consider taking action on transmission opportunities, both through upgrades and partnering-on or investing-in proposed transmission expansion projects, in order to access off-system renewables and energy markets. This aspect of the Preferred Portfolio differs substantially from the content of the 2023 CEP/IRP Preferred Portfolio, which included only 1200 MW of available transmission options (all of which were added in the Preferred Portfolio) and instead relied heavily on generic capacity and renewable resources post-2030. The comprehensive and detailed list of most-appropriate transmission options potentially available to PGE, modeled in this Update provides a substantially more well-defined look at the mix of resources that may become available to meet energy and capacity needs in the 2030's and beyond. In contrast to the generic transmission options used in the 2023 CEP/IRP, the transmission options added to this Preferred Portfolio represent specific opportunities (modeled with somewhat generalized resource cost characteristics). The transmission options, identified with the help of consultant Energy Strategies, are described in detail in **Section 4.6 Transmission options for portfolio analysis**.

Table 30. Cumulative resource buildout of the Preferred Portfolio 2031-2038 (MW)

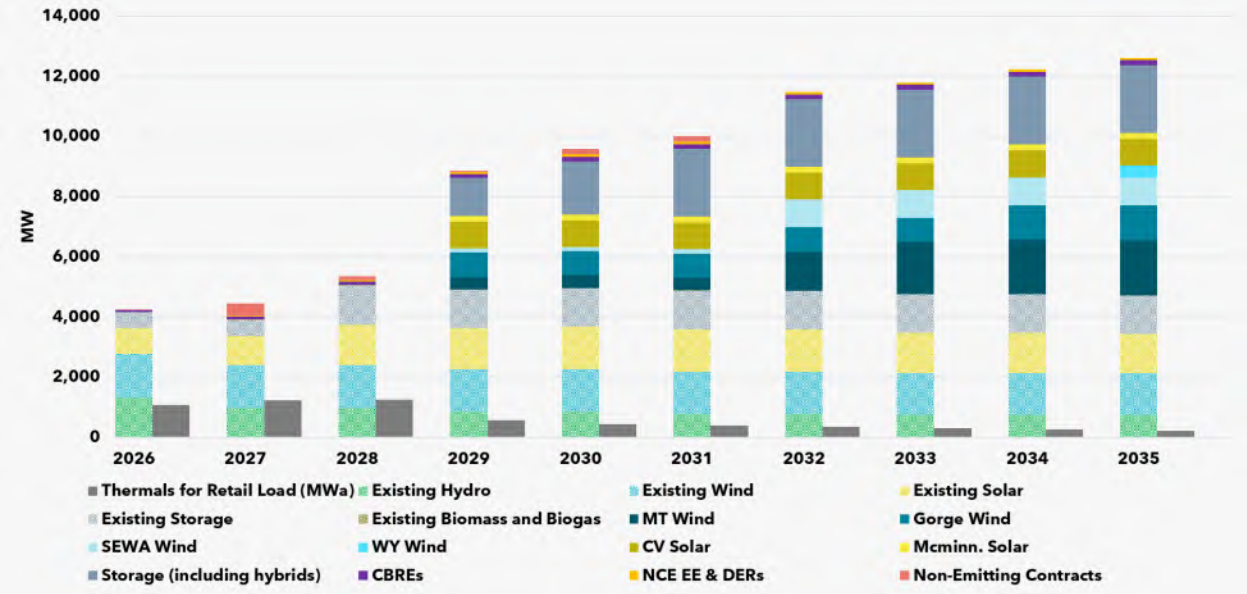
Resource	2031	2032	2033	2034	2035	2036	2037	2038
Wind	1362	3029	3460	3897	4319	4821	5467	5996
Solar (including hybrids)	1089	1089	1089	1089	1089	1089	1089	1089
Storage (including hybrids)	2250	2250	2250	2250	2250	2750	3250	3750
CBREs	155	155	155	155	155	155	155	155
NCE EE (MWa)	68	68	68	68	68	68	68	68
NCE DERs	16	16	16	16	16	16	16	16
Transmission	0	3000	3000	3000	5227	5227	5227	6927
Non-Emitting Contracts*	187	0	0	0	0	0	0	0
Cost-effective EE (MWa)	281	317	352	384	415	446	478	510
Cost-effective DR	266	284	299	312	325	336	348	356
2023 RFP Proxy Solar (including hybrids)	375	375	375	375	375	375	375	375
2023 RFP Proxy Storage (including hybrids)	775	775	775	775	775	775	775	775

*** Values for contracts are annual, not cumulative.**

[139] Some of the transmission options also provide additional capacity through access to diverse energy markets. In the 2023 CEP/IRP final Preferred Portfolio, transmission options did not provide additional capacity associated with diverse market access.

The cumulative addition of the Preferred Portfolio's incremental resources to PGE's existing resource portfolio are shown in **Figure 57**. The quantity of energy retained from existing emitting sources, in average Megawatts (MWa), can be seen to decline through time in accordance with the GHG glidepath that leads to compliance with HB 2021 emissions targets in 2030 and beyond. Incremental resource additions experience a large jump in 2029 when the first supply-side resources become available and another smaller jump in 2032, when the Bethel-Round Butte transmission upgrade unlocks access to 3000 MW of additional off-system renewable resources. The quantity of resources in PGE's existing portfolio varies through time, increasing in 2028 with the addition of 2023 RFP Proxy resources, and declining at various points in time as certain contracts expire. By 2030, the 4629 MW of incremental resource additions in the Preferred Portfolio are nearly equal to the nearly 5 GW of non-emitting resources already expected in PGE's existing portfolio at that time.

Figure 57. Preferred Portfolio Resource Additions (MW)[140]

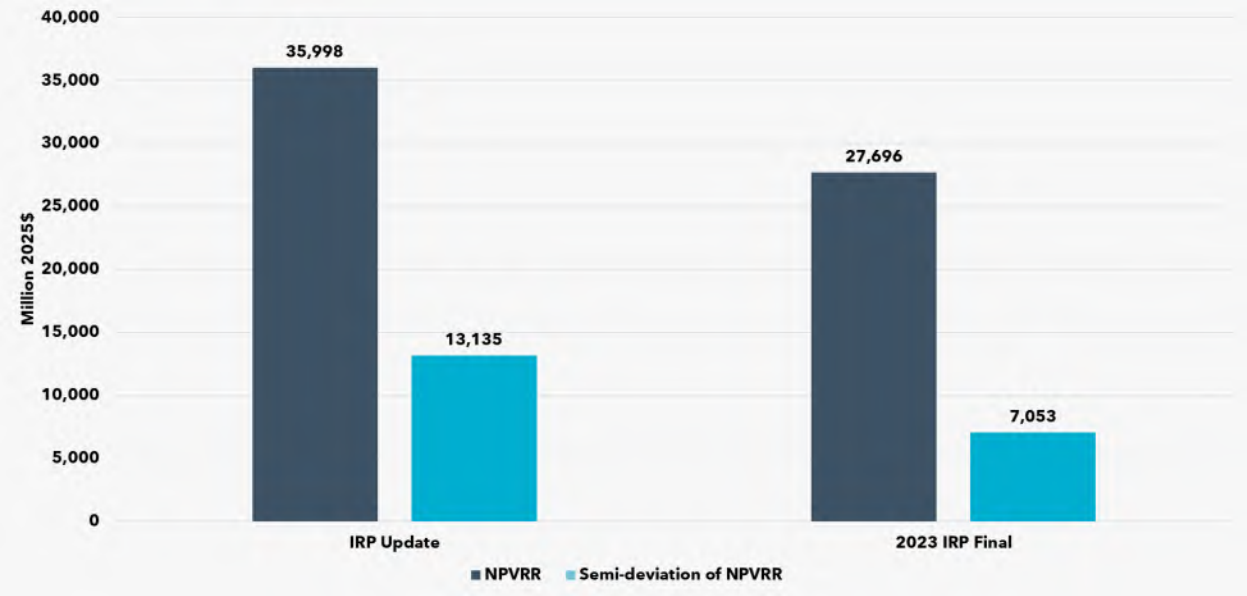


Costs of the updated Preferred Portfolio are larger than those of the final Preferred Portfolio from the 2023 CEP/IRP.[141] Across the full 20-year planning horizon the updated Preferred Portfolio has an NPVRR of $35,998 million, which is a $8,302 million increase from the $27,696 million NPVRR of the final 2023 CEP/IRP Preferred Portfolio (**Figure 58**).[142] The increase in portfolio cost is driven by a combination of increased quantity of resource additions and increased $/kW-yr resource costs projections for some types of supply-side resources, as described in **Section 5.1.2 Supply-side resource costs**. These drivers of increased cost outweigh the cost-reducing impacts of having a more well-defined set of transmission options that have reduced reliance on the expensive generic capacity and VER resources that were relied on heavily in the post-2030

[140] Existing resource quantities include 2023 RFP Proxy.
[141] The final Preferred Portfolio from the 2023 CEP/IRP was published in PGE's response to Staff Round 2 Comments. Available here: https://edocs.puc.state.or.us/efdocs/HAC/lc80hac154444.pdf
[142] Portfolio costs in the 2023 CEP/IRP were reported in 2023 $'s and have been adjusted to 2025 $'s for this comparison.

resource buildout of the 2023 CEP/IRP Preferred Portfolio. Additional detail on the annual costs of the Preferred Portfolio is provided in **Section 6.2.1 Yearly cost estimates**.

Figure 58. Cost and Risk Metrics of the Preferred Portfolio (MW)



6.2.1 Yearly cost estimates

The purpose of this section is to show yearly cost estimates of proxy new resource additions in the Preferred Portfolio under a set of utility ownership and tax credit assumptions. This section provides updated results compared to those presented in Section 11.3 of the 2023 CEP/IRP. The Preferred Portfolio was run through a version of the Annual Revenue-requirement Tool (ART) that contains updated input data. The ART uses reference load presented in **Chapter 3 System needs** and existing and incremental proxy resource costs described in **Chapter 5 Resource options**.

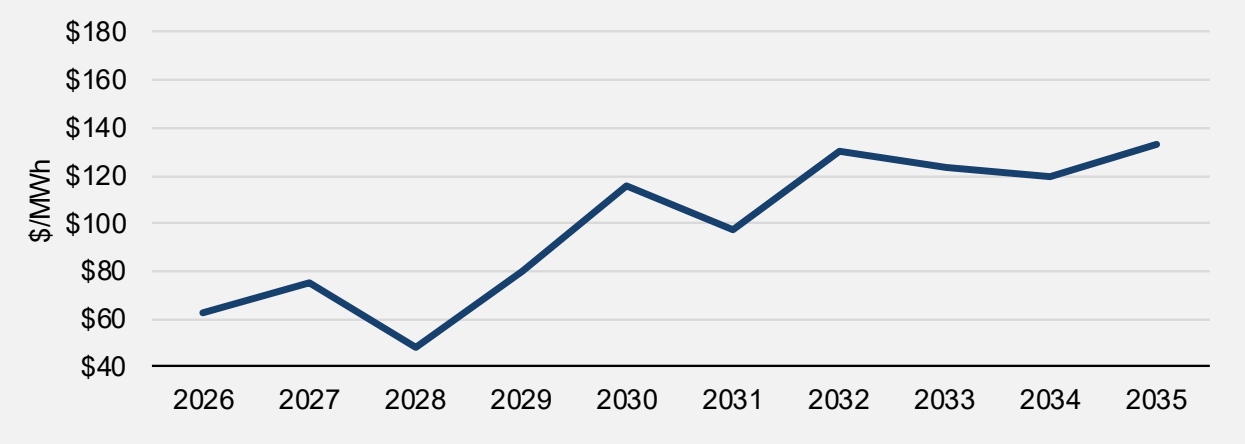
The model incorporates the impact of market sales on an annual basis and can evaluate different combinations of ownership structures and tax incentives for each portfolio.[143] Market purchases and thermal sales are calculated on an annual basis within the Intermediary GHG (IGHG) model and imported to ART. Further, ART only focuses on existing and new generating resources, including associated estimated transmission expansion costs. Estimates do not include costs from the rest of PGE, such as those associated with administrative costs, grid modernization, other transmission and distribution maintenance and upgrades, wildfire mitigation or actual generation costs. Caution is warranted in interpreting these estimates, as these values reflect a change in forecasted annual costs of real and proxy generating assets that only represent a subset of PGE's total annual cost. Accordingly, these yearly price impacts do not represent actual customer price impacts (expressed either as total or a percent) as they only focus on planned generation and transmission expansion cost changes and do not incorporate any other cost

[143] Modeling assumption of the ownership structures do not impact or reflect future procurement approaches nor prejudge outcomes of future procurement processes.

changes across PGE. Additionally, the cost impact uncertainty due to ongoing policy discussions regarding cost allocation to large industrial customers and the resulting unequal and evolving distribution of costs between customers classes is another factor making the results presented here not reflective of actual customer rate impacts. This topic is explored in more detail in through the sensitivity analysis presented in **Section 6.3.3 Large industrial customer growth**.

The price impacts can still be indicative for evaluating options to decarbonize reliably. Through an extensive analysis of resource additions amongst a variety of portfolios, PGE finds that while the incremental resource additions included in these estimates represent the least cost and risk manner to meet the emissions targets established in HB 2021, they are anticipated to raise the costs associated with generation resources relative to today. These Reference Case price changes are shown in **Figure 59** and include a 50 percent ownership assumption and full ITC/PTC tax credits available for relevant resources. This $/MWh annual price represents the modeled cost estimates divided by total PGE load described in **Section 3.1.1 Energy forecast**. Incremental resource additions, including the expansion of the existing transmission system, continue to increase the costs of generation resources through 2035 and beyond. While this analysis does not represent actual changes to customer prices, it is suggestive that, on a planning basis, system costs are likely to increase to comply with HB 2021.

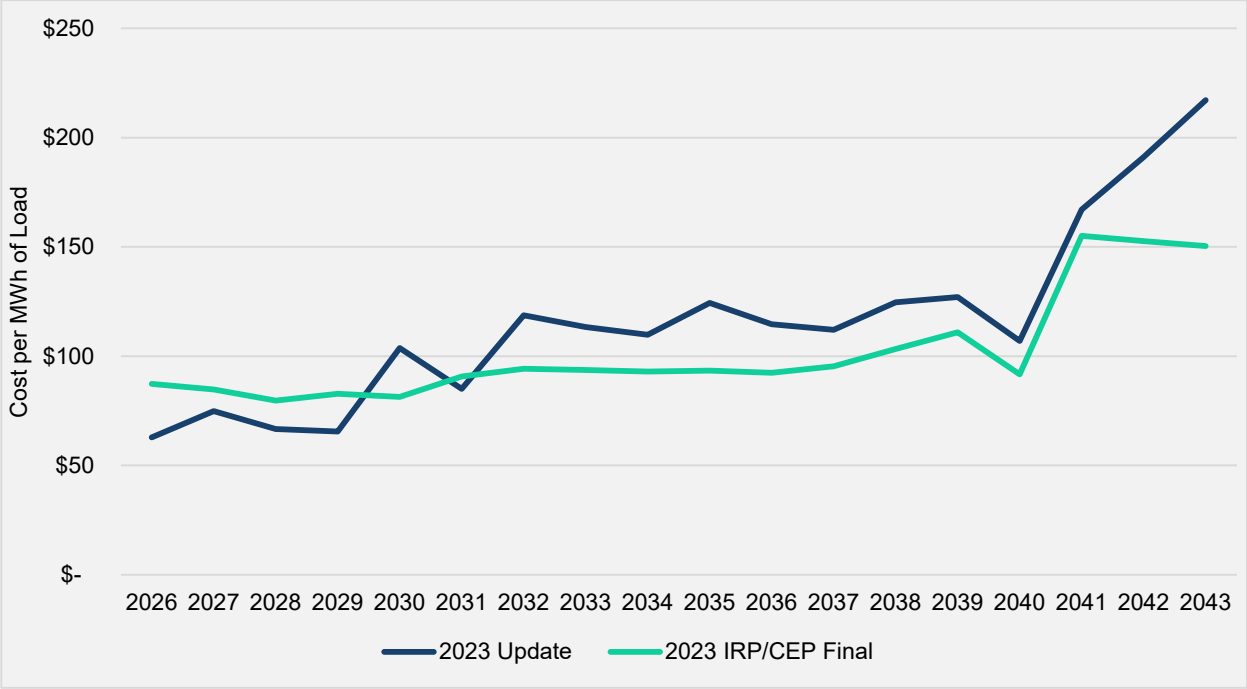
Figure 59. Reference Yearly Price Impacts ($/MWh) of the Preferred Portfolio



As discussed in previous chapters, the 2023 RFP procurement results are not yet final, but based on ongoing negotiations, no new non-emitting resources identified through this RFP can be contracted prior to a January 1, 2028 COD. Incremental resource additions (and associated costs) prior to 2029 are for CBREs and DERs. After this time, the models add much more non-emitting resources to reduce thermal generation serving retail load in order to meet HB 2021 compliance as well as maintain resource adequacy. The yearly cost forecast supports the finding described above and previously in the 2023 CEP/IRP that GHG emission reductions lead to cost increases. **Figure 60** compares the updated yearly price estimates to those presented for the Preferred Portfolio in the 2023 CEP/IRP updated for the final Preferred Portfolio. Total costs are a bit higher in the Update after 2035 and the updated retail load forecast is higher, allowing costs to be spread across more MWhs. In the updated analysis, PGE has replaced generic capacity and energy resources with actual modeled resources which are more cost effective than the generic

capacity and energy resources. These were unavailable in the 2023 IRP due to transmission limitations. While these transmission expansion options have costs associated with them, they are significantly cheaper than the generic capacity and energy resources. The overall increase in costs is due to increased resource additions and increased costs with some resource types.

Figure 60. Comparison of Reference Yearly Price Impacts ($/MWh)



Given the constraints in the planning environment associated with HB 2021 decarbonization goals, load growth, and transmission availability, the need for resource procurement identified in this Update continues to be large and is estimated to result in substantial cost impacts. Included in load growth expectations are significant increases in large new loads which account for between 30 percent to 80 percent of load growth forecast in any given year, averaging 47 percent over the 20-year period. These new large loads significantly increase PGE's need to acquire new resources, increasing total load by about 20 percent by 2044. PGE constructed a Preferred Portfolio that minimizes the costs and risk of new resource acquisitions and maximizes the provision of community benefits by thoroughly investigating key decision points with the potential to impact costs. This includes the selected GHG emissions-reduction pathway described in **Section 3.5.1 HB 2021** that complies with HB 2021 requirements while mitigating costs relative to more aggressive pathways and reducing risks compared to less aggressive pathways. Mitigating the impact of cost increases is critical and PGE will continue to study options that can help minimize costs for customers, including maximizing acquisition of cost-effective energy efficiency, continuing to explore the potential of emerging technologies as they develop and studying options to expand transmission access to cost-effective non-emitting resources.

6.2.2 Hourly energy and emissions accounting results

This section expands upon Chapter 5 of the 2023 CEP/IRP to reflect the hourly energy accounting and resulting GHG emissions impacts of the Preferred Portfolio. In the 2023 CEP/IRP, PGE demonstrated compliance with HB 2021 using annualized estimates of emissions of thermal generation and unspecified market purchases under a variety of GHG reduction glidepaths. In the December 14, 2023, Public Utility Commission of Oregon Staff report on docket LC 80, Staff identified that PGE's annual GHG emissions approximations neglected important aspects of system operations that may impact the Company's annual GHG emissions accounting. Staff highlighted the need for an hourly dispatch analysis to confirm PGE's GHG emissions projections and demonstrate its ability to comply with HB 2021. In Order 24-096, the OPUC directed PGE to resubmit a revised plan with its CEP/IRP Update in 2025 consistent with Staff Recommendation 3, stating that:

- PGE shall conduct hourly production cost simulation of its Preferred Portfolio under the reference case in a manner that separately tracks hourly purchases and hourly sales.
- PGE will use this analysis to revise its GHG emissions forecast to revise its submission to the DEQ.
- PGE shall update the Preferred Portfolio accordingly and provide a narrative explanation of the key planning insights derived from this exercise.[144]

In this Update, PGE addresses the requirements outlined above using a modified version of its PGE-Zone Model (PZM) to simulate hourly energy and emissions positions. This model is referred to as the Modified PGE-Zone Model (mPZM). The mPZM performs hourly production simulations under Reference case conditions in a manner that tracks hourly resource operation, market purchases, and market sales based upon supply and demand conditions.

The mPZM uses outputs from the PZM, the Brattle Clean Energy Surplus Model (CESM), Intermediate GHG Model (IGHG), and the Preferred Portfolio from ROSE-E portfolio development as inputs. Hourly and annual constraints are added to prevent emitting generation and unspecified market purchases from exceeding quantities specified by HB 2021 emissions limits. Additional details of how PGE applies the hourly energy and emissions accounting methodology are set forth in **Appendix D Hourly emissions methodology**. The results of this simulation indicate that, based upon forecasted market conditions, PGE's Preferred Portfolio can comply with HB 2021 emissions limits in 2030.

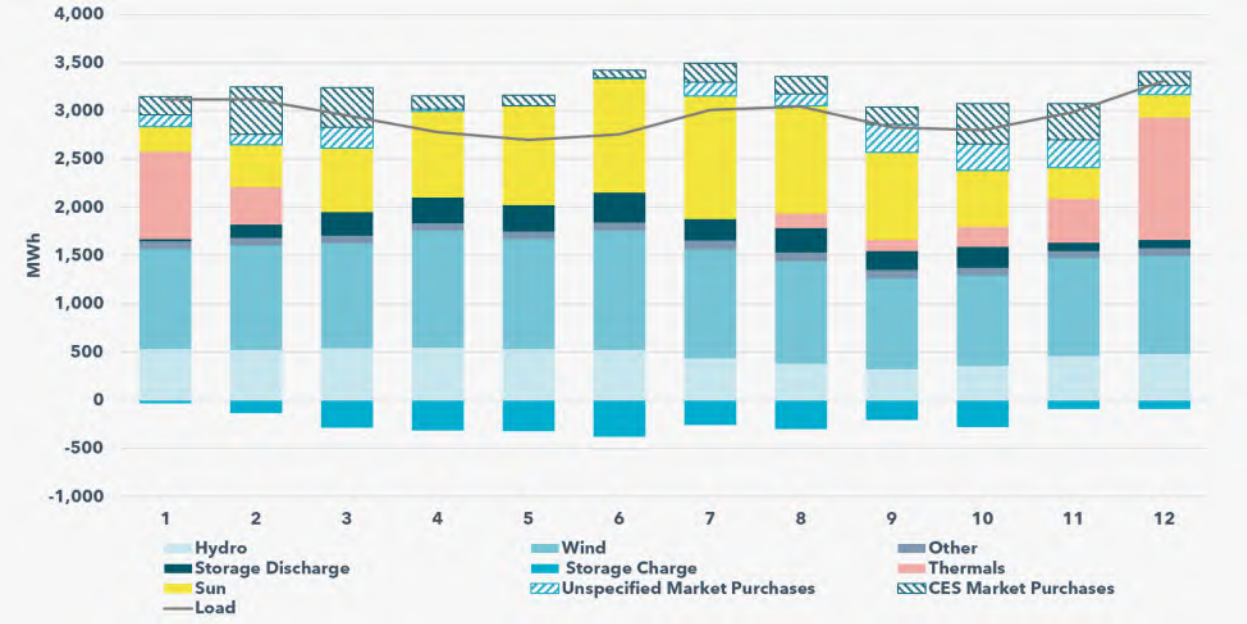
The following sections provide the results of this hourly mPZM analysis. First, a summary of monthly results demonstrates how emissions compliance is achieved; next, assumptions regarding market availability are detailed; generation from thermal resources are summarized; finally, example weeks in June and December provide greater detail on model results.

[144] https://apps.puc.state.or.us/orders/2024ords/24-096.pdf

6.2.2.1 Summary of results

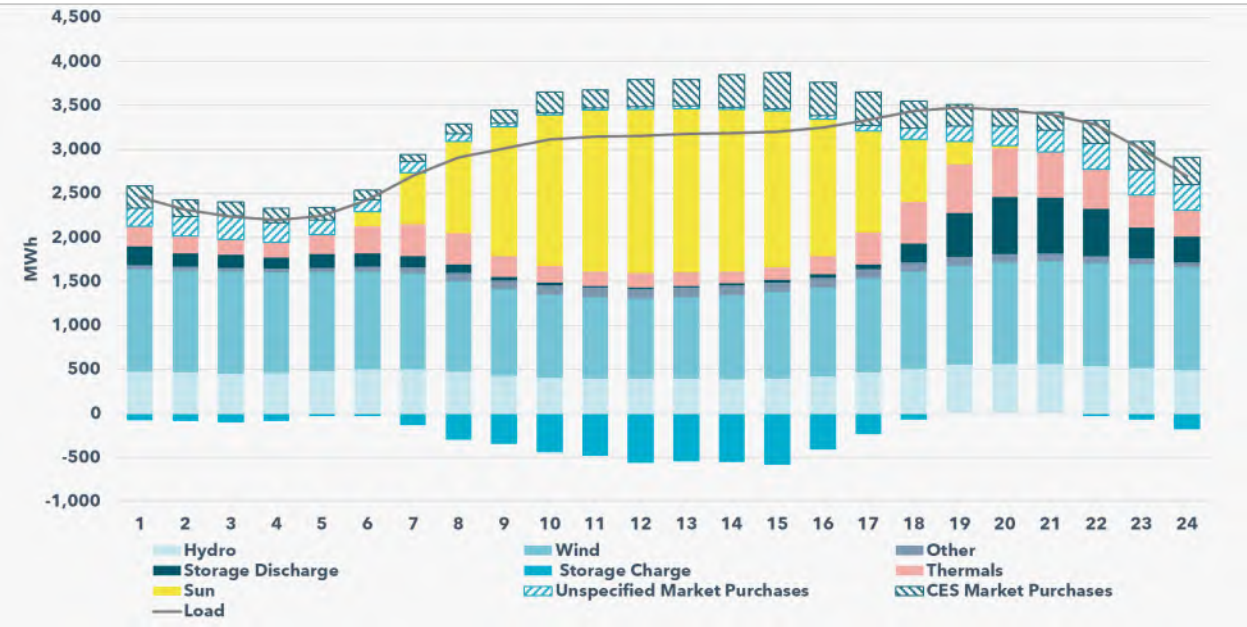
Figure 61 demonstrates the composition of supply used to meet demand for each month in 2030. Thermal generation is concentrated in the winter when non-emitting energy is scarce. Storage charging and discharging occurs in the spring, when storage opportunities to levelize net demand across the day is most present. Market purchases from non-emitting sources (clean energy surplus or "CES") are concentrated in the shoulder months across hours when the premium for such energy relative to the unspecified market (premium for clean energy or "PFC") is low. Unspecified market purchases are largley allocated outside of the spring months.

Figure 61. Monthly Modified PZM results show the simulated generation (MWh) by resource type across 2030



The composition of supply used to meet demand for the average day in 2030 is demonstrated in **Figure 62**. Thermal generation and storage discharge are concentrated over the peaks of the day. Storage charging occurs primarily during midday solar hours. Clean energy surplus market purchases are more frequent midday, during solar hours, as well, and unspecifed market purchases occur most frequently over the evening and early morning periods.

Figure 62. Hourly Modified PZM results show the simulated MWh by resource type across an average day in 2030



6.2.2.1 Assumptions of market availability

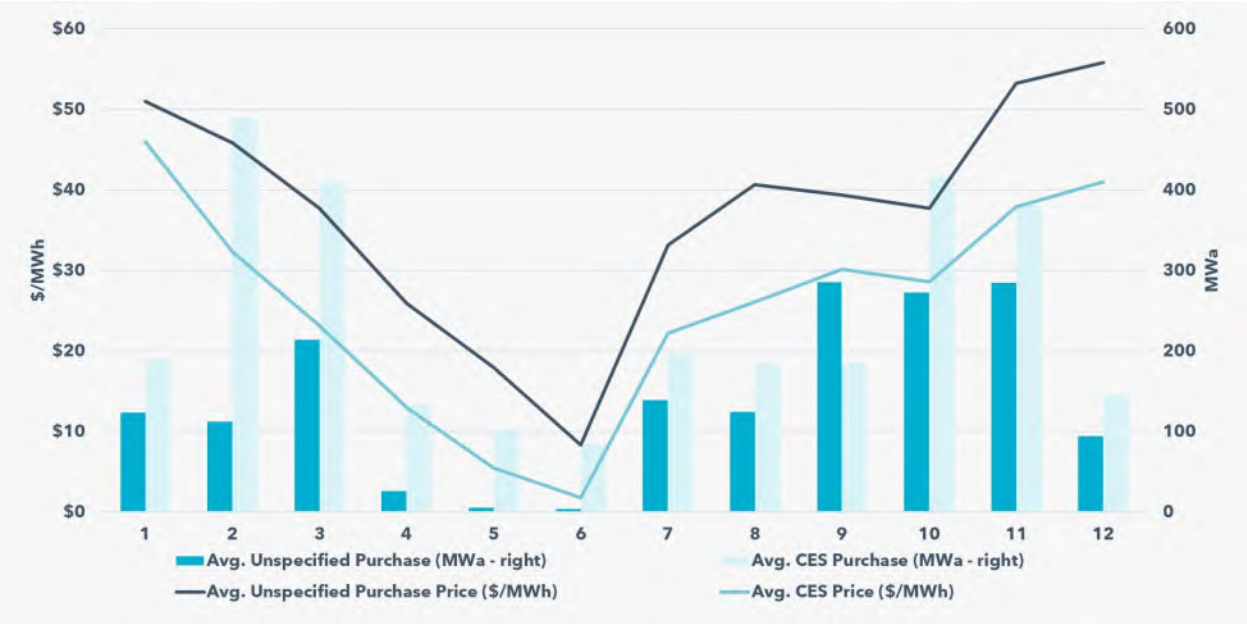
These simulations assume that when PGE's hourly position is long generation (supply exceeds retail demand), the excess generation contributes towards market sales. The thermal output dispatched by the Modified PZM optimization demonstrates the portion of thermal generation dedicated to serve retail load. Any additional wholesale sales of thermal generation will not be represented in the Modified PZM output. Any additional wholesale sales in the Modified PZM are a function of excess non-thermal resources such as periods of ample wind and solar generation and/or the presence of hydro must-run conditions. The periods in which the simulation results in PGE selling into the market are generally April–July. The timing of these long positions tends to align with periods of clean energy surplus across the WECC as the premium for clean energy is near zero during hours of most sales. This is demonstrated in **Figure 63** where the columns depict the average market sales volume (MWa) by month. The average realized price (the market price plus the premium for clean energy) is represented by the dark blue line, and the average premium for clean energy is shown as the red line. Given that non-emitting generation is greatest in the spring, as shown above, PGE market sales also tend to occur predominantly in the spring.

Figure 63. Average Hourly Revenue on Market Sales by Month



Figure 64 shows the timing of both unspecified and clean energy surplus market purchases in the mPZM simulation; the price of clean energy surplus market purchases includes the additional premium for clean energy. The methodology first assigns unspecified market purchases to hours with the highest premium, up to the portion of PGE's 2030 emission budget allocated to unspecified market purchases by the IGHG model. Clean energy surplus market purchases then fill remaining hours of need based on the quantity and timing of availability detailed in the Brattle report provided in **Appendix F Market for non-emitting energy**. Total market purchases average 382 MWa for the year, with 141 MWa allocated to unspecified purchases and 241 MWa allocated to CES purchases. Please see PGE's discussion of market developments in **Section 2.2.1 CAISO's Extended Day Ahead Market**.

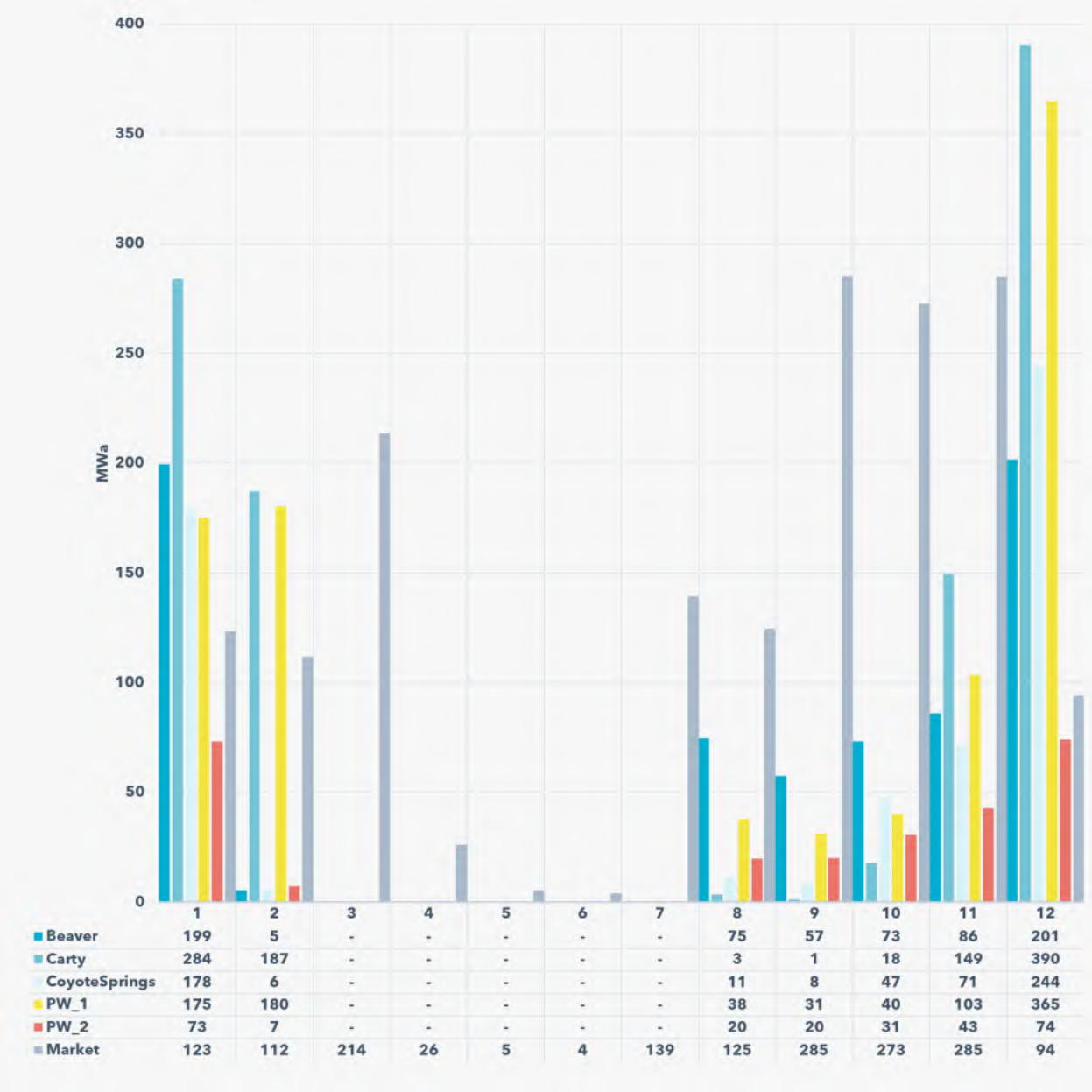
Figure 64. Timing of both unspecified and CES market purchases in the mPZM simulation



6.2.2.1 Thermal generation

Thermal generation allocated to serve PGE retail load is capped at the annual generation levels determined in the IGHG model. The mPZM optimizes emitting resource generation allocated to the retail portfolio across 2030 up to the IGHG limits. **Figure 65** shows the timing of emitting generation by month for the 2030 simulation.

Figure 65. Monthly generation (MWa) by emission source across 2030 forecast

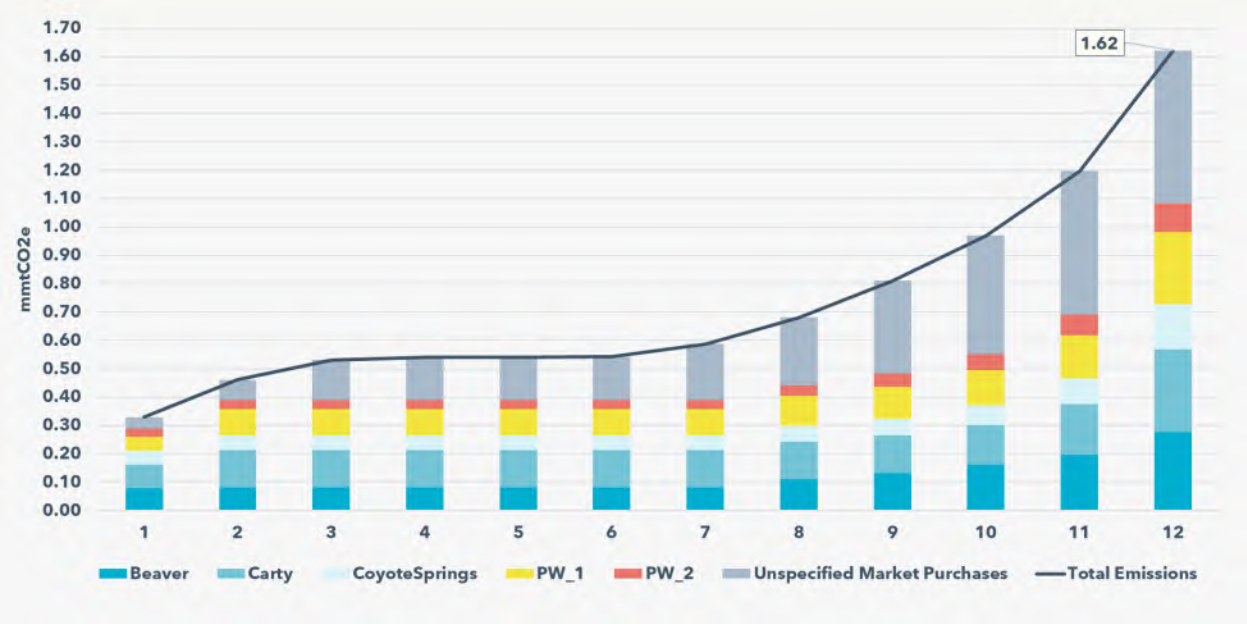


	1	2	3	4	5	6	7	8	9	10	11	12
Beaver	199	5	-	-	-	-	-	75	57	73	86	201
Carty	284	187	-	-	-	-	-	3	1	18	149	390
CoyoteSprings	178	6	-	-	-	-	-	11	8	47	71	244
PW_1	175	180	-	-	-	-	-	38	31	40	103	365
PW_2	73	7	-	-	-	-	-	20	20	31	43	74
Market	123	112	214	26	5	4	139	125	285	273	285	94

Since thermal generation and unspecified market purchases are capped, the emissions associated with serving retail load are designed to meet the HB 2021 emission limit of 1.62 million metric tons of CO_2 ($mmtCO_2e$). The timing of emissions is concentrated most heavily in the winter months as shown **Figure 66**. Approximately 60 percent of all simulated emissions occur in January, November, and December. This summary shows how PGE could use its emitting resources in a planning context, given the Preferred Portfolio and market assumptions detailed above, to meet portfolio needs within the 2030 emission targets. While the Update's simulation thermal operations in 2030 identifies how thermal output can be forecasted, PGE recognizes that many operational considerations and market complexities are challenging to

fully incorporate into planning. These differences prevent precise estimates of future operating conditions.

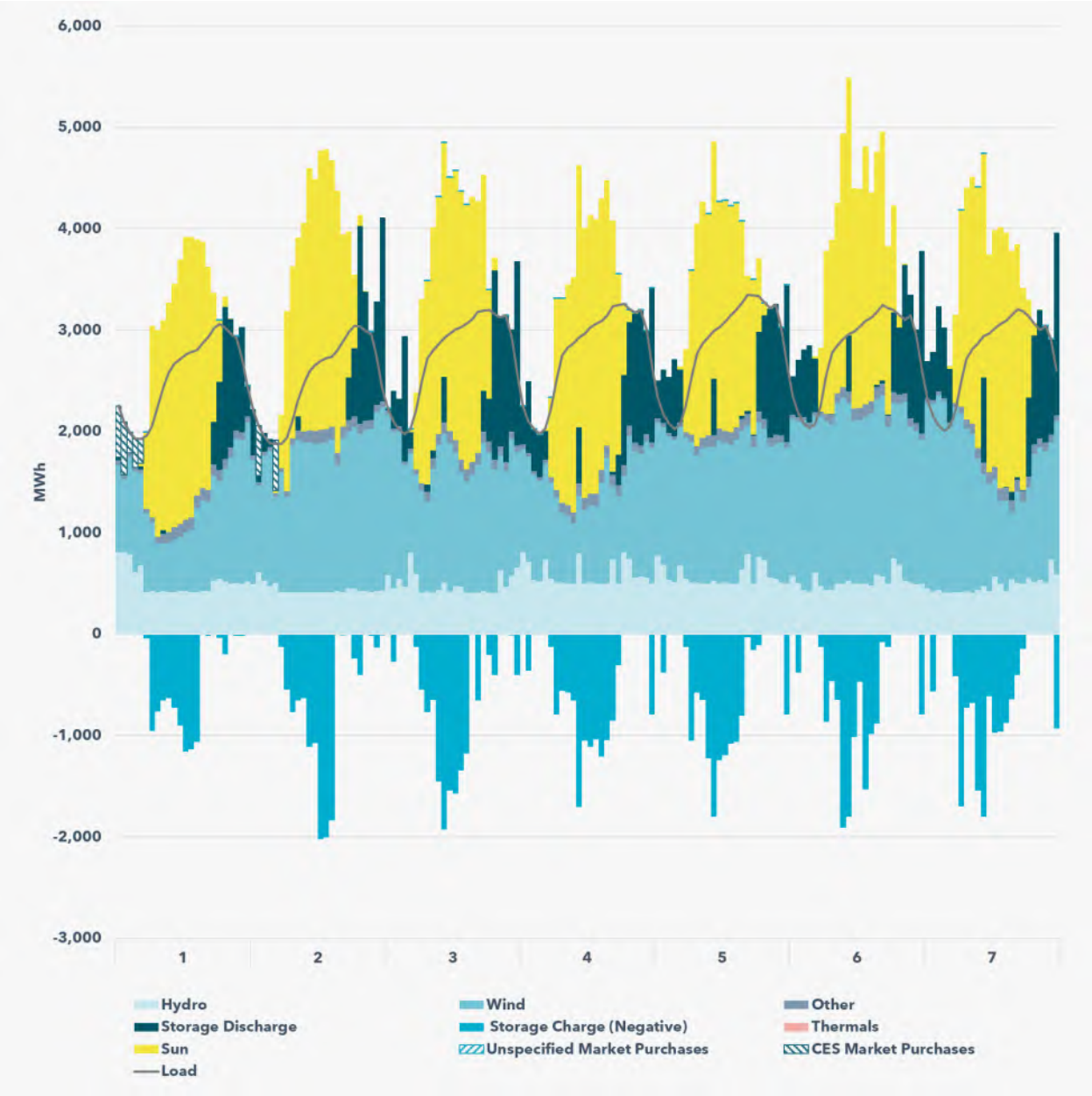
Figure 66. mPZM simulated 2030 monthly cumulative emissions (mmtCO2e) by source



6.2.2.1 Hourly generation snapshots

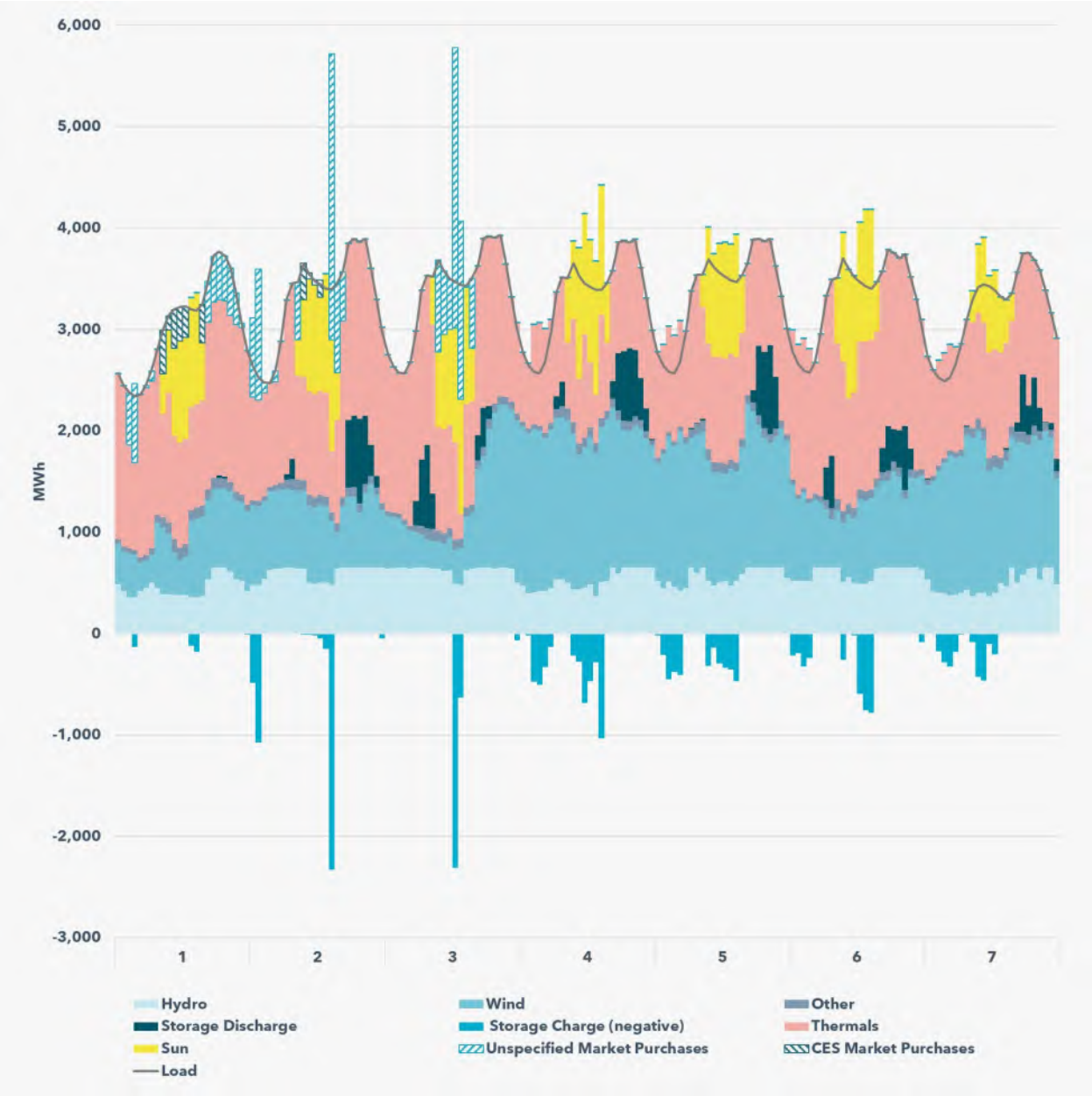
To demonstrate more granular representations of the mPZM results, sample weeks with hourly values by resource type are provided (**Figure 67**). The results include the first seven days of the month for June and December 2030 to demonstrate seasonal variation. June is punctuated by solar and wind generation with storage resources utilized to smooth the daily load-resource balance.

Figure 67. Hourly mPZM snapshots show simulated supply and demand positions by resource type in June 2030



In December 2030, thermal generation is deployed as PGE non-emitting generation is volatile and scarce while market premiums for clean energy are high (**Figure 68**). Unspecified market purchases are leveraged to charge batteries midday so they can be dispatched across evenings and early mornings.

Figure 68. Hourly mPZM snapshots show simulated supply and demand positions by resource type in December 2030



6.2.3 Preferred Portfolio resource adequacy testing

To ensure that the Preferred Portfolio can meet PGE's reliability needs, the Update analyzes the portfolio's specific resource configuration in the Sequoia adequacy model. This test evaluates how adequate the system is after including the Preferred Portfolio and assesses whether the ELCCs used in capacity expansion modeling remain valid when considering the dynamic system interactions present in a portfolio of resources.

The Company's capacity expansion model ROSE-E is constrained to meet system need (**Section 6.1.3 Capacity need**) utilizing an estimate of proxy resource capacity contributions or ELCCs

(**Section 5.1.6 Resource capacity contribution**). The estimation incudes two simplifications that PGE validates when assessing adequacy of the Preferred Portfolio. First, ELCCs are estimated in 2030 only, as estimating ELCCs in Sequoia is a computationally intensive and prolonged process. Second, ROSE-E interprets ELCCs as additive, where the addition of one resource does not affect the ELCCs of another. However, the capacity contribution of a resource is dynamic relative to system demand and supply across time. Including the Preferred Portfolio in Sequoia provides a more granular assessment of its effect on system reliability and appropriateness of the simplifications above. If abstractions used in capacity expansion modeling are representative of the dynamic system, the adequacy effect of the Preferred Portfolio would result in zero capacity need and a 2.4 loss-of-load hours (LOLH) adequacy metric.

Table 31 details the seasonal capacity need of PGE's system after including the Preferred Portfolio. These estimates show the portfolio is estimated as adequate in summer and winter seasons for 2026 through 2030, except a remaining capacity need in winter 2028 of 68 MW. As discussed in **Section 3.4 Capacity need**, structured or bilateral contracts that may be facilitated by State RA participation are tools PGE may use to procure capacity in the short-term.

Table 31. Reference Seasonal Capacity Need with Preferred Portfolio Resources

Year	Summer Need (MW)	Winter Need (MW)
2026	0	0
2027	0	0
2028	0	68
2029	0	0
2030	0	0

Analyzing the frequency of unserved energy events provides insight into how adequate the system is in future years. **Table 32** displays the LOLH metrics that correspond to the capacity need estimates above. Estimates greater than 2.4 LOLH indicate positive capacity needs. For example, the capacity need of 68 MW in winter 2028 represents a system with 2.01 hours of unserved energy per year greater than the threshold. Conversely, estimates less than 2.4 LOLH provide a measure of the degree of system adequacy. In 2030, the Preferred Portfolio additions result in an adequate system in both summer and winter. However, the higher LOLH metric in winter suggests that meeting reliability in the winter is the active constraint in PGE's capacity expansion.

Table 32. Seasonal LOLH of PGE system with Preferred Portfolio Resources

Year	Summer LOLH	Winter LOLH
2026	2.27	0.03
2027	1.45	0.20
2028	0.41	4.41
2029	0.00	0.06

Year	Summer LOLH	Winter LOLH
2030	0.06	2.25

The results above indicate that the ELCC simplifications used by ROSE-E are reasonably accurate for identifying an adequate portfolio, as shown by the approximately exact capacity built for winter 2030. Additionally, and as discussed further below, winter adequacy challenges appear to be the cause of significant resource additions in the Preferred Portfolio.

6.2.3.1 Energy sensitivity adequacy assessment of Preferred Portfolio

The Update includes an energy sensitivity analysis of the Preferred Portfolio to further PGE's understanding of cost and reliability implications driven by winter adequacy challenges. This analysis aims to identify the nature of PGE's capacity needs decomposed from PGE's energy needs.

To conduct the energy sensitivity assessment, all 4679 MW of nameplate resources in the Preferred Portfolio were partitioned into 2879 MW of resources required to meet ROSE-E's energy need including solar and wind (Energy Only Preferred Portfolio) and 1800 MW of storage resources.[145] The Energy Only Preferred Portfolio was added to the PGE system as modeled in Sequoia. Short duration storage resources were then incrementally added to examine their effect on capacity need.[146] **Figure 69** shows the changes to 2030 capacity need for winter and summer using this method.

The results indicate that short duration storage resources are effective at addressing PGE's summer capacity needs and inefficient at meeting PGE's winter capacity needs. The results clearly demonstrate the challenge of addressing winter adequacy with short duration storage resources under current system assumptions.[147] A 2030 winter capacity need of 123 MW persists after adding the Energy Only Preferred Portfolio and no additional storage resources.[148] This suggests that the 1800 MW of four-hour batteries in the Preferred Portfolio is required to resolve 123 MW of winter capacity need, a 6.8 percent ELCC. For comparison, the summer need

[145] Total value includes sum of nameplate for storage and energy resources associated with hybrids. Energy resources from hybrids were segmented and included in the base system with equivalent generation profiles. Additionally, the Energy Only Portfolio includes energy equivalent to the 123 MWa Non-Emitting Contract modeled as a hydro resource using parameters from recent hydro contracts.

[146] All incremental additions are modeled as 4-hour stand-alone energy resources with standard Sequoia assumptions, starting each simulated week fully charged. This assumption is consistent with how storage and hybrid resources are modeled in the above adequacy assessment. Additions were made in 100, 200, 400, 600, 800, 1000, 1400, 1800, and 2000 MW tranches then smoothed and interpolated using the same methodology as in the 2033 CEP/IRP and 2023 CEP/IRP Update.

[147] The Energy Only Preferred Portfolio plus 1800 MW of storage resources results in a winter capacity need of 0 MW and 2.21 LOLH, compared against the Preferred Portfolio's winter capacity need of 0 MW and 2.25 LOLH as shown in **Table 32.** The modest difference in modeling results relates to small differences in assumed charging behavior between hybrid and standalone storage resources and other portfolio modeling simplifications. Interpolation between the 1400 MW tranche an 1800 MW tranche of storage additions results in a curve suggesting approximately 1600 MW are required to achieve adequacy.

[148] As compared to the 978 MW and 886 MW capacity needs for summer and winter, respectively, prior to any additions from the Preferred Portfolio, **Section 3.4 Capacity need**.

remaining after energy additions is 213 MW. This need is resolved with an estimated 400 MW of storage additions, a 53 percent ELCC.

Figure 69. Capacity Need of Energy Only Portfolio and Cumulative 4-hour Storage Additions – 2030 Reference

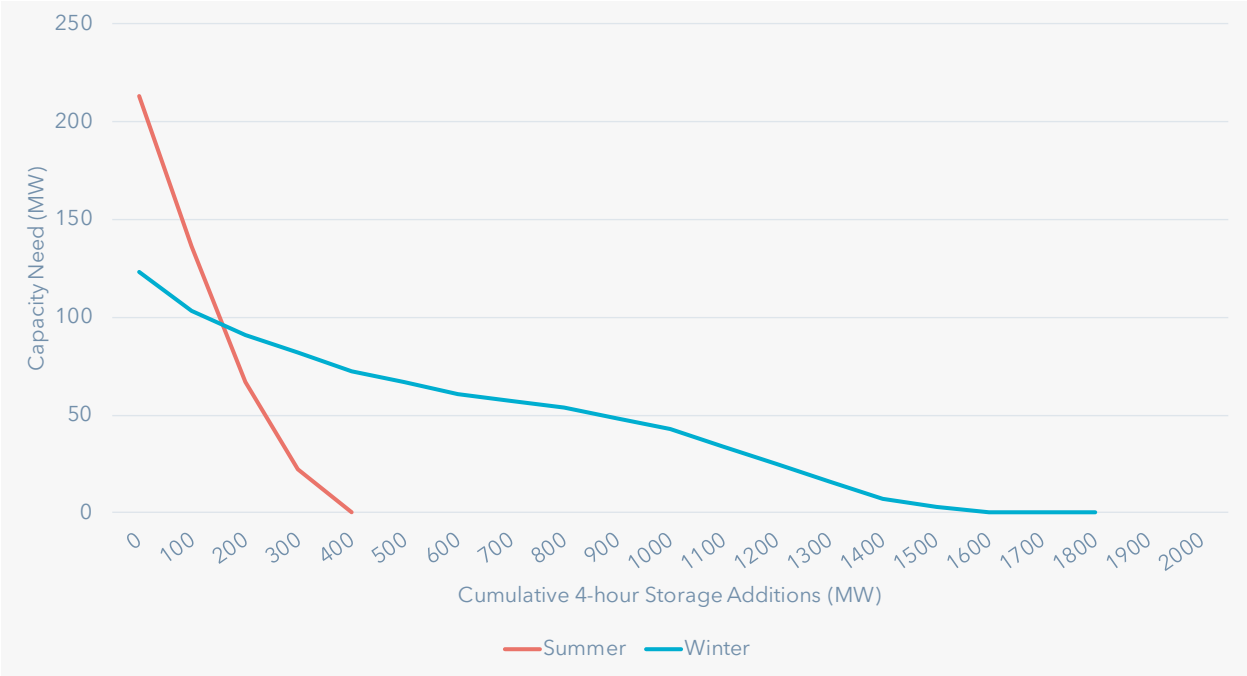
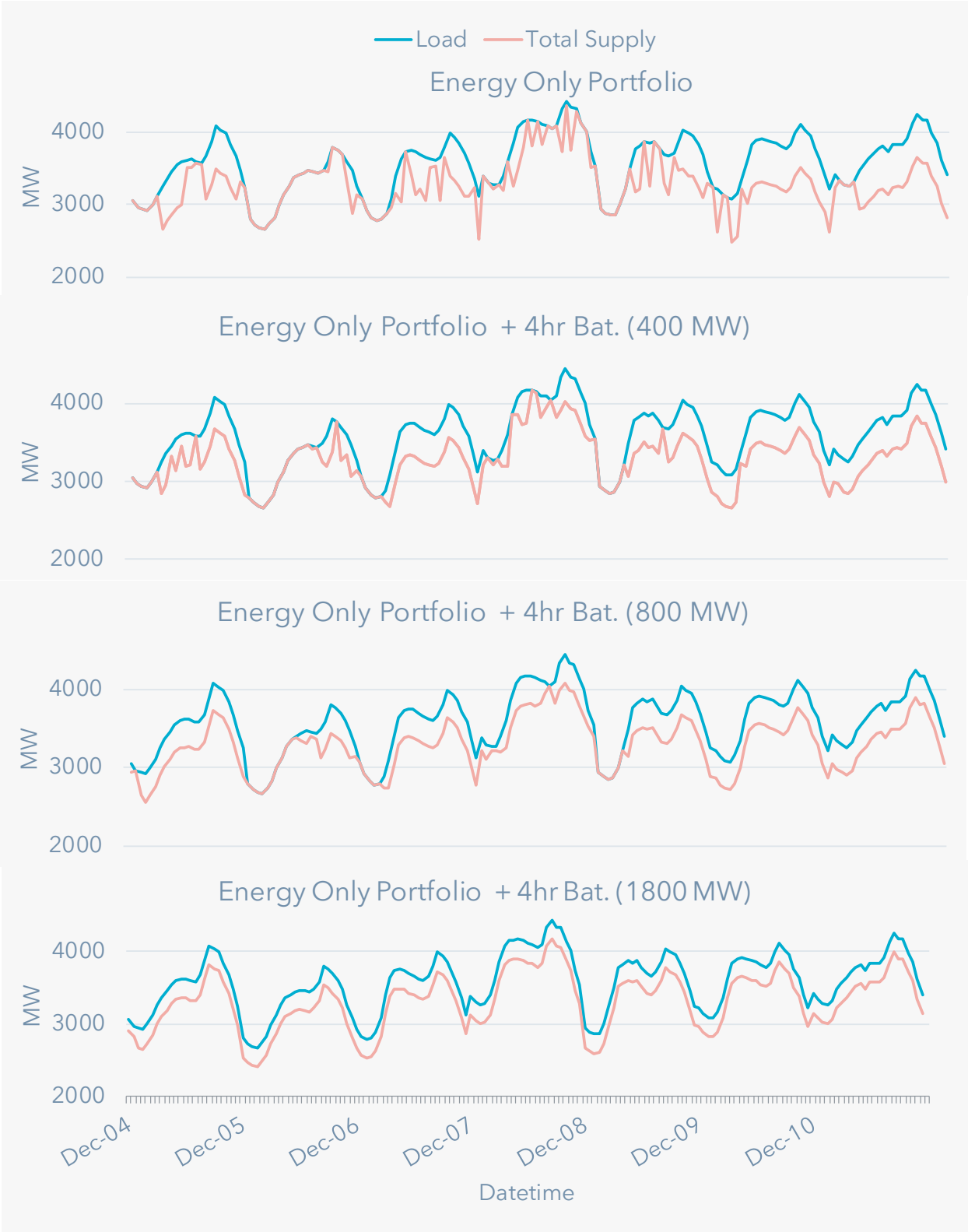


Figure 70 shows a Sequoia simulation of load and supply during a week in December 2030. This image highlights the challenge of trying to meet load in winter with short-duration storage resources. The first panel shows load and total supply in the base system with the Energy Only Portfolio, where gaps between total supply and load are unserved energy. As the quantity of storage increases the supply curve is shaped to reduce the largest hours of unserved energy. Due to insufficient energy, the optimal solution is to charge during periods of adequacy and lessen the size of unserved energy events in other hours, as is clear in Panel 4.[149] Panel 4 represents a tail event in the system, a week of energy shortfall where all 168 hours are short. Such a week has a 1 in 100,000 chance of occurring in an adequate system which includes the Preferred Portfolio. This inability of storage resources to resolve shortages when energy is short is representative of the declining marginal winter capacity curve shown in **Figure 69**.

[149] The objective function of Sequoia is to minimize the sum of the greatest hour of unserved energy of the week plus the average shortfall across the week.

Figure 70. December 2030 Weekly Adequacy Simulation



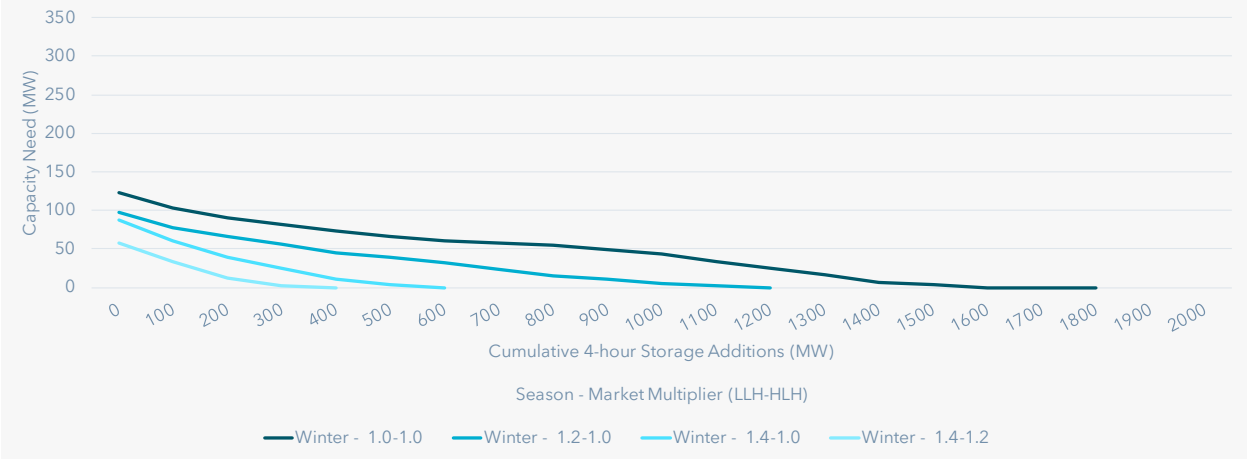
Previous regional resource adequacy studies have also reported on the challenges of meeting adequacy needs in the Pacific Northwest with short-duration storage. Energy and Environmental

Economics (E3) highlighted the steeply declining ELCC value of storage resources as a pattern that is particularly acute in the Pacific Northwest due to the quantity of hydro resources in the region.[150] This report concluded that firm capacity is an important component of a deeply decarbonized grid, and achieving decarbonization using only wind, solar, hydro and energy storage is impractical and prohibitively expensive. To compare the capacity value of dispatchable hydro resources against energy storage, the Company modeled the 2030 ELCC of the Non-Emitting Contract from the Preferred Portfolio based on parameters detailed in recent bilateral hydro agreements. The capacity value of this contract was estimated at 189 MW and when added to the system with the Energy Only Portfolio in 2030 resulted in ELCCs of 122 percent in summer and 115 percent ELCC in winter, as compared to 46 percent in summer and 22 percent in winter for 200 MW of 4-hour battery storage.

To test whether availability of energy is constraining the value of storage resources in winter, the same Energy Only Preferred Portfolio and incremental storage sensitivity analysis was conducted under various market availability assumptions. Adjustments were made by scaling Sequoia's market access assumptions for low-load hours (LLH) and heavy-load hours (HLH).[151] **Figure 71** shows the effect of this market sensitivity test on seasonal capacity need, where the market access multiplier represents the scalar for LLH and HLH, respectively. For example, in the 1.2-1.0 market access multiplier scenario an additional 20 percent (approximately 200 MW) is available during LLH and no change is assumed during HLH. In the 1.4-1.0 scenario, an additional 400 MW to the maximum availability in LLH results in winter adequacy at approximately 600 MW of incremental storage. This quantity of storage is equivalent to that included in the State RA Requirements Portfolio, 1200 MW less than the Preferred Portfolio.

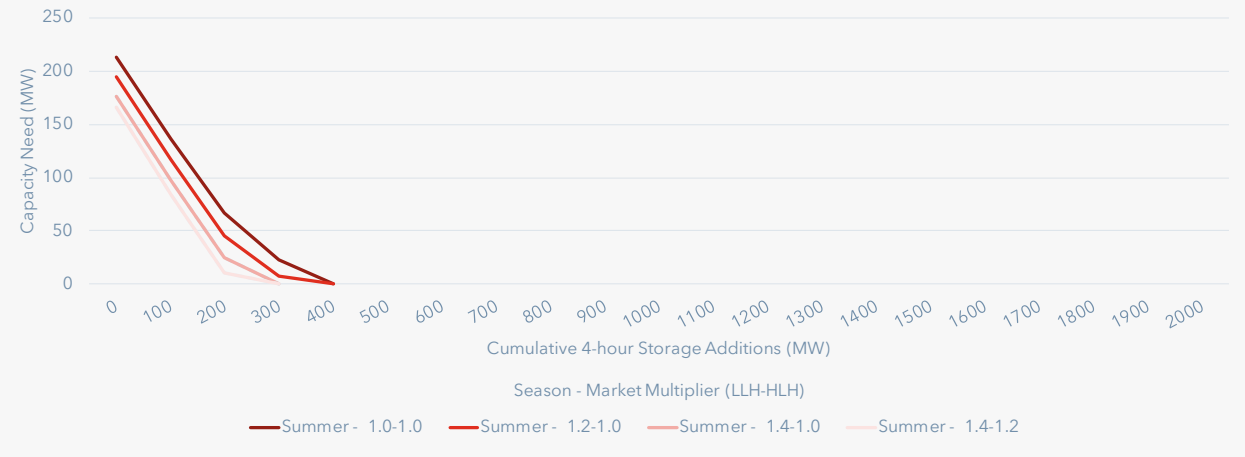
Figure 71. Capacity Need of Energy Only Portfolio with Incremental 4-hour Storage Additions and Variable Market Availability Assumptions – 2030 Reference

Panel A – Winter Capacity Need



[150] Energy and Environmental Economics. 2019. Resource Adequacy in the Pacific Northwest. San Francisco, CA.
[151] Sequoia's standard market assumptions vary by month, weekend/weekday, and hour (LLH/HLH) and are negatively correlated to load (i.e., greater load assumes less availability). In December, weekday values are limited to 999 MW and 150 MW for LLH and HLH, respectively. In August, values are limited to 999 MW and 0 MW for LLH and HLH, respectively.

Panel B – Summer Capacity Need



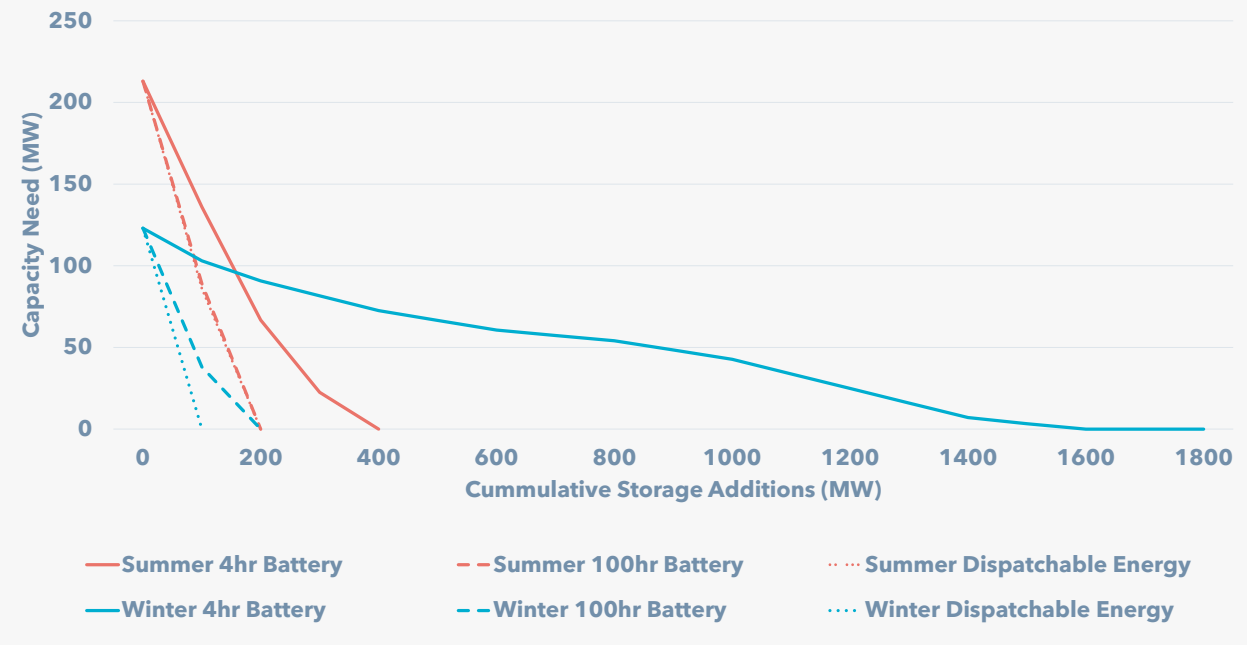
The above results highlight the sensitivity of the Preferred Portfolio to PGE's assumptions of access to regional markets. An estimated 66 percent of the 1800 MW of storage in the Preferred Portfolio is offset with approximately 400 MW of additional energy in LLH. Changing market access assumptions to arrive at a portfolio roughly equivalent to the State RA Requirement Portfolio reduces the NPVRR of resources by roughly $7 billion dollars across the planning horizon.[152] However, an Energy Only Portfolio with storage resources equivalent to the State RA Requirements portfolio is inadequate in winter 2030 as estimated in Sequoia. 60 MW of winter capacity need remain to achieve the 24-hours in 10 years metric. This capacity need equates to 3.73 LOLH, or 37 hours of unserved energy in 10 years for winter.

Finally, PGE estimated capacity contributions from emergent technologies as part of this analysis. These estimates are considered preliminary, and the Company intends to further refine them and EDAM market capacity contributions (see **Section 2.2.1 CAISO's Extended Day Ahead Market**) as part of the 2026 CEP/IRP. **Figure 72** compares capacity contributions of long-duration storage (LDS) and dispatchable energy technologies against those from 4-hour storage, as displayed in **Figure 69**.[153] This analysis suggests that approximately 200 MW of 100-hour storage and 100 MW of dispatchable energy provides effective capacity equivalent to 1800 MW of 4-hour batteries when added to the Energy Only Portfolio. Unlike 4-hour storage, the characteristics of these emergent technologies appear better suited to resolve the multi-hour reliability events characteristic to the winter season because of their ability to hold greater quantities of energy or generate energy on demand.

[152] Energy resources in the State RA Requirements Portfolio are roughly equivalent to those in the Preferred Portfolio. Value represents the difference between the NVPRR of the Preferred Portfolio and the State RA Requirements Portfolio presented in **Section 6.2 Preferred Portfolio** and **Section 6.3.5 State RA requirements**.

[153] LDS is modeled as a 100-hour battery with 35% round-trip efficiency, while dispatchable energy is modeled as perfect capacity. Long-duration storage is assumed to start each dispatch period fully charged, just as short-duration storage. Improved representation of the operational availability of LDS is suggested for the 2026 CEP/IRP.

Figure 72. Capacity Need of Energy Only Portfolio and Emergent Technology Additions – 2030 Reference



The results from this energy sensitivity analysis show that ELCCs for winter storage do not improve with additional energy availability and short-duration storage remains an inefficient marginal resource for meeting winter adequacy needs. Short-duration resources are inefficient primarily due to the length of constraining reliability events. This conclusion motivates **Section 6.7 Net cost of capacity resources**, where the Company represents the cost of marginal resource with a value that captures the capacity and energy costs required to ensure adequacy.

Further, this analysis provides insight into four considerations PGE intends to investigate in the 2026 CEP/IRP with respect to future capacity needs: (1) continue to rely on short-duration storage as the marginal resource, (2) evaluate the role of additional energy from expanded market access, (3) evaluate the role of an expanded regional sharing mechanism as part of the State Resource Adequacy requirements, and (4) review the viability of emergent technologies as the marginal resource. PGE expects it necessary to identify different long-term marginal capacity resources better suited to provide the energy and capacity necessary to meet ongoing winter adequacy challenges, such as long-duration storage, hydrogen storage resources, advanced geothermal, nuclear generation, carbon capture utilization and storage, and long-distance transmission access to geographically diverse trading hubs, such as the North Plains Connector.

6.3 Portfolio sensitivities

This section describes, and presents results for, the multiple sensitivities that are conducted on the Preferred Portfolio. Topics explored through these sensitivities include the quantity of emitting energy retained by PGE to serve retail load, large industrial customer growth, resource adequacy planning assumptions and the availability of non-emitting market purchases for hourly emissions accounting. Except where otherwise specified, PGE held the assumptions for each

sensitivity constant with those of the Preferred Portfolio in order to isolate the impacts to the topic of interest. Select results are presented for each scenario to highlight the findings of interest.

6.3.1 Reliability needs only

The 'Reliability Needs Only' scenario demonstrates how capacity and energy needs driven by load growth and portfolio composition changes. In this scenario, HB 2021 GHG emissions targets are not enforced. The quantity of thermal energy retained from PGE's existing fleet of resources to serve retail load is determined by recent historical plant operations. Additionally, thermal resources continue to provide capacity beyond 2039, unlike the Preferred Portfolio, in which the capacity from thermals must be replaced with non-emitting sources in 2040. Although not constrained to HB 2021 emissions reductions, the 'Reliability Needs Only' scenario is compliant with RPS requirements. As in all other portfolios analyzed in the Update, this portfolio does not contemplate the addition of new natural gas resources to PGE's portfolio.

Resource additions for the 'Reliability Needs Only' scenario are shown in **Figure 73**. Optimized resource additions through 2030 include 1262 MW of wind, 1189 MW of solar, 1745 MW of storage, 83 MW of non-cost-effective EE and DERs, 155 MW of CBREs, and 9 MW of non-emitting contracts. Total resource additions in 2030 are 95 percent of those in the Preferred Portfolio. The substantial incremental resource additions by 2030 without reducing thermals suggests resource adequacy, including the need to serve growing load in a reliable manner, is a main driver of PGE's resource needs.

Results differ more substantially from the Preferred Portfolio later in the analysis time-horizon when the ability to retain thermals for capacity impacts resource additions. By 2040, the resource additions of the "Reliability Needs Only' scenario are only 53 percent of those in the Preferred Portfolio. Driven largely by these later-year differences, the cost and risk of the 'Reliability Needs Only' scenario, shown in **Figure 74**, are substantially lower than the Preferred Portfolio. 20-year portfolio NPVRR for the 'Reliability Needs Only' scenario are $4,970 million lower than the Preferred Portfolio.

Figure 73. Resource Additions for Reliability Needs Only Scenario (MW)

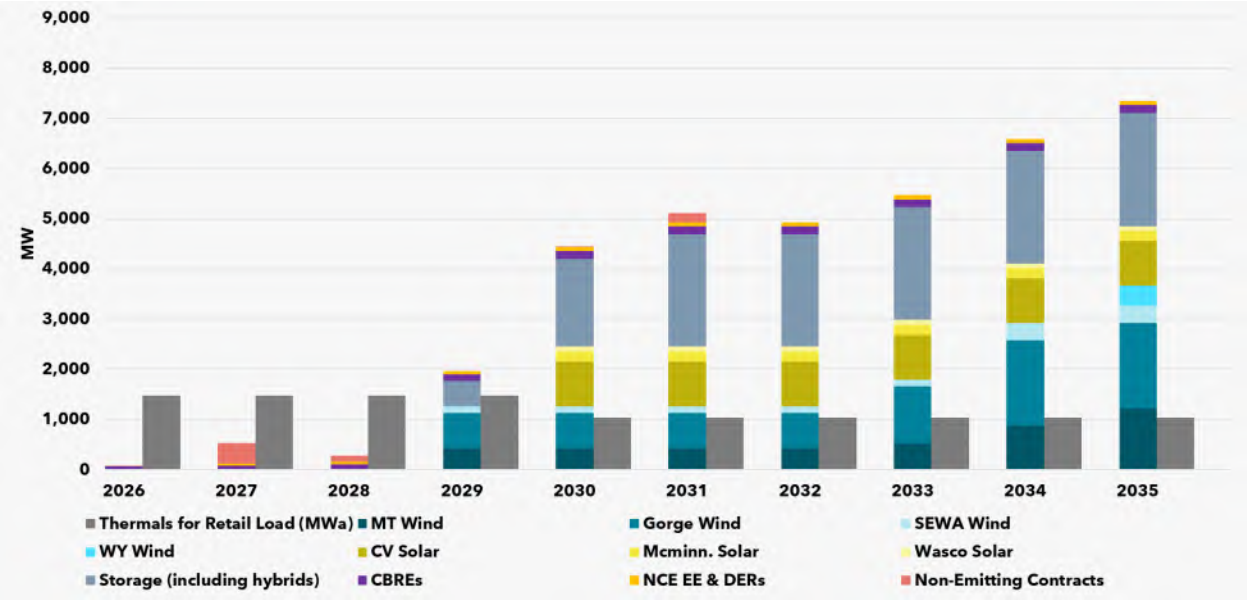
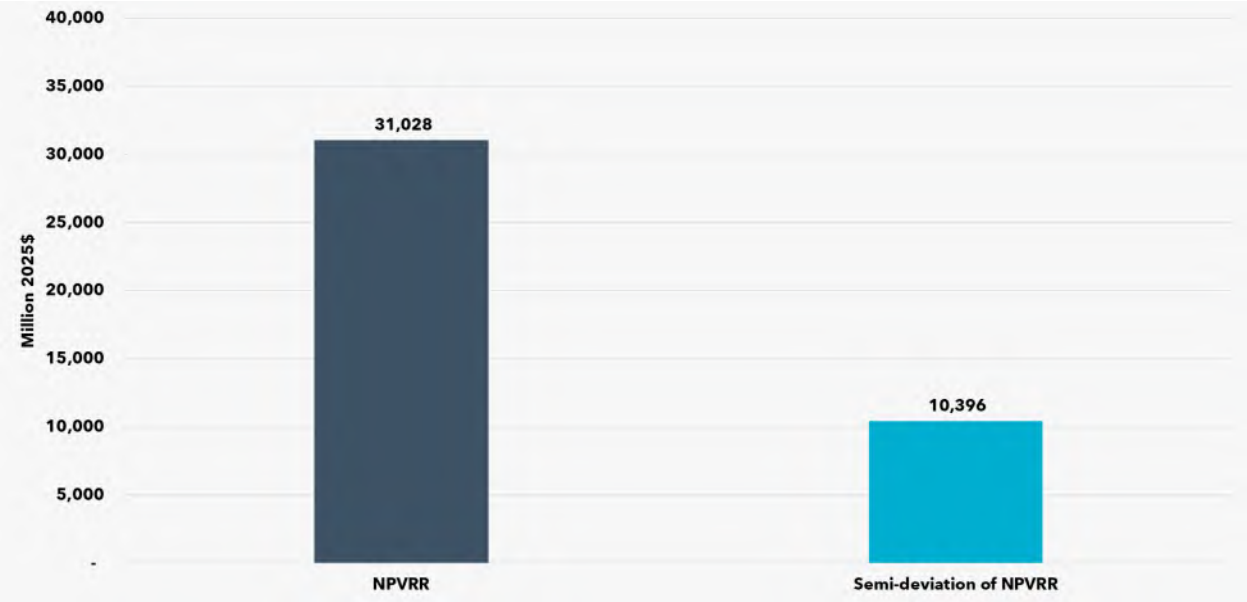


Figure 74. Cost and Risk of Reliability Needs Only Scenario



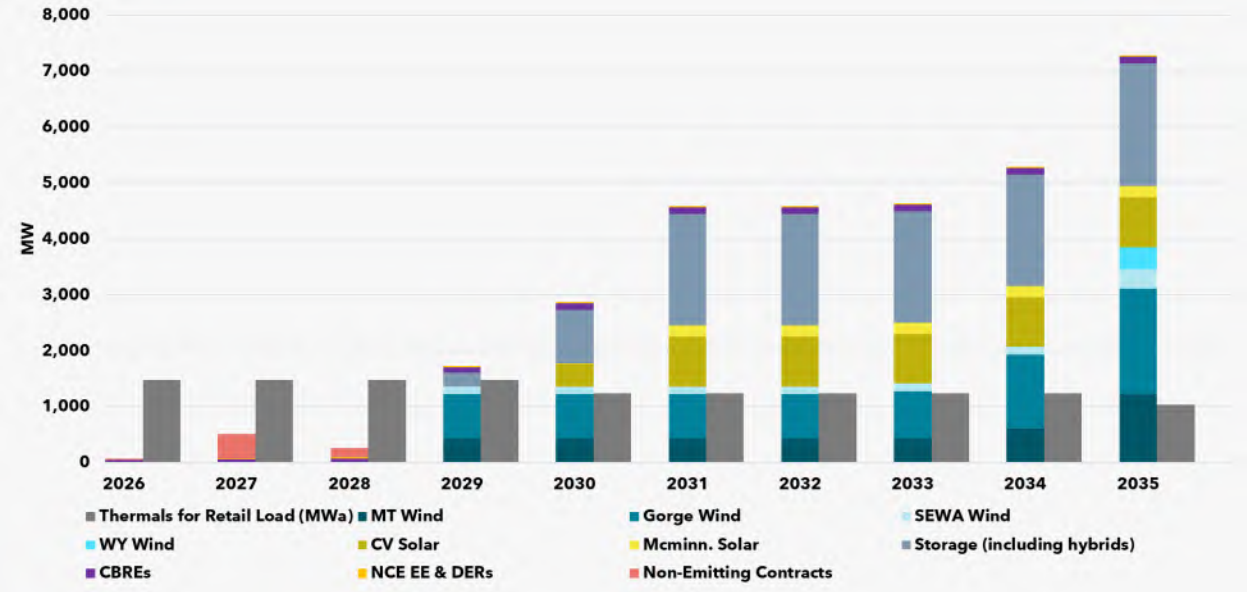
6.3.2 Further Reliability need sensitivities

The scenarios presented in this section expand upon the 'Reliability Needs Only' scenario by considering how needs are reduced assuming 1) that PGE extends a 250 MW contract for dispatchable emitting energy and 2) PGE extends a 250 MW contract for dispatchable emitting energy in addition to a 250 MW non-emitting hydro contract. These scenarios are named the 'Dispatchable Emitting Contract Scenario' and the 'Dispatchable Emitting and Hydro Contracts Scenario'. Both contract extensions are assumed to provide both energy and capacity from 2030 through 2034. Aside from the contract extension assumptions, these scenarios rely on identical

assumptions to the 'Reliability Needs Only' scenario. In contrast to the small impact on needs found when comparing the 'Reliability Needs Only' scenario, with its' reduced energy needs, to the Preferred Portfolio, the addition of capacity and energy from contract extensions in these scenarios produces substantial reductions in 2030 resource needs, as illustrated in the results below.

Portfolio resource additions for the 'Dispatchable Emitting Contract Scenario' shown in **Figure 75**. Additional quantities of emitting energy can be seen as taller gray bars in 2030 – 2034. Through 2030, the portfolio adds 1362 MW of wind, 415 MW of solar, 952 MW of storage, 24 MW of NCE EE and DERs, and 119 MW of CBREs. Total resource additions are 2872 MW through 2030, which is 1571 MW, or 35 percent, lower than in the 'Reliability Needs Only' Scenario. The decrease in resources is driven largely by decreases in the quantity of solar and storage, with CBRE's, NCE EE, and NCE DERs are also reduced.

Figure 75. Resource Additions for Dispatchable Emitting Contract Scenario

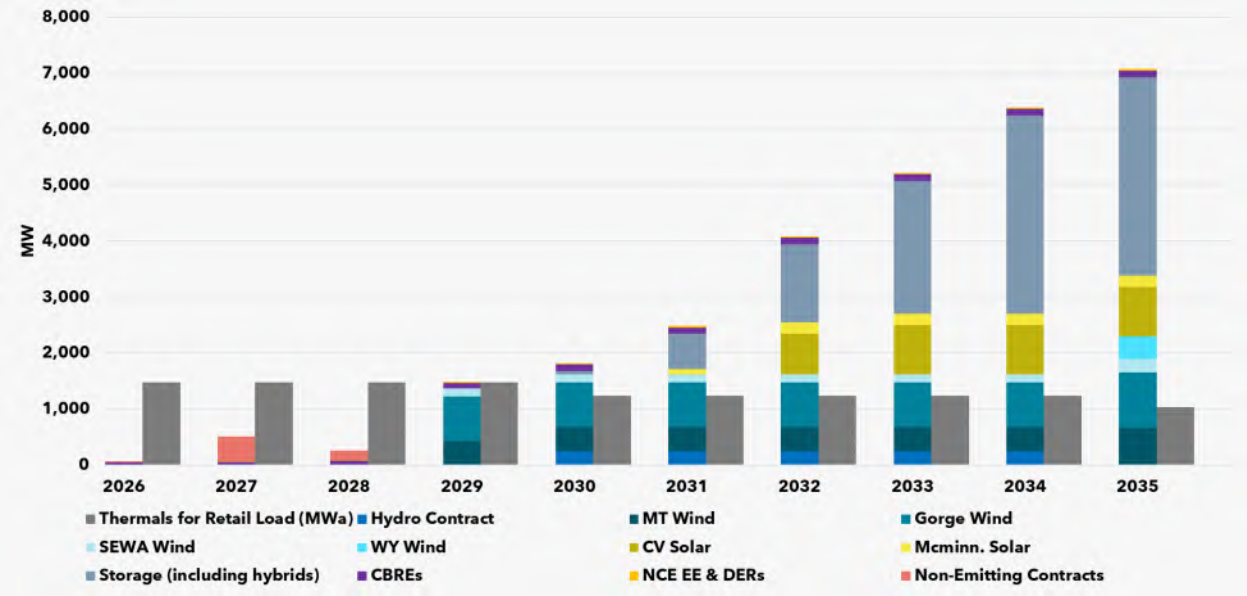


Portfolio resource additions for the 'Dispatchable Emitting and Hydro Contracts Scenario' shown in **Figure 76**. Through 2030, the portfolio adds 1362 MW of wind, 64 MW of storage, 24 MW of NCE EE and DERs, and 119 MW of CBREs. Total resource additions are 1569 MW through 2030, which is 2874 MW, or 65 percent, lower than in the 'Reliability Needs Only' Scenario. Consistent with the results of the previous scenario, the decrease in resources is driven largely by decreases in the quantity of solar and storage.

Notably, in the 'Dispatchable Emitting and Hydro Contracts Scenario' the need for transmission options is reduced, with the needs reduced enough during the 2030 – 2034 period of contract extensions that the 3000 MW Bethel-Round Butte transmission upgrade (BRB) is foregone when it becomes available in 2032. The impact of this outcome produces an initially unintuitive result when comparing the resource additions of the two contract extension scenarios in 2033 - 2034

reveals. Comparison of **Figure 75** and **Figure 76** reveal larger 2033 and 2034 resource additions in the 'Dispatchable Emitting and Hydro Contracts Scenario', which has 500 MW of contract extensions than the 'Dispatchable Emitting Contract Scenario', which has 250 MW of contract extension. Instead of investing in BRB, the 'Dispatchable Emitting and Hydro Contracts Scenario' lowers costs by relying on additional quantities of storage to meet needs in these years and delaying the addition of any transmission options until 2035.

Figure 76. Resource Additions for Dispatchable Emitting and Hydro Contracts Scenario



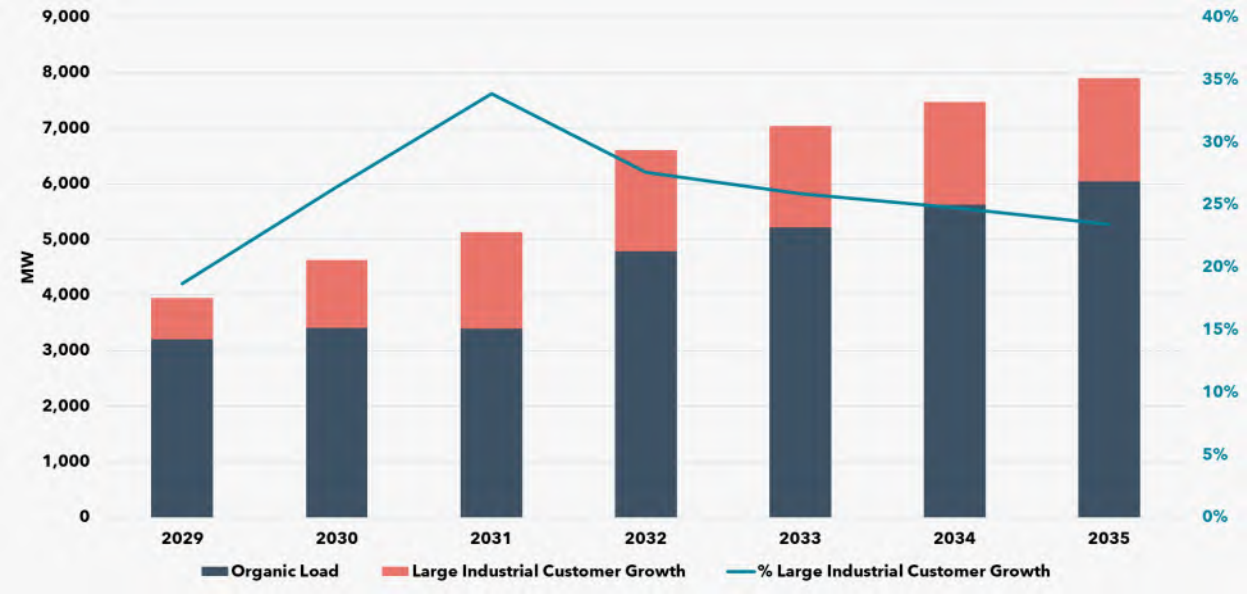
6.3.3 Large industrial customer growth

As described in **Section 2.4 Industrial load growth**, substantial electricity demand from large industrial customers is projected in the PNW in coming decades and will have implications for utility planning. PGE is taking steps to mitigate the risk of inequitable customer cost impacts associated with large industrial load growth, including through its filings in UE 430 and UM 2377, in which PGE has proposed a change to its tariff regarding cost allocation amongst customer classes. In addition, the Oregon legislature is considering law that would place data centers into a specific customer class. The Update analysis is illustrative of how new resource costs are driven by all large and growing industrial customers. There remain important differences in methodology and purpose between the IRP Update analysis and methodology that may result from UM 2377 which may limit the applicability of these results which should be considered illustrative only.

As an initial exploration of the impacts of this projected growth on PGE's planning, an analysis was conducted to identify what the quantity of resource additions in PGE's Preferred Portfolio are associated with meeting the needs created by the growth of large industrial customers. To do so, PGE created a load forecast sensitivity that excludes large industrial customer growth. This forecast and the methodology used to develop it are described in detail in **Section 3.1.3 Load forecasts – excluding large customer** . The load that remains to be served after removing the

impact of large industrial customer growth is referred to here as 'organic load'. Using this load forecast, a scenario was created that produced a portfolio of resource additions that provides sufficient energy and capacity needs to meet organic load growth and is compliant with HB 2021. The resulting capacity need for the 2030 reference case is estimated at 497 MW and 473 MW for summer and winter, respectively, roughly 50 percent of the estimated capacity need for the Preferred Portfolio. The quantity of resources associated with serving large industrial customer growth can be estimated by taking the difference in the resource buildout of the Preferred Portfolio and the 'No Large Industrial Customer Growth' scenario, which adds resources to meet organic load only. **Figure 77** shows the total cumulative resource additions in each year for the Preferred Portfolio and the 'No Large Industrial Customer Growth' scenario and shows that by 2030, about 26 percent resource additions can be attributed to growth in large industrial customer load. Resource additions associated with large industrial customer growth reach as high as nearly 34 percent in 2031.

Figure 77. Cumulative Resource Additions for Large Industrial Customer Growth



6.3.4 Market scenarios

PGE developed three market scenarios to analyze uncertainties in the potential availability of low- and non-emitting power for purchase. These scenarios vary assumptions in PGE's IGHG model which impact the quantity of emitting energy that PGE is ultimately able to retain to serve retail load. Compliance with HB 2021 is assumed for each alternative market scenario. The three market scenarios are described in **Table 33**.

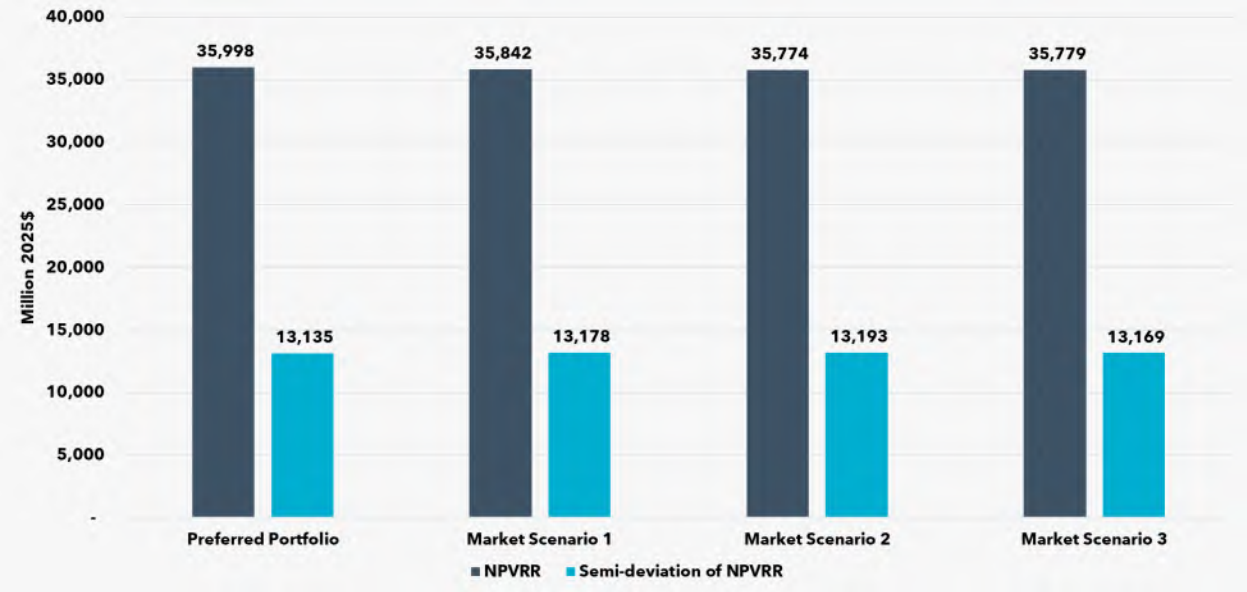
Table 33. Market Scenarios

Scenario	Description
Market Scenario 1: Specify More Power Purchases	Specify 50% of the assumed unspecified market purchases (informed by historical data) serving retail load in the IGHG

Scenario	Description
	model as non-emitting with the remaining 50% assigned the market unspecified emissions rate.
Market Scenario 2: Extend Low-Emitting Existing Purchases	Extend known low-emitting short-term specified purchases that would otherwise expire in the IGHG model.
Market Scenario 3: Lower Emission Rate	Reduce the emissions rate of unspecified market purchases in the IGHG model by 30%.

Because the assumptions in the market scenarios allow PGE to retain more emitting energy and thus reduce the energy need, resource additions are lower than in the Preferred Portfolio. However, because capacity need is unchanged, the impacts on resource buildouts and portfolio cost and risk are modest. Portfolio cost and risk metrics for the market scenarios are shown in **Figure 78**. Relative to the Preferred Portfolio, Market Scenario 1 lowers portfolio cost by $156 million, while Market Scenarios 2 and 3 produce costs $224 million and $219 million lower than the Preferred Portfolio, over the 20-year analysis time-horizon.

Figure 78. Cost and Risk of Market Scenarios



6.3.5 State RA requirements

The 'State RA Requirements' scenario models PGE's resource adequacy needs using methods from the WRAP instead of using the PGE resource adequacy methods that are standard in the Preferred Portfolio and all other scenarios. The alternative methodology used for this scenario impacts capacity need and proxy resource ELCCs, as described in **Appendix I Inputs for state RA requirements portfolio**. Because of the assumed sharing of resources by regional entities, the WRAP methodology generally produces a lower estimated capacity need than PGE's standard IRP methods. As a result, the resource additions in the 'State RA Requirements' scenario are substantially lower than in the Preferred Portfolio and portfolio cost is $6,546 million lower

over the planning horizon. Resource additions for the 'State RA Requirements' scenario are shown in **Figure 79**, and cost and risk metrics are shown in **Figure 80**.

Figure 79. Resource Additions in State RA Requirements Scenario (MW)

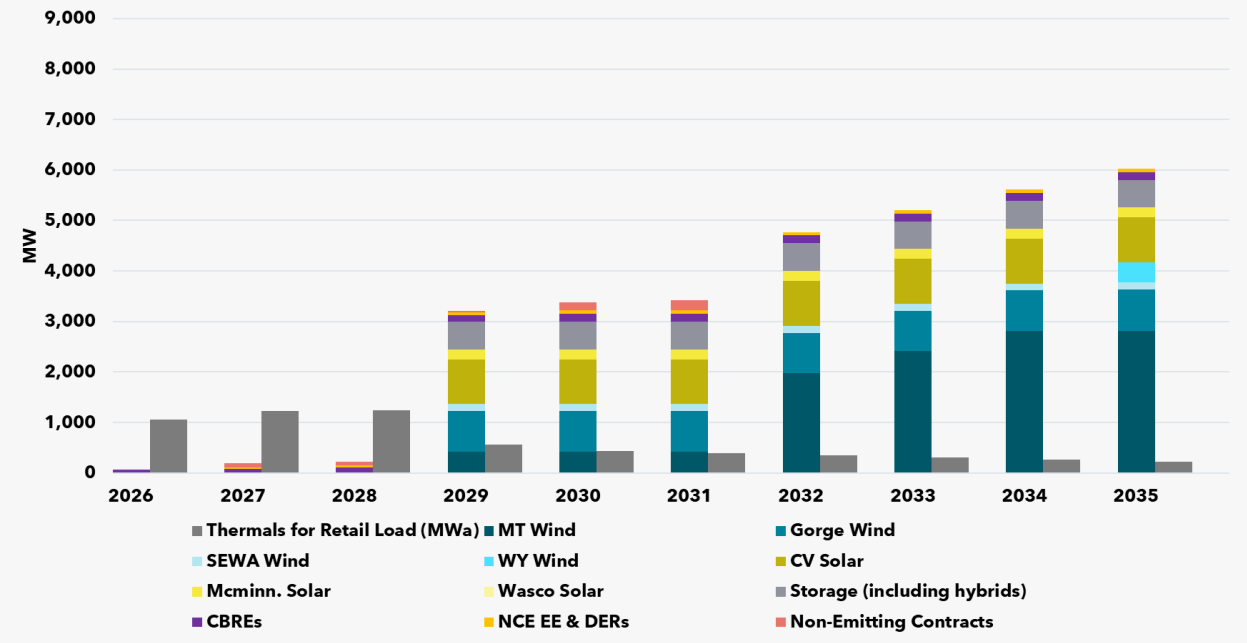
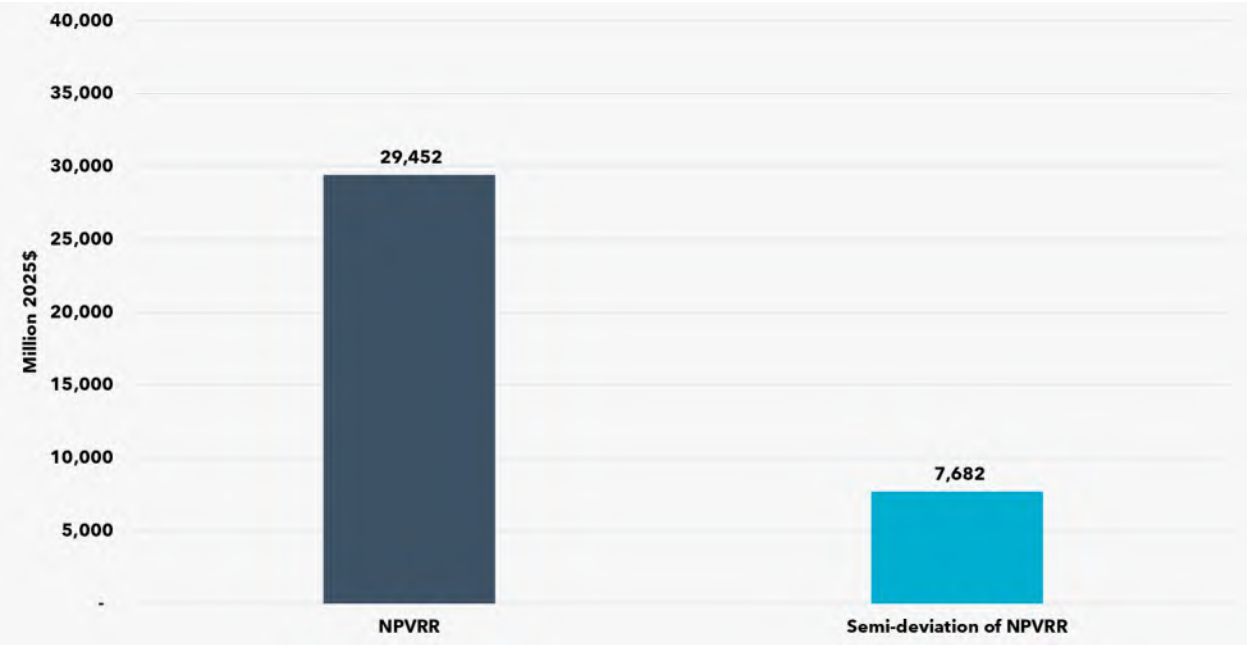


Figure 80. Cost and Risk of State RA Requirements Scenario

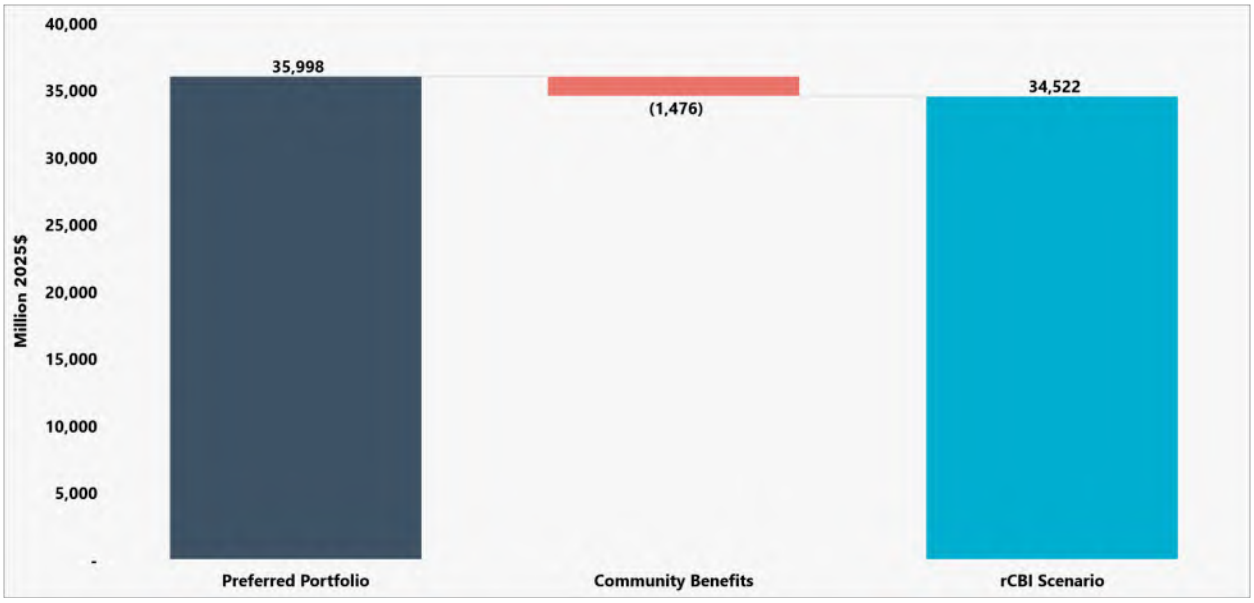


6.3.6 Resource Community Benefits Indicator (rCBI)

The 'rCBI' scenario applies reductions in fixed costs to certain CBRE, NCE DR, and NCE EE resources to reflect the societal value of community benefits associated with these resources, as described in **Section 5.5 Community benefits indicators (CBIs)**. Because the majority of NCE EE and DR, and the entirety of CBRE resources available, are added in the Preferred Portfolio, differences in resource buildout between the 'rCBI' scenario and the Preferred Portfolio are minimal. The reduced fixed costs did result in the selection of an additional 2 MW of NCE DR resources.

The lower costs associated with these resources lowered portfolio NPVRR by $1,476 million compared to the Preferred Portfolio (**Figure 81**). This reduction in NPVRR represents the value of localized community benefits provided by the resources in the portfolio. The $1,476 million in community benefits reflects the societal benefits provided by the resources in the portfolio and does not represent a decrease in the monetary cost of the portfolio or suggest that the 'rCBI' portfolio would result in lower customer bills than the Preferred Portfolio.

Figure 81. NPVRR of Preferred Portfolio and rCBI Scenario



6.3.7 Absence of non-emitting market

The 'Absence of Non-Emitting Market' scenario contemplates the quantity of resource additions that would be necessary to meet HB 2021 emissions targets using hourly energy accounting if PGE didn't have access to the non-emitting market energy that is available in the analysis reported in **Section 6.2.2 Hourly energy and emissions accounting results**. A detailed description of the iteration method is provided in **Appendix D Hourly emissions methodology**. In brief, the question is answered using the following approach:

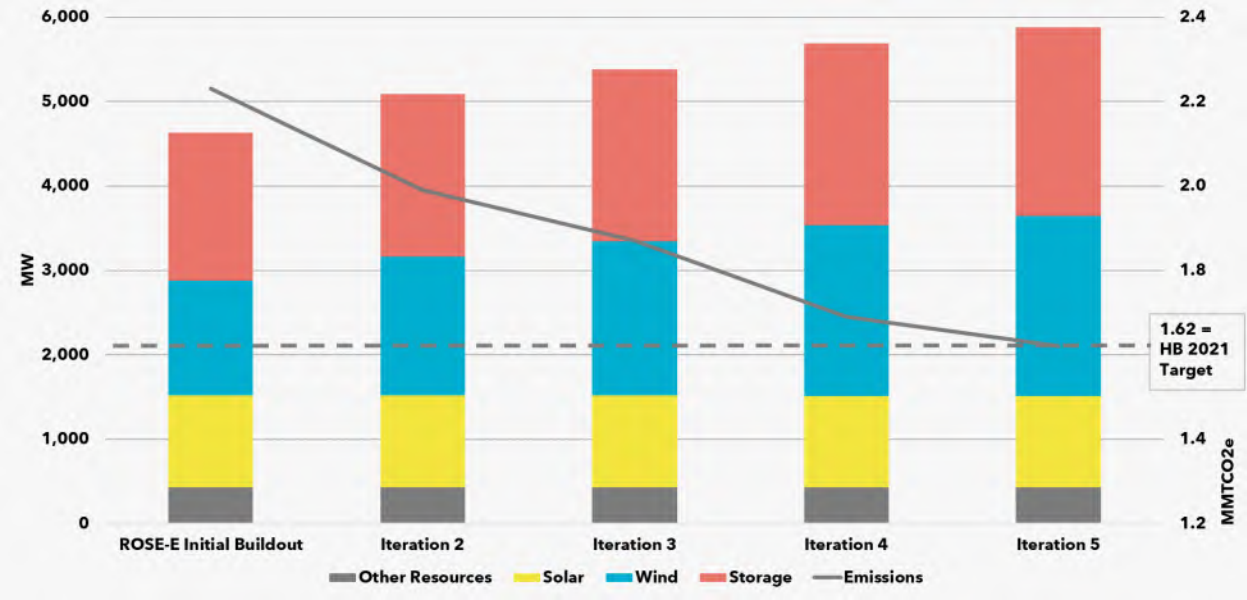
1. ROSE-E determines the resources required to meet resource needs based on monthly energy sufficiency.

2. The modified PZM estimates what hours in the year would PGE be short (and by how much) under average conditions.
3. An outboard workbook creates a new energy constraint to be met and resource options are assigned a weighted capacity factor that encourages the addition of resources that are most useful in meeting that need. The new constraint is fed back into step 1 until a portfolio that meets all hourly needs is produced.

Because transmission constraints would make it impossible to add sufficient resources to meet the hourly emissions requirements in 2030, the resource additions in iterations subsequent to the initial ROSE-E buildout are not subject to transmission constraints.

Over the course of five iterations between ROSE-E and the modified PZM, incremental additions of renewable and storage resources are added until the portfolio achieves emissions of 1.62 MMTCO2e when evaluated at an hourly time-step (**Figure 82**). When the portfolio achieves emissions targets, the quantity of resource additions has increased by 1249 MW, from 4629 MW in the initial ROSE-E buildout to 5881 MW in the fifth iteration. This 21 percent increase in the quantity of resources in the portfolio illustrates that for PGE to decarbonize in isolation, substantial additional resources would be required that may exacerbate procurement challenges and cost pressure. The findings underscore the importance of access to market opportunities to purchase non-emitting energy from entities within the region.

Figure 82. Resource Addition Iterations in Absence of Non-Emitting Market Scenario



6.4 Small scale renewables plan

As required by ORS 469A.210, PGE has a 10 percent small-scale renewable requirement, requiring that 10 percent of electrical generating capacity come from renewable resources smaller than 20 MW or qualifying biomass generators starting in 2030.[154] Per Staff

[154] Oregon ORS 469A.210 can be found at https://www.oregonlegislature.gov/bills_laws/ors/ors469a.html.

Recommendation #5, approved via LC 80 Order 24-096, PGE has included a SSR compliance analysis as part of this Update. This compliance analysis provided in this section assesses the forecast SSR need, resource contributions, costs, and acquisition/compliance actions. This will include results from portfolio analysis using a SSR proxy resource. It will also include a discussion of how PGE plans to acquire the needed resources to achieve compliance and a discussion on the current status and potential future status of customer sited resources for SSR compliance.

6.4.1 SSR needs assessment

The SSR need is a function of the nameplate capacity of resource in PGE's baseline portfolio and new resources added through capacity expansion modeling. In the Preferred Portfolio, PGE forecasts an aggregate SSR need of 769 MW in 2030, growing to 1292 MW by 2040 (**Table 34**).

Table 34. Total SSR Compliance Requirement by Year

Year	Preferred Portfolio
<2030	No min. requirement
2030	738 MW
2035	991 MW
2040	1314 MW

6.4.2 Contributions from baseline resource acquisition

Several ongoing resource acquisition pathways contribute to SSR development, including the Oregon Community Solar Program projects, QF development, and CBRE acquisition:

- CSP capacity in 2030: 93 MW
- QF capacity <20 MW under contract to PGE in 2030: 260 MW
- CBRE acquisition forecast for 2030: 155 MW
- Other PGE owned or contracted SSR-eligible projects modeled in 2030 portfolio: up to 51 MW

Per OPUC Order 21-464, net metered (NEM) renewables do not contribute to SSR compliance (or to PGE's aggregate electrical capacity). However, the role of net metered solar in PGE's planning has continued to evolve since 2021 as interconnected NEM solar more than doubled in three years. Improvements in inverter capabilities, increasingly common storage pairing, and advancement of grid planning and management as discussed in Distribution System Plans and PGE's Virtual Power Plant activities all have contributed to the value of solar to PGE's system. PGE's SSR compliance assessment considers NEM solar as a sensitivity. Customer solar deployment by 2030 is forecast to be 675 MW (see **Section 5.2.1.1 Distributed solar (PV)**).

6.4.3 Remaining SSR need

Table 35 summarizes PGE's 2030 SSR compliance position, with and without contributions of NEM. With NEM ineligible to contribute to compliance, PGE's forecasted incremental

compliance requirement in 2030 is 179 MW of SSR resources. With all NEM solar considered as an eligible resource there is no incremental compliance need in 2030 (in this case, the first year in which an incremental need arises is 2036).

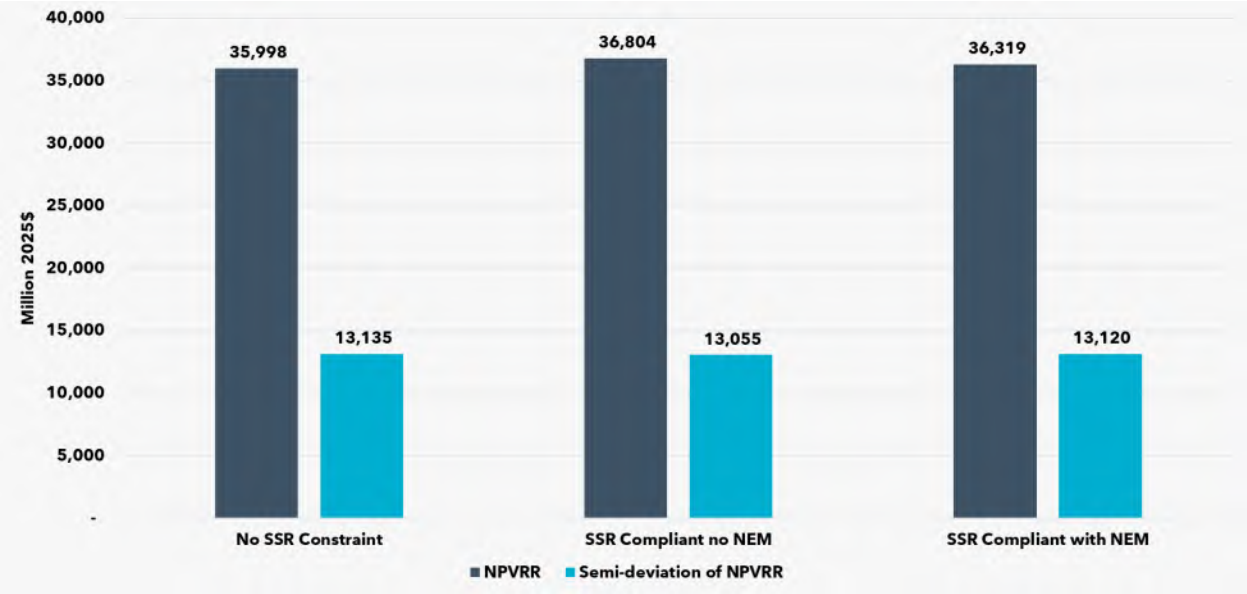
Table 35. SSR Compliance Position, 2030

Compliance Position	All NEM Remains Ineligible	All Customer Sited Eligible
2030 Compliance Need	738 MW	806 MW
Baseline Resource Contribution	560 MW	560 MW
Customer-Sited Contribution	0 MW	675 MW
Incremental Compliance Requirement	179 MW	0 MW

6.4.4 SSR compliance cost assessment

As discussed in **Section 5.4 SSR resource**, PGE used a modeling assumption that SSR resources cost eight percent more and have identical resource characteristics to utility-scale renewables. In order to assess the cost impacts of complying with SSR requirements in every year of the portfolio analysis time-horizon beginning in 2030, two portfolios were constructed. The first portfolio assumes that NEM is not eligible to contribute to compliance ('SSR Compliance No NEM'), and the second assumes that NEM is eligible ('SSR Compliance NEM'). Pairing of NEM solar with storage can increase the value of NEM resources and could plausibly be a consideration in future assessment of SSR eligibility; however, the 'SSR Compliance NEM' scenario does not incorporate any assumptions regarding storage addition. The costs of these portfolios, along with a portfolio that does not enforce SSR compliance, are shown in **Figure 83.** The cost of compliance in each of the two SSR scenarios can be illustrated by comparing the cost of these portfolios against that of the 'No SSR Constraint' portfolio. Results show that over the full analysis time-horizon, procurement of sufficient volumes of SSR resources increases net present portfolio costs by $806 million when NEM is not eligible and $321 million when NEM is eligible (due to costs incurred for compliance after 2036).

Figure 83. Cost Impacts of SSR Compliance



6.4.5 SSR acquisition strategy

As shown in **Figure 83**, significant customer benefit can be realized by reassessing the SSR eligibility of NEM capacity. This change would be fully consistent with Oregon statute as most recently revisited in HB 2021 and require only a Commission order, with no changes to administrative rules. As described in PGE's recent 2024 Distribution System Plan, PGE also is prioritizing deployment of a virtual power plant in which customer resources are harnessed for system benefit, akin to traditional supply-side resources. PGE looks forward to further progress on this topic as a key component of the SSR acquisition strategy.

In addition, PGE is pursuing the following resource acquisition actions, as discussed in the Action Plan:

- CBRE Acquisition
- All-Source Energy and Capacity procurement, in which PGE encourages offers from SSRs

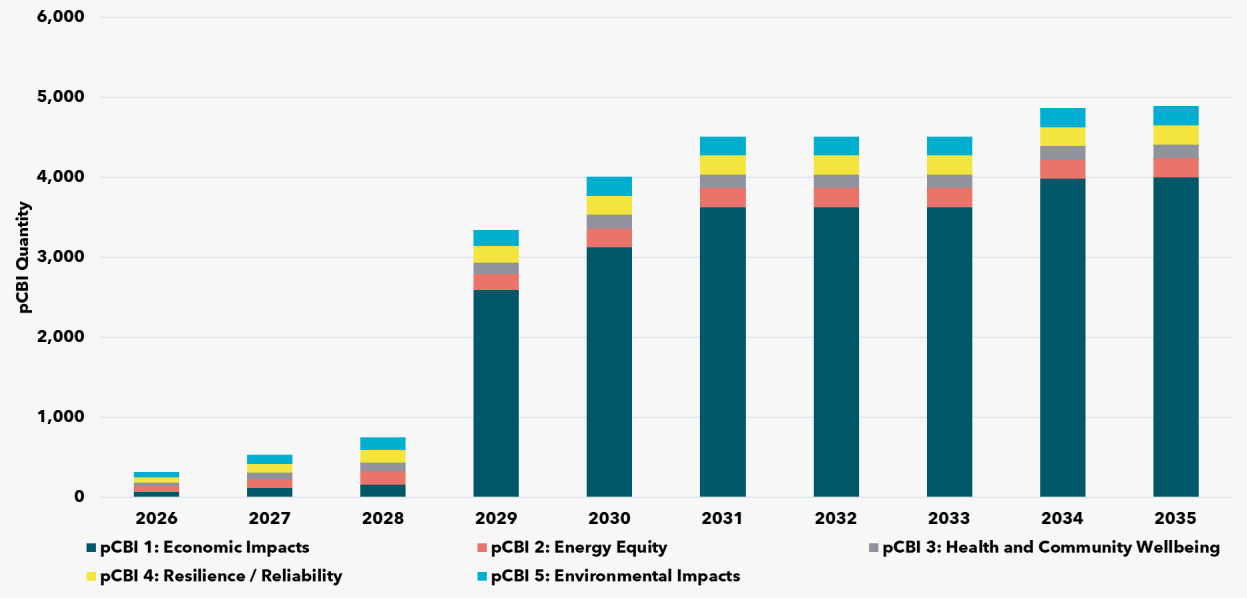
PGE believes incremental SSR procurement should only be pursued to the extent SSRs provide unique community benefits aligned with the CBRE acquisition pathway.

6.5 Portfolio CBIs

The cumulative quantity of each of the five pCBI scoring metrics through 2035 for the Preferred Portfolio are shown in **Figure 84**. A large increase in pCBIs generated can be seen in 2029, driven by the addition of substantial quantities of renewable resources, which generate economic community benefits (pCBI 1) when sited in OR. pCBIs 2-5 are generated by NCE EE and DERs and CBREs only and their quantities can be seen to increase through 2030 as additions of these resources are made to the portfolio. Because NCE EE and DERs and CBREs resources are not available for addition beyond 2030, the quantity of pCBIs 2-5 generated by the portfolio

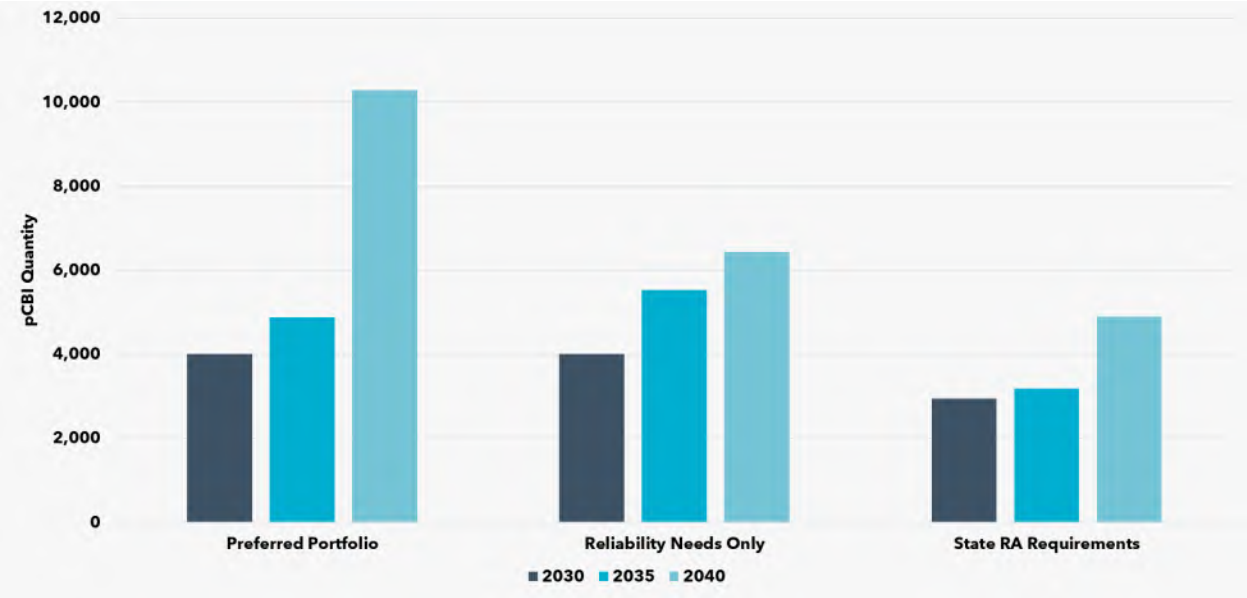
do not increase after 2030. Because of their very similar resource buildouts, the pCBIs generated by the 'rCBI' and three 'Market' scenarios are nearly identical to that of the Preferred Portfolio.

Figure 84. pCBIs of the Preferred Portfolio



Because pCBIs are unitless measures of community benefit, they are most useful in comparing the provision of benefits across alternative scenarios than as an absolute measure of community benefits. The total pCBI quantities of the Preferred Portfolio, and 'Reliability Needs Only' and 'State RA Requirements' scenarios are shown for 2030, 2035, and 2040 in **Figure 85**. Because the Preferred Portfolio has larger quantities of renewable resource additions, it generates more pCBIs than the 'Reliability Needs Only' and 'State RA Requirements' scenarios throughout the study period. In 2030 however, the 'Reliability Needs Only' portfolio generates more pCBIs than the Preferred Portfolio because it has a larger quantity OR renewables, which provide economic impact benefits (pCBI 1) than the Preferred Portfolio which relies more heavily on MT wind (which does not provide economic impact benefits due to it's out of state location). Intuitively, because larger quantities of resource additions generate more pCBIs, more expensive scenarios tend to generate more pCBIs.

Figure 85. Total pCBI Comparison

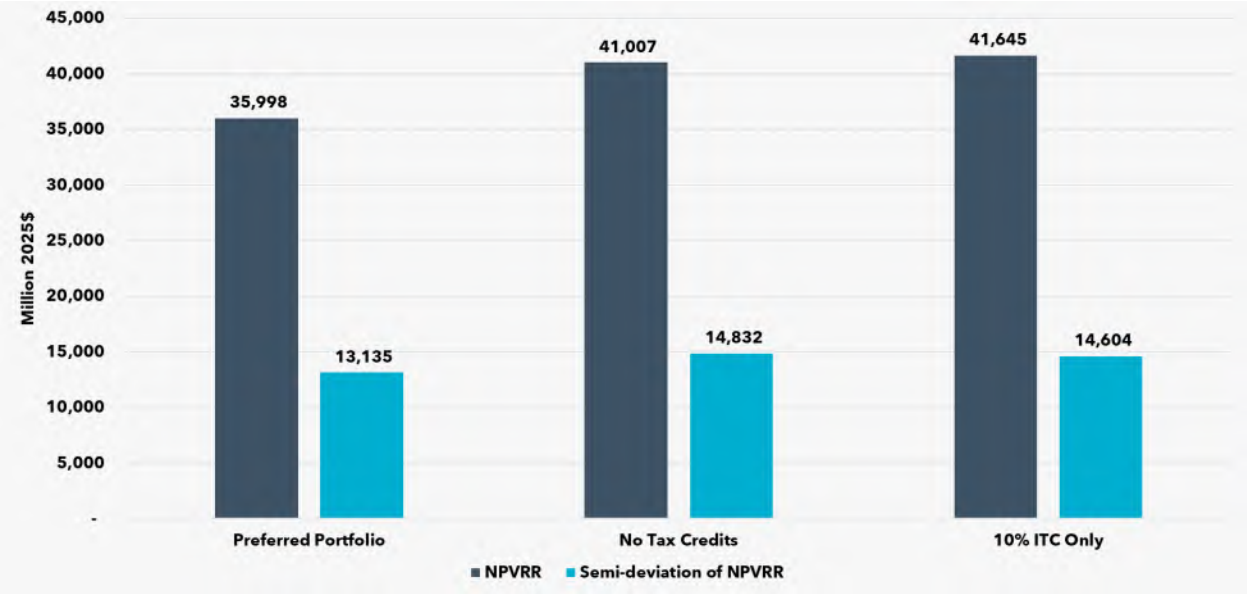


6.6 Federal tax credit availability scenarios

As noted in **Section 5.1.3 Tax credit sensitivities**, PGE's baseline resource cost assumptions assume the same tax credit environment for generation and energy storage resources as described in PGE's 2023 CEP/IRP. To help understand the potential impact on portfolio outcomes of changes to this set of assumptions, two sensitivities are considered: '10 percent ITC Only' and 'No Tax Credits'. In both scenarios, the costs of certain resources are increased relative to baseline assumptions. The impacts on resource costs of the change in assumptions in each of these scenarios are described **Section 5.1.3 Tax credit sensitivities.** The impact on portfolio composition and cost are explored through portfolio sensitivities in this section.

Both tax credit availability scenarios are modeled with identical assumptions to the Preferred Portfolio in every respect except for the changes to resource costs. The impact on portfolio costs and risk over the 20-year planning horizon in these two scenarios is shown in **Figure 86**. Intuitively, because resources are more expensive, portfolio NPVRR of each tax credit scenario is larger than the Preferred Portfolio. Relative to the Preferred Portfolio, NPVRR is $5,647 million larger in the '10 percent ITC Only' scenario and $5,009 million larger in the 'No Tax Credits' scenario. Reduction or removal of federal tax credits also increases the risk of costly outcomes outside of the Reference Case future, with increased semi-deviation of NPVRR across the 351 futures analyzed relative to the Preferred Portfolio.

Figure 86. Cost and risk of tax availability scenarios



Resource additions of the '10 percent ITC Only' and 'No Tax Credits' scenarios are shown in **Figure 87** and **Figure 88**, respectively. Portfolio resource buildouts of the scenarios are nearly identical to the Preferred Portfolio prior to 2032, with resource additions being driven by transmission constraints and the quantity of transmission available to the individual transmission zones. After 2031, the most notable changes associated with the re-optimized resource selection in both scenarios is a substitution of additional MT wind for some of the SE Washington wind in the portfolio. This effect is driven by the fact that a similar absolute increase in costs for both proxy resources produces a smaller relative increase in the cost of MT wind because it is more expensive, making MT wind relatively more cost-effective. In the '10 percent ITC Only' scenario MT wind increases by 570 MW, and in the 'No Tax Credits' scenario MT wind increases by 430 MW. The increases in resource costs did not create a meaningful shift in the relative cost-effectiveness between wind, solar, and storage resources.

Figure 87. Resource additions in 10 percent ITC scenario (MW)

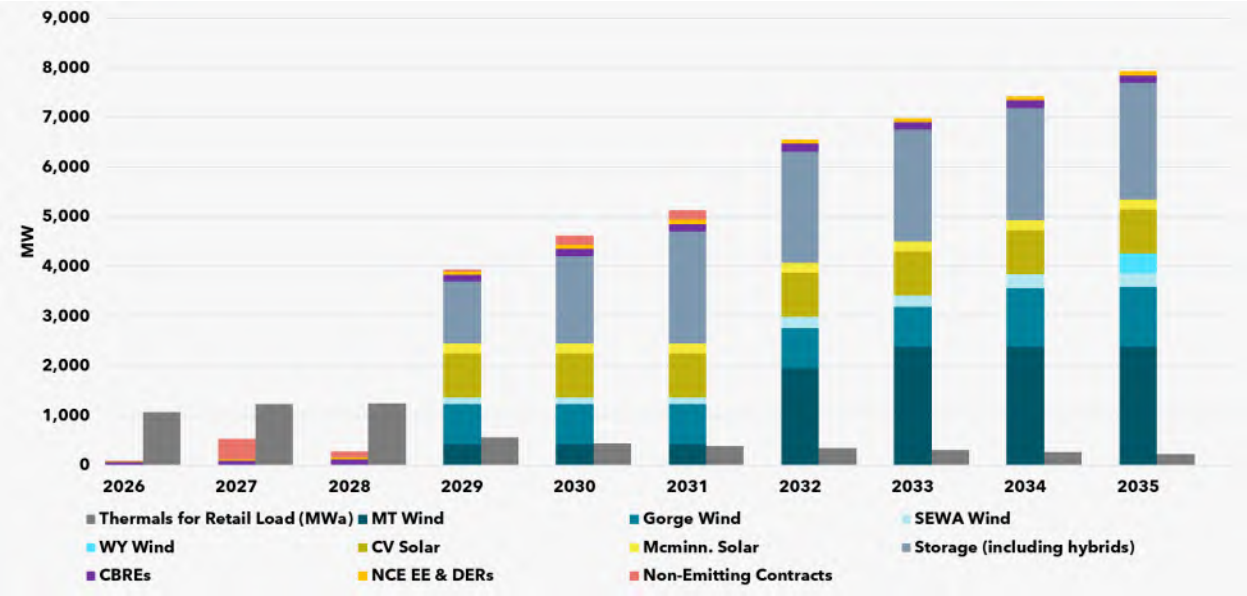


Figure 88. Resource additions in no tax credits scenario (MW)

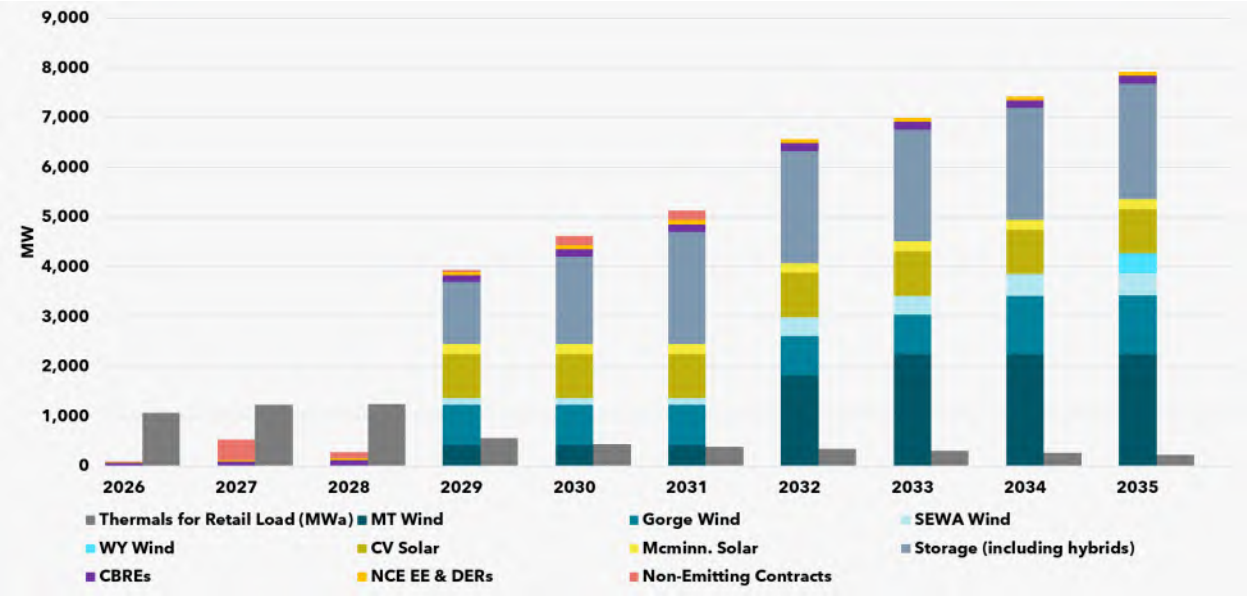


Figure 89 below reflects the annual change in the revenue requirement under all three tax scenarios. This is the incremental cost excluding the baseline existing resource costs. Those costs in addition to the existing portfolio costs results in the portfolio generation cost per MWh shown in **Figure 90**. The most notable changes occur in 2029 and 2040, where the Preferred Portfolio selects a large quantity of resources with large tax credits associated with them. Those cost savings are reduced or removed in the other scenarios.

Figure 89. Annual incremental revenue requirement by tax scenario ($k)

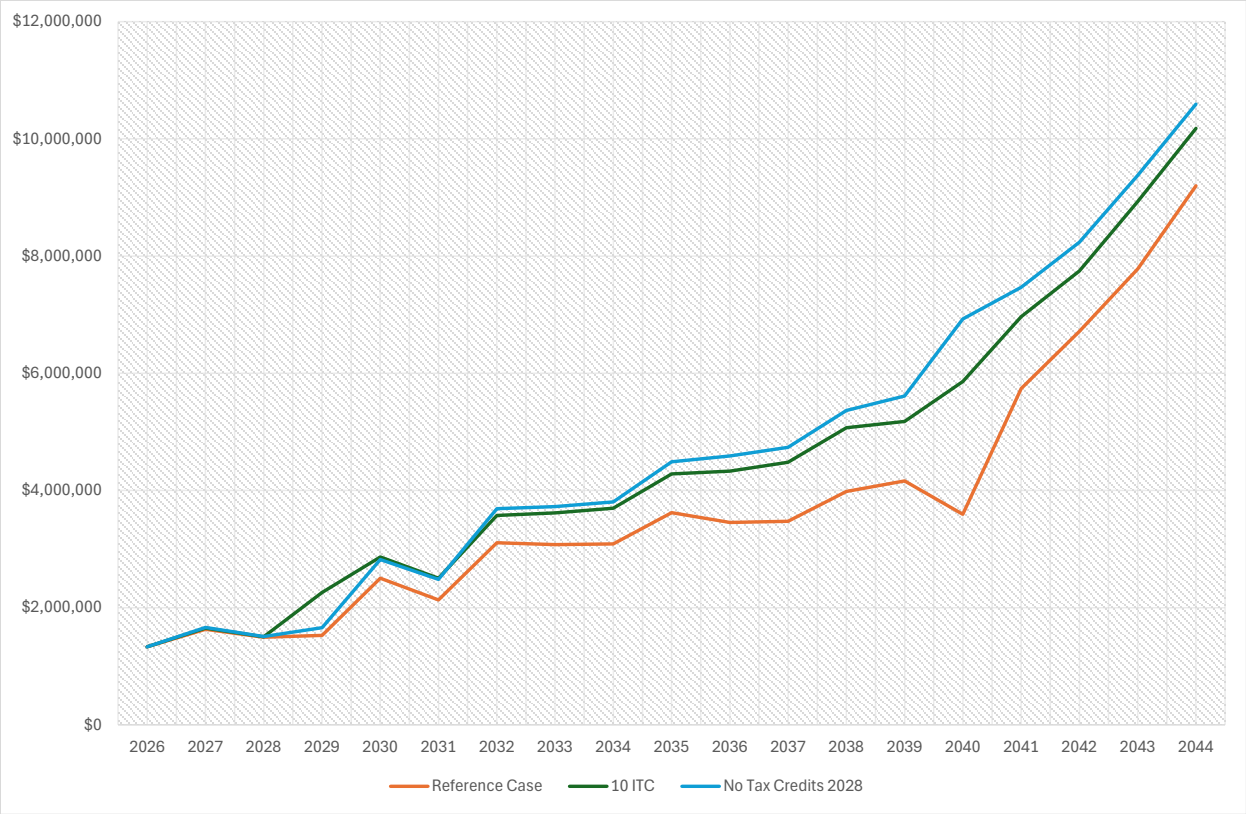
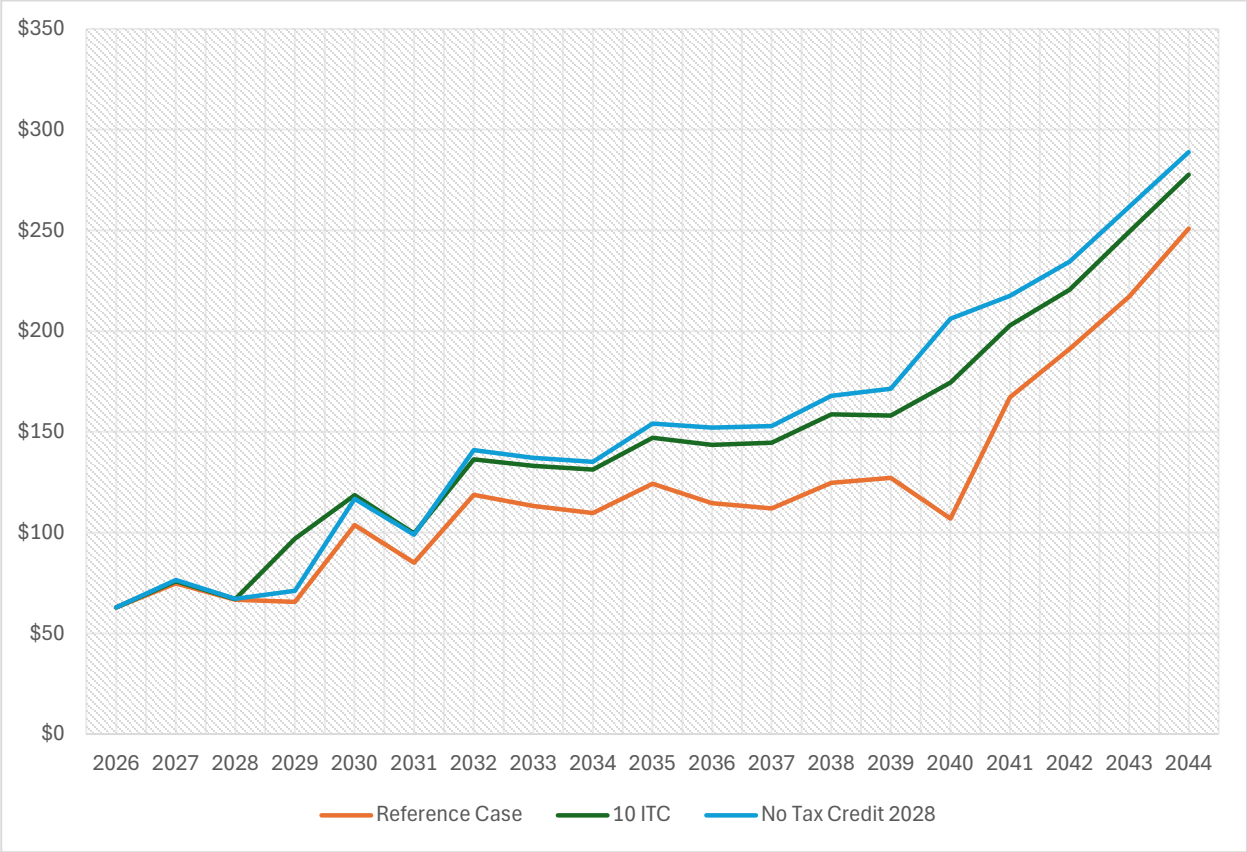


Figure 90. Annual portfolio generation cost by tax scenario ($/MWh)



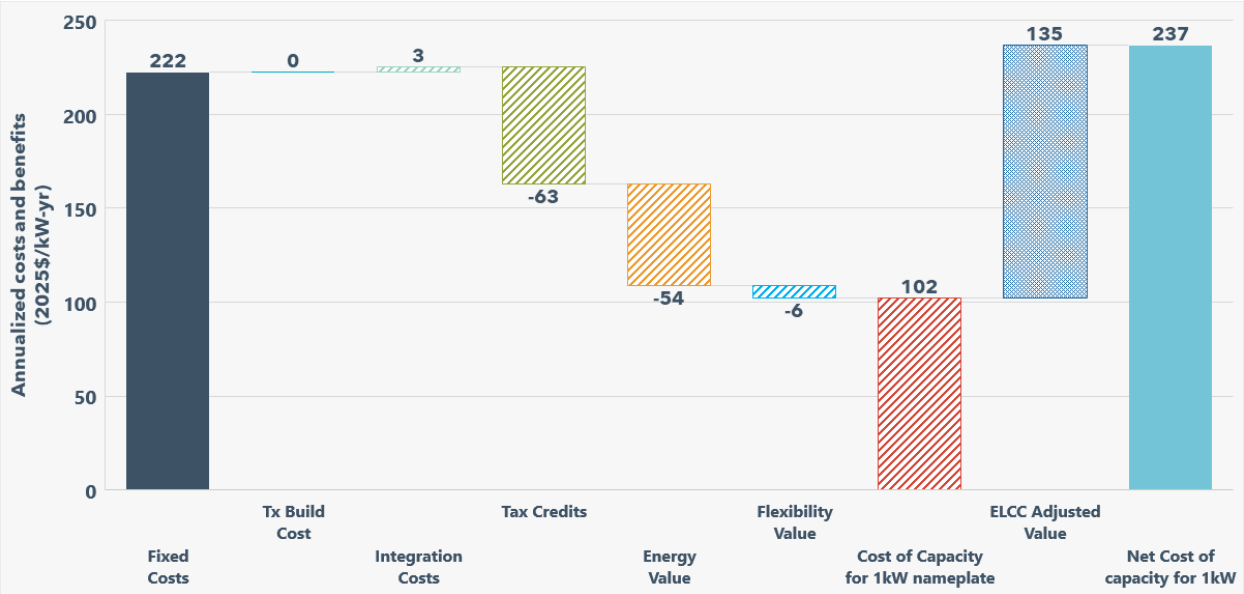
6.7 Net cost of capacity resources

Candidate resources described in **Section 5.1 Resource economics** flow into the portfolio analysis as well as provide inputs to determine resource capacity values and net costs. Additional specific cost or value assumptions to inform net costs are described below. The resource net costs are not used directly in portfolio analysis, though the resulting capacity value is useful for the purpose of comparing resources or for calculating the administratively determined avoided cost payments for resources procured outside of competitive or negotiated processes. This section provides an overview of updates to Section 10.6 of PGE's 2023 CEP/IRP on the net cost of capacity.

The components previously used to derive the net cost of capacity aligned with a 4-hour battery. However, given PGE's growing capacity needs driven by demand growth, reliability, and decarbonization targets, a battery may not be the most representative new resource due to reliable capacity performance limitations, especially in winter months. PGE continues to investigate alternative resource assumptions to inform net cost results. Presented in **Figure 91** is a bridge approach that looks across costs and benefits for each supply-side resource and weights their contribution to a portfolio-blended value based on each resource's nameplate capacity additions by 2030 in the Preferred Portfolio. Dollar amounts are presented on a levelized basis in 2025 dollars.

- The blended net cost of 1 kW nameplate is $102/kW-yr.
    - This amount is calculated as the sum of all the applicable costs net of any benefits (including tax credits) and represents the cost of capacity to procure 1 kW nameplate of the portfolio-blended proxy resource.
- The blended ELCC of the Preferred Portfolio new resource additions in 2030 is 43 percent.[155]
- The net cost of capacity is calculated by dividing $102/kW-yr by the ELCC of 43 percent, resulting in $237/kW-yr.
    - This represents the Net Cost of Capacity.
- The "ELCC adjusted value" noted in **Figure 91** represents the difference between the net cost of 1 kW nameplate and the net cost of 1 kW of capacity contribution.

Figure 91. Deriving the blended cost of 1 kW of capacity contribution



As discussed in **Section 6.2.3.1 Energy sensitivity adequacy assessment of Preferred Portfolio**, long-duration energy storage appears to possess valuable attributes for meeting PGE's future reliability needs. Preliminary analysis indicates that the net cost of capacity for a 100-hour energy storage resource could fall below the $237/kW-yr threshold detailed above. The assumptions of this initial analysis are summarized in **Table 36**.[156]

[155] This ELCC of each individual resource is based on an average of summer and winter firm capacity additions. The portfolio-blended average ELCC weights each resource's ELCC by its nameplate capacity added in the Preferred Portfolio by 2030.
[156] Cost assumptions from: https://formenergy.com/wp-content/uploads/2025/01/Navigating-the-Pacific-Northwests-Energy-Challenges.pdf

Table 36. Proxy 100-Hour Battery Storage Parameters (2030 COD)

Item	Unit	Amount
All-in Overnight Capital	2025$/kW	2,808
Fixed O&M	2025$/kW	24
Real Levelized Fixed Cost	2025$/kW-yr	218
Round-trip Efficiency	%	35
Useful Life	Years	20

Given the framework and assumptions presented above, the Cost of Capacity for 1 kW nameplate of the Proxy 100-Hour Battery Storage resource is detailed in **Table 37**.

Table 37. Proxy 100-Hour Battery Storage Net Cost of 1 kW Capacity (2030 COD)[157]

Net Cost Component	Unit	Amount
Fixed Costs	2025$/kW-yr	218
Energy Value	2025$/kW-yr	0
Flexibility Value	2025$/kW-yr	0
Cost for 1 kW nameplate	2025$/kW-yr	218
Annual ELCC (100 MW)	%	106
Net Cost of 1 kW Capacity	2025$/kW-yr	206

PGE's preliminary analysis estimates the annual ELCC for the first 100 MW addition of 100-hour energy storage at 106 percent.[158] The resulting Net Cost of Capacity for 1 kW of this resource, given the assumptions, would be $206/kW-yr. As noted above, the net cost of capacity is calculated by dividing the cost for 1 kW nameplate by the ELCC ($218 / 106 percent = $206). The Net Cost of Capacity is less than the $237/kW-yr threshold for ELCC values greater than approximately 92 percent.

[157] Energy and Flexibility values are assumed to be zero for the purposes of this exercise.
[158] Annual ELCC is the average of summer and winter ELCCs as estimated in Sequoia for the 2030 Reference case.

Chapter 7. Action Plan

PGE developed the Action Plan for the 2023 CEP/IRP based on the key findings of the Preferred Portfolio in the 2023 CEP/IRP. Though the Preferred Portfolio has been updated several times since (including this Update), PGE is not making changes to the Action Plan from the 2023 CEP/IRP, as the actions included continue to represent the best combination of cost, risk, community benefit, and emission reductions.

Chapter highlights

- PGE is not requesting Oregon Public Utility Commission acknowledgement of this Update and is therefore maintaining the Action Plan that was acknowledged as part of the 2023 CEP/IRP.
- PGE continues to identify the need for more RFPs to procure additional resources for resource adequacy, reliability, and compliance with HB 2021 GHG emissions targets.
- Updated analysis described in this Update suggests resource need has increased.

7.1 Action Plan

The five actions, as acknowledged by the Oregon Public Utility Commission in the 2023 CEP/IRP, are described in the following sections, as are the potential directional changes suggested by the updated portfolio analysis presented in **Chapter 6 Resource plan**.[159] PGE is not requesting acknowledgement of this Update, and this Action Plan is consistent with that acknowledged as part of the 2023 CEP/IRP.

7.1.1 Customer resource action

- *Action 1A. Acquire all cost-effective EE plus additional quantities identified in the CEP/IRP analysis*

PGE planned to acquire all cost-effective energy efficiency, which was forecast to be a cumulative 182 MWa for 2024 through 2028.

PGE identified 53 MWa of additional EE by 2030 as beneficial for customers over the planning horizon. Within this Action Plan window, by 2028, PGE aims to acquire 32 MWa at lowest cost.

Updated ETO forecasts described in **Section 5.3 Energy efficiency** project cost-effective EE to be 173 MWa for 2025 through 2028. PGE will continue to explore opportunities to deploy

[159] In the Matter of Public Utility Commission of Oregon, PGE 2023 IRP and CEP, Docket No. LC 80, Order No. 24-096 (Apr 18, 2024), Appendix A, p.5, available at https://apps.puc.state.or.us/orders/2024ords/24-096.pdf.

sensible EE measures. PGE will also continue to engage with ETO as guiding principles and potential securitization mechanisms regarding utility rate impacts due to cost-effective EE measures that are developed.

- *Action 1B. Incorporate customer demand response*

  PGE planned to enroll distributed flexibility resources that customers choose to provide. By 2028, this is currently forecast to be a total enrollment of:[160]

- *211 MW of summer demand response (Low: 173 MW, High: 343 MW)*
- *158 MW of winter demand response (Low: 127 MW, High: 234 MW)*

Updated forecasts using PGE's AdopDER described in **Section 5.2 Distributed energy resources (DERs)** project increased program participation for a total of 1,269 MW on average from cost-effective DERs in 2030 (a 182 MW net increase from the 2023 CEP/IRP).

7.1.2 CBRE action

- *Action 2: Initiate a CBRE-focused RFP*

  PGE planned to conduct an RFP targeting 66 MW of CBRE resources to come online by 2026.

PGE is conducting a request for offers (RFO) for CBRE resources to support a trajectory towards achieving the target from the 2023 CEP/IRP of 155 MW of CBREs by 2030. PGE's approach to the CBRE RFO has been informed by engagement with and input from community representatives, PGE's CBIAG, potential bidders, and OPUC Staff. Since CBRE is a new type of resource acquisition, PGE has been providing information and exploring appropriate regulatory treatment through regular updates to OPUC Staff. The RFO is open through November 2025, with three rounds of evaluation. PGE anticipates more details and results to be available for the next full CEP/IRP (2026).

7.1.3 Energy action

- *Action 3: Conduct one or more energy RFPs*

  PGE planned to conduct one or more RFPs to add non-emitting resources to support progress toward meeting the 2030 emission targets established in HB 2021. The Reference Case need projected in 2030 was 905 MWa. Through 2028, PGE targeted acquiring 1,254 MWa, or one fifth of that need (251 MWa) per year in the Action Plan (2024-2028).

PGE's baseline portfolio, inclusive of proxy assumptions for procurement from the 2023 RFP, as well as increased EE and DERs, outweigh increased need associated with the new load forecast and other modeling updates. PGE's resulting energy need for 2030 described in **Section 3.3 Energy need** is estimated to be 1204 MWa. This could be thought of as 301 MWa of energy

[160] Demand response values include existing programs.

acquisition necessary in each of the next four calendar years to 2030. At the time of publication of this Update, PGE has two RFPs in progress.

7.1.4 Capacity action

- *Action 4a: Pursue capacity opportunities in the bilateral market*
- *Action 4b: Conduct one or more capacity RFPs*

PGE forecasted significant capacity needs in 2028: 905 MW and 787 MW in the summer and winter, respectively.

Updated analysis described in **Section 3.4 Capacity need** finds PGE's near-term capacity need through 2028 decreased due to supply side additions, namely bilateral contracts, and resource additions modeled as the 2023 RFP Proxy. The updated summer need is estimated at 47 MW in 2026, growing to 485 MW in 2027 with the expiration of hydro contracts with Grant PUD, then drops to 0 MW in 2028 as RFP Proxy Resources enter the modeled supply. In winter, there is 159 MW of need in 2027 that grows through the early years of the analysis period. Actual procurement from the 2023 and 2025 RFPs will seek to fill capacity needs, however, the forecasted near-term need cannot be met by RFP timelines and will therefore need to be addressed by commercial activity in bilateral market purchases.

7.1.5 Transmission expansion action

- *Action 5A: Develop a comprehensive transmission study regarding options to alleviate congestion on the South of Allston (SoA) flowgate*
- *Action 5B: Develop a comprehensive transmission study to explore options to upgrade the Bethel-Round Butte line (from 230 to 500 kV)*

Section 4.6 Transmission options for portfolio analysis describes modeled transmission expansion options through an approach that is consistent with the 2023 CEP/IRP and as informed by new third-party analysis described in **Section 4.5 Third-party assessment of PGE regional transmission options**. Continued study of transmission options will be critical to evaluating access to additional cost-effective clean energy resources ad capacity markets outside of the PNW.

7.2 Conclusion

The 2023 IRP Action Plan, as well as the 2023 and 2025 RFPs are designed to reflect PGE's values and commitment to serving customers with low-cost and clean technologies while mitigating future risks. The Action Plan was developed by estimating system resource needs using forecasts of long-term demand and projections of generation from existing and contracted assets. The difference between that estimated demand and existing supply forms the basis of forecasted system need. To fill that need, all available options and their potential costs and benefits in PGE's system were evaluated. The portfolio analysis was then tailored to answer the most critical questions PGE faces in long-term planning, comparing the relative performance of portfolios

with various combinations of supply-side options. A Preferred Portfolio was created with the best set of incremental resource additions that met system needs while minimizing cost and risk, while maximizing community benefits and considering emissions targets. Finally, an Action Plan was created to act on the key near-term drivers of the Preferred Portfolio. Concurrently with these actions, PGE will continue to work to specify sources of market purchases and accompanying emission rates, utilize funding opportunities to mitigate customer price pressure and implement transmission upgrades within PGE's Balancing Authority and connecting to BPA's system. These actions provide clarity on PGE’s priorities and become a tool for future conversation with customers, communities, stakeholders and the OPUC.

Appendices

Appendix A Federal grant funding

The Oregon Public Utility Commission directed PGE to include a report on federal incentive implementation relevant to resource procurement and transmission development.[161] This section outlines the federal grant programs PGE has engaged with, including awarded grants, denied grants, grants still in application phase and instances where PGE withdrew from the application process. As noted in **Section 2.5.2 Grant funding**, changes at the Federal Administration increase uncertainty to the delivery of funding from grants detailed below.

A.1Grants awarded

Grid Services Demonstration Project – USDOE (GID01)

- Project partners: PGE (Lead), Bonneville Power Administration (BPA), Pacific Northwest National Laboratories (PNNL), Portland State University (PSU), University of Texas, Austin (UTA), GE Vernova
- Description: The proposed project will use technologies at the Wheatridge Renewable Energy Facility to create a demonstration concept to show how different types of active and reactive power controls can transform a renewable resource from a simple intermittent energy source to a resource capable of providing a wide range of grid services, such as inertia, voltage and frequency support. Thermal resources currently provide these services and the need to replace such grid stabilizing services will increase with thermal retirement.
- Areas of focus: Grid resiliency, grid modernization
- Project budget: $9-12 million **($4.5 million grant**; $4.5+ million match)
- Grant Phase: Execution

Park and Charge: Leveraging Utility Pole-Mounted Chargers to Increase Access to Overnight EV Charging in Portland, Oregon (GID13)

- Project partners: Portland Bureau of Transportation (PBOT) (Lead), PGE, Pacific Power, Forth, PSU, National Renewable Energy Laboratory (NREL), Columbia-Willamette Clean Cities Coalition
- Description: This project leverages PBOT's jurisdiction over parking policies and permitting of the public right-of-way (ROW) as well as PGE and Pacific Power's existing utility poles to offer an innovative charging solution that is low-cost, scalable, equitable, and accessible. This project will site and deploy 50 Level 2 EV chargers (40 by PGE) on utility-owned poles in the public ROW in existing on-street parking spaces with a focus on underserved communities who lack access to at-home charging.

[161] ORDER NO. 24-096 Staff Recommendation 8 available here: https://apps.puc.state.or.us/orders/2024ords/24-097.pdf

- Areas of focus: EV Adoption
- Project budget (PGE): $**40,000** PGE grant share
- Grant Phase: Execution

Quality Green Jobs Regional Challenge – Jobs for the Future (1st, 2nd , and 3rd phases) (GID14)

- Project partners: Oregon Clean Energy Coalition members (PGE applied on behalf of the Oregon Clean Energy Coalition)
- Description: The Quality Green Jobs Regional Challenge is an initiative that will invest nearly $5 million in communities across the country to develop and implement regional quality green job strategies reaching 25,000 individuals. The OCEWC was one of six regions chosen to participate in all three phases of the challenge. The first phase focused on engagement with key partners including labor, CBOs, employers, governments, and employers. The second phase of the grant focused on building a Quality Green Jobs Agenda included strategies for training and placing Oregonians into jobs within the clean energy sector as well as a statewide market assessment. Phase three will develop and implement an outreach and education model that will work with partners across the state to train and place 5,000 Oregonians in the clean energy sector.
- Areas of focus: Workforce development
- Project budget (PGE): $**10,000 (first phase); $75,000 (second phase); $750,000 (third phase). Pure grant,** no cost share requirement.
- Grant Phase: Execution

Bethel-Round Butte Transmission Line Upgrade (PGE a sub-applicant) - USDOE GRIP (GID05)

- Project partners: Confederated Tribes of the Warm Springs (CTWS) Lead, PGE
- Description: This project, a partnership between the CTWS and PGE, will upgrade the existing 230 kV Bethel-Round Butte Transmission line to 500 kV. The project will accelerate the much-needed development of transmission capacity, enabling new carbon-free generation in Central and Eastern Oregon to reach customer demand loads in Western Oregon, including PGE service territory. Grant funds will directly off-set PGE capital investment costs. The added capacity and associated upgrades will also increase resiliency of the transmission system as well as resiliency of the CTWS Tribal communities by increasing resources available to the Tribes to support adaptation and response strategies. Engineering studies are underway which may impact final project design. Project discussed in **Section 4.6.1 Bethel-Round Butte upgrade**.
- Area of focus: Grid modernization, reliability, decarbonization

- Project budget: ~$860 million ($**250 million grant,** $363 million match over 8 years)
- Grant Phase: Execution

Accelerating and Deploying Grid Edge Computing – US DOE GRIP Grant (GID02): DE-GD0000901

- Project partners: PGE (Lead), Oregon State University, Saturday Academy
- Description: The U.S. DOE selected Portland General Electric (PGE) for a $50 million matching funds grant to deploy Grid Edge Computing (GEC) at approximately 90,000 locations by 2029, across approximately 10 percent of its customer base. GEC is a combination of advanced computing power and software applications deployed on devices at the grid edge, accelerating PGE's grid transformation. The project will use near real-time information from edge computing devices to improve visibility of the electrical system, provide operational insights and improve outage response, and ultimately help to anticipate and mitigate the impacts of extreme weather on grid resiliency. Anticipated benefits include:
    - Local decision-making: Grid adjustments, like demand response, can potentially be made autonomously at the edge
    - Better integration of DERs: Seek to manage and optimize DERs such as EVs and storage at the grid edge
    - Near-Real-time monitoring and control: Detect and respond to grid issues, such as dynamic DER capacity constraints or issues with power quality
    - Improved reliability and resilience: Edge systems ensure critical functions are maintained even during network disruptions or cyberattacks. Customers benefit from fewer outages and more consistent energy delivery.

  Through edge computing and advanced algorithms that collect and analyze grid-edge data, this project will demonstrate how GEC can help accelerate the transformation of PGE's distribution system and help it meet clean energy targets. Advancements from this project that will accelerate grid transformation will be demonstrated through five technical use cases: 1. Real-time grid visibility, 2. Dynamic (near-real-time) DER local capacity insights, 3. DER integration and optimization, 4. Validating DER performance, and 5. Enhanced Grid Resiliency.
- Area of focus: Grid reliability, grid resiliency, grid modernization
- Project budget: Approximately $115 million ($50 million grant; $65 million match)
- Grant Phase: Post award execution

Renewable Hydrogen Production and Generation – USDOE (GID04)

- Note: June 4, 2025, PGE is withdrawing from this grant given the exit of an essential project partner, challenging project economics for utility customers, and potential federal policy changes. PGE does not see a viable path forward for the Boardman Hydrogen Project at a manageable cost.

  Note: PGE is withdrawing from this grant effective June 4th given the exit of an essential project partner, challenging project economics for utility customers, and potential federal policy changes. As a result, PGE does not see a viable path forward for this project at a manageable cost.

- Description: The project will install electrolyzers at PGE's Boardman site in Morrow County to produce hydrogen from renewable electricity, along with on-site storage and hydrogen-only peaker turbines to supply PGE customers with dispatchable non-emitting electricity. The project will also install a pipeline to the Port of Morrow to supply industrial hydrogen uses. Toward the end of the decade the project may add a hydrogen-only pipeline further east to the Port of Umatilla and Pendleton to supply additional uses of clean hydrogen. Project discussed in **Section 5.6.2 Hydrogen and ammonia**.
- Area of focus: Production of hydrogen from renewable electricity; energy storage; use of renewable hydrogen for industrial uses and power generation
- Project budget: $600K Phase 1 to PGE.
- Grant Phase: Execution

Critical Sector Job Quality – USDOL (GID03)

- Project partners: Oregon Clean Energy Workforce Coalition (PGE applied on behalf of the coalition), Clackamas Workforce Partnership, East Cascades Works, Oregon Building Trades and Construction Council, Bricklayers Local 1, Ironworkers Local 29, Cement Masons Local 555, Oregon Department of Corrections, CTWS, Oregon Higher Education Coordinating Commission
- Description: The Coalition's demonstration projects will support building the much-needed clean energy workforce in two distinct areas of the state – Clackamas County and Central Oregon. The first demonstration project will provide a 12-week pre-apprenticeship construction program to adults in custody that are getting ready to transition out of the correctional system. The second demonstration project will provide career learning and career exposure opportunities to opportunity youth (those not connected to work or school).
- Area of focus: Workforce development
- Project budget: Approximately **$3 million** from US Department of Labor; no cost share requirement
- Grant Phase: Execution

Proactive Human-Machine Teaming Enabled Cybersecure Technologies – USDOE Cybersecurity, Energy Security, and Emergency Response (CESER) (GID25)

- Project Partners: Pacific Northwest National Laboratory (PNNL) (Lead), University of Central Florida (UCF), New Jersey Institute of Technology (NJIT), Siemens Technology, PGE, and Florida Power & Light
- Description: The project will develop, validate, and field demonstrate (via red-team testing) human-machine teaming enabled AI/ML tools and algorithms (acronym: 'PROTECT') for operators to perform real-time detection, precise localization, and appropriate mitigation for a wide range of cyber-attacks on DER operations data. The proposed solutions primarily target the cybersecurity enhancement in a DER Operations Center (e.g., DMS/ADMS, DERMS, and DER Aggregators).
- Area of focus: Cyber security
- Project budget: $3.5 million over 3 years; $**200K** PGE no cost share
- Grant Phase: Execution

Forecasting Load and Demand Response during Heat Waves through Large-Scale Sensing and Data Fusion – USDOE (GID35)

- Project Partners: Lawrence Berkeley National Laboratory (LBNL) (Prime), PGE, NREL, AutoGrid
- Description: This project aims at developing novel methods and applications – based on large-scale sensing and data fusion techniques – to estimate the system load during heat waves, provide better forecasts for DR resources, unlock building demand flexibility, and provide information to utilities and ISOs on the process of planning emergency rotating power outages.
- Area of focus: Grid Resilience, Grid Modernization
- Project budget: $1.6 million, PGE In-kind only and no cost share
- Grant Phase: Close Out

Western-based Analysis of Distributed Battery Storage System Emission Benefits and Tradeoffs – USDOE (BENEFIT) (GID34)

- Project Partners: Johns Hopkins University (Prime), PGE, NREL, Columbia University, Arizona Public Service, Rocky Mountain Power, Mandalay Homes, SolarEdge, Sonnen
- Description: This team will evaluate the dispatch and emissions impacts of over 3,000 BESSs associated with residential utility programs in operation across three western-based utilities: APS, RMP, and PGE. The project team will also rely on product manufacturing partners (i.e., Sonnen, Mandalay Homes, and SolarEdge) to gather complementary data on the dispatch,

lifecycle emissions, and related impacts of over 20,000 BESSs nationwide. This information can be used to validate the existing emission benefits/opportunities for BESS, while modeling pathways to co-optimize emission reductions with benefits to the homeowner and utility grids.

- Area of focus: Grid Resilience, Grid Modernization
- Project budget: $1.6 million, PGE In-kind only and no cost share
- Grant Phase: Execution

Sensor Placement, Monitoring, and Data Analytics Platform (Sensor-MAP) – USDOE SETO (GID42)

- Project Partners: NREL (Prime), PGE, Duquesne Light Company (DLC), Open Systems International (OSI), Virginia Tech, Oakridge National Labs (ORNL)
- Description: National Renewable Energy Laboratory (NREL), in collaboration with Portland General Electric (PGE), DLC, OSI, ORNL, and Virginia Tech, proposes to develop and demonstrate Sensor Placement, Monitoring, and Data Analytics Platform (Sensor-MAP), and develop an extensible open-source software suite to perform multistage probabilistic optimal sensor selection and placement that includes observability quantification at both the system and individual state levels; steady-state and dynamic state estimation applications for distribution grids (D-SSSE and D-DSSE) with high levels of distributed energy resources (DERs), including solar photovoltaics (PV); and dashboards for enhancing situational awareness.
- Area of focus: Grid Resilience, Grid Modernization
- Project budget: $3 million, PGE In-kind only and no cost share
- Grant Phase: Negotiation

North Plains Connector – USDOE GRIP (GID20)

- Project Partners: Montana Department of Commerce (Prime), North Plains Connector LLC, Allete Inc, Standing Rock, Northern Cheyenne, Crow Agency, NorthWestern Energy, Basin Electric Power Cooperative, Montana-Dakota Utilities, Minnkota Power Cooperative, PGE, Puget Sound, Avista Utilities, Otter Tail Power Company, Berkshire Hathaway
- Description: NPC is a transformative transmission project that will establish a new 3,000 MW connection between Montana and North Dakota and the eastern and western electrical grids. Project discussed in **Section 4.6.5 North Plains Connector**.
- Area of focus: Grid modernization
- Project budget: Approximately $3.7 billion ($700 million grant (10 percent apportioned for Colstrip Transmission System upgrade); $140 million grant benefit to PGE)

- Grant Phase: Negotiation

Hydropower Incentives – USDOE (GID07, GID37, GID38, GID40)

- Project partners: PGE (Lead), Confederated Tribes of the Warm Springs
- Description: Hydropower facility resiliency, dam safety, and environmental projects at multiple facilities that meet the requirements of the FOA for improvements. Projects proposed at Pelton-Rd Butte, Blue Heron and TG Sullivan plants, and Faraday. Each FERC licensed area is eligible for up to $5 million in grants (70 percent cost share required). Administrative costs incurred by existing PGE staff.
- Area of focus: Hydropower operations
- Project Budget: **$11.3 million** from US Department of Energy for 4 sites
- Project Phase: Negotiation

A.2 Full applications submitted

Oregon Dept of Energy (ODOE) IIJA Resilience Grants - USDOE and ODOE (GID55)

- Project partners: PGE (Lead)
- Description: State formula grants from USDOE to ODOE to enhance electrical grid resiliency and mitigate impacts of wildfires. PGE proposes to expand the microgrid at the Salem Smart Power Center to enhance reliability to several City and State facilities.
- Areas of focus: Grid modernization, Grid resiliency, wildfire mitigation
- Project Budget: Up to $5.54 million ($5.54 million match)

Geothermal with Confederated Tribes of Warm Springs (CTWS) – USDOE (GID63)

- Project Partners: CTWS (Lead), PGE
- Description: Geothermal Resources' Value in Implementing Decarbonization
- Area of focus: Grid Resiliency, Grid Modernization
- Project budget: Grant $1.5M, No cost share requirement

A.3 Application interviews

Distribution System Operator with Virtual Power Plants, Dynamic Operating Envelope, and Competitive Market-Choice (DSO+3) – USDOE STRIVES Topic 1 (GID59)

- Project partners: PNNL (Lead), PGE, Oregon State University (OSU), University of Nevada, Reno (UNR)
- Description: Demonstration of a distribution system operator (DSO) model using (1) virtual power plants (VPP) operating in different modes with different parameters by different entities, (2) a topology- and physics-based dynamic operating envelope (DOE) function managed by the DSO, and (3) competitive market choice (CMC) for consumers through VPP selection and VPP diversity.
- Area of focus: Grid Modernization
- Project Budget: $3 million max grant

A.4 Grants not awarded

Bethel-Round Butte Middle Mile Fiber Project – NTIA (GID33)

- Project partners: PGE (Lead), Peak Internet, Link Oregon
- Description: The project will install a new fiber optic communications cable on the Bethel-Round Butte 230kV transmission path. Peak internet is partnering with PGE to provide broadband services to underserved communities along the transmission path and other partners will benefit from increased communications capabilities for university networks. PGE and BPA will partner to swap fibers for the benefit of both organizations in protecting critical generation and transmission infrastructure.
- Areas of focus: Broadband communications, grid resiliency
- Project budget: $65 million ($30 million grant; $35 million match)

Cybersecurity for Distributed Energy Resources – USDOE (CESER) (GID29)

- Project partners: NREL (Lead), PGE, Iowa State University, Portland State University, OpenEGrid, Avangrid, Xcel Energy
- Description: Develop a cyberattack-resilient DER infrastructure and communications architecture to comprehensively address confidentiality, integrity, and availability requirements in DER communications.
- Area of focus: Grid modernization

Carbon Optimization Framework for Energy Emissions (COFFEE) Grant (Non-IIJA) - USDOE

- Project partners: PGE (Lead), NREL, PSU

- Description: The COFFEE project aims to create a usable and repeatable guide for how to operate and optimize Battery Energy Storage Systems (BESS) and Electric Vehicle (EV) programs for decarbonization.
- Area of focus: Decarbonization
- Project budget: ~$1.5 million ($1.2 million grant, $300,000 match)

Distribution Grid Modernization for Reliability and Wildfire Risk Reduction – USDOE GRIP (GID08)

- Project partners: PGE (Lead), EPRI, PNNL
- Description: The Distribution Grid Modernization project will accelerate the modernization of the distribution grid with the implementation of a variety of technologies like distribution automation and early fault detection along with hardening techniques such as undergrounding of high voltage lines and the installation of covered conductors where appropriate within PGE's High Fire Risk Zones.
- Areas of focus: Wildfire mitigation, grid reliability, grid modernization
- Project budget: Approximately $213 million ($100 million grant; $113 million match)

Enhanced Wildfire Awareness Technologies and Visualization Platforms to Support Public Safety and Community Awareness Initiatives (PGE a sub-applicant) - USDOE GRIP (GID031)

- Project partners: EPRI (Lead), PGE, other confidential partners
- Description: The proposed project will enhance and unify situational awareness capability for wildfire incidents by deploying transformational technology solutions including AI enhanced imaging technologies and multi-purpose micro weather stations that would be integrated into a geospatially referenced data visualization system.
- Area of focus: Wildfire mitigation, grid modernization
- Project budget: Approximately $5 million ($2.5 grant; $2.5 million match)

Operation and Planning Tools for Inverter-Based Resource Management and Availability for Future Power Systems (OPTIMA) – USDOE (GID11)

- Project partners: WSU (Lead), PGE, Utilidata, SW Power Pool, Texas A&M, San Diego State University, Grid Protection Alliance
- Description: In this project, we propose the use of synchronized measurements, both synchrophasors and synchronized point-on-wave measurements, for deriving intelligence on the operational impact of IBRs on power grids.
- Area of focus: Grid modernization, Grid resiliency

Mt. Hood Corridor Resiliency Project (2022-2025) – FEMA (BRIC Grant) (GID16)

- Project partners: Clackamas County (Lead), City of Portland, PGE
- Description: The Mt. Hood Corridor Resiliency Project is a multi-phased critical infrastructure project supporting the resiliency of community lifelines in the northern region of the state. Stage 1 would underground the transmission and distribution lines that power the Bull Run Watershed, which is the primary drinking water supply for nearly one million people in the cities of Gresham, Portland, Fairview, Sandy, and Tualatin. This is the third attempt at this grant.
- Areas of focus: Wildfire mitigation, grid resiliency, grid modernization
- Project budget: Approximately $88 million ($50 million grant; $38 million match)

Undergrounding Powerlines to Reduce Wildfire Risk in National Forests 2024 – IFNF (GID46)

- Project Partners: PGE (Prime), USFS
- Description: Portland General Electric proposes partnering with the U.S. Forest Service to underground powerlines to reduce potential fire starts in a high wildfire risk zone of the Mt. Hood National Forest.
- Area of focus: Wildfire Mitigation
- Project budget: $500,000 (No Match)

Powering Climate and Infrastructure Careers Challenge - Families and Workers Fund – Private (GID28)

- Project Partners: Confederated Tribes of the Warm Springs (lead), PGE, Oregon Clean Energy Workforce Coalition
- Description: The project will support training the workforce needed to enable the state's clean energy transition with a particular focus on providing opportunities for tribal members in pursuit of the tribe's renewable energy development goals on the reservation.
- Area of focus: Workforce development
- Project budget: $1.5 million

Western Bounty Transmission - USDOE GRIP (GID19)

- Project Partners: Nevada Governor's Office of Energy (Prime), ENGIE North America, PGE, Los Angeles Department of Water and Power

- Description: A transformational project that will substantially increase transmission capacity throughout the Western Interconnection on an inter-regional basis while unlocking and enabling between 15-29GW (or more) of otherwise inaccessible high-quality remote renewable resources. Western Bounty is a multi-terminal and bi-directional voltage source converter (VSC) high voltage direct current (HVDC) system in a "hub and spoke" arrangement.
- Area of focus: Grid modernization
- Project budget: Approximately $12 billion ($1 billion grant, $11 billion match) PGE support only, no matching funds

Scale Smart Managed Charging and Enhance Grid Resilience through Enriched Grid Edge DERMS (DSO+3) – USDOE Connected Communities Topic 1A

- Project partners: PGE (Lead), OSU
- Description: Enrich PGE's Grid Edge Distributed Energy Resource Management System (DERMS) integrations to scale Smart Charge Management to more EVs in PGE's territory and to inform investigation of scalable, utility-side load optimization strategies and grid resiliency support.
- Area of focus: Grid Modernization
- Project Budget: ~$3 million

An Energy Resilience Planning Tool for PGE – USDOE CESER

- Project Partners: PGE (Prime), PNNL
- Description: PGE and PNNL have assembled an integrated team driven by common goals, led by experts in the key research areas, and supported by PNNL's institutional capabilities related to data hosting, live data feeds, high-performance computing, cybersecurity, all aspects of grid operations, T&D modeling, and energy assurance planning. PGE's EGRASS platform will leapfrog current solutions by integrating varied multi-hazard impacts into a high-resolution T&D system. The statistical analyses and microclimate forecasts will lead to more accurate outage forecast in advance of actual outages, minimizing customer impacts.
- Area of focus: Grid Resilience
- Project budget: Approximately $3.5 million ($1.2 million grant, $1.3 million match)

Wildfire and All Hazards Modeling and Mitigation Consortium – USDOE GRIP (GID09)

- Project partners: Avista Utilities (Prime), PGE, Chelan County Public Utility District, City of Drain, City of Monmouth, Consumers Power, Forest Grove Light & Power, Blachly-Lane Electric Cooperative, Clark Public Utilities, Northern Lights, Inc., Douglas Electric

Cooperative, Puget Sound Energy, Inland Power & Light Company, Kootenai Electric Cooperative, Northwestern Energy, Lawrence Berkeley National Lab, Pacific Northwest National Lab

- Description: Avista Utilities is partnering with utility experts from across the Pacific Northwest, National Laboratories, universities, and private innovators to combat increased wildfire and all hazard threats to the electrical distribution system. The consortium will develop a granular wildfire risk model and methodology, and high-definition weather model, enhancing all consortium members' ability to assess wildfire risk and inform all hazards mitigation decisions. The weather model will enable consortium utilities to better assess impacts and minimize operating risks to the electrical system from extreme weather events, including fire weather, in both real-time and for the planning horizon.
- Areas of focus: Wildfire mitigation, grid resiliency, grid modernization
- Project budget: Approximately $507 million ($250 million grant; $257 million match)

Mobile Batteries for Adaptive Resilience – USDOE GRIP (GID17)

- Project Partners: Avista Utilities (Prime), PGE
- Description: DOE funding would allow the project partners to develop and deploy an innovative battery solution to provide a more adaptive and resilient grid. Each microgrid will include one or more interfaces for fast connection of mobile energy storage systems, plus allow for expansion to include solar, EV charging, and additional storage.
- Area of focus: Grid resilience
- Project budget: Approximately $40 million ($20 million grant; $20 million match)

West Coast Real-Time Inertia Measurement Project – USDOE GRIP (GID21)

- Project Partners: RT Technologies USA INC. (Prime), CAISO/RC West, Southern California Edison, PacifiCorp, PGE, and EPRI
- Description: RT has developed an innovative, first of a kind technology which provides operators with access to unique highly accurate, continuous and direct, real-time inertia measurement and analytics data for the grid. GridMetrix® uses this patented, world-first, breakthrough method to maximize the safe and reliable integration of renewable energy. Grid operators can now make informed decisions about inertia level and renewable grid frequency stability. With a stable grid and rapidly scaling up renewables and scaling down fossil fuels, a net zero carbon grid can be achieved safely, reliably, and faster.
- Area of focus: Grid modernization
- Project budget: Approximately $30 million ($15 million grant, $15 million match)

Grid Copilot for an Electrified, Decarbonized & Empowering Grid – USDOE (GID61)

- Project Partners: GE Vernova (Prime), Florida Power & Light, Duke Energy, Commonwealth Edison, Portland General Electric, Avista Utilities, Alfred University, University of Central Florida, University of California Riverside, Amazon Web Services
- Description: Grid Copilot is powered by a physics-informed artificial intelligence (AI)-based digital twin of the grid, overcoming limitations with traditional engineering techniques, in providing real-time and predictive monitoring and situational awareness analytics, robust recommendations and automated solutions for digital grid control, big data validation and cleaning, online simulation coach to train utility workforce, and an agent to engage developers and communities suggesting a diverse mix of energy resources for accelerated interconnection.
- Area of focus: Grid Resilience/Modernization
- Project budget: Approximately $200 million ($100 million grant, $100 million match)

Weavegrid – USDOE GRIP (GID62)

- Project Partners: Weavegrid (Prime), PGE, Avista, PSE, PG&E, SCE, BGE, Xcel, Alabama Pwr, Georgia Pwr, TEP, PEPCO, Orange & Rockland, Eversource, Luma
- Description: Managed EV charging to enhance grid resilience.
- Area of focus: Grid Resiliency, Grid Modernization

Vegetation-based ignition risk characterization and comprehensive near-term wildfire risk mitigation – USDOE CESER

- Project Partners: GE Vernova (Prime), WSU, PGE
- Description: GEVAR team is proposing to create a comprehensive framework and tools to mitigate wildfire risk with optimized vegetation management and Public Safety Power Shutdown (PSPS) events as well as minimize the impact of PSPS on the communities.
- Area of focus: Grid Resilience
- Project budget: Advisory Committee Only

Hydropower Incentives – USDOE (GID39, GID41)

- Project partners: PGE (Lead), Confederated Tribes of the Warm Springs
- Description: Hydropower facility resiliency, dam safety, and environmental projects at multiple facilities that meet the requirements of the FOA for improvements. Projects proposed at Pelton-Rd Butte, Blue Heron and TG Sullivan plants, and Faraday. Each FERC licensed area is eligible for up to $5 million in grants (70 percent cost share required).

- Area of focus: Hydropower operations
- Project Budget: $11.3 million across multiple sites

A.5 Pending grant opportunities awaiting federal guidance

Distribution Grid Technology and Modernization Partnership – USDOE GRIP (GID06)

- Project partners: PGE (Prime), Umatilla Electric Coop, Eugene Water & Electric Board, Clark Public Utilities, Pacific Northwest National Labs
- Description: This project concept aims to remove barriers to participation by leveraging the ADMS and DERMS system already in service at PGE's state of the art Integrated Operations Center (IOC). A new, replicated system will be stood up for consortium utilities to manage and operate their distribution networks, in a secure geofenced segment of the system.
- Areas of focus: Grid modernization, DER integration
- Project budget: Approximately $100 million ($50 million grant; $50 million match)

Data Center Flexibility as a Grid Enhancing Technology - USDOE GRIP (GID18)

- Project Partners: Virginia Department of Energy (Prime), Maryland Clean Energy Center, Oregon Department of Energy, North Carolina Department of Environmental Quality, Amazon, Rappahannock Electric Cooperative, PGE, Georgia Power, PacifiCorp, North Carolina Electric Cooperatives, (Exelon), Intel, LevelTen Energy, Grid Forward
- Description: Utilities will invest in a range of grid-enhancing technologies to expand transmission capacity and support the more flexible interconnection of large data center loads. DC operators will leverage on-site generation, storage and load control capabilities to support regional grid operations. The utilities, operators and state energy officials will collaborate on potential new tariff designs, utility programs and cost-benefit assessments to replicate the concepts and capabilities demonstrated.
- Area of focus: Grid modernization
- Project budget: Approximately $700,000,000 ($250 million grant; $450 million match)

Agentic AI for Automated Interconnections – ConnectWerx, USDOE (GID67)

- Project Partners: ThinkLabs AI (Lead), PGE, ISO New England, NYISO, National Grid, TVA, UC Riverside
- Description: This project is expected to provide guidance on existing interconnection process and bottlenecks, data needed for building the AI models, evaluate results of AI-assisted analysis and compare against existing approach, and potential deployment in appropriate Cloud environment for end-to-end testing.

- Area of focus: Grid Modernization
- Project budget: Grant $12M+, No cost share requirement

Connected Communities – TechWerx (USDOE) (GID68)

- Project Partners: Resource Innovations (Lead), PGE
- Description: Resource Innovations will develop a platform to take in AMI and program participation data and produce per-participant, hourly grid impacts for demand response and flexible load measures that account for load diversity.
- solutions to support decarbonization and grid modernization efforts.
- Area of focus: Grid Modernization
- Project budget: Grant $1M, No cost share requirement

Appendix B Sequoia methodological update

PGE made one methodological update in Sequoia as part of the 2023 CEP/IRP Update. The result of this methodological change allows Sequoia to model the most recent 30 years of historical load and generation data, shifting the analysis period from 1992-2021 to 1994-2023. This shift in analysis period allows Sequoia to model more recent weather effects on load and variable energy resources.

Updating the analysis period in Sequoia required redefining the day-type characterization, or load bins, of historical days.[162] Consistent with past versions of Sequoia, load-bins are five equally sized percentile ranges (i.e. 0th-20th, …, 80th-100th) of weather-dependent load used to match demand with variable energy resources (VERs). Load-bins allow Sequoia to simulate various plausible load and VER generation scenarios under the assumption that temperature, load and generation from VERs are correlated. The effects from the updated analysis period are reported in two steps: 1) changes to the method used to estimate the 1992-2021 weather-dependent load from which load-bins are calculated; and 2) redefinition of load-bins using 1994-2023 weather-dependent load as estimated from the updated methodology.

For PGE's resource adequacy modeling purposes, weather-dependent load for years 1980-2019 was estimated at hourly intervals one time using a neural network model produced by external consultant, E3. IRP analysts incrementally added hourly load shapes for years beyond 2019, backward adjusting the incremental load to remove the influence of population growth, economic changes, and other influences on load that are not weather-dependent. The manual approach used to detrend load motivated the development of a more rigorous and reproducible methodology.

For the Update PGE developed a regression model to estimate weather-dependent load using fixed effects and daily weather measurements as specified in **Equation 1**.[163] Where $\widehat{MW_t}$ is the estimated load in MW for hour t, given the daily temperature in degrees Celsius for midpoint, heating degrees, cooling degrees, maximum and minimum. X_{it} represents various fixed effects as indicator variables for: year, month, hour, day of week, holiday, and weekend.

Equation 1. Weather-dependent load using fixed effects and daily weather measurements

$$\widehat{MW_t} = \beta_0 + \beta_1 MidpointTemp_d + \beta_2 HeatingDegrees_d + \beta_3 CoolingDegrees_d + \beta_4 MaxTemp_d + \beta_5 MinTemp_d + \beta_i X_{it}$$

[162] For more information on day-type characterization see 2019 IRP Appendix K.1.1.

[163] The IRP elected to use a random-forest algorithm due to improved out-of-sample accuracy compared to ordinary least-squares (OLS) regression. Random-forest estimation explained 98 percent of load variability with a mean absolute error (MAE) of 57 MW, while OLS estimation explained 93 percent of variability with MAE of 124 MW. **Equation 1** is specified as an OLS regression for interpretation purposes only, covariate weights for random-forest algorithms are not calculated as coefficients as in ordinary least squares.

The model was trained on a sample of 361,849 observations and tested on an out-of-sample set of 178,225 observations. Accuracy metrics on the out-of-sample set showed 98 percent of the variability in load was captured, with an average absolute error of 57 MW. After training the model, weather-dependent load was estimated by simulating historical hourly demand from 1960-2023 in MW from year 2023. Estimated capacity need for the 2028 reference case using the updated weather-dependent load profile is 11 MW and 13 MW greater for winter and summer, respectively. Finally, shifting the analysis period forward 2 years (1994-2023) and re-calculating load-bins using the updated weather-dependent load shape results in an additional 3 MW of winter and 33 MW of summer capacity need for the 2028 reference case.

Appendix C QF capacity update

As part of this Update, Qualified Facility (QF) capacity estimates were updated in Sequoia to align with contracted and online resources. Sequoia uses monthly estimates of QF MW capacity as proxied by six distinct resources: Biogas, Geothermal, Hydro, PV East, PV West, and Wind. Individual QF resources are grouped into the above categories to simplify modeling assumptions. Two assumptions are included in the estimation of QF capacity based on Order 24-96. The first is that for those QF projects that are contracted but not yet operating, it is assumed that 75 percent of the MW will reach operation. Second, a 75 percent renewal rate of QF capacity is assumed after contract termination. Estimated MW for the 2028 Reference Case are listed in **Table 38**, in addition to a comparison to pre-update modeling assumptions.

Table 38. Modeled QF Resources

Modeled QF Resource	2023 IRP (MW)	2023 IRP Update (MW)	Change (MW)
PV West	139.65	134.66	-4.99
PV East	263.25	234.25	-29
Biogas	5.2	8.92	3.72
Geothermal	0	0	0
Hydro	4.04	7.19	3.15
Wind	29.15	29.15	0

There is a net 27.12 MW reduction in QF capacity for the 2028 Reference Case. The 35 MW decrease in modeled resources is due to a 29 MW and 4.99 MW reduction in capacity for PV East and PV West, respectively. An increase of 3.72 MW and 3.15 MW of Hydro and Biogas resources, respectively, account for the remaining differences in estimated QF capacity.

Appendix D Hourly emissions methodology

This section outlines the steps that PGE has taken to update its GHG emissions forecasting to incorporate hourly analysis of its energy and emissions accounting.

These steps make assumptions about thermal generation and market purchases specified in the IGHG model to produce an hourly system position and resulting emissions impacts using the following:

- An alternative approach to production cost modeling that balances the hourly system position in Aurora to produce an hourly allocation of IGHG-constrained thermal generation, hydro and storage dispatch optimized around serving PGE retail load and provide the final validation of the Preferred Portfolio by generating a resource dispatch output that results in a system position consistent with HB 2021 compliance.
- An allocation of IGHG-allocated market purchases across hours of remaining need.
- An hourly accounting of the availability and price premium associated with a WECC-wide clean energy surplus estimate. These estimates were estimated by The Brattle Group and are used to reflect the contribution that the non-emitting market can provide in supporting PGE's hourly energy position.

D.1Challenges with existing IRP emissions reporting

In the 2023 CEP/IRP, the PZM was used to simulate PGE existing dispatchable generation resources, contracts and new resources using economic dispatch based upon electricity prices[164]. The electricity prices contained risk variable inputs that vary across each of the 39 forecasts of electricity prices. When a resource is economically dispatched, market price exceeds the variable cost of operation.

The PZM simulation forecasts total resources generation but does not distinguish between generation associated with retail load and wholesale sales. This gap was addressed using the IGHG model. This step used the GHG emissions reduction glidepath and historical estimates of wholesale market transactions to estimate the amount of energy dedicated to wholesale sales and the amount of energy dedicated to PGE retail load service for each GHG-emitting source. The estimated amount of emitting energy used for PGE retail load service is incorporated into the capacity expansion model (ROSE-E).

By economically dispatching PGE resources to the price forecasts simulated by the WECC model, PGE is assuming the presence of a regional market in which PGE is a pure price taker. Relative to the size of the entire Western Interconnect, PGE comprises less than 3 percent of the total load as measured by peak loads. No quantity of PGE market purchases or market sales will change the WECC price forecasts. Adapting this methodology to demonstrate that PGE is compliant with HB 2021 emissions requirements is difficult given that partitioning emitting

[164] Outlined in Appendix H.1.2 of PGE's 2023 CEP/IRP.

energy to wholesale sales from retail load service is a complex modeling challenge. This is the original reason for using the intermediate IGHG Model as a bridge between production cost and capacity expansion models.

PGE can allocate thermal generation to serve retail load (up to the emissions target for HB2021 compliance) or sell it to the wholesale market. In prior analysis, PGE experimented with post-model adjustments to thermal dispatch that removed thermal dispatch directed to serve wholesale sales by prioritizing thermal generation for when retail load hours are shortest (deficit-sorting) and during hours when prices are highest (price-sorting).[165] Neither method allowed the model to co-optimize thermal generation with other dispatchable resources such as storage or hydro. The result presented an improvement in the hourly representation of PGE system, but the methodology leaned on out-of-model adjustments.

At this point there is no simple way to develop market logic in Aurora that would allow thermal units to choose between unconstrained wholesale sales and constrained retail load service within the PZM in time for the 2023 CEP-IRP update. The current methodology in the PZM uses WECC input price forecasts to dispatch resources. The methodology in which resources are dispatched to forecasted market prices is limited in its ability to represent the disaggregation of thermal generation into an unconstrained wholesale market and retail load service with an annual emissions cap.

The remainder of this appendix shows the methodology used to adapt PGE's production cost model to better represent PGE's hourly energy and emissions position in 2030. Section D.2 provides the change in model dispatch logic that addresses the challenges described in the previous section while discussing how thermal generation is allocated to retail load subject to the HB 2021 emissions constraint. Section D.3 discusses modifications to the dispatch of storage generation that result from the change in modeling logic. Section D.4 shows how non-emitting market availability is incorporated in the new hourly energy and emissions modeling.

D.2 Modifications to model dispatch logic and thermal dispatch

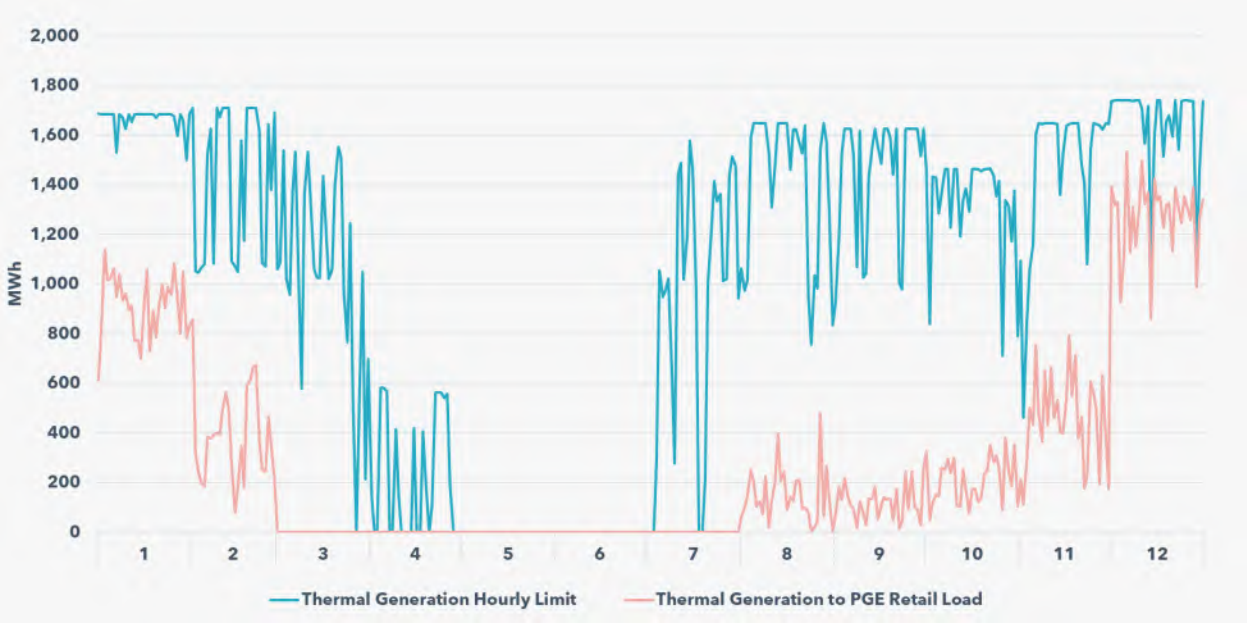
To solve the problem identified in **Section D.1**, PGE has modified the PZM to dispatch PGE resources at minimum cost subject to the constraint that retail load obligations are met with the HB 2021 annual emissions cap in place. This model is called the Modified PZM. The effect of changing the dispatch logic from dispatching resources to price to dispatching resources to meet retail load allows PGE to model how PGE's Preferred Portfolio can meet its hourly retail load requirements and comply with the annual GHG emissions limit. The model can choose the timing of the thermal dispatch from the total economic dispatch (both retail load service and wholesale sales) that is previously determined in the PZM. The Modified PZM will dispatch the portion of that thermal generation allocated to serve retail load service from the IGHG model. This is represented in the Modified PZM by an hourly cap on emissions (by thermal resource) determined by the total economic dispatch level set by the PZM. This allows the Aurora

[165] Portland General Electric Company. (2023, November 21). LC 80 – Portland General Electric Company's 2023 Clean Energy Plan and Integrated Resource Plan: Reply to Staff Round 2 Comments and Recommendations.

optimization to select the hourly profile of the total annual thermal energy dedicated to serve retail load as calculated in the IGHG Model.

Hourly thermal limits are also placed on thermal generation to prevent using thermals during hours deemed uneconomic in the PZM (where resources are dispatched against WECC-wide market prices). This is depicted as the blue line in **Figure 92**. The red line provides the timing of thermal output used to serve PGE retail load in the mPZM.

Figure 92. Thermal Generation Hourly Limits & Thermal Generation to PGE Retail Load by Month

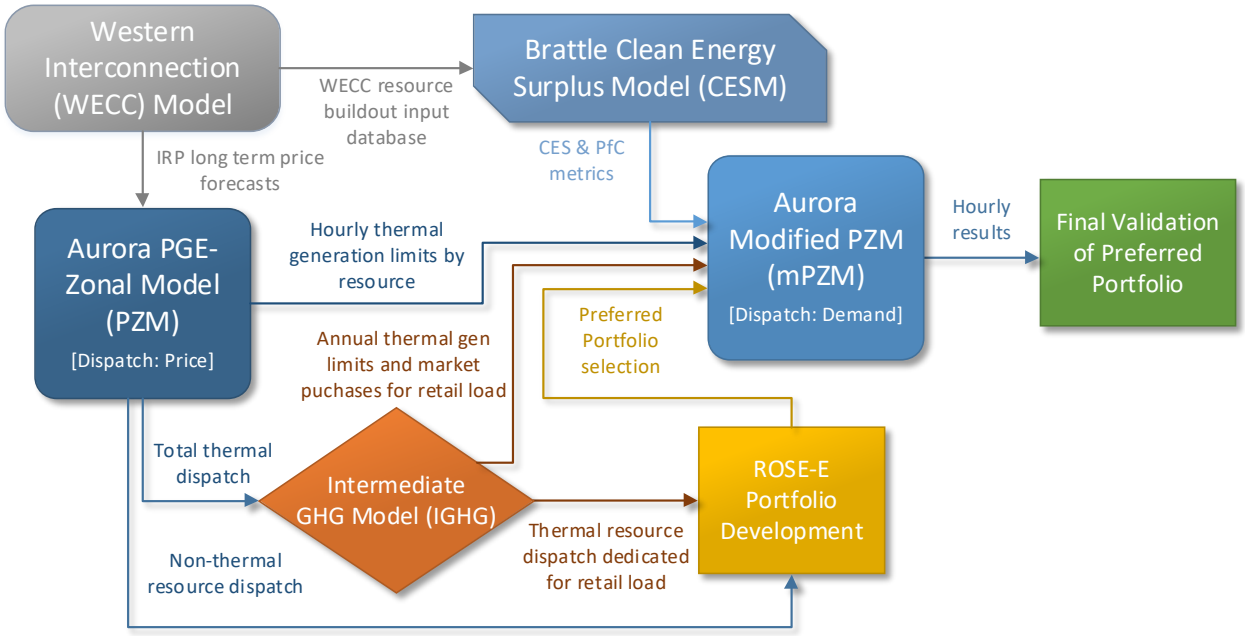


The results of the Modified PZM system dispatch are sent to the excel-based Hourly Energy and Emissions Accounting Workbook (Hourly Workbook). The Hourly Workbook is designed to apply the IGHG-allocated unspecified market purchases using the price-sorting methodology. Any remaining short energy position is applied the unspecified emission rate of 0.428 mmtCO2e in accordance with the Oregon DEQ reporting methodology in OAR Chapter 340, Division 215. From this, the emissions impact is calculated and the determination of compliance with HB 2021 is made based upon the modeled selected portfolio.

In addition, the Modified PZM incorporates hourly information about the availability of clean energy from the market and the corresponding price premium attached to this clean energy. **Section D.4 Incorporating non-emitting market generation** discusses how the market for non-emitting energy is incorporated into the Modified PZM.

Figure 93 below outlines the flow of data and connectivity between the models as it pertains to hourly energy accounting.

Figure 93. IRP modeling diagram Hourly Energy Accounting



The purpose of the Modified PZM Aurora model and hourly workbook is to (1) provide ROSE-E with information on the remaining short positions after applying the IGHG-allocated thermal generation and market purchases such that ROSE-E can weight its portfolio selection as outlined in Portfolio Analysis and (2) determine whether the portfolio of resources selected by ROSE-E provides sufficient resources to meet hourly retail load requirements and GHG-compliance needs. The Modified PZM model is focused on calculating the 2030 energy position to meet hourly retail load obligation and emissions compliance constraints and does not calculate energy values for purposes of minimizing net cost in portfolio optimization. That function remains the purpose of the PZM.

D.3 Change in storage dispatch logic

In the PZM, storage dispatch only considers the value of price arbitrage, or the ability to reshape energy across the day by charging when prices are low and discharging when prices are high. If the dispatch of thermal resources is not constrained by emissions, then this dispatch outcome is the lowest cost solution subject to the parameters chosen.

However, given the constraints imposed by HB 2021, the dispatch of storage resources should include the opportunity cost of emissions. Within any given emissions budget, an additional ton emitted from one generation resource requires a reduction of one ton from somewhere else. The opportunity cost of an additional emission is the cost of this offsetting reduction in generation. Since the cost of the offsetting reduction in generation is not included in the storage dispatch logic, the PZM results will be sub-optimal under the following outcomes:

- Storage discharged to provide energy in excess of retail load due to high prices. This energy could have been saved for another hour in which PGE is short and the market price is lower (displacing emitting resources or market purchases in future hours). The

price difference between the high-priced hour and the low-priced hour must be less than the opportunity cost of emissions.

- Storage is charged to consume energy in deficit of retail load due to low prices. This energy could have been consumed during another hour in which PGE is long and market price is higher (displacing emitting resources or market purchases in current hour). The price difference between the high-priced hour and the low-priced hour must be less than the opportunity cost of emissions.

This problem is solved by changing the model dispatch logic such that storage resources are dispatched economically to internally generated hourly prices that are solved by using model supply and demand conditions instead of by using externally-provided forecasted input prices as is used in the PZM. This change in logic prioritizes storage dispatch to move energy across the day from hours in which PGE has excess energy to hours in which PGE has excess demand instead of prioritizing storage dispatch logic to arbitrage market prices. This is useful in maximizing the displacement of emitting thermal generation using storage to meet system needs and provides a better representation at how well the Preferred Portfolio can meet PGE system needs when PGE's system is emissions constrained.

D.4 Incorporating non-emitting market generation

The yearly IGHG model in the 2023 PFC/IRP utilized an assumption that PGE was able to rely upon market purchases above the allocated market purchases in the IGHG model at times in which it was short. With this assumption, the average hourly position was 9 MWa long in 2030.[166] This conclusion relied on the assumption that PGE will be able to sell emitting generation at no price discount for market sales above those allocated by the IGHG model. Inversely, this conclusion also relied on the assumption that PGE will be able to access non-emitting generation at no price premium for market purchases above those allocated by the IGHG model.

- If this assumption was true, then this analysis indicated that meeting emissions targets with the Preferred Portfolio's set of incremental resource additions is possible under expected conditions.
- If this assumption was false, then both PGE and Staff's draft analyses were in alignment. Both pointed to a need for an increased quantity of non-emitting generation to be acquired between now and 2030 to ensure compliance with HB 2021 under expected average conditions.

PGE recognized that if there is no market to buy non-emitting energy in the hours that PGE is short, forecasted need required allocating additional emissions to those market purchases to balance. In the analysis provided in LC 80: PGE's Reply to Round 2 Comments, PGE

[166] Portland General Electric Company. (2023, September 6). *LC 80 – 2023 Clean Energy Plan and Integrated Resource Plan: Reply to Round 1 comments* (p. 53). Oregon Public Utility Commission. [https://edocs.puc.state.or.us/efdocs/HAC/lc80hac131341.pdf]

demonstrated that under the condition of no market for non-emitting generation, additional resource procurement would be needed to comply with annual cap on GHG emissions.

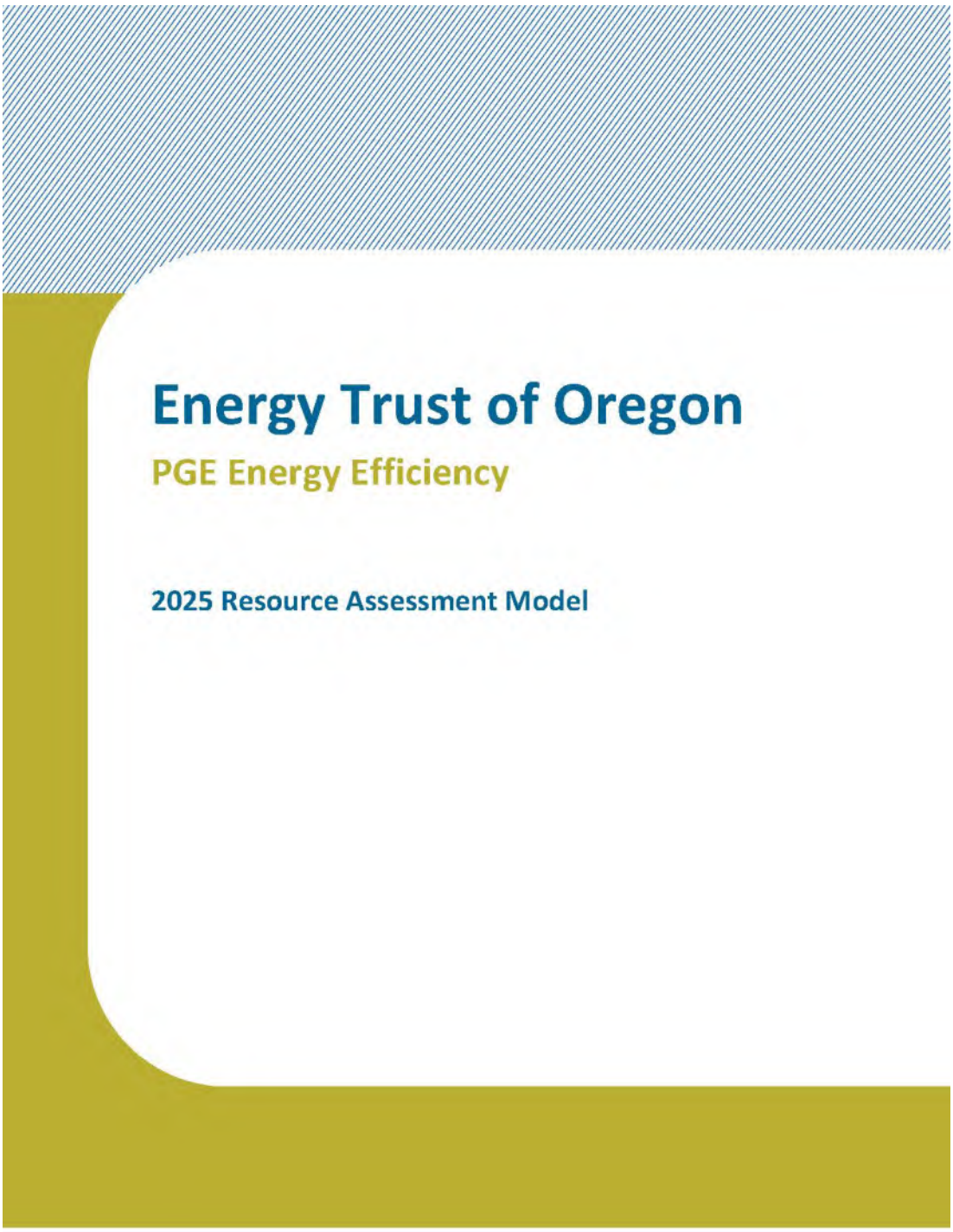
In response to these concerns, PGE contracted The Brattle Group to develop a high-level framework for estimating WECC-wide and regional analysis of the market for non-emitting energy to serve as an input into the hourly energy and emissions accounting modeling. The Brattle Group performed an analysis of the regional WECC market and provided PGE with forecasts of the availability and price premium of non-emitting or clean energy available to PGE in 2030. The Clean Energy Surplus (CES) is the clean energy available beyond that which is needed to meet annual state-level clean energy targets and the Premium for Clean (PFC) is the additional cost beyond the energy price associated with the purchase of surplus clean energy.

Brattle used PGE's IRP Aurora results from the Regional WECC model that is used to generate PGE's IRP Price Forecasts and other input parameters capturing regional data on state clean energy requirements to calculate the CES. After allocating the annual CES across hours of the year, Brattle applied deliverability constraints to determine how much CES is available to PGE in Oregon West for each hour of 2030. In addition, Brattle used the CES to calculate the PFC by hour in the analysis. For a detailed description of the Brattle Analysis, read **Appendix F Market for non-emitting energy**.

The Modified PZM incorporates the CES and PFC by including the CES as a market resource available up to the hourly deliverable energy to Oregon West Zone. This market energy is priced at the sum of the forecasted Oregon West hourly price plus the hourly PFC. The Modified PZM optimizes dispatchable generation and available non-emitting market purchases to leverage PGE's generation, contracts, and the regional diversity in clean energy to meet its HB 2021 compliance goals.

When the results of the Modified PZM analysis contains a summation of short hours less than the quantity of unspecified market purchases, the hourly workbook reallocates non-emitting market purchases to replace non-emitting market purchases to that extent that the full IGHG allocation is exhausted. This is accomplished by replacing the hours with the largest Premium for Clean first as ranked from highest to lowest. Given a budget of unspecified market purchases, total cost will be minimized by purchasing unspecified energy instead of clean energy from the market when the Premium for Clean is highest. This method is also indicative of the likelihood of finding energy in the clean energy market—it will be more difficult to procure clean energy when the Premium for Clean is non-zero.

Appendix E Energy Trust of Oregon (ETO)



Energy Trust of Oregon Background

Energy Trust of Oregon, Inc. (Energy Trust) is an independent nonprofit organization dedicated to helping utility customers in Oregon and Southwest Washington benefit from energy efficiency and renewable power. Energy Trust operates under a grant agreement with the Oregon Public Utility Commission (OPUC).

As a result of state legislation, tariffs and other requirements, Energy Trust is funded by customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista. Energy Trust's model of delivering energy efficiency programs unilaterally across the service territories of the five gas and electric utilities they serve has experienced a great deal of success. Since the inception of the organization in 2002, Energy Trust has achieved total annual savings of 1,025 aMW of electricity. Additionally, Energy Trust has saved 103 million therms since gas efficiency programs began in 2003. Combined, this equates to more than 40 million metric tons of CO2 emissions avoided, and Energy Trust has played a significant factor with relatively flat energy loads observed by both gas and electric utilities from 2014 to 2023, as shown in OPUC utility statistic books.[1]

Energy Trust, with support from PGE, serves residential, commercial and industrial customers in Oregon. In 2024, Energy Trust's service to PGE customers through energy efficiency programs achieved 37.8 aMW of electric savings achieving 132% of goal. Energy Trust achieved electric savings at a utility levelized cost of 0.035$/kWh, meeting OPUC performance measures to achieve electric savings at a levelized cost below 0.046 $/kWh.

PGE actively promotes Energy Trust offerings to its customers and supports their participation in Energy Trust efficiency programs. Also, when shared technologies and programs are mutually beneficial, PGE coordinates its demand response program activities with Energy Trust's energy efficiency programs. For example, smart thermostats are used by PGE for demand response, but also provide energy efficiency savings, which the Energy Trust counts towards its energy saving goals.

In addition to administering energy efficiency programs with support from PGE, Energy Trust also provides a 20-year demand-side management (DSM) resource forecast to identify cost-effective energy efficiency savings potential. This forecast examines how much of that potential is estimated to be achieved by Energy Trust over the 20-year period. The results are used by PGE and other utilities in Integrated Resource Plans (IRP) to inform the energy efficiency resource potential Energy Trust expects to acquire in their territory, helping to offset the need for new generating resources to meet projected load growth.

Energy Trust Forecast Overview and High-Level Results

Energy Trust developed a 20-year DSM energy efficiency resource forecast for PGE using Energy Trust's resource assessment modeling tool (hereinafter 'RA Model') to identify the total 20-year cost effective modeled energy efficiency savings potential. Energy Trust then deploys this cost-effective potential exogenously to the RA model into an annual energy efficiency savings projection based on past program

[1] OPUC 2023 Stat book – 10 Year Summary Tables: https://www.oregon.gov/puc/forms/Forms%20and%20Reports/2023-Oregon-Utility-Statistics-Book.pdf

experience, knowledge of current and developing markets, and future codes and standards. This final 20-year savings projection is provided to PGE for inclusion in their Integrate Resource Planning (IRP) forecasts. The 2025 IRP results show that PGE can save 171.7 average megawatts[2] (aMW) in the next five years from 2025 to 2029 and over 675 by 2043.[3] These results represent an 11% and 22% increase respectively in deployed cost-effective DSM potential over the prior IRP in 2023. The main drivers of this increased potential are:

1. Growth in the PGE load forecast, most notably in the commercial sector.
2. Growth in avoided costs.
3. Updated measure assumptions, new measures and updated market characterizations.
4. Lighting market transformation and HB 2531. While Energy Trust will not claim the bulk of these savings, they are still expected to come off PGE's system and thus savings are included in this forecast.
5. Residential electrification.

Figure 1 depicts the full suite of savings potential identified in the model by potential type (Technical, Achievable, Cost-effective achievable).

Figure 1 – 20-year Savings Potential by Sector and Potential Type

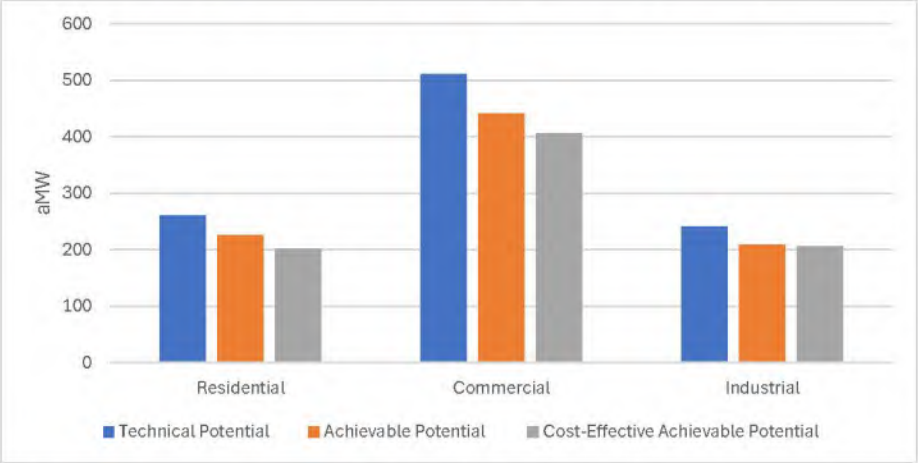
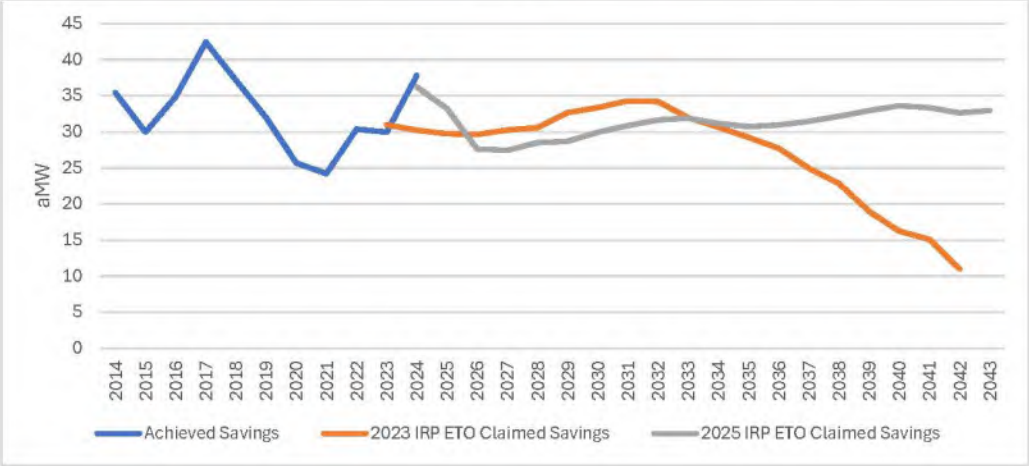


Figure 2 links actual historic savings going back to 2014 to the Energy Trust claimed savings projection for the 2025 IRP. It also compares the 2025 IRP forecast to the 2023 IRP forecast.

[2] All energy described in this report is measured at the generator.
[3] Includes 47.5 aMW of market transformation savings that Energy Trust will not claim resulting from residential and commercial lighting standards going into effect.

Figure 2 - Annual Savings Projection Comparison for 2023 and 2025 IRPs, with Actual savings since 2014

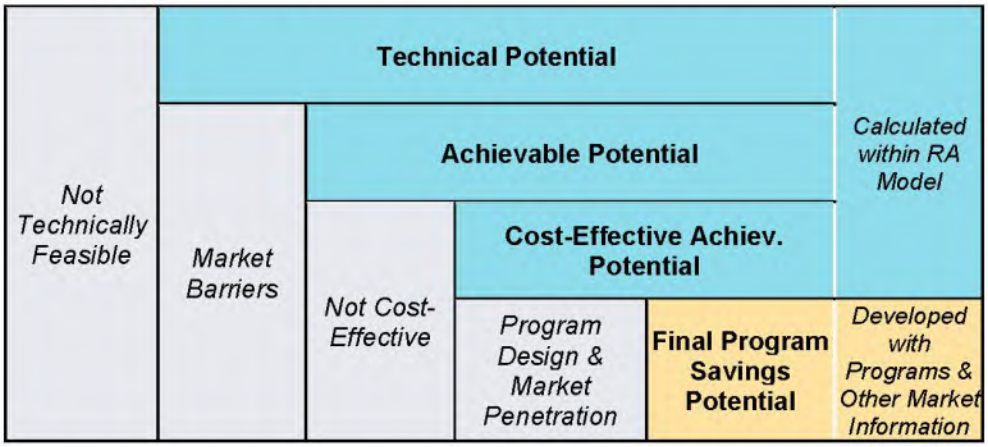


Energy Trust 20-Year Forecast Methodology

20-Year Forecast Overview

Energy Trust developed a 20-year DSM resource forecast for PGE using Energy Trust's RA Model to identify the total 20-year cost-effective modeled energy efficiency savings potential, which is 'deployed' exogenously of the model to provide an estimate of the final savings forecast. There are four types of potential that are calculated to develop the final savings potential estimate, which are shown in Figure 3 and discussed in greater detail in the sections below.

Figure 3 – Types of Potential Calculated in 20-year Forecast Determination

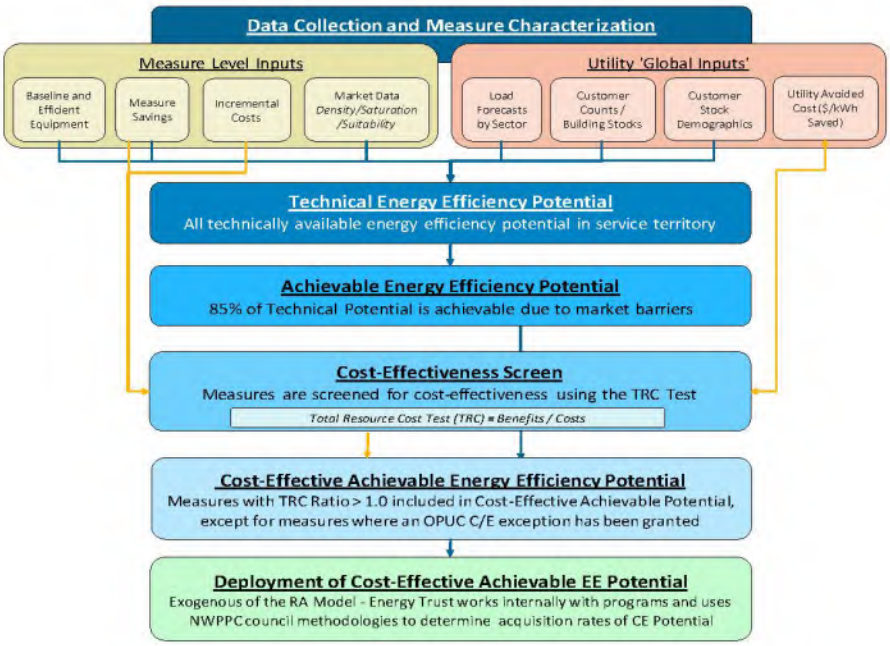


The RA Model utilizes the modeling platform Analytica®[4], an object-flow based modeling platform that is designed to visually show how different objects and parts of the model interrelate and flow throughout the modeling process. The model utilizes multidimensional tables and arrays to compute large, complex datasets in a relatively simple user interface. Energy Trust then deploys this cost-effective achievable potential exogenously to the RA model into an annual energy savings projection based on past program experience, knowledge of current and developing markets, and future codes and standards.

20-Year Forecast Detailed Methodology

Energy Trust's 20-year forecast for DSM savings follows six overarching steps from initial calculations to deployed energy savings, as shown in Figure 4. The first five steps in the varying shades of blue nodes - Data Collection and Measure Characterization to Cost-Effective Achievable Energy Efficiency Potential - are calculated within Energy Trust's RA Model. This results in the total cost-effective potential that is achievable over the 20-year forecast. The actual deployment of these savings (the acquisition percentage of the total potential each year, represented in the green node of the flow chart) is done exogenously of the RA model. The remainder of this section provides further detail on each of the steps shown below.

Figure 4 - Energy Trust's 20-Year DSM Forecast Determination Flow Chart



[4] http://www.lumina.com/why-analytica/what-is-analytica1/

1. Data Collection and Measure Characterization

The first step of the modeling process is to identify and characterize a list of measures to include in the model, as well as receive and format utility global inputs for use in the model. Energy Trust compiles a list of commercially available and emerging technology measures for residential, commercial, industrial and agricultural applications installed in new or existing structures. The list of measures is meant to reflect the full suite of measures offered by Energy Trust, plus a spectrum of emerging technologies.[5] Simultaneous to this effort, Energy Trust collects necessary data from the utility to run the model and scale the measure level savings to a given service territory (known as 'global inputs').

- ***Measure Level Inputs:***
  Once the measures to include in the model have been identified, they must be characterized to determine their savings potential and cost-effectiveness. The characterization inputs are determined through a combination of Energy Trust primary data analysis, regional secondary sources[6], and engineering analysis. There are over 30 measure level inputs that feed into the model, but on a high level, the inputs are put into the following categories:
  1. ***Measure Definition and Equipment Identification***: This is the definition of the efficient equipment and the baseline equipment it is replacing (e.g. a ductless mini-split heat pump replacing residential electric resistance space heat). A measure's replacement type is also determined in this step – Retrofit (RET), Replace on Burnout (ROB), or New Construction (NEW).
  2. ***Measure Savings***: the kWh or therms savings associated with an efficient measure calculated by comparing the baseline and efficient measure consumptions.
  3. ***Incremental Costs***: The incremental cost of an efficient measure over the baseline. The definition of incremental cost depends upon the replacement type of the measure. If a measure is a RET measure, the incremental cost of a measure is the full cost of the equipment and installation. If the measure is a ROB or NEW measure, the incremental cost of the measure is the difference between the cost of the efficient measure and the cost of the baseline measure.
  4. ***Market Data:*** Market data of a measure includes the density, saturation, and suitability of a measure. A density is the number of measure units that can be installed per scaling basis (e.g. the average number of showers per home for showerhead measures). The saturation is the average saturation of the density that is already efficient (e.g. 50% of the showers already have a low flow showerhead). Suitability of a measure is a percentage input to represent the percent of the density that the efficient measure is suitable to be installed in. These data inputs are all generally derived from regional market data sources such as NEEA's Residential and Commercial Building Stock Assessments (RBSA and CBSA).

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[5] An emerging technology is defined as technology that is not yet commercially available but is in some stage of development with a reasonable chance of becoming commercially available within a 20-year timeframe. The model is capable of quantifying costs, potential, and risks associated with uncertain, but high-saving emerging technology measures. The savings from emerging technology measures are reduced by a risk-adjustment factor based on what stage of development the technology is in. The working concept is that the incremental risk-adjusted savings from emerging technology measures will result in a reasonable amount of savings over standard measures for those few technologies that eventually come to market without having to try and pick winners and losers.

[6] Secondary Regional Data sources include: The Northwest Power Planning Council (NWPPC), the Regional Technical Forum (the technical arm of the NWPPC), and market reports such as NEEA's Residential and Commercial Building Stock Assessments (RBSA and CBSA)

- ***Utility Global Inputs:***

  The RA Model requires several utility level inputs to create the DSM forecast. These inputs include:

  1. ***Customer and Load Forecasts***: These inputs are essential to scale the measure level savings to a utility service territory. For example, residential measures are characterized on a scaling basis 'per home', so the measure densities are calculated as the number of measures per home. The model then takes the number of homes that PGE serves currently and the forecasted number of homes to scale the measure level potential to their entire service territory.
  2. ***Customer Stock Demographics***: These data points are utility specific and identify the percentage of stock that utilize different heating fuels for both space heating and water heating. The RA Model uses these inputs to segment the total stocks to the stocks that are applicable to a measure (e.g. gas storage water heaters are only applicable to customers that have gas water heat).
  3. ***Utility Avoided Costs***[7]: Avoided costs are the net present value of avoided energy purchases and avoided system costs that result from energy efficiency savings represented as $s per kWh saved. These values are provided by PGE based generally upon the avoided costs generated by PGE as an outcome of their IRP modeling. Avoided costs are the primary 'benefit' of energy efficiency in the cost-effectiveness screen.

2. Calculate Technical Energy Efficiency Potential

Once measures have been characterized and utility data loaded into the model, the next step is to determine the technical potential of energy that could be saved. Technical potential is defined as the total potential of a measure in the service territory that could be achieved regardless of market barriers, representing the maximum potential energy savings available. The model calculates technical potential by multiplying the number of applicable units for a measure in the service territory by the measure's savings. The model determines the total number of applicable units for a measure utilizing several of the measure level and utility inputs referenced above:

Total applicable units =	*Measure Density * Baseline Saturation * Suitability Factor * Heat Fuel Multipliers (if applicable) * Total Utility Stock (e.g. # of homes)*
Technical Potential =	*Total Applicable Units * Measure Savings*

The measure level technical potential is then summed up to show the total technical potential across all sectors. This savings potential does not account for the various market barriers that will limit a 100 percent adoption rate.

3. Calculate Achievable Energy Efficiency Potential

Achievable potential is simply a reduction to the technical potential based on each measure's achievability assumption rate, to account for market barriers that prevent total adoption of all cost-effective measures. Historically the achievable potential was defined as 85 percent of the technical potential. The Northwest Power and Conservation Council (NWPCC) updated the achievability assumption for certain measures in the most recent power plan, and Energy Trust has aligned the

[7] Energy Trust uses a single electric blended avoided costs for its programs, measure development and benefit/cost metrics.

RA model with these assumptions. Many measures still have 85 percent achievability while market transformation and codes and standards are assumed to be closer to 100 percent achievability.

Achievable Potential =	*Technical Potential * achievability %*

4. Determine Cost-effectiveness of Measures using TRC Screen

The RA Model screens all DSM measures in every year of the forecast horizon using the Total Resource Cost (TRC) test, a benefit-cost ratio (BCR) that measures the cost-effectiveness of the investment being made in an efficiency measure. This test evaluates the total present value of benefits attributable to the measure divided by the total present value of all costs. A TRC test value equal to or greater than 1.0 means the value of benefits is equal to or exceeds the costs of the measure and is therefore cost-effective and contributes to the total amount of cost-effective potential. The TRC is expressed formulaically as follows:

TRC = Present Value of Benefits / Present Value of Costs

Where *the Present Value of Benefits* includes the sum of the following two components:

a) Avoided Costs: The present value of electricity saved over the life of the measure, as determined by the total kWh saved multiplied by PGE's avoided cost per kWh. The net present-value of these benefits is calculated based on the measure's expected lifespan using PGE's discount rate.
b) Non-energy benefits are also included when present and quantifiable by a reasonable and practical method (e.g. water savings from low-flow showerheads, operations and maintenance (O&M) cost reductions from advanced controls).

Where *the Present Value of Costs* includes:

a) Total participant incremental cost

The cost-effectiveness screen is a critical component for Energy Trust modeling and program planning because Energy Trust is only allowed to incentivize cost-effective measures, unless an exception has been granted by the OPUC. Energy Trust is governed by policy directives to obtain all reasonably attainable cost-effective potential[8].

5. Quantify the Cost-Effective Achievable Energy Efficiency Potential

The RA Model's final output of potential is the quantified cost-effective achievable potential. If a measure passes the TRC test described above, then the *achievable savings* (designated percentage of technical potential) from this measure is included in the cost-effective achievable potential. If the measure does not pass the TRC test above, the measure is not included in the cost-effective achievable potential. However, the cost-effectiveness screen can be overridden for some measures under three specific conditions:

1) The OPUC has granted an exception to offer non-cost-effective measures under strict conditions or,

[8] As directed in OPUC docket UM-551 and 2017 ORS 757.054

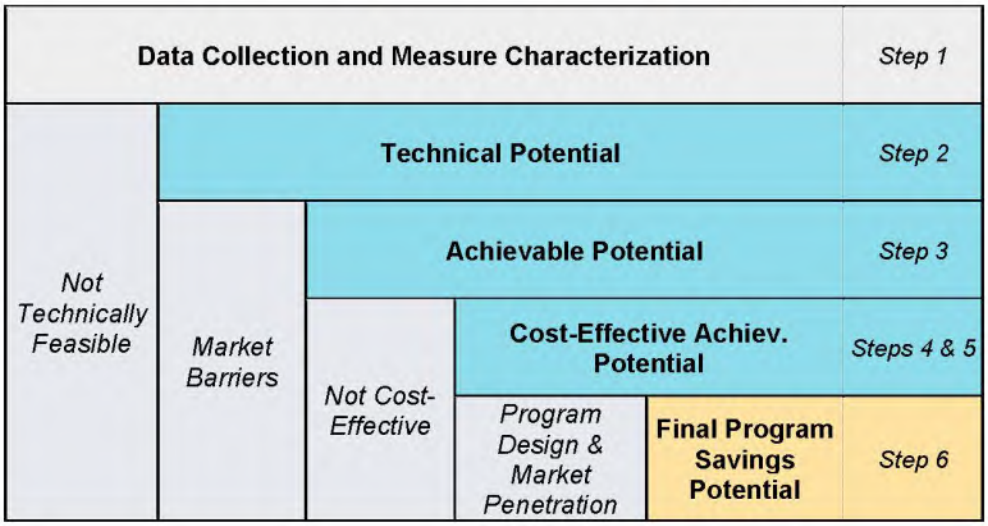
2) When the measure isn't cost-effective using utility specific avoided costs, but the measure is cost-effective when using blended electric avoided costs for all of the electric utilities Energy Trust serves and is therefore offered by Energy Trust programs.

6. Deployment of Cost-Effective Achievable Energy Efficiency Potential

After the model determines the 20-year cost-effective achievable potential, Energy Trust develops a savings projection based on past program experience, knowledge of current and developing markets, and future codes and standards. The savings projection is a 20-year forecast of energy savings that is projected to result in a reduction of load on PGE's system. This savings forecast includes savings from program activity for existing measures and emerging technologies, expected savings from market transformation efforts that drive improvements in codes and standards.

Figure 5 below reiterates the types of potential shown in Figure 3, and how the steps described above and in Figure 4 fit together.

Figure 5 - The Progression to Program Savings Projections



Forecast Results

Forecast results will be shown in several different sections, as the RA model has different output capabilities that are applied to project energy savings potential in a variety of different views, including by segment, end use, and in supply curves. The final savings projection is provided by segment and program delivery type. The RA Model produces results by type of potential, as well as several other useful outputs, including a supply curve based on the levelized cost of energy efficiency measures. This section discusses the overall model results by potential type and provides an overview of the supply curve.

Forecasted Savings by Sector

Table 1 summarizes the technical, achievable, and cost-effective achievable potential for PGE's system in Oregon. The savings in the table represent the total 20-year cumulative energy savings potential identified in the RA Model for each of the three respective types of potential identified in Figure 3 and Figure 5, prior to deployment of the savings into the final savings projection.

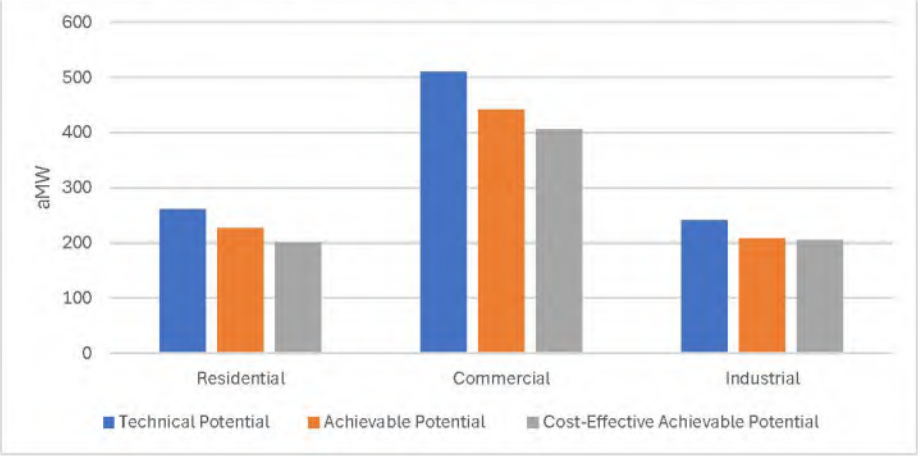
Table 1 - Summary of Cumulative Modeled Savings Potential - 2024–2043

Sector	Technical Potential (aMW)	Achievable Potential (aMW)	Cost-Effective Achievable Potential (aMW)
Residential	261	226	202
Commercial	511	442	406
Industrial	241	209	206
Total	**1,012**	**876**	**813**

Figure 6 shows cumulative forecasted savings potential across the three sectors Energy Trust serves, as well as the type of potential identified in PGE's service territory.

The Commercial sector represents the largest source of efficiency potential within PGE's territory. 86% of the industrial technical potential is cost-effective, while the residential and commercial sectors cost-effective achievable potential are 77% and 80% of technical potential respectively.

Figure 6 - Savings Potential by Sector – Cumulative 2024–2043

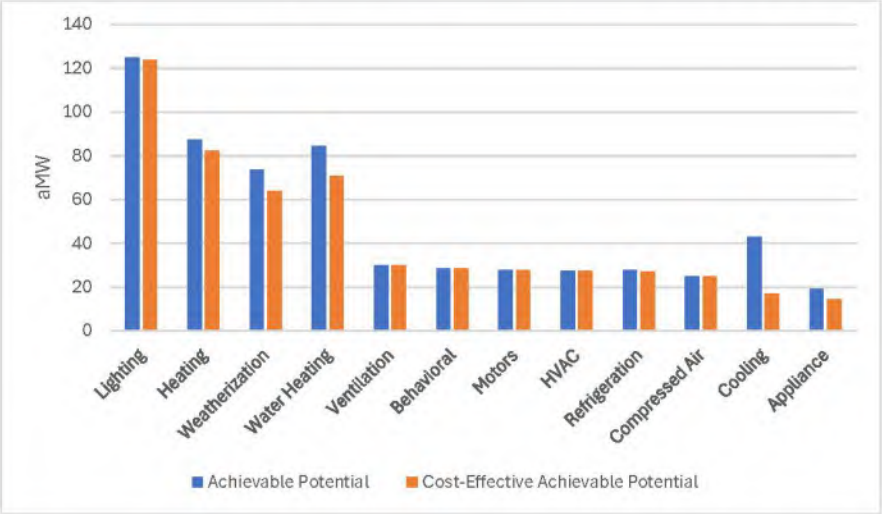


Cost-Effective Achievable Savings by End-Use

Figure 7 below provides a breakdown of PGE's 20-year cost-effective DSM savings potential by major end use. Some potential that doesn't map to a single end-use is omitted from this figure such as general new construction whole building measures and custom industrial and large commercial measures.

Lighting, heating, weatherization and water heating are the end-uses with the largest energy savings potential in PGE territory. Most of the lighting and heating potential is cost effective while a lower share of weatherization, water heating and cooling past TRC test in the model.

Figure 7 – 20-year Cost-Effective Achievable Cumulative Potential by End Use



Contribution of Emerging Technologies

As mentioned earlier in this report, Energy Trust includes a suite of emerging technologies (ETs) in its model. The emerging technologies included in the model are listed in Table 2.

Table 2 - Emerging Technologies Included in the Model that are pertinent for PGE

Residential	Commercial	Industrial
• Window Attachments •Thin Triple Pane Windows • Advanced Insulation • Heat Pump Dryers • Split System CO2 Heat Pump Water Heater • Smart Line Voltage Thermostats	• Zero Net Energy Ready Construction • Hybrid Indirect-Direct Evaporative Cooler • Advanced Refrigeration Controls • Refrigeration Anti-Fogging Film • Advanced Window Technologies	• CO2 Refrigeration • Industrial Heat Pumps • Advanced Wall Insulation

Energy Trust recognizes that emerging technologies are inherently uncertain and utilizes a risk factor to hedge against that risk. The risk factor for each emerging technology is used to characterize the inherent uncertainty in the ability for ETs to produce reliable future savings. This risk factor was determined based on qualitative metrics of:

- Market risk

- Technical risk
- Data source risk

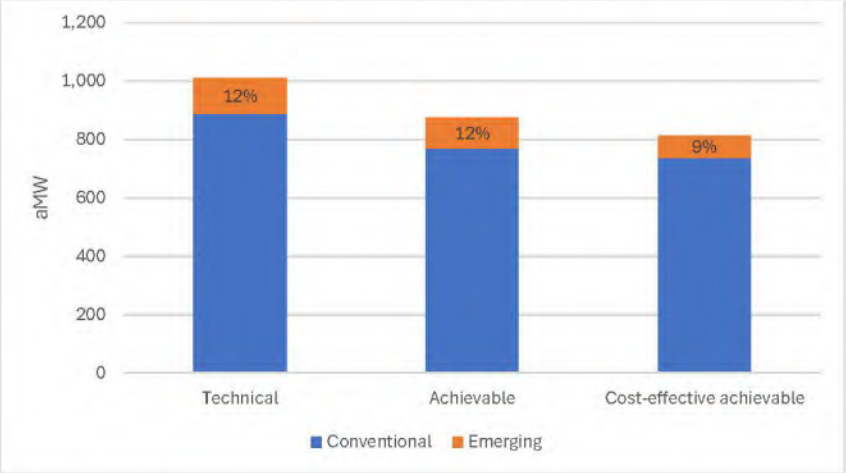
The framework for assigning the risk factor is shown in Table 3. Each ET was assessed within each risk category and a total weighted score was then calculated. Well-established and researched technologies have lower risk factors while nascent, unevaluated technologies (e.g., CO2 heat pump water heaters) have higher risk factors. This risk factor was then used as a multiplier of the incremental savings potential of the measure.

Table 3 - Emerging Technology Risk Factor Score Card

	ET Risk Factor				
Risk Category	10%	30%	50%	70%	90%
Market Risk (25% weighting)	**High Risk:** • Requires new/changed business model • Start-up, or small manufacturer • Significant changes to infrastructure • Requires training of contractors. Consumer acceptance barriers exist			**Low Risk:** • Trained contractors • Established business models • Already in U.S. Market • Manufacturer committed to commercialization	
Technical Risk (25% weighting)	**High Risk:** Prototype in first field tests. A single or unknown approach	Low volume manufacturer. Limited experience	New product with broad commercial appeal	Proven technology in different application or different region	**Low Risk:** Proven technology in target application. Multiple potentially viable approaches.
Data Source Risk (50% weighting)	**High Risk:** Based only on manufacturer claims	Manufacturer case studies	Engineering assessment or lab test	Third party case study (real world installation)	**Low Risk:** Evaluation results or multiple third-party case studies

Figure 8 below shows the amount of emerging technology savings within each type of DSM cumulative potential. While emerging technologies make up about 21% of the technical potential, once the cost-effectiveness screen is applied, the relative share of emerging technologies drops to about 13% of total cost-effective achievable potential. This is because many of these technologies are still in early stages of development and are quite expensive. Though Energy Trust includes factors to account for forecasted decreases in cost and increased savings from these technologies over time, some are still never cost-effective over the planning horizon or do not become cost-effective until later years.

Figure 8 – Cumulative Contribution of Emerging Technologies by Potential Type



Cost-Effective Override Effect

Table 4 shows the savings potential in the RA model that was added by employing the cost-effective override option. As discussed in the methodology section, the cost-effective override option forces non-cost-effective measures into the cost-effective potential results and is used when a measure meets one of the following three criteria:

1. A measure is offered under an OPUC exception.
2. When the measure isn't cost-effective using PGE-specific avoided costs but the measure is cost-effective when using blended electric avoided costs for all of the electric utilities Energy Trust serves and is therefore offered by Energy Trust programs.
3. The measure is not cost-effective in our model, but may appear cost-effective in program settings, where costs are combined with other measures or highly variable from project to project[9].

[9] Some measures can have high degrees of variations in savings and costs. If a measure is cost-effective in the RA model then all savings attributable to the measure are included. Conversely, if a measure is not cost-effective in the RA model then zero savings will be shown in the model. While costs are updated frequently to reflect changing markets there may be instances where some instances of installation are cost-effective and others are not. Many of these types of projects are screened individually for cost-effectiveness in Energy Trust's custom program offerings.

Table 4 - Cumulative Cost-Effective Potential (2024-2043) due to Cost-Effectiveness Override (aMW)

Sector	Total Cumulative Cost-Effective Potential With CE Override	Total Cumulative Cost-Effective Potential No CE Override	Difference
Residential	202	132	69
Commercial	406	406	-
Industrial	813	206	-
Total DSM:	**813**	**744**	**69**

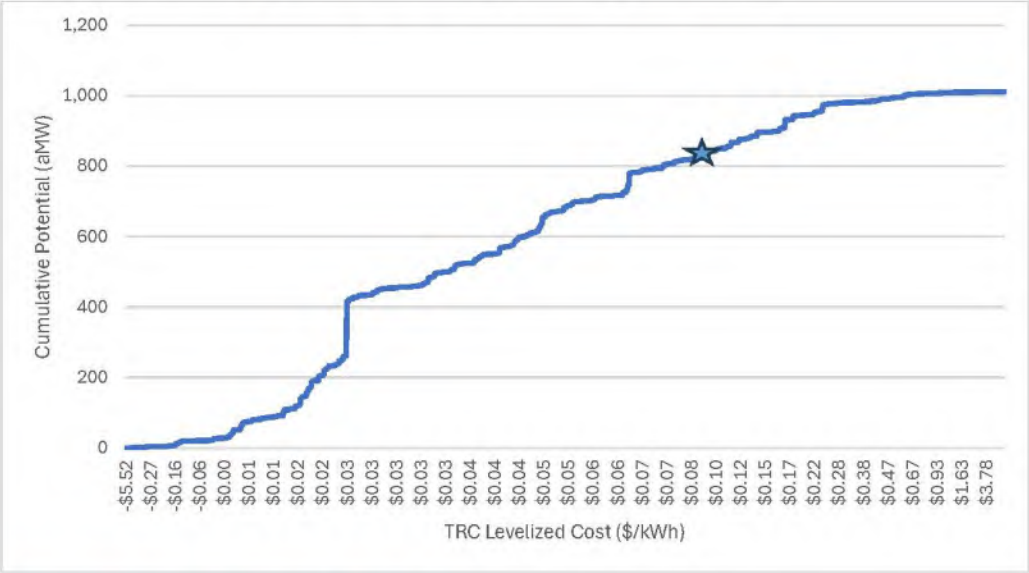
In this IRP, 9% of the cost-effective potential identified by the model is due to the use of the cost-effective override for measures. This is a higher share than in previous IRPs and is attributable to the OPUC cost-effectiveness exception for manufactured homes early replacement (14 aMW of the 69 aMW shown in Table 4). This measure generates a lot of potential due to the stock of existing manufactured homes in PGE territory, however this measure receives a low ramp-rate in the deployment process to account for market barriers and qualification criteria of homes and not all potential is deployed. Measures under exception make up 7% of the cost-effective achievable potential without the override applied to manufactured homes early replacement.

Supply Curves and Levelized Cost Outputs

An additional output of the RA Model is a resource supply curve developed from the levelized cost of energy of each measure. The supply curve graphically depicts the total potential in average megawatts that could be saved at various costs for all measures. The levelized cost for each measure is determined by calculating the present value of the total incremental cost of the measure over its economic life, per kWh of energy savings ($/kWh saved). The levelized cost calculation starts with the customer's incremental cost of a given measure. The total cost is amortized over an estimated measure lifetime using the PGE's discount rate provided to Energy Trust. The annualized measure cost is then divided by the annual kWh savings. Some measures have negative levelized costs because non-energy benefits amortized over the life of the measure are greater than the total cost of the measure over the same period.

Figure 9 below shows the supply curve developed for this IRP that can be used for comparing demand-side and supply-side resources. The star on the graph shows roughly the cutoff where savings become non-cost-effective, although some savings above the star are included due to cost-effective override.

Figure 9 – Electric Supply Curve ($ per kWh saved)



Deployed Results – Final Savings Projection

The results of the final savings projection show that PGE can save 171.7 aMW in the next five years from 2025 to 2029 and over 675 aMW by 2043. This represents a 16.5 percent cumulative load reduction by 2043[10] and is an average of 1.1 percent incremental annual load reduction. The cumulative final savings projection is shown in Table 5 compared to the technical, achievable and cost-effective achievable potential.

Table 5 - 20-Year Cumulative savings potential by type, including final savings projection (aMW)

Sector	Technical Potential	Achievable Potential	Cost-Effective Achievable Potential	Final Savings Projection[11]
Residential	261	226	202	151
Commercial	511	442	406	260
Industrial	241	209	206	203
Exogenous Savings[12]				62
Total	1,012	876	813	675

[10] Cumulative savings assumes customers will continue to purchase equipment of equal or higher efficiency equipment after the measure reaches the end of its useful life and therefore savings in this instance are assumed to persist in future years.
[11] The final savings projection includes market transformation lighting savings that will not be claimed by Energy Trust but are expected to come off PGE's system. These savings account for 44.7 aMW of the combined commercial and industrial final savings projections and 2.9 aMW of the residential final savings projection.
[12] Exogenous savings are calculated outside of the RA model and consist of commercial and residential prior codes, industrial large projects and residential electrification.

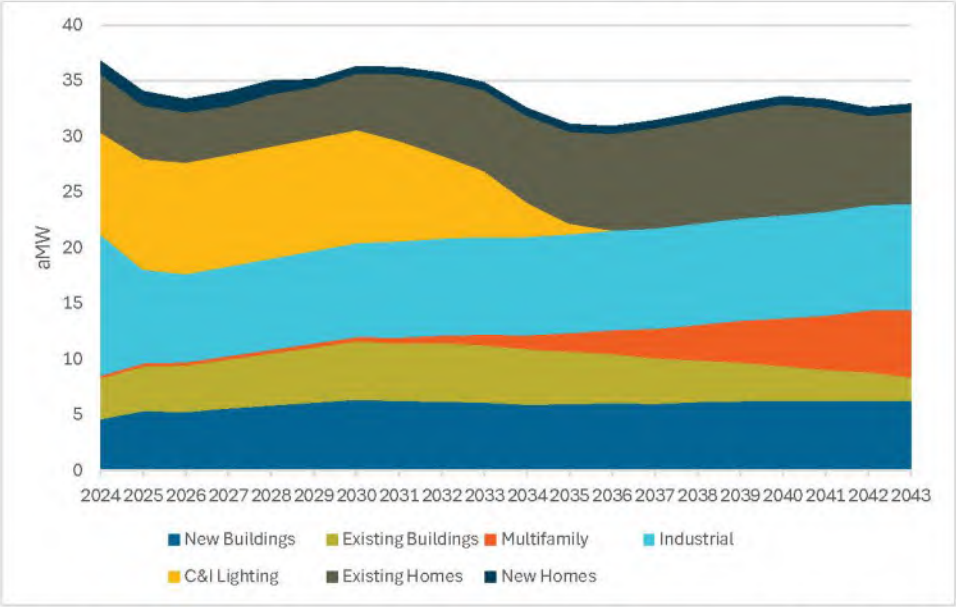
Energy Trust's general modeling principle is to deploy 100% of retrofit cost-effective achievable potential or ramp to 100% of cost-effective achievable potential for replacement and new construction measures consistent with Northwest Power and Conservation Council ramp rate methodology. However, certain measures have unique market barriers, uncertainties, or are early in their market adoption trajectory limiting their deployment. As such, the final deployed savings projections in Table 5 are a subset of the cost-effective achievable potential. This is most notable for the residential and commercial sectors which have a higher share of these measures where 100% deployment of cost-effective achievable potential is not feasible. There are several reasons why 100% acquisition is unrealistic, including:

1) "Lost Opportunity Measures" – Measures that are meant to replace failed equipment (ROB) or new construction measures (NEW) are considered lost opportunity measures because programs have one opportunity to influence the installation of efficient equipment over code baseline when the existing equipment fails or when the new building is built. This is because these measures must be installed at that specific point in time, and if a program administrator misses the opportunity to influence the installation of more efficient equipment, the opportunity is lost until the equipment fails again. Energy Trust expects that most of these opportunities will be met in later years as efficient equipment becomes more readily adopted. However, in early years, the level of acquisition for these opportunities is smaller and ramps higher as time progresses.
2) "Hard to Reach Measures" – some measures that show high savings potential are notoriously hard to reach. These include multifamily and shell measures.
3) The nascent and uncertain nature of emerging technologies limit their market adoption in the forecast horizon similar to #2 above.
4) New, comprehensive measures added to the RA model including New Buildings Custom Data Center and New Homes Manufactured Home Early Replacement – Custom Data Center savings are subject to modeling uncertainty. Energy Trust modeled their adoption using program expertise and achievements from past projects and, given the magnitude of load forecast, make up a large share of the commercial sector step down in Table 5. Similarly, the Manufactured Home Early Replacement measure calculates potential for a large share of manufactured homes in PGE territory, however it is unrealistic that 100% of homes will turn over in the forecast period given its relatively high cost and labor (note this measure is under OPUC exception).

Exogenous savings are calculated outside of the RA model because they are generally accounted for in market characterization assumptions (prior codes) or their baseline is present in the utility load forecast (residential electrification). Energy Trust models prior codes using a forecast from NEEA. The inclusion of Residential Electrification is new for this round of modeling and was calculated as incremental lost opportunity savings above PGE's electrification forecast and were deployed consistent with similar lost opportunity measure adoption. Finally, Energy Trust exogenously adds industrial large projects because those savings are not characterized by the measures included in the RA model. In total exogenous savings total 62 aMW and make up 9% of the final savings projection.

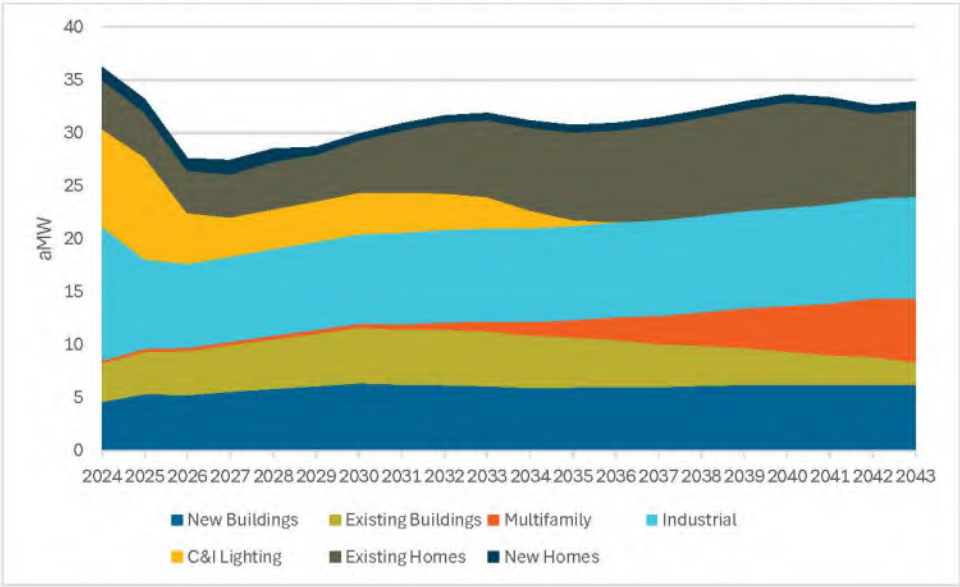
The final savings projection of 675 aMW in Table 5 represents 20-years of efficiency savings. The annual shape of the deployed efficiency forecast is shown in Figure 10 below.

Figure 10 – Annual Deployed Final Savings Potential



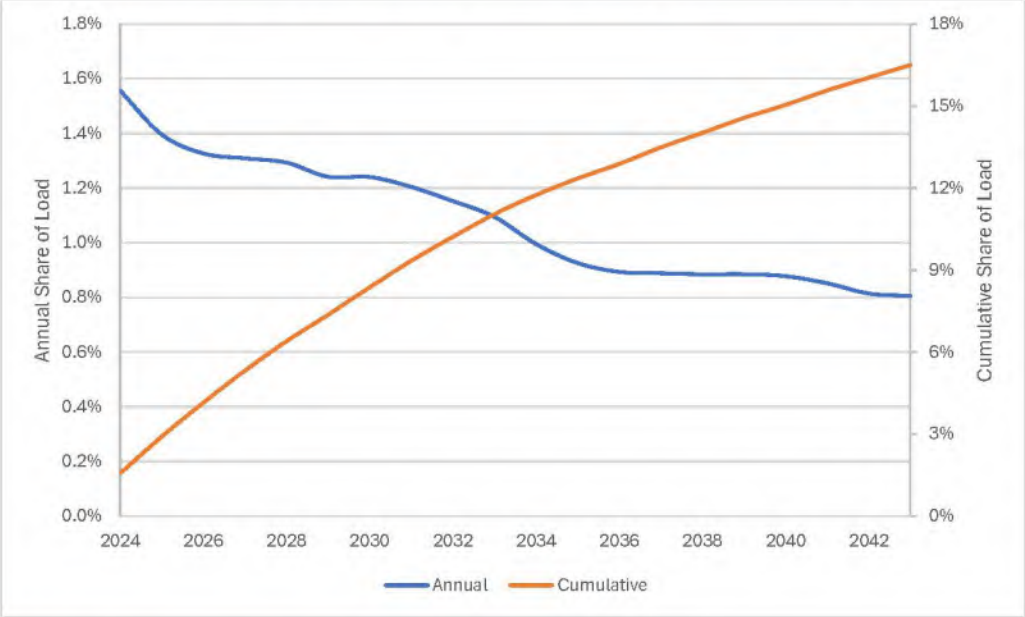
As previously noted, the final savings projection depicted in Figure 10 above includes 47.5 aMW of market transformation lighting savings that energy trust will not claim. Figure 11 below shows the annual efficiency forecast of Energy Trust claimed savings.

Figure 11 – Annual Deployed Energy Trust Claimed Savings Potential



Finally, Figure 12 shows the annual and cumulative savings as a percentage of PGE's load forecast. Annually, the savings as a percentage of load varies from about 0.8% at its lowest to 1.6% at its highest, as represented on the *left* Y-axis of the graph and the blue line. Cumulatively, the savings as a percentage of load builds to 16.5% by 2043, shown on the right Y-axis and the gold line.

Figure 12 – Annual Forecasted Savings as a Percentage of Annual Load Forecast



Deployed Results – Peak Day Results

Ongoing regional emphasis on peak and capacity management and an OPUC docket focused on electric utility Distribution System Planning (OPUC docket UM 2005) has resulted in continued interest in the contribution energy efficiency can make to managing electric utility loads. Additionally, the OPUC has directed Energy Trust to report peak impacts in the appendices of our annual report beginning in 2017[13].

Peak hour factors are the percentage of annual energy savings that occur during peak hours over the course of a year. Energy Trust calculates peak demand factors using Equation 1, where load factors and coincidence factors being derived from the NWPCC library of load profiles.

Equation 1 – Calculation of Peak Factors from Load and Coincidence Factors

*Peak factor = (1 yr/8760) * Load Factor * Coincidence Factor*

Figure 11 below shows the annual, deployed peak day savings potential based upon the results of the 20-year forecast. Each measure analyzed is assigned a load shape and the appropriate peak factor is

[13] For the 2023 version of this report see Appendix 9 of Energy Trust's "*2023 Annual Report to the Oregon Public Utility Commission & Energy Trust Board of Directors*" available at https://www.energytrust.org/wp-content/uploads/2024/04/Energy-Trust-of-Oregon-2023-Annual-Report.pdf

applied to the annual savings to calculate the overall DSM contribution to peak day capacity. Cumulatively, this is equal to 1,980 MW[14], as shown in Table 6 below.

Figure 11 - Annual Deployed Peak Savings Contribution by Season

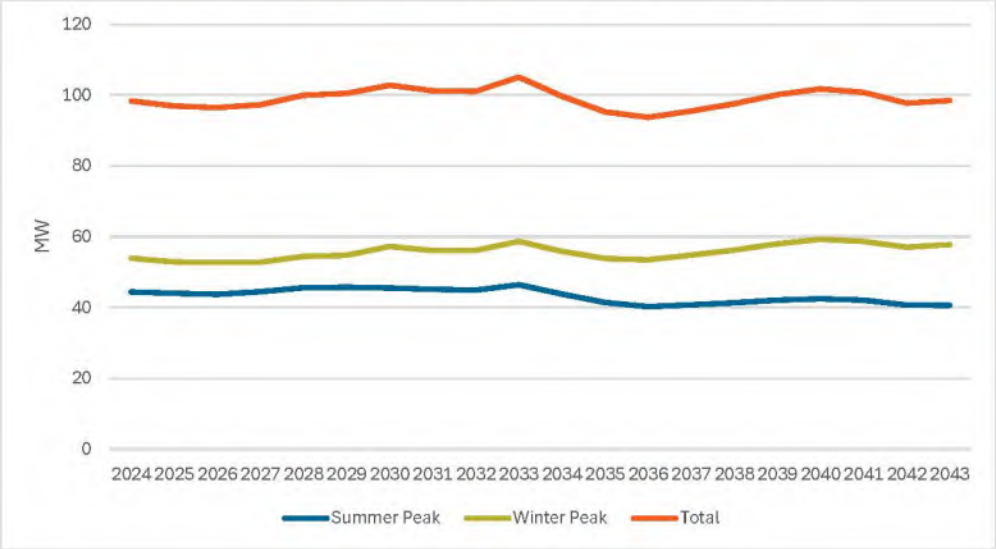


Table 6 - Cumulative Deployed Peak Savings Contribution by Sector

Sector	Cumulative Peak Savings (MW)	% of Overall Peak Savings
Residential	797	40%
Commercial	643	32%
Industrial	540	27%
Total	1,980	

Non-Cost-Effective Energy Efficiency

Starting in 2023, PGE requested that Energy Trust submit savings and levelized cost data from measures that did not pass the TRC cost-effectiveness screen in the Energy Trust RA model. This allows PGE to compare efficiency to supply side resources where the total resource cost of efficiency exceeds benefits calculated by utility submitted avoided costs. This modeling could highlight areas of value in addition to what is quantified in the UM 1893 avoided costs docket. This analysis is completed by PGE and the results are detailed in their IRP report. Summary values for the non-cost-effective efficiency submitted

[14] Peak results do not include energy savings from exogenous categories.

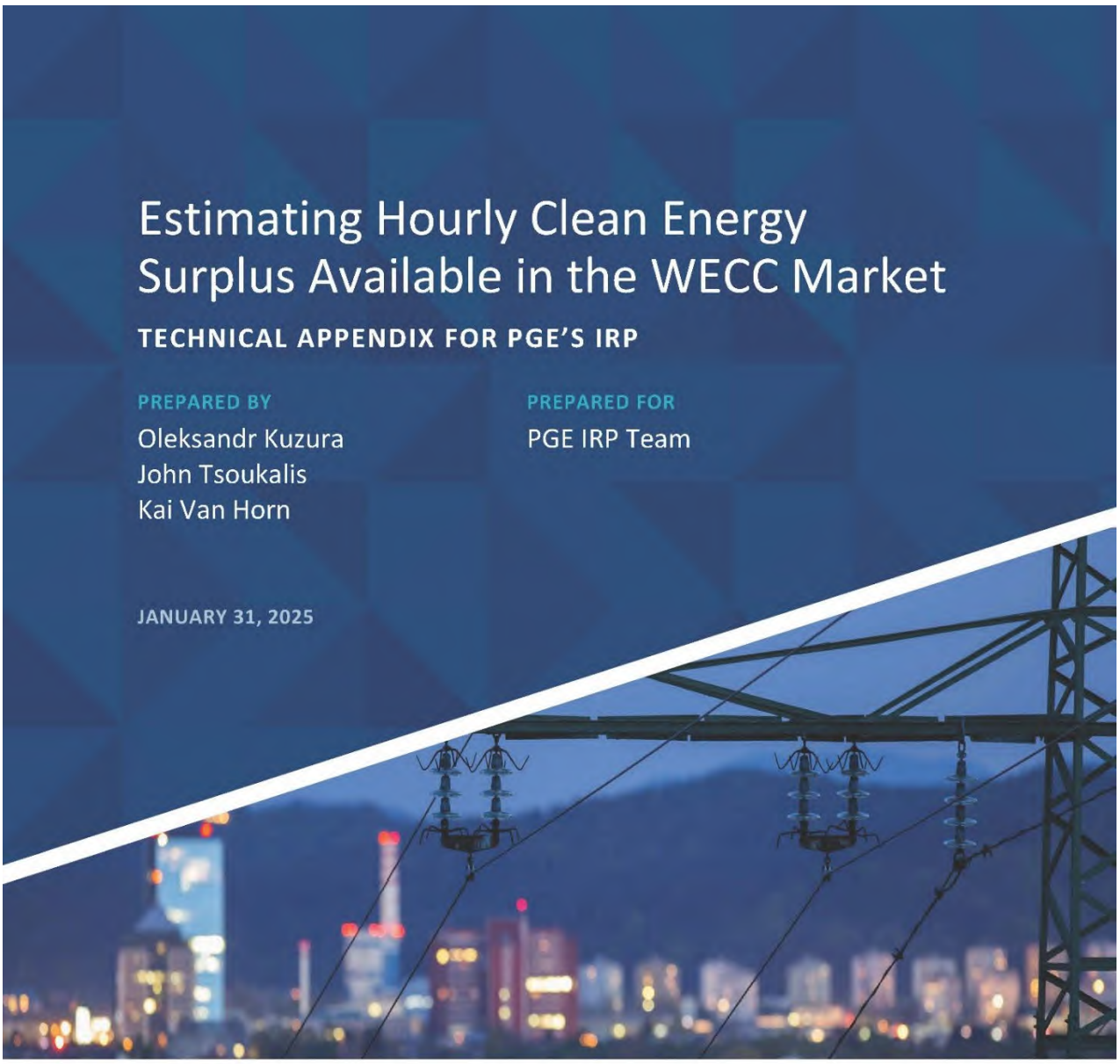
by Energy Trust are shown below in Table 7. For the 2025 IRP analysis, these savings total 75.1 aMW at a weighted average levelized cost[15] of $0.401/kWh.

Table 7 – 20-year Non-Cost-Effective Efficiency Potential

Sector	Non-Cost-Effective Achievable Potential (aMW)[16]	Weighted Average Levelized Cost ($/kWh)
Residential	32.6	$0.406
Commercial	40.1	$0.412
Industrial	2.4	$0.149
Total	75.1	$0.401

[15] This levelized cost represents the total resource cost, levelized over measure life ($/kWh) plus a 31% administrative cost adder.
[16] The values in this column do not exactly match the difference between Achievable Potential and Cost-Effective Achievable Potential in Table 5 for several reasons including substitution between competing measures, cost-effective override, and the timing of discretionary measures on the margin of cost-effectiveness.

Appendix F Market for non-emitting energy



Brattle

PGE

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I. Introduction And Background

The Oregon Public Utility Commission (OPUC) directed Portland General Electric (PGE) to adopt hourly accounting of its clean energy position and the associated greenhouse gas (GHG) implications in its 2025 Clean Energy Plan (CEP) and Integrated Resource Plan (IRP) update. This directive was issued in Docket LC 80, in which OPUC Staff declined to acknowledge PGE's 2023 CEP due to concerns about PGE's ability to procure clean energy from the market. Specifically, PGE's portfolio was forecasted to be long on clean energy during shoulder seasons and short on clean energy during peak hours, matching regional supply trends across the Western Electricity Coordinating Council (WECC) territory. OPUC Staff and stakeholders raised concerns about PGE's assumption that clean energy would be equally available year-round, noting that supply could be limited at times and might also incur a premium cost to purchase.

The Brattle team (hereby "we") was engaged by PGE to address the OPUC's request to develop and implement an hourly accounting methodology for estimating the availability and cost of purchasing clean energy. Developing this methodology required answering the following questions:

- In each hour, how much clean energy is available after accounting for resources committed to other GHG reductions for non-PGE entities in the WECC?
- What, if any, is the cost premium associated with procuring surplus clean energy in a given hour? How does that cost premium vary with available supply?

We developed the Excel-based Clean Energy Surplus Model (CESM) to estimate the hourly WECC-wide market availability of clean energy deliverable to PGE and the potential cost premiums it may incur. The CESM uses hourly results from PGE's AURORA IRP simulations and a curve capturing the relationship between clean energy surpluses and potential purchase premiums to produce an hourly time series of clean energy deliverable to PGE and the potential associated premiums. The CESM outputs are then used in PGE's calculation of its resource plans' annual GHG impacts.

This appendix describes the CESM framework, including key assumptions, data inputs, outputs, strengths, and areas for future improvements. It is organized into five sections. Section 0 provides a detailed step-by-step explanation of the CESM's surplus calculation framework.

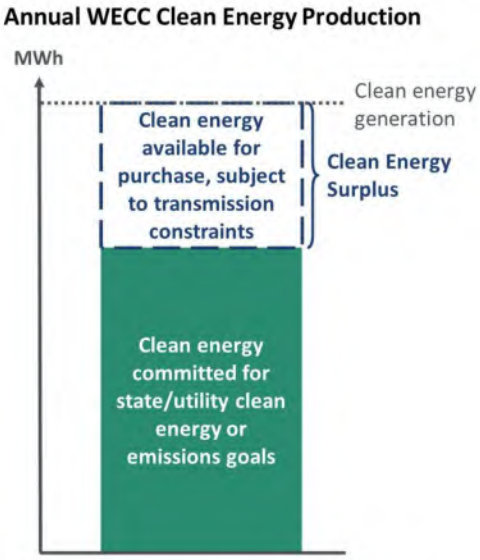
Section III details the CESM's premium calculation approach. Section IV summarizes the CESM's clean energy surplus and premium results for two AURORA simulations. Section V discusses the CESM's strengths and areas for potential future improvements.

II. Clean Energy Surplus Estimation Overview and Key Assumptions

Market purchases of clean energy could help offset PGE's emissions, but PGE's ability to access them depends on the WECC-wide clean energy supply, clean energy demand, and transmission available to PGE to import that energy. We define "clean energy surplus" (or "surplus") as the clean energy generated in the WECC beyond that which is needed to meet annual state-level clean energy requirements. Clean energy supply depends on the amount and types of generation resources available in each state and varies with regional and seasonal weather patterns and installed capacity. Clean energy demand depends on binding policy targets and voluntary goals set by states, municipalities, corporations, and other entities.[1] Transmission availability to PGE depends on the total transfer capability (TTC) over WECC transmission paths and the hourly utilization for regional trading. Figure 1 provides an illustration of the clean energy surplus as it relates to the overall availability of clean energy.

[1] We consider only binding state requirements in the CESM due to data availability constraints on voluntary targets.

FIGURE 1. ILLUSTRATIVE EXAMPLE OF CLEAN ENERGY SURPLUS



Using the CESM, we calculate hourly clean energy surpluses deliverable to PGE by:

1. Evaluating annual state-level clean energy surpluses or deficits,
2. Allocating annual regional surpluses or deficits to individual hours, and
3. Aggregating state-level results to the WECC-wide and regional levels,
4. Applying transmission constraints between PGE and the neighboring regions.

An overview of the CESM surplus calculation steps is given in Figure 2, with detailed descriptions of each step following.

FIGURE 2. SUMMARY OF CESM CLEAN ENERGY SURPLUS CALCULATION STEPS



1. Pre-Process and Aggregate Zonal AURORA Results to the State Level

PGE's IRP simulations in AURORA produce hourly load and generator dispatch results at a zonal level. The AURORA model divides the WECC into zones representing states, portions of states, and major transmission hubs as shown in Appendix C. In the CESM we assume states and transmission hubs with interconnected generation resources are the base geographic units to align with the geographic application of clean energy policy requirements. For utilities with multi-state service territories, generation and load are divided along state lines, consistent with the representation in the AURORA database.

We pre-process the AURORA results by aggregating sub-state results to the state level and combining all statewide generation into a single set of "clean" or "other" generation results. Appendix C contains a designation of resource types and a mapping of AURORA zones to states.

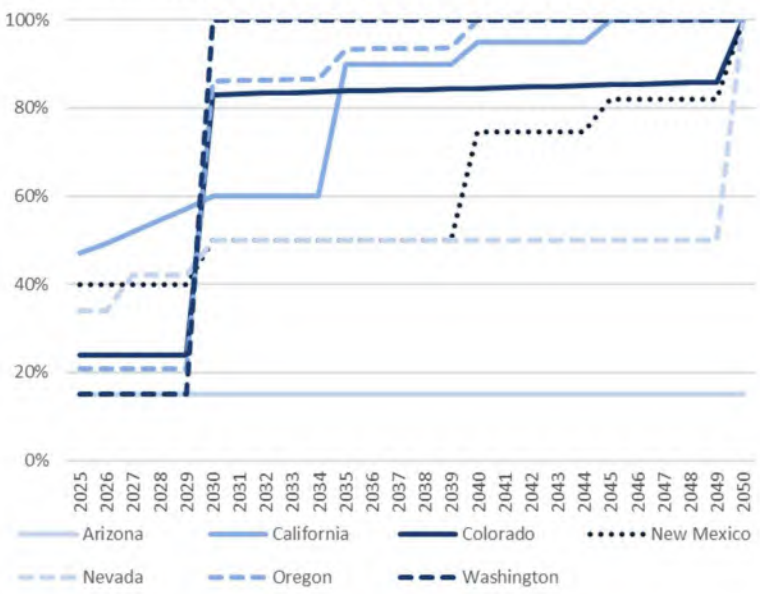
2. Calculate State-Level Annual Clean Energy Requirements

In the CESM, we assume only clean energy associated with legally binding state clean energy requirements is unavailable when calculating WECC-wide clean energy surplus. Voluntary targets from municipalities, corporations, and other entities have uncertain enforcement mechanisms. The CESM reflects additional demand from voluntary targets, such as corporate clean energy pledges or municipal clean energy programs through its calculation of purchase premiums described in Section III.

We calculate the total WECC-wide demand for clean energy by summing individual states' annual clean energy requirements. We calculate annual state-level clean energy requirements as the sum of each state's hourly electric demand multiplied by that state's percent-based clean energy requirement. State-level percent-based requirements are based on the LBNL's State Renewables Portfolio and Clean Electricity Standards database.[2] The CESM interpolates or extrapolates state-level targets set for specific years to derive annual clean energy targets for each of the PGE IRP study years, as needed. Figure 3 charts annual state-level targets included in the CESM, omitting data for states without policy targets.

[2] Lawrence Berkeley National Laboratory (LBNL). *U.S. State Renewables Portfolio & Clean Electricity Standards: 2023 Status Update*, 2023. Accessed online at https://emp.lbl.gov/publications/us-state-renewables-portfolio-clean.

FIGURE 3. STATE CLEAN ENERGY TARGETS INCLUDED IN THE CESM



3. Calculate State-Level Annual Clean Energy Surpluses or Deficits

The total volume of clean energy available to PGE for purchase depends on each state's annual clean energy generation surplus or deficit relative to its annual clean energy requirements. We assume that states prioritize meeting their annual clean energy requirements using in-state generation, and that any state-level clean energy generation in excess of state-level clean energy requirements would be available as surplus. On the other hand, any shortfalls in state-level clean energy generation relative to state-level targets reduce the total amount of clean energy surplus available WECC-wide, as we assume surpluses from other states fill requirement deficiencies before being offered to the market.

We calculate annual state-level clean energy surpluses or deficits as the difference between each state's annual clean energy policy targets and the total clean energy production that can be used to satisfy those requirements. In each hour, we assume that all clean energy generation up to a state's hourly load can be used to meet clean energy policy targets ("usable" clean energy). We assume that clean energy generation exceeding states' hourly loads would

be deemed surplus clean energy. We then calculate annual clean energy generation usable for meeting states' clean energy policy targets by summing usable clean energy generated across all hours of the year.

Next, we compare each state's annual usable clean energy generation to its annual clean energy targets. If a state's total annual clean energy generation is not enough to satisfy its annual clean energy requirements, that state is assumed to be in deficit and must rely on clean energy from other states to meet its targets. On the other hand, if a state's annual usable clean energy generation is greater than its annual clean energy requirements, that state is assumed to have an annual clean energy surplus.

4. Allocate State-Level Annual Surpluses or Deficits to Individual Hours

To calculate the hourly availability of clean energy WECC-wide and regionally, we next allocate states' gross annual clean energy surpluses or deficits to individual hours surplus availability. As a starting point, we assume that surpluses and deficits are proportional to hourly clean energy production and loads.

In the CESM we apply a heuristic to carry out this hourly allocation by assuming that states' surpluses or deficits are proportional to the difference between hourly clean energy production and demand. We implement this "proportional" approach in the CESM by deriving an annual surplus or deficit allocation factor.

For states with gross annual surplus clean energy production, we calculate the allocation factor as the difference between the state's total annual clean energy production and its total annual clean energy requirement. This factor is then applied to determine the portion of a state's hourly clean energy production that could be offered on the market. For example, a state with 100 MWh of annual clean energy production and 80 MWh of clean energy requirements would have an allocation factor of 20%. This means that the state can offer 20% of its annual clean energy production (20 MWh) and still have enough usable clean energy production to meet its annual clean energy targets (80 MWh). In an hour when the state produces 10 MWh of clean energy, it is assumed to offer 2 MWh on the market (20% of production in that hour) and keep 8 MWh (the remaining 80% of production in that hour) to count toward its own policy requirements.

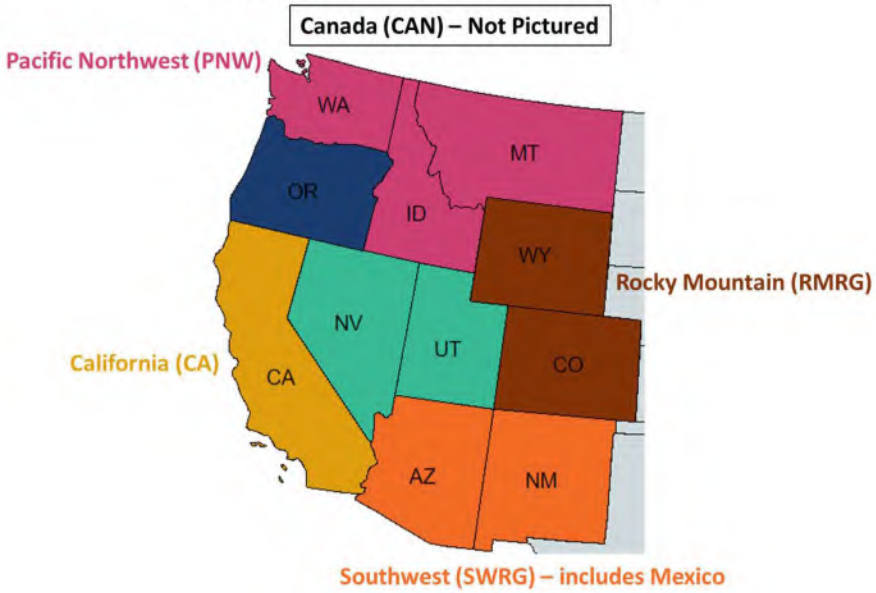
For states with gross annual deficits of clean energy, we calculate the allocation factor as the difference between the state's annual clean energy target and the state's total annual clean energy production. This allocation factor is then used to determine quantity of clean energy procurement the state would seek to procure on the market in each hour. For example, if a state's annual clean energy policy target is 100 MWh and its local annual clean energy production is 60 MWh, then the state's allocation factor would be 40%. In an hour when the state's load is 10 MWh and its local clean energy production is 8 MWh, the state would seek an additional 0.8 MWh of clean energy (40% of 2 MWh) to contribute to filling its annual deficit.

5. Aggregate Hourly State-Level Results to Regional and WECC-Wide Level

We use the CESM to calculate the WECC-wide hourly surplus or deficit by summing the hourly surpluses and deficits of each state. The Oregon-West (OR-WE) AURORA zone contains PGE and is omitted from this calculation to represent PGE's view of the WECC market.

We aggregate state-level results into regions based on states' transmission connectivity to facilitate data validation and later application of deliverability constraints (Figure 4). Assuming sufficient transmission availability among states within each region, the CESM calculates hourly regional surpluses and deficits by summing the hourly surpluses and deficits of the region's member states. For example, the proportional allocation method may suggest that Wyoming could have 10 MWh of clean energy to offer on the market the same hour that Colorado could seek to procure 5 MWh of clean energy to fill its deficit. Since these states comprise the RMRG region, the CESM would indicate a 5 MWh clean energy surplus in the RMRG region in this hour.

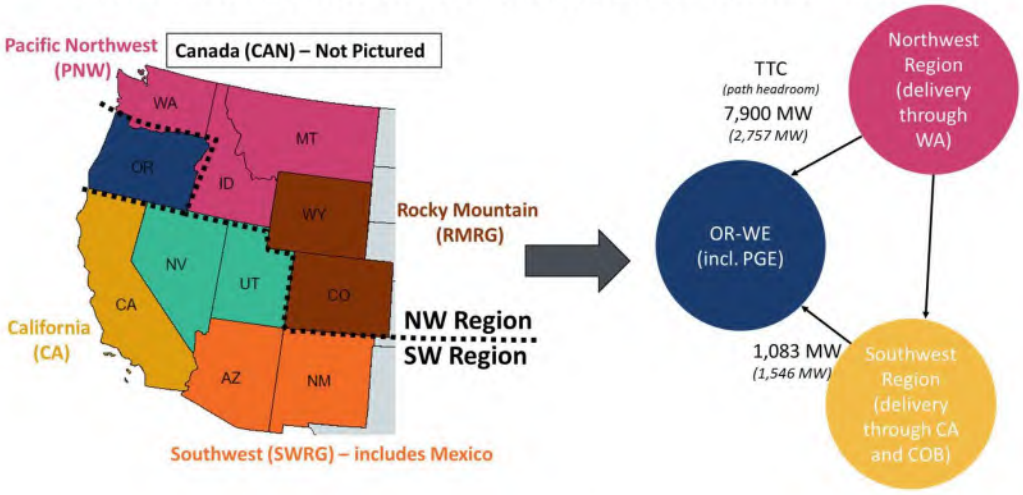
FIGURE 4. REGIONAL AGGREGATION IN THE CESM



6. Calculate Clean Energy Surplus Deliverable to PGE

We further limit the availability of clean energy surplus to PGE in the CESM based on available transmission headroom on the transmission paths connecting PGE to the rest of the system. To do so, we use the transmission path limits and power flow represented in the AURORA model between the OR-WE zone and the neighboring zones representing California, Washington, and the California-Oregon Border (COB) trading hub. For tractability in the CESM calculations, we aggregate the regions in Figure 4 into the Northwest and Southwest super-regions (Figure 5) and consider clean energy deliverability to PGE based on its transmission capacity and availability to these regions.

FIGURE 5. DIVISION OF WECC STATES INTO NORTHWEST AND SOUTHWEST REGIONS



We then calculate surplus *deliverable* to PGE in the Oregon-West zone in three steps:

1. **Balance Northwest and Southwest regional surpluses and deficits** by calculating the hourly surplus or deficit available in the Northwest and Southwest regions. This step uses a similar approach to that used for aggregating state-level results to the regional level as described in Step 5 above.

   In the CESM, we assume surplus transfers are unrestricted by transmission constraints within each super-region, except between the Rocky Mountain (RMRG) region and the rest of the Northwest. RMRG has a larger wind generation resource in Wyoming than it has transmission interconnectivity with the rest of the Northwest region. To reflect this in the CESM, we enforce a constraint between RMRG and the Pacific Northwest (PNW) region, balancing RMRG surpluses and deficits with the rest of the PNW. When RMRG surplus exceeds available headroom on the RMRG to PNW path, the rest of the RMRG surplus is assumed to be sent to the Southwest region. Any RMRG surplus beyond that which is deliverable to the Northwest and Southwest regions via available transmission headroom is assumed to be unavailable to PGE.

2. **Calculate available hourly transmission path headroom from the Northwest and Southwest regions to Oregon-West.** We calculate within the CESM the available headroom to Oregon-West based on the path ratings and hourly transmission utilization results from the AURORA model. For each transmission path, we calculate a net hourly flow by netting

out flows in the forward and reverse direction as defined in the AURORA inputs. To arrive at available headroom for the CESM, we then subtract the net flow from the path's TTC in each hour. In this initial version of the CESM, we assume no re-dispatch of storage or thermal resources to relieve congestion constraints or improve deliverability of clean energy to PGE at certain times of day. We calculate the total headroom from the Southwest region into OR-WE as the sum of the transmission headroom from California to OR-WE and from COB to OR-WE.

3. **Adjust Northwest and Southwest region surpluses for deliverability into OR-WE, accounting for transfers between the Northwest and Southwest regions**. We limit hourly transfers within the CESM from the Northwest and Southwest regions into OR-WE based on the hourly transmission headroom available into OR-WE. We additionally assume that surplus transfers can occur between the Northwest and Southwest regions as needed to ensure full utilization of transmission headroom into OR-WE. For example, if the Northwest region had 100 MWh of surplus but only 80 MW of transmission headroom available to OR-WE in some hour, then PGE could access only 80 MWh of surplus from the Northwest region in that hour. However, the CESM assumes those 20 MWh of surplus could be delivered to OR-WE via the Southwest region if there were enough transmission headroom available on the paths from the Northwest to the Southwest and from the Southwest to OR-WE.

III. Clean Energy Premium Estimation Approach

The CESM reflects an expectation that PGE may have to pay a premium to secure clean energy supplies when those supplies are relatively scarce.

We reflect this expectation in our calculations by estimating an hourly Clean Energy Premium, defined as the additional cost that PGE may have to pay beyond the energy price associated with the purchase of clean energy. Within the CESM we use a Clean Energy Premium Curve (CEPC) to translate hourly WECC-wide clean energy surpluses into hourly clean energy premiums. The CESM calculates the hourly Clean Energy Premium PGE may have to pay in three steps:

1. Create a WECC-wide CEPC for the simulation year

2. Calculate WECC-wide hourly Clean Energy Premiums
3. Implement PGE-specific Clean Energy Premium adjustments

Next, we discuss each of these steps in greater detail.

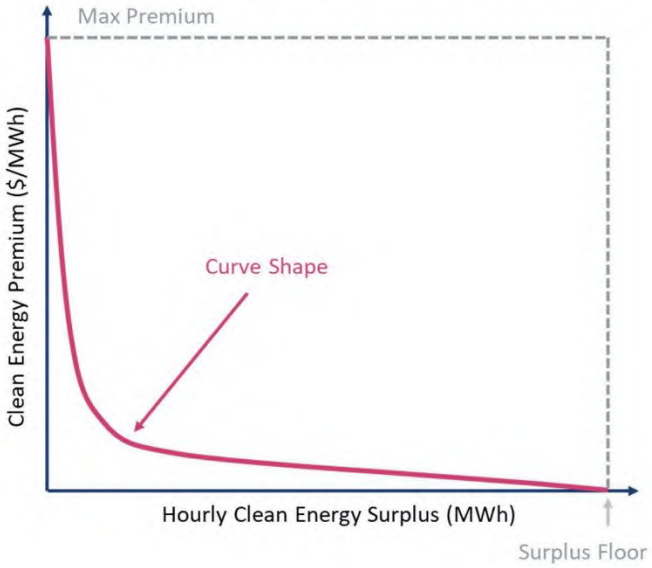
1. Create a WECC-Wide CEPC for the Simulation Year

The CEPC captures the impact of competition for scarce clean energy on the value of its clean energy attribute, broadly mimicking the price-quantity dynamics observed in other clean attribute markets. We define the CEPC separately for each model year using three parameters:

- **Curve shape** reflecting the relationship between the Clean Energy Premium and WECC-wide surplus quantity,
- **Max premium** related to the levelized cost of procuring clean energy from newly built capacity, in the case of PGE the cost of a new build wind resource, and
- **Surplus floor** threshold quantity above which the premium is assumed to be zero.

Figure 6 shows an illustrative CEPC with the above parameters labeled, followed by additional discussion of each parameter.

FIGURE 6. CLEAN ENERGY PREMIUM CURVE PARAMETRIZATION



CEPC Curve Shape Parameter

We model a negative exponential relationship between clean energy surplus and premium in the CESM, assuming clean energy attributes in the WECC would have similar price-quantity dynamics as renewable energy certificates (RECs) in other markets. Historical solar REC (sREC) auction outcomes from PJM states with liquid markets show an exponential relationship between trade volumes and clearing prices (Figure 7).[3] This relationship indicates that as the supply shrinks, buyers are willing to pay increasing premiums to secure clean attributes in the market. On the other hand, if there is ample supply, premiums settle at a relatively low baseline value. The negative exponential shape used in the CESM is a normalized version of the PJM sREC auction outcome graph shapes, tuned using outputs from the AURORA model.

[3] We relied on PJM sREC auction outcomes for the CESM due to a lack of available clean attribute market data in the WECC.

FIGURE 7. PJM SOLAR REC AUCTION PRICE-QUANTITY RELATIONSHIP BETWEEN 2010-2024



CEPC Max Premium Parameter

Based on guidance from PGE, we set the CEPC Max Premium parameter based on the cost of a new build wind resource, assuming that wind would be the source of incremental supply of clean energy beyond what is available from existing resources. We set the CEPC Max Premium to $15/MWh for the year 2030, reflecting a $10/MWh levelized cost of energy (LCOE) for a new wind resource earning the Production Tax Credit and a 1.5× scalar to reflect cost uncertainty not reflected in the LCOE. The LCOE value is based on the 2023 NREL ATB's calculation of the LCOE of a Class 4 onshore wind turbine using the moderate cost trajectory.[4]

CEPC Curve Floor Parameter

We set the Curve Floor parameter based on WECC-wide clean energy surpluses observed in the AURORA results when energy prices are below a certain threshold. Low energy prices indicate high enough clean energy production that there should be no premium associated with its procurement. This study used a $0/MWh threshold price, which indicates clean energy curtailments in the AURORA model. The Curve Floor parameter was set at the minimum WECC-wide surplus observed across all hours when the WECC-wide load-weighted average energy price was at or below the $0/MWh threshold.

2. Calculate WECC-Wide Hourly Clean Energy Premiums

We use the CESM process detailed in Steps 1 through 5 detailed in Section 0 above to calculate the total available WECC-wide surpluses in each hour. Since the premium does not depend on

[4] National Renewable Energy Laboratory. *2023 Annual Technology Baseline*. 2023. https://atb.nrel.gov/electricity/2023/land-based_wind.

how much of the available surplus is deliverable to PGE, we use the CEPC to calculate hourly WECC-wide premiums using the results of Step 5.

3. Implement PGE-Specific Premium Adjustments

We divide each hour's WECC-wide premium by the capacity factor of a reference wind profile in that hour to capture the impact of wind availability on the cost of producing a MWh of clean energy in each hour. A key concern for PGE's CEP is whether to rely on market purchases or to procure new clean generation capacity. An owned or contracted resource seldom produces clean energy equal to its nameplate capacity. Thus, PGE may need more than a MW of clean generation nameplate capacity to produce a MWh of clean energy when needed. Dividing the hourly WECC-wide premium by the capacity factor of a reference wind output profile in that hour serves to make comparable the cost of procuring capacity or purchasing surplus on the market.

IV. Clean Energy Accounting Results

We evaluated potential clean energy surplus availability for the year 2030 based on AURORA model results from the 2023H2 and 2024H2 production cost model databases from Wood Mackenzie. The annual regional and WECC wide generation mix and load modeled in each set of AURORA inputs is given below in Figure 8, followed by the monthly WECC-wide generation mix and load in Figure 9. Both model databases show the WECC-wide and regional generation mixes as having high proportions of clean energy and an annual surplus. WECC-wide surpluses tend to concentrate in the spring months, when loads are low and clean energy generation is high. The Northwest region has higher surplus than the Southwest region, despite higher policy requirements, due to substantial wind and hydro penetration.

FIGURE 8. ANNUAL GENERATION ASSUMPTIONS IN THE AURORA MODEL

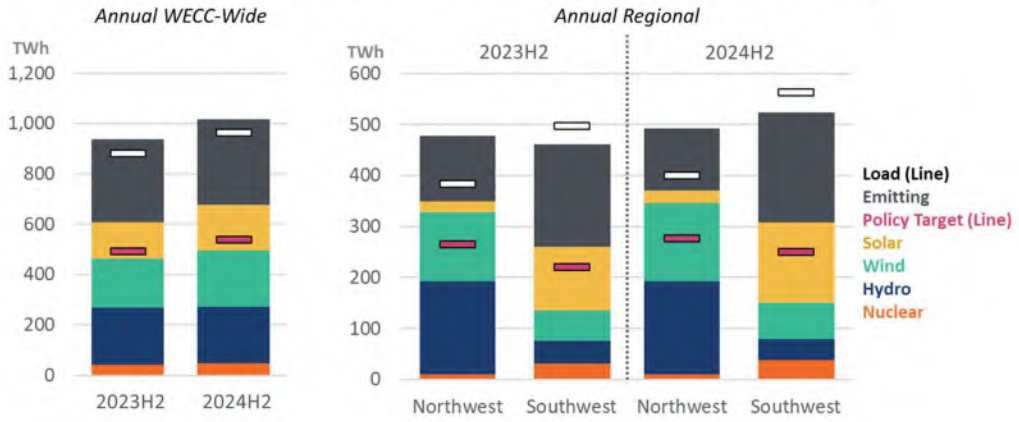
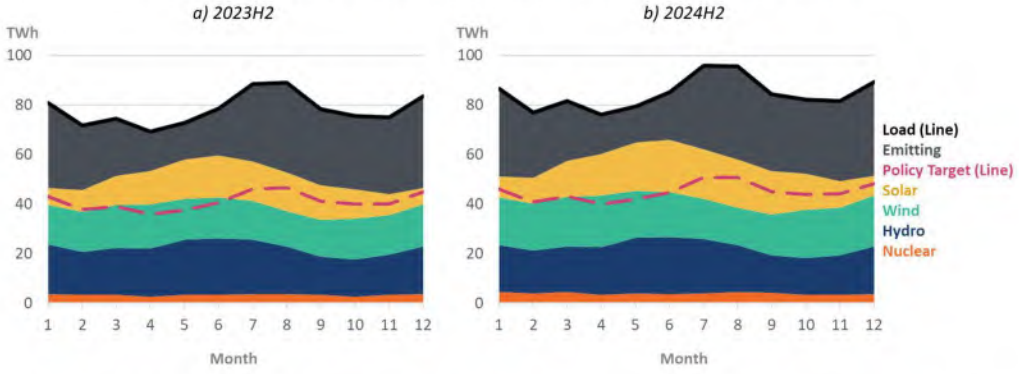
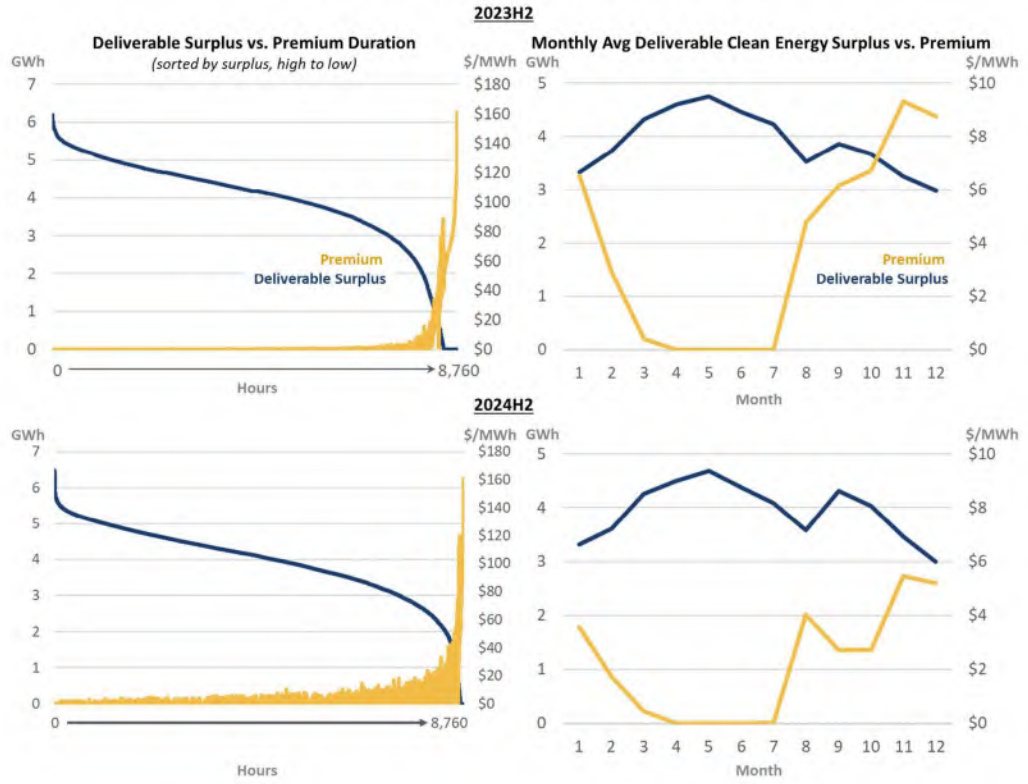


FIGURE 9. MONTHLY GENERATION ASSUMPTIONS IN THE AURORA MODEL



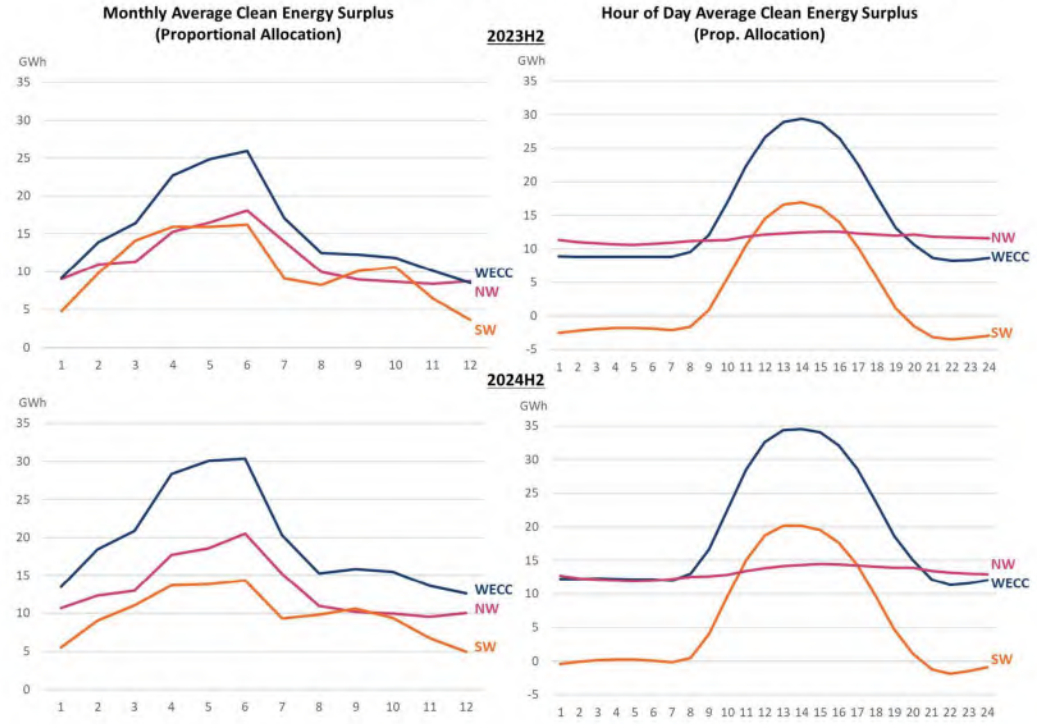
We find that deliverable surpluses are highest in the spring and early summer, roughly in line with the seasonality of clean generation. Premiums follow an inverse pattern and are highest in the winter, when surpluses are low, reflecting the price-quantity relationships defined in the CEPC. Figure 10 below plots the deliverable surpluses and premiums for both sets of AURORA data as a duration curve (left charts) and as average monthly values (right charts). The duration curves plot hourly surplus (blue line) and premium (yellow line) results arranged by surplus quantity in descending order. The monthly charts represent the simple average surplus and premium value for each month.

FIGURE 10. DELIVERABLE SURPLUS AND PREMIUM



We observe substantial variability in WECC-wide and regional surpluses across different months and hours of the day (Figure 11). The Northwest region's monthly clean energy generation patterns drive WECC-wide monthly clean energy surpluses because the Northwest region has a rich wind and hydro resource. On a daily scale, the Southwest region drives WECC-wide surplus patterns due to its large solar resource. In the right charts in Figure 11, the blue line (WECC-wide surplus) has a very similar shape to the orange line (Southwest average surplus), displaying a hump during solar generation hours. The pink line (Northwest average surplus) remains mostly flat across all hours of the day.

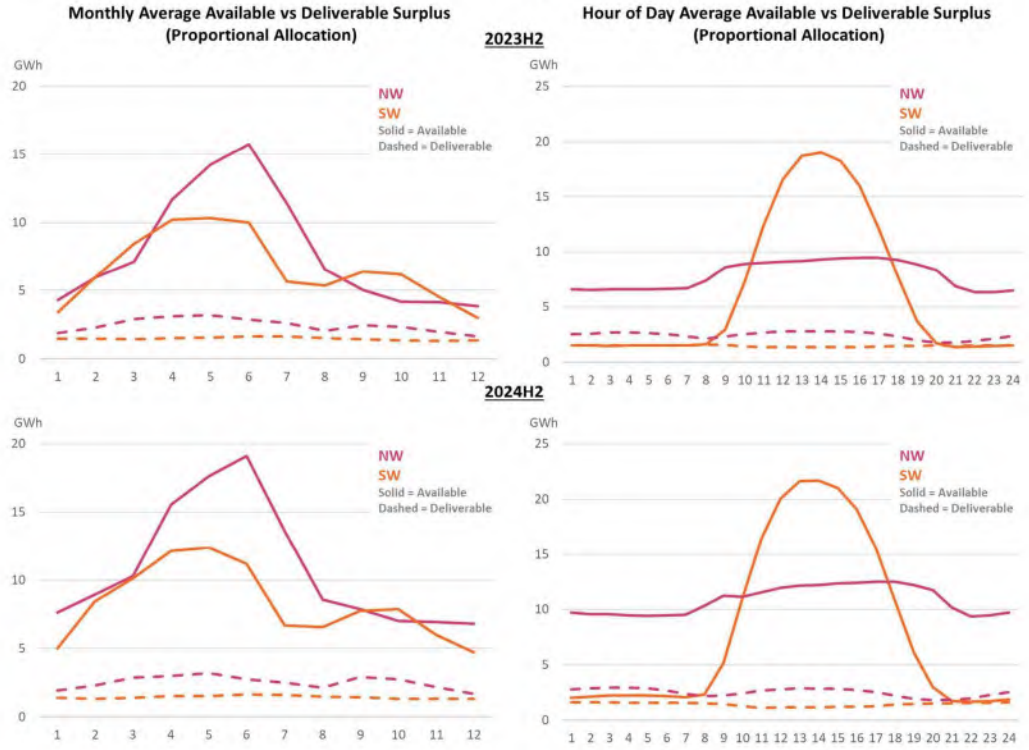
FIGURE 11. WECC-WIDE AND REGIONAL SURPLUSES[5] BY MONTH AND HOUR OF THE DAY



We found that deliverability constraints substantially curtail PGE's access to clean surplus. Figure 12 plots the available (solid line) and deliverable (dashed line) surplus for each region by month (left charts) and hour of day (right charts). PGE's deliverability constraints are most impactful during the springtime for Northwest surpluses and during the daytime for Southwest surpluses, with an overall impact of allowing just over 30% of available surplus to be delivered to PGE.

[5] Charts show average surplus quantities for hours when surpluses are available, before accounting for RMRG deliverability constraints and transfers between NW and SW regions. Aggregating to the WECC-wide level alters the timing and amounts of surpluses shown such that the NW and SW values may add to more than the WECC quantity.

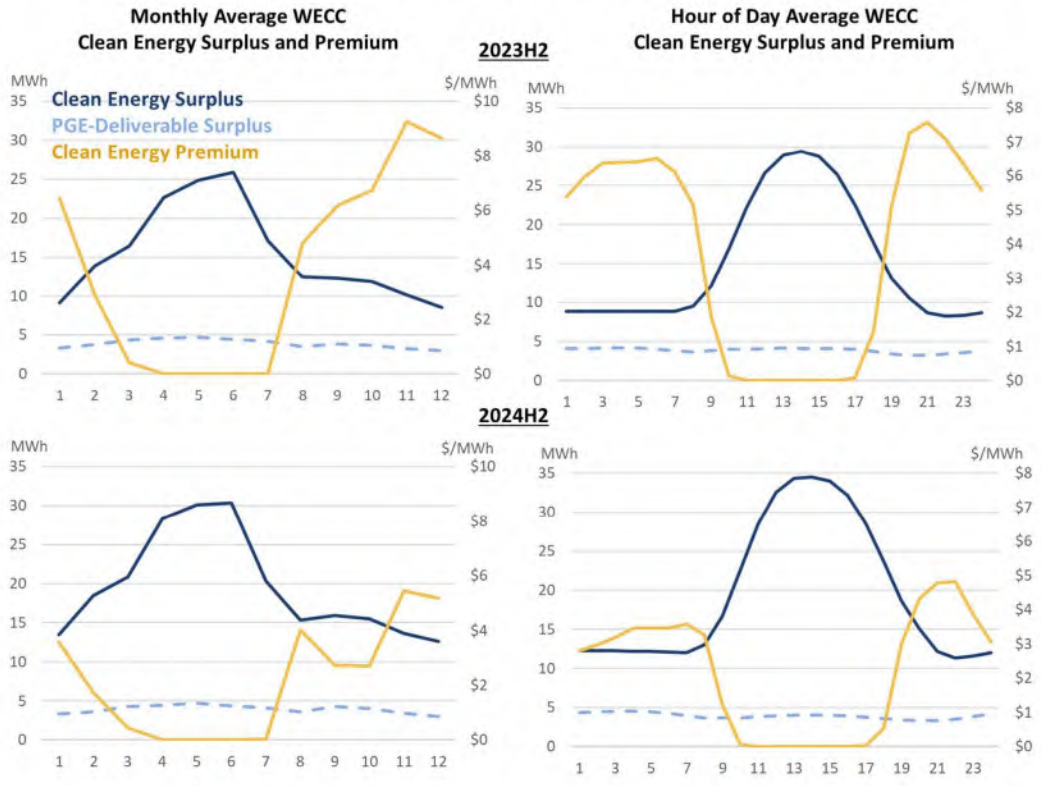
FIGURE 12. REGIONAL SURPLUS DELIVERABILITY RESULTS[6]



Hourly premium results are driven by WECC-wide surplus dynamics, reflecting the inverse relationship between surplus quantity and premium defined in the CEPC (Figure 13). Premium are based on WECC-wide surpluses and do not depend on deliverability to PGE. High WECC-wide surpluses in the spring and during the middle of the day drive down premiums during those periods.

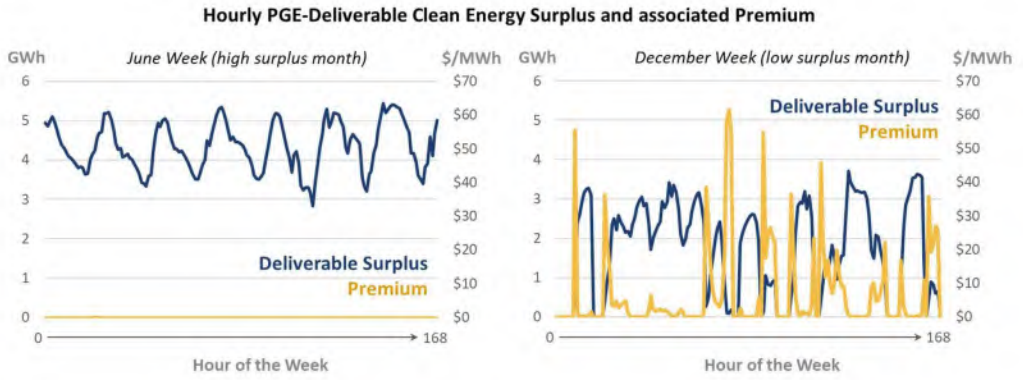
6 Regional surpluses reflected in Figure 12 reflect surpluses deliverable from the respective regions. The solid lines indicate available surpluses after accounting for transfers from RMRG and between the NW and SW regions. The dotted lines indicate the regional surpluses deliverable to PGE.

FIGURE 13. WECC-WIDE AVAILABLE AND DELIVERABLE CLEAN ENERGY SURPLUS AND PREMIUM



We examined hourly CESM results to validate the annual, monthly, and hour-of-day trends observed above. Figure 14 plots hourly results for a week in June (left chart) and December (right chart) from the 2023H2 set of results. In June, when surpluses are high, there is no premium. In the December week, surpluses vary throughout the day, often falling to zero during evening hours with peak demand.

FIGURE 14. HOURLY CESM RESULTS



V. Framework Evaluation and Next Steps

The CESM provides a starting point for assessing the availability and cost of clean energy surplus in the WECC and deliverable to PGE.

The strengths of this hourly surplus accounting framework include:

- Broad capture of the fundamental dynamics that drive the availability and relative value of clean energy
- Simplicity in implementation with tunable parameters
- Internal consistency with the AURORA simulations that inform other areas of the PGE IRP analyses.
- Adaptability for studying multiple future outlook scenarios.

There are several areas in which the CESM can be improved:

- Add detail when applying deliverability constraints. The CESM currently includes deliverability constraints at the seams of the OR-WE AURORA zone containing PGE, assuming no transmission limitations in delivering surpluses to the seams from more distant entities. A future refinement could add constraints for calculating clean energy deliverability

to PGE's immediate neighbors and additionally to those neighbors' neighbors. We expect this improvement would reduce surplus deliverable to PGE.

- Refine the hourly surplus/deficit allocation approach. WECC entities may have various clean energy market participation strategies, including front-loading surplus procurements, concentrating purchases during times of abundant production, or attempting to maximize premium revenues. Alternate hourly allocation approaches can capture such behaviors, thereby altering the amount of surplus available to PGE. Adjustments to the allocation approach could increase or decrease the surplus available to PGE, depending on the specifics of the approach.
- Consideration of moving surplus within days or across days with storage. Our initial approach uses storage dispatch profiles as they are in Aurora results, but the WECC entities may dispatch storage resources to alter the amount of surplus available. We expect this improvement could modestly increase the surplus deliverable to PGE because the AURORA model already optimizes storage dispatch.
- Refine the approach to calculating state targets to account for varying clean energy eligibility requirements. We expect this refinement would have little to no impact on surplus deliverable to PGE because ineligible non-emitting energy can be traded to satisfy other states' requirements.
- Include the impacts of renewable forecast uncertainty. Deviations between day-ahead forecasts and real-time clean energy production would alter the quantity of available surplus and the utilization of transmission paths. We expect this refinement would have modest impacts on deliverable surplus quantities because renewable forecast errors are small compared to base production schedules and forecasting methods continue to improve.

Appendix A: Detailed List of Assumptions

General assumptions

- Each AURORA zone falls within a single state
  - Zones that are not labeled as belonging to specific states will be mapped based on proximity

- Clean energy surplus reflects availability after accounting for clean energy commitments to other states' policy goals
- Clean energy generated outside of PGE is only committed to state-legislated targets, not corporate or voluntary goals (i.e., those goals compete with PGE for clean energy surplus)
- Curtailed clean energy is assumed to be undeliverable and thus not considered part of the WECC-wide surplus
- Same set of resource types considered "clean" for all state RPS programs
- Transmission and deliverability constraints limit WECC-wide clean energy surplus only on a regional basis, if at all

Surplus estimation assumptions

- All clean energy policy targets increase linearly by year from 2024 until their mandated achievement year, with trajectories including interim targets
- All clean energy in excess of a balancing area's (BA's) load is counted as surplus
- If this results in an annual deficit relative to policy targets for the BA, then we assume that WECC-wide surpluses in other hours are reduced proportionally to return the BA to annual compliance
- Clean energy in states without policy targets is all counted as surplus
- There are no contributions to meeting annual policy targets from banked clean energy credits
- Surplus deliverability is not meaningfully impacted by sub-zonal transmission constraints
- Sufficient TTC exists between sub-zones of NW and SW deliverability regions to balance surpluses/deficits
- No shifting of surpluses between hours within a day (e.g., by using storage)

Premium estimation assumptions

- Premium price quantity dynamic resembles that of REC markets
- Maximum premium is representative levelized net cost of new wind build for PGE with hourly adjustments for wind availability
- Minimum premium is zero

- Surplus floor will be related to AURORA surplus quantities and energy prices
- Premium curve is static across the year

Appendix B: Table of Input Data Sources

CESM Input	Source
Generator state mappings	AURORA input
Generator type mapping	AURORA input
State RPS/CES targets	Brattle assumption based on public data from LBNL
Mapping of AURORA zones to states	Brattle team assumption
RPS unit type eligibility by program	Brattle team assumption
Transmission capacity from WECC zones to PGE/trading hubs	AURORA input
Hourly flow on transmission paths	AURORA results
Zonal hourly load	AURORA results
Hourly generation by unit	AURORA results
Zonal generator-weighted LMP	AURORA results
Annual market purchase premium floor and ceiling	Brattle assumption
Clean energy premium curve shape	Brattle assumption based on PJM REC auction outcomes

Appendix C: AURORA Modeled Zonal Topology And Resource Types

Figure 15 contains the zonal and transmission topology modeled in the AURORA database.

FIGURE 15. AURORA MODELED ZONAL TOPOLOGY AND TRANSMISSION CONNECTIONS

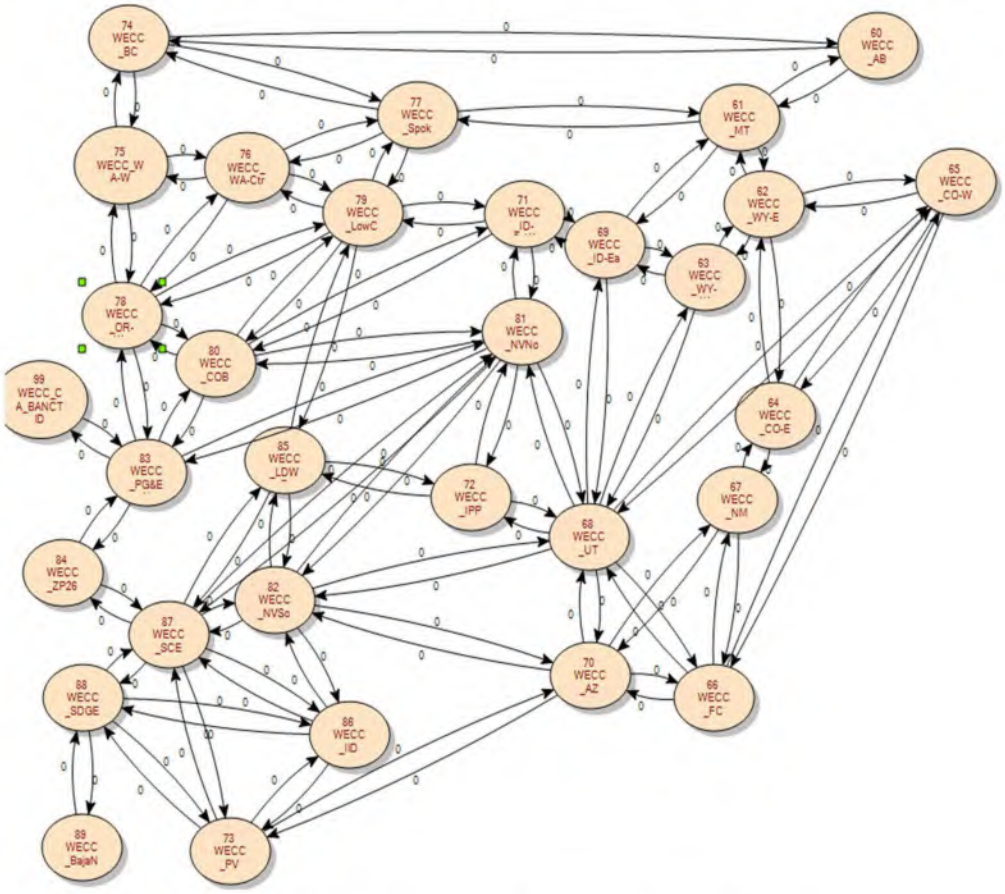


Table 1 contains a mapping of zones modeled in AURORA to WECC states.

TABLE 1. MAPPING OF AURORA ZONES TO STATES

AURORA Zone	State
WECC_Alberta	Alberta
WECC_Montana	Montana
WECC_Wyoming-RMPA	Wyoming
WECC_Wyoming-NWPP	Wyoming
WECC_Colorado East	Colorado
WECC_Colorado West	Colorado
WECC_FourCorners	New Mexico
WECC_NewMexico	New Mexico
WECC_Utah	Utah
WECC_PNW_IdahoEast	Idaho
WECC_Arizona	Arizona
WECC_PNW_IdahoSouthwest	Idaho
WECC_IPP	California
WECC_Palo Verde	California
WECC_BritishColumbia	British Columbia
WECC_PNW_WashingtonWest	Washington
WECC_PNW_WashingtonCentral	Washington
WECC_PNW_Spokane	Washington
WECC_PNW_OregonWest	Oregon
WECC_PNW_LowerColumbia	Washington
WECC_COB	COB Trading Hub
WECC_NevadaNorth	Nevada
WECC_NevadaSouth	Nevada
WECC_CA_PGandE_North	California
WECC_CA_PGandE_ZP26	California
WECC_CA_LADWP	California
WECC_CA_IID	California
WECC_CA_SCE	California
WECC_CA_SDGE	California
WECC_BajaNorth	Mexico
WECC_CA_BANCTID	California

Table 2 contains a list of resource types modeled in AURORA (both 2023H2 and 2024H2 datasets) and their designations as clean or other in the CESM.

TABLE 2. CESM AURORA RESOURCE TYPE MAPPING

AURORA Unit Type	CESM Designation
Hydro	clean
Nuclear	clean
Solar Utility	clean
Solar Utility Non-PTC	clean
Solar Utility PTC	clean
Wind Offshore	clean
Wind Onshore	clean
Wind Onshore Non-PTC	clean
Wind Onshore PTC	clean
Demand Response	load
Electric Vehicles	load
Solar Distributed	load
Battery Storage 12 Hour	other
Battery Storage 4 Hour	other
Battery Storage 8 Hour	other
Coal	other
Energy Storage	other
Gas CC	other
Gas Cogen	other
Gas Peaking	other
Gas Steam	other
Oil	other
Other	other

Appendix G Stakeholder engagement

June 4, 2025 CEP/IRP Roundtable 25-4

- Agenda (video, ppt)
- Examining Winter Reliability Constraints (video, ppt)
- Updated Price Forecast (video, ppt)
- Final Portfolio (video, ppt)
- Additional Tax Policy and Reliability Planning Scenarios (video, ppt)
- Report Structure (video, ppt)
- Closing Remarks | Next Steps (video, ppt)

April 25, 2025 CEP/IRP Roundtable 25-3

- Agenda (video, ppt)
- Draft Portfolio Analysis Results (video, ppt)
- Closing Remarks | Next Steps (video, ppt)

February 19, 2025 CEP/IRP Roundtable 25-2

- Agenda (video, ppt)
- Integrating Clean Energy Availability (video, ppt)
- Portfolio Design II (video, ppt)
- Market Scenarios (video, ppt)
- Large Industrial Customer Growth Details (video, ppt)
- WRAP Based Needs (video, ppt)
- Closing Remarks | Next Steps (video, ppt)
- Stakeholder Feedback and PGE Responses

January 8, 2025 CEP/IRP Roundtable 25-1

- Agenda (video, ppt)
- Update Filing Date (video, ppt)
- 75 percent Transmission Requirements (video, ppt)
- Resource Effective Load Carrying Capabilities (video, ppt)
- Energy Values (video, ppt)
- Transmission Options | Energy Strategies (video, ppt)
- Closing Remarks | Next Steps (video, ppt)

December 16, 2024 Stakeholder Engagement

- Long Lead-Time Resource RFI (ppt)

November 6, 2024 CEP/IRP Roundtable 24-7

- Agenda (video, ppt)
- CEP/IRP Update Filing Extension (video, ppt)
- Calpine (video, ppt)
- Updated Energy/Capacity Positions (video, ppt)
- Updated Emissions Projection (video, ppt)
- Transmission - Step 3 – Market Access (video, ppt)
- Portfolio Design (video, ppt)
- Closing Remarks | Next Steps (video, ppt)
- Stakeholder Feedback and PGE Responses

October 2, 2024 CEP/IRP Roundtable 24-6

- Agenda (video, ppt)
- RFP Proxy (video, ppt)
- DER Update (video, ppt)
- Transmission | Step 1: Existing Capacity (video, ppt)
- Transmission | Step 2: Future Capacity (video, ppt)
- Updated Price Forecast (video, ppt)
- Closing Remarks | Next Steps (video, ppt)
- Stakeholder Feedback and PGE Responses

September 4, 2024 CEP/IRP Roundtable 24-5

- Agenda (video, ppt)
- Transmission Options (video, ppt)
- ETO: Updated Energy Efficiency Forecast (video, ppt)
- Cadeo: CBI Study (video, ppt)
- Closing Remarks | Next Steps (video, ppt)
- Stakeholder Feedback and PGE Responses

August 7, 2024 IRP Roundtable 24-4

- Agenda (video, ppt)
- Brattle Study: Clean Energy Availability (video, ppt)
- Capacity Need (video, ppt)
- Closing Remarks | Next Steps (video, ppt)

July 11, 2024 IRP Roundtable 24-3

- Agenda (video, ppt)
- Transmission Options (video, ppt)
- Load Forecast (video, ppt)
- Resource Economics Update (video, ppt)
- Small Scale Renewables (video, ppt)
- ROSE-E Changes (video, ppt)
- Closing Remarks | Next Steps (video, ppt)

June 5, 2024 IRP Roundtable 24-2

- Agenda (video, ppt)
- North Plains Connector (video, ppt)
- Hourly Energy & Emissions Accounting
    - Discussion Framework | Part I (video, ppt)
    - Capacity Expansion | Part II (video, ppt)
- Qualifying Facility Forecast (video, ppt)
- Closing Remarks | Next Steps (video, ppt)

May 1, 2024 IRP Roundtable 24-1

- Agenda (video, ppt)
- 2024 Schedule | Feedback Form (video, ppt)
- CEP/IRP Update | Updates & Non-Updates (video, ppt)
- Community benefits indicators (CBI) Study (video, ppt)
- Transmission Study (video, ppt)
- Closing Remarks | Next Steps (video, ppt)

Appendix H Transmission planning and interconnection process

H.1FERC Order 1000 process

PGE coordinates its planning processes with other transmission providers through membership in NorthernGrid and the Western Electric Coordinating Council (WECC). PGE uses the NorthernGrid process for regional planning, coordination with adjacent regional groups and other planning entities for interregional planning, and development of proposals to WECC. Additional information is included in PGE's OATT Attachment K, in Transmission Planning Business Practice on OASIS, and on NorthernGrid's website at https://www.northerngrid.net.

H.2 FERC Order 1920 process

FERC Order No. 1920 reforms the regional transmission planning process by establishing a new 20-year, scenario-based Long-Term Regional Transmission Planning (LTRTP) process.[167] Three diverse and plausible scenarios must be studied, and these scenarios must be re-assessed and revised at least once every five years. Sensitivity analysis of uncertain operational outcomes during multiple concurrent and sustained generation and/or transmission outages due to an extreme weather event across a wide area must also be performed for each scenario. PGE's compliance with FERC Order No. 1920 will be primarily realized through modifications to the existing NorthernGrid regional transmission planning process to incorporate the new requirements established in FERC Order No. 1920.

The new long-term scenarios must be developed using a set of seven categories of factors. These categories of factors are like those used in integrated resource planning, including criteria such as federal, state, and tribal rules and regulations for resource mix, decarbonization, and electrification. Factor Category 3 specifically requires incorporating integrated resource plans into the scenario development. The requirement for these using these factor categories in scenario-based transmission planning closely aligns the long-term regional transmission planning process with the integrated resource planning process.

FERC Order No. 1920 also requires that transmission providers measure a set of seven benefits for each scenario to evaluate LTRTP facilities over a 20-year horizon starting from the in-service date of the facility. The seven benefits go beyond traditional reliability metrics in the existing transmission planning processes to address economic benefits for transmission projects that integrate cost-effective new resources, such as lowering production costs and mitigating congestion. This again speaks to the alignment with the requirements of FERC Order No. 1920 and the integrated resource planning process.

[167] FERC Order No. 1920, issued on May 13, 2024.

Additional requirements of FERC Order No. 1920 include development of selection criteria for facilities, re-evaluation of facilities due to changing policies or reliability criteria, use of grid-enhancing technologies, cost allocation, and more transparency into the local transmission planning, regional transmission planning, and interregional transmission planning processes.

PGE appreciates the strong partnership with the relevant state entities throughout the Order No. 1920 six-month state engagement period, which began November 1, 2024, and concludes November 1, 2025. The NorthernGrid transmission providers also commenced an open stakeholder engagement process to receive feedback on the new LTRTP in March 2025 per the new requirement issued in FERC Order No. 1920-A.[168] NorthernGrid will propose on compliance the start of the long-term regional transmission planning process, which will commence no later than two years after the filing date. The states in the NorthernGrid and WestConnect regional planning organizations requested and received a compliance extension at FERC to allow for more time for cost allocation discussions. All NorthernGrid FERC-jurisdictional transmission providers must complete their compliance filing by December 12, 2025. A second compliance filing for the new interregional transmission planning requirements is due February 12, 2026.

H.3 Local transmission planning process

H.3.1 Process overview

PGE's OATT is posted on its Open Access Same-time Information System (OASIS) at http://oasis.oati.com/PGE. Additional information regarding Transmission Planning is located in the Transmission Planning folder on PGE's OASIS.

The Local Transmission Plan (LTP) is prepared within the two-year process as defined in PGE's OATT Attachment K and summarized in **Table 39**. The LTP identifies the Transmission System facility additions required to reliably interconnect and transmit forecasted generation resources and serve the forecasted Network Customers' load, Native Load Customers' load, and Point-to-Point Transmission Customers' requirements, and also includes legacy, non-OATT agreements and rollover rights over a ten-year planning horizon. Additionally, the LTP typically incorporates the results of any stakeholder-requested economic congestion studies results that were performed.

Table 39. Local Transmission Planning Cadence

		Quarter	Tasks
Near Term	Even Years	1	Select Near Term base cases and gather load data
		2	Post Study Methodology on OASIS, select one Economic Study for evaluation
		3 & 4	Select Longer Term base cases, post draft Near Term Plan on OASIS, hold public meeting to solicit stakeholder comment

[168] FERC Order No. 1920-A, issued on November 21, 2024.

		Quarter	Tasks
		4	Incorporate stakeholder comments and post final Near Term plan on OASIS
Longer Term	Odd Years	5	Gather load data and accept Economic Study requests
		6	Select one Economic Study for evaluation
		7 & 8	Post draft Longer Term plan on OASIS, hold public meeting to solicit stakeholder comment
		8	Post final Longer Term plan on OASIS, submit final Longer Term Plan to stakeholders and owners of neighboring systems

PGE updates its Transmission Customers about activities and progress made under the Attachment K planning process during regularly scheduled customer meetings. Meeting announcements, agendas, and notes are posted in the Customer Meetings folder on PGE's OASIS. Meeting dates are posted on PGE's OASIS.

H.3.2 NERC planning standards (TPL-001)

PGE's Transmission System is designed to reliably supply projected customer demand and projected Firm Transmission Service. Studies are performed annually to evaluate where Transmission upgrades may be needed to meet the performance requirements established in the NERC TPL-001-5 Reliability Standard and the WECC TPL-001-WECC-CRT-3.2 Regional Criteria. Results from the annual TPL-001 process are made available via the Local Transmission Plan document, which is posted publicly on PGE's OASIS page.

The summer (June 1st through October 31st) and winter (November 1st through March 31st) load seasons are considered the most critical study seasons due to heavier peak loads and high power transfers over PGE's Transmission and Distribution System to its customers. However, the off-peak seasons have different regional flow patterns that can result in issues not seen during peak load times. PGE defines the seasons to align with Attachment I of the RC West.[169]

PGE maintains system models within its planning area for performing the studies required to complete the system assessment. These models use data that is provided in WECC base cases in accordance with the MOD-032 reliability standard. Electrical facilities modeled in the cases have established ratings, as defined in PGE's "Facility Ratings Methodology" document and in accordance with the FAC-014 reliability standard. A facility rating is determined based on the most limiting component in each transmission facility, in accordance with the FAC-008 reliability standard.

[169] RC West Southwest Power Pool BC Hydro, "RC Guidelines for Seasonal Assessment and Coordination Process," Attachment I, page 14, https://www.caiso.com/documents/rc0680.pdf.

Reactive power resources are modeled as made available in the WECC base cases. For PGE, reactive power resources include shunt capacitor banks available on the 230 kV, 115 kV, and 57 kV systems.

Studies are evaluated for the Near-Term Planning Horizon (years 1 through 5) and the Long-Term Planning Horizon (years 6 through 10) to ensure adequate capacity is available on PGE's transmission system. The load modeled in the studies is obtained from PGE's corporate forecast, reflecting a 1-in-20 demand level for peak summer and peak winter conditions. Known outages of generation or transmission facilities with durations of at least six months are appropriately represented in the system models. However, any significant outage is studied as a result of an N-1-1 contingency and is therefore analyzed for every major season and year that PGE studies as part of the TPL process. Transmission equipment is assumed to be out of service in the base case system models if there is no spare equipment or mitigation strategy for the loss of the equipment.

Studies in the Near Term – Two Year Planning Horizon and the Near Term – Five Year Planning Horizon are performed for peak summer, peak winter, and off-peak spring conditions. Sensitivity studies are performed for each of these cases by varying the study parameters to stress the system within a range of credible conditions that demonstrate a measurable change in performance. PGE adjusts the real and reactive forecasted load and the transfers on the paths into the Portland area on all sensitivity studies. For peak system sensitivity cases, the 1-in-20 load forecast.

The load levels used in the 2024 Local Transmission Plan are available on PGE's OASIS page.

The Bulk Electric System (BES) is evaluated for steady state and transient stability performance for planning events described in Table 1 of the NERC TPL-001-5.1 reliability standard. When system simulations indicate an inability of the systems to respond as prescribed in the NERC TPL-001-5.1 standard, PGE identifies projects and/or Corrective Action Plans which are needed to achieve the required system performance throughout the Planning Horizon.

H.3.2.1 Steady state studies

PGE performs steady-state studies for the Near-Term and Long-Term Transmission Planning Horizons. The studies consider all Contingency scenarios identified in Table 1 of the NERC TPL-001-5.1 reliability standard (Categories P0-P7) to determine if the BES meets performance requirements. PGE uses the criteria defined in the WECC TPL-001-WECC-CRT-3.2 document to establish acceptable System steady state voltage limits and post-Contingency voltage deviations. The WECC System Performance Criteria requires that the change in bus voltage percentage not exceed 8 percent for N-1 contingencies. Additionally, internal PGE performance criteria require that the change in bus voltage percentage not exceed 10 percent for N-2 and N-1-1 contingencies. These studies also assess the impact of Extreme Events on the System expected to produce severe System impacts.

The Contingency Analyses simulate the removal of all Elements that the Protection System and other automatic controls are expected to disconnect for each Contingency without Operator intervention. The analyses include the impact of the subsequent tripping of generators due to

voltage limitations and tripping of Transmission Elements where relay loadability limits are exceeded. Automatic controls simulated include phase-shifting transformers, load tap changing transformers, and switched capacitors and reactors.

Cascading, or the uncontrolled successive loss of System Elements triggered by a Disturbance that results in the inability of the Elements of the BES to regain a state of operating equilibrium is defined as a System instability. Cascading is not allowed to occur for any Contingency analysis. If the analysis of an Extreme Event concludes there is Cascading, an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s) is completed.

H.3.2.2 Voltage stability studies

PGE's Transmission System is evaluated for voltage stability in accordance with the WECC established criteria.[170] These performance criteria are summarized in the table below. Any voltage stability result that violates the criteria listed below is defined as a System instability. Contingencies to PGE and adjacent utility equipment at 500 kV and 230 kV are evaluated. All planning events were screened or reviewed for voltage stability requirement per WECC Criterion WR5 by simulating P0 and P1 events at 105 percent of forecasted peak load and simulating P2-P7 events at 102.5 percent of forecasted peak load. This screening indicated all planning events met the reactive margin requirement with the implementation of their associated operating procedures, RAS, or Corrective Action Plans.

H.3.2.3 Transient stability studies

PGE evaluates the transient stability performance of the BES for select Contingencies to PGE and adjacent utility equipment at 500 kV, 230 kV, and 115 kV. The studies evaluate single line-to-ground and three-phase faults to these facilities, including generators, bus sections, breaker failure, and loss of a double-circuit Transmission line. Extreme events are studied for three-phase faults with Delayed Fault Clearing.

For all 500 kV and 230 kV breaker positions, PGE implements high-speed protection through two independent relay systems utilizing separate current transformers for each set of relays. For a fault directly affecting these facilities, normal clearing is achieved when the Protection System operates as designed and faults are cleared within four to six cycles.

PGE implements breaker-failure protection schemes for its 500 kV and 230 kV facilities, and the majority of 115 kV facilities. Delayed clearing occurs when a breaker fails to operate, and the breaker-failure scheme clears the fault. Facilities without delayed clearing are modeled as such in the Contingency definition.

The transient stability results are evaluated for compliance with the following NERC and WECC System performance requirements. The simulation durations are run to 20 seconds. All

[170] "Guide to WECC/NERC Planning Standards I.D: Voltage Support and Reactive Power," prepared by the Reactive Reserve Working Group (RRWG) and approved by the Technical Studies Subcommittee (TSS) on March 30, 2006. https://www.wecc.biz/_layouts/15/WopiFrame.aspx?sourcedoc=/Reliability/Voltage%20Stability%20Guide.pdf&action=default&DefaultItemOpen=1

oscillations that do not show positive damping within 20 seconds after the start of the studied event shall be deemed unstable.

H.3.2.4 Short circuit studies

Short circuit studies are performed annually addressing the Near-Term Planning Horizon. If the short circuit current interrupting duty on a circuit breaker exceeds 97 percent of its equipment rating, PGE identifies projects and/or Corrective Action Plans which are needed to achieve the required System performance throughout the Near- and Long-Term Planning Horizon.

H.4 Other relevant transmission planning standards

H.4.1 TPL-007

Transmission system planning requirements surrounding geomagnetic disturbances are addressed in NERC Standard TPL-007-4. Geomagnetic disturbances occur when high-energy emissions from the sun, known as coronal mass ejections, interact with the Earth's magnetic field. The resulting electromagnetic disturbances can propagate along long conductors, such as transmission lines, and have been known to cause power system damage in the past.[171]

TPL-007-4 requires that PGE:

- Maintain and report information on all Bulk Electric System transformers in its service territory
- Install a geomagnetic current sensor on at least one bulk transformer it its service territory
- Coordinate on a geomagnetic disturbance study with regional stakeholders every five years
- Address any thermal or reactive power exceedances identified in this study via a Corrective Action Plan.

Historically, PGE has not experienced significant system impacts from geomagnetic disturbances. This is due to a combination of the transmission topology in the area and the nature of the soil in the Willamette Valley. During a recent geomagnetic storm in May 2024, which was the highest recorded in nearly 20 years, there were negligible effects detected on PGE's system.

The related NERC Standard EOP-010-1 governs how PGE works with NASA and the Reliability Coordinator (RC West) to address geomagnetic disturbances in the operations horizon.

H.4.2 TPL-008 (in development)

On June 15, 2023, FERC issued FERC Order No. 896 that acknowledges the "challenges associated with planning for extreme heat and cold weather events, particularly those that occur during periods when the Bulk-Power System must meet unexpectedly high demand. Extreme heat and cold weather events, which can cause public safety and economic risks, have occurred

[171] See for example, Guillon, et.al., "A Colorful Blackout: The Havoc Caused by Auroral Electrojet Generated Magnetic Field Variations in 1989" IEEE, Nov 2016. https://ieeexplore.ieee.org/document/7592967.

with greater frequency in recent years and are projected to occur with even greater frequency in the future. As such, the impact of concurrent failures of Bulk-Power System generation and transmission equipment and the potential for cascading outages that may be caused by extreme heat and cold weather events should be studied and corrective actions should be identified and implemented."[172]

Part of the Order 896 effort involves the creation of a new NERC Standard, TPL-008-1, which currently in the drafting phase (as of August 2024). It is expected to be finalized in early 2025, with the various requirements having implementation dates of 12- to 60-month.

While the standard is not yet finalized, in general, it will require Transmission Planning entities such as PGE to:

- Coordinate on the development of extreme weather base cases for both cold winter and hot summer conditions
- Model and simulate the ability of the transmission system to respond to transmission outage scenarios (i.e. contingencies) during these extreme weather events
- Develop Corrective Action Plans for any scenarios that do not meet the established acceptance criteria in the standard

The goal of this standard is to ensure that the transmission system remains robust to future extreme weather conditions.

H.4.3 FERC Order No. 2023

FERC Order No. 2023 reforms the large generator interconnection process to make it more efficient by moving to a first-ready, first-served cluster study process.[173] The new process consists of a 150-day Cluster Study (or Cluster Restudy) and a 90-day or 180-day Facilities Study. New financial and readiness requirements, including increased deposits, increased site control, and significant withdrawal penalties are aimed to reduce the number of speculative interconnection requests entering the queue and, as a result, minimize the number of withdrawals from the interconnection queue, which typically result in restudies, lengthening the interconnection study process. These improvements provide more certainty that the new resources identified in the integrated resource planning process can be energized when they are needed, minimizing delays in the interconnection study process.

Information available to prospective interconnection customers is improved with the publishing of an interconnection heatmap, which will be updated at the end of every cluster study or cluster restudy. This heat map can be utilized in the integrated resource planning process to identify on-system locations with existing capacity for new renewable resources.

New advancements were added to FERC Order No. 2023 to allow more flexibility and timeliness improvements for interconnecting new resources. First, multiple customers at the same site with the same Point of Interconnection (POI) can submit a single interconnection request. This

[172] N. Am. Elec. Reliability Corp., 183 FERC ¶ 61,191 (2023) (FERC Order), Final Rule.
[173] FERC Order No. 2023, issued on November 6, 2023.

streamlines jointly owned interconnection projects because multiple owners do not need to submit individual requests. Second, Surplus Interconnection Service can be requested for a project with a signed large generator interconnection agreement – the project no longer must be in commercial operation. This allows for more co-location of different renewable resources behind a single POI to move faster, not waiting for the energization of the first resource to be able to apply for the subsequent resource. Finally, FERC Order No. 2023 requires transmission providers to evaluate alternative transmission technologies for each identified network upgrade. These alternative transmission technologies traditionally can be constructed and energized before traditional solutions, often at a lower cost. All these improvements provide even more certainty to the interconnection process timeline for use in the integrated resource planning process.

To continue alignment with state-jurisdictional and FERC-jurisdictional large generator interconnection processes, the QF-LGIP was amended to conform with the cluster study process. This is beneficial for QF projects, as these projects will be subject to the same cost allocation and sharing as the FERC-jurisdictional projects, potentially reducing costs by spreading across more projects. The OPUC approved PGE's filing with an effective date of January 7, 2025.

PGE began the Transitional Cluster Study on January 6, 2025 to study projects in the serial queue as of May 26, 2024, which was 30 days after PGE submitted its compliance filing to FERC. There are no QF-LGIP projects in the Transitional Cluster Study, as none were in the interconnection queue as of May 26, 2024. The first Cluster Study Request Window for when new large generation projects can request interconnection will open January 1, 2026.

H.4.4 Miscellaneous

In addition to the transmission planning specific standards, there are a number of additional NERC standards in which transmission planning is involved. These include:

- Establishing requirements for generation requesting to interconnect to the Bulk Electric System (FAC-001)
- Establishing a study process for generation interconnection (FAC-002)
- Vegetation management practices near transmission lines (FAC-003)
- Development of detailed generator models, including real and reactive power capabilities (MOD-025), exciter models (MOD-026), and governor and turbine models (MOD-027)
- Coordination of transmission base case development (MOD-032) (Note: PGE and neighboring utilities coordinate this process through the Western Power Pool and the Western Electricity Coordinating Council)
- Validation of transmission base cases for both steady-state and transient stability, utilizing recorded historical events (MOD-33)

- Development of Underfrequency Load Shedding (PRC-006) and Undervoltage Load Shedding (PRC-010) schemes to maintain system stability during extreme transient events.

These related study efforts help ensure that the future state of the transmission system is modeled accurately and that planners can make the best long-term decisions regarding necessary upgrades to reliably maintain the grid.

Appendix I Inputs for state RA requirements portfolio

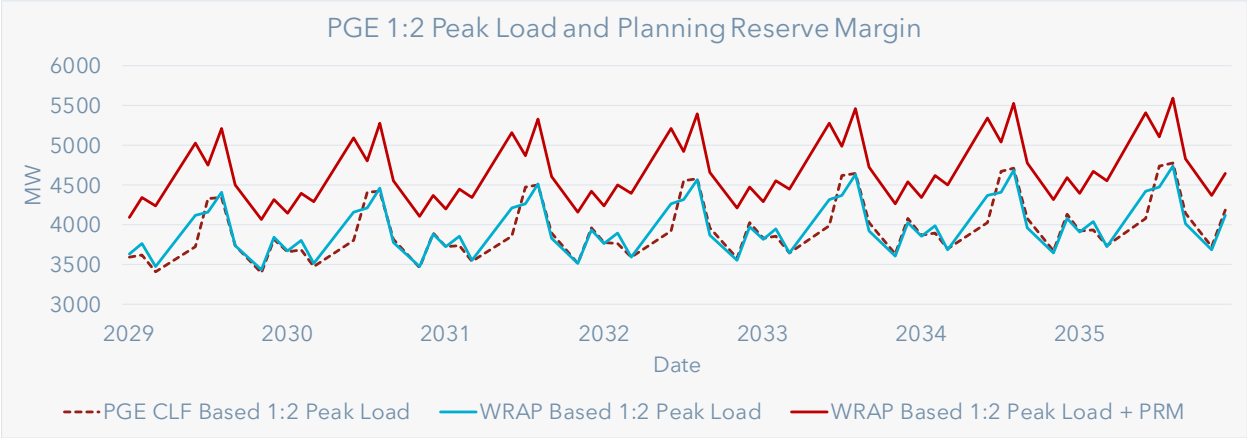
PGE used demand and supply assessment methods from the Western Resource Adequacy Program (WRAP) to analyze the adequacy of PGE's system across the IRP planning horizon. These methods provide the primary metrics needed to derive capacity need and ELCCs for portfolio modeling based on State RA Requirements, which currently rely on WRAP methodology. WRAP metrics for Summer 2026 and Winter 2025-2026 in the MID-C subregion, and WRAP's 2025 qualifying capacity contribution (QCC) estimates for PGE resources are the primary inputs for this exercise.[174,175]

I.1 WRAP based load forecast

PGE estimated load requirements using WRAP methodology for seasonal peak load forecasts plus the WRAP estimated PRM required to achieve a 1 event in 10 years adequacy metric. 5-years of historical PGE load data was used to estimate 1:2 peak load for summer (May-September) and winter (November-March) months as described in WRAP Business Practice Manual (BPM) - 103 – Participant Forward Showing Capacity Requirements.[176] A PGE specific annual growth rate of 1.2 percent was used to scale peak loads across the planning horizon.[177] This growth rate was estimated using PGE's May 2024 load forecast. WRAP's month specific PRM was applied to the resulting load forecast to arrive at estimated load requirement by month.[178] **Figure 94** shows the resulting load forecast for a portion of the planning horizon with and without the PRM. For comparison the median of maximum peak monthly load from the PGE's May 2024 Corporate Load Forecast (CLF) is show. The figure shows there is close alignment in estimated 1:2 peak loads from PGE estimates and WRAP based estimates. There is a divergence in the month of June due to a heavier weighting of the 2021 heat dome event as only 5 years of historical load data are used in the WRAP based estimates.

[174] WRAP Metrics for Summer 2026
[175] WRAP Metrics for Winter 2025-2026
[176] WRAP BPM 103
[177] WRAP's established growth rate is 1.1%, as defined in WRAP BPM-103. 1.1% was defined through and informal survey process, as described in the WRAP's Detailed Design Document – March 2023. Rather than use the establish growth rate for this exercise, PGE elected to estimate a growth rate specific its system.
[178] Preliminary values published 3-31-2024 used for winter season months.

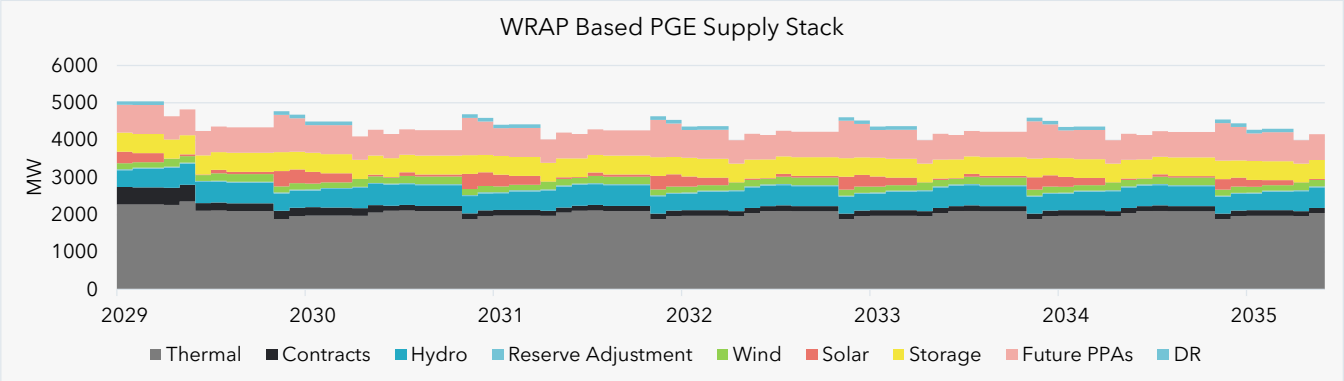
Figure 94. WRAP Based PGE 1:2 Peak Load and Planning Reserve Margin



I.2 WRAP based supply forecast

The company used WRAP provided estimates of resource specific QCC values to estimate the capacity contribution of existing PGE resources in each month of the WRAP summer and winter seasons. WRAP's Winter 25-26 Forward showing (FS) and Summer 2026 FS qualifying capacity values were used capacity assumptions across the planning horizon. Exits and entry from the supply stack were assumed in accordance with assumptions used for resource adequacy modeling in Sequoia. For example, exits were assumed based on known contract expiration dates for the related resources or structured agreements and 2023 RFP Proxy resources were assumed to enter the supply stack in January 2028. **Figure 95** displays the supply assumptions that resulted from this WRAP based forecast.

Figure 95. WRAP Based PGE Supply Stack

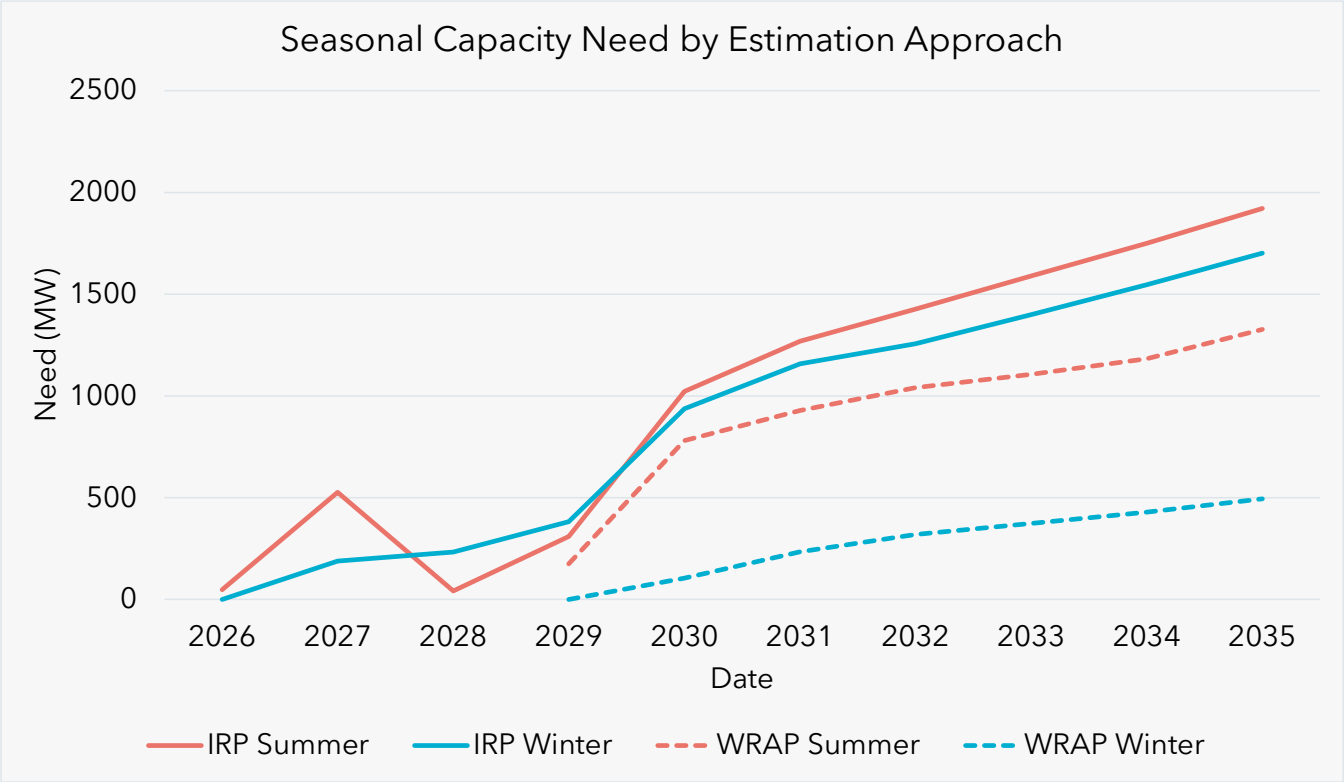


I.3 WRAP based capacity need

Capacity need was calculated using the difference between WRAP based forecasts of load requirements and supply, as detailed above. **Figure 96** shows the resulting capacity need as compared to the IRP derived capacity need values as estimated in Sequoia. 2030 capacity need

is approximately 250 MW less in Summer and 830 MW less in Winter using the WRAP based methods, compared against the IRP estimates from Sequoia.

Figure 96. Seasonal Capacity Need by Estimation Approach



I.4 WRAP based ELCCs

PGE used ELCC estimates from WRAP's summer 2025 and winter 2025-2026 adequacy assessment for the valuation of Proxy Resources in portfolio expansion modeling. The company elected ELCC values from the +6 GW entry scenarios provided by WRAP. **Figure 97** shows a comparison of WRAP based ELCCs for the base system and +6 GW scenarios against ELCCs estimated in Sequoia for 100 MW and 2000 MW tranches. In general, summer WRAP ELCCs for storage and solar resources are significantly greater than IRP estimates for resources within the same WRAP zones. Wind resources show less divergence between the two estimation approaches, save for Gorge Wind, which has a predominantly summer generation profile.

Figure 97. Summer IRP-WRAP ELCC Comparison

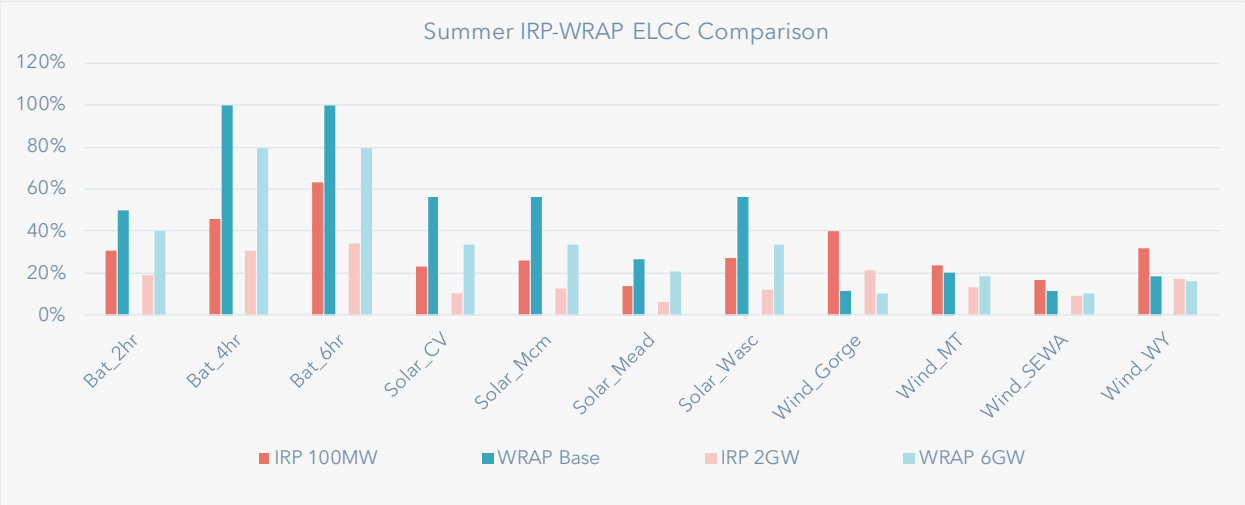
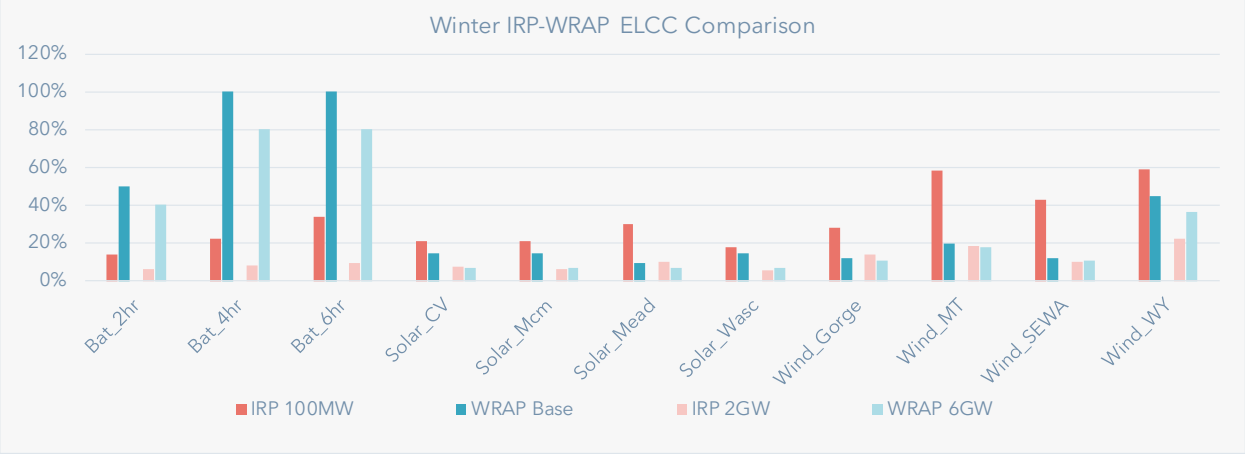


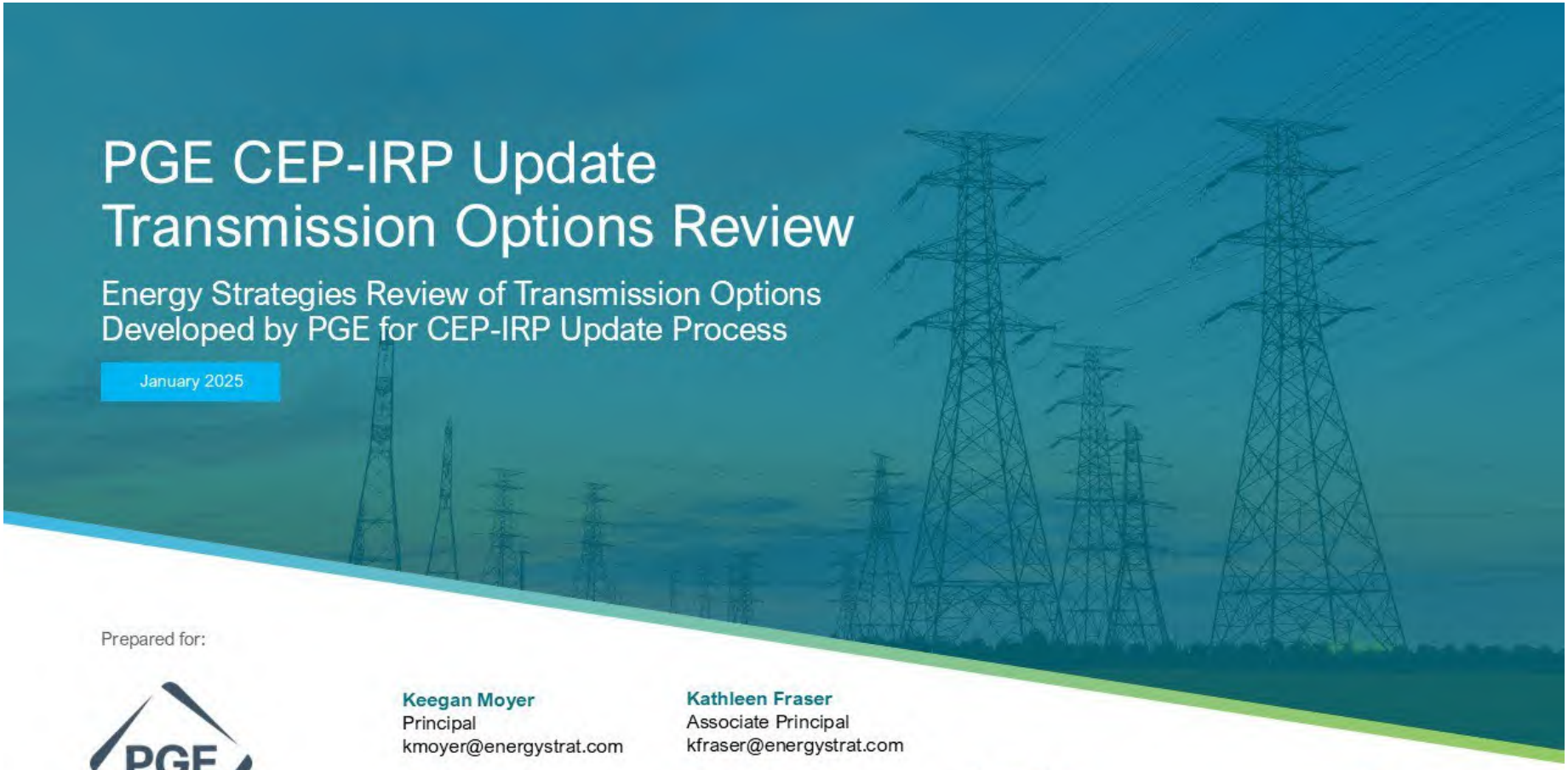
Figure 98 shows a similar comparison for the winter season. Winter WRAP ELCCs for storage resources continue to be significantly greater than IRP estimates for similar storage resources, while IRP estimates of solar and wind resources are greater.

Figure 98. Winter IRP-WRAP ELCC Comparison



For PGE's Proxy Resources without a direct overlap with WRAP ELCCs, the following assumptions were made: North Dakota Wind assigned ELCC values for WRAP Region 4 (Colorado and Wyoming), Batteries greater than 6-hour duration assigned WRAP ELCCs for 4-hour batteries, hybrids assigned the sum of WRAP based solar and 4-hr battery ELCCs, while other smaller resources (e.g., EE, DERs, CBREs) maintained ELCCs as estimated in Sequoia.

Appendix J Transmission options study



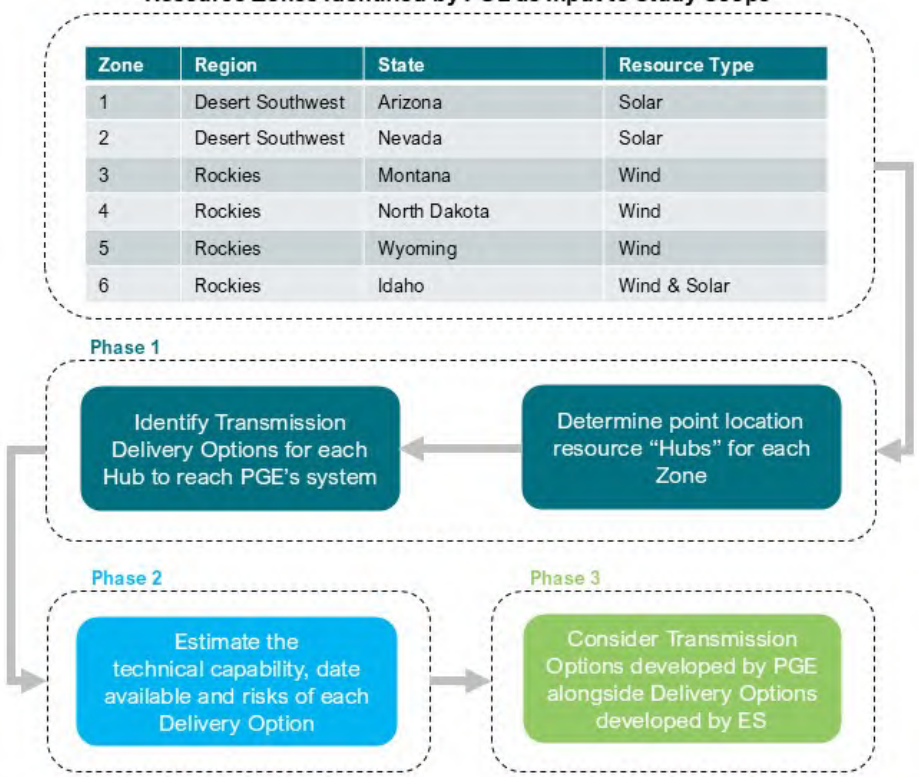
ENERGY STRATEGIES

Work Scope

- **Portland General Electric (PGE) engaged Energy Strategies (ES) to identify and evaluate transmission strategies to access remote resources.**
  - Designed to help PGE evaluate options to efficiently meet load and policy requirements in its Clean Energy Plan and Integrated Resource Plan (CEP-IRP).
- **The study consists of three phases:**
  1. **Identify Transmission Delivery Options** for six Resource Zones, considering:
     - Existing transmission system (e.g., Available Transfer Capacity (ATC))
     - Known or previously proposed transmission upgrades
     - New transmission upgrades
  2. **Characterize technical and risk profiles** of each feasible delivery option.
  3. **Review Transmission Options** developed by PGE and propose alternatives based on assessment.

Resource Zones Identified by PGE as Input to Study Scope

Zone	Region	State	Resource Type
1	Desert Southwest	Arizona	Solar
2	Desert Southwest	Nevada	Solar
3	Rockies	Montana	Wind
4	Rockies	North Dakota	Wind
5	Rockies	Wyoming	Wind
6	Rockies	Idaho	Wind & Solar



PGE | IRP Regional Transmission Study

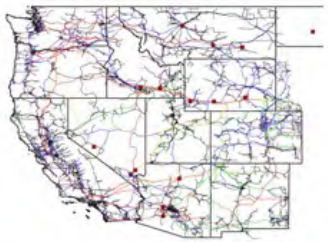
ENERGY STRATEGIES

Transmission Delivery Options Development Methodology & Results

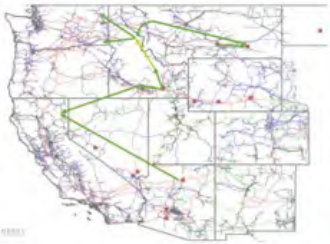
1 Resource Zones identified by PGE

Zone	State and Resource(s)
1	Arizona Solar
2	Nevada Solar
3	Montana Wind
4	North Dakota Wind
5	Wyoming Wind
6	Idaho Wind & Solar

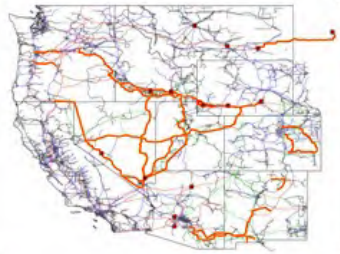
2 Establish Resource Hubs



3 Review ATC Postings on OASIS



4 Include Likely Transmission Upgrades



Interim selection of Transmission Delivery Options by Energy Strategies:

State and Resource	Description	Capacity (MW)	Date Available
Arizona Solar	APS ATC + NVE Expansion + existing NWACI + PGE Rights	183	~2035-2040
	APS Upgrade + NVE Expansion + existing NWACI + PGE Rights	550	2040+
Nevada Solar	NVE Expansion + updated NWACI + Bethel Round Butte	~600	~2035-2040
	SWIP N + Gateway West 8 + B2H + new BPA TSRs	400	~2035-2040
Montana Wind	Existing PGE Rights after Colstrip retired	270	2030
	PGE rights + new BPA & possibly NWMT TSRs	~1000	~2035-2040
North Dakota Wind	North Plains Connector + PGE rights + new BPA + NWMT TSRs	~1000	~2035-2040
Wyoming Wind	Gateway West & B2H + new BPA TSRs	400	~2035-2040
Idaho Wind & Solar	Gateway West & B2H + new BPA TSRs	400	~2035-2040
	New Hemingway -> Grizzly line + Bethel Round Butte	~1000	2040+

Highlighted Transmission Options Correspond to PGE Transmission Options from prior IRP roundtables

3

PGE | IRP Regional Transmission Study

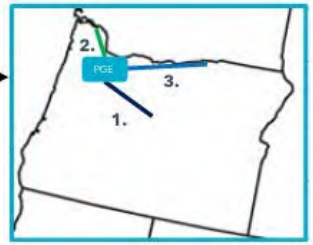
ENERGY STRATEGIES

Review of PGE's Transmission Options from Prior Roundtables

- **Energy Strategies work scope included a review of Transmission Options developed by PGE:**
  - At the direction of the Oregon Public Utility Commission (PUC), PGE to update 2023 CEP-IRP Transmission Options.
  - As part of the CEP-IRP Update process and monthly public roundtables, PGE has developed 7 Transmission Options and asked Energy Strategies to review these options as a part of its broader work scope:
    1. **Are these options appropriate to meet the PUC's direction?**
    2. **What are the risks for each?**
    3. **Of the transmission alternatives identified by Energy Strategies, do any serve as viable alternatives?**

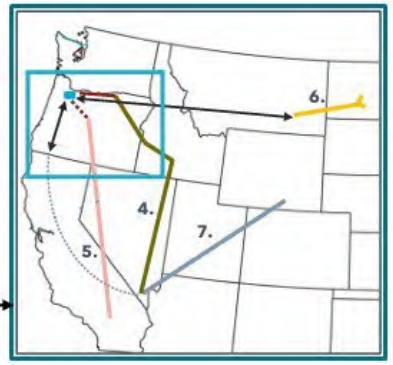
Seven Transmission Options Identified in PGE CEP-IRP Roundtables

1. Bethel-Round Butte
2. Trojan-Harborton
3. Cascade Renewable Transmission Project
4. SWIP N + Gateway West 8 + B2H
5. Western Bounty
6. North Plains Connector
7. TransWest Express



Oregon/PNW specific transmission options

As the ES work scope did not consider stand alone intra-Oregon transmission, we will provide comments but cannot propose alternatives at this time.



Remote resource transmission options

With the consideration of remote resource zones in the ES scope, we assess the viability of these transmission options and propose alternatives as needed.

4

ENERGY STRATEGIES

Overview of Findings from Review of PGE Transmission Options

Resource Area	PGE Transmission Option	ES Alternatives to Consider	Recommendation
North Dakota (Wind)	**North Plains Connector**	No alternatives recommended	• With PGE's Colstrip rights and NWMT + BPA TSRs, North Plains Connector is the best option. • Based on development status and need for downstream upgrades, recommend first available date no sooner than 2035 (perhaps later).
Wyoming (Wind)	**TransWest Express + CAISO**	Gateway West & B2H	• There is significant policy and pricing risk to using TransWest Express, without providing firm transmission access. • Using Gateway West may require upgrades to existing lines to increase transfer capacity.
Nevada (Solar)	**Western Bounty**	Greenlink and PGE's Rights + Upgrades	• Western Bounty likely too early in development to reach service before mid- to late-2030s. • Combining NVE's Greenlink with PGE's rights and upgrades provides a lower risk alternative to consider.
Nevada (Solar)	**SWIP N + Gateway West 8 + B2H**	No alternatives recommended	• This transmission option represents a strong option but would require additional TSRs on the BPA introducing timing risk.

- **Resource areas evaluated by ES not captured by PGE transmission options:**
  - Arizona
  - Idaho
  - Montana
- **Resource areas and transmission options in PGE CEP/IRP Roundtables outside ES scope:**
  - OR/WA/BPA
    - Bethel – Round Butte
    - Trojan – Harborton
    - Cascades Renewable Transmission
  - CAISO

PGE | IRP Regional Transmission Study

ENERGY STRATEGIES

"Evolving Grid" Status Improves Transmission Service-Driven Upgrades, but Significant Uncertainty Remains

- **BPA's Evolving Grid initiative prioritizes significant transmission projects that are critical to meet regional needs in the PNW.**
  - Initiative supports upgrades that will improve resource deliverability in the coming decade, attempting to address cyclical nature of TSRs triggering recurring upgrades in TSEP cycles and eventually dropping out.
  - Evolving Grid is designed to provide an actionable path forward primarily for projects that were identified in BPA's 2021, 2022 and 2023 TSEP processes and relate to specific TSRs.
- **Despite this step, BPA has not yet committed to constructing these projects and many still have several years of scoping, design and NEPA milestones prior to a BPA decision to fund and construct.**
  - In-service dates for EVG 1 projects: ~2026-2032.
  - In-service dates for EVG 2 projects: not announced, but possibly mid-late 2030s.
- **Conclusion for this work: Evolving Grid 1.0 projects create capacity that is likely "already spoken for" by existing TSRs (and generation projects PGE is likely aware of via RFPs) and Evolving Grid 2.0 projects have too many uncertainties to forecast impact at this time.**
  - Therefore, for this study we assume generic "new BPA TSRs" are needed for service on or through BPA to reach PGE and recommend continued monitoring of both sets of Evolving Grid projects.



Evolving Grid 1.0

1	Cross Cascades North Upgrades • Schultz-Raver 500 kV Line Upgrade • Paul 500 kV Substation Upgrade • Olympia 230 kV Substation Upgrade
2	Big Eddy-Chemawa 230/500 kV Line Upgrade
3	Portland Area Upgrades • Pearl-Sherwood McLoughlin 230 kV Line Upgrade • Keeler-Horizon 230 kV Line • Keeler 230/500 kV Transformer Addition
4	Chehalis-Covington 230 kV Line Upgrade
5	Ross-Rivergate 230 kV Line Upgrade
6	Rock Creek-John Day 500 kV Line Upgrade
7	Six Mile Canyon 230/500 kV Substation (New Construction)
8	Bonanza 230/500 kV Substation (New Construction)
9	La Pine-Bonanza 230 kV Line (New Construction)
10	Buckley 500 kV Substation Rebuild

Evolving Grid 2.0

1	Grand Coulee-Columbia-Schultz 500 kV Line Upgrade
2	Schultz-Olympia 500 kV Line Upgrade
3	North of Pearl Upgrades
4	Central Oregon 500 kV Dynamic Reactive Upgrades
5	RATS: Reno-Alturas Reactive Addition
6	Salem Area Upgrades #1 (North of Marion)
7	Salem Area Upgrades #2 (North of Marion)
8	NOB Substation (New Construction)
9	Lower Columbia-Bonanza 500 kV Line (New Construction)
10	Bonanza to NOB 500 kV Line (New Construction)
11	Ostrander-Pearl 500 kV Line Upgrade
12	Big Eddy-Quenett Creek Upgrade
13	Big Eddy-The Dalles Line Rebuild

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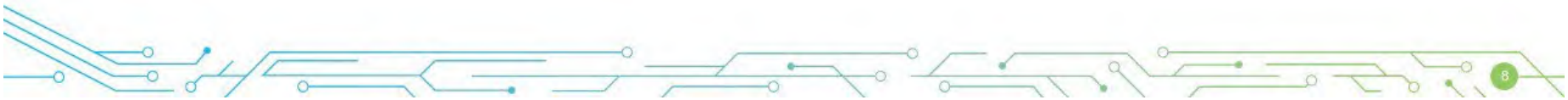

ENERGY STRATEGIES
Review of PGE Proposed Transmission Options and Selected Alternatives
7

ENERGY STRATEGIES

PGE Transmission Options Review – Overview of Contents

1. **PGE Transmission Options to access remote resources:**
   - SWIP N + Gateway West 8 + B2H
   - Western Bounty
   - North Plains Connector
   - TransWest Express Transmission Project

2. **Appendix: PGE Transmission Options specific to Oregon/PNW:**
   1. Bethel – Round Butte 500kV Upgrade
   2. Trojan – Harborton Upgrade
   3. Cascades Renewable Transmission Project



ENERGY STRATEGIES

SWIP N + Gateway West 8 + B2H

Details from PGE's CEP-IRP Update Roundtable:

- *This option entails PGE purchasing access on five transmission lines leading to the desert southwest:*
  1. *Boardman to Hemingway (B2H)*
  2. *Gateway West segment E8*
  3. *Southwest Intertie Project (SWIP) – North*
  4. *One Nevada Transmission Line (ON Line)*
  5. *Desert Link*
- *This is achievable by **2027** (line COD). However, this option would require additional access across BPA's system, which is plausibly expected by **2032** (IRP COD).*
- *Up to **600 MW** of Nevada solar is modeled to be enabled through this option.*

SWIP N + Gateway West 8 + B2H:



- **Energy Strategies' conclusions:**
  - SWIP N + Gateway West 8 + B2H is a viable transmission option to access Nevada generation – it involves transactions with three transmission providers: 1. NVE, 2. PacifiCorp or Idaho Power, and 3. BPA.
  - Up to 400 MW of Nevada solar can be accessed, with unallocated transmission capacity on B2H as the limiting segment (see details on next slide).
  - Boardman (Longhorn) to PGE requires additional TSRs on the BPA system.
  - Earliest Date: 2035-2040, with greatest timing risk related to receiving additional TSRs on BPA system and availability of capacity on B2H.

ENERGY STRATEGIES

SWIP N + Gateway West 8 + B2H: Details

- **Energy Strategies' determination of rights on each segment:**

Segment	Description	Rights MW	Est. Date Available
NVE	ATC from Greenlink projects (Southsys to Northsys)	~550 (1)	2029
SWIP North	Utilizing DOE's northbound entitlements	500 (2)	2027 COD
Gateway West E8	Utilizing forecasted available transmission	600 (3)	2028 COD
B2H	Use currently unallocated 218MW of PAC rights and 182MW of IPCo rights	400 (4)	2026 COD
Longhorn to PGE	New BPA TSRs – see prior slides	400	2035-2040
	Rights and Date Available entire path:	**400**	**2035-2040**

SWIP N + Gateway West 8 + B2H:



(1) ATC from OASIS Postings, Southsys to Northsys, 550MW represents minimum during 2029-2033 period (Expansion entails Greenlink West, Greenlink North).
(2) For SWIP-North, CAISO and the DOE hold a combined 1072.5 MW of entitlements in the northbound direction. We assume that PGE could request and acquire up to 500 MW (equal to DOE's entitlements) (sources: here and here).
(3) Gateway West Segment E8 will have a transfer capacity of 2000 MW. Energy Strategies assumes PGE can request and receive 600 MW of capacity (source: PacifiCorp here).
(4) From IPCO for B2H (CPCN documents filed by IPCO here and here).

Western Bounty

Details from PGE's CEP-IRP Update Roundtable:

- *The Western Bounty Transmission System is a proposed 3000 MW HVDC line that could connect southern California to the Grizzly substation*
- *The projected commercial operation date (COD) is **2033***
- *Up to **3000 MW** of Nevada solar is modeled to be enabled through this option*
- *This option would provide access to the SP-15 market hub*
- *Additional BPA upgrades would be required for this option to reach PGE*

Western Bounty



- **Energy Strategies' conclusions:**
  - Western Bounty early in its development cycle and unlikely to materialize before mid- to late-2030s based on historical transmission development rates.
    - Development started in 2023 with the Interregional Transmission Project (ITP) joint evaluation process only starting in 2024. Project is early stage.
  - The scope, timing and available capacity of necessary BPA upgrades would likely limit PGE's 3000 MW of proposed solar access to a smaller amount – we do not recommend assuming 3000 MW of availability.
  - As an alternative, NVE's Greenlink expansion that increases ATC on their system, together with PGE's rights on the Northwestern AC Intertie (NWACI) and the Bethel – Round Butte upgrade, could be utilized to access resources within a similar proposed timeframe (details provided on next slide).

ENERGY STRATEGIES

Western Bounty Alternative: NVE Expansion and PGE rights

- **NVE Greenlink expansion and PGE's rights and projects as an alternative to Western Bounty for access to southwest solar:**
  - With NVE's Greenlink expansion, Southsys to Northsys capacity increases, creating additional ATC which PGE can utilize.
  - Pros:
    - Less risk in terms of parties involved and permitting timelines: NVE taking lead on "Greenlink 3" (Fort Churchill -> Captain Jack).
    - The expected route for Greenlink 3 roughly falls within the "Mountain – Northwest" National Interest Electric Transmission Corridor meaning any environmental review process under NEPA could be expedited as part of DOE's National Transmission Needs Study.
  - Cons:
    - Available capacity is less than considered with Western Bounty, however the 3000 MW envisioned capacity on Western Bounty would be limited by BPA upgrades.
- **Conclusion: Less risk and same desired timeframe and capacity potential as Western Bounty.**

Greenlink vs. Western Bounty:



ID	Element	Description	Rights MW	Est. Date Available
1	NVE	ATC from Greenlink projects (Southsys to Northsys)	~550 (1)	2029
2	Greenlink 3	Fort Churchill -> Captain Jack (early stage proposed by NVE)	725 (2)	2035-2040
3	Captain Jack -> Grizzly	Planned contractual updates to allow intra-region scheduling on the Northwest AC Intertie (NWACI) and use PGE's existing rights.	627 (3)	2029
4	Bethel – Round Butte Upgrade	TTC depends on configuration but not limiting segment in path	~3000 (4)	2032
		Rights and Date Available entire path:	**627**	**2035-2040**

(1) ATC from OASIS Postings, Southsys to Northsys, 550MW represents minimum during 2029-2033 period (Expansion entails Greenlink West, Greenlink North).
(2) NVE IRP Filing on initial study work related to Fort Churchill -> Captain Jack (Greenlink 3) (sources: here and here)
(3) Data from PGE.
(4) Data from PGE.

North Plains Connector

Details from PGE's CEP-IRP Update Roundtable:

- *This project is a 412-mile HVDC transmission line to be constructed with endpoints near Bismarck, North Dakota and Colstrip, Montana.*
- *PGE currently has **270 MW** of rights from Colstrip to PGE.*
- *If nothing changes between now and 2032, only a combined 270 MW NPC will be available for model selection.*
- *However, the company has submitted TSRs for an additional 720 MW across both BPA's and NorthWestern's systems.*
- *Up to 3000 MW of North Dakota wind is modeled to be enabled through this option, subject to the constraints mentioned above.*
- *Additionally, this option would provide access to the MISO Resource Zone 1 market.*
- *This option's COD is expected by **2032**.*

North Plains Connector:



- **Energy Strategies' conclusions:**
  - With PGE's existing rights from Colstrip, this project represents the best option to access North Dakota wind.
  - However, the timing to receive requested BPA and NWMT TSRs, as well as early stage of project development, are not consistent with a 2032 availability - we suggest a late 2030s timeframe may be more appropriate given historical greenfield transmission development timelines.
  - As already noted above, the actual MW capacity of access will be limited by PGE rights from Colstrip and pending TSRs.

PGE | IRP Regional Transmission Study

ENERGY STRATEGIES

TransWest Express Transmission Project

Details from PGE's CEP-IRP Update Roundtable:

- *This project is a two-part line that connects near Sinclair, WY and near Boulder City, NV:*
  - *Near Sinclair, WY to near Delta, UT: 3000 MW DC*
  - *Near Delta, UT to near Boulder City, NV: 1500 MW AC*
- *This option is being structured as a gen-tie through CAISO, which PGE can access using its rights at the California-Oregon Border (COB) trading hub.*
  - *This line could add up to approximately 3,000 MW of transmission access, however PGE's COB rights limit access to 600 MW of Wyoming Wind.*
  - *No other market access benefits assumed.*
- *The anticipated COD for this option is 2027 and would not require any additional transmission expansion.*

TransWest Express Transmission Project:



- **Energy Strategies' conclusions:**
  - PGE would need to be a subscriber on TWE and deliver to Eldorado; then make a market purchase at California Oregon Border (COB) which may be subject to paying CAISO transmission access charge (TAC).
    - This strategy would also be subject to basis risk between Eldorado and COB (or require a developer to carry this risk).
    - Would also likely need to ensure the transaction was designated as a high priority wheel-through.
    - This results in potentially high cost of transmission to access WY wind.
  - Other factors to consider include CAISO LSEs obtaining all TWE capacity (for reliability/clean energy needs), lack of ability to document delivery to PGE given lack of firm service, significant policy risk and dependence on CAISO market rules.
  - An alternative using Gateway West and B2H may be viable but has risks in timing and availability of capacity.

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ENERGY STRATEGIES

TransWest Express Alternative: Utilizing Gateway

- **Utilizing the Gateway buildout as an alternative to TransWest Express for access to Wyoming wind:**
  - Pros:
    - Provides access to Wyoming wind on a firm basis while avoiding the policy and pricing risks that would be associated with CAISO market transactions.
  - Cons:
    - Puts PGE in competition with PAC and IPCo and would require timely granting of TSRs on all systems.
- **Conclusions: Neither TransWest Express nor the Gateway alternative are ideal options**
  - PGE may be unable to secure affordable transmission access to Wyoming wind on a firm basis in the 2030s.

Gateway West vs. Transwest Express:



ID	Element	Description	Rights MW	Est. Date Available
1	Gateway West: Anticline -> Populus	Completing construction of Gateway West segment D-3	400 (1)	2031
2	Gateway West: Populus -> Hemingway	Completing construction of Gateway West segment E	400 (1)	2036
3	B2H	Use currently unallocated 218MW of PAC rights and 182MW of IPCo rights	400 (2)	2026 COD
4	Longhorn to PGE	New BPA TSRs.	400	2035-2040
		Rights and Date Available entire path:	**400**	**2035-2040**

(1) Gateway West segment E8 will have a transfer capacity of 2000 MW. Energy Strategies assumes PGE can apply for 400 MW of capacity (source: PacifiCorp here).
(2) (2) From IPCO for B2H (sources: IPCO here and here).

Appendix: Review of PGE Oregon/PNW Specific Transmission Options

PGE | IRP Regional Transmission Study

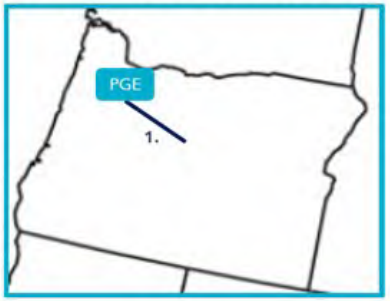
ENERGY STRATEGIES

Bethel – Round Butte 500kV Upgrade

Details from PGE's CEP-IRP Update Roundtable:

- *The Bethel-Round Butte reconductoring would increase the capacity on the existing line.*
- *The line is 98 miles, running from the Bethel substation (near Salem) to the Round-Butte substation.*
- *The projected commercial operation date (COD) is **2032** and will not require any other transmission expansion for PGE to access these benefits.*
- *Rebuilding the line from 230 kV to 500 kV will increase capacity.*
- *This could support an increase of **2,385-4,770 MW** increase in 'BPA' resources (off-system resources in the PNW region), depending on specification and subsequent path rating processes.*
- *This option provides market access to the California-Oregon border.*

Bethel – Round Butte 500kV Upgrade:



- **Energy Strategies' conclusions:**
  - As noted in the PGE 2023 CEP/IRP this upgrade is a "no regrets" option and facilitates significant access to queued resources.
  - However, depending on the reconductoring configuration chosen, the total transfer capacity is likely to reach only 3000 MW.

ENERGY STRATEGIES

Trojan – Harborton Upgrade

Details from PGE's CEP-IRP Update Roundtable:

- Approximately 34 miles long, running between PGE's Trojan and Harborton substations, paralleling two existing lines in service since the 1970s.
- PGE currently owns the additional unused ROW necessary for the project and has since the 1970s.
- The projected commercial operation date (COD) is **2032** and will not require any other transmission expansion for PGE to access these benefits.
- This transmission project will enable **800 MW** from BPA's generation resources, subject to cooperative study and agreement with other South of Allston path owners, BPA and PacifiCorp.

Trojan – Harborton Upgrade:



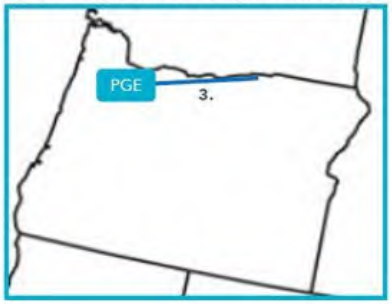
- **Energy Strategies' conclusions:**
  - With the importance of South of Allston and the control over right of way and facilities PGE possesses which are necessary to complete this upgrade, completing Trojan – Harborton upgrades appears "no regrets" similar to the Bethel – Round Butte upgrade.
  - In addition to the mentioned need to coordinate with other South of Allston path owners, timing of benefits from this upgrade is not certain:
    - Realizing the 800MW of BPA generation resources seemingly requires receipt of TSRs PGE has applied for on the BPA system and likely date to receive these TSRs is closer to 2035 than the proposed 2032 COD of this upgrade option.

Cascade Renewable Transmission Project

Details from PGE's CEP-IRP Update Roundtable:

- This project involves an electric transmission cable bundle, buried entirely underground and underwater, along with two converter stations located next to existing substations.
- This travels approximately 100 miles, primarily beneath the Columbia River, from the Big Eddy substation to the Harborton substation.
- The projected commercial operation date (COD) is **2032** and will require additional BPA and PGE transmission expansion for PGE to access these benefits.
- This is modeled to enable the transfer of **1,100 MW** of 'BPA' resources (off-system resources in the PNW region).
- PGE is not currently participating in this project, but involvement may be possible if selected as part of PGE's preferred portfolio.

Cascade Renewable Transmission Project:



- **Energy Strategies' conclusions:**
  - The point of delivery at Harborton makes PGE well-positioned to realize benefits from access to BPA resources.
  - The timing for 1260 MW of solar + storage projects in BPA's Queue at Big Eddy as well as the Cascade Renewable Transmission Project's own queue position (all seeking interconnection/energization in 2029) seems aggressive given the early stage of development for this project.
    - With the challenges to work in the Columbia River, especially from a permitting perspective, late 2030s more likely as a time for project COD.



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2024 Environmental, Social and Governance Report

Advancing toward a clean energy future



About this report

This report outlines Portland General Electric's (PGEs) commitment to advancing environmental, social and governance values core to our business through responsible practices.

We disclose data under the Edison Electric Institute (EEI) ESG Quantitative Template, Sustainability Accounting Standards Board (SASB) and Task Force on Climate-Related Financial Disclosures (TCFD) to provide stakeholders information about how we identify, measure and manage the subset of environmental, social and governance topics that most directly impact long-term enterprise value. The inclusion of information in this report should not be interpreted as characterization regarding the materiality or financial impact of that information.

About Portland General Electric

Portland General Electric is a fully integrated energy company that generates, transmits and distributes electricity, serving roughly half of Oregon's population and nearly two-thirds of its commercial and industrial activity.

CORPORATE STRATEGIC IMPERATIVES



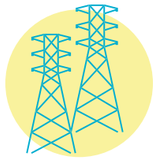
Decarbonize

Reduce greenhouse gas emissions associated with electricity served to retail customers by at least 80% by 2030 and 100% by 2040.



Electrify

Increase beneficial electricity use to capture the benefits of new technologies while building an increasingly clean, flexible and reliable grid.



Perform

Improve efficiency, safety and system and equipment reliability while maintaining affordable energy service and growing earnings per share 5% to 7% annually.

For more information on our Environmental, Social and Governance Report, please contact:

Kristen Sheeran
Vice President, Policy and Resource Planning

Nick White
Manager, Investor Relations and Treasury Operations

Heather Nelson
Director, Diversity, Equity and Inclusion and Talent Management

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"At the heart of Portland General Electric's work is an enduring commitment to our responsibility to provide safe, reliable and affordable energy to every customer and community we serve."

Letter from our President and CEO

At the heart of Portland General Electric's work is an enduring commitment to our responsibility to provide safe, reliable and affordable energy to every customer and community we serve.

Today, our company works at the intersection of important changes in society from the onshoring of manufacturing to the transition to clean energy and the risk of extreme weather events, especially wildfires. The decisions we make and the results we achieve help shape the future of the Pacific Northwest and the country.

As the energy industry experiences rapid change, aligning our core values with our business practices is essential to earning and maintaining the trust of customers and stakeholders. When we ground our business strategy in our values, we can better identify and mitigate the risks of a changing climate, prioritize investments in safety, resilience and reliability for customers, and innovate to deliver affordable electricity.

PGE made sustained progress toward our clean energy goals in 2024. The carbon intensity of the power supply declined to 0.27 MTCO2e per MWh in 2024, despite load growth on our system. Of the energy our company generated and procured in 2024, 45% came from clean, non-carbon emitting sources, a 7% compounded growth rate in our non-emitting resource mix since 2020, building on our commitment to reach net-zero carbon emissions by 2040.

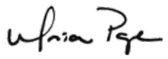
New renewable energy resources from the Clearwater Wind Energy Center and battery storage systems brought increased availability and reliability to our energy mix. These systems, along with the rest of PGE's technology and infrastructure, work together to provide reliable, clean energy even when the wind doesn't blow and the sun doesn't shine.

In 2024, PGE strengthened our commitment to environmental stewardship. As Oregonians, we care deeply about the natural beauty and natural resources that make our state one of the best places to live. In everything we do, we strive to protect those resources for the benefit of all. Our salmon restoration projects, youth engagement programs and clean energy job internships all serve to protect resources and engage future generations.

I am very proud of the work we are doing to create an inclusive environment within our company. Grounded in our company's Guiding Behaviors, over the last ten years, we have seen a 9% increase in the number of women at PGE and a 38% increase in women in leadership. The number of Black, Indigenous and People of Color in our company grew by 39% overall and 110% in leadership.

PGE employees are also active members of the community in which we live and work, with PGE employees and retirees completing 22,957 volunteer hours during the year. The company contributed $5.5 million to charity though corporate contributions, the PGE Foundation, current and retired employee contributions and our company match program. Contributing to economic growth and community development in our service area remains an important part of PGE's culture.

Portland General Electric remains deeply committed to being responsible stewards of Oregon's vital resources. It will take all of us, working together and guided by our shared values, to power a prosperous, clean and vibrant future.



Maria Pope
President and CEO, PGE



"As PGE grows and evolves to meet some of the most pressing challenges of our time, our environmental, social and governance strategy aligned with our core values will continue to guide us to shared success."

Letter from our Vice President, Policy and Resource Planning

At PGE, we pride ourselves on providing excellent service and being effective stewards of our resources. For more than 130 years, we've been a trusted partner to the communities we serve. Our commitment to customers, to environmental stewardship, to employees and their communities, to ethical conduct, transparency and sound governance has never wavered. We anchor our business decisions in these commitments, informed by the best available science and technology, to ensure reliable, affordable electricity service for the communities we serve.

PGE's holistic approach reflects our company's core values of service, accountability, affordability and sustainability and balances environmental, social and governance goals with our core mission to power Oregon's economy and communities. This is underscored by our commitment to deliver long-term results for our stakeholders, including our customers, shareholders and communities.

In recent years, PGE has aggressively pursued Federal grant and tax credit opportunities to lower costs while growing the Company's renewable energy portfolio. We developed programs and technologies that help customers manage their energy use, pursued capital raises through green financing, and attracted and retained a dedicated, talented and diverse workforce.

In 2024, we continued our commitment to delivering shared success through responsible business practices across all operational areas.

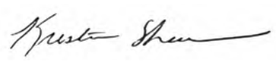
Since 2021, the year PGE first committed to an ambitious 80% emissions reduction target for 2030, PGE and its customers have committed to adding the equivalent of more than 2,900+ MW of new clean energy resources to the grid, including energy efficiency, rooftop solar and flexible demand response programs.

The new Clearwater Wind Energy Center increased our total wind generation to more than 1,000 MW a day — enough to power all our residential customers on wind energy alone — a milestone that we've hit repeatedly since Clearwater began operating. New, utility-scale battery systems including Constable, Sundial and Coffee Creek brought 292 MW of energy storage capacity to the grid in 2024, increasing the reliability of PGE's renewable energy portfolio.

Our environmental stewardship programs saw continued improvement as well. At PGE's hydro facilities, working with our partners, strong environmental stewardship increased fish returns by 185% on the Clackamas River and 510% on the Deschutes River compared to our 10-year average. At the Round Butte Dam, we measured 733 steelhead upstream of the facility, the largest fish return at this site since construction.

From our first hydroelectric project on the Willamette River in 1889 — the site of the nation's first long-distance power transmission — to our state-of-the art salmon restoration programs delivering record breaking returns along the Deschutes and Clackamas rivers in 2024, we deploy business solutions that deliver lasting value for customers, communities, employees and shareholders.

As PGE grows and evolves to meet some of the most pressing challenges of our time, our environmental, social and governance strategy aligned with our core values will continue to guide us to shared success.



Kristen Sheeran, PhD
Vice President, Policy and Resource Planning, PGE



PGE's wind farm, Wheatridge

Our focus areas and priorities

Our purpose is to power the advancement of society. Customers count on us to power their lives with safe, reliable and affordable energy, as they have for more than 130 years. We energize lives, strengthen communities, support sustainable livelihoods and deliver clean energy solutions that advance economic, social and environmental progress.

As our business continues to grow and evolve to meet some of the most pressing challenges of our time, we are committed to a long-term planning and decision-making approach that aligns with our key focus areas.

Affordability

- We work to keep prices as low as possible for customers.
- Design innovative customer programs and solutions to promote energy savings.
- Leverage all available tax credits, incentives and public funding to reduce costs for customers.

Reliability

- Enhance the reliability and resiliency of the grid to withstand extreme weather and growing peak customer demand, facilitate electrification and integrate renewable and distributed energy resources.
- Maintain a comprehensive risk management program, including data security, cybersecurity, physical security, wildfire and climate-related risks.

Decarbonization

- Transition from fossil fuel generation to non-emitting energy and capacity resources to support customers' climate and clean energy goals by 2040.
- Achieve net zero emissions across all of our operations by 2040.

Community

- Provide excellent electricity service to the customers and communities we serve.
- Attract and develop a talented and diverse workforce.
- Support local communities through partnerships, philanthropy, employee giving and volunteerism.

These focus areas closely align with several of the United Nations Sustainable Development Goals (SDGs) — a set of 17 interlinked global goals aimed at achieving peace and prosperity for people and the planet.

We primarily focus on five U.N. SDGs that most directly align with our values and upon which we believe we can create the greatest impact.



A decade of progress

KEY MOMENTS AND DISCLOSURE TIMELINE

We have a solid track record of performance — but we are continuously evolving our ambition and efforts to match the most pressing environmental and social equity challenges of our time.

2014

- Completed **Tucannon Wind farm**

2015

- Achieved **15% Renewable Portfolio Standard** requirement
- **First year of reporting for sustainability progress**

2016

- Collaborated on the passage of Oregon Clean Electricity and Coal Transition Plan law, **doubling the state's RPS standard to 50%,** while requiring PGE to remove coal from PGE's energy mix by 2030

2019

- Launched **Smart Grid Test Bed**
- **Added SASB Framework and EEI ESG Quantitative Sustainability Template to Sustainability Report**

2019

- PGE and NextEra Energy Resources announced development of **Wheatridge Renewable Energy Facility,** the nation's first major energy facility co-locating wind, solar and battery storage

2020

- Permanently shuttered Boardman Generating Station, **eliminating coal generation** in Oregon
- **First stand-alone ESG Report published, including disclosures aligned with the TCFD framework**

2021

- Placed **$150 million** in green bonds following recent closing on $650 million sustainability-linked revolving credit facility

2021

- Collaborated with Oregon lawmakers and stakeholders to pass one of the nation's **most ambitious emissions reduction targets** in the power sector (HB 2021)

2021

- First U.S. utility to sign **The Climate Pledge** committing to net zero emissions by 2040, 10 years ahead of the Paris Accords Goal

2021

- **PGE Board of Directors expands ESG oversight by amending Nominating and Corporate Governance Committee charter to include oversight of sustainability and ESG matters**

2022

- **Issued green bonds** to finance or refinance investments in assets and projects that advance our sustainability goals

2022

- Issued the Company's first **Human Rights Policy Statement**
- **Began reporting on progress toward U.N. SDGs**

2023

- Filed inaugural **Clean Energy Plan**

2023

- **311 MW** Clearwater wind energy facility began generating test energy in 2023 (and came fully online in 2024)

2023

- In collaboration with other parties, awarded over **$300 million** in federal grant funding for projects to support the clean energy economy

2023

- Announced procurement of three battery storage projects totaling **475 MW** — the largest single procurement by a U.S. utility outside the state of California

2023

- Executed, renewed and extended cooperative agreements for more than **500 MW of hydropower** from regional public utility districts

2024

- Produced a record output of **more than 1 gigawatt of wind energy**

2024

- PGE customer actions resulted in the **largest electricity demand shift in company history of 109 MW** during multi-day heat wave

2024

- Achieved **supplier diversity target of 18%**

2024

- **15 years** of No. 1 ranking from the U.S. Department of Energy's National Renewable Energy Laboratory for the largest participation of customers in a renewable energy program among U.S. electric utilities

2024

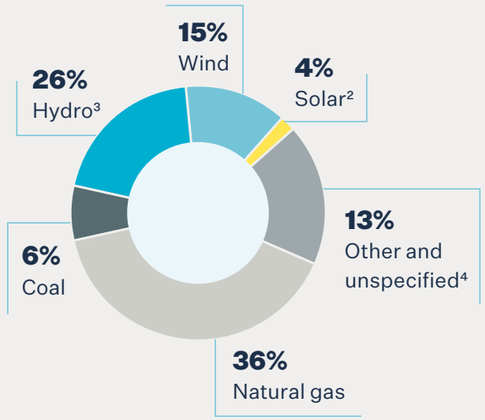
- PGE and its customers have committed to adding nearly **3 gigawatts of clean energy since 2021** (see Clean energy additions graphic)

PGE's 2024 resources and emissions at a glance

RESOURCE MIX FOR PGE'S TOTAL SYSTEM LOAD[1]

Retail and wholesale

45%
NON-EMITTING



1. Percentages above represent 2024 resource mix from PGE's total system load, inclusive of wholesale volumes. The percentage of 2024 retail load, excluding wholesale sales, served by non-emitting resources is 40%. Refer to the appendix for additional information.
2. Represents owned and contracted solar resources, does not include the 264,826 MWh of customer owned rooftop resources.
3. Hydro amounts include purchases from Bonneville Power Administration, which may have an immaterial amount of emissions associated with them, per ODEQ rules.
4. Unspecified is purchased power for which a specific generating resource is not defined and could be any of the generation types (e.g., wind, hydro, gas).



ROOFTOP SOLAR GENERATION

Customer-sited rooftop solar generation provided 264,826 MWh of non-emitting energy in our service territory.

PGE was the first utility in the U.S. to sign The Climate Pledge

THE CLIMATE PLEDGE

There are currently

539 signatories[1]

across 60 industries and 45 countries who have signed The Climate Pledge

1. theclimatepledge.com/us/en/Signatories

2024 EMISSIONS FOR POWER SERVED TO OREGON CUSTOMERS

5.90
million metric tons of CO_2e

GHG emissions from power served to Oregon customers[1]

0.28
metric tons of CO_2e per MWh

GHG intensity for power served to Oregon customers[1]

1. These figures are preliminary and based on generated and purchased energy associated with serving retail customers within the state of Oregon, as required by the Oregon Department of Environmental Quality (ODEQ). Some or all of the renewable energy attributes associated with PGE's Basic Service Mix may be sold, claimed or not acquired.

PGE HAS AMBITIOUS TARGETS TO REDUCE GHG EMISSIONS FROM POWER SERVED TO RETAIL CUSTOMERS WITHIN THE STATE OF OREGON

Baseline (2010-2012 average emissions)	8.1 $MMTCO_2e$
80% reduction from baseline by 2030	1.62 $MMTCO_2e$
90% reduction from baseline by 2035	0.81 $MMTCO_2e$
100% reduction from baseline by 2040	0 $MMTCO_2e$

Scope 1[2]

6.41 million metric tons of CO_2e

Scope 1 emissions includes all of PGE's direct emissions, made up of fuel burned by thermal generating resources, fuel burned by PGE's vehicle fleet and natural gas used at PGE's office facilities.

Scope 2[2]

0.04 million metric tons of CO_2e

Scope 2 emissions are emissions related to transmission and distribution line loss and emissions associated with power purchased from a third party that is consumed by PGE.

Scope 3[2]

2.06 million metric tons of CO_2e

Scope 3 emissions include the generation of purchased electricity then sold to end users. Reporting and data collection capabilities are still being developed for other Scope 3 sources of emissions.

2. Scope 1, 2 and 3 accounting reflects a company's carbon footprint across all corporate operations. PGE's Scope 1, 2 and 3 accounting includes emissions, above and beyond those associated with power served to Oregon customers.

NET ZERO EMISSIONS TARGET

We have set a goal to achieve net zero emissions across our operations by 2040, which will require reducing PGE's Scope 1, 2 and 3 emissions. Our targets align with The Climate Pledge, which implements decarbonization timelines in accordance with the U.N. Paris Agreement.



North Fork Reservoir on the Clackamas River

Resilient energy ecosystem

As Oregon's largest electricity provider, PGE has significant responsibilities to lower carbon emissions, steward critical habitats, protect air and water quality and minimize environmental impacts in the places we serve and call home.

At PGE, we are committed to a future in which all customers, communities and employees can thrive. Our decisions about how we provide electricity impact environmental health, safety and the quality of life today and for future generations. We base those decisions on the best available science, industry-leading knowledge and experience, risk-informed decision-making practices, data-driven analysis of alternatives and above all else, our privilege and obligation to serve Oregonians with reliable electricity at the lowest possible price.

We are confronting the impacts of climate change and extreme weather across our service territory and in the places where we generate, transact and transmit power. Wildfire risk, droughts, extreme storms and record temperature events place some utility assets at risk and pose significant challenges for grid operations, power supply planning and utility management. Some communities we serve – including Black, Indigenous and People of Color (BIPOC), low-income and rural communities – are often disproportionately burdened by climate change and extreme weather and less prepared to withstand its impacts.

By collaborating with customers and communities, PGE aims to mitigate the disruptive impacts of climate change on Oregon's electricity system and protect Oregon's land, water and habitats, while making proactive investments in grid resilience, modernization, electrification and decarbonization.



A changing power supply

Our power supply is steadily decarbonizing to meet the needs of customers today and into the future.

PGE meets the growing energy demands of customers with a diverse mix of generation facilities owned in whole or in part, or through contract. Today, our generation portfolio consists of seven hydroelectric facilities, five natural gas facilities, three wind facilities, one combined wind/solar/battery facility and a partial ownership stake in an out-of-state coal facility. PGE previously announced the acquisition of 475 MW of new battery storage projects, of which 275 MW achieved commercial operations in December 2024 with the remaining 200 MW scheduled for service in mid-2025.

Customer-sited resources, including rooftop solar, batteries and standby generation play an increasingly critical role in our resource portfolio. For example, customer-sited rooftop solar generation contributed an additional 264,826 MWh of non-emitting energy in PGE service territory in 2024.

We manage the output of our own power plants in conjunction with available power supplies on the wholesale market to deliver power to customers at the lowest possible price. We actively coordinate with transmission providers like the Bonneville Power Administration and other utilities and energy suppliers across the region, to secure transmission access and additional power on contract for customers. We also own major transmission rights to the Pacific Intertie and participate in the California Independent System Operator's (CAISO) Energy Imbalance Market (EIM) and the soon-to-be established Extended Day-Ahead Market (EDAM). These options provide additional flexibility to buy and sell power and to access a more diverse and increasingly clean mix of generating resources.

In 2024, PGE made strong progress toward advancing a resource mix for our total system load that is increasingly clean. The percentage of total load comprised by non-emitting resources grew from 35% in 2023 to 45% in 2024. As a result, the carbon intensity of the power supply declined to 0.27 MMTCO2e per MWh in 2024, despite load growth on our system.

3,500+ MWS OF GENERATION CAPACITY

CENTRAL OREGON
- Pelton
- Round Butte

EASTERN OREGON
- Biglow Canyon
- Carty
- Coyote Springs
- Wheatridge

MONTANA
- Clearwater
- Colstrip

EASTERN WASHINGTON
- Tucannon River Wind Farm



- Coal
- Gas
- Hydro
- Wind
- Combined wind, solar, and battery
- Service territory

While natural gas remains the largest component of our generating mix and provides much-needed capacity to meet resource adequacy and reliability requirements — hydropower, wind and utility-scale solar continue to grow on our system, in addition to customer-sited renewable energy resources like rooftop solar. Wind output alone grew by 56%, reaching record breaking levels of wind generation on our system in 2024 primarily due to the addition of the Clearwater Wind facility in Montana. Not only does this facility have a high energy output rate, but it also generates power when other wind resources closer to home in Oregon and Washington are less productive. This exemplifies the importance of resource diversity in our portfolio – and is a critical decarbonization strategy.

Unspecified emissions are reported when the underlying source of generation for energy we purchase from the market, including from CAISO's Energy Imbalance Market, is unknown or not otherwise specified in a contract. Following best practice and ODEQ rules, we assign an emissions rate to unspecified purchases in recognition that the power pool in Western states still includes fossil fuel generation. Throughout 2024, PGE reduced emissions from unspecified sources, from 16% of our retail resource mix in 2023 to 14% in 2024. As Western states decarbonize and energy markets such as CAISO adopt more precise mechanisms for tracking and reporting the carbon content of resources dispatched and allocated through energy markets, emissions associated with unspecified purchases should continue to decline in our system.

PGE recently concluded the largest open-application request for proposal (RFP) for clean energy resources to augment our portfolio to date and we anticipate returning to the market with another RFP in 2025. This and subsequent RFPs will be necessary to meet customers' energy needs and PGE's emissions targets. PGE's steady progress in procuring clean energy and investing in grid-edge technologies and customer programs will reduce reliance on fossil fuels and drive a cleaner resource mix in future years.

MORE ENERGY, FEWER EMISSIONS

0.27 **metric tons of CO2e per MWh is the GHG intensity for PGE's power supply**

Carbon intensity is an indicator of how clean PGE's electricity is. It is measured as carbon emissions per megawatt hour of energy produced for PGE's total system load. Monitoring and assessing the carbon intensity of our generation portfolio is important because it provides insights into how well PGE is doing to decarbonize, even when its total electricity load is increasing.

As reported on page 11, the carbon intensity for PGE's retail load is 0.28 MMTCO2e.

PERCENTAGE OF RESOURCES MIX FROM NON-EMITTING RESOURCES

45% 2024 (actual)

45-50% 2025 (projected)

75-80% 2030 (targeted)

PGE'S HISTORY OF CLIMATE LEADERSHIP

In 2010, PGE negotiated the early closure of the 30-year-old Boardman Generation Station coal plant in Oregon, the state's only coal-fired facility and one of the youngest plants in the nation to retire due to air quality concerns. The plant ceased operations in 2020 and today that site may become the location for solar and storage or emerging green hydrogen technology through PGE's participation in the Department of Energy (DOE) funded Pacific Northwest Hydrogen Hub consortium. In 2016, PGE helped pass Oregon's landmark Coal to Clean bill, establishing a firm timeline for ending coal service for Oregon electricity customers. PGE continues to pursue an exit from Colstrip that balances reliable and affordable outcomes for customers, while also complying with Oregon state law to no longer serve retail customers with coal generated energy.


BEFORE: Boardman Generation Station


AFTER: Demolition of Boardman stack

Climate commitments and emissions

Customers drive our commitments to clean energy, carbon reduction and sustainability.

PGE customers include some of the world's most sophisticated corporate renewable energy buyers and local municipalities with ambitious climate action plans that call for transitioning to cleaner energy and lowering emissions. Portland, Beaverton, Multnomah County, Hillsboro, Salem and many other municipalities have developed climate action plans that encourage us to find new and innovative ways to reduce the carbon intensity of the electricity we serve, while also supporting their electrification efforts, fostering economic development and modernizing the grid to enhance resilience to extreme weather.

Many companies in PGE's service territory have publicly adopted ambitious clean energy or emissions goals, including Oregon Health and Science University, Nike, Intel, STACK Infrastructure, Daimler and others. As large electricity buyers, they look to PGE to support their decarbonization efforts.

PGE supports customers' climate and sustainability goals by decarbonizing the electricity supply and offering innovative voluntary programs that enable customers to go further and faster. We offer programs for large businesses, cities and counties that match their electricity needs with new renewable energy facilities in our region. We also offer convenient options for small business and residential customers to support clean energy development by purchasing renewable energy certificates from energy generation throughout the U.S.

Because of customers' strong preferences for clean energy, PGE has embraced very ambitious targets for decarbonization.

In 2021, PGE became the first utility in North America to sign The Climate Pledge to achieve net zero emissions across company operations (Scope 1, 2 and 3 emissions) by 2040, ten years ahead of the United Nations' Paris Agreement. PGE then collaborated with state lawmakers and stakeholders to pass Oregon's 100% Clean Electricity Law (HB 2021) to establish emissions targets for electric utilities in Oregon. These targets apply to emissions associated with power served to Oregon retail customers and include an 80% reduction in emissions below an average 2010-2012 baseline, 90% reduction by 2030 and a 100% reduction by 2040.

PGE is actively exploring the process of third-party certification of our emissions targets, including the Science Based Target Initiative and other efforts underway by the power sector to develop a science-based target.

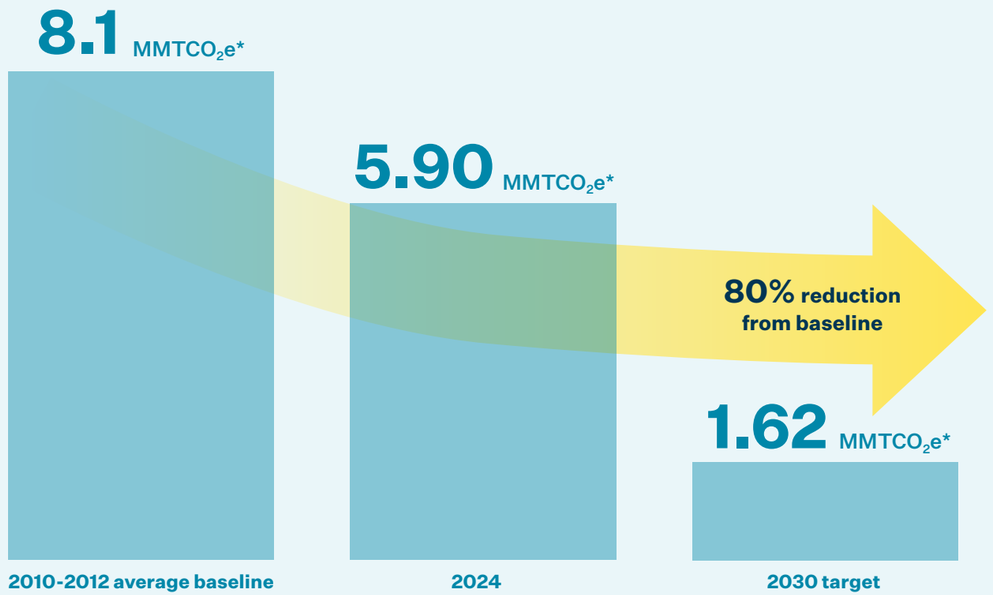
For the 15th straight year, the U.S. Department of Energy's National Renewable Energy Laboratory ranked PGE the first of any U.S. electric utility for customer participation in renewable energy programs.*

**NREL did not release rankings in 2011.*



The Beaverton Public Safety Center equipped with an advanced solar microgrid (photo credit: Energy Trust of Oregon)

PGE is more than one-third of the way toward the emission reductions needed to meet its 2030 emissions target



** Emissions associated with power served to Oregon customers.*

Emissions reporting

PGE has been a mandatory reporter of greenhouse gas emissions for all facilities to state regulators since 2010. Compliance with state emission targets is based on that reporting, which is also subject to third-party verification. Year-to-year variation in emissions is expected primarily due to fluctuations in temperature and hydro, wind and solar generation.

At the close of 2024, PGE disclosed a 27% reduction in baseline emissions from power served to Oregon retail customers. Emissions associated with power served to Oregon customers in 2024 equated to approximately 5.90 million metric tons of CO_2e. This is a 10% decrease in retail emissions reported in 2023, largely driven by additional hydropower and the addition of the Clearwater Wind facility.

PGE also discloses material quantities of emissions from all power generation (retail and wholesale) and company operations as Scope 1, 2 and 3 sources of emissions. Scope 1 includes PGE's direct emissions, primarily from fuel burned by our thermal generating fleet and fuels used in PGE's vehicle fleet and buildings.

Scope 2 for an electric utility is relatively small and associated with transmission and distribution system line losses, and any electricity PGE purchases from third parties for our facilities.

Scope 3 is where PGE reports emissions associated with the power purchased for customers. As noted above, PGE regularly turns to the market to supplement generating resources to meet customers' energy needs reliably and affordably. PGE currently reports Scope 3 emissions from purchased power.

Like most utilities, PGE's emissions are driven by the fossil fuels combusted to generate power, accounting for more than 99% of our currently reported Scope 1, 2 and 3 emissions. This is why emissions reporting, emissions targets and clean energy strategies are largely focused on decarbonizing our power supply, either through generation or purchased power. PGE is actively planning and executing strategies for a balanced transition from thermal generation to increasingly cleaner generation sources while providing reliable energy service that can affordably meet customers' energy needs.

PGE's Clean Energy Plan

Mitigating customer price impacts and maintaining system reliability are core priorities as PGE decarbonizes its power supply.

In 2023, PGE published its combined Clean Energy Plan and Integrated Resource Plan, a twenty-year roadmap for meeting customer energy needs at the lowest possible costs while transitioning from fossil fuel generation. We demonstrated a path toward the 80% emissions reduction target in 2030 that involves resources and technologies that are economically and technically feasible in the region today. No single technology right now can replace the role of natural gas generation in the electric power system. Clean energy of all types — including customer rooftop generation, community-scale microgrids that combine batteries and solar, utility-scale wind, solar and batteries — energy efficiency and demand response programs and customer dispatchable standby generation will all be needed to replace the energy and backstop capacity that natural gas currently provides.

As we look ahead to deeper decarbonization targets in 2035 and beyond, PGE anticipates the need for access to a broader geographic diversity of resources and technologies to replace fossil fuels on the grid. This will require solutions to current regional transmission constraints and adopting future non-emitting technologies as they become cost-effective. This could include green hydrogen, offshore wind, nuclear, long-duration storage and carbon capture and storage.

CLEAN ENERGY ADDITIONS*

Achieving emissions reduction requires steadily adding renewable energy, battery storage, energy efficiency and demand response to our portfolio, so we can reliably and affordably reduce fossil fuel generation.

Since PGE implemented its emission targets in 2021, PGE and its customers have committed to adding 2,900+ MW of clean energy.

Clean energy additions since 2021

Wind
- Clearwater 2024: 311 MW

Utility scale solar
- Wheatridge Solar 2022: 50 MW
- Patchwayit Solar** 2023: 162 MW
- Tower Solar** 2026: 120 MW
- Daybreak Solar** 2026: 138 MW
- Bakeoven Solar** 2026: 60 MW

Batteries
- Wheatridge Battery 2022: 30 MW
- Constable 2024: 75 MW
- Sundial 2024: 200 MW
- Coffee Creek 2024: 17 MW
- Seaside 2025: 200 MW
- Other BESS facilities: 8 MW

Small-scale solar
- Community Solar & QFs: 96 MW
- Rooftop Solar: 172 MW

Hydro contracts
- Mid-C PPA 2023 (2024-2025): 76 MW
- Mid-C PPA 2023 (2024-2026): 434 MW
- Douglas PUD 2024 (2026-2030): 79 MW

Customer programs
- Energy Efficiency***: 122 aMW
- Demand Response****: 603 MW

Next steps:

PGE received Commission acknowledgement to pursue over 1,600 MWs of renewable energy and storage from its 2023 All-Source RFP final short list.

PGE will solicit the market through RFPs for renewable energy resources and storage, starting again in 2025.

PGE is executing on plans to shift up to 25% of peak energy demand through distributed resources and customer programs coordinated through our virtual power plant.

** Through ownership, PPA, contract or customer participation in programs.*
*** Procured by customers through Green Future Impact program.*
**** Preliminary numbers as provided by ETO. Numbers are subject to change from this report to the final filed report, which will occur later in the year.*
***** Cumulative capacity deployed in summer and winter seasons over time period. Total DR capacity in Summer 2024 is 105 MW.*

FUTURE STATE TECHNOLOGIES

DISPATCHABLE ENERGY:
Reliance on wind, solar and short-duration storage exposes portfolios to energy shortfalls and reliance on thermal generation until more non-emitting dispatchable generation is a reality for our region.



Advanced nuclear

Both small modular reactors and advanced nuclear reactors offer potential emissions-free power in the future. The designs' modular construction lowers costs and reduces risks, though siting in Oregon is currently prohibited.



Enhanced geothermal

Enhanced geothermal has not yet been successfully demonstrated in the Northwest, but the technical potential for geothermal remains.



Carbon capture storage (CCS)

CCS technology is the beneficiary of substantial tax credits in the Inflation Reduction Act. Compression, storage and mineralization in the Northwest basalt geology is claimed to resolve the long-term CO2 escape risks.

LONG DURATION STORAGE:
Without dispatchable carbon sources, PGE will require additional renewables paired with long-duration energy storage resources to meet load.



Green hydrogen

Electrolysis allows for surplus renewable energy to be stored as green hydrogen in 100+ mile pressurized pipelines to allow for carbon free electricity generation through combustion.



Iron-air energy storage

Iron-air stationary battery storage has the potential to allow for non-flammable, low-energy density and low-cost per unit MWh long-duration energy storage.



Compressed air

Advanced compressed air energy (A-CESC) is a long-term energy storage technology which has renewed commercial interest.

Balancing affordability, reliability and decarbonization

This is a period of dynamic change for PGE and the power sector at large. We're experiencing an increase in energy demand driven by electrification and rapid growth in demand as a result of advancements like artificial intelligence (AI), expansion of data centers and growth of technology manufacturing. Climate variability is changing how our customers use energy, resulting in record-high winter and summer system peaks and changes in regional power flows that impact power operations and transmission planning. Utilities across the entire western grid are decarbonizing, contributing to energy storage and capacity scarcity, while facing increasing demand on the region's existing transmission and siting availability for new renewables. Power cost volatility, inflation, wildfire mitigation, investments in grid safety and stability and integration of new clean energy technologies are exerting upward pressures on customer prices. We're deploying technologies to help customers reduce energy expenditures and minimize disruptions. Wireless sensors and centrally controlled automated switches help isolate disruptions and more rapidly reroute power, preventing or shortening disruptions. During outages, these technologies help us share timely, accurate information with customers by notifying them when their power goes out and providing updates through digital and mobile channels.

GRID ENHANCING TECHNOLOGIES

The clean energy grid of the future will require new transmission capacity to transport clean electricity to where customers live and work. PGE is prioritizing new grid enhancing technologies (GET), including hardware and software solutions such as advanced conductors, dynamic line ratings, power flow controllers and topology optimization, where applicable, to increase the capacity of our existing transmission infrastructure and minimize disruptions to landscapes or communities from building new transmission infrastructure.

Advanced conductors



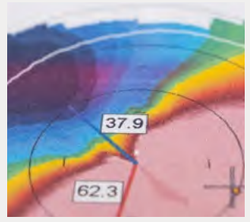
Dynamic line ratings



Power flow controllers



Topology optimization



Customer collaboration

Customers play a critical role in decarbonization as they electrify vehicles, homes and businesses and generate and store their own power.

Currently, 24% of PGE's residential households participate in voluntary programs to shift energy use, including Peak Time Rebates, Smart Thermostats program, and Time of Day pricing. These programs not only save customers money on their bills, but also provide critical capacity to our system, especially when the grid needs it most. In addition, our residential and business customers are rapidly adopting electric vehicles and installing rooftop solar systems, batteries and standby generation.

Programs that allow customers to manage their own energy use as well as generate and store their own power are possible due to an increasingly sophisticated bidirectional grid. We are deploying a distributed energy resource management system (DERMS) to provide real-time visibility into distributed energy resources and to better serve customers using a two-way flow of energy safely and reliably.

At our state-of-the-art Integrated Operations Center, PGE orchestrates these customer-sited resources so they can function as a Virtual Power Plant (VPP), providing energy and resiliency to the grid for the benefit of all customers. A VPP can help customers shift their energy consumption from traditional peak times, reducing their energy costs and avoiding the need for emitting resources. We also work with electric vehicle (EV) drivers to shift charging usage through our EV Smart Charging program.

To help reduce the costs of new clean technologies and resources, we are leveraging federal, state and local funding currently available and guiding customers toward incentives for electric vehicles, heat pumps, energy efficiency, weatherization, solar panels and storage.

RECORD-SETTING CUSTOMER COLLABORATION IN TIMES OF HIGH DEMAND

Climate change-induced extreme whether is contributing to temperatures with higher peaks and lower troughs, as well as greater volatility. By 2030, we aim to serve growing energy needs by partnering with customers to offset up to 25% of peak demand by using distributed resources and flexible load orchestrated through our virtual power plant.

PGE customer actions resulted in the largest electricity demand shift in company history during a multiday heat wave in July 2024. Coupled with PGE's ongoing system upgrades and preparedness efforts, customers' collective energy conservation actions supported reliable power delivery and grid stability during a time of extremely high power demand.

Customer actions reduced electricity demand by nearly 109 MW during peak demand hours on Monday, July 8 and 100 MW on Tuesday, July 9; that is enough electricity to power over 90,000 homes for a four-hour period.

CUSTOMERS MADE THE DIFFERENCE DURING A SUMMER HEAT WAVE



A changing Western grid

Organized markets and regional collaboration help expand our resource footprint and are critical tools for managing costs and reliability.

Just as we work with customers, we also collaborate with energy producers across the West to support the region's decarbonization efforts. This collaboration also helps address transmission constraints and clean resource availability.

The western grid is rapidly evolving and the generation mix continues to change as coal plants are decommissioned and more renewables and storage come online. The region's transmission system is aging and needs to be expanded to accommodate increasing demand and changing climate patterns. According to a recent North American Electric Reliability Corporation (NERC) study, extreme demand during heat events strains resources and the transmission network because the region has insufficient operating reserves.

Western Power Pool's Western Transmission Expansion Coalition (WestTEC) initiative is working to address the lack of transmission across the western interconnection. WestTEC is unique due to the unprecedented regional partner engagement, including states and tribes, and will produce an actionable transmission study incorporating a 10-year look and a scenario-based 20-year analysis.

Organized market expansion across the West facilitates regional decarbonization, lowering costs, accelerating renewable integration, improving operational efficiencies and reducing the need for real-time flexible reserves. PGE was one of the early participants in the Western Energy Imbalance Market (WEIM), a decision that has significantly reduced power costs for customers from what they otherwise would have been and enhanced our system reliability during extreme weather events. PGE is committed to participation in EDAM organized by CAISO. PGE is also a leader in the development of the Western Resource Adequacy Program (WRAP), operated by the Western Power Pool. PGE is currently active in the non-binding phase of this first-of-its-kind resource adequacy program that includes both forward-showing and operational components.

Reducing emissions across sectors

While the Clean Energy Plan focuses on decarbonizing the electricity supply, our broader commitment to net zero leads us to find ways to lower emissions and across other areas of our business, while supporting our customers in their efforts to electrify their vehicles, homes and buildings. Reducing diesel and gasoline purchases for PGE's fleets and reducing energy use in PGE's buildings and facilities reduces our operational costs. Similarly, our customers may reduce expenditures on their total energy purchases by switching to electric vehicles, implementing energy efficiency measures, switching from gas to electric appliances, or more directly managing their energy use through demand response programs.

Transportation electrification

The transportation sector is the single largest contributor to Oregon's total greenhouse gas emissions and the state is actively supporting vehicle electrification efforts through vehicle incentives and development of charging infrastructure. Oregon has joined other West Coast states in prohibiting new retail sales of internal combustion engine vehicles by 2035. As internal combustion engines are phased out, PGE is anticipating rapid adoption and expansion of electric vehicles in the service area.

In 2024, programs and strategies in place to support vehicle electrification include:

- **Residential EV Smart Charging:** This program offers customers rebates for Level 2 chargers and bill credits to encourage vehicle charging during times when energy demand and prices are lower.
- **Public charging:** The Municipal Charging Collaboration Program aims to improve charging availability for customers and identify how pole and curbside chargers can create greater access, especially for those in underserved communities.
- **Business and multi-family make-ready solutions:** This program expands commercial installation of public or semi-public EV charging, including multifamily locations, workplaces, retail locations, destination centers, schools and houses of worship.
- **Fleet Partner program:** This program helps businesses and municipalities transition their fleets by taking out the guesswork of fleet transition, providing cost analysis, preliminary design, construction and other support services from start to finish.

Drive Change Fund

Using funds made available from the Oregon Clean Fuels Programs, PGE awarded local organizations $4.8 million to expand access to transportation electrification. We also awarded $6.5 million to electrify school buses in eight districts through the Electric School Bus Fund.

Fleet electrification

At PGE, we are electrifying our own vehicle fleet to reduce fuel and maintenance costs, improve local air quality and advance our broader net zero goal for 2040. We've electrified 18% of the total fleet, up from 15% last year.

Our efforts to decarbonize our fleets reflect emerging technological changes in the fleet space and utilize technologies beyond electrification that can contribute to emissions reduction. For example, we have implemented a new telematics solution, Geotab, that offers real-time transparency into the fleet's performance and reducing fossil fuel use. We also utilize R99 renewable diesel in our fleet, a high-efficiency fuel with lower CO_2 emissions.

Oregon is the
6th largest
retail market for EVs in the nation.

One out of every six car sales
in Oregon were electric in 2024.

PGE FLEET ELECTRIFICATION

Electrified
18%
of our total fleet (up from 15% in 2023)

Added
43
EVs to our fleet in 2024

Electrified
30%
of our Class 1 vehicles



An electric Chevrolet Silverado added to our fleet in 2024

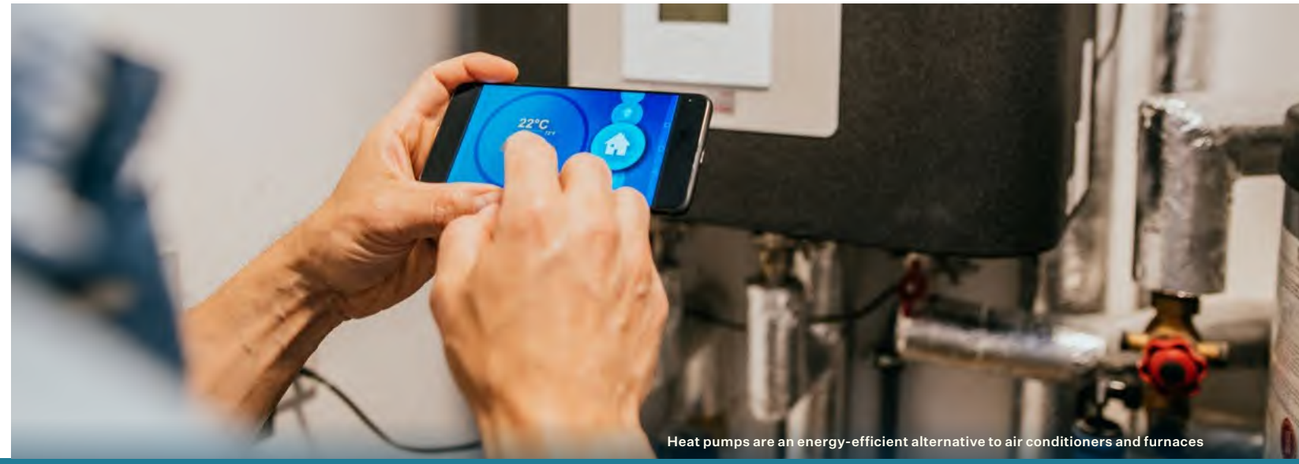
Building electrification

PGE engages broadly with home builders to promote energy efficiency and the use of efficient electric appliances, such as heat pumps and induction cooktops. Oregon has a statewide goal of installing 500,000 new heat pumps by 2030. PGE is doing our part to support the achievement of that goal by marketing to our customers the varied benefits of heat pumps and promoting their use via incentives offered through the Energy Trust of Oregon. Within PGE's Smart Grid Test Bed, PGE is offering incentives for new homes built with heat pumps and flexible load technologies. In addition, to help support building new efficient electric homes, PGE recently increased its line extension allowance to home builders. Lastly, to help inform the appliance and vehicle choices made by our customers, PGE supports and participates in local home and vehicle electrification fairs where customers can learn about PGE programs and the latest in building electrification technologies.

Facilities

PGE is committed to reducing environmental impacts in the buildings we own and we explore ways to conserve energy to support a reduction in demand on the grid and reduce overhead costs for our corporate electricity use. Methods employed include improving insulation to reduce heating and cooling demands, reduced water usage for landscaping and rooftop solar on six properties.

Our corporate headquarters' ongoing operations and maintenance also meet the rigorous sustainability standards of LEED for Existing Buildings Operations and Maintenance rating system, which was certified at the Gold level in 2015. Using this experience, two locations were built to LEED Gold standards.


Heat pumps are an energy-efficient alternative to air conditioners and furnaces



PGE manages Balancing Rocks Overlook, along with the U.S. Forest Service in the Deschutes National Forest



Selective Water Withdrawal on the Deschutes River



Kokanee swimming upstream in the Deschutes River

How we care for the environment

Oregon's natural beauty inspires us to operate in ways that preserve and enhance ecosystems, generate less waste and recycle as much material as possible. As a steward of over 11,000 acres of land in Oregon, we are committed to caring for natural habitats and creating conditions that are safe, restorative and resilient to wildfire.

PGE manages
11,000+ acres
of wildlife habitat

PGE also has a robust environmental management system (EMS) to fulfill compliance obligations, manage environmental issues and address environmental risks and opportunities. The core objectives of the EMS are establishing compliance with laws and regulations, providing training to employees with environmental responsibilities, minimizing environmental risk and being prepared for unplanned events such as spills or releases.

Modernizing our hydropower plants

Hydroelectric facilities have powered the region and the nation with reliable, emissions-free electricity for over a century, making them PGE's oldest assets to address climate change. As we add more intermittent resources like wind and solar to the grid, hydro provides flexible emissions-free power that can be quickly dispatched to customers when needed or stored for later use. Our hydropower projects play a key role in our efforts to decarbonize Oregon's electricity supply and we operate and maintain them to the highest environmental standards.



Oak Grove Powerhouse

OAK GROVE POWERHOUSE CELEBRATES 100 YEARS OF CLEAN ENERGY PRODUCTION

100 years ago, the Oak Grove Powerhouse on the Clackamas River helped electrify Oregon, providing power for homes and businesses as the Portland area developed into the metropolitan center it is today. Over the course of a century, the facility weathered floods and fires, booms and busts in the economy and the transformation of the Pacific Northwest. Oak Grove's legacy and enduring importance in PGE's generation fleet highlight the value of hydropower to Oregon communities and clean energy landscape for years to come.

Deschutes River Basin

In the Deschutes River Basin, we work with the Confederated Tribes of the Warm Springs (CTWS) Reservation of Oregon with whom we co-own the Pelton Round Butte hydro facility to provide enough clean, emissions-free hydropower to power more than 127,000 homes. At the same time, we're advancing an ambitious, long-term initiative to restore native salmon and steelhead runs to a fully reconnected Deschutes River Basin. Restoring these runs includes aiding the downstream migration of juvenile fish, as well as the upstream return of adults, which spawn in their historic habitat upstream of Lake Billy Chinook.

While we have not yet reached our long-term goals for self-sustaining, harvestable runs of salmon and steelhead, we are seeing incremental progress and science suggests we're on the right track. Results to-date include:

- **Juvenile collection:** Each year we collect between 38,000 and 490,000 juvenile fish at the Selective Water Withdrawal – our fish collection facility. Changes to hatchery practices and operations have improved our ability to capture these young fish.
- **Spawning in the wild:** Chinook, sockeye and steelhead now have access to 250 miles of their historic habitat that were blocked for nearly 50 years. Adult fish returning from the ocean have been located spawning near Bowman Dam on the Crooked River, in Whychus Creek at Camp Polk and upstream of Camp Sherman on the Metolius River.
- **Record returns:** Fish returns have increased by 501% on the Deschutes River across our 10-year average. In 2022, more than 700 adult spring Chinook salmon were released above Round Butte Dam – the highest number since the reintroduction effort began in 2010. These fish were observed spawning in nature and their offspring passed through our collection facility in 2024 on their way to the ocean, starting the cycle over again. During the first six months of the 2024-2025 steelhead run, we passed a record 733 steelhead upstream of Round Butte Dam, including 528 reintroduction program fish that came through our facilities as juveniles - the largest steelhead return since dams were completed on the Deschutes River in the 1960s. The improved returns are likely a result of better ocean conditions, as well as changes we've implemented over time in response to science.

Of the 2,500 hydropower projects in the U.S., only 200 are certified by the Low Impact Hydropower Institute (LIHI) for their environmental excellence. Pelton Round Butte was first LIHI certified in 2007 and was recertified in 2023. This certification affirms that we're generating power in a way that respects Oregon's aquatic, terrestrial, cultural and recreation resources.

The Pelton Round Butte project continues to be managed collaboratively by PGE and CTWS with oversight from local, state, federal, and non-governmental organizations. For example, the Pelton Round Butte Fish Committee meets bimonthly to oversee the Licensees' development and implementation of study plans, reports, facility designs and operating and implementation plans that affect aquatic ecosystems. In addition, the Fish Committee has developed a Reintroduction Roadmap and Water Quality Graphic to help visualize ongoing efforts for reintroduction and water quality. All of this helps to make sure that we are on the path to restoring a healthy Deschutes basin – both upstream and downstream of the dams.

In 2024, PGE's environmental team and CTWS hosted the 30th annual Pelton Round Butte Fisheries Workshop. Since the 1990s, when PGE and CTWS first started hosting the workshop, fish habitat in the upper Deschutes Basin has improved. Whychus Creek (an important tributary to the Deschutes) has more water flowing through it, several key partner organizations have formed to protect and restore habitat in the river and PGE and the Tribes have contributed $28 million to fish and water conservation.

On top of these habitat enhancements, salmon and steelhead are now spawning and reproducing upstream of Round Butte Dam – something that hadn't happened since before the hydropower complex was constructed in the 1960s.



Ospreys are one of several avian species that benefit from PGE's Avian Protection Plan



Northern red-legged frog

Clackamas River Basin

Since building our first fish ladder in 1907, we've been innovating to protect, enhance and study fish populations in the Clackamas River Basin, where we operate four hydropower facilities. Since 2006, PGE has spent more than $200 million to modernize and improve passage systems on the Clackamas River which salmon and steelhead use to migrate past the dams. We've also updated our fish ladder at River Mill Dam to accommodate Pacific lamprey, an important but often-overlooked fish species in the Pacific Northwest. Our work is guided by a federal license and partnerships with non-profit organizations and local, state and federal agencies who work together to protect and restore the Clackamas.

Led by a dedicated team of biologists, we've built safe and effective fish passage systems near the dams and collaborated with partners to restore habitat throughout the river basin. Our success shows in the growing number of wild fish migrating up and down the Clackamas and in positive shifts in fish behavior, including:

- **Higher survival rates:** PGE is on the way to meeting our 97% passage goal as early measurements show fish are migrating downstream past PGE dams quickly and safely.
- **Earlier upstream migration:** Spring Chinook are traveling past the dams a month earlier, reaching headwater streams when water temperatures are cooler and healthier for fish.
- **Record returns:** Fish returns have increased by 185% on the Clackamas River across our 10-year average.In 2023, the PGE team at Westside Hydro on the Clackamas River successfully passed more than 25,000 adult salmon and steelhead upstream of North Fork Dam. This success, along with several other fish return records broken in 2023, is a testament to the power of collaboration with partners in the Clackamas River Basin over the past 18 years to modernize and improve fish passage systems.

Avian Protection Plan

In addition to our efforts to protect aquatic life, we are always looking for opportunities to make facilities, power poles and other utility equipment safer for birds. Our companywide Avian Protection Plan has been incorporated into our design and construction standards for all new poles and replaced electrical infrastructure.

These actions include:

- Training employees on bird protection issues and procedures.
- Tracking bird and nest issues to minimize impacts in high-risk areas and building nesting platforms to reduce pole-top nesting and outages.
- In 2024, 8,208 poles and 4,544 transformers were added or replaced with ones that feature avian-safe protective covers or design features.
- Collaborating with the U.S. Fish and Wildlife Service and the Avian Power Line Interaction Committee on strategies that reduce bird and power interactions.

Habitat restoration at Harborton

PGE continues transforming Harborton — a property we have owned for 80 years — into a haven for native plants and wildlife. In 2020, PGE completed a major restoration project at this 53-acre site along the Willamette River in Northwest Portland's industrial corridor, one of the most important breeding grounds for northern red-legged frogs and a prime rest area for migrating juvenile salmon. In 2024, wildlife surveys continued to find an increased abundance of use, documenting juvenile salmonids, several mammals, over 60 species of birds and over 700 northern red-legged frog egg masses.

To support wildlife habitat gains, invasive reed canary grass and other plant species are being aggressively replaced with native species. PGE is currently in discussions with the City of Portland and local organizations on additional improvements for red-legged frogs as part of the proposed Harborton Reliability Project to enhance transmission capacity.

Brownfield redevelopment at Seaside Battery Project

PGE, in collaboration with Eolian, is finishing construction of a 200 MW battery storage farm on the former Time Oil property, in Portland, Oregon. Time Oil was a major petroleum terminal during World War II, serving the needs of the nearby Kaiser Shipyards. The property was recently cleaned up and listed on the EPA's national inventory of Brownfield sites. PGE is repurposing the site for an extensive new battery storage site, bringing renewed functionality and infrastructure into the greater Portland Harbor area.

Water management

Protecting natural resources, including water resources, continues to be a priority. PGE's operational facilities are located in basins with low baseline water stress, with the exception of our two wind farms, both of which are located in basins rated as medium-high baseline water stress. However, wind farms as a form of electric generation are not major water consumers.

Our PGE-led and PGE-partnership projects in these watersheds focus on basin-wide water conservation measures to increase in-river flows that are critical for habitat improvement and fisheries restoration goals.

Waste management

We have rigorous protocols to minimize waste generation, foster efficient use of resources and prioritize responsible disposal. We emphasize recycling and reuse wherever feasible. In instances where waste cannot be recycled, we employ practices to treat and dispose of waste in an environmentally friendly manner.

Our waste handling and disposal procedure provides guidelines to all personnel for maintaining environmental compliance related to waste, outlining responsibilities and procedures for hazardous, universal, electronic and other types of waste.

Creating a space in nature for all

In addition to managing resources and restoring habitat, we provide recreational opportunities so that Oregon residents and visitors can enjoy the natural beauty of our state and its history. Customer surveys for 2024 show that 97% of respondents who made reservations at PGE-managed parks and recreation sites were satisfied with their experience. Additionally, 68% of respondents report being PGE electricity customers. PGE is also committed to protecting archaeological sites and historic buildings located on the lands we operate.

PGE's 28 parks and recreation sites across nearly 3,600 acres host over

491,000

visitors annually.



Children reading TRACK Trail brochures at Timber Park

In 2024, PGE's Timber Park in Estacada celebrated the launch of a new TRACK Trail designed to provide an engaging environmental scavenger hunt experience for young children and their families, encouraging them to embrace the outdoors.



Children enjoying Project Zero's comic book at a community event

Thriving communities

The well-being of employees and the communities we serve is foundational to PGE's long-term success.

We never lose sight of our core purpose of powering Oregon homes and businesses and the vital role employees play in delivering affordable, reliable, safe and increasingly clean electricity to Oregon's communities. We recognize that employees and their families live, work and play in the communities we serve. We secure our shared future by aligning our business practices and values to deliver lasting benefits for communities and team members.

PGE is committed to advancing a clean energy future that is inclusive of the needs of all customers. This means prioritizing energy affordability and providing customers with the tools and resources they need to manage energy use and costs and building a diverse workforce that is reflective of the communities we serve. It requires that we proactively engage with communities to better understand their needs and expectations for the clean energy transition and meaningfully invest in communities through employee volunteerism and giving. Our ongoing commitment to a positive and empowered workplace culture creates a stronger workforce and a more resilient company, able to serve communities with integrity and impact.



Serving communities

Energy affordability is at the forefront of all decision-making at PGE.

We acknowledge our role in delivering an essential service that is foundational to the well-being and vitality of society. Affordability and access remain at the forefront of PGE's commitment to serving customers, as we balance multiple imperatives to serve society's growing need for electricity, decarbonize our power supply and enhance system reliability in the face of increasingly extreme weather events. Our focus on affordability drives us to continuously innovate by reducing costs and simplifying processes as we launch new technologies and tools to deliver exceptional electricity service for customers.

We take a holistic approach to affordability that includes prudent planning and decision-making to manage system costs. We maximize the use of public funds, including grants, tax credits and incentives to mitigate costs of key energy projects and programs. We also provide bill discounts and assistance to support our most vulnerable customers and innovative tools and programs to help all customers manage their energy use and costs. Our goal is to serve electricity at the lowest possible cost, reduce customer energy burdens and find solutions to the challenges our most vulnerable customers face accessing energy assistance and incentives and implementing energy-saving measures.

PGE continues to collaborate with federal, state and local entities to support customers and reduce energy burdens. This includes our long-standing relationship with Energy Trust of Oregon (ETO) supporting programs and incentives for energy efficiency, energy conservation in schools and low-income affordable housing, no-cost weatherization and rooftop solar. In 2024, PGE established a multiyear planning approach and co-deployment framework, in partnership with ETO, to provide a more accessible and seamless experience for customers to manage their energy use though combined ETO and PGE services.

We also continued expansion of our Income-Qualified Bill Discount program (IQBD), which provides bill discounts to income-qualified recipients, adding two new income-based discount tiers and offering larger discounts to the most heavily burdened households. Additionally, we continue to work with Oregon Department of Housing and Community Services, Oregon Department of Energy and community action agencies to administer a variety of assistance and resources for customers in need.

In 2024, PGE conducted an Energy Burden Assessment, prepared by Empower Dataworks, to gain further insight into the energy burden needs of residential customers and assess our progress in meeting customer needs.

This assessment found that our IQBD program is operating effectively and following energy assistance best practices.

PGE will utilize insights gleaned from this assessment to continuously improve affordability program design, evaluate the performance of energy assistance programs and develop targeted marketing and outreach strategies.

Regardless of a customer's income, PGE provides several programs and options for flexibility and bill management. PGE is here to help customers manage their energy use and guide the adoption of energy saving tools and technologies.

PGE HAS PARTICIPATED IN CLEAN ENERGY GRANT PROJECTS TOTALING MORE THAN $2 BILLION

Grant Partnerships

- Bethel Round Butte with the Confederated Tribes of Warm Springs
- Grid Edge Devices
- North Plains Connector Transmission
- Hydrogen Hub
- Department of Labor (Critical Sector Jobs)



Direct Grant Support

Nearly $470 Million

Negotiation
$152M

Active Application
$ 1.2M

Execution
$315M

1. PGE has participated in federal clean energy grant programs totaling more than $2 billion, including nearly $470 million in direct grants for PGE.

CUSTOMER TOOLS AND PROGRAMS TO MANAGE ENERGY COSTS

Rebates and incentives for electrification, energy efficiency and weatherization help customers reduce energy costs.

Residential and community solar combined with battery programs can reduce customer costs and provide additional grid value.

Income-Qualified Bill Discount program lowers prices for nearly 90,000 enrolled households.

PGE+ takes the guesswork out of getting the right electrical appliance or equipment for customers' homes.

Energy management programs: Smart Thermostat, Time of Day pricing, EV Smart Charging, Peak Time Rebates and Equal Pay

Community engagement and impact

The success of PGE programs and services relies upon engaged and informed customers.

Our work as an electric utility is dynamic and complex. Successfully engaging diverse customers and communities requires intentionality in communicating our core values of equity, transparency and environmental stewardship, creating inclusive forums for public input and investing in community partnerships. PGE's Community Engagement and Community Impact teams lead our strategies with communities as we continue to explore new ways to engage with and learn from the communities we serve.

Community engagement

PGE is committed to engaging in various ways to meet the diverse needs of the communities we serve. Our Community Benefits and Impacts Advisory Group (CBIAG) is the centerpiece of our efforts to develop more equitable strategies for our shared energy future in partnership with environmental justice communities. To protect the safety and well-being of communities in high fire risks areas, PGE collaborates with public safety partners and local governments to increase community awareness and education about wildfire preparedness. PGE also hosts public forums for sharing information and gathering input on infrastructure improvements in communities.

Engaging with area Tribes

We respect and embrace the integral role of Tribes as sovereign governments, economic drivers, political influencers and nation-builders in our collective journey toward a clean energy future. PGE also co-owns the Pelton Round Butte hydroelectric facility with the Confederated Tribes of the Warm Springs.

Tribes have been stewards of lands in which we now work since time immemorial. We have worked closely with Tribal governments, businesses, elders, employees and organizations for many years, providing Tribal leaders, along with other members of the community, an opportunity to engage meaningfully with PGE. As part of these valued relationships, we also seek to raise awareness of historic barriers and address Tribal equity issues with Tribal leaders and other members of the community. PGE's Strategic Tribal Engagement Plan (STEP) provides an enterprise-wide framework for our teams to develop and maintain successful Tribal partnerships.



PGE celebrates Bethel Round Butte grant with the Confederated Tribes of Warm Springs

TRIBAL PARTNERSHIP

The Confederated Tribes of Warm Springs are the co-owners of the Pelton-Round Butte hydroelectric facility and the recipients of a $250 million grant from the Department of Energy to partner with PGE on upgrading the 230 kV Bethel-Round Butte transmission line — a critical artery in the region's transmission system.



PGE volunteers at We Believe in Portland event

Community impact

PGE is deeply rooted in the communities we serve and where we operate facilities and produce power. PGE is dedicated to uplifting and supporting those communities through charitable giving, volunteerism and partnerships. In 2024, PGE and the PGE Foundation surpassed $4.2 million in charitable giving, guided by a strategic investment strategy focusing on education, economic development, workforce readiness and environmental stewardship.

PGE Foundation

The PGE Foundation, a private 501(c)(3) endowed foundation created in 1997, is committed to strengthening economic prosperity by investing in education, creative learning and career pathways that help people build the knowledge and skills they need to reach their full potential. Grants are awarded through a competitive evaluation process and approved by a board of directors made up of PGE officers and senior leaders. 40% of the PGE Foundation board and staff identify as BIPOC, reflecting the diversity of the communities we serve.

In 2024, the PGE Foundation granted $1.6 million to organizations that empower Oregonians to achieve personal and community prosperity through investments in education, career development and creative expression. 64% of grant dollars supported communities of color and 38% invested in culturally-specific, BIPOC-led organizations. 16% of total giving supported organizations in rural areas of Oregon where PGE operates.

The PGE Foundation was the primary funder of the PGE Project Zero green jobs internship program, which received the 2024 Edison Electric Institute Corporate Citizenship Award. Project Zero engages students and young adults in learning about clean energy and sustainability through stewardship and internship programs. The Project Zero green jobs program will now transition to Portland Opportunities Industrialization Center in 2025, with continued financial support from PGE Foundation.

PGE's commitment to customers includes supporting organizations that help communities build resilience and thrive. The PGE Foundation granted $25,000 to the Portland Central City Taskforce to help restore the livability, economic and cultural vitality of Portland's Central City – also home to PGE's corporate headquarters. Following severe weather events in January 2024 that impacted PGE's service area, the PGE Foundation donated $50,000 to several local organizations that provided vital emergency services and resources, including warming shelters, food and water distribution and emergency response coordination.

"As Oregonians, we value the expertise of community partners, prioritizing areas of shared value that reflect the mutual interests of the community and PGE."
– Kregg Arntson, Executive Director, PGE Foundation

GIVING BACK TO COMMUNITIES

$5.5M total company charitable giving from corporate contributions, PGE Foundation, current and retired employees and company match.

55 scholarships through the PGE Foundation and PGE Director Scholarship program focused on access to higher education for students of color, women and students with demonstrated financial need.

22,957 volunteer hours completed by employees and retirees.

66% employee participation in charitable giving and/or volunteerism

Powering community partnerships

Engaging the next generation in learning about climate science and clean energy is at the heart of our corporate partnership strategy, reflecting our values as an Oregon company committed to education access, environmental stewardship and economic equity. In 2024, PGE contributed $1.6 million to support community-based nonprofits across our service area, including a significant investment in a new five-year partnership agreement with Oregon Museum of Science and Industry (OMSI), Oregon's signature destination for experiential science learning and a trusted source of science and climate information for the communities we serve.

PGE has a decades-long history of partnership with OMSI, having once donated the property where OMSI sits and serving on the OMSI Board of Trustees. PGE is the exclusive Energy Sector Partner of OMSI's new Nancy Stueber Natural Sciences Hall opening in 2026 with a focus on climate and clean energy and more than 1 million visitors anticipated per year. To support science learning across Oregon, PGE is also collaborating with OMSI to enhance their existing statewide education outreach programs on energy topics with hands-on classroom activities and take-home projects. One example is through the OMSI Lab embedded in Tamarack Elementary School, where students can explore STEM applications related to clean energy engineering.

PGE corporate partnerships in 2024 included support for culturally-specific organizations and events, including El Grito, Fiesta Mexicana, Self-Enhancement, Inc., Skanner Foundation MLK Day, the White Lotus Foundation and PRIDE NW. It also included more than $49,000 to support organizations and events in more rural areas where PGE has power generating assets. Other corporate partners in 2024 included Adopt One Block - We Believe in Portland, Friends of Trees, Oregon Zoo, Portland Winter Light Festival, and SOLVE amongst others.


PGE volunteering with HOPE Dementia Support



PGE and OMSI have a longstanding partnership



PGE volunteers and a newly-planted tree at a Friends of Trees event

Employee giving and volunteerism

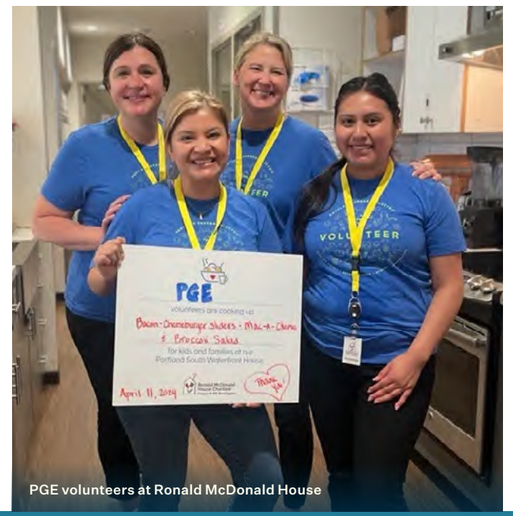
In 2024, almost two thirds of employees participated in the matching gift program, well above the national average of ~10%. On average, PGE employees and retirees contribute to 1,200 organizations and schools through the employee giving program, including organizations in 97 cities all across Oregon.

PGE's matching gift program provides 100% match up to $2,000 per employee for eligible contributions. Employee-driven contributions must meet anti-discrimination and IRS eligibility requirements. In 2024, PGE updated its matching gift eligibility parameters and risk controls to ensure alignment with PGE values.

Spring Into Action is a month-long volunteering campaign that amplifies employees' commitment to giving back. This year, we saw more than a 50% increase in participation, with over 500 employee volunteers contributing to volunteer events that involved planting native trees, city cleanups, park and beach cleanups, food donations and student education. Employees volunteered for over 2,200 hours, exceeding our goal of 1,500 hours for the volunteering campaign. Additionally, PGE employees regularly volunteer in classrooms and lead hands-on activities. These opportunities focus on connecting science, technology, engineering and mathematic (STEM) concepts to real-world applications, exposing students to career opportunities that help them envision future possibilities and understand how they might positively impact their communities and the planet.



PGE employees at We Believe in Portland event



PGE volunteers at Ronald McDonald House

Workforce development

Providing equitable access to the breadth of opportunities available within the clean energy sector is a core value in how PGE approaches the clean energy transition. This is embedded in how we support supplier diversity and labor standards on PGE projects, implement Community Benefit Plans through federal grant funding and lead the Oregon Clean Energy Workforce Coalition.

In 2024, PGE spent
$228M with diverse suppliers.

This represents 18.3% of total spend with diverse-owned suppliers in 2024,
achieving our 18% target.

Supplier diversity and Responsible Contractor Policy

In 2024, PGE continued our efforts to build more robust supplier diversity practices and labor standards. This included an updated RFP evaluation template to provide preference points for diverse suppliers and subcontracting and union contractor utilization. PGE also updated its Responsible Contractor Policy in coordination with labor unions to advance high road labor standards including the payment of prevailing wage and apprenticeship utilization.

Embedding equity in community engagement and outreach continues to be a pivotal process in driving inclusive procurement. We encourage employees to identify small and diverse suppliers when looking for goods and services, construction and professional services. Through the PGE Foundation, we are also assisting underrepresented and diverse vendors in establishing themselves through supporting entrepreneurship, business development and economic opportunities. We encourage any supplier with whom we spend over $250,000 with to provide quarterly information about their diversity practices and empower our suppliers to promote diversity and inclusion in their planning when contracting outside services. We continued to evaluate our supplier diversity efforts and seek opportunities to grow and evolve the program.

Apprenticeship

Our apprenticeship program offers rigorous training and competitive pay, preparing students of all ages and backgrounds to become journeyman lineworkers and other trade workers. The program provides a well-defined wage increase schedule, support from established employees and the local union chapter and consistent progress monitoring to facilitate success at the entry level and beyond. As with all PGE roles, we work to recruit a diverse pool of candidates.

Clean Energy Workforce Coalition

PGE convened the Oregon Clean Energy Workforce Coalition in 2022. It includes representatives from nearly 100 organizations across industry, labor unions, government, employers, education, nonprofits and community-based organizations (CBOs). The Oregon Clean Energy Workforce Coalition continued to grow in 2024 by intentionally recruiting and prioritizing culturally specific CBOs and Tribes to incorporate the voices and needs of all workers within decision-making processes. The coalition will be launching statewide listening sessions in partnership with local CBOs and Tribes to better inform program development and identify barriers to participation. Our efforts will guide existing and future program pilots aimed at training and placing workers in Oregon's clean energy economy.

Community benefits planning

PGE believes in strategically investing in and creating opportunities that benefit traditionally underrepresented groups who often experience the most detrimental impacts of climate change. We are actively pursuing support for such initiatives.

A key component of PGE's federal grant implementation is the Community Benefits Plan (CBP), which details how awardees will use funds to deploy essential clean energy infrastructure in ways that provide opportunities to underserved populations. Over the next several years, PGE's CBP implementation will include developing a clean energy K-12 curriculum in collaboration with educators, a workforce training program for Tribal members, partnerships with pre-apprenticeship programs in construction trades and an energy mentorship program.



PGE's Latin American Business group at Tualatin Call Center during Cinco de Mayo event

Valuing and supporting our employees' well-being

We understand that when communities and our employees thrive, so do we.

As a large employer in Oregon, PGE recognizes that our commitment to the community begins with how we treat employees. Our employees are the cornerstone of our success. The investments we make in our people multiply outwards to benefit the workforce and enrich communities.

We encourage work-life integration and overall physical, emotional and financial well-being. Our benefits help provide the support employees' need to be their best selves as they serve customers and communities in our region. We're proud to offer these valuable advantages: competitive salary, medical, dental and vision insurance, a company incentive program for non-represented employees, ongoing training opportunities, mentorship and professional development programs, paid vacation, retirement savings with company match, education assistance, volunteer opportunities and flexible work options.

All employees have access to paid time off to care for ill or injured family members through PGE time-off programs and through the Paid Leave Oregon program. Non-represented employees are also provided with six weeks of paid parental leave to bond with new children through birth, legal adoption, or foster care. This program runs concurrently with state and federal job-protected leave, Paid Leave Oregon, or other state paid leave programs, which are available to all employees. We also recognize that the process of finding caregiving and educational services can be difficult. To help, employees have access to a free premium-level membership with a vendor to help locate services such as nannies, back-up care, elder care, pet sitters and tutoring services.

Physical and emotional well-being

PGE's employee wellness program, myWellness, provides the benefits and resources needed for PGE employees to power their day. Our health plans offer a variety of wellness perks and programs to support well-being, including free apps and fitness classes, health coaching and discounts on gym memberships and meal delivery services. Many PGE locations have on-site exercise equipment or fitness facilities for employee use. For non-represented and represented employees at Carty, Coyote and Port Westward, the Personify Health program offers tools and programs to keep our employee's wellness goals top of mind. Employees have access to on-demand classes including cardio, strength, yoga, meditation and sleep and new this year, access to a rigorous weight management program. Each fall, we offer convenient on-site flu shots to help protect employees during flu season so they don't have to take time away from their busy schedules to get vaccinated. In addition to programs to support physical health, employees' mental and emotional health are supported through PGE's Employee Assistance Program (EAP) provided by Canopy. Employees can access 10 free counseling sessions through Canopy and other work-life balance support, including webinars, free legal consultation, ID theft services, life coaching and other family support services.

Financial well-being

Another key feature of PGE's wellness program is supporting employees' financial well-being. Our programs have empowered employees to make informed financial decisions and receive support via multi-channel approaches through a comprehensive range of services and resources, including financial education seminars, personalized financial counseling and access to retirement planning tools. Canopy, our EAP, also provides free, unlimited financial coaching, financial wellness webinars and budgeting tools. Meeting employees and their families wherever they are in their financial journey is paramount to PGE's success as we strive toward our strategic goals.

Employee culture and engagement



PGE checks in with employees regularly to ask about our culture and their levels of engagement. Our employee engagement survey is an opportunity for employees to share how PGE can help them feel inspired and energized to do great things and how we can sustain a company culture we are all proud to be a part of. In 2024, our average engagement score was 70.5. Along with engagement survey data, we also look closely at exit interviews and other feedback to understand how workplace experiences affect our collective ability to give our very best.

Understanding the level of inclusion employees feel is a priority for us. In 2024, we added a fourth question to our engagement survey as part of the inclusion index: "I feel a sense of belonging at PGE," "Our team has a climate in which diverse perspectives are valued," "I feel free to speak up without fear of negative consequences" and "Everyone at PGE has an equal opportunity to succeed."

Guiding Behaviors

Our Guiding Behaviors have been central to our company for more than 25 years. While business conditions, customer needs and corporate strategies evolve, our values are long-held and enduring. Our Guiding Behaviors are foundational and provide a single set of expectations for how we work together to be more customer-centric, purpose-driven and results-oriented. Our culture defines not just how we get work done — it shapes our treatment of each other, our approach to safety and our experiences as employees at PGE.

Career development

PGE is committed to supporting the career development goals and long-term success of employees. We provide guidance, resources and frameworks for development, including regular performance appraisals for employees, allowing them to remain adaptable and proficient in a constantly evolving business landscape.

GUIDED BY OUR SHARED GOALS AND ASPIRATIONS, WE ARE INTENTIONALLY SHAPING OUR CULTURE TO BE:

Customer-centric:
Customers and their current and future needs are at the forefront of all that we do. We actively look for ways to improve customers' experience with PGE.

Purpose-driven:
Our commitment to decarbonization and to serving customers and the community with affordable, clean, reliable power is understood and shared across employees.

Results-oriented:
We are outcome-focused, hold ourselves and each other accountable and work as a team to build and align processes that achieve results.



Good Energy Happy Hour bringing together women in the utility industry

Learning opportunities

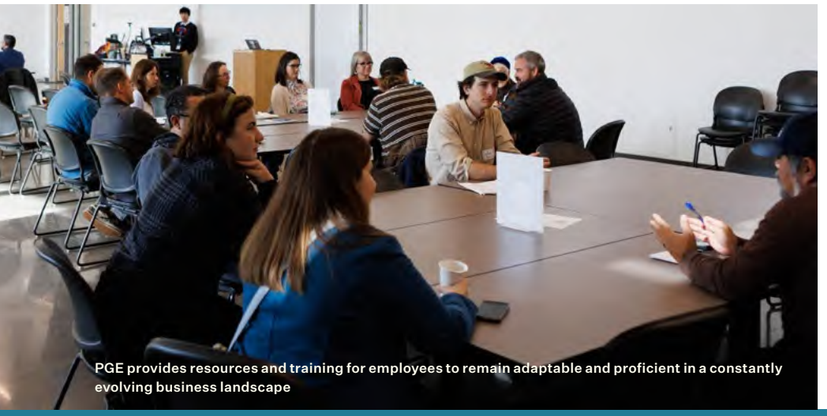
PGE offers a variety of in-person and online learning opportunities to enhance both technical and essential skills. All employees can access LinkedIn Learning and the Career Development guide, which provide curated learning opportunities on high-priority topics. An average of 7.7 hours of required learning per employee was completed during the 2024 learning cycle. We partner with educational institutions such as Portland State University and the Western Energy Institute to develop or deliver joint training to support programs for staff. We offer skill-building workshops including Electric Utility Fundamentals + Insights, Project Management Basics, Presenting Data Visually and Crafting Strategic Visual Stories. We evaluate the effectiveness of learning solutions through surveys and performance changes. The results of this evaluation influence further development of our learning solutions.

Tuition assistance

PGE supports continuing education and professional development by providing tuition assistance and financial incentives for relevant courses and degrees.

Job rotations

Employees can participate in job rotations within PGE to foster cross-functional skills. Rotation programs allow PGE to develop and retain talent by providing opportunities for employees to gain valuable experience working in different roles and areas of the company while more effectively deploying talent to meet business needs and reduce disruptions caused by talent gaps. Rotations can help close critical skill gaps and improve employee performance while helping prepare employees for their next role. Rotations also support our employees' desire to have more internal development opportunities.



PGE provides resources and training for employees to remain adaptable and proficient in a constantly evolving business landscape

CAREER MOBILITY

13%

of employees were **promoted** in 2024

Leadership development

We nurture leadership at all levels. Our development initiatives aim to identify, nurture and promote organizational leadership potential. We continue to strengthen our leadership pipeline with our programs for high potential leaders with the Enterprise Transformation Leadership and Leadership Excellence programs, co-created with Korn Ferry. These cohort-based programs elevate capabilities and create an always-learning mindset for our leadership bench. PGE also offers the Leadership Effectiveness Acceleration Program (LEAP) to achieve stronger outcomes and engagement by cultivating exceptional leadership. In a competitive talent market, LEAP helps PGE attract and retain top performers by investing in their development, while growing leaders who create environments that inspire people to bring their best. Our leadership programs combine experiential learning, executive coaching, peer-to-peer feedback, mentoring and interactive dialogues with senior leaders and market experts.

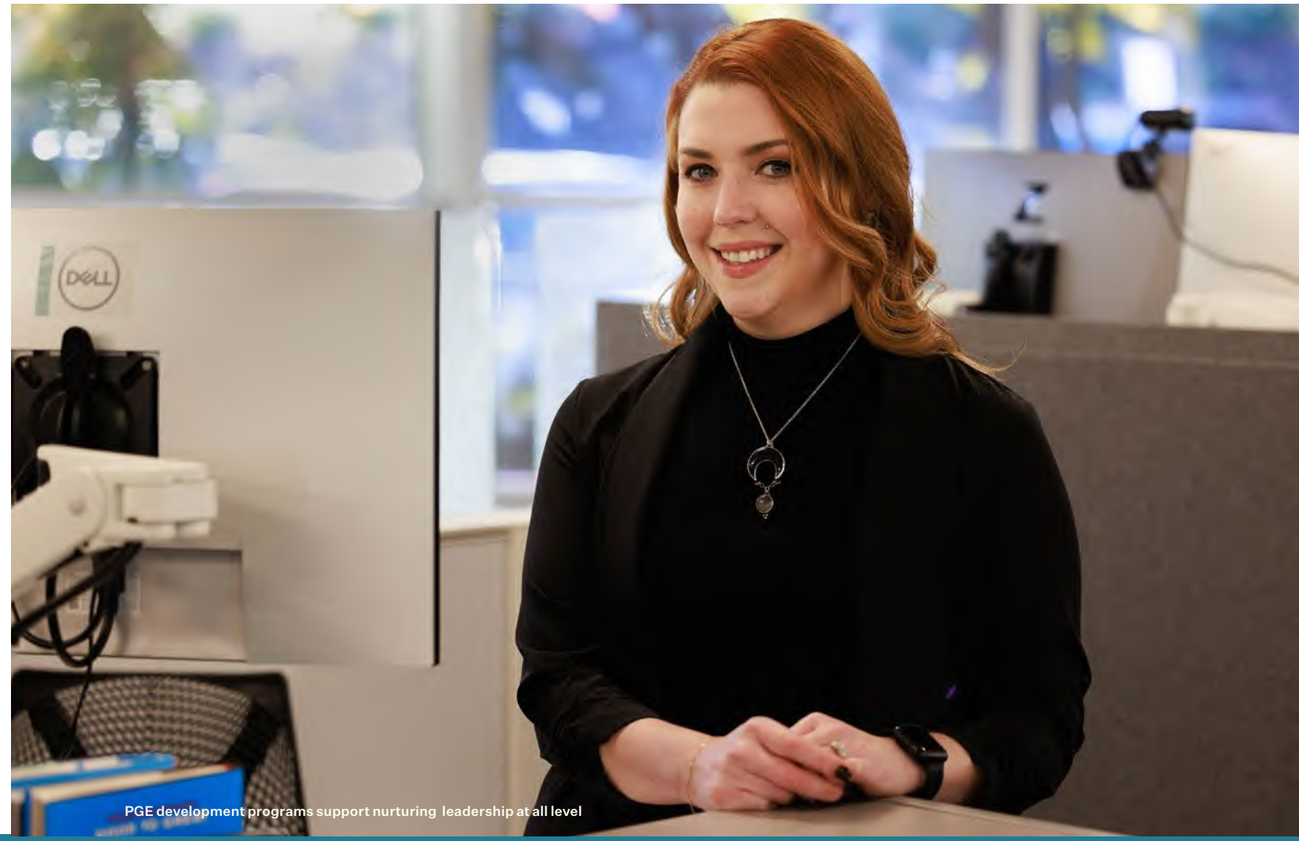
Our Workforce Planning department works with business leaders to forecast hiring needs and identify the skill sets needed now and for the future. Through a variety of community partnerships, we continue to expand our talent pipeline and provide living wage jobs here at PGE.

We hold a monthly manager discussion series on relevant topics to increase our leaders' capability and business acumen. These 90-minute sessions create a productive arena for honest conversations, along with a platform to share unique experiences and connect with other leaders.

We also offer leadership development courses targeted to historically underrepresented groups. The development programs, Accelerate and Illuminate, are geared toward expanding leadership diversity and creating new career pathways for women and BIPOC employees.

We've had **149 graduates of Accelerate and Illuminate** since 2019.

This resulted in **71 promotions** and **39% promotions** to management.



PGE development programs support nurturing leadership at all level

Workplace leadership

Our commitment to diversity is an expression of our values and a business priority that makes us stronger as a company. All employees are expected to do their part by embracing others' varied backgrounds, qualities, skills, perspectives and cultures and being willing to talk, listen and learn. We are committed to ensuring a positive work environment where everyone is treated with dignity and respect. We have five commitment areas:

- Recruitment and development
- Leadership diversity
- Awareness, education and training
- Partners and suppliers
- Customer and community engagement

Recruitment and development

We're committed to being a green employer of choice with a workforce that reflects Oregon's increasingly diverse population. Increasing representation and inclusivity at all levels of our organization is a top priority. 44% of hires were female and 29% of hires were BIPOC in 2024. For leadership hiring, 36% were female and 14% were BIPOC.

In 2022, we started a semi-annual Count Me In campaign to promote self-identification. This helps us understand the makeup of our workforce and enables us to create more intentional programs for our employees that allow them to feel seen and heard.

We also perform annual pay equity studies to ensure pay decisions are applied fairly and consistently throughout our workforce.

Leadership diversity

Equity in leadership is crucial, which is why we're growing the diversity of our board of directors and officer team. While we are making steady progress from year to year in almost every workforce demographic category, we also recognize that more can and must be done.

Awareness, education and training

Education is fundamental to building an equitable workplace culture. PGE strives to provide learning opportunities that support employees where they are at. Sessions are designed to offer safe spaces to build skills around self-identity and cultural competence. By offering the opportunity to explore perspectives and discuss experiences in specific communities, we foster greater understanding and positive change in the workplace.

In addition to these optional learnings, all employees complete several required learning modules annually, including PGE's Code of Business Ethics and Conduct training and Harassment and Bullying Prevention, which focus on treating others with dignity and respect.

WORKFORCE DEMOGRAPHICS

Black, Indigenous and People of Color in leadership

BIPOC 26%
White 74%

110% increase since 2014

Gender representation in leadership

Women 37%
Men 63%

38% increase since 2014

Black, Indigenous and People of Color

BIPOC 25%
White 75%

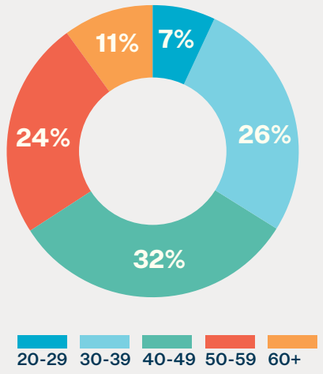
39% increase since 2014

Gender

Women 34%
Men 66%

9% increase since 2014

Age demographics of PGE employees:



PAY EQUITY AT PGE

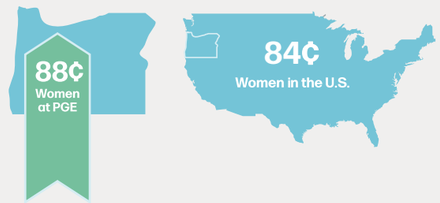
PGE has achieved equal pay for equal work



BIPOC: Black, Indigenous and People of Color

PGE employees in the same role, with comparable work experience at the same work location, continue to earn a near-perfect dollar-for-dollar pay.

PGE is continuing to shrink the gender pay gap



The gender pay gap is a measure that compares the average pay for women relative to the average pay for men, regardless of factors that determine compensation. At PGE, the gender pay gap is $0.88, which is better than the national average of $0.84[1].

1. Per the Pew Research Center.

PGE'S BUSINESS RESOURCE GROUPS:

- **Asian and Pacific Cultures BRG (APCBRG)**
- **Advocate Broaden Lead Enlighten BRG (ABLE BRG)**
- **Black BRG (BBRG)**
- **Lesbian, Gay, Bisexual, Transgender plus others (LGBT+ BRG)**
- **Latin American BRG (LABRG)**
- **Military Veterans BRG (MVBRG)**
- **Native American BRG (NABRG)**
- **Women's BRG (WBRG)**

PGE's Business Resource Groups (BRGs) also support education and awareness, company business objectives, strengthen our leadership pipeline, enhance employee engagement and build cultural affinity. Participation in these various groups is open to all PGE employees, regardless of how they identify.

Each BRG has an executive mentor from our officer team to guide, represent and support the group. These pairings provide the BRGs a direct avenue of communication with officers, which fosters opportunities to network and develop relationships with executive leadership and enhance recognition of their contributions. In tandem, the officers gain insight into the challenges faced by marginalized employees and access to a wellspring of ideas to improve employee experience. Annually, our Board of Directors actively engages in learning events with our BRGs, aimed at fostering and enhancing business acumen.

Partners and suppliers

We are dedicated to expanding our procurement from diverse small business suppliers, with a strategic focus on amplifying opportunities for minority-, women-, and veteran-owned enterprises. For more information on our supplier diversity commitment, see page 35.

Customer and community engagement

A strong community is the foundation for a prosperous future. Promoting affordability and access remains at the forefront of PGE's commitment to serving customers and our CBIAG is the centerpiece of our efforts to develop more equitable engagement strategies. We also support communities through the PGE Foundation, charitable giving, volunteerism and community partnerships. For more information, see pages 32-34.



PGE crew repairing distribution lines

Governance

Sound corporate governance practices bring lasting value to all our stakeholders.

As our business continues to grow and evolve to address some of the most pressing issues of the time, high standards for corporate governance guide decision making to deliver outcomes for customers, shareholders, employees and communities. We seek solutions that manage costs for customers, foster a resilient and reliable grid, enhance financial performance, reduce environmental impacts, protect the health, safety and well-being of PGE employees and benefit communities.

Our success in achieving these goals depends on our ability to earn and maintain the respect and trust of customers, stakeholders and the communities we serve. To do this, we must hold ourselves to the highest ethical standards. Our work to transparently align our business practices with our core values helps PGE mitigate significant risks to our business. We take a holistic approach that balances a commitment to environmental, social and governance goals with our core mission to supply reliable, affordable electricity service to Oregon.

We believe that good governance is the foundation for consistent, long-term value creation — it allows us to be prepared to address key issues while providing a framework that reflects our values of service, accountability, innovation, sustainability and affordability.



Governance

The Board of Directors

Our Board of Directors is elected annually by our shareholders. The Board receives high levels of support, with over 99% of shareholders voting in 2024 and directors receiving over 99% support on average.

In 2024, our governance practices earned the highest score from proxy advisory firm ISS, a score we have held for 12 consecutive years.

We follow established best practices for Board governance, including implementing maximum tenure and retirement age, ongoing director education and annual Board and director evaluations. These practices are consistent with shareholders' and voting advisory firms' guidelines and we review them annually. The Board annually evaluates committee assignments and periodically moves directors to new committees or into committee leadership positions. These practices allow us to maintain the depth of knowledge required to provide effective oversight of a complex business, while also providing for fresh perspectives.

The directors bring diverse perspectives — as large commercial customers, residents of the Pacific Northwest, experts in customer experience, policy and governance experts and skilled utility operators — which promote an understanding of customers' and stakeholders' needs. In addition, the Board annually identifies the expertise required to allow the Board to efficiently and properly carry out its fiduciary responsibilities. These regular assessments help the Board respond to changes in the industry by identifying potential new expertise that should be brought to the Board.

For 2025, the Board determined that the following areas of expertise are critical for providing effective oversight:

- Finance and Accounting
- Industrial and Utility Operations
- Technology, Cybersecurity and Information Security
- Innovation and transformation
- Environment and Sustainability
- Regulatory and Public Policy
- Human Capital Management and Culture
- Infrastructure Development
- Risk Management and Compliance
- Strategic Planning, Business Development and/or M&A
- Senior Executive Leadership
- Corporate Governance
- Customer Experience

Each of these areas is well-covered by our current Board members. For more information about the expertise of our Board members, see our Proxy Statement.

In 2024, the Board engaged a consulting firm to provide an independent view of its practices and culture. This assessment assisted the Board with prioritizing 2025 work to focus on the highest impact items. It also helped open new channels to create effective communication across the Board, committees and management.

The Role of the Board

Oversight of strategy
The Board's primary responsibility is to oversee the company's long-term strategy. To do that, the Board holds an annual strategy meeting that is separate from the quarterly board meetings. Topics at the meeting include industry and national trends and information about the company's forecasts and evolving customer needs. Past strategy meetings have included nationally recognized speakers on topics like cybersecurity, climate change and infrastructure development and visits to customer or company sites. The Board measures progress and assesses strategy at subsequent meetings to evaluate whether strategic changes are needed in a rapidly changing environment.

Oversight of succession and workforce development
Workforce development and succession planning are essential to building a resilient, future-ready organization. By investing in employees' growth and cultivating internal talent, organizations create a skilled, knowledgeable workforce that can respond more effectively to customer needs and deliver higher-quality service. They also make sure that high-potential employees are prepared to step into key roles, preserving institutional knowledge and ensuring continuity.

The Board believes CEO succession planning is one of its most important responsibilities. In accordance with our Corporate Governance Guidelines, the Board actively oversees CEO and senior management succession planning and talent development to create a strong pipeline of internal candidates ready to assume executive roles. To provide further insight into our internal talent pool, the Board also identifies opportunities for directors to engage with potential senior management successors. At least annually, the Board reviews succession plans for senior management, including a review of possible internal candidates' qualifications and development plans.

MEET OUR 2025 BOARD OF DIRECTORS



Our nine-member Board is comprised of PGE CEO Maria Pope and eight independent directors.

The Compensation, Culture and Talent Committee is primarily responsible for overseeing our workforce development and leadership succession programs. The Compensation, Culture and Talent Committee also regularly engages with management on a broad range of human capital management topics, such as pay equity, strategic workforce planning, employee engagement, performance management and employee well-being programs.

Oversight of financial management
Through the Audit and Risk Committee, the Board plays a critical governance role by ensuring that our financial reporting is accurate and reliable, overseeing our risk management program and overseeing the independent and internal auditors. In 2024, the Audit and Risk Committee membership included two audit committee financial experts as defined by the SEC. The Committee directed improved reporting on SOX controls and internal audit results, allowing the Committee to gain better insight into internal controls. The Committee also has regular executive sessions with the company's independent auditor to hear their perspectives on the company's financial reporting.

The Finance and Operations Committee of the Board provides oversight of capital budgeting and how capital spending is prioritized and access to capital markets and liquidity.

Oversight of sustainability
Oversight of sustainability is woven across all of the Board's committees. The Board's strategic responsibility includes overseeing actions to address risks and opportunities related to climate change and the company's decarbonization strategy. The Nominating, Governance and Sustainability Committee provides guidance to programs related to sustainability, including reviewing progress toward our decarbonization goals and community and political engagement. The Audit and Risk Committee has oversight of ESG disclosures and the company's risk management programs. The Compensation, Culture and Talent Committee has oversight of talent management and compensation plan metrics. The Finance and Operations Committee approves capital budgets, oversees safety and operations and key performance indicators related to financing structures.



PGE crews making repairs at Zig Zag

Risk management and mitigation

Effective risk management is essential to an organization's stability and resilience. At PGE, we use data and modeling to understand risk. We evaluate risks across a wide range of potential consequences, such as safety, impact to customers, environmental, reliability, financial and compliance. Using a consistent evaluation methodology, we can calculate risk values and evaluate mitigations to reduce these values.

We invest millions of dollars each year in maintaining and developing our infrastructure to provide reliable service to customers. Our governance programs work to make sure that PGE's investments are made responsibly and are aligned with corporate priorities to mitigate risk and continue building value for customers and shareholders. Capital projects are vetted through internal governance that requires increased scrutiny and higher levels of approval as the cost of the project increases. Employees with relevant expertise make sure that the reviews focus on long-term strategy and maximize value and are ultimately reviewed and approved by executive officers, the Finance and Operations Committee and the Board.

Enterprise risk management

Our enterprise risk management program reports directly to the company's Executive Risk Committee (ERC), which is responsible for reviewing key enterprise risks and current and planned mitigation actions. The ERC reports to the Audit and Risk Committee of the Board and reviews our top risks at least once every twelve months. The Audit and Risk Committee also has special oversight of market and credit risk associated with energy trading activities and receives detailed reports quarterly.

Climate change

At PGE, we recognize climate change impacts how we serve customers, our assets and communities. We are actively adapting to these risks by strengthening infrastructure to better withstand extreme weather. In addition, we are collaborating with communities to enhance system resiliency. We're also accelerating investments in renewable and non-emitting backup energy capacity and refining our forecasting models to account for changing climate patterns and energy needs. Details can be found in our Clean Energy Plan and Integrated Resource Plan, Distribution System Plan and Wildfire Mitigation Plan.

Wildfire risk management

We understand that the risk wildfire poses to customers, employees and our environment in terms of safety, financial, property and ecosystem damage is significant and growing. We take our ongoing wildfire risk mitigation efforts seriously. Our key objectives are to mitigate the potential of electric infrastructure contributing to wildfires, protect our utility assets and minimize the impact of mitigation measures on customers. During fire season, we closely monitor mitigation efforts to safeguard system performance, train employees on wildfire related safety practices and PSPS procedures and engage customers in fire season readiness.

Our Wildfire Steering Committee (WSC) is comprised of key executives, under the oversight of the Board of Directors. The WSC provides oversight and strategic direction on operational, policy (legal and regulatory) and financial activities related to wildfire risk management. Our Wildfire Mitigation team plans and implements the Wildfire Mitigation Program, which includes developing our Wildfire Mitigation Plan (WMP). The WMP is filed annually with the Oregon Public Utilities Commission. The 2025 WMP details PGE's plan for enhancing situational awareness, system hardening, conducting thorough inspections and managing vegetation, among other mitigation measures. It includes PGE's commitment to spend $53 to $56 million in operations and maintenance costs and $56 to $78 million on system improvements to strengthen our ability to protect customers, our assets and communities. With increased investments planned through 2027, the WMP focuses on hardening our system to reduce wildfire risks to mitigate impacts on customers. To date, we have developed tools and implemented advanced technologies designed to anticipate and respond

PGE EXECUTES A DATA-DRIVEN, HOLISTIC WILDFIRE RISK REDUCTION PLAN



to high-fire risk conditions, including:

- 37 AI-driven wildfire cameras covering 100% of high-risk zones and remote generation assets
- 85 weather stations that provide real-time data
- Early fault detection sensors that identify issues before they cause outages or ignitions
- Refined risk modeling accuracy
- Patrolled and cleared over 1,000 line-miles through our advanced risk reduction vegetation management.

In 2024, we completed approximately 16,500 probable hazard mitigations in high fire risk zones. We also patrolled and trimmed over 5,300 line-miles across our service territory.

We govern this work through the Executive Risk Committee, Wildfire Steering Committee and a dedicated Wildfire Mitigation team focused on wildfire risk; we regularly report to the Board on progress against our WMP. We include metrics on grid hardening, ignition prevention inspections and corrections, line-miles of vegetation cleared and reported ignitions.

While we take our responsibilities seriously, we recognize we can't do it alone. Successful wildfire mitigation requires coordination and collaboration with multiple organizations to advance mitigation efforts. These organizations include local and state emergency managers, the U.S. Forest Service, the Bureau of Land Management, the Oregon Department of Forestry, Indigenous Tribes, fire districts and other emergency responders.



AI-driven wildfire cameras in Mt. Hood National Forest

AI-DRIVEN WILDFIRE CAMERAS

AI-driven wildfire cameras allow PGE, in collaboration with fire and Tribal agencies, to gain quicker visibility and improve response times to protect our assets. During the Hawn Creek fire, first responders received notification of the incident almost two hours ahead of traditional means, allowing the Oregon Department of Forestry to monitor the fire and activate response.

Innovation and solutions

Innovation allows PGE to evaluate viable technologies that support PGE's vision for a non-emitting, reliable and resilient grid. Governance enables us to move quickly on assessing new technologies that improve the customer experience and enhance reliability while putting appropriate guardrails on investments. In addition to internal governance on innovation spending, executive officers report to the Board quarterly on investments made and lessons learned by exploring new technology.

The company's executive team identified the following focus areas that are used to evaluate and prioritize innovation projects:

- Decarbonization at scale
- Strengthen grid performance
- Execute business enhancements
- Realize transportation electrification and load flexibility.

We also encourage leveraging innovation in safe ways. For example, our AI policy is designed to help users harness the power of AI while raising awareness of the risks of AI use, including safeguarding information and privacy.

Safety and emergency preparedness

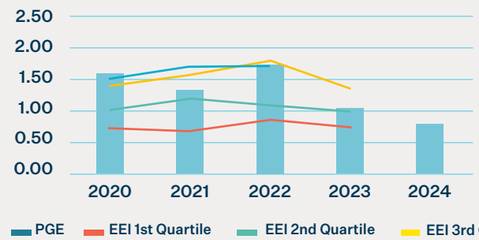
2024 SAFETY DATA

The introduction of the industrial injury prevention specialist and the injury management program has aided in significant continued improvement of PGE's safety metrics:

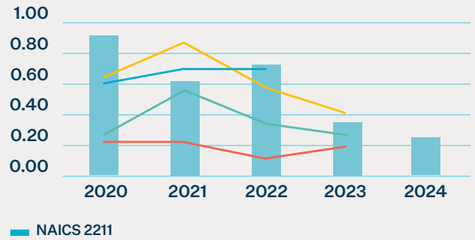
0.79 Annual OSHA Recordable Rate
a 64% decrease over the past 5 years

0.26 Lost Time Incident Rate
a 66% decrease over the past 5 years

OSHA Recordable Incident Rate



Lost Time Incident Rate (LTIR)



PGE EEI 1st Quartile EEI 2nd Quartile EEI 3rd Quartile NAICS 2211

The rate of OSHA recordable incidents (also known as the total recordable incident rate) per 100 workers over a set period of time.

The rate of incidents leading to an employee being unable to work for a minimum of one day per 100 workers over a set period of time.

PGE vs. EEI Companies: Group 3 (utilities with 2000-3999 employees)

Safety

Safety is a long-standing priority at PGE. Our dedication to safety is reflected in rigorous training programs, continuous risk assessments and clear communication. We empower employees to uphold high standards in every interaction. We are focused on preventing workplace injuries through pre-emptive interaction and coaching. We have deployed a comprehensive program for injury prevention and management, driver and vehicle safety and increasing supervisors in the field to evaluate working conditions and practices. PGE has also hired an Industrial Injury Prevention Specialist — a mid-level medical provider who is a certified athletic trainer with industrial occupational specialization. The intent is to connect with employees and provide education and guidance on injury prevention and self-care and guidance on minor injuries, allowing employees to return safely to full function. This service has helped drive improvements in one of PGE's most pervasive safety challenges, which is soft-tissue injuries when field employees perform more physically demanding work in variable environments.

To uphold our commitment to safety, we have upgraded the employee health and safety management system to be more user-friendly and better enable employees to report incidents, manage tasks and access critical safety information. Enhanced features and improved data accuracy help managers make informed decisions, track compliance and implement safety measures proactively and swiftly.

Emergency preparedness

PGE proactively plans for unforeseen events, from natural disasters to system outages, enabling us to minimize disruptions and maintain critical services when customers need them most.

Preparing for an emergency requires a comprehensive plan and a local team trained and ready to execute. The 2023 Push Partner Point of Distribution project was a full-scale exercise involving 20 players from various departments at PGE, designed to evaluate our readiness for a large-scale public health emergency, such as biological terrorism. In partnership with the Cities Readiness Initiative Push Partner program, we introduced this exercise in real-time to a group of over 100 employees. This hands-on drill helped us update processes, documentation and training to increase effectiveness in an emergency. This readiness protects employees and reassures customers that they can rely on the Company's ability to respond swiftly and effectively, even in challenging situations.



View from the West Hills across Portland to Mt Hood

Transparency across our business practices

We strive to meet the highest standards of excellence in our work and reporting; our commitment to transparency helps us achieve that goal. Visibility into how we run our business automatically results in accountability, not just to stakeholders but to each other.

Public policy and political advocacy

Public policy can significantly impact our company and stakeholders, so we participate in the political process through regular and constructive engagement with government officials and policymakers, by making contributions to candidates and organizations and by encouraging political engagement by our employees. We collaborate with organizations like the Edison Electrical Institute on national energy policy issues. Our advocacy is focused on supporting customer growth objectives, investing in infrastructure, decarbonization and reducing wildfire risk.

PGE is committed to complying with all laws and regulations governing political activities and engaging in the political process ethically and transparently. All political activities, including contributions, are conducted or made in full compliance with the law and our Political Engagement Policy.

Contributions are approved by the officer responsible for government affairs or by our President and CEO. Any exceptions to the Political Engagement Policy require approval from our General Counsel.

We publish an annual report detailing corporate-funded contributions and expenditures to promote transparency. The Nominating, Governance and Sustainability Committee of the Board reviews this report, along with our Political Engagement Policy and any exceptions, annually. The committee collaborates with management each year to align our political lobbying and contributions with our strategic priorities.



Oregon State Capitol

Ethics and compliance

At PGE, acting with integrity and accountability is fundamental to how we operate and we hold our employees, leadership and board to high standards.

Our Ethics and Compliance programs are designed to reinforce transparency, responsibility and ethical business practices across the company. The cornerstone of this program is our Code of Business Ethics and Conduct (Code), adopted by the Board and upheld by all directors, officers and employees. The Code addresses many areas of workplace conduct, including conflicts of interest, unfair or unethical use of corporate opportunities, protection of confidential information and legal and regulatory compliance. All existing employees are required to affirm adherence to the Code through biennial refresher training. Our CEO, CFO and Controller must also abide by the specialized Code of Ethics for Chief Executive and Senior Financial Officers.

Anti-corruption training is provided to all employees, with additional specialized training for leaders, procurement teams and those who work with government officials. Employees are expected to act in PGE's best interests, avoid conflicts of interest and refrain from exchanging gifts that could influence or appear to influence business decisions. All employees are prohibited from engaging in any form of corruption, including making or accepting improper payments or other forms of compensation. We have stated policies for disclosing any potential, perceived or actual conflicts and clear processes for requesting approval for certain gifts, meals or entertainment.

The Audit and Risk Committee of the Board of Directors receives quarterly updates from our Ethics and Compliance departments on key compliance metrics and internal investigations related to employee conduct.

Employees are expected to report any violations of the law, our ethics codes or company policies. Employees may use a variety of internal channels to make their reports, including their manager, HR Business Partner, the Ethics team, or directly to the Chief Legal and Compliance Officer. We also offer the option to report anonymously through the EthicsPoint hotline, which NAVEX, a trusted third-party whistleblowing hotline service operates. The Audit and Risk Committee has also adopted procedures for receiving and addressing whistleblower concerns regarding accounting practices, internal controls and auditing matters.

Additional information on our ethics and compliance policies and commitments can be found on our website:

- Human Rights Policy Statement
- Sustainability Policy
- Supplier Code of Conduct
- Code of Business Ethics and Conduct
- Safety Policy
- Political Engagement Policy

*Additional information on our financials and governance can be found in our Proxy and Annual Report.

ESG data tables

In this section, we disclose data under the Edison Electric Institute (EEI) ESG Quantitative Template, Sustainability Accounting Standards Board (SASB) and Task Force on Climate-Related Financial Disclosures (TCFD). We also provide additional key ESG metrics.

54 2024 ESG REPORT KEY METRICS

56 2024 SASB REPORT

64 2024 TCFD DISCLOSURES

77 2024 EEI QUANTITATIVE INFORMATION

86 FORWARD LOOKING STATEMENTS

2024
ESG Report Key Metrics

DATA IN THIS REPORT IS FROM OUR 2024 FISCAL YEAR (JANUARY 1, 2024, TO DECEMBER 31, 2024), UNLESS OTHERWISE NOTED.

Environmental	**2022**	**2023(A)**	**2024(B)**
Emissions Intensity: Metric tons of CO2e / MWh associated with power served to retail customers within Oregon[1]	0.29	0.32	0.28

Resource Mix for PGE's Total System Load (wholesale and retail)	**2022**	**2023**	**2024**
Natural gas	31%	41%	36%
Coal	8%	8%	6%
Hydro[4]	28%	21%	26%
Wind	10%	10%	15%
Solar	3%	4%	4%
Unspecified and Other[5]	20%	16%	13%
	100%	100%	100%
Non-emitting	41%	35%	45%

Resource Mix for PGE's Retail Load (excludes wholesale)[3]	**2022**	**2023(A)**	**2024(B)**
Natural gas	34%	43%	40%
Coal	6%	6%	5%
Hydro[4]	26%	20%	21%
Wind	9%	9%	14%
Solar	3%	5%	5%
Unspecified and Other[5]	22%	17%	15%
	100%	100%	100%
Non-emitting	38%	34%	40%

Energy Used by the Company (MWh)[7]	28,568	29,505	27,222
Percent of PGE fleet electrified or with additional electric technology[2]	12%	16%	18%

Voluntary renewable program participation			
Residential/small business participants	234,905	233,182	229,926
Commercial/industrial participants	187	204	212

Social	**2022**	**2023**	**2024**
Women in management	33%	35%	37%
Racial/ethnic group management representation[6]	26%	27%	26%
Total PGE and PGE foundation investments (in thousands)	$3,720	$3,230	$4,154
Community investment as a percentage of net income	1.6%	1.4%	1.3%
Employee and retiree volunteer hours	18,037	23,306	22,957
Scholarships awarded	55	55	55
Refer to our Sustainability webpage for preliminary EEO-1 data			

Governance
Governance and business performance data is available in our 2024 10-K, 2024 Annual Report and 2025 Proxy statement.

NOTES

(1) Value calculated using data provided by PGE per Oregon Department of Environmental Quality, Investor-owned Utility GHG protocols. Value cannot be used directly with Generation Fleet emissions as it is based on total energy served to retail customers, including power purchased from other sources.

(2) Electric vehicles as defined by the Edison Electric Institute.

(3) Information presented is based on data reported to Oregon DEQ in PGE's Investor Owned Utility GHG Report. Percentages represent the portion of power delivered to PGE customers in Oregon.

(4) Hydro includes power purchased from Bonneville Power Administration (BPA).

(5) "Other" fuels may include biomass, biomass gases, landfill gas or other fuel types, including certain emissions-free sources that do not meet DEQ requirements to qualify as "specified purchases." PGE presumes the resources are not emissions-free.

(6) Data based on voluntary employee reporting.

(7) Electric department only, excludes station use.

(A) These amounts have been restated from the prior year ESG report as a result of finalizing review and third-party verification procedures with the Oregon Department of Environmental Quality.

(B) These amounts are preliminary and could vary from those filed with ODEQ. Refer to footnote 3 under the EEI template for additional details related to this metric.

2024
Sustainability Accounting Standards Board (SASB) Report

THIS YEAR MARKS PORTLAND GENERAL ELECTRIC'S FIFTH YEAR MAPPING OUR DISCLOSURES TO THE SASB STANDARD FOR ELECTRIC UTILITIES & POWER GENERATORS. OUR RESPONSES REFLECT 2024 PERFORMANCE AS OF 12/31/2024.

Topic	Data Request	PGE Response
Greenhouse gas emissions and energy resource planning	(1) Gross global Scope 1 emissions, percentage covered under (2) Emissions-limiting regulations (3) Emissions-reporting regulations	(1) Total $MTCO_2e$ from Scope 1 activities: 6,412,964. Refer to the Notes for a breakout by activity. (2) 99.9% of our Scope 1 emissions relate to our thermal generating resources, which are covered in the State of Oregon emissions-limiting regulations. (3) 99.9% of our Scope 1 emissions relate to our thermal generating resources, which are covered in the State of Oregon emissions-reporting regulations. Notes: (1) The reported Scope 1 emissions are from PGE's thermal generating resources, fuel burned by PGE's fleet, SF6 and natural gas used at PGE's office facilities. Thermal generating resources make up 6,404,517* $MTCO_2e$, vehicle fleet fuel burned equates to 6,656, SF6 equates to 1,233 and natural gas used equates to 558. Emissions associated with R99 diesel fuel not included within Scope 1 are 2,651 $MTCO_2e$. Emissions associated with fleet fuel burned include estimates related to the vehicle type in order to assign an emission factor. Given the emission factors for vehicle types are materially consistent, this does not materially impact emissions reported. *This is a preliminary number that is subject to change following regulatory agency review and approval of submittals.
	Greenhouse gas (GHG) emissions associated with power deliveries	5,895,803 $MTCO_2e$* PGE is required to report emissions associated with power delivered to retail customers in Oregon to the Oregon Department of Environmental Quality (ODEQ) on an annual basis. Refer to the link for publicly available historical information. PGE follows ODEQ's Greenhouse Gas Reporting guidelines when calculating this number. This includes the use of ODEQ specific emission factors, removing power sold to end users outside of Oregon, and proportionally adjusting retail sales for wholesale sales in order to arrive at the total amount of MWhs sold to Oregon customers. This amount represents anthropogenic emissions only. 2024 biogenic emissions were 75,820 $MTCO_2e$. Greenhouse Gas Emissions Reported to ODEQ *To calculate 2024 emissions associated with power deliveries to retail customers in Oregon, PGE used ODEQ 2023 emission factors for purchased power and estimated emission factors for generated power as ODEQ 2024 emission factors are not yet available. This is a preliminary number and could vary from those filed with ODEQ.
Greenhouse gas emissions and energy resource planning *(continued)*	Discussion of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets and an analysis of performance against those targets	Oregon has some of the most ambitious clean electricity targets in the country—achieving at least an 80% reduction in greenhouse gas (GHG) emissions associated with the power served to customers by 2030, a 90% reduction by 2035 and a 100% reduction by 2040. The baseline for these reductions is based on the annual average of 2010, 2011 and 2012 emissions as reported to the ODEQ. PGE is more than one-third of the way toward the emission reductions needed to meet its 2030 target. For more information about PGE's emissions progress, see page 11 of the 2024 ESG Report. PGE's transition plan to a clean energy future is outlined in its Clean Energy Plan, which is embedded in our strategy to meet Oregon's House Bill 2021 emissions targets. The plan prioritizes investments in renewable energy resources, transportation electrification, and advanced grid technologies. In 2024, 77% of PGE's retail emissions come from PGE-owned generating assets that are covered in Scope 1 reporting. Achieving emissions reduction requires steadily adding renewable energy, battery storage, energy efficiency and demand response to our portfolio, so we can reliably and affordably reduce fossil fuel generation. Since implementing its emissions targets in 2021 PGE and its customers have committed to 2,900+ MW of clean energy. Recent additions to this portfolio include 475 MW of new battery storage projects, with 275 MW achieving commercial operations in December 2024 and the remaining 200 MW scheduled for service in mid-2025. Of the 275 MW in service, PGE owns 75 MW and procures the remaining 200 MW under a 20-year storage capacity agreement. The portfolio also includes PGE procurement of 311 MW of energy from the Clearwater Wind facility which began generating power in January 2024. PGE owns 208 megawatts of the project and procures the remaining 103 megawatts under a purchase power agreement (PPA). Resources required to meet the remaining 2030 need and further progress toward our emission reduction goals are anticipated to be procured through future acquisition processes, including, but not limited to, the 2021, 2023 and 2025 All-Source RFP and future RFPs. For more information about PGE's resource additions to meet its emission targets, see page 18 of the 2024 ESG Report.

Topic	Data Request	PGE Response
Air quality	Air emissions of the following pollutants: (1) NOx (excluding N_2O) (2) SOx (3) Particulate matter (PM_{10}) (4) Lead (Pb) (5) Mercury (Hg) Percentage of each in or near areas of dense population	(1), (2), (5): Refer to section 6 of the EEI template for these metrics. PGE 2024 EEI ESG Report PM_{10} — Pb 479 MT — 0.048 MT Percentage near a dense population NOx — 36.7% SOx — 4.1% PM10 — 56.1% Pb — 1.5% Hg — 14.4%
Water management	(1) Total water withdrawn (2) Total water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress Percentage of each in regions with High or Extremely High Baseline Water Stress	(1) 23,209 thousand cubic meters (2) 22,490 thousand cubic meters consumptive, 719 thousand cubic meters non-consumptive N/A; PGE operations are not in High or Extremely High Baseline Water Stress areas Note: Water withdrawal and consumption data is associated with PGE thermal generating facilities only, and does not include nominal water use (e.g., drinking water) for which data was not readily available.
	Number of incidents of non-compliance associated with water quality permits, standards and regulations	None
	Description of water management risks and discussion of strategies and practices to mitigate those risks	Efficient use of natural resources–including water resources–continues to be a priority. PGE's operational facilities are located in basins with low or low-medium baseline water stress per the World Resources Institute (WRI) Aqueduct Water Risk Atlas. PGE's thermal generation assets, which rely on water access, are located in basins that are classified as low baseline water stress. PGE operates three hydropower generation systems licensed by the Federal Energy Resource Commission (FERC): Pelton Round Butte Hydroelectric Project (Deschutes River), Clackamas River Hydroelectric Project (Clackamas River and tributaries), and Willamette Falls Hydroelectric Project (Willamette River). License conditions (e.g., specific flow requirements based on seasonal natural resource needs) were developed in partnership with natural resource agencies and environmental stakeholders and support our objectives of healthy native fisheries (e.g., salmon and steelhead) and long-term sustainability for wildlife and water quality in the basins where we operate. Our efforts include significant PGE-led and PGE-partnership projects in the watersheds of our hydropower facilities focused on basin-wide water conservation efforts to increase in-river flows that are critical for habitat improvement and fisheries' restoration goals.

Topic	Data Request	PGE Response
Coal ash management	Amount of coal combustion residuals (CCR) generated, percentage recycled	112,406 MT of CCR generated from operations, 0.0% recycled. These values represent PGE's 20% share of Colstrip.
	Description of coal combustion products (CCPs) management policies and procedures for active and inactive operations	PGE does not have any active coal combustion product operations, and the State of Oregon has not developed a Coal Combustion Residual (CCR) permit program for EPA approval; therefore, the one CCR landfill that PGE operated for the Boardman Coal Plant completed closure on August 21, 2021, in accordance with the requirements of the Closure Plan developed per 40 CFR 257.102(b). Inspection of the closed CCR landfill occurs annually and PGE monitors groundwater per the requirements of 40 CFR 257.93 and 40 CFR 257.94. On April 25, 2024, the EPA released final regulations pertaining to electric generation facilities, including Disposal of Coal Combustion Residuals (CCR) from Electric Utilities – Legacy CCR Surface Impoundments. This rule builds on 2015 regulations, which apply to active power plants that dispose of coal combustion residuals in surface impoundments or landfills, by regulating inactive surface impoundments at inactive power plants, as well as CCR management units at both active and inactive power plants. PGE has assessed the potential impact of these regulatory changes and believes they will not have a material impact on the Company's current Asset Retirement Obligations. PGE does have 20% share of Colstrip, and the majority owner manages the CCP program following state and federal regulations.
Energy affordability	Average retail electric rate for: (1) Residential (2) Commercial (3) Industrial customers	 (1) 18.05 cents/kWh (2) 13.77 cents/kWh (3) 8.61 cents/kWh
	Number of residential customer electric disconnections for nonpayment, percentage reconnected within 30 days	Total number of residential disconnections: 35,324 Number of residential disconnections reconnected within 30 days: 30,720 As a percentage of total: 86.97%
	Discussion of impact of external factors on customer affordability of electricity, including the economic conditions of the service territory	Together with policymakers and regulators we are working to keep affordability at the forefront of clean energy transition discussions. Careful planning and policy design can reduce the costs of an emissions-free economy. Despite efforts to keep electricity broadly affordable, we recognize that some customers need more help. We support our customers by connecting them with bill assistance funding and discount programs, energy efficiency and weatherization, arrearage forgiveness, flexible payment options and advocating for public sector funding. Per the passage of the Energy Affordability Act (Oregon House Bill 2475) that authorizes the Public Utility Commission of Oregon to consider differential energy burden and other inequities of affordability in rates, PGE offers income-qualified customers a new program that provides a 15-60% discount on their energy use. This program is the first of its kind for large, investor-owned utilities in Oregon and is designed to result in a meaningful reduction in energy bills for income-qualified customers, alleviating hardship and providing easier, more affordable access to reliable power. To date, PGE has enrolled nearly 90,000 households in the program. For more information about PGE's energy affordability efforts, see page 30 of the PGE's 2024 ESG Report.

Topic	Data Request	PGE Response
Workplace health and safety	(1) Total recordable incident rate (TRIR) (2) Fatality rate (3) Near miss frequency rate (NMFR)	(1) 0.79 (2) 0 employees (3) 1.98
End-use efficiency and demand	Percentage of electric load served by smart grid technology	>99%

Topic	Data Request	PGE Response
	Customer electricity savings from efficiency measures, by market	37.8 aMW were saved from PGE's Energy Efficiency Measures in 2024. In 1999, the Oregon Legislative Assembly adopted Senate Bill 1149 which directed Oregon's two largest investor-owned electric utilities, Portland General Electric (PGE) and Pacific Power, to collect three percent of their revenues for a public purpose charge (PPC). In 2002, the Energy Trust of Oregon (ETO), an independent non-profit organization overseen by OPUC, was created to administer the PPC funds received from the OPUC and to incent new cost-effective energy conservation, new market transformation efforts, above-market costs of new renewable energy resources and new low-income weatherization. Since then, the ETO has helped PGE customers save energy and money by providing information, assistance and cash incentives for energy efficient upgrades and renewable energy systems. In support of this mission, the OPUC directs PGE to provide ETO with a limited set of information about large and commercial industrial customers, including customer name, service address and whether the customer is applying self-direct credits against its energy-efficiency and renewable public purpose charge during each billing period. In 2021, the Oregon Legislative Assembly adopted House Bill 3141 which directs ETO to, with public utilities, jointly develop public utility-specific budgets, action plans and agreements that detail the entity's public utility- specific planned activities, resources and technologies. The legislation also expands the scope and allocation of new renewable energy sources to include distribution system connected technologies (DSCT) and require that 25 percent be used for activities, resources and technologies that serve low and moderate income customers, including for technologies that do not have above-market costs. In 2022, PGE implemented HB 3141 by codifying a Budget Coordination Memorandum with the Energy Trust of Oregon which established an annual process for development of utility specific action plans and staff work groups. The 2023 utility specific action plan includes, among other activities, coordinated capacity building for community partners, pairing of PGE income qualified bill discounts (QBD) with no/low-cost heat pump incentives, and advancement of two non-wires solution proposals to address equity needs and grid constraints. 2024 was an excellent year with continued, steady customer demand growth for heat pumps and other home energy efficient products. PGE's partnership with ETO has exceeded the annual goal by 35% with 37.8 aMW saved and the annual IRP goal by 32%. *These numbers are preliminary numbers as provided by the ETO. Numbers are subject to change from this report to the final filed report, which will occur later in the year.

Topic	Data Request	PGE Response
Nuclear safety and emergency management	Total number of nuclear power units, broken down by results of most recent independent safety review	N/A Note: The NRC regulates the licensing and decommissioning of nuclear power plants, including PGE's Trojan nuclear power plant, which was closed in 1993. The NRC approved the 2003 transfer of nuclear spent fuel from a spent pool to a separately licensed dry cask storage facility that will continue to house the fuel on the former plant site until a United States Department of Energy (USDOE) facility is available. Radiological decommissioning of the plant site was completed in 2004 under an NRC-approved plan, with the plant's operating license terminated in 2005. Spent fuel storage activities will continue to be subject to NRC regulation until all nuclear fuel is removed from the site and radiological decommissioning of the storage facility is completed. 2024 Form 10-K
	Description of efforts to manage nuclear safety and emergency preparedness	PGE permanently ceased commercial operation of the Trojan nuclear power plant in January 1993. Since then, the plant has been dismantled as part of the decommissioning process and all nuclear fuel has been placed in long-term, dry storage as of September 2003. Trojan's nuclear fuel is stored in robust canisters which are encapsulated in vertical concrete casks that provide structural protection, radiation shielding and sufficient passive cooling to maintain the safety of the fuel. Based on this robust design and extensive analysis of hazards, there are no operations or credible accidents that result in a release of radioactive material from the canisters. As an owner of special nuclear material, PGE is licensed by the Nuclear Regulatory Commission for fuel storage. In 2019, following an extensive review of PGE's proposed Aging Management Program, the Nuclear Regulatory Commission granted an extension of PGE's license to store fuel an additional 40 years to 2059. Nuclear safety is the highest priority for the Trojan staff, and its nuclear safety culture is assessed and monitored by an Independent Spent Fuel Storage Installation (ISFSI) Safety Review Committee, which advises the Corporate Executive Responsible for Trojan on all matters related to the safe storage of spent fuel. The Trojan organization operates in compliance with a Quality Assurance Plan under which operations and security functions are regularly audited. Trojan Spent Fuel Storage

Topic	Data Request	PGE Response
Grid resiliency	Number of incidents of non-compliance with physical or cybersecurity standards or regulations	Portland General Electric Company is subject to mandatory physical and cybersecurity standards adopted by the North American Electric Reliability Corporation (NERC). Our practice is to self-report all identified instances of actual or potential noncompliance with the NERC physical and cybersecurity standards, regardless of severity. In 2024, PGE had five instances of actual or potential noncompliance filed with the Western Electricity Coordinating Council (WECC), the Regional Entity responsible for NERC compliance monitoring and enforcement in the Western Interconnection. All five of the instances were identified by PGE and self-reported. One instance has already received a Compliance Exception disposition from WECC. Four instances are under review by WECC's Risk and Enforcement staff.
	(1) System Average Interruption Duration Index (SAIDI) (2) System Average Interruption Frequency Index (SAIFI) (3) Customer Average Interruption Duration Index (CAIDI), inclusive of major event days	(1) 757 minutes (2) 1.18 events (3) 642 minutes PGE experienced a total of 6 Major Event Days in 2024. The most significant impact was a storm event in January 2024 which resulted in 5 Major Events Days, approximately 400,000 customer impacted, and 14 days of disruption to PGE operations. PGE also experienced 1 Major Event Day in December 2024.

Topic	Data Request	PGE Response
Activity metrics	Number of: (1) Residential (2) Commercial (3) Industrial customers served	 (1) 829,721 (2) 113,942 (3) 281
	Total electricity delivered to: (1) Residential (2) Commercial (3) Industrial (4) All other retail customers (5) Wholesale customers	MWh in thousands (1) 7,732 (2) 7,024 (3) 6,941 (4) N/A (5) 9,722
	Length of transmission and distribution lines	As of December 31, 2024, PGE-owned electric transmission system consisted of 1,269 circuit miles as follows: 287 circuit miles of 500 kV line; 418 circuit miles of 230 kV line; and 564 miles of 115 kV line. The Company also has 29,398 circuit miles of distribution lines that deliver electricity to its customers.
	Total electricity generated, percentage by major energy source, percentage in regulated markets	Total electricity generated and percentage by major energy source: EEI ESG Report 100% in regulated markets
	Total wholesale electricity purchased	13,310* *in thousands of MWh

2024
Task Force on Climate-Related Financial Disclosures (TCFD)

PGE IS COMMITTED TO PROVIDING OUR STAKEHOLDERS WITH TRANSPARENCY AROUND OUR SUSTAINABILITY PRACTICES AND HOW WE ARE ADDRESSING CLIMATE-RELATED ISSUES. A SUMMARY OF OUR RESPONSE TO THE TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES (TCFD) FOLLOWS. ADDITIONAL INFORMATION CAN BE FOUND THROUGHOUT THIS REPORT, IN OUR ANNUAL REPORT ON FORM 10-K AND AT THE VARIOUS RESOURCES LINKED BELOW.

Topic	Data Request	PGE Response
Governance Disclose the organization's governance around climate-related risks and opportunities.	Describe the board's oversight of climate-related risks and opportunities.	The Board of Directors provides strategic oversight of PGE's operations and governance, supporting alignment with its mission and overseeing and advising management on PGE's strategic imperatives to decarbonize, electrify and perform, and creating value for shareholders, customers, and stakeholders. Responsibility for environmental, social, and governance (ESG) performance—including climate-related risks and opportunities—is integrated into PGE's policies and governance principles. Through the "Sustainability and ESG Governance Framework," the company aligns sustainable practices with business goals fostering transparency around ESG-related risks and opportunities. The Board and its committees oversee significant strategic, operational, financial, reputational, and ESG risks. This includes active review of the company's enterprise risk management (ERM) program to monitor and address strategic and emerging risks, including those related to climate change. The Board evaluates whether management has implemented effective systems to identify, assess, and manage material risks across areas such as cybersecurity, environmental, financial, legal, and regulatory risks. Regular reporting from management keeps the Board informed of risks and mitigation efforts, including those arising from climate-related events like wildfires and ice storms. The Board also oversees the impact of legislation and regulation on PGE's clean and renewable energy and transportation electrification strategies, supporting alignment with local, state, and federal goals. At least annually, the Board and the Finance and Operations Committee review corporate goals and approve capital budgets to prioritize system resilience, customer-focused programs, and investments tied to key ESG metrics. The Board has established four standing committees to assist the Board with its oversight responsibilities each of which plays a specific role in monitoring and addressing climate-related risks and opportunities. **Audit and Risk Committee** The Audit and Risk Committee assists the Board in overseeing the company's Enterprise Risk Management Program (ERM), which includes the identification, evaluation, and mitigation of material environmental risks, including climate-related risks. The committee receives quarterly reports from management on the activities and findings of the risk management program, including risks related to financial reporting, internal controls, and ESG disclosures. The Audit and Risk Committee oversees controls and metrics for ESG performance, including those addressing climate-related risks, are robust and reliable.

Topic	Data Request	PGE Response
Governance Disclose the organization's governance around climate-related risks and opportunities. *(continued)*	Describe the board's oversight of climate-related risks and opportunities.	**Nominating, Governance, and Sustainability Committee** The Nominating, Governance, and Sustainability Committee oversees the company's ESG strategy, policies, and progress, with a specific focus on climate change, sustainability, and environmental issues. This committee evaluates risks and opportunities associated with the company's governance and sustainability initiatives, monitoring progress against emissions and clean energy goals and targets related to climate change. Additionally, the committee reviews and guides the development of policies that support the company's decarbonization strategy. **Finance and Operations Committee** The Finance Committee oversees the company's financial and capital planning to support its climate-related objectives, as well as overseeing the company's operations, technology investments and emergency preparedness response plans. This includes overseeing the alignment of capital budgets with strategic goals. The committee reviews financing arrangements tied to ESG key performance indicators and assesses potential financial risks that could impact the company's ability to achieve its climate-related goals. **Compensation, Culture, and Talent Committee** The Compensation, Culture, and Talent Committee oversees compensation plan metrics, including long-term incentive (LTI) goals related to decarbonization, as well as human capital management programs and outcomes. Starting in 2019, PGE incorporated emission reduction metrics as part of a long-term incentive (LTI) awards program to encourage the planning and execution of actions that drive progress toward the decarbonization of PGE's resource portfolio. PGE's LTI awards granted to executives and other key employees includes a performance metric related to achievement of the Company's strategic goals surrounding clean energy. This metric is used to create incentive to reduce carbon potential in the Company's energy supply portfolio in support of Oregon's GHG emission reduction goals. The metric is to be measured based on average megawatts of forecast energy from carbon-free resources, Oregon Renewable Portfolios Standard-qualifying resources, and low-carbon emitting (i.e., greater than or equal to 95% carbon-free) systems of resources added to the Company's energy supply portfolio during the performance period. The committee also monitors talent management, human capital disclosures, and workforce health and safety, aligning with the company's ESG and strategic objectives. For more detailed descriptions, please refer to the committee charters available on PGE's Corporate Governance website.
	Describe management's role in assessing and managing climate-related risks and opportunities.	The executive team is responsible for developing and executing strategies that address PGE's climate-related risks and opportunities, including efforts to decarbonize, electrify, and improve performance. Regular updates are provided to the board on the progress of these strategies, including achievements toward emissions reduction and clean energy goals, the status of key climate-related initiatives, and emerging risks such as wildfire and other climate impacts. Management is responsible for day-to-day management of identifying and mitigating climate-related risks and pursuing climate-related opportunities. To promote consistency and comprehensiveness in its approach, PGE established a management-level Sustainability and Environmental, Social and Governance Steering Management Committee (S&ESG) to oversee the execution of climate-related strategies. The committee reports to the Strategy Executive Steering Committee and meets on an as-needed basis, with plans to meet at least annually beginning in 2025. Co-chaired by the Controller and the Vice President of Policy and Resource Planning, the committee includes senior leaders from various departments such as Environmental Services, Finance, Supply Chain, and Human Resources. This cross-functional group drives alignment across the organization, actively managing and integrating both climate-related risks and opportunities into business operations. The committee also provides governance and oversight, supporting PGE's efforts to manage climate risks, capitalize on opportunities and comply with relevant standards and regulations. In addition to the S&ESG Management Steering Committee, PGE's enterprise risk management program reports directly to the Company's Executive Risk Committee (ERC), which is responsible for reviewing key enterprise risks and current and planned mitigation actions, including climate-related risks. The ERC reports to the Audit and Risk Committee of the Board, who is responsible for assisting the Board in overseeing the Company's enterprise risk management program and reviews top risks at least once every twelve months. The Audit and Risk Committee also has special oversight of market and credit risk associated with energy trading activities and receives detailed reports on a quarterly basis. In addition, PGE established in June 2024, the Wildfire Steering Committee (WSC), a subcommittee of the ERC. The WSC, comprised of key executives, aids the ERC in performing risk analysis of PGE's wildfire risk management activities. The subcommittee also supports the ERC with its oversight and strategic direction on operational, policy (legal and regulatory) and financial activities related to wildfire risk management.

Topic	Data Request	PGE Response
Strategy Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.	Describe the climate-related risks and opportunities the organization has identified over the short-, medium-, and long-term.	PGE has identified and assessed various climate-related risks and opportunities across short-, medium-, and long-term horizons, leveraging a combination of regulatory frameworks, customer preferences, and environmental trends. These assessments inform the Company's strategic planning, capital investment, and operational decisions to support resilience and adaptability in a changing climate. **Risks:** PGE faces both physical and operational risks stemming from extreme weather and wildfire, and transitional risks associated with regulatory and market changes as the energy sector evolves toward a clean energy future. Key risks include: **Physical and Operational Risks** • **Wildfire Risk:** Wildfires of greater size and prevalence, as seen in recent years in Oregon, pose risks to public safety, grid resilience, the reliability of PGE's services and the financial health of the utility. Wildfires can damage generation facilities and transmission infrastructure, disrupt energy delivery, and increase the cost of power procurement. Drought conditions and declining tree health exacerbate wildfire risks, necessitating significant investments in vegetation management, grid hardening, and safety measures such as Public Safety Power Shutoff (PSPS) zones leading to higher capital and operating expenses. Capital investment and operating expenses related to this risk may not be recoverable through increases in customer prices or insurance proceeds. • **Severe Weather and Climate Change Impacts:** Climate change is driving more intense, frequent, and extreme weather events, including ice and snowstorms, high winds, flooding, heatwaves, and drought. These events can disrupt energy delivery, cause power outages, and damage PGE's transmission and distribution systems. Such disruptions often result in increased costs to restore service, repair facilities, and procure energy and fuel, which can adversely affect cash flow and liquidity. For instance: o Variations in seasonal temperatures increase energy demand, with warmer-than-normal summers or cooler-than-normal winters. o Rapid increases in load requirements during unexpected weather changes, particularly if coupled with transmission constraints, increase operational costs and risks. In recent years, PGE's territory has experienced unprecedented heat, historic ice and snowstorms, and wildfires. In August 2023 the region experienced a record-breaking heat wave with temperatures reaching all-time recorded highs for the month. This resulted in a peak load demand of 4,498 MW, exceeding the Company's previous all-time peak load demand. Beginning in January 2024, the Company's service territory encountered the first of a series of severe winter weather events, including snow, ice, and high winds that caused catastrophic damage to physical assets and resulted in widespread customer power outages. **Transitional Risks** • **Regulatory Compliance:** PGE is subject to various environmental laws and evolving GHG emissions reduction mandates, including Oregon's House Bill 2021. Compliance may require substantial investments in emissions reduction technologies, carbon offsets, and transitioning high-emitting facilities to non-emitting resources, with costs and timelines subject to regulatory and technological uncertainties. Environmental regulations protecting wildlife and endangered species can delay or restrict the development and operation of power generation, transmission, and distribution facilities, increasing costs and reducing renewable energy availability. Additionally, new or changes in regulations could further increase capital expenditures and operating costs. • **Economic and Market Risks:** Customer expectations for clean energy and decarbonization are driving rapid shifts in market dynamics. PGE must balance these evolving demands with the need to maintain reliability and affordability. Additionally, transitioning away from fossil fuels, including planned exits from coal-fired Colstrip Units 3 and 4, presents operational and economic challenges, particularly in ensuring sufficient resource adequacy during peak demand periods. • **Financial Risks:** Rising costs associated with climate-related events and the capital investments required to mitigate these risks may pose financial risks. Efforts such as grid hardening, wildfire mitigation, and the transition to renewable energy require substantial expenditures, which may not always be recoverable through customer pricing. These financial risks necessitate careful balancing of decarbonization goals with maintaining affordability and reliability for customers, while ensuring long-term financial stability for PGE. The potential for unlimited liability associated with catastrophic wildfires connected to utility infrastructure is increasing insurance costs and elevating the utility's risk profile, raising the cost of capital.

Topic	Data Request	PGE Response
Strategy Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material. *(continued)*	Describe the climate-related risks and opportunities the organization has identified over the short-, medium-, and long-term. *(continued)*	**Processes for Assessing Financial Impacts** PGE employs a structured approach to determine which climate-related risks and opportunities could have a material financial impact. Climate-related risks are integrated into the Enterprise Risk Management (ERM) framework, which is overseen by the Audit and Risk Committee, where they are assessed alongside other operational and financial risks to determine whether they are material in nature. Refer to PGE's 2024 10-K Risk Factors for additional details related to the Climate Change risks that the Company has identified. **Climate-Related Opportunities** While climate change presents challenges, considerable opportunity exists as PGE works with customers, stakeholders and communities to lead the clean energy future. PGE is leveraging climate-related opportunities to advance decarbonization, enhance grid resilience, and deliver innovative energy solutions for customers. Key opportunities include: • **Renewable Energy Leadership:** PGE continues to be a national leader in renewable energy participation through its Green Future and Green Future Impact programs, empowering customers to meet their sustainability goals. The Green Future program is the largest renewable power program by participation in the nation, with over 235,000 residential and small commercial customers voluntarily enrolled. These programs highlight strong customer demand for clean energy solutions while driving progress toward PGE's clean energy targets and strengthening customer relationships. • **Electrification and Grid Modernization:** PGE is investing in the electrification of transportation and other sectors, supporting technologies such as electric vehicles (EVs) and heat pumps. Recent grid enhancements include the integration of geographically diverse energy markets, deployment of energy storage systems, and use of automation and control technologies to manage flexible loads and distributed energy resources. PGE's Virtual Power Plant (VPP) exemplifies this innovation, utilizing distributed resources such as rooftop solar, battery storage, and demand response programs to enhance grid reliability and reduce emissions. In 2024, the VPP helped manage record energy demand, reducing load by nearly 109 MW during peak conditions. • **Customer-Centric Innovation:** PGE uses advanced data analytics, automation, and communications networks to support energy-saving programs and demand response initiatives. These efforts reduce reliance on fossil fuel-based peaking resources, enhance grid flexibility, and provide customers with cost-effective, sustainable energy solutions. By modernizing the grid and expanding customer offerings, PGE works to keep customers engaged as active participants in the clean energy transition. • **Community Resilience:** PGE is committed to fostering equitable access to clean energy while enhancing community resilience. Efforts include developing connected neighborhood microgrids, deploying smart community initiatives, and upgrading design standards to withstand extreme weather conditions. Investments in wildfire mitigation, such as updated vegetation management practices and Public Safety Power Shutoff (PSPS) zones, further support grid resilience and public safety. In addition to large-scale wind and solar generation, PGE utilizes Community-based Renewable Energy (CBRE) resources. These resources are typically smaller-scale (< 20 MW) resources that are distribution-connected and provide a wider range of community benefits, including resiliency and bill savings for customers. These resources could include stand-alone community-scale solar photovoltaic resources, solar paired with storage microgrids for resilience and small low-impact hydro opportunities.

Topic	Data Request	PGE Response
Strategy Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material. *(continued)*	Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy and financial planning.	**Business** PGE operates in a region experiencing increasingly intense climate-related events, including unprecedented heat, historic ice and snowstorms, and wildfires. These events are not just abstract global statistics; they have tangible impacts on local communities and the electrical grid. For example, in January 2024, a severe winter storm brought snow, ice, and high winds to the Company's service area, causing extensive damage to physical assets and widespread power outages. With the support of over a dozen mutual assistance crews, PGE restored power to more than 400,000 customers in the days following the storm. Similarly, in August 2023, a record-breaking heatwave set all-time high temperatures for the month, driving peak load demand to 4,498 MW—exceeding the Company's previous all-time peak and surpassing the prior summer peak by nearly 6%. Such conditions underscore the critical need to combat the effects of climate change by decarbonizing the power supply and investing in a more reliable and resilient grid. The increasing frequency and intensity of extreme weather events, driven by climate change, amplifies the likelihood and consequences of certain risks, such as prolonged outages caused by ice storms that make roads impassable. Similarly, escalating risks from extreme heat, drought conditions, and declining tree health exacerbate wildfire threats. Addressing these challenges requires strategic investments in mitigation planning, including vegetation management, grid hardening, and safety measures such as Public Safety Power Shutoff (PSPS) zones. These investments drive higher capital and operating expenses but are critical to ensuring public safety and maintaining reliable service. PGE recognizes that global climate change has far-reaching consequences that shape its approach to risk management and infrastructure planning. For additional information on risk management, mitigation, and adaptation impacts, refer to PGE's Risk Management disclosures below. Further discussion of the impact of climate-related risks and opportunities on PGE's business is provided in the response to the question above, "Describe the climate-related risks and opportunities the organization has identified over the short-, medium-, and long-term," as well as in the Overview section of the Management's Discussion and Analysis in the 2024 10K. **Strategy** Climate-related risks and opportunities are central to PGE's strategic imperatives to electrify, decarbonize, and perform. The transition plan to a clean energy future is embedded in PGE's Clean Energy Plan, which is required for compliance with Oregon's House Bill 2021 emissions targets. This strategy prioritizes investments in renewable energy resources, transportation electrification, and advanced grid technologies. Strategic planning processes, including Integrated Resource Planning (IRP) and Distribution System Planning (DSP), integrate climate-related risk assessments to prioritize grid enhancements and decarbonization strategies.

Topic	Data Request	PGE Response
Strategy Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material. *(continued)*	Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy and financial planning. *(continued)*	**Financial Planning** PGE's financial planning processes integrate climate-related considerations, driving substantial capital investments to support decarbonization and resilience initiatives. Since 2021, PGE has issued $1 billion in green bonds to finance projects under its Green Financing Framework, supporting renewable energy integration, grid modernization, and community-based renewable energy development. These investments are complemented by cost-effective solutions such as energy efficiency programs and demand response initiatives, which reduce reliance on fossil fuel-based peaking resources and lower operational costs. Additionally, PGE actively incorporates climate-related scenarios into financial planning to evaluate risks and opportunities over the short, medium, and long term. For instance, scenario modeling informs resource adequacy decisions, including the development of storage solutions and community resilience microgrids. PGE also evaluates financial risks associated with regulatory compliance, market shifts, and physical impacts, while balancing decarbonization and affordability. By aligning its financial strategy with clean energy targets, PGE is positioned to deliver long-term value for shareholders and stakeholders alike. All material capital expenditures are discussed within PGE's annual 10-K filings. For more information on PGE's green bonds visit PGE's Green Financing Website.

Topic	Data Request	PGE Response
Strategy Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.	Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	PGE defines resilience as the ability to anticipate, adapt to, withstand, and recover from disruptive events, including those driven by climate risks. PGE's strategy focuses on addressing critical risks to generation, transmission, and distribution systems while aligning efforts across business functions to enhance system and community resilience. PGE integrates climate resilience into the planning processes by considering and differentiating actions related to other plans, such as the Distribution System Plan (DSP) and Wildfire Mitigation Plan (WMP) analysis. These plans seek to advance resilience across three focus areas: • **PGE Infrastructure Resilience:** Investments in grid hardening and energy supply infrastructure aim to mitigate outages during disruptive events such as heatwaves, wildfires, wind, or ice storms. • **Operational Resilience:** Enhancements to emergency preparedness, outage response, cybersecurity, and customer support improve PGE's ability to meet customer needs during disruptive events and accelerate service restoration. • **Customer Infrastructure Resilience:** Exploration of customer-sited solutions, such as microgrids, batteries, and other distributed energy resources (DERs), empowers customers to maintain electric service during disruptive events and contribute to grid stability under normal conditions. This approach emphasizes the importance of addressing climate-related risks, such as wildfires and extreme weather events, as part of the company's broader resilience strategy. PGE's strategic planning incorporates extensive scenario analysis to assess resilience under varying climate-related scenarios, including those aligned with limiting global temperature rise to 2°C or lower. PGE's analysis emphasizes identifying, mitigating, and adapting to risks associated with transitioning to a low-carbon economy while considering increased physical climate risks such as extreme weather events. For example, PGE strives to account for, understand, and forecast wildfire risk factors across our service territory and generation areas. The Pacific Northwest faces significant and multifaceted challenges under the Representative Concentration Pathway (RCP) 8.5 climate scenario, which projects the most severe outcomes of greenhouse gas emissions. RCP 8.5 takes into account a 2°C or lower scenario. **Key considerations of PGE's resilience strategy include:** • **Impact Assessment Across Business Functions:** PGE evaluates resilience risks across generation, transmission, distribution, and customer-facing systems. Climate-related risks, including the frequency and intensity of extreme weather events, are modeled using data from studies conducted with organizations like the Oregon Climate Change Research Institute and Oregon State University. These studies evaluate potential outcomes under Representative Concentration Pathways (RCP 4.5 and RCP 8.5), providing insights into future weather extremes, including heatwaves, windstorms, and ice events. • **Integration into Operational and Capital Planning:** PGE's resilience strategy integrates predictive climate modeling into capital investments and operational practices. For example, grid-hardening initiatives and emergency response improvements aim to enhance infrastructure and operational resilience. Projects such as microgrids and distributed energy resources (DERs) are developed to support both system-wide and community-specific needs during disruptive events. • **Community Resilience and Equity Focus:** PGE incorporates equity considerations through tools like the Heat Vulnerability Index and the Equity Index, which help identify areas and populations most affected by climate risks. These tools guide resource allocation to help vulnerable communities benefit from investments in resilience, including cooling relief programs and distributed energy solutions.

Topic	Data Request	PGE Response
Strategy Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material. *(continued)*	Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario. *(continued)*	• **Deep Decarbonization Study Insights:** In 2018, PGE commissioned a study of pathways for deep decarbonization in its service territory to inform its Integrated Resource Planning process and the carbon policy discussion in Oregon. In 2022, the study was updated to account for new climate and clean energy laws and regulations in Oregon. The Deep Decarb Study explores potential pathways for economy-wide decarbonization across PGE's service territory given the enactment of House Bill 2021 and DEQ's Climate Protection Program emissions targets. It demonstrates that PGE's strategies are feasible for achieving compliance with HB 2021 and CPP targets, emphasizing the need for unprecedented renewable and storage procurement. Insights from the study have directly informed PGE's Clean Energy Plan and Integrated Resource Plan, ensuring alignment with long-term climate goals and policy requirements. • **Financial and Strategic Impacts:** PGE assesses the financial implications of climate scenarios by evaluating potential changes to revenue streams, operational costs, and asset performance. These assessments consider technology pathways, policy developments, and energy market shifts to keep resource procurement and strategic investments aligned with Oregon's clean energy targets. • **Scenario-Specific Adaptations:** PGE participates in initiatives like the EPRI Climate READi program to develop common frameworks for understanding climate risks and prioritizing mitigation investments. These efforts support adaptability and help align resilience measures align with evolving climate data and regional needs. • **Time Horizons and Scenario Models:** PGE's various scenario analyses spans short-, medium-, and long-term horizons, informed by climate projections through 2070. Resilience strategies are regularly updated to reflect emerging data, community feedback, and advancements in renewable energy and storage technologies. For additional details on PGE's scenario modeling and outcomes, refer to Section 13.2 (Evaluating Resilience Risks) and Section 13.5 (Programs and Opportunities) of the Clean Energy Plan and Integrated Resource Plan.

Topic	Data Request	PGE Response
Risk management Disclose how the organization identifies, assesses and manages climate-related risks.	Describe the organization's processes for identifying and assessing climate-related risks.	PGE employs a structured, risk-informed decision-making process to identify and assess climate-related risks, providing a comprehensive evaluation of risks and opportunities across the organization. By integrating industry-leading practices, such as the ISO 31000 standards and the Committee of Sponsoring Organizations of the Treadway Commission (COSO) framework, PGE applies a consistent methodology for risk identification, analysis, evaluation, and mitigation planning. **Risk Identification and Assessment Framework** PGE evaluates risks across multiple dimensions, including safety, environmental, reliability, financial, regulatory, and customer impacts. The process involves a combination of tools and methodologies, including: • **Scenario Analysis and Probabilistic Forecasting:** Projections of climate-related risks such as wildfires, extreme heat, freezing rain, and drought guide infrastructure planning and operational strategies. • **Iterative Risk Identification:** Surveys, workshops, expert judgment, and case studies inform a detailed understanding of emerging and existing risks. • **Stakeholder Engagement:** Collaboration with regulators, customers, and community partners aligns risk management strategies with shared priorities and compliance requirements, such as Oregon's HB 2021 and the Renewable Portfolio Standard (RPS). • **External Research and Partnerships:** PGE incorporates insights from studies like the Oregon Climate Change Research Institute and Oregon State University's projections for extreme weather events, which highlight how events such as once-in-a-century storms may become far more frequent, dramatically altering risk profiles. **Climate Change Variables and Risk Classification** Recognizing that historical data is no longer a reliable predictor of future climate impacts, PGE incorporates climate change variables into its risk models. Projections of increased wildfire severity, declining vegetation health, and heightened aridity are used to refine asset management practices, infrastructure investments, and emergency response protocols. For example: • **Fire Regime and Wildfire Risks:** PGE applies fire regime models that consider fuel loads, climate patterns, and ecosystem types to assess and prioritize mitigation measures in high-risk areas. • **High-Resolution Weather Models:** PGE utilizes a 2 km-resolution weather and vegetation moisture forecasting model to better understand and contextualize climate risks, allowing for improved operational planning and decision-making. **Governance and Oversight** PGE's integrated governance structure supports consistent evaluation and monitoring of climate-related risks. The Executive Risk Committee, chaired by the CEO and including senior leaders such as the CFO and Chief Legal Officer, oversees risk management processes. Specialized committees, including the Integrated Security Executive Committee and Compliance Committee, apply the same consistent framework to assess risks and prioritize actions. Refer to the Governance TCFD Disclosures above for further details on PGE's governance oversight of climate related risks. **Prioritizing and Addressing Risks** Climate-related risks are evaluated based on their likelihood, potential size, and scope. PGE employs methodologies such as Risk Spend Efficiency (RSE) and Value Spend Efficiency (VSE) to quantify the effectiveness of mitigation measures, helping to direct investments toward achieving the highest potential risk reduction per dollar spent. For example: • **Wildfire Mitigation:** Investments in covered conductors, vegetation management, and grid hardening are guided by models that incorporate climate change variables and collaboration with partners such as the Oregon Department of Forestry. • **Customer Resilience:** Distributed Energy Resources (DERs), such as microgrids and battery storage, are evaluated for their potential to enhance customer resilience during disruptive events and contribute to grid stability under normal conditions. **Integration into Strategic and Financial Planning** Identified risks and opportunities are incorporated into PGE's strategic and financial planning processes, including the Clean Energy Plan (CEP) and Integrated Resource Plan (IRP). Scenario analyses and climate projections help guide resource allocation, prioritize investments in grid resilience, and support compliance with regulatory mandates. For example, insights from wildfire risk models and climate studies inform PGE's Wildfire Mitigation Plan (WMP) and Distribution System Plan (DSP), aligning with broader resilience strategies. **Transparency and Reporting** PGE regularly evaluates and reports material climate-related risks in its annual Form 10-K filing and aligns its risk assessment processes with best practices and regulatory requirements. This includes identifying risks with potential financial implications and providing transparency around mitigation strategies. By combining robust internal frameworks with external benchmarking, PGE adapts its risk management approach to address the evolving challenges of climate change.

Topic	Data Request	PGE Response
Risk management Disclose how the organization identifies, assesses and manages climate-related risks. *(continued)*	Describe the organization's processes for managing climate-related risks.	**Processes for Managing Climate-Related Risks** Building on the identification and assessment processes described above, PGE employs a proactive and integrated approach to managing climate-related risks. These risks are addressed through robust governance, targeted mitigation strategies, and an emphasis on long-term adaptability to evolving climate challenges. PGE's management processes focus on prioritizing and mitigating risks across multiple dimensions, such as safety, environmental, regulatory, financial, and customer impacts. Climate-related risks—including severe weather events, wildfires, and regulatory changes—are evaluated for their materiality and managed through a combination of mitigation, transfer, and control strategies. **Risk Mitigation and Adaptation Measures** Key strategies include: • **Wildfire Mitigation and Resilience:** PGE's Wildfire Mitigation Plan (WMP) guides annual investments in system hardening, vegetation management, and operational measures such as Public Safety Power Shutoffs (PSPS). During 2024, PGE invested $40 million in capital projects related to wildfire mitigation and resiliency and utility asset management. These initiatives aim to reduce ignition risks, enhance grid resilience, and minimize customer impacts during wildfire events. • **Emergency Preparedness:** PGE employs meteorologists to assist in forecasting and event management, while also coordinating with local, county, and state agencies to reduce the impact of climate-related events on customers and communities. • **Grid Modernization:** Investments in Distributed Energy Resources (DERs) and Virtual Power Plants (VPPs) enhance grid flexibility, reliability, and the ability to integrate renewable energy sources. These initiatives support PGE's long-term decarbonization goals while addressing the risks posed by fluctuating demand and extreme weather. • **Distribution System Plan (DSP):** The DSP plays a critical role in managing climate-related risks by guiding infrastructure upgrades and resource integration. It aligns with PGE's Clean Energy Plan (CEP) to support grid resilience and accelerated decarbonization. **Prioritization of Climate-Related Risks** Materiality determinations for climate-related risks are conducted using established criteria, including likelihood, scope, and potential financial impact. High-priority risks—such as wildfire threats and regulatory compliance—are integrated into enterprise-level planning processes. PGE employs methodologies like Risk Spend Efficiency (RSE) and Value Spend Efficiency (VSE) to evaluate and prioritize mitigation projects based on estimated risk reduction value. **Integration with Strategic Planning** As outlined in the section above, climate-related risks are embedded into PGE's strategic and financial planning processes. Scenario analyses and predictive modeling guide resource allocation and help identify opportunities to enhance resilience while balancing affordability and reliability. PGE's plans, including the Wildfire Mitigation Plan (WMP) and Integrated Resource Plan (IRP), reflect a commitment to addressing climate risks holistically. **Ongoing Review and Adaptation** PGE continuously monitors and reviews the effectiveness of risk controls and mitigation activities through tools such as the Risk Dashboard and integrated risk assessments. These processes help refine strategies, track progress, and incorporate new data into planning efforts. Collaboration with regulators, customers, and community partners further supports alignment with shared priorities and helps maintain the effectiveness of mitigation efforts. By integrating climate-related risk management into its broader operational and strategic framework, PGE maintains its focus on delivering safe, reliable, and sustainable energy while adapting to the challenges posed by a changing climate.

Topic	Data Request	PGE Response
Risk management Disclose how the organization identifies, assesses and manages climate-related risks. *(continued)*	Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organization's overall risk management.	Climate-related risks and processes for identifying, assessing, and managing those risks are a part of PGE's overall approach to enterprise risk management (ERM). PGE's ERM program facilitates the identification, analysis, evaluation, and treatment of risks across the company, including climate risks such as wildfires, major storms, and other natural disasters to determine their potential impact on operations and financials. These risks are evaluated alongside other enterprise risks, such as operational, financial, and regulatory risks, using a consistent framework designed to address interdependencies. The ERM process leverages tools such as probabilistic analysis, expert judgement, and scenario analysis to evaluate both current and future climate-related risks. For instance, wildfire and storm risks are assessed through predictive modeling that considers regional climate trends and are integrated into capital investment and operational planning. This work is conducted at multiple levels within the organization, involving line managers, senior management, and officers. PGE's ERM program reports directly to the Executive Risk Committee (ERC), which is composed of the CEO, CFO, and other senior leaders, which reviews key enterprise risks and current and planned mitigation actions. The ERC, in turn, reports to the Audit and Risk Committee, who is responsible for assisting the board of directors in overseeing PGE's Enterprise Risk Management program. Additionally, climate-related risks are embedded into PGE's overall business strategy, which centers on three long-term imperatives — electrify, decarbonize, perform. For example, climate-related risks influence resource allocation for infrastructure resilience, the prioritization of renewable energy projects, and investment in grid modernization. These strategic imperatives are overseen by the board of directors, ensuring alignment with PGE's long-term goals.

Topic	Data Request	PGE Response
Metrics and targets Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.	Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.	PGE has numerous metrics to guide the Company's actions in managing climate-related risks and opportunities. These metrics span decarbonization, greenhouse gas (GHG) emissions reduction, electrification, and performance. Key metrics, along with references to sources where historical data and methodologies projections can be found, are detailed below: **Decarbonization Metrics** • **Renewable energy capacity sourced and developed (MW):** Refer to the EEI report, page 79-81 • **Renewable energy procured and produced from the capacity above (MWh):** Refer to the EEI report, page 79-81 • **Annual renewable energy portfolio as a % of retail load served by qualifying renewable resources:** Refer to the EEI report, page 79-81 • **Percentage of retail load served by non-emitting resources:** Refer to the EEI report, page 79-81 **GHG Emissions Metrics** • **GHG emissions associated with the power delivered to Oregon retail customers:** Refer to the SASB report, page 58 • **Scope 1, 2, and 3 GHG Emissions:** Refer to the Metrics and Targets disclosure B below, page 76 **Electrification & Performance Metrics** • **Percentage of PGE's vehicle fleet electrified:** Refer to ESG report Key Metrics table, page 54 • **System reliability metrics, such as System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI), among many others:** Refer to the SASB report, page 62 • **Amounts issued under PGE's Green Financing Framework, created to support investments in projects and assets that advance PGE's sustainability goals** • **Voluntary renewable program participation:** Refer to ESG report Key Metrics table, page 54 **Water and Waste Management Metrics** PGE reports metrics on climate-related risks associated with water and waste management through the EEI ESG Quantitative Report and SASB Report. For additional details on PGE's methodologies and strategies for mitigating water and waste management risks, refer to the SASB and EEI ESG Quantitative reports. **Additional Information** For metrics used to measure and manage financial impacts of climate-related risks and opportunities, refer to the 2024 10-K, 2024 Annual Report, and 2025 Proxy Statement. **Incentive compensation tied to clean energy** PGE's long-term incentive (LTI) awards granted to our executives and other key employees includes a performance metric related to achievement of PGE's strategic goals surrounding clean energy. This metric is used to create incentive to reduce carbon potential in the Company's energy supply portfolio in support of Oregon's GHG emission reduction goals. The metric is to be measured based on average megawatts of forecast energy from carbon-free resources, Oregon's Renewable Portfolio Standard-qualifying resources, and low-carbon emitting (i.e., greater than or equal to 95% carbon-free) systems of resources added to the Company's energy supply portfolio during the performance period. For more information on metrics incorporated into PGE's renumeration policies, refer to the Company's 2025 Proxy statement.

Topic	Data Request	PGE Response
Metrics and targets Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.	Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.	**Scope 1*** Refer to the Greenhouse Gas Emissions section of the SASB Report for Scope 1 disclosures. **Scope 2*** Market Based — 39,314 MTCO2e Location Based — 39,507 MTCO2e This represents emissions from electricity purchased and consumed as well as T&D line loss associated with wheeled power in 2024. **Scope 3*** 2,062,153 MTCO2e from the generation of purchased electricity that is sold to end users. Reporting and data collection capabilities are still being developed for other Scope 3 sources of emissions. *These metrics are preliminary and have been calculated using the GHG Accounting Protocol's Corporate Standard. **GHG Intensity** 0.27 MTCO2e per MWh for PGE's total system load 0.28 MTCO2e per MWh for power served to Oregon retail customers** ** These figures are preliminary and based on generated and purchased energy associated with serving retail customers within the state of Oregon, as required by the Oregon Department of Environmental Quality (ODEQ). Some or all the renewable energy attributes associated with PGE's Basic Service Mix may be sold, claimed or not acquired. Refer to the Emissions section of the EEI ESG Quantitative report for more GHG efficiency ratios.

Topic	Data Request	PGE Response
Metrics and targets Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.	Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	PGE has established ambitious climate-related targets to manage risks and opportunities in alignment with Oregon's regulatory requirements and voluntary commitments. These targets address greenhouse gas (GHG) emissions reduction, renewable energy integration, and transportation electrification. They are foundational to PGE's Clean Energy Plan and Integrated Resource Plan (CEP/IRP), guiding the Company's efforts toward a cleaner, more sustainable energy future. **1. HB 2021: State-Mandated GHG Emission Reduction Goals** Oregon's House Bill 2021 (HB 2021) established some of the most ambitious clean electricity targets in the nation, requiring utilities to reduce GHG emissions associated with the power served to retail customers. These reductions are measured against a 2010–2012 baseline of 8.1 million metric tons of CO2e and include the following interim targets: • 80% by 2030, • 90% by 2035, • 100% by 2040. These targets were informed by the Oregon Climate Change Research Institute's Sixth Climate Assessment and reflect a science-based approach to decarbonization. PGE uses the 2010–2012 baseline of 8.1 million metric tons of CO2e for HB 2021 emissions tracking, consistent with state mandates, and interim progress is reported in the Company's CEP and ESG filings. In 2024, emissions associated with retail power served were reduced by approximately 34% compared to the 8.1 million metric ton baseline. PGE continues to prioritize investments in renewable resources, storage solutions, and demand-side programs to meet these targets. **2. PGE's Climate Pledge: Voluntary Net-Zero Goal** In 2021, PGE joined The Climate Pledge, a voluntary commitment to achieve net-zero carbon emissions by 2040—ten years ahead of the Paris Agreement's target of 2050. This pledge includes: • Regular measurement and reporting of GHG emissions, • Implementation of decarbonization strategies through business innovations, efficiency improvements, renewable energy, and material reductions, • Offsetting residual emissions with socially beneficial, permanent, and quantifiable carbon offsets. This voluntary goal complements HB 2021, demonstrating leadership in transitioning to a low-carbon economy while maintaining reliability and affordability. **3. Oregon Renewable Portfolio Standard (RPS)** Oregon's Renewable Portfolio Standard (RPS) mandates that utilities deliver an increasing share of renewable energy to their customers, requiring: • 27% of retail load by 2025, • 35% by 2030, • 45% by 2035, • 50% by 2040. These targets use annual retail load as the baseline for measuring compliance. In addition to these thresholds, the RPS requires that coal-fired generation be eliminated from serving Oregon customers. PGE has consistently met RPS requirements through investments in wind, solar, and hydro resources. Progress is reported annually through compliance filings with the Oregon Public Utility Commission and detailed in the CEP/IRP.

Topic	Data Request	PGE Response
	Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets. *(continued)*	**Integrated Planning and Progress Measurement** To achieve these goals, PGE aligns its Integrated Resource Plan (IRP) and Clean Energy Plan (CEP) with state mandates and voluntary commitments. The 2023 IRP/CEP, filed with the Oregon Public Utility Commission, outlines a 20-year roadmap for decarbonization. PGE also engages in innovative projects like Electric Island, a heavy-duty electric truck charging site, to promote the adoption of clean energy technologies across sectors. **Key Performance Indicators and Methodologies** PGE tracks progress against these targets using both absolute and intensity-based metrics, including: • Annual GHG emissions reductions (in metric tons of CO2e) using the 2010–2012 baseline, • Renewable energy penetration (as a percentage of retail load), These metrics are regularly reported through regulatory filings and sustainability reports, providing transparency and accountability to stakeholders. For detailed methodologies, annual performance data, and future plans, refer to PGE's CEP/IRP and annual ESG report.

2024
Edison Electric Institute (EEI) ESG/ Sustainability Quantitative Information

PARENT COMPANY: PORTLAND GENERAL ELECTRIC

BUSINESS TYPE(S): VERTICALLY INTEGRATED

STATE(S) OF OPERATION: OREGON

STATE(S) WITH RPS PROGRAMS: YES

REGULATORY ENVIRONMENT: REGULATED

REPORT DATE: 3.05.25

THE METRICS REPORTED WITHIN THIS TEMPLATE ARE UNAUDITED.

PORTFOLIO

Ref. No.	Metric	2022	2023	2024	Comments, links, additional information and notes
1	**Owned Nameplate Generation Capacity at end of year (MW)**	**3,377**	**3,359**	**3,573**	**Source: SEC Form 10-K. Please note that the figures included within the 10-K do not include solar energy, as the amount is immaterial for financial reporting purposes.**
1.1	Coal	296	296	296	
1.2	Natural Gas	1,842	1,811	1,818	
1.3	Nuclear	0	0	0	
1.4	Petroleum	0	0	0	
1.5	Total Renewable Energy Resources	1,239	1,252	1,459	
1.5.1	Biomass/Biogas	0	0	0	
1.5.2	Geothermal	0	0	0	
1.5.3	Hydroelectric	419	432	431	
1.5.4	Solar	3	3	3	
1.5.5	Wind	817	817	1,025	
1.6	Other	0	0	0	

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PORTFOLIO

Ref. No.	Metric	2022	2023(A)	2024(B)	Comments, links, additional information and notes
2	**Net Generation for the data year (MWh)[1]**	**20,439,051**	**20,521,683**	**20,938,189**	**Source:** PGE reporting to Oregon Department of Environmental Quality Investor-Owned Utilities greenhouse gas reporting. Values reflect MWhs serving retail load and do not include wholesale sales.
2.1	Coal	1,237,766	1,321,145	974,674	
2.2	Natural Gas	6,953,007	8,919,240	8,467,857	
2.3	Nuclear	0	0	0	
2.4	Petroleum	2,245	1,648	1,507	
2.5	Total Renewable Energy Resources	7,948,582	6,960,237	8,479,964	
2.5.1	Biomass/Biogas	87,110	93,525	91,771	
2.5.2	Geothermal	0	0	0	
2.5.3	Hydroelectric	5,333,555	4,014,699	4,341,274	
2.5.4	Solar	625,755	950,112	985,717	
2.5.5	Wind	1,902,162	1,901,902	3,061,202	
2.6	Other (includes non-listed fuel types and unknown sources)	4,297,451	3,319,413	3,014,187	

PORTFOLIO

Ref. No.	Metric	2022	2023(A)	2024(B)	Comments, links, additional information and notes
2.i	**Owned Net Generation for the data year (MWh)[1]**	**9,942,119**	**11,955,791**	**12,039,805**	**Source:** PGE reporting to Oregon Department of Environmental Quality Investor-Owned Utilities greenhouse gas reporting. Values reflect MWhs serving retail load and do not include wholesale sales.
2.1.i	Coal	1,237,766	1,321,145	974,674	
2.2.i	Natural Gas	6,924,213	8,769,359	8,393,788	
2.3.i	Nuclear	0	0	0	
2.4.i	Petroleum	2,245	1,648	1,507	
2.5.i	Total Renewable Energy Resources	1,777,895	1,863,640	2,669,836	
2.5.1.i	Biomass/Biogas	0	0	0	
2.5.2.i	Geothermal	0	0	0	
2.5.3.i	Hydroelectric	583,885	671,678	694,591	
2.5.4.i	Solar	2,348	1,846	1,716	
2.5.5.i	Wind	1,191,662	1,190,116	1,973,530	
2.6.i	Other (includes non-listed fuel types and unknown sources)	0	0	0	

PORTFOLIO

Ref. No.	Metric	2022	2023(A)	2024(B)	Comments, links, additional information and notes
2.ii	**Purchased Net Generation for the data year (MWh)[1]**	**10,496,932**	**8,565,892**	**8,898,384**	
2.1.ii	Coal	0	0	0	
2.2.ii	Natural Gas	28,794	149,881	74,069	
2.3.ii	Nuclear	0	0	0	
2.4.ii	Petroleum	0	0	0	
2.5.ii	Total Renewable Energy Resources	6,170,687	5,096,597	5,810,127	
2.5.1.ii	Biomass/Biogas	87,110	93,525	91,771	
2.5.2.ii	Geothermal	0	0	0	
2.5.3.ii	Hydroelectric	4,749,670	3,343,021	3,646,683	
2.5.4.ii	Solar	623,407	948,266	984,001	
2.5.5.ii	Wind	710,500	711,786	1,087,672	
2.6.ii	Other (includes non-listed fuel types and unknown sources)	4,297,451	3,319,413	3,014,187	

PORTFOLIO

Ref. No.	Metric	2022	2023	2024	Comments, links, additional information and notes
3	**Capital Expenditures and Energy Efficiency (EE)**				
3.1	Total Annual Capital Expenditures (nominal dollars)	$811,000,000	$1,462,000,000	$1,262,000,000	Source: SEC Form 10-K
3.2	Incremental Annual Electricity Savings from EE Measures (MWh)	254,290	223,655*	250,850*	*ETO 2024 Preliminary Annual Results that are subject to change. This amount includes public purpose charge and incremental investment.
3.3	Incremental Annual Investment in Electric EE Programs (nominal dollars)	$84,993,482	$87,833,700	$130,447,583	
4	**Retail Electric Customer Count**				**Source: SEC Form 10-K, Average 2024 Customers**
4.1	Commercial	112,602	112,667	113,942	
4.2	Industrial	269	273	281	
4.3	Residential	809,573	815,920	829,721	

EMISSIONS[2]

Ref. No.	Metric	2022	2023(A)	2024(B)	Comments, links, additional information and notes
5	**GHG Emissions: Carbon Dioxide (CO_2) and Carbon Dioxide Equivalent (CO_2e)**				
5.1	**Owned Generation**				
5.1.1	**Carbon Dioxide (CO_2)[2]**				
5.1.1.1	Total Owned Generation CO_2 Emissions (MT)[2]				
5.1.1.2	Total Owned Generation CO_2 Emissions Intensity (MT/Net MWh)[2]				
5.1.2	**Carbon Dioxide Equivalent (CO_2e)**				
5.1.2.1	Total Owned Generation CO_2e Emissions (MT)[1]	4,078,253	5,022,755	4,522,904	To calculate 2024 emissions associated with power deliveries to retail customers in Oregon, PGE used ODEQ 2023 emission factors as ODEQ 2024 emission factors are not yet available.
5.1.2.2	Total Owned Generation CO_2e Emissions Intensity (MT/Net MWh)[1]	0.41	0.42	0.38	
5.2	**Purchased Power**				
5.2.1	**Carbon Dioxide (CO_2)[2]**				
5.2.1.1	Total Purchased Generation CO_2 Emissions (MT)[2]				
5.2.1.2	Total Purchased Generation CO_2 Emissions Intensity (MT/ Net MWh)[2]				
5.2.2	**Carbon Dioxide Equivalent (CO_2e)**				
5.2.2.1	Total Purchased Generation CO_2e Emissions (MT)[1]	1,938,049	1,536,979	1,372,899	To calculate 2024 emissions associated with power deliveries to retail customers in Oregon, PGE used ODEQ 2023 emission factors as ODEQ 2024 emission factors are not yet available.
5.2.2.2	Total Purchased Generation CO_2e Emissions Intensity (MT/Net MWh)[1]	0.18	0.18	0.15	

EMISSIONS[2]

Ref. No.	Metric	2022	2023(A)	2024(B)	Comments, links, additional information and notes
5.3	**Owned Generation + Purchased Power**				
5.3.1	**Carbon Dioxide (CO_2)[2]**				
5.3.1.1	Total Owned + Purchased Generation CO_2 Emissions (MT)[2]				
5.3.1.2	Total Owned + Purchased Generation CO_2 Emissions Intensity (MT/Net MWh)[2]				
5.3.2	**Carbon Dioxide Equivalent (CO_2e)**				
5.3.2.1	Total Owned + Purchased Generation CO_2e Emissions (MT)[1]	6,016,302	6,559,734	5,895,803	These amounts represent anthropogenic emissions only. Total biogenic emissions for 2022, 2023, and 2024 were 101,603 MTCO2e, 78,433 MTCO2e, and 75,820 MTCO2e.
5.3.2.2	Total Owned + Purchased Generation CO_2e Emissions Intensity (MT/ Net MWh)[1,3]	0.29	0.32	0.28	
5.4	**Non-Generation CO_2e Emissions**				
5.4.1	Total CO_2e emissions of SF6 (MT)[4]	7,008	5,777	1,233	See footnotes 4 and 5.
5.4.2	Leak rate of CO_2e emissions of SF6 (MT/Net MWh)	0.000530	0.000355	0.000072	

EMISSIONS

Ref. No.	Metric	2022	2023	2024	Comments, links, additional information and notes
6	**Nitrogen Oxide (NOx), Sulfur Dioxide (SO_2), Mercury (Hg)**				
6.1	Generation basis for calculation[5]				See footnote 5.
6.2	**Nitrogen Oxide (NOx)**				
6.2.1	Total NOx Emissions (MT)	2,446	2,787	2,495	See footnote 5.
6.2.2	Total NOx Emissions Intensity (MT/Net MWh)	0.000185	0.000171	0.000146	
6.3	**Sulfur Dioxide (SO_2)**				
6.3.1	Total SO_2 Emissions (MT)	808	953	853	See footnote 5.
6.3.2	Total SO_2 Emissions Intensity (MT/Net MWh)	0.000061	0.000059	0.000050	
6.4	**Mercury (Hg)**				
6.4.1	Total Hg Emissions (kg)	7.1	7.7	7.5	See footnote 5.
6.4.2	Total Hg Emissions Intensity (kg/Net MWh)	0.00000054	0.00000047	0.00000044	

RESOURCES

Ref. No.	Metric	2022	2023	2024	Comments, links, additional information and notes
	Human Resources				
7.1	Total Number of Employees	2,873	2,842	2,915	
7.2	Percentage of Women in Total Workforce	33%	33%	34%	
7.3	Percentage of Minorities in Total Workforce	26%	27%	25%	
7.4	Total Number on Board of Directors/Trustees	12	10	9	As of 12/31/2024.
7.5	Percentage of Women on Board of Directors/ Trustees	42%	50%	56%	As of 12/31/2024.
7.6	Percentage of Minorities on Board of Directors/ Trustees	42%	50%	44%	As of 12/31/2024.
7.7	**Employee Safety Metrics**				
7.7.1	Recordable Incident Rate	1.77	1.04	0.79	2023 value updated from the prior year as a result of an updated calculation performed in 2024.
7.7.2	Lost-time Case Rate	0.74	0.36	0.26	2023 value updated from the prior year as a result of an updated calculation performed in 2024.
7.7.3	Days Away, Restricted, and Transfer (DART) Rate	1.03	0.75	0.39	
7.7.4	Work-related Fatalities	0	0	0	
8	**Fresh Water Resources (cooling water; does not include nominal water use (e.g., drinking water) for which data were not readily available)**				
8.1	Water Withdrawals — Consumptive (Millions of Gallons)	5,964	5,635	5,942	Water use data generally limited to consumptive cooling water use, non-consumptive estimates included where available.
8.2	Water Withdrawals — Non-Consumptive (Millions of Gallons)	132	207	190	Water use data generally limited to consumptive cooling water use, non-consumptive estimates included where available.
8.3	Water Withdrawals — Consumptive Rate (Millions of Gallons/Net MWh)	0.000450	0.000347	0.000349	
8.4	Water Withdrawals — Non-Consumptive Rate (Millions of Gallons/Net MWh)	0.000010	0.000013	0.000011	

RESOURCES

Ref. No.	Metric	2022	2023	2024	Comments, links, additional information and notes
9	**Waste Products**				
9.1	Amount of Hazardous Waste Manifested for Disposal (MT)	4.3	51.2	17.2	In past ESG reports, PGE has included aerosol cans in the calculation of hazardous waste manifested for disposal. However, over time, PGE has changed its approach to managing aerosol cans, which we now treat as universal waste; consequently, we are no longer reporting aerosol cans as hazardous waste. This change is reflected in our 2024 total.
9.2	Percent of Coal Combustion Products Beneficially Used	0.74%	0.00%	0.00%	
KEY	**MT = metric tons** **1 lb. = 453.59 grams** **1 metric ton = 1.1023 short tons**				
	TOTAL CO_2e IS CALCULATED USING THE FOLLOWING GLOBAL WARMING POTENTIALS FROM THE IPCC FOURTH ASSESSMENT REPORT: **CO_2 = 1** **CH_4 = 25** **N_2O = 298** **SF_6 = 22,800**				

NOTES

(1) Generation MWhs, purchased MWhs, and greenhouse gas emissions data are reported based on the Oregon Department of Environmental Quality (ODEQ) Investor Owned Utility GHG report (oregon.gov/deq/FilterDocs/IOUProtocols.pdf). This report shows greenhouse gas emissions and MWhs in terms of power provided to PGE retail customers; it does not account for generation, purchases, or emissions associated with power delivered outside of PGE service territory.

(2) Greenhouse gas emissions are reported in terms of CO_2e only and are based on the ODEQ Investor Owned Utility GHG report. The ODEQ report shows greenhouse gas emissions associated with power provided to PGE customers and does not account for emissions associated with power delivered outside of PGE service territory.

(3) This calculation has been performed for inclusion in PGE's Environmental, Social and Governance report only and is not intended for other use. It represents preliminary MTCO2e/MWh associated with PGE's retail load. Some or all of the renewable energy attributes associated with PGE's retail load may be sold, claimed or not acquired.

(4) As reported to EPA under the mandatory GHG Reporting Protocols (40 CFR Part 98, Subpart DD).

(5) Calculated based off of total PGE system generation (which includes power served to retail customers and power served outside of PGE's service territory).

(A) These amounts have been restated from the prior year ESG report as a result of finalizing review and third-party verification procedures with the Oregon Department of Environmental Quality.

(B) These amounts are preliminary and could vary from those filed with ODEQ.

Blank cells indicate that the Company has not measured, is unable to track, or has not provided this data point. Cell values of zero indicate that the Company has measured the requested metric and has resulted in a measurement of zero.

Forward-Looking Statements

Statements in this report that relate to future plans, objectives, expectations, performance, events and the like may constitute "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995, Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. These forward-looking statements represent our estimates and assumptions as of the date of this report. The Company assumes no obligation to update or revise any forward-looking statement as a result of new information, future events or other factors.

Forward-looking statements include statements regarding the Company's full-year earnings guidance (including assumptions and expectations regarding annual retail deliveries, average hydro conditions, wind generation, normal thermal plant operations, operating and maintenance expense and depreciation and amortization expense) as well as other statements containing words such as "anticipates," "assumptions," "based on," "believes," "conditioned upon," "considers," "could," "estimates," "expects," "forecast," "goals," "intends," "needs," "plans," "predicts," "projects," "promises," "seeks," "should," "subject to," "targets," "will continue," "will likely result," or similar expressions.

Investors are cautioned that any such forward-looking statements are subject to risks and uncertainties, including, without limitation: the timing or outcome of various legal and regulatory actions; changing customer expectations and choices that may reduce demand for electricity; the sale of excess energy during periods of low demand or low wholesale market prices; operational risks relating to the Company's generation and battery storage facilities, including hydro conditions, wind conditions, disruption of transmission and distribution, disruption of fuel supply, and unscheduled plant outages, which may result in unanticipated operating, maintenance and repair costs, as well as replacement power costs; delays in the supply chain and increased supply costs (including application of tariffs impacting solar module imports), failure to complete capital projects on schedule or within budget, failure of counterparties to perform under agreement, or the abandonment of capital projects, which could result in the Company's inability to recover project costs, or impact our competitive position, market share, revenues and project margins in material ways; default or nonperformance of counterparties from whom PGE purchases capacity or energy, which require the purchase of replacement power and renewable attributes at increased costs; complications arising from PGE's jointly-owned plant, including ownership changes, regulatory outcomes or operational failures; the costs of compliance with environmental laws and regulations, including those that govern emissions from thermal power plants; changes in weather, hydroelectric and energy market conditions, which could affect the availability, cost and required collateral for purchased power and fuel; changes in capital and credit market conditions, including volatility of equity markets, reductions in demand for investment-grade commercial paper or interest rates, which could affect the access to and availability or cost of capital and result in delay or cancellation of capital projects or execution of the Company's strategic plan as currently envisioned; general economic and financial market conditions, including inflation; the effects of climate change, whether global or local in nature; unseasonable or severe weather conditions, wildfires, and other natural phenomena and natural disasters that could result in operational disruptions, unanticipated restoration costs, third party liability or that may affect energy costs or consumption; the effectiveness of PGE's risk management policies and procedures; PGE's ability to effectively implement Public Safety Power Shutoffs (PSPS) and de-energize its system in the event of heightened wildfire risk; cyber security attacks, data security breaches, physical attacks and security breaches, or other malicious acts, which could disrupt operations, require significant expenditures, or result in claims against the Company; employee workforce factors, including potential strikes, work stoppages, transitions in senior management, and the ability to recruit and retain key employees and other talent and turnover due to macroeconomic trends; widespread health emergencies or outbreaks of infectious diseases such as COVID-19, which may affect our financial position, results of operations and cash flows; failure to achieve the Company's greenhouse gas emission goals or being perceived to have either failed to act responsibly with respect to the environment or effectively responded to legislative requirements concerning greenhouse gas emission reductions; social attitudes regarding the electric utility and power industries; political and economic conditions; acts of war or terrorism; changes in financial or regulatory accounting principles or policies imposed by governing bodies; changes in effective tax rate; and risks and uncertainties related to All-Source RFP projects, including, but not limited to, regulatory processes, transmission capabilities, system interconnections, permitting and construction delays, legislative uncertainty, inflationary impacts, supply costs and supply chain constraints. As a result, actual results may differ materially from those projected in the forward-looking statements.

Risks and uncertainties to which the Company is subject are further discussed in the reports that the Company has filed with the United States Securities and Exchange Commission (SEC). These reports are available through the EDGAR system free-of-charge on the SEC's website, www.sec.gov and on the Company's website, investors.portlandgeneral.com. Investors should not rely unduly on any forward-looking statements.

Metrics calculated using the Greenhouse Gas Reporting Protocol's Corporate Standard within this report are subject to change if changes in methodology occur, either as a result of a change in interpretation and application of the protocol or formal changes made to the protocol's guidance.


PGE

From: Lenna Cope
Sent: Friday, January 30, 2026 4:31 PM
To: CLARK Christopher * ODOE
Cc: Chris Bozzini; Kathleen Campanella; Ziola, Kiana
Subject: PGE Comments to the Proposed Order on RFA4 of the BCWF Site Certificate
Attachments: BIGL RFA4_Comment Letter to ODOE_01302026.pdf; BCWF RFA4_Goal 3 Comment Letter_01302026.pdf

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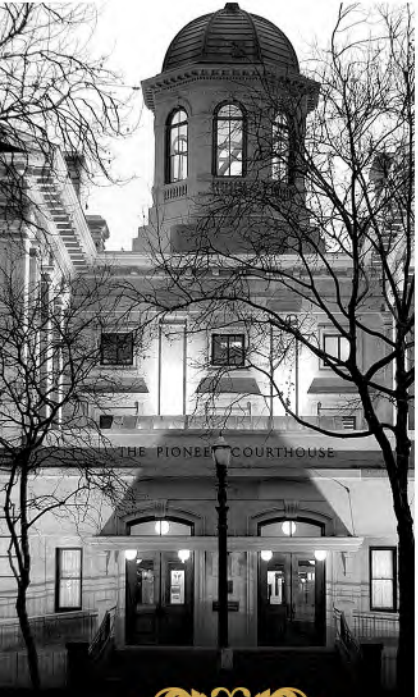
Categories: Tracked To Dynamics 365

Mr. Clark,

Please find attached PGE's comments in response to the Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. Two attachments associated with our Goal 3 Comment Letter will be uploaded to a SharePoint site for you to download. That link will be shared shortly. The attachments will be PGE's 2023 Clean Energy Plan/Integrated Resource Plan Update and PGE's 2024 ESG Report.

Thank you.

Lenna Cope, P.E.
Pronouns: she/her
Senior Environmental Specialist | 503-464-2634 | 503-313-5022
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BIGLOW CANYON WINDFARM HEARING BEFORE
OREGON DEPARTMENT OF ENERGY
ENERGY FACILITY SITING COUNCIL

HELD VIA WEBEX

THURSDAY, JANUARY 15, 2026

3:30 P.M.

GRASS VALLEY COMMUNITY PAVILION

233 NORTH MILL STREET

GRASS VALLEY, OREGON 97029

PARTICIPANTS

ENERGY FACILITY SITING COUNCIL MEMBERS:
Cindy Condon, Chair
Kent Howe
Marcy Grail
Patricia “Patty” Perry
Richard Devlin

OREGON DEPARTMENT OF ENERGY:
Todd Cornett, Council Secretary, Assistant Director for Siting
Christopher Clark, Senior Siting Analyst
Sarah Esterson, Senior Policy Advisor

CERTIFICATE HOLDERS:
Jess Malin, Executive Vice President of Development, BrightNight
Kathleen Campanella, Senior Director of Development, BrightNight
Todd Elwood, Senior Permitting Director, BrightNight
Kristen Sheeran, Vice President, Public Policy and Resource Planning, Portland General Electric
Dan Wilson, Director of Renewable Operations, Portland General Electric

PARTICIPANTS CONTINUED

CERTIFICATE HOLDERS:

Lenna Cope, Environmental Specialist, Portland General Electric

PUBLIC COMMENTERS:

Jennifer Miller

Irene Gilbert

Kathy McCullough

Kevin McCullough

Colton McCullough

Ormand Hilderbrand

Chad Higgins

John Langdon

Dan Hilderbrand

Amanda Whitman

BIGLOW CANYON WINDFARM HEARING BEFORE
OREGON DEPARTMENT OF ENERGY
ENERGY FACILITY SITING COUNCIL
HELD VIA WEBEX
THURSDAY, JANUARY 15, 2026
3:30 P.M.

CHAIR CONDON: Good evening and welcome.
I'm Cindy Condon. The time is now 3:32.
I would like to call the January 15, 2026, meeting of the Energy Facility Siting Council to order.
Mr. Secretary, please call the roll.
SECRETARY CORNETT: Cindy Condon?
CHAIR CONDON: Here.
SECRETARY CORNETT: Marcy Grail?
COUNCILOR GRAIL: Here.
SECRETARY CORNETT: Kent Howe?
COUNCILOR HOWE: Here.
SECRETARY CORNETT: Richard Devlin? Richard Devlin?
Do you know if Council Member Devlin is on?
COUNCILOR DEVLIN: Hello?
SECRETARY CORNETT: Okay.

COUNCILOR DEVLIN: Can anyone hear me?
SECRETARY CORNETT: Yep.
COUNCILOR DEVLIN: Yeah.
SECRETARY CORNETT: Yes. We can hear you. Thank you, Council Member Devlin.
COUNCILOR DEVLIN: Okay.
SECRETARY CORNETT: And Patty Perry?
COUNCILOR PERRY: Here if you can hear me.
SECRETARY CORNETT: We can. Thank you.
Chair Condon, you have a quorum.
CHAIR CONDON: Thank you.
Mr. Secretary, are there any agenda modifications?
SECRETARY CORNETT: Chair Condon, there are no agenda modifications at this time.
CHAIR CONDON: So we'll just get --
SECRETARY CORNETT: A little bit closer.
CHAIR CONDON: A little bit closer? How's this?
SECRETARY CORNETT: Yep, good.
CHAIR CONDON: I have the following announcements.
For council members and anyone addressing the Council, please remember to state your name clearly, and please do not use the speakerphone

feature as it will create feedback.

Please mute your phones, and if you are joining us by phone and receive a phone call, please hang up from this call and dial back if after finishing -- in after finishing your other call.

For those signed in onto the webinar, please do not broadcast your webcam.

For agenda Item C, public comment period and agenda Item F, the Biglow Canyon Amendment 4 Public Hearing, there are three ways to let us know you are interested in providing comments to the Council.

One, for those in person, please fill out a registration card and submit it to Nancy Hatch, who is our administrator.

Two, for those using the Webex, you will need to use the "raise your hand" feature.

Three, for those on the phone only, you will need to press “star 3”, which will alert us that you want to speak, and Nancy Hatch will unmute you as necessary.

We will go over these options again during that agenda item.

If you want to receive future email notifications of Council meetings, project

milestones, or rulemakings through our ClickDimensions program, you can do so by clicking on the link in the agenda or on the Council webpage. Look for the green box on the right-hand side of the page that says sign up for emails, updates.

You are also welcome to access the online project mapping tool and any documents by visiting our website. Please note that the audio and video of this meeting is being recorded and may be posted to the Council's website following the meeting.

Energy Facility Siting Council meetings shall be conducted in a respectful and courteous manner where everyone is allowed to state their positions at the appropriate times consistent with Council rules and procedures.

Willful, accusatory, offensive, insulting, threatening, insolent, or slanderous comments which disrupt the Council meetings are not acceptable.

Pursuant to Oregon Administrative Rule 345-011-0080, any person who engages in unacceptable conduct, which disrupts the meeting, may be expelled.

So first on our agenda is the consent calendar. And this is an action item, approval of the November 21, 2025, meeting minutes.

COUNCILOR HOWE: Chair Condon?
CHAIR CONDON: Yes, Councilor Howe?
COUNCILOR HOWE: I move that the Council approve the minutes of the November 21, 2025, meeting as presented and recommended by staff.
CHAIR CONDON: Do we have a second online?
COUNCILOR GRAIL: Chair Condon, this is Marcy. I second that motion.
CHAIR CONDON: Thank you, Councilor Grail.
COUNCILOR DEVLIN: Madam Chair?
CHAIR CONDON: Yes?
COUNCILOR DEVLIN: I was not present for this meeting so I'll be abstaining.
CHAIR CONDON: Thank you, Councilor Devlin.
Mr. Secretary, will you please call the roll -- or for the vote?
SECRETARY CORNETT: Kent Howe?
COUNCILOR HOWE: Yes.
SECRETARY CORNETT: Patty Perry?
COUNCILOR PERRY: Yes.
SECRETARY CORNETT: Cindy Condon?
CHAIR CONDON: Yes.
SECRETARY CORNETT: Marcy Grail?
COUNCILOR GRAIL: Yes.

SECRETARY CORNETT: The motion carries, Chair Condon.

CHAIR CONDON: Thank you, Councilors.

And now for the Council Secretary Report.

SECRETARY CORNETT: Thank you, Chair Condon. Give me one second.

I'm going to first start with project updates.

So the first project update is the Well Springs project.

So we received the Notice of Intent for that project on January 2nd. The project would be a 750-megawatt solar PV project with 500 megawatt of battery storage on approximately 7,365 acres or 11 square miles.

The project location is in Morrow County, approximately five miles northwest of the town of Ione. The parent company is MN8. And that's M-N-8 Energy Development Company LLC.

The Department's project webpage will be live tomorrow. This is a fairly new project, so the project page will be up tomorrow. And we anticipate sending the public notice of the receipt of the Notice of Intent and a comment period by next week as well.

That is also a reminder for at least state employees that Monday is the Martin Luther King Jr. holiday, so we won't be working on Monday, but we will try to get to it after that.

COUNCILOR HOWE: This is Kent.

Did you say that was Morrow County?

SECRETARY CORNETT: Yeah. That's in Morrow County.

So, I mean, generally, I mean, if you can kind of picture where the Boardman Bombing Range is --

COUNCILOR HOWE: Yeah.

SECRETARY CORNETT: And so if you go kind of south of the Boardman Bombing Range, kind of south and to the west of it, so it's --

COUNCILOR HOWE: Okay.

SECRETARY CORNETT: -- you know, I described it as sort of five miles northwest of Ione. And that's correct. But it's also kind of southwest of the Boardman Bombing Range.

COUNCILOR HOWE: Thank you.

SECRETARY CORNETT: The next update is the Sunstone Solar project.

So at the November Council meeting, there was a discussion regarding the parent company of the

Sunstone Solar project going into bankruptcy. So they were planning on submitting an amendment to split the site certificate. They withdrew that and there was some conversation that we had kind of explaining kind of all of that.

So as a reminder what that project is, it was approved by Council in November of 2024. It includes 1,200 megawatt of solar, 1,200 megawatt of battery storage, and it would be on approximately 9,442 acres or 14.75 square miles. That's also in Morrow County.

On Tuesday, I sent council members an article that Amazon won the bid to purchase the facility, although I just found out that I think you need a login to be able to access that. So my apology. We'll follow up with that with the information from the article, and we'll just copy and paste that and put it into an email so you can see that.

But I mean, again, Amazon won the bid for that, and they are now -- well, I don't know if now they're the owner, but they are essentially going to become the owner. But as we discussed in November -- the November meeting, just as a reminder, the -- Sunstone can sell it to them and Amazon can buy it,

but until Amazon comes in and requests and receives approval for a site certificate transfer amendment, they can't do anything with the project.

So again, a site certificate is functionally a business contract between the state of Oregon, EFSC on behalf of the state of Oregon and the developer. We currently do not have any business relationship with Amazon for this project. That will have to be established first before they can move forward on doing anything related to the site certificate.

The next project is the Saddle Butte Energy Facility. So at the December Council meeting, I let you know that we have received the Notice of Intent for that project. This would be a 488-megawatt wind energy project consisting of up to 70 wind turbines, each up to 698 feet tall. I'll say that again, 698 feet tall.

There would also be 488 megawatts of battery storage. The project location is in Gilliam County, approximately six miles southwest of the city of Arlington. The parent company is Brookfield Renewables. They own the Shepherds Flat facilities. So it's kind of in range -- geographic range of those facilities.

Since the December meeting, we have set up a project page. It's available. We provided public notice, and then we held a public information meeting in Condon on Tuesday. And the public comment period on the Notice of Intent concludes on January 30th.

Next is the Speedway Energy Facility. So like the Saddle Butte Energy Facility, at the December Council meeting I let you know that we received the Notice of Intent for that project. That would be a 1,400-megawatt solar PV and wind project including 500 megawatts of battery storage.

The project is located generally southeast and northeast of exactly where we're at right now. So if you look, you know, kind of in these directions of this building, it would be all around this building. Maybe not on that side, but all around where we're exactly at right now.

The parent company also is Brookfield Renewable, same as the Saddle Butte Energy Facility. And we had a public -- so yeah, we had a public information meeting in this room last night. And the Notice of Intent concludes on January 23rd. So it's been a bit of a busy week in terms of meetings and hearings and getting on the road.

Next is the Yellow Rosebush Facility. So the Yellow Rosebush Energy Facility. So this would be 800 megawatts of solar PV, 800 megawatts of battery storage on approximately 8,000 acres, about 12 square miles. The project location is in Wasco and Sherman Counties, east of the city of Maupin. The developer is Savion LLC, which is a division of the Royal Dutch Shell Company.

At the November meeting, the Council reviewed the draft Proposed Order and all comments that were made or that were received, and provided direction to staff to make changes in the Proposed Order, which we did. And we issued the Proposed Order and included also a notice of opportunity to request to participate in the contested case.

That's a mouthful, but I think it bears clarifying. Frequently, people say they've asked for a contested case. There is a contested case with every application. It is an automatic step in the process. The distinction is if anybody requests to participate in it. And we did have two requests to participate in the contested case.

So at this point that has gone to the -- we contract with the Office of Administrative Hearings. They provide a contested case -- or a

hearing officer for us for that, and that hearing officer will be the one that's evaluating those requests for a contested case to make sure that they justify participation.

And so we -- if there wasn't any request for participation in a contested case, we would have had the Council's review of the final decision tonight. But that will take some time. So we'll keep you up to date on that and that will certainly be updated in my Secretary Report, as well as in the Monthly Siting Report.

Next is the Leaning Juniper 2A Amendment Determination. So on December 21st, the Department issued its determination. We received a request for an amendment determination and that was that -- yeah, their request was that they wouldn't have to go through the amended process.

So the changes they were proposing wouldn't trigger an amendment. And the changes proposed included a tax equity sale leaseback transaction with certificate holder and a national financial institution under which that institution would acquire the legal title to certain facility equipment as personal property and simultaneously lease that equipment back to the certificate holder

under a long-term lease.

So the Department's determination was based on an evaluation of Oregon Administrative Rule 345, Division 27-0350, and those are the factors where an amendment is required. And none of those factors triggered.

We had this kind of request previously I believe one time and made the same determination. However, because this is a determination, you know, that an amendment is not required, Council has the opportunity to request that that be brought forth to Council as an agenda item where you would review it and you could then come to your own conclusion whether you agree or disagree with that determination.

CHAIR CONDON: I just raised my hand myself.

Thank you, Secretary Cornett. Question about that. And I am not sure about the review necessary, but this is the second time we've had something similar come up. And I'd like to make sure we understand what it -- as these get more complicated in terms of the structure, that we understand kind of the full responsibility associated with it and how it plays out over time.

I mean, I understand the words that you're using, but I'm not sure what it means to us versus what it means to the company itself. So I'm wondering if there's an opportunity to do it. Not necessarily to review the decision of the Department but to really understand why the decision was made or how the decision was made based on your understanding of the risks associated or long-term -- long-term process for it.

I hope that makes sense.

SECRETARY CORNETT: Yeah. I mean, this is something either, again, this particular one is totally within Council's authority to say we want to take a look at this ourselves. We want to take a, you know, review it and we would then put it on a future Council meeting. And then we would provide, you know, our analysis -- well, their requests, their analysis, our requests -- or our determination, our analysis to you and you could come up to your own conclusions and certainly ask us more questions. And then ask the certificate holder more questions about it as well.

That's an opportunity, you know, we've looked at it. We don't believe that it triggers an amendment as those rules kind of require right now.

This is also the second time, I believe. I'm going to look at Sarah -- yeah, second time that we've seen this. We don't know if there's going to be a pattern or not. So this could also be, you know, outside of this specific action, this could be determination. I won't say action. I'll say determination.

We could do this in the future as an information item where we explore this sort of outside the context of a request.

CHAIR CONDON: It's hard to do head nods in the room, you know, about whether we want to do it or not. I know I would like at least an informational session on it, especially as we're looking at Organizational Expertise standard and financial assurance standard. To me, that all fits together.

Councilor Howe, any --

COUNCILOR HOWE: Secretary Cornet, you said you bring it to us once you've made your determination.

SECRETARY CORNETT: That's what I'm doing now.

So the way the amendment determination process works is -- you know, and a site certificate

holder is not obligated to use this process.

COUNCILOR HOWE: Yeah.

SECRETARY CORNETT: It's to their benefit. They could make some choice, put it in their annual report, and include that as sort of a facility modification. We would then review that, and then the risk is that if we determine, no, that should have been an amendment, well, they've already made these changes. They then are forced to come back in. So it's to their benefit that they, you know, frequently choose this method, which is to get some, you know, validation.

COUNCILOR HOWE: Right.

SECRETARY CORNETT: You know, kind of officially that an amendment is not required. And so what they do is they make their case. They say here's the requirements when an amendment is required. This is what we're proposing. You know, presumably they're going to say we don't believe this triggers these things.

We then review that ourselves and then the requirement is at the next Council meeting after we make our determination, I provide this update to you and then, again, your ability is to either say, yeah, that sounds great, or if you're like, we

really want to take a look at this ourselves and we want to do the evaluation of all of that information, that's absolutely within your authority.

COUNCILOR HOWE: I, myself, am fine with the staff evaluation.

COUNCILOR GRAIL: This is Marcy, and I agree with Council Member Howe. I'm fine with the staff evaluation as well.

CHAIR CONDON: And just to clarify, I'm fine with the decision. It's the information that I'm -- an informational item that I'm asking about, not necessarily related to this project. But how these structures -- they're different. And how they -- how they work in a project for both the developer and the state.

SECRETARY CORNETT: And we could absolutely put it on the list for a future Council meeting if you want to do it as an information item.

COUNCILOR HOWE: Yeah, as an information item that doesn't hold this out then that sounds fine to me.

SECRETARY CORNETT: Sure.

Sorry, Nancy, can we turn the heat down a little bit? It's starting to get warm right here.

CHAIR CONDON: Councilor Devlin or Perry, any -- any thoughts?

COUNCILOR PERRY: Yes. Thank you, Chair Condon.

I would be interested, as you are, with the information, making it an informational item on one of our agendas to just understand a little bit more about that process. I totally agree with, you know, allowing the staff to be able to make those -- or the reviewing body review those requests as appropriate. And I -- I would just like to know how they do that.

CHAIR CONDON: Councilor Devlin?

COUNCILOR DEVLIN: I would actually concur with those statements. I would be fine with having a presentation about the process. But I mean, ultimately, the process, I think, should stay at the staff level to make that determination.

SECRETARY CORNETT: Sorry. For the record, Todd Cornett.

Just for clarification, my understanding was not the amendment determination process and how that works, but it was more specifically this specific type of request.

CHAIR CONDON: Yes.

SECRETARY CORNETT: The sale lease back on the equipment?

CHAIR CONDON: Yes.

COUNCILOR DEVLIN: Yeah.

SECRETARY CORNETT: Okay.

CHAIR CONDON: Which was the previous one as well.

SECRETARY CORNETT: Correct.

CHAIR CONDON: With the sale on the lease back. So yeah.

I think we're all in agreement.

SECRETARY CORNETT: Okay. We'll make a note of that.

Nancy, can you make a note of that for a future agenda item? Thank you.

Okay. Moving on to compliance updates.

So, you know, as I've indicated before, the way that the annual reports work is the -- so for, in this case, the 2024 annual reports, every certificate holder has to submit a report annually. The ones that they did for the calendar year 2024 have to be submitted, most of them, by the end of April 2025.

So then that gives us the, you know, the time to start working and reviewing those. We're

getting to the end of those reviews. Didn't quite finish. We've done all of the initial reviews. We've requested some additional information from some of the certificate holders to provide additional information to clarify that they meet conditions. We're still waiting to hear some -- from some back, but we're getting close to concluding those, which is great. Having more staff resources is hugely beneficial.

But I do have two quick updates on two of the Shepherds Flat facilities. So the Shepherds Flat Central, again, we kind of talked about that. Brookfield in Gilliam County just to the south of Arlington, that's a 265-megawatt facility. It's been in operation since 2012. And with regard to their meeting their conditions, I provided an update on Shepherds Flat Central last Council meeting. And really, these are the same things.

There have been sort of persistent issues with weed control and revegetation management since construction or reconstruction of the -- well, initial construction of the process of the project, and then also following the 2019 repower. So they know that. We know that. They're working on it. We're, you know, being clear with them. So we're

looking for more information.

Yes, thank you. I meant to say turn it on there.

And yeah. That won't be concluded until 2026. It's just, you know, we're -- I know we're in 2026 now, but it'll take a while because there's some pretty significant, you know, sort of detailed information that has to be evaluated and provided. So, but as I said, they're diligently working on it. We're diligently working on it. And we do believe that we can kind of come up to speed on those in 2026.

Shepherds Flat South, kind of similar. That's a 290-megawatt facility located in Gilliam and Morrow Counties. Also operational since 2012. The majority of the site is under cultivation for wheat production, but the site also has had persistent weed control and revegetation kind of management issues. So really the same thing as the other one. They are diligently working on it, and we do expect to have that all concluded in 2026.

Okay, next on my list is Executive Order 2529. So I brought this up at the -- I don't know, was it the last Council meeting or the one previous to that?

So Governor Kotek issued this Executive Order in November. This order requires the Department of Energy to take several -- undertake several directives in coordination with other state agencies. And it includes two required studies to be submitted to the governor by September 1, 2026. And these studies are being led by our P&I Division, Policy and Innovation, and also us to some degree. And I'll indicate what that means in a second.

So for one of the studies, ODOE is directed to inventory, assess, and analyze barriers to permitting, construction, and interconnection of clean energy projects and associated infrastructure.

For the other study, ODOE is directed to evaluate and recommend actions to update siting and permitting processes to facilitate deployment of renewable energy, energy storage, and grid infrastructure. Those are the mandates in the executive order.

So we will be looking -- we'll be working on this, you know, in the coming months, and we'll be giving you updates as to what we're doing. We will likely be doing some outreach on that as well, but again, we will ultimately have to provide a report to the governor by September.

And then, great, next slide. You got it.

So we are soon to be entering into the short legislative session. So I've included on this slide the schedule. Again, it's the short session, so it really isn't very long, but that doesn't mean it won't be significant. It just means it's short. And we do already anticipate there being some legislation related to energy facility siting and maybe Energy Facility Siting Council, your statutes specifically.

But you can see, you know, the session starts on February 2nd, and then there are always deadlines or bills basically start to die. So bills have to be posted for a work session. Then they actually have to have a work session. And if they don't meet those thresholds, then they basically just move out. So there always ends up being like some huge volume of bills and it starts narrowing down pretty significantly.

So you can see the deadlines for the first chamber and then the deadline for second chamber. And then March 8th is the constitutional end of session. So it has to be done by then.

So like the long session, I'll be providing updates in the Monthly Siting Report and

the Secretary Report. The difference is in the long session, there's a lot more time to sort of understand what's going on and see this and with a short session, it's February, and by the time we have March, it's done anyway. So there won't be much time.

So I might be submitting information to Council outside of the Monthly Siting Report and outside of the Council Secretary Report at a Council meeting just so you're updated as to what kind of legislation relates to you.

Another update, and you're probably not tracking this, but there are now new federal visual accessibility requirements. And these are applicable to all government agencies, state agencies, I believe local governments as well. The purpose of those is to ensure that all people, including any with any kind of visual limitations can access all websites and digital information.

So, you know, you go onto a, you know, a website, and if you have sort of visual impairments you may not be able to see that information. So now you have pretty sophisticated screen readers and other types of devices that actually can provide, you know, the content to somebody who has, you know,

sort of visual limitations. And so by the end of April, we have to be compliant with those federal requirements.

The agency is moving forward. We're moving forward. Bebe and Nancy have already been working on templates. Really, this is just a way to kind of make sure that -- you're going to start to see some variations and some differences in the PowerPoint presentations. You know, if we have a map or a chart or a graph or a screenshot, there has to be alternative text associated with that because somebody can't necessarily see that. The screen reader would have to be able to read what that image or what that graph is.

So we're just coming up to speed, you know, but we have until April to figure that out. So again, we're already working on it, but you know, just as a -- you'll start to see those changes. And we also will need to provide a handout to anybody who submits slides for the Council meeting or anybody, you know, all of our applicants, they will have to submit information, digital information that meets those requirements as well.

COUNCILOR GRAIL: Just a question on that. I presume that the agency gets support from a

resource. You're not doing all of the work to get it done, or you are doing the work?

SECRETARY CORNETT: I mean it's an enterprise-wide thing. Everybody within the state of Oregon. I'm not sure how much sort of direction and detail is coming out of the Department of Administrative Services. My understanding is a lot of state agencies are really sort of having to chart this course by themselves for now.

I'm sure as anything changes, you know, that sort of change is difficult, likely we'll see probably more consistency in the future. But my understanding is right now it is largely at the individual agency level.

COUNCILOR GRAIL: Interesting. Thank you.

SECRETARY CORNETT: My list is the next Council meeting, that will be February 13th, Friday the 13th. We'll be in Salem, and we only need that Friday meeting. And we anticipate right now that that would end around 1:00 p.m. So it won't be a very long meeting.

COUNCIL MEMBER: And I will not be at that meeting.

SECRETARY CORNETT: Correct.

COUNCIL MEMBER: I'm just going to say I'm

not going to -- I was going to try and make it, but I will be absent.

SECRETARY CORNETT: I think being out of the country is a realistic absence.

And that concludes my Secretary Report unless any council members have any questions.

COUNCILOR DEVLIN: Madam Chair?

CHAIR CONDON: Yes. Councilor Devlin?

COUNCILOR DEVLIN: Madam Chair, just a quick question to the secretary.

I was looking in previous evenings on the website, and sometimes you can find things on the websites and sometimes you can't. Sometimes they exist. Sometimes they don't.

But I was trying to look to see if there were any cumulative reports from -- on the compliance side or any cumulative reports on I think what we refer to as incident side. What I mean is some way to query. Like if you had a particular applicant before you who perhaps had an amendment, not necessarily speaking just about the one -- of the ones we have today, but where you could actually do a query where you could find out what previous compliance reports have shown, and cumulatively what incidents there have been at that site.

And if it's not available, that's fine because I, at this point, cannot estimate what it would take to actually make it available, other than a member just simply making a specific inquiry.

SECRETARY CORNETT: Yeah. Thank you, Council Member Devlin.

The timing is interesting that you ask for this because we just had a compliance meeting today. The compliance team is working on their presentation for next Council meeting, and this is exactly one of the things that we discussed. What are the types of things that the Council is interested in either being, you know, presented at a Council meeting, during like the Monthly Siting Report, or in other avenues?

I mean, so that information is sort of theoretically available. We'd have to conduct the research and then pull it all together. So we don't have it sort of nice and packaged up right now, but it is a good question. And this is one of the things I want Council to think about as the compliance team comes next month. What are you interested in on the compliance side? What do you think the public is interested in from the compliance side? We have the resources now to be

able to spend a lot more time and pull that kind of data together.

So your question is, yeah, can we do that? Absolutely can we do that. You know, could we do that today? No. You know, but this is the kind of stuff that will be very helpful to hear about at the next Council meeting so we can start changing that program to have more information available to the Council and members of the public.

You know, and then also thinking about, you know, as we've initiated the rulemaking for compliance, you know, what kind of rule changes, you know, may or may not relate to some of these questions? You know, we don't have to create rules to do those types of things, but there can be overlap. So I think it will be helpful to be thinking about that.

And so I appreciate the timing of your question. It was literally like three hours ago we had a similar type of conversation. So it was very good timing.

COUNCILOR DEVLIN: Thank you.

CHAIR CONDON: Thank you, Councilor Devlin.

And just a comment about that. I think

that is the next stage in a process that we started I think two years ago to have a compliance report every meeting. And so I think all of us are probably getting more comfortable with, okay, here are the issues, here are the projects involved. And so the logical next step is, I think exactly what Councilor Devlin is asking about.

SECRETARY CORNETT: Yeah. And as I said, now that we have the actual resources, the staffing resources to do that, now that we have three people, it makes it much easier to do those kinds of projects. With one person, you know, scrambling just to try to keep up with everything, a huge volume of work that had to be done on an annual basis, it was overwhelming. It's still overwhelming even with three people, but we can start to do these things.

And as I always say, you know, we do three things, you know, within the Siting division. You know, we do the review of applications and amendments, we do rulemaking, and we do compliance. And you see the first two, you know, almost every meeting. You don't see compliance as much, but it is just as important as the other two. And so we want to kind of amplify that program and provide the

information that you want in the way you want it. So please be thinking about that.

CHAIR CONDON: And the other thing I'll say is I also think that as we get these compliance reports, at least it makes me think about, well, what could we do at the beginning of the process as we see the projects start to make sure we have that in place? So.

SECRETARY CORNETT: And that's tying the compliance team with, you know, reviews of the applications and amendments to ensure that those conditions that are being created are as clear and implementable as possible. Yeah, there's a lot of overlap between, you know, these sort of subprograms within the division.

CHAIR CONDON: That's great.

Thank you, Councilor Devlin.

Any other questions? Again, I can't see on the screen so feel free to just speak up. Okay.

Thank you. Thank you. Thank you, Mr. Secretary.

And now we'll move on in the agenda and we'll have Summit Ridge Renewable Energy Facility Notice of Intent Extension Request, Sarah Esterson, senior policy advisor. And we will review the

request beginning with the presentation from Ms. Esterson.

SARAH ESTERSON: Good afternoon, Chair Condon, Vice Chair Beier, and members of the Council.

If we could go to the next slide, please, Nancy.

So let's start with a little background. Summit Ridge Wind LLC, the certificate holder, has requested to extend the notice -- the expiration date of their Notice of Intent for the Summit Ridge Renewable Energy Facility from January 25, 2026, to January 25, 2027.

The Summit Ridge Renewable Energy Facility is a 261-megawatt wind and solar facility proposed in Wasco County for your reference.

So you have rules that apply to a Notice of Intent extension request, and those rules establish your scope of review. That scope includes review of two criteria. One is a timely criteria and the other is good cause.

The timely criteria establishes that a request for extension of a Notice of Intent expiration date must be submitted at least 45 days prior to the expiration date. And as I mentioned,

they also have to provide or describe a good cause for the extension request.

Okay, so let's review the criteria. The first criteria of timely. So the NOI expiration date was January 25, 2026. The request to extend the expiration date was received on November 24, 2025, which was 62 days prior to that deadline, so we are recommending that the timely submission criteria is met.

And then for good cause -- and I said certificate holder earlier. I meant applicant. The applicant provided two reasons to justify the extension request which are somewhat interrelated. But they've requested more time to allow landowner negotiations primarily due to uncertainty and changes in Bonneville Power administration's planning for a substation that the applicant had been planning to interconnect to. So they said they need more time to negotiate siting given changes.

And then the additional reason was that BPA has sort of changed their mind on the funding of the substation. But they still want an agreement in place so that they can tie in. Applicant has indicated that they would come to an agreement, execute an agreement in late January or February.

And we did ask for some sort of additional description and details so that we could evaluate the merits of this representation of landowner negotiation, and we feel like they provided that upon request.

So now I think -- next slide, please, Nancy.

We are recommending that Council find that the criteria have been met and that the NOI expiration date may be extended by one year.

And we'll now turn it over to you for deliberation and possible decision.

CHAIR CONDON: Council members, any comments? Questions?

COUNCILOR GRAIL: This is Marcy. I have none.

CHAIR CONDON: Councilor Howe?

COUNCILOR HOWE: I have none.

CHAIR CONDON: I have one.

Can you go back to the previous slide?

It's just -- do you have a feel for the order of -- the sufficient time -- does the planning with BPA and the negotiation with landowners occur at the same time or do landowners want to understand that there is a BPA and an agreement with BPA first

or vice versa? BPA wants to understand that, no, you have the -- you have the agreements with landowners and you're ready for the interconnect. Do you have --

SARAH ESTERSON: I don't think I know the answer to that. But in their discussion, they described that there's been like years of waiting for BPA to move forward on a decision on the substation. And then there was significant staff turnover earlier in the year. And then there were changes with the substation that necessitated new negotiation with landowner in terms of siting. So I can't speak to what the landowners knew to be true before the uncertainty came about.

CHAIR CONDON: An additional question. How many extensions are allowed for the Notice of Intent?

SARAH ESTERSON: One.

CHAIR CONDON: Is it just one? Okay. Thank you.

If there are no other questions or comments --

COUNCILOR HOWE: Chair Condon, I move that the Council find the petition by the applicant to extend the expiration date of the Notice of Intent

for the proposed Summit Ridge Renewable Energy Facility was timely submitted and demonstrates good cause for the extension for the reasons described in the staff report. I further move that the Council approve the extension of the expiration date of the Notice of Intent for the proposed Summit Ridge Renewable Energy Facility by one year for a new expiration date of January 25, 2027.

CHAIR CONDON: Do we have a second?

COUNCILOR PERRY: Patty Perry here. I will second that.

CHAIR CONDON: Thank you, Councilor Perry.

Any more discussion?

With that, Secretary Cornett, can you call for the vote?

SECRETARY CORNETT: Cindy Condon?

CHAIR CONDON: Yes.

SECRETARY CORNETT: Richard Devlin?

COUNCILOR DEVLIN: Yes.

SECRETARY CORNETT: Marcy Grail?

COUNCILOR GRAIL: Yes.

SECRETARY CORNETT: Kent Howe?

COUNCILOR HOWE: Yes.

SECRETARY CORNETT: Patty Perry?

COUNCILOR PERRY: Yes.

SECRETARY CORNETT: The motion carries, Chair Condon.

CHAIR CONDON: Thank you.

And now to the next item. We have a public comment period. Sorry. We're a little bit late in that according to the timeline. This time is reserved for the public to address the Council regarding any item within Council jurisdiction that is not otherwise closed for comment.

In the agenda, we have set the amount of time for individual commenters to seven minutes.

Nancy, how many comment cards and raised hands on the webinar and phone do we have?

NANCY HATCH: At this point, we have one commenter in the room, and there are no hands raised yet. So we can go ahead and call Jennifer Miller to go ahead and come on up and make your comments.

And if you could start with name -- name and address and spell your name, that would be great.

JENNIFER MILLER: My name is Jennifer Miller. Boring. J-E-N-N-I-F-E-R M-I-L-L-E-R. And I live in Hermiston, Oregon.

And my comments are just really general. I have a letter that I'm reading from, and I will

hand that over when I am finished so it can be submitted to the record or however you do that.

NANCY HATCH: Thank you.

JENNIFER MILLER: So my name is Jennifer Miller, and I'm here representing both myself and OCTA, Oregon and California Trails Association.

My comments at this moment, excuse me, are general ones. I would like to ask the Council to look at projects -- projects from, say, a helicopter view.

This area of Eastern Oregon is being covered rapidly by wind, solar, and transmission activities. Valuable farmland and native flora and fauna is being crowded out almost daily. Exclusive farming/wheat fields are being bought or signed over for projects with little guard to how our food will be produced in the future.

Wheat fields, grazing, and rural means of making a living are being drastically affected. It seems as if the locals have to operate under one set of rules while energy projects get others, and there's not much consistency.

In this particular area, and I mean this Grass Valley area, of course, there are historic trails that need to be considered. The Barlow Road

cutoff runs through this area, and I do know that this Council was addressed last night by Wendell Baskins, so I'm -- we're part of the same group and I'm just continuing some of those comments.

SECRETARY CORNETT: Very quickly --

JENNIFER MILLER: Sure.

SECRETARY CORNETT: I think only Chair Condon was online last night.

JENNIFER MILLER: Oh.

SECRETARY CORNETT: The other council members didn't hear Mr. Baskins. So, and if that makes you want to change your public comment today, you can. But just to make sure you know that the rest of them didn't hear that.

JENNIFER MILLER: That's fine. I was just saying, yeah. So I'm just saying that some of the projects that are happening in this area are not -- I think some of them are not knowledgeable that there is the Barlow road cutoff and that projects do need to know about that going into, you know, just from the very beginning, knowing that this historic trail cutoff does exist.

And it would be really helpful if that cutout route could be added to layers on the project maps. So like when we go in and look at things, we

can see where the main historic Oregon Trail is, but we also feel that the Barlow Road cutoff needs to be added as well because it is also a very historic trail within the site, within the boundary of Oregon. Plus, the other 15-16 major historic trails.

So we're just -- I'm asking if that map could be added. And I know OSU has something to do with the mapping, so some kind of coordination perhaps could be done to make sure that that cutoff map can be included.

I do have two maps that were also here last night, but I will submit mine as well so that people today can look at them. And hope that that this blue line that's on these maps could be added.

So in conclusion, my request is just that a bigger picture is viewed instead of the projects or piece, you know, looking at piecemeal. The overall impact to this whole area is huge. It's just not a series of parcels, but a unique and amazing landscape that has its own beauty and importance.

Any questions?

CHAIR CONDON: Thank you for your comments, Ms. Miller.

Any questions?

I don't hear anybody but I do have one.

JENNIFER MILLER: Okay.

CHAIR CONDON: So I'm curious, and I did apparently hear the comments last night. I am curious if the association that you're a part of, if you have -- if you have communication or scheduled meetings with landowners who are all part of this process.

JENNIFER MILLER: We often don't know which landowners are impacted until we can look at the project on the map. So sometimes we don't even know about it until it's almost too late that it's even happening. As people are learning more about OCTA, the Oregon and California Trails Association, some projects are reaching out to us so that we can start working on things ahead of time and trying to create that space where, you know, preservation can be worked into the project if at all possible.

And so, does that answer your question?

So yes and no. Like we don't always know who owns what and, of course, most projects have nondisclosure agreements signed. And so it's hard to know who knows what and who's willing to talk about what. And we understand that projects are

going to happen. We understand that we need energy. We're just trying to do what we can do to save as much as we can while it is possible.

CHAIR CONDON: Thank you. Yeah. I appreciate that. It's just, it kind of was opaque to me about what happens beforehand. You know, what communication could be done.

JENNIFER MILLER: It would be great if we could get in on projects way sooner so that we could look up and then say, oh, that's not any threat of the trail. That's, that's fine. Like that's not a problem. Or this is going to be a huge visual impact. Let's see what we can do about that. Or please don't put that transmission line directly along the length of this section of the trail. Perhaps cross it instead and parallel it, you know, a further distance away so that it's not such a big impact.

So I mean, there's lots of things that we try to do to keep the story alive.

CHAIR CONDON: Okay. Secretary Cornett?

SECRETARY CORNETT: Yeah. Thank you, Chair Condon.

For the record, Todd Cornett.

Are you signed up to receive our Monthly

Siting Report?

JENNIFER MILLER: Yes.

SECRETARY CORNETT: Okay, good. Because frankly, we usually don't even know the details of a project until they submit their Notice of Intent. So, you know, whatever has occurred before then, we're not even in the loop on. So when we get that Notice of Intent and then we start to put it in the Monthly Siting Report or we provide the notice, that's really the first time that we have any indication. But it is important to know that that's the preapplication stage.

So identifying anything, any resources, obviously your interest is in, you know, primarily with the trails, but that's the time to do it is during those Notice of Intent comment periods.

JENNIFER MILLER: Right. And I'm sure that, I mean, you know, it's not just the trails. I mean like there was a huge native presence in this area for hundreds of years, and so that is also an important thing.

CHAIR CONDON: Thank you.

JENNIFER MILLER: You're welcome.

CHAIR CONDON: Thanks for being here.

Nancy? Sorry.

NANCY HATCH: Alright, so at this point there is one person with their hand raised. But let me just go ahead and remind everyone how to raise their hand. You see it on the screen in front of you. If you are on the webinar, you are going to click on the participant window at the bottom of the screen. You're going to push the hand icon and that will raise your hand. When you're finished commenting, you're going to click it again to lower it.

If you are on the phone, push “star 3” on your keypad to raise your hand and “star 3” again to lower your hand.

So at this moment I will unmute -- I have Ms. Irene Gilbert. I am going to go ahead and unmute your mic. And you are ready to leave your comment?

IRENE GILBERT: Thank you. Thank you for allowing me to speak. Can you hear me?

CHAIR CONDON: Yes.

IRENE GILBERT: Okay, great.

I wanted to comment on a couple of things. One is, as I've followed the Council over several years, I've noted that the opportunity for the public to actually access the council members has

become less and less easy and available. And one thing, I sent a couple of notices, a couple of information items to -- specifically to the Council regarding the Wildlife Mitigation Plan because of the exceedances.

Basically, I said that I felt that with an error rate doing mitigation that was projected to only bring the bat deaths down to one one-hundredths of a percentage below the threshold of concern should be of concern to the Council. And also, that there's nothing that I can see in terms of a follow-up evaluation or surveys to determine whether or not they actually stayed below the 2.5 standard. So I am concerned about that kind of thing.

I also wanted to comment on the decision regarding an amendment to whether or not an amendment was needed due to the sale of the BQH interest in the transmission line to a private enterprise.

Issues include this is a non-energy organization which was -- has never done this before. They were created just to have this sale. They don't fall -- they are not going to fall under the authority of the PUC because they're not an energy company. And so there's going to be no

control over how much they're charging for energy or any of those kinds of things that are controlled that way.

The fact that there is no longer going to be the stated customers or owners that were in the original certificate for public convenience and necessity has resulted in at least three appeals of the PUC determination that they were not going to rescind that certificate of public convenience and necessity.

I'm also concerned because PacifiCorp is basically wanting to sell this because their financing rating has fallen so much. And I'm concerned about the ability to access -- even access any funds from this shell company if it is needed to restore the site.

So lots and lots of concerns that should be of concern to the Council. And the PUC has not approved this sale. They're going to have to have full contested cases because of the substantial impacts and the unusual nature of this sale.

So to think that the Energy Facility Siting Council does not believe that you should have a full amendment process really is a real surprise to me. And frankly, I'll be really surprised if

there isn't, you know, some kind of legal response to it just given the fact that it's no longer the same owner. It's no longer to the same customers.

There's a question about whether or not they should even be condemning property to build this. And part of that question is related to the fact that this new company has no experience and nobody is going to control what they do to the customers.

So I encourage you to have some more discussion about this and perhaps decide that a decision to not provide an amendment isn't the wisest choice given. I mean this is a big deal. A big deal legally. A big deal publicly. And it's not going to go away.

So that's my comment about BQH. Be careful what you do.

And I wanted to say I'm sorry to see Katie gone. She was asking questions that needed to be asked, especially since the public has such a hard time getting to the Council with information. I was really surprised to see the email that I sent to the council members returned saying we aren't taking comments on this. And I'm assuming you never saw my email. But to have that kind of a blockade between

the public and EFSC, it seems to defeat your entire reason for existing. So thank you.

Any questions?

CHAIR CONDON: Thank you, Ms. Gilbert.

Any questions from the Council or comments?

Thank you very much.

Nancy, any more hands raised?

NANCY HATCH: There are no more hands raised at this time. We'll do a last call. If you'd like to make a comment, please raise your hand.

CHAIR CONDON: I think that'll do it for us. So we will move on. Thank you, Ms. Miller. Thank you, Ms. Gilbert for your comments.

And we'll move on to our next item, which is the Stateline Wind Project Wildlife Monitoring and Mitigation Plan Amendment. And this is an action item for the Council.

Christopher Clark, senior siting analyst will be guiding us through the review. Thank you.

CHRISTOPHER CLARK: Thank you, Chair Condon, Council members.

For the record, my name is Christopher Clark. I'm a senior siting analyst with the

Department, and I've been assigned to monitor compliance for the statewide wind project.

So Nancy, if I could get the next slide, please.

So the Stateline Wind Project is an operational wind power facility located in Umatilla County, Oregon and Walla Walla County, Washington. The Council has jurisdiction over the components cited in Oregon.

As shown on this slide, the facility consists of three phases that are separated into two distinct geographic and operational units. Those are Stateline I and II, which are the black dots, and the Vansycle II portion of the facility, which are the red dots. I'm going to be talking mostly about Vansycle II today as that's what this mitigation proposal is for.

I also just wanted to point out that there's different certificate holders for each of the geographic units, but both certificate holder LLCs are subsidiaries of NextEra Energy Resources LLC.

So moving specifically into the discussion of Vansycle II, that portion of the facility includes 43 Siemens, 2.3 megawatt turbines. The

Council approved the final order on Request for Amendment 7 in 2022, and that authorized that the turbines, which had been commissioned in 2009, can be repowered with larger diameter rotors.

If I could get the next slide, please.

So that repowering was completed in 2023. Sorry.

And then a post-repowering fatality monitoring study that was required by the Wildlife Monitoring and Mitigation Plan that was included as part of that final order on Request for Amendment 7 required one year of post-repowering fatality monitoring, which was completed between 2023 and 2024.

After the monitoring was complete in April of last year, the certificate holder notified us that there was an exceedance of the threshold of concern for bat fatalities. And based on the estimation methods required by the WMMP, the report estimated that there were approximately 5.86 bat fatalities per megawatt attributable to the facility in the monitored year compared with the threshold of 2.5 fatalities per megawatt. No other thresholds of concern were exceeded.

And I did want to note that all recorded

bat fatalities were from two migratory bat species. That's the hoary bat and silver-haired bat.

After an opportunity for public comment on the monitoring results and consultation with the Oregon Department of Fish and Wildlife (ODFW), the Department notified the certificate holder that based on the magnitude of the exceedance and the species affected, that mitigation was necessary. We received the mitigation proposal that was included as Attachment 1 to your staff report in October.

I'll go into the details on the next slide, but I did want to remind the Council that the approved Wildlife Monitoring and Mitigation Plan authorizes the Department to agree to mitigation actions and changes to the WMMP, but it requires us to notify the Council of any agreements and the Council retains the authority to approve, reject, or modify the actions or agreements.

Okay, so any questions so far? Sorry, I'm going a little fast.

Okay. So in the mitigation proposal itself, the certificate holder proposes to curtail operations of all Vansycle II turbines for the life of the facility. Curtailment would occur when wind speeds are below the manufacturer's recommended cut-

in speed of 3.0 meters/second year-round. And then the cut-in speed would increase to 5.0 meters/second in July and October, and 6.0 meters/second in August and September.

Curtailment essentially means feathering or breaking turbine blades so that the rotation of the blades slows. I can go into exactly the definition of curtailment that we've worked out or received from the certificate holder in a couple of slides, but I just wanted to make sure that was clear.

And then I wanted to kind of illustrate what this graph is showing is that we have studies showing that curtailment is an effective strategy to reduce bat mortality associated with wind facility operations and that mortality rates are -- or reductions in mortality rates are positively associated with increased curtailment wind speeds. So the more you curtail, the less likely it is that there will be fatalities.

I don't want to present myself as an expert on all the science on this, but the general idea is that bats are more active at lower wind speeds since very windy conditions make it harder for them to fly and hunt. So stopping or slowing

blades to less than dangerous speeds at these low wind speeds is a really good strategy to reduce mortality without impacting the power production of the wind farm as much as other things might.

And then I wanted to point out that the yellow line on this graph is showing the proposed cut-in speed for wind. So if winds are below 3.0 meters/second, you round it. It shows the flat part of the line. That's when the wind turbines would not rotate as quickly. That wind speed increases during the months when the most fatalities were reported. Those months also coincide with the migration periods for the two bat species that are affected.

So this proposal was based on the threshold of concern and based on the statistical analysis provided in a meta-analysis of a number of different curtailment studies. There's a link to that meta-analysis in your staff report. The proposal would be expected to reduce fatalities to 2.49 fatalities per megawatt per year, which is just below the threshold.

We did consult with our colleagues at ODFW on the review of the proposal and whether it would be effective in addressing the concern, and they

provided support for curtailment as a strategy to minimize and mitigate bat mortality risks. And they noted that if this proposal was accepted, it would be the first time that curtailment was implemented at an Oregon facility.

I did want to note; one thing is that there are no follow-up requirements for monitoring of the effectiveness of this proposal. But ODFW outside of the regulatory process is working to connect an independent researcher with the facility to conduct a study of fatalities after curtailment is implemented.

So based on the comments we received from ODFW and review of the evidence provided, the Department notified the certificate holder that we agreed with the proposal in December.

And if I could get the next slide.

We are still in the process of working with the certificate holder to document the specifics and details of the agreement as an amendment to the WMMP. Specific items that we've discussed or have resolved so far is the standard for curtailment which is that they would reduce the speeds of turbines -- turbine blade rotation to less than one rotation per minute when the 10-minute

average of wind speed is below the applicable cut-in speed.

We are still working to solidify the reporting and validation requirements, although they've informed us that their SCADA system can give a report of whether or not the curtailment was implemented to the minute and that they're working on a way to include that into the annual compliance report that would be submitted to us each April.

They're also looking at a way to notify us if there was a significant failure of the system and curtailment didn't happen when it was supposed to for a prolonged amount of time.

The certificate holder also notified us that they intended for this mitigation proposal to only be implemented from dusk to dawn because it is a proposal related to that mitigation. We let them know that we thought that was a material change since it wasn't specified in the original thing. Although we don't necessarily object to it, we wanted to talk to our colleagues at ODFW again and make sure there weren't any additional concerns. They're also working on getting the specifics of what dusk to dawn means and how that will be determined.

So, all that to say on this slide is that while we don't have a red line for you at this time, we thought it would still be valuable to get additional feedback. If the Council's comfortable with moving forward with this information, I think it would still make sense to vote. I'll leave that up to you. But if you have any questions, I'm happy to answer them.

CHAIR CONDON: Council members, any questions or comments about the presentation?

Councilor Howe?

COUNCILOR HOWE: Yeah, this is Kent. Great staff report. Good explanation.

When I was going through it, it was kind of -- what's the word for when it's not straightforward in the way that you're thinking -- in the way I'm thinking anyway. And so like when I was reading in November to June, when the blade rotation would be limited when the wind speed is below 3.0 meters/second -- I looked that up. That's about 7 miles an hour -- then the manufacturer is going to cut the speed of the blade, I think, is what that means.

CHRISTOPHER CLARK: Thank you, Council Member Howe.

So the manufacturer's cut-in speed is the speed at which the wind has to be blowing for the turbine to begin producing electricity.

COUNCILOR HOWE: Okay.

CHRISTOPHER CLARK: So if the wind is not that fast, they will feather it out of the wind so that the blades don't spin as fast.

COUNCILOR HOWE: Okay. Okay. So on that graph, when the winds are higher in those months, it seemed like it was -- the way it was showing was --

CHRISTOPHER CLARK: Nancy, can you go back to that slide? Perfect. Thank you.

COUNCILOR HOWE: It looks like it allows them to go faster because the line goes up as opposed to dipping down. And that just confused me. And it's not you. It's not the -- it's just my brain was looking at it and thinking, okay. I think what I wanted to do is have it show a reduction in the speed of the blade, but that's showing how much it's going to reduce the speed of the blade.

CHRISTOPHER CLARK: Council Member Howe, I'd say what the line on the graph represents is how fast the wind has to be blowing before the turbine starts spinning. It's not related to the speed of the turbine itself.

COUNCILOR HOWE: Oh.

CHRISTOPHER CLARK: It's related to the speed of the wind. And once the wind starts blowing, if it starts -- for most of the year outside of the migration period, if the wind's at 2.9 meters/second based on their meteorological towers --

COUNCILOR HOWE: Yeah.

CHRISTOPHER CLARK: -- the turbines will be stopped from spinning as quickly.

COUNCILOR HOWE: Okay.

CHRISTOPHER CLARK: Once it hits 3.0 meters/second or more, they will feather the blades back into the wind and it'll start spinning normally.

COUNCILOR HOWE: Okay.

CHRISTOPHER CLARK: And I do not know how fast those turbine blades go, but it is fast when they are into the wind. So yeah.

Chair Condon?

CHAIR CONDON: Secretary Cornett?

SECRETARY CORNETT: So just for clarification. So to me this graph represents the fatalities.

Is that right?

CHRISTOPHER CLARK: It's a two-axis graph. So the axis on the left, the Y axis on the left is the number of fatalities and that would be the bar graph. And then the line graph is the cut-in speed.

SECRETARY CORNETT: Right.

CHRISTOPHER CLARK: Right.

SECRETARY CORNETT: Yeah, and so the, you know, obviously August, September, October, that's where the majority or much higher levels of bat fatalities are occurring.

CHRISTOPHER CLARK: Right.

SECRETARY CORNETT: And so trying to adjust the cut-in speed during those months to a different level to reduce those fatalities.

Is that the basic concept?

CHRISTOPHER CLARK: That's correct. Yeah.

And in the meta-analysis, it kind of indicates that for each additional meter per second of wind speed that you allow curtailment to continue basically, you get a greater number of -- you get fewer and fewer reductions.

So bats are still active above 3.0 meters/second. So if you increase it to five or six, more bats -- or less bats will be negatively impacted by the turbines.

COUNCILOR HOWE: So the yellow line is the proposed cut-in speed. And so theoretically, a year from now if you showed this graph, the yellow line would be the same because that's their established cut-in speed.

CHRISTOPHER CLARK: Yeah.

COUNCILOR HOWE: But if it works as it's supposed to work, those numbers probably in July, August, September October, those should be reduced below that because those cut-in speeds changed according to that yellow line.

CHRISTOPHER CLARK: Right. Yeah.

COUNCILOR HOWE: I knew that's what it all was saying, but intuitively it seemed like to reduce the wind speed, the graph shouldn't go up. It ought to be reducing the wind speed, you know the speed of the -- like, I get it, and I think you did a great job. Thank you.

CHRISTOPHER CLARK: Thanks. I'll take full credit for this graphic. It made sense in my brain, but I understand why it's not intuitive.

CHAIR CONDON: But just, can you go back to the graph? I just want to make sure.

So from November -- well, as it says, from November to June, the turbines are basically still.

Right?

CHRISTOPHER CLARK: Alright, Council Member Condon, between November and June, curtailment would only occur when wind speeds are below 3.0 meters/second. So that's actually the most they would be operating -- they would be operating most of the time between November and June.

CHAIR CONDON: So bats don't fly in higher wind -- at higher wind speeds?

CHRISTOPHER CLARK: Yeah. And I don't know exactly where that ceiling is for them, but they are more active at low wind speeds. That's correct.

CHAIR CONDON: Yes, okay.

COUNCILOR HOWE: That helps too. I didn't understand that.

CHAIR CONDON: Okay, I think I was kind of thinking about this backwards.

COUNCILOR HOWE: I was, too.

CHAIR CONDON: So I have a question related to curtailment. Has curtailment been used in a, I mean, I'm presuming that the Oregon Department of Fish and Wildlife has lots of information about this issue. Is curtailment used

in other states effectively, and therefore this should be meaningful curtailment here? Should be meaningful to decrease fatalities?

CHRISTOPHER CLARK: All right, Chair Condon, yes. I don't know how often it has been used as a regulatory instrument, but the meta-analysis provided is actually based on real studies that happened across the United States, including studies, I think in the Northwest, but definitely studies that included the two species that are present here were present in those studies. And they look at both a pre-curtailment study and a post-curtailment study to a certain extent and then see how the reductions played out.

So I think there are -- I couldn't tell you the exact number of studies, but it being a meta-analysis that does include several that were conducted over a decade. So empirically supported to be an effective strategy. Yes.

CHAIR CONDON: Okay. Thank you. And the final question for me on it is, given the higher than anticipated fatalities before, is there any mitigation, you know, post-mitigation? You know, we've seen contributions to wildlife centers or whatever to speak to the over fatalities.

CHRISTOPHER CLARK: When we had our initial consultation with ODFW, we kind of asked about that. There's two reasons why that sort of compensatory mitigation was not preferred and this sort of operational curtailment that's actually designed to reduce future fatalities was the option that we pushed for and what was proposed.

So there's not a lot of data available about migratory bats. There's not a lot of science on them, so not a lot of studies. And biologists don't even know a ton about their migration patterns. So we see them when they show up in a fatality study, but it's hard to kind of estimate what would really help them as far as that sort of compensatory mitigation.

And the other thing is where raptors might be able to go to a rehabilitation study, bats are both very small, and I think any interaction they have with a wind turbine that results in an injury or a fatality is almost always a fatality. So there's not a lot of like opportunities for rehabilitation of injured bats just because of the nature of how they are affected by the turbines.

CHAIR CONDON: Yes. And to be clear, I wasn't suggesting that -- I think the mitigation

approach as it is here going forward is much better than a compensatory approach. But it was the compensatory compensation for the higher than expected that I was questioning. But just a question.

CHRISTOPHER CLARK: Thank you, Chair Condon.

One comment on the thresholds of concern is they are a signpost. So it's, you know, we have requirements for post-construction fatality monitoring often. And then if the threshold is exceeded, it's not necessarily like they need to meet the threshold, like that triggers a conversation with us and then we see if this is an impact that wasn't considered in the permitting that needs to be addressed. And that's what we found was the case in this case. A lot of times there will just be another year monitoring and it'll be found to be an anomaly.

So, it is, you know, a little more nuanced than we just need them to get down to 2.5.

CHAIR CONDON: Okay. Thank you.

Any other comments or questions?

Seeing or hearing none.

COUNCILOR HOWE: Chair Condon, I move that

the Council approve the proposed amendments to the Stateline Wind Project Wildlife Monitoring and Mitigation Plan that curtails turbine operations at the Vansycle II unit below specified wind speeds to address an exceedance of the threshold of concern for bat fatalities as presented in the staff report.

CHAIR CONDON: Thank you, Counselor Howe.

COUNCILOR DEVLIN: Second.

CHAIR CONDON: We have a second from Councilor Devlin.

COUNCILOR PERRY: Yeah. Patty Perry seconds the motion.

CHAIR CONDON: Oh, we had a second from Councilor Devlin.

COUNCILOR PERRY: Okay.

CHAIR CONDON: Thank you, Councilor Perry.

And Secretary Cornett, can you please call the vote?

SECRETARY CORNETT: Patty Perry?

COUNCILOR PERRY: Yes.

SECRETARY CORNETT: Richard Devlin?

COUNCILOR DEVLIN: Yes.

SECRETARY CORNETT: Kent Howe?

COUNCILOR HOWE: Yes.

SECRETARY CORNETT: Cindy Condon?

CHAIR CONDON: Yes.

SECRETARY CORNETT: Marcy Grail?

COUNCILOR GRAIL: Yes.

SECRETARY CORNETT: The motion carries, Chair Condon.

CHAIR CONDON: Thank you, Secretary Cornett and councilors.

COUNCILOR PERRY: Chair Condon?

CHAIR CONDON: And thank you.

Yes?

COUNCILOR PERRY: This is Marcy.

And Christopher, I've just got to tell you, thank you for what you're doing. I tell you, everybody every year, this is the hardest thing for me to do on EFSC.

I can't -- the whole bat thing just wigs me out, so good on you for getting in there and pulling it together for us, Christopher. Because if I had to read very much, I don't -- I don't think I'd be pulling my weight. So thanks as always for a great presentation.

CHAIR CONDON: Yes. Thank you.

Is it the picture that wigs you out?

COUNCILOR GRAIL: When I see you again I will amuse you with all my nuanced fears and

paranoia and all the things bat related. Bats and rats, all the things just, I can't even tell you. I can't look at them on TV without getting the heebie-jeebies. Yes, technical term heebie-jeebies. I turn into a five-year-old child. I just -- I'm sitting here with my eyes kind of open, like squinting, trying to not be a child about it. But oh, that's a rough one.

CHAIR CONDON: Well, thanks for sticking with us.

Okay, next item on the agenda is the Oregon Trail Solar Facility Revegetation and Noxious Weed Plan Amendments. It's an action item. And Sarah Esterson is once again policy advisor for a presentation. Thank you.

SARAH ESTERSON: Thank you. Good evening, Chair Condon, Vice Chair Beier, and members of the Council.

So the site certificate for the Oregon Trail Solar Facility authorizes up to 41 -- you can go back just one second.

It authorizes up to 41 megawatts of a combination of wind and solar powered generation components within an approved site located in Gilliam County. The certificate holder is Oregon

Trail Solar LLC, which is a wholly-owned subsidiary of OVIN Grid Power LLC.

So for this facility, the preconstruction and construction is being phased, and it's currently in both phases with plans to move forward with construction of a 31-megawatt solar facility and 20-megawatt Battery Energy Storage System on Monday.

So as you know, as we talk about compliance, that preconstruction compliance is a phase where the certificate holder is required to comply with preconstruction conditions that are established in the site certificate that you've issued prior to moving forward with construction. And this is a process where the certificate holder is submitting information to the Department for review and approval or (inaudible). Mitigation plans are almost always preconstruction requirements that have to be finalized and approved prior to construction.

So in this instance, for this facility, we're here to discuss changes related to two mitigation plans, the revegetation and noxious weed plans. So as part of preconstruction compliance or this facility for these two plans, the certificate holder requested changes that are beyond the scope

of changes contemplated in the draft plan.

So while we've reviewed for approval for finalization, they've requested substantive changes that we want to bring back to the Council for transparency to make sure that you would agree with these types of changes. And as we've discussed in a couple of meetings over the last year, if not a lot, that mitigation plans do have an amendment clause that allows for changes to be reviewed outside of the amendment process that maintains an obligation that we bring it forward to Council for concurrence, modification, or rejection.

Okay. So let's move into the substantive changes that the certificate has proposed. So first, the revegetation plan. The revegetation plan applies to temporary impacts to habitat predominantly. And then it has general requirements for restoration of temporary impacts to cropland.

So the proposal is to remove all requirements that apply to temporarily impacted habitat because based on the solar facility there really isn't temporary impacts outside the fence line that are considered habitat. What they have is a little sliver of a collector line that is -- it has grassland dispersed throughout other ag land in

between the Pachwaywit Facility and active ag.

So if you look at it on its own, it's grassland. That's considered habitat. But when you look at it overall and you consider habitat function and value based on consultation with ODFW, we agree to categorize it as category six, which relieves the obligation to do a habitat restoration level plan that is within the revegetation plan.

So just to note, general revegetation requirements still apply. You have a mandatory condition that applies to all temporary impacts, and it says you have to restore temporarily impacted land commensurate with adjacent lands. And then they have an obligation under the 1200 C permit that DEQ issues, all EFSC facilities have to get this permit, that also has a vegetation, a stabilization requirement before they can close that permit out. So while the proposal is to basically remove this habitat restoration level requirement because there's no real habitat, know that revegetation is still a requirement.

Okay, so, and then we are going to lift the general restoration of cropland -- temporarily impacted cropland over into the noxious weed plan. So now we can go over into the noxious weed plan.

That noxious weed plan also has a seeding and weed treatment obligation. So you're going to get revegetation through the noxious weed plan as well.

But the substantive change here that was beyond finalization requires amendment is that they again want to use sheep grazing as a vegetation management strategy at this site. You have evaluated this request for several solar to date, including the Montague Solar also known as Pachwaywit, as well as Bakeoven and Daybreak.

And as you know with ODFW coming forward, you received a presentation a few months ago, their biggest concern with sheep grazing is the potential for disease transmission to big game or to Bighorn sheep. And so we did consult with the regional biologist, Lindsay Somers at ODFW to confirm whether that disease transmission risk concern existed for this site, and they confirmed that it did not.

But they do have a set of best management practices they've recommended be included in the plan, so that is included in red line and the Attachment 2 for your consideration. But it includes doing fence checks to make sure that the fence is intact and that sheep can't escape, and that they would be monitoring and reporting to

evaluate if there are Bighorn sheep identified or if any of sheep escape from the site should they choose to use it.

And then we've recommended that the noxious weed plan make clear that use of sheep grazing and the success thereof is reported annually to the Department as we do want to understand if this is working or what type of problems are occurring, and that they are following through with those ODFW notification elements.

Okay. And yeah, I summarized that on the slide too.

Okay, so those are the substantive changes proposed that would necessitate an amendment of both the revegetation plan and the noxious weed plan. And we are recommending that Council concur with staff and agree that these changes can be incorporated.

So I'll hand it over to you for deliberation and decision.

CHAIR CONDON: Council members, any comments or questions?

COUNCILOR GRAIL: No questions. This is Marcy.

CHAIR CONDON: Thank you. Thank you, Ms.

Esterson for the presentation.

And I think we might be ready for a motion.

COUNCILOR HOWE: Chair Condon, I move that the Council approve the proposed amendments to the Oregon Trail Solar Project Revegetation Plan and the Noxious Weed Plan as presented in the staff report.

CHAIR CONDON: Thank you, Councilor Howe.

Do we have a second?

COUNCILOR GRAIL: This is Council Member Grail. I second the motion.

CHAIR CONDON: Thank you, Councilor Grail.

Any discussion?

Secretary Cornett, I think we're ready for a vote.

SECRETARY CORNETT: Richard Devlin?

COUNCILOR DEVLIN: Aye.

SECRETARY CORNETT: Kent Howe?

COUNCILOR HOWE: Yes.

SECRETARY CORNETT: Marcy Grail?

COUNCILOR GRAIL: Yes.

SECRETARY CORNETT: Patty Perry?

COUNCILOR PERRY: Yes.

SECRETARY CORNETT: Cindy Condon?

CHAIR CONDON: Yes.

SECRETARY CORNETT: The motion carries, Chair Condon.

CHAIR CONDON: Again, thank you, Ms. Esterson, for the presentation.

And now we have on the schedule a break. So we'll take a break at this point. And our next agenda item is at 6 o'clock. And so this will be a longer break than normal break. Sorry about that. We don't have circus animals or anything. So bear with us.

We do have some refreshments and some people to talk to. So thank you very much. We'll break until 6:00.

(WHEREUPON, a recess was taken.)

CHAIR CONDON: Good evening. My name is Cindy Condon. It is now 6:00 -- 5:59, almost 6 o'clock, and I would like to call the meeting back from recess and continue on with our next agenda item, which is Biglow Canyon Amendment 4, a public hearing.

And with us tonight is Chris Clark, senior siting analyst, who will provide an overview of the siting process and the proposed amendment as the hearing progresses -- and the hearing will progress.

Thank you, Chris. You have --

CHRISTOPHER CLARK: Thank you, Chair Condon, Council members.

For the record, my name is Chris Clark. I'm a senior siting analyst with the Department, and we are here tonight for the public hearing on the Proposed Order for Request for Amendment 4 of the site certificate of the Biglow Canyon Wind Farm.

I am going to start the presentation tonight with an overview of the Proposed Amendment and the Proposed Order.

I'll then turn it over to our senior siting analyst, Sarah Esterson, who will be serving as the presiding officer for tonight's hearing.

Sarah will give an overview of the hearing process itself and then open the floor to public hearing and oral testimony. The order of testimony will be the certificate will be given an opportunity to speak followed by members of the public, and then the Council will have an opportunity to ask clarifying questions.

To get into the overview of the Proposed Order, this project, the Biglow Canyon Wind Farm, is an operating wind power generation facility in Sherman County. The facility includes 217 Vestas and Siemens turbines and related and supporting

facilities, including a collector substation and an O&M facility. The facility is located within an approximately 39 square mile site located about two miles from the city of Wasco at its closest point.

In Request for Amendment 4, the certificate holder proposes to construct and operate a 125-megawatt solar photovoltaic power generation facility, 500 megawatt- hour Battery Energy Storage System, or BESS, and new related or supporting facilities at the existing site.

The proposed facility components would be located within a proposed solar micrositing area, which is represented by the pink hashed outline on this map. The proposed solar micrositing area includes approximately 1,924 acres, which is -- that is located entirely within the approved site boundary. That proposed micrositing area is located approximately 4.8 miles northeast of the city of Wasco.

This Request for Amendment is being processed under the amendment rules that were adopted by the Council last October. The Department received the preliminary application or preliminary Request for Amendment, excuse me, on April 21, 2025.

We conducted a completeness review in

coordination with reviewing agencies, and after receiving responses to requests for additional information between July and September of last year, and then in a revised amendment request in November, we issued a determination that the request was complete on December 5, 2025.

On December 16th, we issued the Proposed Order, as well as a public notice establishing the comment period on the Proposed Order and tonight's hearing.

After the close of the public hearing period, the certificate holder will be required to respond in writing to comments, and the Department will have the option to respond as well. And then there will be an opportunity for commentors to reply to those responses and certificate holder to provide sur-replies to those replies. Sarah Esterson will go over this process in more detail during her presentation.

No later than 21 days after the deadline for sur-replies, the Department must issue a draft of the final order with written analysis of any comments on the Proposed Order, including analysis of responses and replies and sur- replies and whether we recommend any changes to the Proposed

Order. And then if we recommend any changes, we will include them in a draft final order which we will present to the Council. The Council can review, and then modify, reject, or approve as their final order.

If the Council grants issuance of an amended site certificate, the Council will then issue an amended site certificate effective upon execution by the Council Chair and by the site certificate holder.

So this request would add new energy facilities to the existing site and the existing site certificate. And for that reason there were a lot of existing conditions in the approved site certificate which were applicable to preconstruction and construction phases of the existing facility, which while no longer applicable to the existing facility could be updated and amended to apply to the proposed facility components. Some of those conditions, particularly mandatory conditions, would also apply to both the operation of existing and proposed components.

To make applicability of the existing and proposed conditions more clear, the Department has recommended that the site certificate be reorganized

and that all conditions be renumbered with an identifier that includes phase and standards, similar to more recent site certificates. But many of those changes aren't changing, and some of the conditions that are new or proposed to be amended are very similar to conditions that have been imposed or adopted by the Council in recent proceedings.

So I'm not going to go into the standards which only have those kinds of conditions in them in a lot of detail during this presentation. They are shown on this slide, the standards that I won't cover more here, but I did want to give the opportunity to the Council to ask questions now if you want, just so you know that there are findings and conditions associated with all these. I just don't have more in my presentation about them at this time.

Yeah. Is that better? Excellent.

Okay. I'll hear any questions. I'm going to go over some select issues and conditions in the Proposed Order. I do know we have a lot of interest tonight, so I will try to keep it brief.

For the general standard of review, the Department is recommending that the Council find

that this facility or the Request for Amendment would comply with the applicable standards and that the Council approve this as part of a general standard review.

As far as conditions, we do have two fairly standard conditions for construction deadlines that I did just want to highlight. These are similar to what the Council has done recently. But given some legislative changes recently I thought it would be worth just pointing out that our recommended general standards 1 and 2 would recommend that the Council impose construction deadlines.

That for the beginning of construction, construction would be required to start within six years after the date the amended site certificate is issued and then construction would be required to complete -- be completed within three years after the date that construction actually begins.

This is, again, consistent with the mandatory condition language that requires the Council to set deadlines and with the requirements of HB 3681, which requires the Council to give at least six years to the start of construction. But I did want to point out that in the Request for

Amendment, the certificate holders indicated that they intend to begin construction in the second quarter of this year and that construction would take 17 to 19 months.

Okay. Moving to Organizational Expertise. We wanted to highlight that this project is somewhat unique in that the certificate holder, which is Portland General Electric Company, would construct and operate the solar components in partnership with another entity, BIGL bn, LLC BIGL, which is a subsidiary of BrightNight LLC, under a Build Transfer Agreement.

So given this partnership, we are both looking at the expertise of Portland General Electric and BrightNight. BrightNight, as it says on the slide, is based in Florida and has designed and constructed over 6 gigawatts of solar and storage projects in the United States. And in the Request for Amendment, BrightNight and PGE have committed to having stringent contracting standards to ensure the selected contractors and vendors can adequately support the construction and operation of facility components proposed in the Request for Amendment.

To ensure that this happens, the

Department has recommended the Council adopt and amend several conditions. Recommended amended Condition 1 would require the certificate holder to provide notice of the identity and qualifications of all primary contractors and vendors involved in the construction of the solar facility, which is a fairly standard condition and similar to what is in current Condition 1. The change is that the condition would also require PGE to identify the individuals at BIGL that will manage and oversee the selected vendors and contractors. So there's an additional layer of oversight included.

Similarly, recommended amended Condition 2, which currently only applies to construction, would require the certificate holder and BIGL to contractually require all contractors and subcontractors for the construction -- and operation it should say on the slide -- of the solar facility to comply with all applicable laws and regulations and the terms and conditions of the site certificate.

Next, we just wanted to highlight -- and I think this is one of the things you will hear about during the hearing tonight -- is that the existing wind facility has experienced substantial equipment

and maintenance issues over the past few years and that we have been documenting incidents since 2022, including blade detachment, oil and grease releases, multiple transformer failures, multiple turbine door and hatch malfunctions. Those are things that have been reported to the Council in your regular compliance reports. There are also things that are being addressed through corrective action plans and other compliance actions at the site.

But we have given those issues and the lessons learned identified by the certificate holder in their request. I recommended a few additional conditions, new conditions be imposed to enhance the oversight of operations and maintenance activities at the site, recommended Organizational Expertise. Conditions 1 and 2 would require finalization and implementation of a draft framework operations maintenance plan prior to and during operations.

That plan outlines the operational responsibilities, long-term maintenance protocols, quality assurance processes, environmental compliance measures, and emergency response and monitoring systems that would be relied upon to safely operate and maintain the solar components. A version of that draft framework plan that includes

information the Department believes will be required to be included prior to operation is included as Attachment C to the Proposed Order. The additional information requirements included by the Department include things like budgeting, community outreach, and reporting protocols.

Recommended Organizational Expertise Condition 3 would incorporate construction progress reporting requirements which are established in OAR Chapter 345, Division 26. But where those reports are typically provided semiannually, the recommended condition would increase the frequency of reporting to every three months to allow the Department to track progress and compliance more closely.

And then recommended -- and the last bullet should read recommended amended Condition 4 would impose enhanced incident reporting requirements, similar to the requirements provided in OAR Chapter 345, Division 29.

Moving to land use. We just wanted to highlight that there are numerous land use conditions intended to ensure compliance with the Sherman County Zoning Ordinance and other local land use criteria. But we wanted to focus on the goal exception and Recommended Land Use Condition 6,

which would be implementing part of that exception request.

So in the goal exception request, the certificate holder provides several reasons why the policy underlying statewide planning goal three should not apply. And the Department recommends that the Council grant a goal exception based on two of those reasons which are locational dependence to both existing infrastructure, including transmission and transportation infrastructure, as well as a rural economic development reason.

And the Council -- or the Department has recommended the Council reject proposed minimal impacts to other resources in consistency with the state climate goals and policy reasons.

As part of the local rural economic development benefit reasons, the certificate holder has represented that it will finalize and implement a draft Community Investment Plan and contribute $1,600 per acre of cultivated land that would be occupied by the solar components to a Community Investment Plan that would be administered by the Mid-Columbia Economic Development District. Recommended Land Use Condition 6 would require the certificate holder to implement those

representations.

For fish and wildlife habitat, the -- and my apologies for not having the exact number, but the facility would occupy mostly cultivated farmland but there would be, I think, around 24 acres. My apologies again for that not being the exact number of category two sage brush -- sage brush, shrubland habitat and other habitat areas, to mitigate for those impacts. The Recommended Fish and Wildlife Habitat Conditions 1 and 2 would require the certificate holder to finalize and implement a draft habitat mitigation plan and provide in kind in proximity mitigation for habitat impacts.

This is a pretty standard approach for mitigation to habitat impacts. And one thing we wanted to flag here is that the habitation mitigation area that was identified in consultation with the Oregon Department of Fish and Wildlife is a habitat mitigation area adjacent to the Carty generation facility in Morrow County. We understand that that site is preferred because it provides high-quality grassland habitat of a similar kind to the habitat that would be impacted and is adjacent to other habitat mitigation areas which would enhance the conservation value of the habitat

mitigation area.

We also have a condition which is fairly similar to standard conditions requiring seasonal restrictions on construction work near active nest sites, and those were recommended in accordance with recommendations from ODFW.

We have several public services conditions that are amended from conditions that would be in the existing site certificate, as well as new conditions for Public Services. I want to highlight in particular Recommended Amended Conditions 74 and 76, and then recommended new public services Conditions 1 and 2.

Recommended Amended Conditions 74 and 76 would require the certificate holder to demonstrate that an adequate water supply for construction and operation has been secured and that all water for construction will be legally obtained. That's similar to the conditions the Council has adopted in other water-constrained areas in the state.

For Recommended Public Services Conditions 1 and 2, they would require the certificate holder to develop and implement a construction worker housing plan to provide strategies to minimize impacts to the local housing supply. That is in

part due to the limited nature of RV parking here in Sherman County and the potential for adverse impacts if there's not a coordinated effort to make sure construction workers get appropriate housing options.

In addition to Organizational Expertise, as I mentioned earlier, I think one of the things the Council will hear a lot about tonight and the thing that the Council has heard about in comments already submitted on the record is wildfire prevention and risk mitigation. We just wanted to summarize some of the findings in the Proposed Order.

So conditions in -- in Sherman County are conducive to large and fast-moving fires, grass fires, and the probability of a fire in the proposed solar micrositing area is high, particularly in the summer months according to data from the community wildlife -- the community wildfire protection planning tool, as well as the Oregan wildfire explorer map data. Areas of elevated fire risk in the proposal or micrositing area which are shown by the darker red areas on the map on the slide are concentrated around existing residential structures and infrastructure.

We also want to point out that damage to agricultural lands and other areas is possible. You can see in this map, too, that there are some areas within canyons that are mapped as having, you know, wide benefits from fire. Those are really ecosystem benefits and don't reflect the hazard of a fire spread.

Design features and maintenance standards to reduce wildfire risks that are discussed both in the Request for Amendment, as well as the draft construction wildfire management, Wildfire Mitigation Plan that's attached to the Proposed Order and the Proposed Order itself, in orienting arrays adjacent and parallel to existing roads for access and fire breaks, setting perimeter fences back at least 50 feet from property lines and facility components, 20 feet back from those fences, installing 20-foot service roads with 10-foot vegetation clearance zones on either side, maintaining 20-foot vegetation clearance areas around the outside of all perimeter fences, and maintaining 20-foot gravel or compacted soil buffers around the O&M building, collector substation, and a proposed battery energy store system.

And to show in a little bit more detail

inside those areas called vegetation clearance zones and areas within the solar array fence vegetation would be limited to a height of 10 to 12 inches during the rainy season when fires are less likely, and then one to three inches during the dry season.

A minimum vegetation clearance of 12 inches would also be maintained from electrical equipment at all times.

As far as the conditions, Wildfire Prevention and Risk Mitigation Conditions 1 and 2 would require the certificate holder to develop and implement a Construction Wildfire Mitigation Plan, whereas Wildfire Prevention and Risk Mitigations Conditions 3 and 4 would apply to the operation of the facility.

The certificate holder would be required to develop and implement an operational Wildfire Mitigation Plan. But the condition as recommended would allow the certificate holder to rely on the Public Utility Commission reviewed wildfire protection plan or other plans included in the final order or approved by the Department to satisfy the requirement.

And I'm highlighting this. I do want to point out that there is a draft Construction

Wildfire Mitigation Plan attached to the Proposed Order, but there's not an operational Wildfire Mitigation Plan at this time, although some of the requirements and vegetation standards have been incorporated into other plans.

In particular, vegetation management conditions would be incorporated into a draft Comprehensive Revegetation and Soil Management Plan which is required under Recommended Soil Protection Conditions 1 to 4. And then I wanted to just highlight that the setbacks from the property lines are being recommended under a Land Use condition, recommended land use Condition 1.

That concludes my review of the things that we thought would be most important for the Council to be aware of and things that the public might be interested in before this.

I do want to go quickly over a review of the comments that we've received to date, and then I'll turn things over to Sarah. But I'll just pause for a second in case there's any questions.

Okay. So my site is a little out of date. I put this together at about noon today, but since that time we've received one additional comment. So as of today, the Department has received nine

written comments. Six of those comments are from Kathryn McCullough. One of the comments was from the Mid-Columbia Economic Development District. The certificate holder provided comments, and then we also received comments from the Confederated Tribes of the Warm Springs Reservation of Oregon.

I believe most of the folks who provided comments are here tonight, so I'm going to go over what's in there very, very briefly. I do not have a slide for the Mid-Columbia Economic Development District's comments, and I'll just summarize that they explained their relationship with the Community Investment Plan and their partnership in implementing it. So good comments to review.

Issues raised in comments by Ms. McCullough include concerns about the certificate holder's ability to safely operate and maintain the proposed facility components. And those comments provide documentation of ongoing maintenance issue at the existing wind facility.

The comments provide concerns about the certificate holder's ability to maintain vegetation equipment on site in a manner that provides protection from wildfire. Concerns about potential liability for damages to the solar facility from a

wildfire arising from farm practices. Concern over the lack of the operational Wildfire Mitigation Plan.

A comment that Exhibit P, which is the wildlife habitat exhibit and the biological assessment in the request do not adequately address impact to mammals and other species that could be present at the sites such as pronghorn and mule deer. And concern about the adequacy of a single hearing.

Again, I'm summarizing this very quickly. There's obviously more detail in those comments and the commenter herself, I believe, will be touching on a lot of these topics tonight. But I just wanted to give an overview of what was in there.

The certificate holder also provided very extensive comments requesting corrections to the facility description, minor corrections to certain findings and conditions in the site certificate. I'm sure you will hear in more detail from them about those tonight.

They've requested additional flexibility in transmission corridor siting under the proposed Recommended Condition GEN-TL-05. Request for changes on timing of compliance with Water Rights

Conditions PRE-WR-01, and Operations WR-01, relating to the timing of providing a well log for new wells and flowmeter readings for existing wells based on when it's possible to get that information.

And request for a release of the prohibition on vegetation removal during critical periods for ground nesting birds if clearance surveys are conducted prior to removal.

And then I will -- I don't have a slide for the comments from the Confederated Tribes of Warm Springs, but I do think it's important just to raise those, that they requested a specific review of a condition related to the scope of when cultural resource monitoring would be required. They've asked that it'd be required during all ground disturbing activities, not just in ground disturbing activities within an avoidance buffer.

And so that concludes my presentation, and unless there's questions for me, I will turn it over to the presiding officer to give an overview of the hearing process.

SARAH ESTERSON: Okay, good evening and welcome. This is the public hearing on the Proposed Order on Request for Site Certificate Amendment 4 for Biglow Canyon Wind Farm.

I'm Sarah Esthersen, senior policy advisor for the Oregon Department of Energy Siting Division. I'm serving as the presiding officer for this hearing.

Today is 15 January 2026. The time is 06:27.

This public hearing is being held at an Energy Facility Siting Council Meeting in person here at the Grass Valley Pavilion in Grass Valley, Oregon. This hearing is also being held via Webex webinar with a call-in option for those who cannot participate in person or via webinar.

Please note that this hearing is being recorded and the presentations, written comments, and all verbal testimony are part of the decision record for this amendment request.

Okay, so hopefully you're aware the comment period on the Department's Proposed Order on Request for Amendment 4 extends through January 30th at 5:00 p.m. It is important that you know the following information.

A person who contends that the Council should reject the request to amend this site certificate or that Council in its final order should reject or revise certain aspects of the

Department's Proposed Order must meet the following.

You must comment in person or in writing prior to the close of the comment period. Again, that January 30, 2026, 5:00 p.m. deadline.

You must raise your issue with sufficient specificity to afford the Council, the Department, and the certificate holder an adequate opportunity to respond. To raise an issue with sufficient specificity, you must in your comments identify the recommended findings of fact, conclusions of law, or conditions of approval that are included in the Proposed Order to which you object. You need to specify the Council standard or other applicable state or local requirement on which your objection is based. And present facts or statements that support your objection. If your comment is not made with sufficient specificity, the Council will not be able to make changes in its final order based on your comments.

Okay, so if you comment during this comment period, which started December 5th, again, extends through January 30th, you will automatically be part of a subsequent process, which is designed to further evaluate the issues that you raise. This is a new process for us, so it's going be

interesting.

So the certificate holder, which is Portland General Electric, is required to respond to all comments. The Department may respond, but the certificate holder is required to respond to all comments. So the certificate holder and the Department have a deadline of February 13 to respond to your comments. These responses are going to be provided to you in the same method that you commented.

So if you email your comments and we have your email address, that's how you're going receive responses. If you submit your comments in hard copy with a physical address and we don't have an email, we will respond -- the certificate holder will respond in writing to your physical address. If you don't provide an address, no email, no physical address, you will not be able to participate in the subsequent process. We will have no way to communicate with you and respond.

So what to expect. So first and foremost, certificate holder and the Department are going to be trying to determine if your comments have been raised with sufficient specificity. So I just read through that.

Did you identify recommended findings of fact that you have an issue with? Have you identified a Council standard or applicable requirement that you believe is not being met, and have you provided facts or supporting information to support your objection?

If you haven't met any of those, the response is going to identify that, one or all of those things.

If you have provided comments that meet the sufficient specificity criteria, certificate holder and the Department are going are going to say that, and we are going to either identify where your issue is believed to be addressed and potentially already resolved within the Proposed Order, or it's going provide a resolution to your issue if it's not yet addressed.

So it's kind of a big step. Again, February 13th, you will be getting this response that has all of these words you may or may not be familiar with, but that's coming.

In the Department's response, we plan to provide, you know, helpful information to help you understand how to navigate through this process. And this, you know, this is intended to help further

evaluate your comments and make sure that we understand and that we get it right.

Okay, so then, that's not the end of it. So February 13th, certificate holder and the Department are responding. Then you, as a commenter, will have an opportunity to reply to those responses. And you have a deadline that's already been established in the Department's notice. That deadline is February 27th.

So you don't have to, but you can choose. If the Department and/or the certificate holder has said your comments were not raised with sufficient specificity -- we don't know what standard your comments are related to, you didn't provide any facts -- you can then take that and identify the Council standard and provide facts.

You can disagree. It's a process designed to sort of continue evaluating those comments.

And then after you respond, if you choose to respond, both certificate holder and the Department have a final opportunity to provide surreply. Again, ideally it's a resolution. We will see how that works out. I believe our deadline for surreply is March 6th. So that's kind of the whole extent of the comment process.

And feel free to ask any of us questions after the meeting. Chris Clark's information will be on a slide later. You're free to reach out to him at any time and ask how this is going to work or how it's working once it gets -- once that February 13th date comes forward.

Okay, so there are several acceptable means for submitting comments on the record. You can submit comments electronically through our comment portal. This is a link to our comment portal.

If you submit through our comment portal, you will get an email confirmation that you have submitted comments, so please make sure you get that. It is important that you include your contact information in comments you submit on the comment portal so that you have an opportunity to get a response and further the evaluation.

You can also submit comments in hard copy by mailing to the Department's Salem office, 550 Capital Street NE, Salem, Oregon, Attention Chris Clark.

And of course, you can provide comments verbally tonight.

As I said, this meeting -- this hearing is

being recorded. We will have the recording transcribed, and that information will be available on our website.

Okay. So we're almost getting started with your turn. The order tonight will start with an opportunity for the certificate holder. Then, we'll open it up to members of the Council. After that -- I'm sorry, then we'll open it up to members of the public. And after that we'll open it up to members of the Council. And then we'll return to the certificate holder. We may establish a time limit on members of the public depending on how many individuals are interested in commenting tonight.

So let's go ahead and start with the certificate holder.

Is the certificate holder interested in providing comments?

KRISTEN SHEERAN: Testing. That sounded good. Okay, great.

Good evening, everyone, Chair Condon, members of the Council. For the record, my name is Kristen Sheeran. I'm vice president for public policy and resource planning for Portland General Electric.

PGE is a fully integrated electric utility

that has a service population of nearly 2,000,000 Oregonians. And two-thirds of the state's economic activity occurs within our service area.

Can you hear me all now? That's better?

Okay, great.

As owner and operator of the Biglow Canyon Wind Farm, PGE has a long-standing history in connection to Sherman County. In 2024, PGE -- yeah?

UNIDENTIFIED SPEAKER: Can you (indiscernible)?

KRISTEN SHEERAN: I can. Here we go.

All right, let's try that again.

In 2024, PGE contributed $7.3 million in property taxes, about a third of the county's property tax base, helping to support schools, parks, infrastructure. Sherman County is a very special place, and the opportunity to represent PGE in the community here tonight is not lost on me.

But I'm here today to discuss the importance of the Biglow Canyon Wind Farm RFA4 site certificate amendment to PGE's resource portfolio, to our customers, and to Oregon's clean energy and economic development goals. We appreciate the Oregon Department of Energy's staff recommendation to EFSC to approve this amendment.

The Biglow Canyon Wind Farm has supplied clean, affordable energy to Oregonians since 2007. Being one of the first major wind operations in the state, there were learning lessons along the way, including around maintenance and performance. And since that time that we began Biglow Canyon, we have added thousands of megawatts of clean energy to our system. PGE and our partners, including a wind farm in southeast Washington; a wind farm in Montana; a combined wind, solar, and battery here in Oregon, the largest of its scale to open in the United States.

But we are committed to continuously improving and upgrading equipment to increase efficiency and reduce costs for our customers. An ongoing maintenance and overall project at Biglow Canyon Wind Farm to continue safe and reliable plant operations for years to come is well underway as we pursue now adding solar and battery storage to the site.

Through this amendment that we're proposing, the addition of solar and battery storage at the site will help to optimize clean energy generation and delivery in support of our customers' growing electricity, clean energy, and emissions

reduction requirements.

As we plan our system, affordability for customers remains top of mind, and PGE has aggressively pursued federal production and investment tax credits that have reduced the cost of clean energy projects on our system by at least 20 to 40 percent. To date, PGE and its partners have secured over a billion dollars in federal tax credits for our clean energy portfolio to the benefit of our customers.

However, recent changes in federal policy will rapidly sunset clean energy tax credits, escalating the long-term cost of renewable energy and storage, and threatening customer affordability and the pace of achieving the state's clean energy and economic development objectives.

An amended site certificate allows this project to move forward on a timeline that can capture the value of those existing federal tax credits while they're still available for our customers before they're phased out, aligning with PGE and the state's focus on delivering affordable, reliable, and increasingly clean power while acknowledging -- while achieving the directives outlined in Governor Kotek's recent executive order

to accelerate renewable energy siting.

Colocating solar and wind power generation equipment allows us to take advantage of the existing infrastructure on the site, like transmission lines and substations, and to reduce the overall impact to the land and to the environment.

Adding solar capacity complements the existing wind capacity since wind and solar typically produce peak power production at different times of the day. This allows both renewable energy resources to work together to meet a broader range of our customers' energy needs, increasing PGE's overall system reliability and the value of the site overall to our customers.

The addition of battery storage will also provide flexibility to the grid, allowing energy storage when demand is low and its use when demand is high. The right mix of energy resources in the right locations can help reduce reliance on fossil fuels and drive a cleaner, more affordable, and reliable energy resource mix.

PGE has already made strong progress towards achieving the state's emissions targets with an overall resource portfolio that is 45 percent

non-emitting as of the close of 2024. And this includes projects like the Biglow Canyon Wind Farm. The site certificate we're seeking today to add solar and storage will further PGE's progress toward meeting our 2030 state emission targets.

To identify the least cost, least risk portfolio of resources that are needed to meet our customers' current and future energy needs, as well as state clean energy requirements as overseen by the Oregon Public Utility Commission, PGE engages in long-term, integrated resource planning.

In our most recent integrated resource plan updated in July of 2025, PGE identified a need to procure an additional 4500 megawatts of clean energy resources. This represents about a 16 percent increase since PGE's prior IRP that had been filed only in 2023.

Projects like the proposed addition of 125 megawatts of solar and 25 megawatts of storage at Biglow are critical contributors to this growing clean energy need.

PGE's all source request for proposals is a transparent, regulated, competitive process by which interested developers submit detailed project proposals for consideration as we plan to meet our

customers' energy needs.

The 1,600 megawatts of resources that PGE identified on the final short list of projects that resulted from our 2023 all source request for proposals competitive bidding process included the Biglow Solar Project, was acknowledged by the Oregon Public Utility Commission, and the projects were selected for their potential to deliver affordable, reliable, and cleaner energy.

By selecting projects through this competitive process verified by an independent evaluator, PGE can add high-value, responsible projects that capture significant federal incentives and reduce costs while meeting the state's growing energy needs.

Given the shortened timeline that now exists to capture tax credits, the importance of maintaining a project schedule is paramount. We have partnered with BrightNight to ensure responsible and timely delivery of this project that recognizes that this is a critical opportunity in time for Portland General customers, the state and Sherman County. The certificate amendment will allow critical energy need and capacity to meet Oregon's economic development needs and the state's

emission targets.

So we urge the Energy Facility Siting Council to approve the site certificate amendment recommended by staff, thereby maintaining the development schedule with a final decision in March 2026.

And with that, I want to thank you for your time, and I want to hand this over to our project partners at BrightNight to provide more details on the project itself as proposed.

JESS MALIN: Thank you Kristen. And thank you Chair Condon and members of the Council.

My name is Jess Malin. I'm executive vice president of development at BrightNight. I've spent nearly 20 years developing renewable power projects across the United States.

Earlier in my career, I served as a U.S. Air Force pilot, an experience that continues to shape how I approach complex infrastructure development, balancing creativity and innovation with discipline, precision, and an unwavering focus on safety and reliability.

Those same principles guide BrightNight as a company. BrightNight is developing over 30 gigawatts of clean energy projects nationwide with

11 gigawatts located in the Pacific Northwest.

Across our portfolio, we are committed to safety, responsible cost management, and building durable partnerships with the communities where we operate.

Our team consists of some of the most accomplished energy project development and operation professionals within the entire industry. The team at BrightNight is like-minded. We want to be part of a company that is a reliable partner and committed to the communities we invest and operate in, and one that has a strong financial backing with leading edge system design.

Our ability to deliver projects responsibly and on schedule is validated by our backing by investment partners at Goldman Sachs, global infrastructure partners now owned by BlackRock, and Cordelio Power, providing the financial strength and stability our utility partners and their customers expect.

Optimizing projects to deliver maximum value to customers and communities while minimizing impacts is central to how BrightNight operates. We have taken those lessons learned and built on that track record here with the Biglow Solar and Energy

Storage Project.

You will hear this evening in detail the innovative planning and design that has gone into this project, the increased efficiencies and output that Biglow will add to the grid and the best-in-class features to improve operational safety and resilience.

BrightNight is pleased to be here this evening in partnership with PGE to speak with Council about the Biglow Solar and Storage Project and the steps that our teams have taken to develop a thoughtful, responsibly-sited project. Thank you.

And now we'll bring up the actual experts.

KATHLEEN CAMPANELLA: Thank you, Chair Condon and members of the Council. We also want to thank the Oregon Department of Energy staff for their thorough review and the work reflected in the Proposed Order.

For the record, my name is Kathleen Campanella, and I'm senior director of development for BrightNight. And I'm responsible for the development of the Biglow Solar and Storage Project.

I'd like to begin this evening with a simple question. What does it mean to site a project responsibly?

For this project, responsible siting wasn't a single decision or a single mitigation measure. It's a principle -- excuse me for that -- it's a principle that affected nearly every aspect of the project's development and engineering. It shaped where the project is located, how the site boundary was drawn, how impacts were avoided and minimized, and how remaining impacts are addressed.

I want to briefly summarize that approach and how it is reflected in the Department's analysis.

I'll start by discussing colocation. This is a renewable energy project, and by definition, it delivers an environmental benefit. But like any infrastructure project, it also has impacts. Responsible siting means acknowledging that reality and finding the option with the least impacts.

Colocation is just that. For this project, it integrates solar and battery storage with the existing Biglow Canyon Wind Farm, therefore, reducing the need for new transmission lines, new access roads, and disturbing additional land.

Another core element of our approach to responsible siting is community engagement and

listening. This allows us to better understand and address local concerns, resulting in a design that is responsive to the community's voice. We participated in dozens of one-on-one conversations with local leaders, neighboring landowners, agricultural producers, and community members.

Finally, I want to highlight our outreach and coordination with local organizations and public service providers, including county departments, agricultural and conservation groups, economic development entities, and emergency service providers. These discussions are reflected in project plans and in the conditions of the Proposed Order that ensure ongoing coordination with public service providers. Taken together, these efforts reflect the same responsible siting approach I referenced at the outset -- anticipating impacts, engaging early, and responding in a way that aligns with local priorities.

With that, I'll pass it on Todd to discuss vegetation and wildfire management and project safety considerations.

TODD ELWOOD: Thank you, Kathleen.

Chair Condon, Councilors, my name is Todd Elwood. I'm the senior permitting director for

BrightNight.

BrightNight and PGE have heard from the very beginning how important vegetation management and wildfire risk are for this project. We appreciate the input received from ODOE staff, the reviewing agencies and the community that have all informed the design of the project and the draft plans before you today.

Rather than relying on any single measure, the project uses an integrated approach. Project design, construction planning, long-term operations, and community coordination and investment all work together to support long-term landscape resilience. The goal is to reduce ignition risk, limit fuel build up, support early detection and response, and strengthen regional wildfire preparedness.

The project is designed to reduce risk from the outset. The layout, materials, access roads are all planned to minimize ignition sources, break up fuel continuity, and create defensible space around solar panels, the BESS, the substation and related infrastructure. The project has been designed to exceed fire code requirements by maintaining no less than a 20-foot noncombustible buffer around the perimeter of the site.

This conservative approach reflects our commitment to fire safety and directly responds to input received through outreach with local fire agencies and local -- and neighboring landowners.

Wildfire mitigation is addressed during every phase of the project. There will be dedicated Wildfire Mitigation Plans for both construction and operations, including equipment standards, weather-based work restrictions, active monitoring, and coordination with fire agencies and local responders. There will also be emergency responses plans for each phase of the project and training for all contractors as well as local responders.

The project will use low fuel vegetation. Restoration seed mixes are comprised of native grasses and (inaudible) that produce less biomass, cure more slowly, and do not create continuous fine fuels. Our proposed seed mix will reduce the need for repeated mowing or treatment, which in turn lowers ignition risk from maintenance activities.

We also take a proactive approach to noxious weed prevention. Rapid revegetation, clean equipment practices, and ongoing monitoring help prevent invasive weeds that increase fire risk and reduce land productivity. Over the long term,

vegetation management continues through the operation and maintenance plan. This includes regular inspections, adaptive management, and ongoing fuel load control for the life of the project.

Soil stability and erosion control are also key parts of this strategy. Proper soil handling and restoration will reduce weed invasion and help prevent conditions that can worsen wildfire behavior. Revegetation and weed control contractors will be held to stringent qualification standards. All of these measures help protect adjacent agricultural and grain land uses by reducing the potential for wildfire spread beyond the project site.

Did it advance?

Taken as a whole, our commitment to a comprehensive management program demonstrates the project will coexist with and not undermine ongoing agricultural use in the area. As previously mentioned, the use of setbacks and micrositing also help ensure the project will be compatible with neighboring farming operations. BrightNight has implemented setbacks, buffers, and will have three 2,000-gallon fire water tanks outside the perimeter

fence that can be used by our neighbors.

The Proposed Order contains numerous conditions to require accountability and long-term enforcement, and we support staff's recommendations.

Thank you for your time, and I'll hand it off to Lenna to discuss goal three.

LENNA COPE: Chair Condon, Council Members, my name is Lenna Cope. I am an environmental specialist with Portland General Electric, and we wanted to cover a couple of things regarding the goal three exception and a little bit more information about the Community Investment Plan.

As you heard from Chris's presentation, the staff is recommending that the goal three exception be approved based on the locational dependency and the creation of rural economic benefits.

As Kathleen spoke to earlier, colocating the solar facilities with this particular location is very important to be able to take advantage of the existing transmission lines, surplus capacity on those transmission lines, and existing BPA substations.

The real economic benefits will be

realized through the implementation of a Community Investment Plan, which was developed from extensive community engagement and listening. The plan includes prescreening projects identified through outreach, such as dryland wheat, agrivoltaics, agricultural wildfire risk minimization and capacity building, fund matching for Solar and Water Conservation District programs for wheat farmers, next generation farming innovation and technology training program, and capacity building for wheat growers. So those are the prescreened projects included in the Community Investment Plan.

The plan also includes provisions for additional projects to request funding and a local governance structure through the Mid-Columbia Economic Development District.

The analysis of indirect economic impacts performed during our amendment preparation indicate that 1,600 acres (sic) per acre of farmland taken out of production prior to starting construction will be applied to the fund.

This is in addition to the projected $40,000,000 in property tax revenue. And we also estimate that on average will be 165 union workers on site each day during the approximately 18-month

construction period generating additional spending in the local community.

In addition to staff's acceptance of RFA's locational dependency and rural economic benefit reasons, PGE will be advocating for the Council to recognize the project's consistency with state climate goals and policies.

As Kristen discussed in her comments, the site certificate amendment to add solar and storage will further PGE's progress towards the meeting our 2030 mission targets mandated by the state. And for that reason, we will be requesting the Council recognize an additional reason to support the goal three exception, and we will provide additional evidence in the written record to support that request.

Okay. I also wanted to touch on operations and maintenance. We know that there are community concerns with the past maintenance and performance of the Biglow Phase 1 wind assets. PGE's ongoing maintenance and overall project has been addressing those concerns and root issues, and Dan will be speaking to those in just a moment.

But regarding the solar and battery, as has been mentioned by previous speakers and the

staff's presentation, the Proposed Order requires a standalone O&M plan to be approved by the Department with review and updates if needed on an annual basis. The O&M plan covers ongoing inspection, monitoring, reporting, and enforcement by the Department at a level not previously specified in the existing Biglow site certificate or any site certificate issued by the Council previously.

The plan will also integrate commitments from the other major operational plans, such as the Comprehensive Revegetation and Solar Management plan and the Operational Wildfire Mitigation Plan. The content in all the plans is informed by the Department's involvement in other recent solar and battery projects and addresses the challenges faced at those sites with the goal to reduce those challenges at future sites.

The development and approval of the plans are mandated by the site certificate and will be reported on for the life of the project at varying frequencies.

In addition to all those improved details and specific requirements, the Department itself has put significant efforts into their compliance program, has additional compliance staff, and

retains the authority to inspect the facility and require corrective action if anything is found to not meet the requirements.

And now I will hand it over to Dan.

DAN WILSON: Thank you, Lenna.

For the record, my name is Dan Wilson, and I'm the director of renewable operations for Portland General Electric.

In addressing the age and the material condition of the Biglow Wind Farm, at its 18-year age and after a long period of stable operation, the Biglow Wind Farm has shown an increase in equipment failures over the past four years. And this has signaled a condition of age-related degradation, a trend that we confirmed by benchmarking against other industry leaders.

In direct response, we have implemented a comprehensive and proactive enhancement plan to secure the asset's future reliability. The key strategic actions include, first, to operate and maintain, we have hired a new service provider that is an industry leader for all wind generation. The performance of the service is reviewed by PGE's leadership to ensure top-notch compliance to the maintenance standards.

Second, we've increased inspection frequencies for key components.

Third, we are executing a critical redesign and replacement program for the obsolete and failure-prone V82 pitch systems, which have been a primary source of downtime.

Fourth, after completing the pitch system replacements, we are cleaning the towers, hubs, and blades.

In summary, the winds farm's current condition reflects its age, but we are actively mitigating those risks through a targeted capital enhancement and maintenance strategy. The centerpiece of this effort, the pitch system overhaul, directly addresses most of the significant historical failure mode positioning an asset of improved reliability and extended operational life.

Thank you very much, and we look forward to hearing from public comments and will return after our closing. Thank you.

SARAH ESTERSON: Is there a separate presentation that goes on now?

UNIDENTIFIED SPEAKER: Why, is it the last slide?

SARAH ESTERSON: Okay, thank you

certificate holder representatives.

We'll now move to members of the public.

Nancy, could you confirm how many comment cards we have?

While she's doing that, is there anyone in the room that would like to provide verbal testimony tonight that has not filled out a comment card?

If you could raise your hand.

Seeing none, okay.

Five? And if you are on the webinar or on the phone, could you raise your hand if you're interested in providing a verbal testimony.

She can call them.

Do you want to do a time limit on five? Do you want to do a time limit? Let's do seven minutes.

Okay, so we have eight individuals that are interested in providing testimony. And the Council has an opportunity to provide comments and questions and the certificate holder can come back. So we're going put a seven-minute time limit on your comments. Note, this is -- you can provide comments all the way through January 30th.

Can you put a timer on the screen?

Okay, so will you stand up and waive your

hands when your timer goes off?

Okay, so I'm going to let you call the commenters since you have the cards.

Okay, so again, just as a reminder for any individuals that wish to provide testimony tonight, please state your name. Identify if you're representing anyone other than yourself, and confirm your physical mail or email address or make sure that it's written on the comment card.

Okay, now we'll turn it over to you.

NANCY HATCH: Okay, our first commenter is Kathy McCullough.

Come on up, Kathy.

KATHY MCCULLOUGH: All right.

NANCY HATCH: Okay, and just so you know -- go ahead and come on up -- I'll start the timer when you start to present. And then I'll just raise my hand when you're at one minute left to go.

SECRETARY CORNETT: And then just a note, if you're going use the pictures as part of your comments, we'll just take photos of them. So, but we need to do that before you take them away because once you enter them into the record, they're part of the record.

KATHY MCCULLOUGH: Should I sit down or

stand up?

SECRETARY CORNETT: I mean, probably sit down because I don't think standing up it's going pick up on it.

KATHY MCCULLOUGH: Okay, I can talk loud. There you go.

Okay, thanks. So pick up the whole thing?

NANCY HATCH: If you're going to stand up you need to have it close to you.

KATHY MCCULLOUGH: Okay. I think I can sit.

Kathy McCullough, and I live right under the project about a half mile from the PGE building. And I'm retired 747 captain for Delta, and I'm also a microbiology environmental health graduate from Colorado State.

When this project was first started, you wouldn't have found anybody more excited about it than I was because to me these looked like giant propellers. I loved it. I wanted clean energy and wind, and we could farm around them. That was the best. In fact, it helped us. We got new roads. We got in and out of fields we could never get into before. It was amazing. We were probably the biggest proponents of this project. Until.

Construction was great. The first five years, great manager, new equipment, everything was perfect. The next 10 years, horrible. I mean horrible. We were picking up pieces in our field. There were nose cones dropping. They all started leaking, all of them in Phase 1.

And the culmination was when a blade dropped in February 2022, waking up my husband and my dog. I wasn't home at the time. This is the blade down here on the ground there. This is our house across the road. It was really close. It was really loud. We had been complaining for a while because there had been so many pieces.

PGE wouldn't listen to us. They really would not listen. And we didn't know what else to do. I mean, even after the blade fell and PGE got Alltite to come in and start inspecting all the bolts in all 76 of the first Vestas towers, nothing changed.

Alltite came. Alltite went. One company before them said it was the greasiest mess that they had ever seen and it was unsafe and they quit. They had to throw their coveralls away after one day. It was one of those things that we knew would happen. We'd been watching.

This is what they still all look like. They haven't -- they haven't gotten better. They aren't cleaner. None of them have -- there's one that has the new prototype on it, but four years after the blade drop, nothing has been fixed. They have all the parts ordered, but nothing is different to us.

And, in fact, the old -- Brad Jenkins, who was in charge of the project before, lied to the newspaper and said just because they're dirty outside doesn't mean they're dirty inside. Well, I have a picture of the inside. It's horrible. The wiring's cracked. It's really bad. And, and they flat out lied to us.

So, my problem is, how do I trust this company for solar in a county that is so fire prone you would not believe it. Our fires -- this is under Biglow. This is one of the fires we've had. We have six to 10 fires a year during harvest and around the dry season. And they're scary. I mean they are. They move fast. My neighbor barely got in the car and out of her house as a wall of flames was coming towards her.

We all run to fight them. We all have water on the back of our pickups. We have shovels.

We have hoses. We have everything like that, but they still move fast. And I mean fast. There were probably 50 pickups and farmers fighting this fire. And this was a couple of years ago. And it's just one of the many.

And if I trusted PGE with their -- with their wind, I can't trust them with their solar. I can't trust that I'm safe in my house if they're not going to be honest. And if they're going to tell people that we lie.

There's a whole new regime at PGE now. I admit that because I like Dan. I like the people who are there now. And I think we're on a different path. I think we're going in a different direction, but unless it's in the site certificate, they're not going to do anything. And most of this -- most of this amendment is construction. Very little of it concerns actual operation once the construction phase is over.

We really need a strong site certificate. Even with PGE knowing all that, they never reported anything until I went to the paper and got The Oregonian to write four months after -- no, wait. February is when the blade dropped, and I think the paper, maybe September, came out and there was no

change. Nothing. They knew pieces were dropping.

And I just -- I'm glad they have new maintenance. I really am. Or new, you know, new people. But we've got to have a strong site certificate. We could not get them to give us a hold harmless clause for farming. So if we accidentally start a fire and it burns into their facility, that's a $2,000,000,000 facility we don't have money for.

The only other thing I was going say is BrightNight has got great ideas, I mean, for fire. And as a 747 captain, lithium-ion batteries are scary. They are just plain scary. My vinyl siding on my house melted in 2021 to the west side. That's how hot it gets there. So if you don't have good, you know, good protection, you're in trouble.

So this is how they look. They say, oh no, they look great. They're white. They're clean. Yes, they are. This is how the transformer boxes look that PGE has under the towers. How am I supposed to think that the batteries are going to look okay?

I just -- so I hope -- I understand we have to have this green energy mandated, et cetera. Can we get some real teeth in the site certificate?

Can we get some real help out where we are? And if there's a fire, please don't let them sue us so that we can't farm anymore because we only have 5,000,000 liability. We can't pay for that facility.

We've never started a fire during harvest, but we fight four to six a year. Well, no, six to 10. One of these days it's going be our turn.

SARAH ESTERSON: Okay, thank you so much for your comments. Appreciate it.

You will get a designated time, but you can ask whenever you want.

NANCY HATCH: All right, so our next commenter is Kevin McCullough.

KEVIN MCCULLOUGH: Obviously I'm Kathy's wife -- or husband, excuse me. Kathy's husband.

I farm underneath the project. PGE has not done what they said they were going to do, and now that we have new management, this is a good thing. But they need to -- they need to prove that they can operate this. I don't know why you would give them their certificate to put in a solar farm when they have not proven that then they can operate what they have. They keep saying they need more green power.

Do you know how many towers we have

sitting every day out of those 217? Forty to 50 every day. Makes no sense to me why you would be willing to give them a certificate to build a solar thing until they fix this problem over here. It's bizarre to me.

And the other thing is the fires. Like she just said, it's not if we start a fire, it's when we start a fire. And your setbacks aren't even close to deep enough to keep us from having to pay. They're going to sue us and we will no longer be in business.

So, thank you for your time and hopefully you take some of this into account.

NANCY HATCH: Okay, my next commenter is Colton McCullough.

COLTON MCCULLOUGH: Good evening, everyone. I should be the last McCullough commenting, I think, unless there's someone I don't know about.

My name is Colton McCullough, and I am the current farmer on the land that the proposed project would be built on. As some of you know from experience and have learned recently, Sherman County is extremely wildfire prone from late May through October. My main concern with the proposed project

is both fire starting within the project and fire starting outside the project and burning into the project.

I farm on nearly every side of the project and potentially in the middle if approved. Sherman County is an agricultural community with the primary crop grown being wheat. Wheat is typically harvested -- wheat harvest typically happens in July and August. This is when the crop dries out and can be harvested, but it is also when it is most likely to burn. We do a lot to prevent and stop fire from always having a fire-fighting pickup and tractor with a disk in the field, to preventive maintenance on our combines and other equipment, to putting fire breaks around houses and other infrastructure, to shutting down on days of extreme heat and high wind.

Even taking these precautions, there is no way to eliminate the chance that we will start a fire. As they've said, it's not if, it's when. I do my best to prevent fire and will continue to do so, but I am very worried about starting a fire and having it burn into the solar facility. I carry a large liability policy, but not even close to large enough if I burn up a solar facility. There is no economical way to carry a large enough policy.

I don't want to lose the farm or have my son lose the farm because we burned a solar facility sited in the middle of wheat fields where seasonal fire risk is extremely high. I have been told that the panels will not burn, and that may or may not be true. But that doesn't mean that they won't be damaged or melted by the heat of the vegetation burning below them.

The best way to reduce the fire risk in the solar project is to reduce the amount of vegetation available to burn. Under the Request for Amendment 4 currently submitted, it is suggested that the maximum height of the vegetation be 12 inches year-round. This is far too tall and would be a significant wildfire risk during fire season.

Under the Proposed Order submitted by ODOE, it has suggested the vegetation be kept to a maximum height of 12 inches during the rainy season, November to May, and one to three inches during the dry season, June to October, for all areas within the solar fence line. Along with several other stipulations on page 233 of the Proposed Order, I strongly support ODOE's suggestions and feel that it would make the project safer and far less likely to have a wildfire. The small change in management

practice would drastically reduce the wildfire potential within the solar facility.

From what I can tell, ODOE's changes would go under the Comprehensive Solar Revegetation and Soil Management Plan, although redlined in by ODOE. If this is the case, I would like to see some other language addressed in that section. As it currently states, this is only the plan in the interim until an operational Wildfire Management Plan is put in place. It concerns me that there is no operational wildfire plan to be reviewed yet, and PGE's systemwide Wildfire Mitigation Plan may be used.

PGE systemwide Wildfire Mitigation Plan (WMP) primarily focuses on power transmission and some limited information on the generating facilities. It is not a site-specific plan that considers specific wildfire risks for a project like this in a location like here.

I would like to see language saying ODOE's vegetation height and clearances suggestion would be implemented into the operational Wildfire Mitigation Plan and remain a basic requirement for the life of the operation of the facility, if not included into the operational Wildfire Mitigation Plan. Basically, I want to see the vegetation height

suggested by ODOE be a permanent, not easily amended part of the facility requirement throughout the operation of the project, and not be ignored because the operation Wildfire Mitigation Plan says something different or doesn't specify vegetation height.

My intent of public commenting is not to show support for or against the project, but to ensure that critical wildfire preventative strategies are used during building and operation of the project. I would like to see the project be an asset to fire prevention in the county, not a risk. I would like to see it be a fire break where people know when the fire gets to the actual project that it is going be stopped. But there has to be stuff in the site certificate that puts teeth that make them maintain it to the standard.

But if vegetation isn't managed properly, it's not fair to ask the farmers and community members around the project to take the risk associated with the solar facility. I want the Council to realize that this proposed project is being sited in the middle of wheat country that is associated with very high seasonal fire risks. Setting a standard of vegetation management and

making sure that standard is upheld throughout the operations of the facility would address a large part of the fire concern with this solar project. Thank you.

NANCY HATCH: Okay, our next commenter is Mr. Hilderbrand.

ORMAND HILDERBRAND: Greetings. Ormand Hilderbrand is my name, and I am not a McCullough.

I manage my family's farm, which is near the proposed Biglow Renewable Power Project and have been involved with Oregon's environmental and land use issues for years. I am submitting this statement for the record regarding the Biglow Renewable Power Project.

I approach projects like this with a clear understanding that development has impacts. The question is not whether impacts exist, because they do, but whether they are acknowledged, responsibly mitigated, and managed through a rigorous public process.

Even farming has impacts on our land. You know, some may argue that our land shouldn't have been put to the plow back in the 1880s, but it was done. Impacts happen. But based on my experience, I am confident that the impacts associated with this

project can be addressed appropriately. And I'm confident that after 50 to 70 years of the project being a major solar producer, if we get to that point and we need to have the land back for agricultural production, it can come back to agricultural production with improved soil health. That is critical.

I'm a strong believer in clean energy. I've been a director of the Community Renewable Energy Association (CREA) for many years. CREA is a strong advocate for shaping policy to benefit rural Oregon.

And I personally have been involved in the development of my own renewable energy project, PaTu Wind Farm, which is a 9 megawatt, six GE 1.5 SLE turbines that are adjacent to Portland General Electric's Biglow Canyon. I supply power to over 3,000 homes in the Portland area.

That experience has given me a practical understanding of what responsible project planning looks like, including the importance of environmental review, mitigation commitments, and ongoing accountability. You know, we must hold companies accountable for what they say they're going to do.

The Biglow project reflects this level of responsibility. The developer has engaged seriously with the permitting process and has demonstrated willingness to address environmental considerations. I have attended several of the discussions myself, including the presentation of the North Sherman County Fire District that discussed these fire mitigation procedures.

It used to be that we on the east side felt that we had the fire risk all to ourselves. Now that you on the west with the climate change, you are the fire risk, too. So I think everybody can appreciate, especially in a rural county, where the land and agriculture, natural resources are deeply interconnected, the importance of this fire mitigation.

I also believe it's important to consider projects like this in a broader, long-term context. Sherman County's economy has changed significantly over time and the pressures facing agriculture and rural communities continue to evolve. We had -- in the 1920s, we had over 4,000 people living in the county. That's more than twice what we have right now. We had the hotels in the towns and restaurants and theaters, and I've read even Rufus had a golf

course.

That's all -- most of that is gone now. And primarily due to consolidation of farms enabling our producers to reduce their production costs, and they've done a damn good job of it, they've really driven down their costs to compete in a tight environment. And I appreciate people, young farmers like Colton coming on, because we need them to continue this into the future.

But it's going to become tougher. Our farmers have to consolidate, and they have to become larger. And those that don't are not going to be with us anymore.

And can anybody doubt that the drive for more -- that we will see more capital-intensive equipment powered by artificial intelligence? That will continue and further fuel consolidation amongst the farms in Sherman County.

Thoughtfully planned energy projects represent one step in a more diversified and resilient future, one that balances environmental stewardship with economic stability. In this case, it is true that solar saves farms.

Last month, Governor Kotek issued an executive order to state agencies to move faster on

clean energy projects. And recently, even Representative Bentz acknowledged that Oregon will have a critical shortfall in energy unless drastic steps are taken, including expansion of our transmission facilities.

The Biglow Renewable Energy Project is low-hanging fruit with the existing underutilized PGE transmission. While recognizing the project is not without impact, I view the Biglow Renewable Project as a positive contribution when evaluated through the established EFSC process and supported by enforceable mitigation measures.

Thank you for the opportunity to provide this statement and for your careful consideration, positive consideration of this -- these issues as part of the record. Thank you.

NANCY HATCH: Okay, our next commenter in the room is Chad Higgins.

CHAD HIGGINS: Audio check. Okay.

Honorable committee, my name -- thank you for the opportunity for me to present testimony and comments.

My name is Chad Higgins. I'm an associate professor at Oregon State University and a farmer in Linn County. My area of expertise is in integrated

farming and energy systems, agricultural sustainability, and ag tech.

I spent more than the past decade working on ways to integrate solar energy production into agricultural practice and mitigate the conflict between the renewable energy and agricultural production, so called agrivoltaics systems. I'll keep my testimony to the agricultural aspects that pertain to goal three.

Broadly speaking, I care deeply about agricultural land protection and agree with the principle that protection of agricultural land is of critical importance. Indeed, my entire research portfolio and a good part of my life's work has been devoted to serving farmers in local rural communities.

There would be no farms without the land to support them, but farming is incredibly challenging and requires brilliant folks to do it under the current conditions. It isn't sufficient to simply protect land as it's only one piece of the puzzle that makes farming possible.

An economically vigorous agricultural system depends on the land and soil, of course, but it also depends on the skilled farmers, access to

the needed agricultural inputs, access to sufficiently developed agricultural markets, and enough regulatory freedom to allow land managers to adapt to new economic and resource availability conditions. I'm an advocate for balancing agricultural land use tradeoffs with energy tradeoffs wherever possible, and I applaud your efforts in doing that in a respectful and sensitive manner.

My research on agrivoltaics systems has shown that the benefits of shade to cropping systems most critically depend on the dry soil's fertility. That is, crops generally benefit more in water-limiting conditions and with the benefit of good soil. This means that agrivoltaics are appropriate in some locations and not appropriate in others. Note that the proposed project is not an agrivoltaics project.

I will say that the three most common criticisms in my research are one, that I haven't tested any particular crop in a particular region. Afforded to this particular region, it would be you haven't tried, say, wheat in Central Oregon, which is true. It's a fair criticism.

The second major criticism of my work is

that my experimental trials are small compared to proposed commercial projects. That's also fair. I don't have the money to build a multibillion-dollar large project for my research. They tend to be of the multiple-acre size as opposed to multiple thousands of acres.

And third is I just don't believe you, Chad, that this is possible. And if you are a critical thinker, you first have to be critical, and I take that challenge on.

These are fair critiques, even though I endeavor to perform transferable research for maximum social benefits. My research team and I have done most of our work in the Willamette Valley, a location with drastically different hydrology and soil to here.

I will note that we have done a trial in Madras on irrigated carrot seed production that showed consistent results with all of our other studies, and the carrot seed benefited from the energy system. But that trial was limited in scope, and it was not a dryland crop as this situation is.

On the point of scaling, I'll take issue and say if I can make it work profitably at a small scale, the economies of scale dictate that it should

work at the larger scale because you just turn the tractor around less.

The main point is that more research that's targeted to the local region, specific crops and unique conditions, like the fire risk condition that's unique to this area and so critical here, more research would help inform future development in a sustainable way. And I really support the inclusion of the competitive research funding to be managed by the economic development district.

In full disclosure, I will absolutely enter that competition, and my approach would be to work with the community to address their most prescient concerns and questions. But should I not win, I'll applaud any (indiscernible) because I believe that that work would strongly help the community because it's no secret that there's many projects proposed for this area.

Solar siting tends to be local in scope, as you know. But when you find a good spot, there tends to be a concentration in that spot, as you know. And Gilliam County here -- sorry, Sherman County here, I misspoke -- is one of those Goldilocks zones. May the best researcher win. I welcome the competition.

Secondly, I do want to say that these projects are long-lived but ultimately temporary installations. A natural question that a farmer may ask is, what's the agricultural potential of the soil at the end of the project's life? To answer that, my research team, in collaboration with soil scientists at OSU are in a third year of a multi-decadal study where we rest the soil on under solar panels to see the change in soil condition.

As part of that project, we're monitoring the soil's health annually, and thus far at this early stage, we've observed increased soil carbon and fertility relative to the non-solarized control under the same management practice. Of course, there are many years of observation ahead of us here, but the preliminary observations are promising.

Finally, I understand if anyone is skeptical of my science. They don't believe that this is possible or that the benefits are there, but I ask you to believe the evidence of your own eyes, and I invite you to come to my research facilities and tour it for yourself. Anyone here on the committee, anyone in the community, I welcome. Please come out. I know it's a bit of a drive from

here, but I would hope to make it worth our while.

I'm open to the public the second Tuesday of every month at 1:00 p.m. The location is the North Willamette Research and Extension Center in Aurora, Oregon. Please come out. You're most welcome. And I will answer -- I'll make myself available to answer any questions that the committee has or the community that's based on my research in the systems. And yeah, thank you very much.

NANCY HATCH: Okay. Anybody in the room that would like to make a comment that has not turned a form in?

Okay, go ahead and step up to the mic. Just be sure to give us your name and your address, please.

JOHN LANGDON: Thank you. My name is -- Chair Condon, Secretary of Cornett. We -- my name is John Langdon, and I filled out a form and mishandled the application process. I apologize, Sarah.

So I do believe Chad, and I do believe Ormond, that solar saves farms. And so I am a fourth-generation farmer. My address is 30574 Diamond Hill Drive in Harrisburg. I have some property that has a particular interest for solar,

so I've been approached many, many times over the years, and that's led me to have solar companies come to us with proposals. And there's always been a level of understanding and education there.

But I got to go to a meeting like the one last night, a letter of intent meeting, where I got to see Todd in action. And it was pretty impressive. And in that meeting I decided that I needed to educate myself on the ag and solar.

And so for the last 30 months, there's rarely been a day where I -- me and my partners haven't taken that path. We were at Chad's facility on Tuesday, and I think that was our 30th tour in the 30th month. And every time we learn something new. We bring a lot of solar developers, a lot of VIPs. We actually had some shepherdesses out there last time.

And our mission is to learn all we can about ag and solar working together -- communities, agricultural systems, agricultural neighbors, all of those things together, and try to educate myself to be qualified to speak to it and help other people, whether it's this Council or farmers or developers.

So we also -- one of my partners likes to travel, so we went to Europe. We heard that they do

it better over there. They're ahead of us. So we went to Europe. We've been to a multitude of countries and saw a lot of different projects. A lot of those were farm projects. And quite frankly, after dozens and dozens of conversations with developers in a multitude of countries, BrightNight is great. They've done a great job.

I've been in multiple conversations with them about vegetation management. One of the things that we've done in our learning is we've had the opportunity to become vegetation managers. So we are vegetation managers in Oregon. The best way to learn something is to go do it. So we've done that.

And we've looked at every system we can find where agriculture and solar works together in ag communities and with farmers and with those systems. And I can tell you that the conversations with BrightNight have been as outstanding and as advanced as anyone I've had in the world. I would trust them with my land.

So what I'm telling you is these guys seem to be listening to the farmer. Todd and Kathleen have been -- I think they're genuinely interested in the community, the farmer, making it work, making it great, and making it a win-win-win for everybody.

And so I would encourage the Council to look upon them favorably. So, thank you.

NANCY HATCH: Okay, anybody else in the room that would like to make a comment?

Okay, seeing none, we're going to go ahead and move on to the people on the webinar.

Just as a reminder, if you are in the webinar and you would like to raise your hand, at the bottom of the icon -- the main window, excuse me, is a set of icons. Click on that participant, and you'll see a hand icon. You're going to click on that to raise your hand, and you will click it again to lower your hand after you have commented.

If you're on the phone, press “star 3” on your keypad to raise your hand, and then again press “star 3” to lower your hand.

Okay, so our first commenter is Dan Hilderbrand.

Oh, no, he lowered his hand. Okay. If you need to, you can raise your hand again, Dan, if you -- if that was a mistake.

So we're going move on to Ms. Irene Gilbert.

Okay. All right, let's see.

Okay, Irene, don't touch your button. I'm

unmuting you. We're playing a game back and forth right now.

Okay, she's working.

Alright, I can't get Irene on, so Dan, I see your mic is open. You can go ahead with your comment.

DAN HILDERBRAND: Okay, thank you. Can you hear me okay? Hello, can you hear me okay?

NANCY HATCH: Yes, we can hear you just fine.

DAN HILDERBRAND: I'm sorry. Okay.

I'm representing my brother and I, Randy. He's the -- since we've inherited the ranch from my father, he's now the general manager of our operation. We represent the fourth generation of Hilderbrands farming our ranch.

And it's been a struggle as it always has been. Ormand and I grew up on the ranch. As kids, our family every year worrying that we were going have enough yield with the price of wheat combined together, and it's always been a struggle to be an efficient farmer. Now with the exponential increase in not only equipment but the inputs of the farming practices, it's been that much more of a struggle.

The nice thing about this project is it's

going to give us some more flexibility and continuity as far as the dependability of our economical strength to keep the farm going and make a sustainable career rather than a constant financial gamble.

Approving the Biglow Renewable Project is a decision to keep the farmland in production and diversify the economic face of Eastern Oregon. And we want to be responsible stewards of the ranch and farming in general, and this will provide a more predictable revenue stream that we can depend on.

This is not going to replace farming. It's just going to help support and diversify. In the past, farmers had very few opportunities to approve the wind turbines. We're one of the first ones. A lot of people were skeptical of the wind turbines, and we still do to this day.

And one of my first concerns when I heard about this is I was very positive on it, and I thought it was a very good thing for us.

And I went to one of the public comment meetings that the Wasco Activity Center there in Wasco and was pretty confident in what I heard coming from BrightNight and where they were going with it. And they want to be good (indiscernible)

in this project.

And I really feel with the input as far as the wildfires go, yes, we do have them from time to time. It's only in the summer, and it's something that farmers -- we grew up as kids, it's something that you always had to concern yourself with. And it's just something we've grown up with along with the wind and everything else.

The project itself, the 1,400 acres represents about, according to Randy, about one half of one percent of the total acreage. So it's not going to replace farming in any stretch of the imagination.

Originally, when Randy and I were talking about it, he was actually quite skeptical about it. And I said, Randy, look at it like this. We're not farming -- we aren't farming photons or electrons coming from the sun. We're just farming something else.

Our dad was behind the wind turbines. My dad and our Uncle John, Ormand's dad, were very strong advocates of it. And I see what it's done for the county and the income that has helped the entire county. The businesses in Wasco and Morrow and the surrounding areas, it's been a very

beneficial opportunity.

And I had to remind Randy once. I said, Randy, the solar panels are going to look really good out the side of the windshield -- as you're looking at them through the windshield of your new combine.

So I think we could look at this as a very valuable partnership for everybody. And I think with the wildfires, yes, that is a huge concern. It is a very huge concern. I understand that, but that's something the farmers have always had to fight for about six weeks every summer. It's just something that we've always had to learn to live with.

If there's any questions, any correspondence can be directed in care of my brother Randy at Post Office Box 326, Wasco, Oregon.

SARAH ESTERSON: I'm sorry, Dan, could you repeat your address for the record?

DAN HILDERBRAND: You can -- I almost said email. You can send any correspondence in care of Randy Hilderbrand, Post Office Box 326, Wasco, Oregon 97065.

SARAH ESTERSON: Thank you.

DAN HILDERBRAND: Well, I also -- one last

comment.

I do share Council Member Grail's ick factor towards the bats and the rats. They're nothing but large flying rats, so I stand in solidarity with her.

COUNCILOR GRAIL: Thank you, sir.

NANCY HATCH: All right. Thank you very much, Mr. Hilderbrand.

It looks like our next commenter is going to be Amanda Whitman.

Amanda, I'm going to go ahead and unmute your mic. You are ready to comment.

AMANDA WHITMAN: Can you hear me?

NANCY HATCH: Yes, we can hear you.

AMANDA WHITMAN: Okay. Hi, I'm Amanda Whitman, and I am the district manager for Sherman County's Soil and Water Conservation District. I have lived in Sherman County for about 16 years now.

And one of my concerns is that no one from this project has contacted the District as far as conservation issues that would arise with the construction of this project or the outcome of the construction of this project.

In the past, we have been very involved with the original wind farm projects in Sherman

County, and I have noticed with the solar that is not the case. They like to meet with me once and listen to what I have to say, but they're not listening to what I have to say. So that is a concern.

We had significant erosion issues with the one solar project that has been implemented in this county, and there was damage to neighboring land from that project. A lot of this land is prime farmland, and it is also highly erodible land. So no matter how much rainfall we get in the county, we still have major erosion issues that go along with rain.

I have asked multiple solar companies about the long-term effects of solar on our soil and water tributaries, long-term effects, and no one has given me any answers on that.

So there's a lot of concerns that the District has with these projects, especially these larger scale projects that could really affect our watersheds in the county.

The other thing as far as fire goes, we have been working for over a year now with Natural Resource Conservation Services (NRCS) to incorporate a fire break project in the county to help with

these fires that come through our county every year. And you mentioned that you were going to put in 20-foot buffers. The minimum for NRCS is 30 foot. And that is the absolute minimum they're suggesting.

So it's imperative that I think they talk to the partners in this about what they're suggesting. USDA has been active in this county for many years and we know the land. We know the vegetation. We know how fire moves, and I think that's very important.

Another issue is the weeds and annual grasses. We've seen that with other solar projects and wind farms. There's no immediate control over weeds. The Russian thistles in this county, for instance, grow rapidly. They don't need water. They catch on fire very quickly. So if we don't have weed and annual grass control around these projects, it's going to be detrimental.

I'm trying to think what else. I think those are my main concerns. I did not plan on talking tonight, but I felt like those were a few things that I needed to bring up.

The Conservation District has been in this county for 75 years now. We've had over $2,000,000 worth of conservation work implemented in this

county, and a lot of these projects take out those conservation practices. And then what do we do to fix that? We're going back in time on all of the work that we've put in to fix our riparian areas, and I know you think it's upland, but upland affects riparian and the streams and the rivers.

So those are my main concerns tonight, and I will submit a letter before the comment period is over. Thank you.

NANCY HATCH: Alright, thank you, Ms. Whitman.

All right. Well, I'm going to circle back to Ms. Gilbert. I do not see your hand raised, Ms. Gilbert, but if you are interested in commenting, please just raise your hand. And that will bring me -- oh, she's got her hand up. And she's unmuted.

Go ahead, Ms. Gilbert.

IRENE GILBERT: Hello. Are we talking now?

NANCY HATCH: We are talking.

IRENE GILBERT: Okay. Irene Gilbert, 2310 Adams Avenue, La Grande, Oregon. I'm co-chair of the Stop B2H group and I've spent quite a bit of time representing the public interests before EFSC.

So I do have a few -- I haven't done a

thorough review of this, but I will say that the people who did the presentation did a very professional job and I appreciate that.

My concerns lie along the lines of the fact that this group has a really poor track record in terms of compliance or holding their people accountable for following the site certificate conditions. And specifically, the ones that really jump out to me are the fire plan and the noxious weed plan.

Now, the statutes require monitoring and mitigation plans. And what has been happening with the site certificates is that they're approved with a lack of details regarding what is to be included in the monitoring and mitigation plan. And site certificates are issued, but those plans are not finalized until after the public process has ended.

So based on that, I believe there's a really important issue in that the draft plans need to be very detailed, very specific, and include the requests that are being made for specific mitigation methods. And I don't -- I have not found that to be the case so far.

It becomes even more important since the Oregon Department of Energy has been making changes

to monitoring and mitigation plans without amendments to site certificates, so it's making it difficult for landowners and the public to trust that the site certificates are actually going to be complied with.

One thing that I'm very concerned about is the fact that this site certificate references the use of the Public Utilities Commission wildfire plan once the operation of the development begins. So you're working on this for the construction period and getting a lot of feedback. But if you're using the PUC Fire Mitigation Plan without adding specific local criteria, what ends up happening is, for example, developers rate fire hazard differently oftentimes than local areas.

So for example, with the B2H transmission line, Idaho Power found no high-risk areas for fire across any of the five counties that that transmission line crosses. So I think it's important that it be more or less cast in stone that this area will be treated as a high-risk area in terms of fire.

The other thing, the issue of landowner liability for damages to their facilities as a result of fires. And I was glad to hear the last

person comment on this. Twenty feet is not providing the protection or the mitigation for that risk to the property owners that are facing the risk of being sued for damages to the area. I personally think 30 feet is not enough. I would say that in order to issue a site certificate that mitigates for that risk, there needs to be some research into how far do these fires jump when they are in a wheat area and assure that the no fire zone is wide enough to actually provide that.

The EFSC makes a determination about significance of impacts and it's not going to be a significant impact. But I just wanted to remind you that that does not exclude the fact that the developer is supposed to mitigate for all of the impacts. They are to leave these agricultural landowners basically at the same point as they are going into this by addressing the increased risks that are created by this development. Certainly, one of those increased risks is that they could be sued for a fire that happens in their area jumping into this new development.

At any rate, I'm going to spend some more time looking through these, and will make some specific comments and reference the mitigation and

plan statutes, which I understand is required for this. But I do think that while it's a good start, the draft of the fire, and also the noxious weed plans, are not developed to the extent that the public can have any kind of assurance that you're actually going to be, number one, implementing mitigation that leaves the public free of risk of, or addresses the increased risk, or that the monitoring is going to be adequate to assure long-term protection.

The plans don't address, for instance, state requirements for weed management. And there's been a lot of concern from the tribes, from individuals, about the level of weeds that are being spread by these renewable energy projects.

And I would really encourage you to require the developer to comply with the state requirements and to leave the landowners financially free of the consequences of having to go to the county and file against a developer because they're failing to manage the weeds according to the state's statutes.

I guess that's enough. For once I didn't use my seven minutes, I don't believe.

Anyway, thank you for your time.

Any questions?

NANCY HATCH: No. There are no questions. Thank you for your comments.

Alright. So at this point I see no other hands raised.

Is there anyone else in the room that would like to provide a comment? Last call.

SARAH ESTERSON: Okay, so now we're going to provide an opportunity to members of the Council to ask questions or make any recommendations to staff.

COUNCILOR GRAIL: Chair Condon, this is Marcy.

CHAIR CONDON: Thank you, Marcy.

COUNCILOR GRAIL: First of all, I would like to say I wish I had been there in person, but nonetheless, thank you to everyone who took the time to so clearly state your concerns.

One of the things that I've most appreciated about serving on this Council is it has been absolutely educational for me, not just as an Oregonian but professionally.

Sarah, to directly respond to your request about, you know, comments to staff, I'm well aware of the separation between the Department of Energy

and the Oregon Public Utility Commission, but I strongly encourage and ask whether it's just to -- and I'm happy to do some of my own research, but I'm really concerned about our limits that I'm aware of that may or may not align with what can be done elsewhere.

So for example, like I know we can't say, oh, you must have blank number of people, or we can't say you must double whatever the average, you know, standards are or exceed minimum standards. But I'd just -- I really would like to know that there's a way to provide some more assurance to the public.

It's no secret. I've said it probably every meeting since we've started talking about wildfire. Someone mentioned that PGE's plan tends to lean towards -- I don't know if they said transmission or distribution, but anyway, I really just am curious if there's things that we can glean from other areas that can align and help the public get some of the reassurance they need.

And I would just encourage the developer to really think about how they can invest to the public to meet some of these things. Because while you as a, you know, as a developer have a lot of

risk, this is their livelihood. This is their legacy, their communities as well.

So I believe, you know, I have to believe people are operating in good intent, but I really hope that the comments around the noxious weeds and the wildfires are really, really taken to heart.

And lastly, I'll just say that anyone who's participated over the last couple years has heard this Council talk a lot about operational or excuse me, Organizational Expertise. And I think we heard a lot of comments directed at that today. So I hope the developer plans to address those things to provide reassurance to the public and to our Council. Thank you.

NANCY HATCH: Thank you, to Councilor Grail.

Any other comments or questions from the council members?

CHAIR CONDON: I have a question.

COUNCILOR DEVLIN: Madam Chair?

CHAIR CONDON: Yes?

COUNCILOR DEVLIN: I'll be second.

CHAIR CONDON: No, go ahead, Councilor Devlin.

COUNCILOR DEVLIN: Okay. Madam Chair, I

don't know if I have a statement or a question.

It seems to me that, you know, some of the things that people are talking about in terms of past performance there is actually some agreement on. I mean, within the statements from staff, there were some statements about the fact that the actual performance, particularly on the first phase, over time has not been what was expected.

Obviously, some of the people that are critical of the proposal are saying that very clearly, and even the applicant is now admitting that some of that performance has been less than desirable.

Now, the problem I have is I don't have an answer for this. I'm not an attorney. I am not our -- obviously our representative from the Attorney General's office, but we have specific criteria that we view every project in. And I'm not sure that we can actually apply or create a new criteria that in a sense tries to enforce perhaps some shortcoming from a past approval or the performance in a past area.

I'm just not sure of that, how you would do that or if it -- if it even could be done in a matter that would be, let's say, where litigation

would be limited.

The second thing is I clearly doubt that this body has any authority, and I'm not even sure the legislature would have authority to limit the liability of various parties that might be involved in something that would cause damages to another. I mean, that's clearly outside the purview of this Council.

And I'm not even sure about all the ramifications of that if that would even be within the legislature's purview on a statutory basis.

I just want to put those comments on the record. I do think the concerns are real. I do think that turbines wear out. I do believe there have been quite a number of issues with them, particularly that sort of first phase. And I don't know which generation of turbines that was. I know turbines are actually under an enormous amount of stress over time.

It's interesting that one of the speakers is a former 747 pilot, and she's obviously probably aware of the metal fatigue in aircraft over time. And the fatigue and the blades of those turbines, there are significant issues there also.

And I just wanted to put all that on the

record. I'll be probably thinking about what our actual authorities are, but I clearly believe people have made some clear, and to a large degree, some compelling arguments.

NANCY HATCH: Thank you, Councilor Devlin.

Councilor Perry, do you -- do you have your hand raised? I can't see it.

COUNCILOR PERRY: Yes, I did. Thank you.

NANCY HATCH: Yeah. Feel free, yes.

COUNCILOR PERRY: Thank you.

I did have a couple of points. And along the same lines as Councilor Devlin was mentioning.

First of all, about the fire concerns. It seems like when there's a concern with property owners and developers, as a planner, you know, there's been situations where, you know, a covenant not to sue would be in order. But that's not something that this Council has any purview over. That's more like Councilor Devlin was saying, a legal matter between the owners and the developer to work that out on who's responsible for what on the property.

But the other -- the other point I wanted to make was about, you know, as a planner, you know, we've had situations before where we have a property

that, you know, may have a violation on it of some sort and then they want to come in and apply for a land use application to do something else.

And if there's a violation on the property, then you wouldn't necessarily want to approve or be able to approve based on the regulations of that local jurisdiction to approve a new thing on a property if there is some kind of a compliance issue.

And I'm new to this. I'm not as familiar with the administrative rules and the siting standards as experts are and the staff and secretary and our legal office.

But I was just, I guess a question now to the staff, Chris. Would there be some kind of regulation that I may not be aware of that would prohibit the approval of an amendment to an existing site certificate when the existing site certificate's requirements may or may not be satisfactory? But in looking through the staff report, it looks like you have addressed those and with the addition of some additional amendments to the conditions that were placed on there that would remedy some of that.

And I was just wondering if there was

anything that the Siting Council needs to consider on that situation where we have -- if we look at -- if the existing facility is in compliance with everything, then there isn't an issue with moving forward with looking at specifically this in relationship to that with the addition of the solar to this siting certificate.

I just wanted to make sure that that we're covering all those bases. Thank you.

NANCY HATCH: Thank you, Councilor Perry.

And we have Christopher now at the mic.

CHRISTOPHER CLARK: Thank you, Council Member Perry.

For the record, this is Christopher Clark, senior siting analyst.

Just since you called out me specifically, I will respond with two things.

One, I think the relevant standard is the Organizational Expertise standard. And so I'll just read that, at least in part.

So the standard provides that to issue a site certificate, the Council must find that the applicant, or in this case certificate holder, has the Organizational Expertise to construct, operate, and retire the proposed facility in compliance with

Council standards and conditions of the site certificate.

I am not aware of a separate rule that would prohibit the Council from approving a facility if there were a violation in place or something like that or a requirement to cure.

I do want to point out though, and I think this is important for the record, at this point in time, the certificate holder has not been issued any notice of violation, or I maybe can be corrected, but even a notice of noncompliance for these issues. They have been responsive to the Department's requests for corrective action plans and things like that.

So there have been a number of compliance issues at the facility, and that is well documented, but not violations themselves.

COUNCILOR PERRY: Thank you, Christopher.

CHAIR CONDON: Counselor Perry, sorry, was that a thank you, or did you have something further?

COUNCILOR PERRY: No. I think we just kind of talked over each other. I was just thanking Christopher for that response.

CHAIR CONDON: Okay. Thank you very much.

And I do have a question, but I'm

wondering if the McCulloughs can come up to the microphones.

Yeah, you can go first.

COUNCILOR HOWE: This is Kent.

Tonight we heard a lot about Organizational Expertise.

CHAIR CONDON: Hold on just one second.

Oh, sorry. I thought you had a question.

COUNCILOR HOWE: No, no, no.

CHAIR CONDON: Sorry. Go ahead.

COUNCILOR HOWE: Organizational Expertise while -- or the noxious weeds and vegetation management. But we did hear regarding wildfire, a recommendation from the SWCD to I think it was 35 feet. And that probably has some science behind it that could withstand a challenge or whatever, so I think we ought to kind of look into that. That's all.

CHAIR CONDON: Thank you, Councilor Howe.

And now a question for you. I think one of the things this meeting has really brought into focus is our work on compliance. The wildfire rules are pretty new to us. I think we're now in our third year of wildfire rules and working through projects and what's appropriate, what is -- what are

compliance issues. And every step we go we learn more.

But one of the things that is -- has been very opaque to me and it sounds like you are big supporters of renewable energy and certainly went into this project with great enthusiasm. Yes. Passion and enthusiasm. And you -- it worked well and then it didn't.

And so I am wondering, one, some of the issues you have as underlying property owners of the project -- I guess I have operated on the thought that all the underlying property owners have an agreement with the -- with the developer. And in those agreements there are some provisions that we just asked about here that are simply not -- not necessarily open to us. We don't have the authority to do much with it.

So could you enlighten just -- I know some of it is proprietary information, but speak a little bit about the leases, and do your lease agreements speak anything -- speak to anything that you spoke to us about today?

KATHY MCCULLOUGH: What do you think?

You're looking at me blank. You probably know more.

KEVIN MCCULLOUGH: You're talking about -- are you talking about leases or the solar?

KATHY MCCULLOUGH: Solar or wind?

CHAIR CONDON: Well, right now it sounds to me -- I guess the premise for my question is it sounds like it's just a matter of understanding and coming to some agreement. It sounds like the developer is really now concerned with compliance. You've certainly suggested that they have been more proactive. But in their your agreements with them, does it call for action of compliance? Or are you depending on us?

KATHY MCCULLOUGH: We're depending on you because after 10 years of reporting pieces and our concerns and having them ignore us and lie to us, we don't trust them anymore.

And since the blade fell four years ago, more towers are down than ever. And we're just stymied. We don't know -- we're not signed up for solar because we would not sign up for them, period, after what we've seen with the wind.

CHAIR CONDON: Okay.

KATHY MCCULLOUGH: And it's not really addressed in the lease, but it's in the site certificate. And no, there are no violations on PGE

because they never told you guys. Hello?

CHAIR CONDON: Well, and as I see at this meeting, we've talked a lot about it in the last, I don't know, five meetings, some of these issues have come up and are now being addressed. And there seems to be a plan going forward. And I'm wondering if you are aware of that, you know, part of your -- are you included in those conversations with the developer?

KATHY MCCULLOUGH: Yes.

CHAIR CONDON: Okay. All right.

KATHY MCCULLOUGH: You can answer that.

KEVIN MCCULLOUGH: Well, yeah. Yes, we are. And the PGE crew that is there now have been very open in coming and talking to us and wanting our opinions on how things are.

But it's just we have lack of faith in PGE right now. They haven't proven anything to me. They are a disappointment, unfortunately. They need to keep moving forward and figure out how to fix this and then prove to me that this is going to work because they haven't done anything yet other than shut the towers off because they're dangerous.

CHAIR CONDON: Well, you presented your message well, or at least in my opinion, and I thank

you for being here and sharing, one, your experience.

But I also, just given the wildfire mitigation risk, if you have some ideas that you don't see in the mitigation plan -- the draft mitigation plans for construction or that should be there on the solar project that is now proposed, you know, the more detail you can give to us and staff, the better it informs us for our decision-making.

KATHY MCCULLOUGH: Okay. And since Colton is actually farming now, he's --

COLTON MCCULLOUGH: My biggest issue is -- my biggest issue is --

Can you hear me now?

CHAIR CONDON: Yeah.

COLTON MCCULLOUGH: My biggest issue is there's no operational Wildfire Mitigation Plan to even look at right now. So how am I even supposed to comment on something that doesn't even --

CHAIR CONDON: Yeah.

COLTON MCCULLOUGH: I don't have privy to it, so all I'm going off is what ODOE is saying that they're going to put in in the interim. But then I'm not going to have any say when it actually comes out.

CHAIR CONDON: Okay. Okay, thank you.

And it's, you know, I know it's coming. We've heard that. And just keep your ear attuned.

KATHY MCCULLOUGH: Yes. And just as an aside, even BrightNight hasn't been forthcoming with us. This is like the fourth or fifth representatives that have come through that, you know, that are now the experts.

And we were told that the panels weren't going to be within view of our house, and then they were right across the road. So we just panicked. And then our landlord is the one that got them to move them back. Everything we've been promised, somebody reneges on.

And it's getting really frustrating because we feel like we're just in a wave that we can't stop. We keep hearing the right things. We just haven't seen them.

KEVIN MCCULLOUGH: It's not in writing. Until I see it in writing from now on, I will not believe it. It needs to be put in writing and signed by whoever the proper authority is. And that's what needs to happen.

I used to do business on a handshake. Not going to happen ever again. I had really good

intentions with PGE and their wind project, and they kept telling us they're going to do it, but they kept cutting their maintenance budget on the project. How do you -- I don't know how you run anybody's farm or you do anything.

We spend money on our equipment to keep it up and make it work. So we're not going to be out there intentionally starting fires. Their solution was not to do anything. With this new management team, I have great hopes.

CHAIR CONDON: Well, thank you. Thank you for being here and coming up twice.

KATHY MCCULLOUGH: Thanks.

CHAIR CONDON: And having such strong representation.

And I'm wondering if PGE wants to come and respond or -- you don't have to. It's just --

UNIDENTIFIED SPEAKER: (Indiscernible) final comments.

CHAIR CONDON: Okay, yeah. Okay. Thank you.

KATHY MCCULLOUGH: Thanks for listening.

CHAIR CONDON: Okay, yeah. And I will say, and you've heard from all of the, yeah, every -- all the council members spoke today, and these

are of real concern to us. The issues that came up today are of concerns with this project, but overall they have been a real area of focus for us. So thank you for being here for the hearing.

And if there are no more comments from the Council, I'll turn this over.

SARAH ESTERSON: Thank you very much.

Okay, so to close this out, would the certificate holder like to respond to any comments you've received today or this evening?

KRISTEN SHEERAN: Chair Condon, members of the Council, and folks in the room this evening, thank you very much for your time and energy and for the -- for the input.

I'll just say two things and then I'll hand and it over to Lenna to wrap us up here in response to what we've heard tonight.

So one, you know, I think to reiterate, we recognize that some of the concerns raised about the operation of the Biglow Canyon Wind Farm do not meet the standards for excellence that PGE expects of all of its sites, and we are taking appropriate actions.

We also operate thousands of megawatts of clean energy across this region with an excellent track record of safety and reliability.

With regard to wildfire, let me reiterate. The safety and well-being of the communities we serve is paramount, and we recognize the existential risk of operating a utility today in the west amidst growing wildfire risk from climate change.

We maintain and implement robust Wildfire Mitigation Plans as required by the state and submit them to the Oregon Public Utility Commission on a regular basis. Those plans are evaluated by an independent evaluator, by the safety staff at the Oregon Public Utility Commission, and it is through a very public process with robust stakeholder input. We just submitted our most recent Wildfire Mitigation Plan in December, and it is currently under review.

Right now we're forecasting about $120,000,000 annually in wildfire mitigation investments to protect the safety and well-being of the communities we serve. And that includes things that have been discussed tonight, such as grid hardening and vegetation management, situational awareness, so think risk modeling, as well as the use of like AI panoramic cameras. It includes operational procedures across our system -- distribution, transmission, and generation. And it

includes the work that we do with our communities around education and outreach.

So wildfire safety is important, and we continue to evolve our Wildfire Mitigation Plans in response to changing technology, improving technology, as well as evolving industry best practice. And unfortunately, the growing risk of wildfire in this region. Thank you.

LENNA COPE: Thank you.

We just want to again say that we appreciate all the comments and people taking the time to review these documents and come here in person to provide your testimony. We will review all the comments and provide written responses.

But we do want to reiterate that the level of detail in the plans and the monitoring, the inspection, the reporting, and the enforcement by the Department in these plans is at a much greater level than any previous plan. The Department's staff and the staff that we have supporting the development of these plans have identified these improvements to the site certificate and associated plans. And they have teeth. We heard, you know, we want teeth, and we believe these plans do have that.

Additionally, in the written comments, we

will be submitting our communications log with stakeholders into the record to show our outreach to the stakeholders.

Okay, and with that, thank you again for your time, and get home safe tonight.

SARAH ESTERSON: Okay, any final comments or questions from Council to the certificate holder?

Okay. Thank you again, certificate holder.

I need to amend one statement that I previously made about the comment deadline. So all comments must be received by January 30th at 5:00 p.m. Not submitted by but received.

So if you're paper mailing your comments to the Department, make sure you've mailed them in a manner that they can be received by our office on January 30th at 5:00 p.m.

Okay. So it is now 8:20 p.m. on January 15, 2026, and the public hearing portion of the comment period on the Proposed Order for Request for Amendment 4 of Biglow Canyon Wind Farm site certificate has concluded.

I'm going to hand it over to Chair Condon to close the meeting.

SECRETARY CORNETT: Chair Condon, if I

may.

CHAIR CONDON: Secretary Cornett?

SECRETARY CORNETT: Yeah. I just want to take the opportunity to thank everybody for coming out tonight. We really appreciate it. Our process is designed to include public participation. Local participation. That's why we're here. It works better if there is good, robust participation, so I encourage you, if you have comments, please do submit those comments. As you've heard from the Council, we take them very seriously, so please do comment. Thank you.

CHAIR CONDON: I want to add my thanks again for everyone who came to the hearing tonight, and especially those who sat through the whole meeting tonight. So thank you.

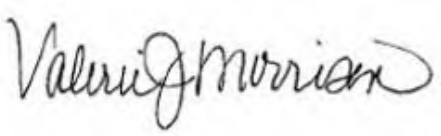
The time is now 8:21, and the January 15, 2026, meeting of the Energy Facility Siting Council is now adjourned. Thank you.

(WHEREUPON, the BIGLOW CANYON WINDFARM HEARING BEFORE OREGON DEPARTMENT OF ENERGY adjourned at 8:21 p.m.)

CERTIFICATE

I, Valerie J. Morrison, do hereby certify that the proceeding named herein was professionally transcribed on the date set forth in the certificate herein; that I transcribed all testimony adduced and other oral proceedings had in the foregoing matter; and that the foregoing transcript pages constitute a full, true, and correct record of such testimony adduced and oral proceeding had and of the whole thereof.

IN WITNESS HEREOF, I have hereunto set my hand this 6th day of February, 2026.



Valerie J. Morrison

$

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February 12, 2026

To Commenters
Sent via email or physical address

Dear Commenter,

The Oregon Department of Energy (Department or ODOE) provides this "Response to Comments" document per OAR 345-027-0367(8)(b), which summarizes and responds to all comments submitted during the comment period on Portland General Electric's (PGE or certificate holder) Request for Site Certificate Amendment 4 for the Biglow Canyon Wind Farm (RFA4) and the Department's Proposed Order on RFA4. This evaluation, and the evaluation of any subsequent replies, will inform the draft of a Final Order that the Department will present to the Energy Facility Siting Council (EFSC or Council.)

The procedural timeline for the public participation process for RFA4 is presented below:

- Proposed Order on RFA4 was issued for public review and comment on December 16, 2025, establishing a 45-day comment period, which concluded on January 30, 2026;
- A public hearing was held on January 15, 2026 at the Grass Valley Pavillion in Grass Valley Oregon.
- At the conclusion of the comment period (January 30, 2026, at 5 p.m.), 17 commenters had submitted comments on the record, including the certificate holder.

This Response to Comments document addresses the comments received during the public comment period. A list of issues raised in comments, with the names of the commenters who raised them, is included in Table 1 below. Each issue has been assigned a unique ID number based on the standard the comment was determined to be associated with. For example, "Issue OE-01" is the first issue raised in comments and is related to the Organizational Expertise (OE) standard (OAR 345-022-0060).

For the purpose of orderly presentation, the comments have been organized by standard, in the order they appear in the Department's Proposed Order on RFA4. Comments that are similar in nature are grouped, rather than repeated in this document.

As described in a separate "Amendment Comment Review Process Doc Navigation Help Letter", attached with the Department's Response, we have provided instructions on how to access comments and other documents associated with this process; and, provided an

explanation on the Department's file management system and how to navigate PDF documents.

Replies must be received by **5:00 pm on February 27, 2026**, to be included in the record. Please note, I will be out of the office from February 13 to February 23, 2026. If you have questions about the process or how to submit replies to the Department or certificate holder's responses to your comments during this timeframe, please contact Sarah Esterson at sarah.esterson@energy.oregon.gov or call (503) 559-9218.

Respectfully,



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Patrick Rowe, Assistant Senior Attorney General, Oregon Department of Justice

Table 1: List of Issues and Commenters

Issue ID	Issue Summary	Commenter
General Standard of Review (OAR 345-022-0000)		
Issue GS-01	Concern about single hearing for a complex amendment	Kathryn McCullough
Issue GS-02	Request for correction to Existing Facility Site Location	Certificate Holder
Issue GS-03	Request for correction to Turbine Dimensions in Existing Energy Facility Description	Certificate Holder
Issue GS-04	Request for correction to Existing Related or Supporting Facilities Description	Certificate Holder
Issue GS-05	Request for correction to Existing O&M Building Description	Certificate Holder
Issue GS-06	Request for revision of proposed road dimension width, from 20 to 16 feet	Certificate Holder
Issue GS-07	Request to allow Temporary Construction Areas outside fenceline, within Solar Micrositing Area	Certificate Holder
Issue GS-08	Request for flexibility in perimeter fencing design	Certificate Holder
Issue GS-09	Request for correction of description of Solar Micrositing Area	Certificate Holder
Issue GS-10	Property owner does not consent to project being developed on his private property, as currently proposed.	Jered Reid/Donald Hilderbrand
Organizational Expertise (OAR 345-022-0060)		
Issue OE-01	Maintenance issues at existing wind facility	Kathryn and Kevn McCullough
Issue OE-02	Request to amend recommended Amended Condition 3 (CON-OE-01), removing reference to fax number as contact method for construction managers.	Certificate Holder
Issue OE-03	Request to revise requirement to provide executed Build Transfer Agreement in draft Operations and Maintenance Plan Framework, allowing for submission of redacted copy	Certificate Holder
Issue OE-04	Request to amend frequency of performance monitoring reports	Certificate Holder
Issue OE-05	Request to clarify frequency of inspections using thermal imaging	Certificate Holder
Structural Standard (OAR 345-022-0020)		
Issue SS-01	Request for flexibility to conduct ground disturbing activities on areas with steep slopes with engineer review	Certificate Holder
Soil Protection (OAR 345-022-0022)		
Issue SP-01	Questions the type and height of weeds required to be controlled	Kathryn McCullough

Table 1: List of Issues and Commenters

Issue ID	Issue Summary	Commenter
Issue SP-02	Requests to clarify statement referring to the use of Sherman County for weed control.	Certificate Holder
Issue SP-03	Requests Revisions to Mapped Soil Units in Analysis Area	Certificate Holder
Issue SP-04	Concerns related to 1-3" veg height under WMP and ability of that height to provide erosion control	Sherman County Weed District
Issue SP-05	Long-term soil health	Kathryn McCullough
Issue SP-06	Requests to develop a strong working relationship with certificate holder/BrightNight to ensure soil protection measures are in place.	Sherman County Soil and Water Conservation District, A. Whitman
Issue SP-07	Potential soil contamination from fire-damaged photovoltaic modules or battery components.	Sherman County Soil and Water Conservation District, A. Whitman
Issue SP-08	Enforcement of requirements for natural resource protection.	Sherman County Soil and Water Conservation District, A. Whitman
Issue SP-09	Requests to Clarify Terms, Clear Brush Free and Vegetation Clearance Area/Zone	Certificate Holder
Issue SP-10	Recommended edits to Draft Comprehensive Revegetation and Solar Management Plan	Certificate Holder
Issue SP-11	Erosion Issues	Sherman County Soil and Water Conservation District, A. Whitman
Issue SP-12	Weed Control	Sherman County Soil and Water Conservation District, A. Whitman
Land Use (OAR 345-022-0030)		
Issue LU-01	Request for reduction in requirements for Site Plan Review	Certificate Holder
Issue LU-02	Objection to Evaluation of Compliance with SCZO 5.2(5)	Certificate Holder
Issue LU-03	Objection to Evaluation of Compliance with SCZO 5.2(6)	Certificate Holder
Issue LU-04	Objection to Evaluation of Compliance with SCZO 5.8	Certificate Holder
Issue LU-05	Objection to Evaluation of Compliance with SCZO 5.8(20)(3)	Certificate Holder
Issue LU-06	Concern with cumulative impacts of solar development in Sherman County	Alan von Borstel
Issue LU-07	Recommendation that “Right to Farm” protections are needed to protect farmers from wildfire liability	Kathryn McCullough, Kevin McCullough, Irene Gilbert
Issue LU-08	Objection to Evaluation of OAR 660-033-0130(38)(G)	Certificate Holder

Table 1: List of Issues and Commenters

Issue ID	Issue Summary	Commenter
Issue LU-09	Recommendation to include impact of lost assessments in economic impact analysis	Oregon Wheat Growers League
Issue LU-10	Objection to claim that Community Investment Plan will offset impacts to agricultural economy	Oregon Wheat Growers League
Issue LU-11	Recommendation to include Oregon Wheat Growers League in Community Investment Selection Committee	Oregon Wheat Growers League
Issue LU-12	Need for engagement with Market Development Organizations in developing Community Investment Plan	Oregon Wheat Growers League
Issue LU-13	Concern with inclusion of agrivoltaics research as pre-screened project in Community Investment Plan	Oregon Wheat Growers League
Issue LU-14	Concern with including weed management projects as pre-screened project in Community Investment Plan	Oregon Wheat Growers League
Issue LU-15	Concern with including fire mitigation projects as pre-screened project in Community Investment Plan	Oregon Wheat Growers League
Issue LU-16	Objection to statement that lease payments will compensate for lost agricultural revenue	Oregon Wheat Growers League
Issue LU-17	Goal Exception - Consistency with State Climate Goals and Policies Reasons	Certificate Holder
Issue LU-18	Goal Exception - Minimal Impacts to Other Resources Reason	Certificate Holder
Fish and Wildlife Habitat (OAR 345-022-0060)		
Issue FW-01	Adequacy of Exhibit P and Evaluation of Impacts to Wildlife	Kathryn McCullough
Issue FW-02	Srivener's Error	Certificate Holder
Issue FW-03	Flexibility on ground clearing activities in Category 2 Habitat	Certificate Holder
Issue FW-04	Recommended edits to Draft Habitat Mitigation Plan	Certificate Holder
Historic, Cultural and Archaeological Resources (OAR 345-022-0090)		
Issues HCA-01	Supplement Record with Tribal Consultation Details	Certificate Holder
Issues HCA-02	Adequacy of archaeological monitoring and protective measures	Confederated Tribes of Warm Springs
Public Services (OAR 345-022-0110)		

Table 1: List of Issues and Commenters

Issue ID	Issue Summary	Commenter
Issue PS-01	Concerns about capacity of local fire responders to fight fire at energy facility	Kathryn McCullough
Issue PS-02	Concern that local fire responders do not have adequate training to respond to fire at energy facility or BESS	Kathryn McCullough
Wildfire Prevention and Risk Mitigation (OAR 345-022-0115)		
Issue WF-01	Concerns about burn probability data used in fire risk analysis	Kathryn McCullough
Issue WF-02	Concerns about use of climate normal for fire risk analysis In Exhibit V	Kathryn McCullough
Issue WF-03	Concerns about fuel models used for fire risk analysis	Kathryn McCullough
Issue WF-04	Request for flexibility in road design standards for roads not needed for fire access	Certificate Holder
Issue WF-05	Recommendations for BESS design criteria to minimize fire risk	Kathryn McCullough
Issue WF-06	Request for clarification of setback requirement	Certificate Holder
Issue WF-07	Concerns about adequacy of 50-foot fire setbacks	Kathryn McCullough; Kevin McCullough
Issue WF-08	Concern about adequacy of 20-foot fuel breaks	Sherman County Soil and Water Conservation District; Irene Gilbert
Issue WF-09	Support for recommended vegetation maintenance standards for wildfire season	Colton McCullough
Issue WF-10	Objection to recommended vegetation maintenance standards for wildfire season	Certificate Holder
Issue WF-11	Request to remove requirement to include drip can with fire suppression equipment.	Certificate Holder
Issue WF-12	Concern about lack of availability of Operational Wildfire Mitigation Plan.	Kathryn McCullough, Irene Gilbert
Siting Standards for Transmission Lines (OAR 345-024-0090)		
Issue TL-01	Request for additional flexibility in transmission line siting	Certificate Holder
Noise Control Regulation (OAR 340-035-0035)		
Issue NC-01	Requests Proposed Order Table 26 be revised to add NSR13 and reference to RFA Exhibit Y Table Y-7.	Certificate Holder
Issue NC-02	Requests revisions to recommended Noise Control Condition 2 (PRE-NC-02) allowing for general waiver versus solar specific	Certificate Holder
Water Rights		

Table 1: List of Issues and Commenters

Issue ID	Issue Summary	Commenter
Issue WR-01	Requests revisions to recommended Amended Water Rights Condition 1 (PRE-WR-01) to Clarify Well Log Submission Timing	Certificate Holder
Issue WR-02	Requests revisions to recommended Amended Condition 75 (OPR-WR-01) on Applicability of Groundwater Usage Monitoring and 5,000 gallon/day limit	Certificate Holder
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I. Introduction

Portland General Electric Company (certificate holder) filed Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm (RFA4) to the Energy Facility Siting Council (EFSC or Council) seeking authorization to expand the existing 450-megawatt (MW) wind power generation facility to allow construction and operation of a 125-MW solar power generation facility and related or supporting facilities within a 1,924-acre solar micrositing area.

On December 16, 2025, the Oregon Department of Energy (Department or ODOE) issued its Proposed Order on RFA4. On the same date, in accordance with OAR 345-027-0367(4), the Department issued a Public Notice, initiating a 45-day comment period, to conclude on January 30, 2026. The Notice also established deadlines for the subsequent comment evaluation process, including:

- February 13, 2026, for the Department and certificate holder responses to comments;
- February 27, 2026, for commenters to reply to Department/certificate holder responses; and,
- March 6, 2026, for the Department/certificate to file sur-replies.

Participants to the public comment process may request more time to submit their response, reply, and sur-reply to the Council or Council Chair, who shall grant the extension on a showing of good cause.

II. Public Comment Process Overview

The Council adopted changes to the Site Certificate Amendment comment process (OAR 345-027-0367) in September 2025, effective October 2025. This is the first amendment request under the new rules.

The purpose of the rule changes was to make the site certificate amendment review process more efficient and effective, improve the public comment process and increase the public's understanding of how to participate in the process. As presented above, the new process includes a step for the certificate holder and the Department to respond to comments; allows for those commenters to then reply; and then concludes with an opportunity for the Department and certificate holder to offer sur-reply.

The rules require that the certificate holder respond to all comments received during the comment period; the Department does not have the same obligation but may choose to respond. As presented in the document below, the Department has provided responses to commenters in a manner that provides organization for the public, the Department and the Council.

The intent of this new comment process is for each commenter to receive feedback from the Department and the certificate holder on the nature of their comments – specifically, whether they were raised with sufficient specificity so that the commenters can then reply with additional information or clarification. Where comments were raised with sufficient specificity, the process is intended to provide each commenter with feedback on whether those issues warrant remedy or change to a recommended finding of fact or recommended new or amended condition, and provide an opportunity for commenters to further explain and provide factual reasoning to support the Department and Council's evaluation of whether the certificate holder has met their burden of proof that they either can or have satisfied the requirements of applicable Council standards and other laws.

III. Evaluation of Issues by Standard

III.A. General Standard of Review (OAR 345-022-0000)

Issue GS-01 (McCullough, Kathryn): Concern about single hearing for a complex amendment
Comment ID: BCWAMD4Doc24-06 Proposed Order Public Comment McCulloughK-6 2026-01-09

Comment Summary
Commenter raises concern about single hearing for complex amendment.

Department Evaluation
On December 16, 2025, the Department issued public notice of the complete RFA4 and the Proposed Order on RFA4 which included notice of a 45-day comment period closing on January 30, 2026. The public notice included information for the in-person and remote public hearing held in Grass Valley on January 15, 2026.

The Department followed procedural rules and no requests were made to Council with a good cause justification for time extensions or additional hearings, therefore, the Department does not recommend any further action is needed on this issue.

Issue GS-02 (Certificate Holder): Request for correction to Existing Facility Site Location
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests correction to description of facility site location. The Proposed Order Cover Letter identifies the Facility Site Location being 4.8 miles northeast of the City of Wasco. The proposed Solar Micrositing Area is 4.8 miles northeast of the City of Wasco, but the Facility Site Location is 2.5 miles northeast of the City of Wasco.

Department Evaluation
The Department's draft Final Order will not include the Cover Letter with the referenced discrepancy. However, the Department agrees that the corrections should be incorporated into

the Proposed Order Section I.C., Approved Site Description and in Section I.D.4., Proposed Solar Micrositing Area; and, in Section 3.3. of the draft Amended Site Certificate, as presented below.

> Proposed Order Section I.C. The site is located approximately 2.5 miles northeast of the City of Wasco in Townships 1 and 2 North, Ranges 17 and 18 East, Willamette Meridian.
>
> Proposed Order Section I.D.4. The facility components proposed in RFA4 would be located within a proposed 1,924-acre Solar Micrositing Area. The Solar Micrositing Area is located approximately 4.8 miles northeast of the City of Wasco.
>
> Draft Amended Site Certificate Section 3.3. The facility is located about 2.5 miles northeast of the City of Wasco in Townships 1 and 2 North, Ranges 17 and 18 East, Willamette Meridian, Sherman County, Oregon. The Solar Micrositing Area is located approximately 4.8 miles northeast of the City of Wasco.

Issue GS-03 (Certificate Holder): Request for correction to Turbine Dimensions in Existing Energy Facility Description
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
The Certificate Holder requests the following corrections be made to the description of turbine dimensions in the Proposed Order, Section I.B.1, to reflect the facility as built:

> ~~The wind turbines are located on private land that the certificate holder has leased from the affected landowners.~~ The Siemens 2.3 MW turbines are mounted on tubular steel towers with a ~~hub~~ height of ~~280~~ 262 feet at the hub and ~~maximum blade tip~~ an overall height of ~~445~~ 413 feet including the turbine blades. The wind turbines are located on private land that the certificate holder has leased from the participating landowners.

Department Evaluation
The certificate holder seeks to clarify the description in the Proposed Order and draft Amended Site Certificate of the dimensions of existing, operational wind turbines based on actual dimensions. Because the certificate holder has the best information about actual turbine dimensions at the facility, the Department agrees to amend Section I.B.1. of the Proposed Order and Section 3.1 of the draft Amended Site Certificate accordingly.

Issue GS-04 (Certificate Holder): Request for correction to Existing Related or Supporting Facilities Description
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary

The certificate holder requests the following revisions to Table 1 of the Proposed Order be made to reflect existing facility components as built:

- Collector line length, underground: ~~106~~75 miles
- Collector line length, overhead: ~~3.9~~5 miles
- O&M Building Quantity: ~~2~~3 each

Department Evaluation
The certificate holder seeks to clarify the description in the Proposed Order Table 1 and draft Amended Site Certificate Section 3.1, Subsection 2.a of existing facility components, consistent with final design. Because the certificate holder has the best information about existing facility components/final design, the Department agrees to amend the Proposed Order Table 1 and draft Amended Site Certificate Section 3.1, Subsection 2.a, based on the changes presented above.

Issue GS-05 (Certificate Holder): Request for correction to Existing O&M Building Description
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
The certificate holder requests that the total square footage of the as built O&M buildings total identified in Section 3.1, Subsection 2.d of the site certificate be changed from 17,500 square feet to 19,500 square feet due to the building evaluated through ODOE's Change Request process.

Department Evaluation
Based on review of the record, the Department confirms that on January 12, 2017, it issued a determination under previous rules referring to a Change Request process, confirming that construction of an additional warehouse at the O&M site could occur without being reviewed through the site certificate process. The square footage of the additional warehouse was 3,600 feet (the amount reflected in the certificate holder's revision).

It is the Department's intent to incorporate changes reviewed through Change Requests, Facility Modifications and Amendment Determination Requests into a Site Certificate when the Site Certificate is open through the amendment process. Therefore, the Department agrees to incorporate changes in the O&M square footage reference, consistent with the dimensions reviewed through the Change Request process, into the draft Amended Site Certificate Section 3.1, Subsection 2.d.

Issue GS-06 (Certificate Holder): Request for revision of proposed road dimension width, from 20 to 16 feet
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary

The certificate holder requests that the Proposed Order Section I.D.3 be amended to clarify that all new facility access roads will be 16, rather than 20, feet in width.

Department Evaluation
In RFA4, Section 4.1.3.6, the certificate holder represented that "all newly constructed roads within the Solar Micrositing Area will be graveled to meet load requirements for all equipment. These internal access roads are expected to be approximately 20 feet in width." In RFA4, Exhibit V, Attachment V-1, the Draft Construction Wildfire Mitigation Plan states that "new roads proposed within the Solar Micrositing Area shall be sufficiently sized for emergency vehicle access in accordance with 2022 Oregon Fire Code requirements, including Section 503 and Appendix D - Fire Apparatus Access Roads. Specifically, the new roads proposed within the solar area fence lines will be 20 feet in width." In a subsequent comment, the certificate holder clarified that this representation was only intended to apply to certain external access roads and other roads needed for emergency access (See Issue WF-04.)

While design changes are permissible at this stage in the process, additional information is requested to support the Department's evaluation. Please provide a site plan showing the location and width of designated emergency access roads and other internal access roads.

Issue GS-07 (Certificate Holder): Request to allow Temporary Construction Areas outside fenceline, within Solar Micrositing Area
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests clarification in the Proposed Order Section I.D.3 that temporary construction areas may be placed anywhere within the proposed Solar Micrositing Area, not only within perimeter fenceline. The certificate holder indicates that this clarification is consistent with the RFA and ensures construction logistics are not inadvertently limited.

Department Evaluation
In RFA4, Section 4.1.3.7., the certificate holder represented that temporary construction yards would be located within the fenceline (permanent disturbance footprint) of the proposed facility:

> "During construction, one 8.7-acre temporary construction area (laydown area) within the perimeter fencing will be used to support construction, store supplies and equipment, and facilitate the delivery and assembly of materials and equipment…Additional temporary construction areas may be used as determined by the construction contractor, but these would be within the solar areas considered permanent disturbance; therefore, maximum impact is evaluated in RFA4"

Certificate holder indicates that the proposed clarification is consistent with the RFA. Please clarify the locations in the RFA where a request for temporary construction areas outside the

fenceline have been presented and evaluated. If the information is not in the RFA, please identify the potential sizes and locations of temporary construction areas outside the perimeter fenceline and provide an evaluation of potential impacts and whether the conditions included in the draft Amended Site Certificate are adequate to address the associated impacts.

Issue GS-08 (Certificate Holder): Request for flexibility in perimeter fencing design
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests additional flexibility in perimeter fencing materials, including use of wire mesh or similar perimeter fencing up to 8 feet in height.

Department Evaluation
The description of perimeter fencing in the draft Site Certificate is consistent with information provided in RFA4, Section 4.1.3.6; however, the Department agrees that flexibility in the final design and type of fencing is allowable as long as the fencing is constructed and grounded in accordance with NESC Rule 110, would maintain public health and safety by preventing unauthorized entrance to the site, and would not create an unnecessary hazard for wildlife. The Department will incorporate changes in the draft Final Order Section I.D.3, draft Amended Site Certificate Section 3.2, and Section 4.1.5 of the Construction Wildfire Mitigation Plan, to allow the additional flexibility requested.

Issue GS-09 (Certificate Holder): Request for correction of description of Solar Micrositing Area
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests changes to a footnote in Facility Component Table to clarify Solar Micrositing Area is larger than permanent disturbance footprint, as presented below:

> ~~The Solar Micrositing Area would occupy approximately 1,445 acres within fenced areas and transmission line corridor. The entire solar facility footprint is considered a permanent disturbance area for the purposes of evaluating and mitigating impacts to resources such as Fish and Wildlife Habitat; however, soil reclamation and weed management is applicable to the solar facility footprint as discussed in applicable section in this order.~~
>
> The approved BCWF site boundary encompasses approximately 25,000 acres and includes all existing and approved BCWF components. The Certificate Holder proposes to modify the use of approximately 1,924 acres within the approved BCWF site boundary (Figure 3) to accommodate the Solar Components. These 1,924 acres

comprise the Solar Micrositing Area (also referred to as the RFA 4 Site Boundary), within which construction of the Solar Components may occur.

Department Evaluation
The Department agrees with the certificate holder that the description of the Solar Micrositing Area and maximum permanent disturbance of the Solar Facility, as provided in the Proposed Order Section I.D, Table 2 footnote 1, should be clear and consistent with the table itself, (e.g. 1,924 acre Solar Micrositing Area and 1,445 acre maximum permanent disturbance.)

The footnote is intended to clarify the term "permanent footprint" from an impact assessment perspective. For example, impacts within the perimeter fence of a solar facility are a permanent impact under the Fish and Wildlife Habitat standard. But that does not mean impacts to soils and vegetation within the fenceline are permanent. In fact, impacts to soils and vegetation within the fenceline are not permanent and these impacts need to be minimized and mitigated under other standards, such as Soil Protection and Land Use.

The certificate holder's proposed revisions are providing a different intent – of clarifying that the existing site boundary is being used to accommodate solar, which has nothing to do with the impact assessment under Fish and Wildlife, Soil Protection or Land Use for this amendment. The Department disagrees with the incorporating the certificate holder's proposed language, but agrees to make the following change:

> Solar facility components would permanently occupy up to 1,445 acres within the 1,924 acre ~~The~~ Solar Micrositing Area~~would occupy approximately 1,445 acres within fenced areas and transmission line corridor~~. Areas within the perimeter fenceline of the solar facility ~~The entire solar facility footprint is~~ are considered a permanent ~~disturbance area for the purposes of evaluating and mitigating impacts to resources such as~~ impact under the Fish and Wildlife Habitat standard; however, impacts within the perimeter fenceline to soils, vegetation and noxious weeds are not considered permanent under the Soil Protection and Land Use standards and must be minimized and mitigated, ~~soil reclamation and weed management is applicable to the solar facility footprint~~ as discussed in applicable sections in this order.

Issue GS-10 (Jered Reid/Donald Hilderbrand): Property owner does not consent to project being developed on his private property, as currently proposed.
Comment ID: BCWAMD4Doc24-16 Proposed Order Public Comments HilderbrandD via Law Office of Jered Reid 2026-01-29

Comment Summary
Mr. Hilderbrand, a person with an ownership interest in real property included in the proposed site, commented that he does not consent to his property being included in the project.

Department Evaluation

Matters related to property rights, including land access, purchasing, and leasing are generally outside of EFSC jurisdiction, meaning that EFSC cannot resolve disputes associated with these issues between landowners and the certificate holder, or between individual owners of a property. Because the commenter has not raised an issue related to a matter within the Council's jurisdiction, the Department does not intend to make any changes to the draft of the Final Order based on this comment.

III.B. Organizational Expertise (OAR 345-022-0060)

Issue OE-01 (McCullough, Kathryn; McCullough, Kevin); Maintenance issues at existing wind facility
Comment ID: BCWAMD4Doc24-01 Proposed Order Public Comment McCulloughK-1 2025-12-23

Comment Summary
Commenters object to approval of RFA4 until maintenance issues at the existing wind facility are addressed, stating that the certificate holder "should not be allowed to build solar until the Vestas towers are fixed." Commenter provides documentation of ongoing maintenance issues at existing wind facility, including blade throw, leaks of hydraulic oil from nacelles and turbine towers, transformer failures, multiple fallen bolts, hatch doors, nose cones, and other objects from turbines.

Department Evaluation
As discussed on page 40 of the Proposed Order, the Department acknowledges that the existing wind facility has experienced substantial equipment and maintenance issues over the past several years. While the Department does not agree that the maintenance issues demonstrate that the certificate holder, in partnership with BIGL, LLC, cannot operate or maintain a solar facility in compliance with site certificate conditions, the issues do demonstrate a deficiency in the adequacy of the existing site certificate conditions in ensuring systematic oversight of vendor performance, preventive maintenance, and safe, reliable construction and operation.

The Department has recommended the Council adopt additional conditions of approval to improve oversight and ensure the safe operation of the proposed solar components, including recommended Organizational Expertise Conditions 1 and 2 which require the finalization of the Draft O&M Framework Plan included as Attachment C to the Proposed Order. The Department may consider additional changes to these conditions or plan should the commenter suggest any in their reply. However, based on the comment and information provided to date, the Department does not intend to make any revisions in the draft Final Order.

Issue OE-02 (Certificate Holder): Request to amend recommended Amended Condition 3 (CON-OE-01), removing reference to fax number as contact method for construction managers.
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests changes to recommended Amended Condition 3 (CON-OE-01) to remove requirement to provide fax numbers for construction managers.

Department Evaluation
The Department agrees that requiring a fax number is unnecessary given the other communication methods included in the recommended amended condition, including phone number and email address. The Department agrees to remove reference to "fax number" in recommended Amended Condition 3 (CON-OE-01) in the draft Final Order.

Issue OE-03 (Certificate Holder): Request to revise requirement to provide executed Build Transfer Agreement in draft Operations and Maintenance Plan Framework, allowing for submission of redacted copy
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests changes to recommended Organizational Expertise Condition 1 and Proposed Order Table 5, which requires submittal of an executed Built Transfer Agreement (BTA) as part of finalization of the O&M Framework Plan. Specifically, certificate holder requests that they be authorized to submit a redacted copy, redacting confidential terms and conditions.

Department Evaluation
The Department agrees that there are likely confidential terms and conditions of the BTA which do not have a nexus with the Organizational Expertise standard and therefore do not need to be included in the version submitted to the Department. Receipt by the Department of an executed BTA is a recommended requirement because it is the mechanism that will establish the certificate holder's role and responsibility for oversight and control over a third-party; and, the third-party's role and responsibility in selecting and managing construction contractors, construction and operation of the proposed solar components. The Department proposes to incorporate the following language in Proposed Order Table 5 and Table 1 of the draft O&M Framework Plan.

> <u>Confidential terms and conditions, unrelated to the roles, responsibilities, oversight and control of the certificate holder, third-parties, site certificate and facility, may be redacted from the executed BTA provided to the Department.</u>

Issue OE-04 (Certificate Holder): Request to amend frequency of performance monitoring reports
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary

Certificate holder requests changes to recommended Organizational Expertise Condition 1 (PRO-OE-01) through Table 1 of the O&M Framework Plan (Proposed Order Attachment C) and Proposed Order Table 5, to reduce the frequency of reporting results of vendor performance from monthly to quarterly. Certificate holder states that monthly reporting may over-emphasize short-term variability that does not reflect underlying performance trends, while quarterly reporting allows for more meaningful evaluation of system performance and provides sufficient time for the certificate holder and O&M contractors to address identified issues.

Department Evaluation
As presented in Table 1 of the O&M Framework Plan (Proposed Order Attachment C) and Proposed Order Table 5, under the heading "Reporting," the proposed monthly reporting requirement applies to identification of any significant performance issues and corrective actions taken by or for the participating entity, contractor(s) and vendor(s). Further, monthly reporting shall identify corrective actions, including stop work or removal from site, required of the vendor(s) for any performance scores less than 95% percent on-time inspection and repair completion rate.

The Department understands the certificate holder's concerns but disagrees that a lessor frequency be established prior to establishing a cadence or implementation and evaluation of the plan. The Department's experience with the existing operating facility demonstrates that more frequency is necessary to track and understand operational and maintenance issues and status and/or plan for repairs.

The draft O&M Framework Plan allows for annual review and update of the plan (see Proposed Order Attachment C, Section 5, Conclusions. The Department maintains that changes in monitoring and reporting frequency be evaluated once the plan is implemented, based on revisions necessary to support effective review and understanding of vendor performance.

The Department recommends an additional change to Section 5.0 of the draft O&M Framework Plan, stating that:

> <u>All changes are subject to review and approval by the Department.</u>

Issue OE-05 (Certificate Holder): Request to clarify frequency of inspections using thermal imaging
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests to modify Proposed Order Attachment C, draft O&M Framework Plan, Section 3.4.2 as presented below:

Routine module inspections and annual infrared/aerial thermal imaging with anomalies detected via SCADA generating corrective work orders ~~within 48 hours~~ according to the final Operations and Maintenance Plan.

Certificate holder requests this change stating that it is unlikely that SCADA will detect module-level anomalies for work order creation.

Department Evaluation
The Department accepts the certificate holder's clarification on the frequency of thermal imaging because it is the certificate holder's proposal, but requests further clarification related to SCADA's identification of anomalies and generation of work orders. Certificate holder states that the SCADA is unlikely to detect anomalies that would generate work orders, but that language is not proposed to be removed, only the reference to the 48-hour generation of work order. The Department proposes the following language based on the certificate holder's explanation:

Routine module inspections and annual infrared/aerial thermal imaging with anomalies detected and addressed ~~via SCADA generating corrective work orders within 48 hours~~ according to the final Operations and Maintenance Plan.

The Department seeks certificate holder confirmation of accuracy on the above proposed language.

III.C. Structural Standard (OAR 345-022-0022)

Issue SS-01 (Certificate Holder): Request for flexibility to conduct ground disturbing activities on areas with steep slopes with engineer review
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests that recommended Amended Condition 68 be changed to allow ground disturbing activities in areas with slopes exceeding 20 percent when reviewed and approved by the Geotechnical Engineer of Record and designed to adequately address non-seismic hazard risks, as presented below.

Proposed Clarified Condition 68 (CON-SS-03):
The Certificate Holder shall design, engineer, and construct the solar facility to avoid dangers to human safety presented by non-seismic hazards, including but not limited to settlement, landslides, flooding, erosion, and collapsible soils. Ground-disturbing activities shall be avoided in areas with slopes exceeding 20 percent unless such activities are reviewed and approved by the Geotechnical Engineer of Record and designed to adequately address non-seismic hazard risks.

Department Evaluation
Recommended Amended Condition 66 requires that the certificate holder complete and submit a final Geotechnical Investigation prepared, which must be prepared for Geotechnical Engineer of Record and would evaluate seismic and non-seismic hazards at the site, based on final design. The language proposed by the certificate holder therefore is duplicative. Any changes to recommended Amended Condition 68 must be reviewed in tandem with recommended Amended Condition 66.

To assist in the evaluation of relaxing the prohibition of ground disturbing works on slopes exceeding 20%, the Department requests additional information regarding the types of ground disturbing activities on slopes exceeding 20 percent that are under consideration, the locations at the site where they are being considered, and any supporting evidence demonstrating how non-seismic geologic hazards in these areas will be mitigated. Please note that the recommended Condition 68 was intended to ensure compliance with the requirements of Sherman County's Natural Hazards (NH) Combining Zone and SCZO Section 3.7. If work on steep slopes within the NH Combining Zone is proposed, all information required under SCZO 3.7(5) must be included in RFA4.

III.C. Soil Protection (OAR 345-022-0022)

Issue SP-01 (McCullough, Kathryn); Questions the type and height of weeds required to be controlled
Comment ID: BCWAMD4Doc24-06 Proposed Order Public Comment McCulloughK-6 2026-01-09

Comment Summary
Commenter questions whether weeds are allowed to be a foot in height and whether noxious weeds, or all weeds, are required to be controlled/mitigated.

Department Evaluation
Noxious weeds will not be allowed to be 1-foot in height. The vegetation height limit of 1-foot established in the draft Construction Wildfire Mitigation Plan (WMP) Section 4.6.1. applies to beneficial vegetation, not noxious weeds.

Noxious weeds and invasive annual grass are required to be treated, controlled and monitored during construction and operation (see recommended Soil Protection Conditions 1 to 3).

The Department considers this issue resolved.

Issue SP-02 (Certificate Holder); Requests to clarify statement referring to the use of Sherman County for weed control.
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary

Certificate Holder requests to clarify that while there is intent to contract the Sherman County Weed Control District to implement measures of the Weed Control Plan, the District may not have sufficient capacity to manage implementation, in which case other qualified vendors may be contracted to implement the measures of the Weed Control Plan.

Department Evaluation
RFA4 Exhibit K Land Use, Section 8.1.3.1 states, "The Certificate Holder currently contracts with the Sherman County Weed Control District to inspect and treat weeds at BCFW and will continue to use their staff's services to treat the Solar Micrositing Area." This representation was incorporated into the Proposed Order Section D.1. Soil Protection; however, it was not expressly incorporated into a condition or weed-related mitigation requirement.

Recommended Soil Protection Conditions 1 to 3 require finalization and implementation of the draft Comprehensive Solar Vegetation and Soil Management Plan (Proposed Order Attachment D). Weed control requirements applicable prior to and during construction and operation are included in this plan. The plan does not require that the certificate holder contract with Sherman County Weed Control District to implement and monitor the requirements of the plan but rather requires that it be implemented by a qualified Weed Control Contractor.

The Department agrees that the recommended findings of fact can be updated based on the certificate holder's revised representation. Rather than revising the facts to refer to the potential of contracting with Sherman County Weed District or qualified vendors for weed control, the Department recommends that the findings of fact be revised to refer to the requirements of the draft Comprehensive Solar Revegetation and Soil Management Plan, as presented below:

> ~~The certificate holder has indicated that the District will be contracted to implement the measures of the Weed Control Plan.~~[1] Prior to and during construction and operation of the facility components proposed in RFA4, the certificate holder will be required to hire a Weed Control Contractor responsible for performing weed control in accordance with the Comprehensive Solar Revegetation and Soil Management Plan under recommended Soil Protection Conditions 1 through 3.[2]

The Department considers this issue resolved.

Issue SP-03 (Certificate Holder); Requests Revisions to Mapped Soil Units in Analysis Area
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

[2] BCWAMD4DocXX. Proposed Order on AMD4 Attachment D, Table A-2, pg. A-3. The draft Comprehensive Solar Revegetation and Soil Management Plan includes additional experience requirements for the Weed Control Contractor.

Comment Summary
Certificate holder requests revision of percentage of Solar Micrositing Area in Soil Unit 16D in Proposed Order Table 7. Commenter recommends amount should be 0.1%, not 0.2%.

Department Evaluation
Based on review of AMD4 Exhibit I, the Department agrees to correct Table 7 in the draft Final Order, as requested.

The Department considers this issue resolved.

Issue SP-04 (Sherman County Weed District) Concerns related to 1-3" veg height under WMP and ability of that height to provide erosion control
Comment ID: BCWAMD4Doc24-15 Proposed Order Public Comment Sherman County Weed District 2026-01-28

Comment Summary
Sherman County Weed District (SCWD) recommends vegetation be maintained at 4-8 inch height during dry season to support erosion control. SCWD suggests that a vegetative height of 1-3 inches will not support erosion control. SCWD also expresses concerns with the viability of bunchgrass species if maintained at the 1-3 inch height.

Department Evaluation
The Department is evaluating several comments related to the recommendation that vegetation within the solar facility and other vegetation clearance areas be maintained at 1 to 3 inches during fire season to mitigate fire risk. Mr. McCullough recommends the recommendation be implemented throughout the life of the facility (Issue WF-09). SCWD recommends that the vegetation height standard be increased to 4 to 8 inches to support erosion control and enhance viability of bunchgrass species. The certificate holder requests that the height standard be increased to 10 to 12 inches year-round.

The Department will continue to evaluate these recommendations, along with any additional evidence submitted in replies, to identify vegetation management standards that provide adequate fuel management to minimize wildfire risk while maintaining appropriate conditions for erosion control and beneficial vegetation.

Issue SP-05 (McCullough, Kathryn); Long-term soil health
Comment ID: BCWAMD4Doc24-17 Proposed Order Public Comment McCulloughK-10 2026-01-29

Comment Summary
Ms. McCullough raises concerns about lack of evidence supporting claims related to long-term soil improvement following use of the site for solar after 50 years.

Department Evaluation
Ms. McCullough does not identify a specific recommended finding, condition, or conclusion for which she objects Vegetation management and erosion control is required under the Draft Comprehensive Revegetation and Soil Management Plan established under recommended Soil Protection Conditions 1 to 3, however commenter has not explained how plan is deficient or could be improved.

At this time, the Department does not intend to make any revisions in the draft of the Final Order based on this comment because the comment has not been made with sufficient specificity – *i.e.*, the commenter does not "[i]dentify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object." OAR 345-027-0367(7),(8).

Issue SP-06 (Sherman County Soil and Water Conservation District, A. Whitman); Requests to develop a strong working relationship with certificate holder/BrightNight to ensure soil protection measures are in place.
Comment ID: BCWAMD4Doc24-21 Proposed Order Public Comment Sherman SWCD 2026-01-30

Comment Summary
Ms. Whitman of Sherman County Soil and Water Conservation District (SCSWCD) requests to develop a strong working relationship with certificate holder/BrightNight to ensure soil protection measures are in place.

Department Evaluation
Ms. Whitman does not identify a specific recommended finding, condition, or conclusion for which she objects. If Ms. Whitman believes there is a regulatory nexus for requiring consultation, and adherence to recommendations provided during consultation, please provide. As such, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. If the commenter objects to one or more findings of fact, conclusions of law, or conditions of approval in the Proposed Order, the Department requests that commenter identifies these findings, conclusions, or conditions in their reply.

Issue SP-07 (Sherman County Soil and Water Conservation District, A. Whitman); Potential soil contamination from fire-damaged photovoltaic modules or battery components.
Comment ID: BCWAMD4Doc24-21 Proposed Order Public Comment Sherman SWCD 2026-01-30

Comment Summary
Ms. Whitman of SCSWCD raises concerns about potential for panels or batteries damaged by fire or other cause to release toxins into soils and waterways.

Department Evaluation

Ms. Whitman does not identify a specific recommended finding, condition, or conclusion for which she objects. Control of noxious weeds and annual grasses is required under the Draft Comprehensive Revegetation and Soil Management Plan established under recommended Soil Protection Conditions 1 to 3, however Ms. Whitman has not explained how the plan is deficient or could be improved. Wildfire minimization and mitigation are required under Wildfire Prevention and Risk Mitigation Conditions 1 to 3, however commenter has not explained how plan is deficient or could be improved.

At this time, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. If the commenter objects to one or more findings of fact, conclusions of law, or conditions of approval in the Proposed Order, the Department requests that commenter identifies these findings, conclusions, or conditions in their reply.

Issue SP-08 (Sherman County Soil and Water Conservation District, A. Whitman); Enforcement of requirements for natural resource protection.
Comment ID: BCWAMD4Doc24-21 Proposed Order Public Comment Sherman SWCD 2026-01-30

Comment Summary
Ms. Whitman of SCSWCD raises concerns about enforcement of measures to protect environment and natural resources. She suggests that the State hold the certificate holder accountable for controlling weeds, preventing soil erosion, promoting fire prevention, and any other practices that ensure the health of the surrounding community and watersheds.

Department Evaluation
Ms. Whitman does not identify a specific recommended finding, condition, or conclusion for which she objects. Control of noxious weeds and annual grasses is required under the draft Comprehensive Revegetation and Soil Management Plan established under recommended Soil Protection Conditions 1 to 3, however Ms. Whitman has not explained how plan is deficient or could be improved. Wildfire minimization and mitigation are required under Wildfire Prevention and Risk Mitigation Conditions 1 to 3, however Ms. Whitman has not explained how plan is deficient or could be improved.

At this time, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. If the commenter objects to one or more findings of fact, conclusions of law, or conditions of approval in the Proposed Order, the Department requests that commenter identifies these findings, conclusions, or conditions in their reply.

Issue SP-09 (Certificate Holder); Requests to Clarify Terms, Clear Brush Free and Vegetation Clearance Area/Zone
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder provides the following clarification to ensure consistent interpretation of buffer area requirements along roads and perimeter fencelines within the Solar Micrositing Area. The terms "clear, brush-free area" and "vegetation-clearance area/zone" are used in multiple locations in the Proposed Order and Attachments D and G without consistent definition. To improve the clarity and avoid misinterpretation, the certificate holder requests that these terms be replaced with "low-growing, fire-resistant vegetation," or that the documents otherwise clarify that these buffer areas are intended to be maintained with low-growing, fire-resistant vegetation rather than fully devoid of vegetation.

In addition, the certificate holder notes an inconsistency regarding whether the required buffer along the perimeter fenceline is intended to be 10 feet on each side or 20 feet measured along the exterior or interior and requests clarification from ODOE to ensure consistent understanding and implementation of the buffer requirement.

Department Evaluation
In the Proposed Order Attachment G Section 4.1.6 (draft Construction WMP), the Department recommended the following:

> During construction clearing, grubbing, and grading, the contractor will establish a noncombustible buffer zone extending a minimum of 10 feet inside the fenceline and another minimum 10-foot limits of disturbance buffer outside the fenceline for a total of a minimum of 20 feet of noncombustible buffer around the perimeter of the site.

Also as presented in the draft Amended Site Certificate Table 1, the vegetation management buffer for the perimeter fenceline is established at 20 feet. These requirements were based on the draft Construction Wildfire Mitigation Plan and draft Comprehensive Revegetation and Soil Management Plan provided by the certificate holder. While design changes are permissible at this stage in the process, additional information is requested to support the Department's evaluation. Please provide specific revisions to the draft Comprehensive Solar Revegetation and Soil Management Plan and draft Construction Wildfire Mitigation Plan. Please explain how public comments discussed under Issue SP-04, WF-08, and WF-09 were considered in developing the revisions.

The Department agrees that the varying terms used in Section III.D.1 and draft Amended Site Certificate should be replaced with a consistent term, "noncombustible buffer" and be further clarified that for the perimeter fenceline, the buffer extends 10-feet on either side.

Issue SP-10 (Certificate Holder); Requests revisions to Draft Comprehensive Revegetation and Solar Management Plan
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder provides additional recommended edits to the draft Comprehensive Revegetation and Solar Management Plan presented as Attachment D to the Proposed Order.

Department Evaluation
The Department reviewed the certificate holder's proposed changes to the draft Comprehensive Revegetation and Solar Management Plan and generally agrees to administrative changes and clarifications. As presented for Issue FW-03, the Department's requests reasons and explanation to support the certificate holder's request for flexibility in ground disturbing activities during the sensitive ground nesting bird season. In addition, the certificate holder requests changes to the seed mix presented in Appendix F Table 2. The Department is reviewing with ODFW and will provide any agreed upon changes in the draft Final Order.

Issue SP-11 (Sherman County Soil and Water Conservation District, A. Whitman); Erosion Control
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15

Comment Summary
Ms. Whitman of SCSWCD raises general concerns about the spread of noxious weeds and annual grass at the site and their potential to increase wildfire risk.

Department Evaluation
Ms. Whitman does not identify a specific recommended finding, condition, or conclusion that is objected to. Control of noxious weeds and annual grasses is required under the draft Comprehensive Revegetation and Soil Management Plan established under Recommended Soil Protection Conditions 1 to 3, however commenter has not explained how the plan is deficient or could be improved.

At this time, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. If the commenter objects to one or more findings of fact, conclusions of law, or conditions of approval in the Proposed Order, the Department requests that commenter identifies these findings, conclusions, or conditions in their reply.

Issue SP-12 (Sherman County Soil and Water Conservation District, A. Whitman); Weed Control
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15

Comment Summary
Ms. Whitman of SCSWCD raises general concerns about the spread of noxious weeds and annual grass at the site and their potential to increase wildfire risk.

Department Evaluation

Ms. Whitman does not identify a specific recommended finding, condition, or conclusion that is objected to. Control of noxious weeds and annual grasses is required under the draft Comprehensive Revegetation and Soil Management Plan established under Recommended Soil Protection Conditions 1 to 3, however commenter has not explained how the plan is deficient or could be improved.

At this time, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. If the commenter objects to one or more findings of fact, conclusions of law, or conditions of approval in the Proposed Order, the Department requests that commenter identifies these findings, conclusions, or conditions in their reply.

III.D. Land Use (OAR 345-022-0030)

Issue LU-01 (Certificate Holder); Request for reduction in requirements for Site Plan Review
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests the following changes be made to recommended Land Use Condition 3:

a. Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department and the Sheman County Planning Commission, an application for Conditional Use Permit ~~pursuant to ORS 469.401(3) meeting the requirements of SCZO Section 5.4(1) and (3).~~
b. ~~The Site Plan required under SCZO 5.4(1) must demonstrate compliance with all applicable local ordinances and site certificate conditions.~~
[Final Order on AMD4]

The certificate holder asserts that because it has elected to seek a Council determination of compliance with statewide land use planning goals under ORS 469.504(1)(b), Sherman County would not have discretionary approval of a CUP or Site Plan, and compliance with applicable sections of the Sherman County Zoning Code (SCZO) would be determined by Council and memorialized in the Final Order and Site Certificate.

Department Evaluation
The certificate holder is correct that under ORS 469.401(3), an affected County does not have general discretion to reject a permit addressed in an amended site certificate, the statute explicitly authorizes the County to consider whether the permit is consistent with the terms and conditions of the amended site certificate. The statute also requires the certificate holder to submit “proper applications and payment of the proper fees” for any permit addressed in the site certificate, including the Conditional Use Permit.

The Department believes the condition is appropriate as written. The language proposed to be stricken explains what information the Department believes is necessary for the CUP application to be complete. In addition, the Department and the County will need a final site plan in order to verify that the facility will comply with setback, dimensional requirements, and other restrictions imposed through site certificate conditions and applicable local ordinances. If the certificate holder believes this is incorrect, or that additional clarification is needed, the Department requests that additional explanation be provided in the certificate holder's reply.

Issue LU-02 (Certificate Holder); Objection to Evaluation of Compliance with SCZO 5.2(5)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder objects to the Department's recommended finding that the proposed facility would not comply with SCZO 5.2(5) and requests that the Department reconsider its recommended finding that the acreage thresholds under OAR 660-033-0130(38)(k) are a "land standard" within the meaning of the SCZO, arguing instead that they are thresholds that, if triggered, require the application of more stringent review criteria under the exceptions test.

Department Evaluation
In the Proposed Order, the Department recommends the Council find:

> "…the facility components proposed in RFA4 would generally comply with applicable air, water, and solid waste standards; however, as described in the evaluation of directly applicable state rules and laws under ORS 197.646, below, the facility components proposed in RFA4 would exceed the maximum amounts of arable and high-value farmland allowed under OAR 660-033-0130(38), and for this reason cannot be approved without an exception to Statewide Planning Goal 3."

OAR 660-033-0130 establishes the minimum standards applicable to the schedule of permitted and conditional uses under OAR 660-033-0120. OAR 660-033-0130(38)(g) provides as follows: "For high-value farmland described at ORS 195.300(10), a photovoltaic solar power generation facility shall not use, occupy, or cover more than 12 acres" unless certain standards are met. A similar standard is established under OAR 660-033-0130(38)(i) which provides; "For arable lands, a photovoltaic solar power generation facility shall not use, occupy, or cover more than 20 acres..."

Similar to all other standards set in the rule and the SCZO, if a facility would use, occupy, or cover, more land than allowed by the rule, then the facility cannot be approved as a conditional use. Instead, the project proponent must seek an exception to the standards and the Statewide Planning Goal the standards implement. Because the acreage thresholds in OAR 660-033-0130(38) are used to determine whether a facility can be approved as a Conditional Use, and because they are directly applicable to any Sherman County Land Use decision under ORS

197.646, the Department maintains that they are effectively land use standards within the meaning of SCZO 5.2.

Issue LU-03 (Certificate Holder); Objection to Evaluation of Compliance with SCZO 5.2(6)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder objects to the Department's recommended finding that the proposed facility would not comply with SCZO 5.2(6) and requests that the Department reconsider its finding that failure to comply with acreage threshold under OAR 660-033-0130(38)(k) is a "use violation" within the meaning of the SCZO.

Department Evaluation
The Department agrees with the certificate holder that the obligation to receive approval of a Goal 3 exception does not constitute a "use violation" of the SCZO, and agrees to revise the analysis.

Issue LU-04 (Certificate Holder); Objection to Evaluation of Compliance with SCZO Section 5.8(20)(1)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder objects to the Department's recommended finding that the proposed facility would not comply with SCZO 5.8(20)(1) and request that the Department reconsider its finding that failure to comply with acreage threshold under OAR 660-033-0130(38) would result in the proposed facility being incompatible with farm use.

Department Evaluation
The Department interprets the "compatibility with farm use" standard under SCZO 5.8(20)(1) to mean that the non-farm use is compatible with farm uses on the subject tract, which is a distinct issue from the compatibility with adjacent uses criteria found in SCZO 5.8(20)(2) and in the Council's exception criteria under ORS 469.504(2)(c)(C). The Department maintains that the minimum standards applicable to conditional uses under OAR 660-033-0130 are an appropriate measure of whether a proposed facility is compatible with farm use when the County has not adopted its own standards or criteria.

Issue LU-05 (Certificate Holder) Objection to Evaluation of Compliance with SCZO 5.8(20)(3)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder objects to the Department's recommended finding that that proposed facility would not comply with SCZO 5.8(20)(3) and requests that the Department reconsider its finding that conversion of approximately 1,445 acres of cultivated land, including 1,006 acres of high-value farmland, to a non-farm use has the potential to materially alter the overall land use pattern of the analysis area by reducing the number of tracts available for farmland and potentially affecting the local agricultural economy.

Department Evaluation
The Department disagrees with the scope of the analysis provided by the certificate holder, including 130 square miles. The Land Use analysis area includes the area within and extending ½-mile from the site boundary. The Department requests that the certificate holder provide an analysis of SCZO 5.8(20)(3) based on the established Land Use analysis area, to support review of this comment.

Issue LU-06 (von Borstel, Alan); Concern with cumulative impacts of solar development in Sherman County
Comment ID: BCWAMD4Doc24-11 Proposed Order Public Comment Von BorstelA 2026-01-20

Comment Summary
Mr. Von Borstel raises concern that cumulative impacts of solar development in Sherman County may adversely affect wildlife, wildfire protection, cultural, historic and scenic the agricultural community, and supporting industries.

Department Evaluation
Mr. Von Borstel raises concerns about the cumulative impact of solar development in Sherman County. He did not identify a specific standard or legal requirement or a specific impact that would result from the construction and operation of the proposed facility under consideration.

As such, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. If the commenter objects to one or more findings of fact, conclusions of law, or conditions of approval in the Proposed Order, the Department requests that commenter identifies these findings, conclusions, or conditions in their reply.

Issue LU-07 (Multiple Commenters); Recommendation that "Right to Farm" protections are needed to protect farmers from wildfire liability
Comment ID: BCWAMD4Doc24-02 Proposed Order Public Comment McCulloughK-2 2025-12-24; BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05; BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30; BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15

Comment Summary
Commenters raise concerns about the increased risk of liability to farmers that could arise if a fire started by farming practices damaged the solar facility. Commenters object to recommended approval of solar facility in "high fire risk area" without hold harmless clause. Commenters assert that potential liability for a wildfire started by normal farming practices could result in bankruptcy, and without protections from liability the project infringes on the commenters "right to farm" under ORS 30.930 to 30.947.

Department Evaluation
Matters of liability are generally not within the Council's jurisdiction. Providing farmers the suggested liability protections would be a matter to take up with the state legislature. The Department does not intend to make any revisions in the draft of the Final Order based on this comment because the comment raises an issue that is not within the scope of Council's authority.

Issue LU-08 (Certificate Holder); Objection to Evaluation of OAR 660-033-0130(38)(G)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2

Comment Summary
Certificate holder objects to Departments recommended findings under evaluation of OAR 660-033-0130(38)(h)(G).

Department Evaluation
In its evaluation of this criteria, the Department states, "No solar facilities have been constructed or have been approved within the study area identified by rule, so no further analysis is necessary; however, the rule was intended to apply to a facility less than 12 acres in size and does not accurately capture the proposed facilities' potential impacts on the stability of the overall land use pattern..."

As stated, the Department's recommended finding is that no further analysis of the criteria is needed. The additional explanation is intended to provide context for recommended findings under the evaluation of SCZO 5.8.20(3). The Department will include clarifying changes in both sections to clarify that the Department's evaluation of the proposed facilities potential impacts on the stability of the overall land use pattern of the area is informed by, but independent of, the test required under OAR 660-033-0130(38)(h)(G).

Issue LU-09 (Oregon Wheat Growers League); Recommendation to include impact of lost assessments in economic impact analysis
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Comment Summary
Commenter raises a concern that the certificate holder's analysis of economic impacts of the RFA4 facility changes does not account for lost agricultural assessments that fund research,

market development, and grower services. Recommends updating the impact analysis to account for lost assessment revenues.

Department Evaluation
The commenter has not objected to a Department recommended finding of fact, conclusion of law or condition of approval in the Proposed Order, but rather to the scope of the certificate holder's analysis of the indirect economic impacts of the proposed RFA4 changes.

Based on the comment and information provided to date, the Department will not make any revisions in the draft of the Final Order based on this comment because the comment has not been made with sufficient specificity – *i.e.*, the commenter does not "[i]dentify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object." OAR 345-027-0367(7),(8).

Issue LU-10 (Oregon Wheat Growers League); Objection to claim that Community Investment Plan will offset impacts to agricultural economy
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Comment Summary
Commenter contends the draft Community Investment Plan (CIP) "does not deliver" on a statement by the certificate holder that the CIP will "ensure any negative economic impacts that could result from the decrease in total acres of wheat production in the county will be offset by investments in the local agricultural community."[3] Contends that mitigation cannot fully offset the loss of agricultural land into an industrial use.

Department Evaluation
The commenter has not objected to a Department recommended finding of fact, conclusion of law or condition of approval in the Proposed Order regarding the CIP, but rather to a statement the certificate holder made about the CIP. Council must consider whether the proposed CIP supports a "rural economic benefits" reason for granting an exception to statewide planning Goal 3, which seeks to preserve agricultural land. The Department has not contended the CIP will fully offset any/all negative economic impacts to the local agricultural community. Rather, the Department has recommended the Council find the proposed CIP "*reasonably addresses* the indirect impacts of converting agricultural lands in the proposed Solar Micrositing Area to nonfarm use"[4] and recommended Council find that implementation of the CIP supports a rural economic benefits reason for granting an exception to Goal 3.

Based on the comment and information provided to date, the Department will not make any revisions in the draft of the Final Order based on this comment because the comment has not been made with sufficient specificity – *i.e.*, the commenter does not "[i]dentify the

[3] RFA4, Exhibit K, Land Use, p. 71.
[4] Proposed Order, pp. 139-140.

recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object." OAR 345-027-0367(7),(8).

Issue LU-11 (Oregon Wheat Growers League): Recommendation to include Oregon Wheat Growers League in Community Investment Selection Committee
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Comment Summary
Commenter recommends that farmer representatives should be included in decision making process. Recommends Oregon Wheat Growers League be included in structure.

Department Evaluation
The commenter expresses concern there is no guarantee a farmer representative will be "built into the decision-making process" and proposes to "update the structure to include a representative from the Oregon Wheat Growers League."

To help inform the development of the CIP and to identify potential projects that would support the local agricultural economy the certificate holder met with, among other persons and groups, local wheat farmers and the Oregon Wheat Commission. That coordination led to the certificate holder including in the CIP five "pre-screened" projects that would qualify for funding.

For other proposals, a five-person advisory committee (Selection Committee) would review applications and make recommendations to the Sherman County Board of Commissioners on funding. The Selection Committee would include one representative from Sherman County government; one representative from an academic institution engaged in agriculture research in Sherman County or an agricultural-related nonprofit entity located in Sherman County; *one dryland farm producer in the County*; one community member; and one representative with expertise in wildfire as it relates to agricultural lands.[5]

At this time, the Department does not intend to make any changes in the draft Final Order based on this comment because wheat farmers were consulted in developing the five pre-screened projects, and the Selection Committee that may recommend other possible projects will include a dryland farm producer. The Department may consider additional changes to findings or conditions based on additional information provided on the record.

Issue LU-12 (Oregon Wheat Growers League): Need for engagement with Market Development Organizations in developing Community Investment Plan
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

[5] Proposed Order, p. 139 and Attachment E (the draft CIP), Section 4.2.1.

Comment Summary
Commenter recommends that further consultation with market development organizations (e.g. , Oregon Wheat Commission, U.S. Wheat Associates, National Association of Wheat Growers and Northwest Grain Growers) seeking to understand the long-term markets in domestic and international capacities "is needed to clarify statements listed in the market statements."

Department Evaluation
It is not clear to the Department to what "market statements" the commenter is referring, nor what further consultation with the recommended organizations would achieve.

Based on the comment and information provided to date, the Department will not make any revisions in the draft of the Final Order based on this comment because the comment has not been made with sufficient specificity – *i.e.*, the commenter does not "[i]dentify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object." OAR 345-027-0367(7),(8).

Issue LU-13 (Oregon Wheat Growers League): Concern with inclusion of agrivoltaics research as pre-screened project in Community Investment Plan
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Comment Summary
Commenter raises concern with inclusion of agrivoltaics research in pre-screened mitigation project list, alleging "[t]his areas is overstated" and the project "would not produce meaningful results." Recommends producer-led analysis of research proposals would allow research investments to match the growing area most effectively.

Department Evaluation
Dryland wheat agrivoltaics research is one of five pre-screened projects identified in the draft Community Investment Plan (CIP) as having a direct benefit to the rural agricultural economy of Sherman County. These five projects were developed based on outreach and coordination with key stakeholders from the Sherman County agricultural community, as well as state-wide agricultural-related organizations including local wheat farmers, the Oregon Watershed Enhancement Board (OWEB), Oregon State University (OSU) including its extension service in Sherman County and the College of Agricultural Sciences, the Oregon Wheat Commission, the Sherman County Fire District, Sherman County Emergency Services, the Rural Sherman County Fire Board, the Weed Master, the Road Master, the County Planning Office, and County Judge. Further, as noted above, the Selection Committee for CIP mitigation projects will include one representative one dryland farm producer in the County.

The Department does not intend to make any revisions in the draft of the Final Order based on this comment because the agrivoltaics project was identified after consultation with a range of stakeholders, not just agricultural producers, and because producers will be represented on the Selection Committee that will make the final choices for mitigation projects.

Issue LU-14 (Oregon Wheat Growers League): Concern with including weed management projects as pre-screened project in Community Investment Plan
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Comment Summary
Commenter raises concern with inclusion of weed management projects in the pre-screened mitigation project funding list. Asserts the project adds burden to neighboring properties and recommends weed management be incorporated into the project requirements rather than diminishing agricultural mitigation funds.

Department Evaluation
The commenter contends "the project should ensure that a weed management plan that can be reasonably enforced is completed outside of ag mitigation efforts."

Weed control is a requirement under Proposed Order. The certificate holder has prepared the Comprehensive Solar Revegetation and Soil Management Plan (Comprehensive Plan) to serve as a primary source of commitments related to revegetation, soil management, dust control, stormwater management, and noxious weed control through the pre-construction, construction, and operations phases for the photovoltaic solar energy generation and battery storage (Solar Components) associated with RFA4.

Under the Proposed Order recommended Soil Protection Conditions 1 through 3, the certificate holder would be required to finalize the draft Comprehensive Plan (included as Attachment D), and construct and operate the solar facility in compliance with the Plan. As with all site certificate conditions, the Department and Council maintain authority to enforce these condition requirements. The commenter has not raised any issues related to the adequacy of the draft Comprehensive Plan or Recommended Soil Protection Conditions 1 through 3.

The weed control measures funded under the draft CIP would not address weeds related to the Biglow facility but rather would provide a grant program for county wheat farmers to invest in precision agricultural technology such as weed management equipment, remote sensing technology to assist with weed mapping or soil mapping.

The draft CIP Project 4 is a "[g]rant program for county wheat farmers to invest in precision agricultural technology such as weed management equipment, remote sensing technology to assist with weed mapping or soil mapping, variable rate technology to collect data on soil variability to inform application of fertilizers, and other technologies." The description further states "[t]he cost-share grant program for precision agricultural technology is assumed to increase the number of farmers who otherwise would not have access to precision management technology due to the significant upfront cost barrier."[6]

[6] Proposed Order Attachment E, Draft Community Investment Plan, pp. 10-11.

The Department does not intend to make any revisions in the draft of the Final Order based on this comment because recommended conditions in the Proposed Order would already require the certificate holder to take weed control measures, and the weed control funding measures described under the draft CIP would not be used to control weeds related to the certificate holder's project but rather would be utilized by county wheat farmers.

Issue LU-15 (Oregon Wheat Growers League): Concern with including fire mitigation projects as pre-screened project in Community Investment Plan
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Comment Summary
Commenter raises concern with inclusion of investments in minimizing fire risk in the pre-screened mitigation project funding list. Recommends fire mitigation should be considered separately from agricultural mitigation.

Department Evaluation
Under Council's Wildfire Prevention and Risk Mitigation standard, OAR 345-022-0115, Council must find the certificate holder has adequately characterized wildfire risk within the analysis area and that the proposed facility will be designed, constructed, and operated in compliance with a Wildfire Mitigation Plan approved by the Council.

In the Proposed Order, the Department recommends the Council impose new conditions requiring the certificate holder to submit plans addressing wildfire risks associated with the construction and operation of the solar facility. Recommended Wildfire Prevention and Risk Mitigation Conditions 1 and 2 require the certificate holder to submit to the Department, for review and approval, a Construction Wildfire Mitigation Plan (WMP), (consistent with Attachment G to the Order) and to adhere to the WMP during construction of the solar facility. And Recommended Wildfire Prevention and Risk Mitigation Conditions 3 and 4 require the certificate holder to submit to the Department for review and approval an Operational Wildfire Mitigation Plan and adhere to it during operations.

In 2024, separate from the Council process related to the proposed Biglow solar facility, Sherman County developed and adopted a Community Wildfire Protection Plan (CWPP) to identify and mitigate wildfire risk in the county and to develop a strategy to reduce those risks. The CWPP identifies several projects that would assist the County in mitigating wildfire risk (e.g., upgrading, maintaining, or adding firefighting equipment for Sherman County's Rural Fire Protection Districts and training for volunteers).

In the certificate holder's draft CIP, "Agricultural Wildfire Risk Minimization and Capacity Building" is one of the five pre-screened projects identified as having a direct benefit to the rural agricultural economy of Sherman County. Under the draft CIP Project 2, the County could allocate mitigation funding to support either partial or full implementation of the projects

identified in its CWPP, as well as other initiatives aimed at supporting the County's agricultural community in wildfire mitigation and response.

The Department does not intend to make any revisions in the draft of the Final Order based on this comment because recommended conditions in the Proposed Order already require the certificate holder to take measures to comply with the Council's Wildfire Prevention and Risk Mitigation standard. Separately, the wildfire risk minimization measures described under the draft CIP would not be used to address wildfire risks related to the certificate holder's project but rather would benefit the County overall.

Issue LU-16 (Oregon Wheat Growers League): Objection to statement that lease payments will compensate for lost agricultural revenue
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Comment Summary
Commenter objects to a statement by the certificate holder that lease payments will compensate for any lost agricultural revenue incurred by a landowner/farmer due to conversion of farmland to energy use[7]; the commenter contends that the farm operator may not own the subject parcel and may not benefit from lease payments and suggests clarification is needed to determine if the persons who provided statements are only landowners or if they are also farm operators.

Department Evaluation
The commenter has not objected to a Department recommended finding of fact, conclusion of law or condition of approval in the Proposed Order, but rather to a statement the certificate holder made that lease payments will offset the direct loss of agricultural production resulting from its proposed solar facility.

As discussed in the Proposed Order, because the proposed solar facility would use, occupy, or cover more farmland than allowed under state laws and regulations, for Council to approve the facility, it would have to provide an exception to Statewide Planning Goal 3, which seeks to preserve and maintain agricultural lands for farm use.

The certificate holder argues that one reason Council should provide an exception to Goal 3 is because its proposed solar facility will promote rural economic development in several ways including through lease payments to affected landowners. The Department analyzed this argument in the Proposed Order and, while it agreed that some aspects of the proposal support Council granting an exception to Goal 3 because of the rural economic development that will result (e.g., through the proposed Community Investment Plan), the Department recommended Council find that the certificate holder has not provided sufficient evidence to demonstrate that lease payments will benefit agricultural operations because the participating

[7] RFA4, Exhibit K, Land Use, p. 18.

landowner or individuals farming the land have not demonstrated, or even indicated, they intend to use the lease payments from the proposed solar facility to make or allow for new farm investment.[8]

Therefore, it is not necessary to seek clarification regarding the landowner statements and the Department does not intend to make any revisions in the draft of the Final Order based on this comment because the Department has recommended Council reject the certificate holder's position that the lease payments support Council granting an exception to Goal 3.

Issue LU-17 (Certificate Holder); Land Use/Goal Exception – Project Furthers Oregon's Clean Energy Directives and Goals
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15; BCWAMD4Doc24-23 Proposed Order Public Comment Certificate Holder-3 2026-01-30

Comment Summary
Certificate holder objects to the Department recommending Council reject their argument that an exception to Goal 3 is justified because authorizing the facility components proposed in RFA4 is consistent with State policies and goals addressing climate change and encouraging the acceleration of Oregon's clean energy transition.

In their comments on the Proposed Order, the certificate holder provides additional evidence and argument in support of its position. The certificate holder discusses state legislation (SB 1547, ORS 469A.005-469A.210) mandating that large investor-owned utilities, including PGE, meet Renewable Portfolio Standard targets. The certificate holder also addresses two recent Executive Orders issued by Governor Kotek, Executive Order 25-25, *Accelerating Wind and Solar Energy Development in Advance of Elimination of Federal Clean Energy Tax Credits* (EO 25-25), and Executive Order 25-29 *Reducing Greenhouse Gas Emissions and Advancing Oregon's Clean Energy Future* (EO 25-29). The certificate holder contends "a Goal 3 exception is justified because the facility, as amended, directly furthers Oregon's clean energy directives and goals."

Department Evaluation
The Department does not intend to make any revisions in the draft of the Final Order based on this comment and recommends Council not make changes in its Final Order based on this comment.

The State of Oregon has taken several measures to combat climate change and encourage the development of renewable energy, including those discussed by the certificate holder. At the same time, Oregon has a rigorous land use system that seeks, among other goals, to preserve the state's agricultural lands, via Goal 3. None of the statutes or Executive Orders the certificate holder cites require EFSC to grant an exception to Goal 3 for a renewable energy facility. Indeed, per statute, EFSC "*may* find goal compliance for a facility that does not otherwise

[8] Proposed Order on RFA4, pp. 141-142.

comply with one or more statewide planning goals by taking an exception to the applicable goal" (ORS 459.504(2), emphasis added). Therefore, as the certificate holder has noted, EFSC has the discretion to decide when to grant an exception to a statewide planning goal.

In recent years, most projects reviewed by EFSC have sought an exception to Goal 3. That is because large renewable energy facilities, in particular solar photovoltaic power generation facilities, require significant amounts of land and that land is often zoned for Exclusive Farm Use. Therefore, it is up to EFSC to balance Oregon's goals and directives to combat climate change/encourage renewable energy against the state's Goal 3, seeking to preserve agricultural land. This is a responsibility the Department and EFSC take seriously. The Department believes that granting an exception to Goal 3 based solely on the fact that a proposal would result in the construction or expansion of a renewable energy facility is tantamount to ignoring Goal 3 altogether. Indeed, EFSC has consistently rejected arguments that because a proposed facility would assist in meeting Oregon's climate change and renewable energy policies, that alone is a reason justifying taking an exception to Goal 3. Rather, the Department and Council have sought to take a closer look at the impacts a proposed facility would have on agricultural lands and the agricultural economy. This is a location-specific and project-specific analysis. Council has regularly approved exceptions to Goal 3 where the project proponent can demonstrate the facility is located near existing energy or transportation infrastructure (and thus would displace less agricultural land than a facility farther from such infrastructure), will have minimal impacts to agriculture and/or provide a benefit to the rural/agricultural economy.

In the Proposed Order the Department recommends Council find that the certificate holder has provided sufficient evidence to justify an exception to Goal 3 based on the RFA4 facility components being locationally dependent on nearby major transmission infrastructure and transportation corridors and because the proposed Community Investment Plan funds are likely to be used in a manner that benefits the local agricultural economy and provide rural economic development benefits. Therefore, should Council agree with the Department's recommendation, it would grant an exception to Goal 3 for the proposed additions to the facility, not based solely on the fact that those additions will further Oregon's clean energy directives and goals, but because it makes sense to site an energy facility at that location, given the presence of nearby energy and transportation infrastructure and because the certificate holder will implement measures that will benefit the rural/agricultural economy.

The Department maintains its recommendation that Council not base a goal exception on the proposed facility components furthering Oregon's clean energy directives and goals. Were Council to do so, proponents of future renewable energy projects may cite such a decision as a basis for Council to grant an exception to Goal 3 even if their projects, unlike this one, are not locationally dependent, would not provide a benefit to the rural/agricultural economy and/or would have greater impact on agricultural lands and productivity.

Issue LU-18 (Certificate Holder); Land Use/Goal Exception – Minimal impacts to Other Resources

BCWAMD4Doc24-23 Proposed Order Public Comment Certificate Holder-3 2026-01-30

Comment Summary
Certificate holder objects to recommended rejection of Minimal Impacts to Other Resources Reason to support an exception to Statewide Planning Goal 3. Provides comparison of potential impacts compared to other recent orders.

Department Evaluation
The Department does not intend to make any revisions in the draft of the Final Order based on this comment and recommends Council not make changes in its Final Order based on this comment.

The certificate holder maintains that an exception to Goal 3 is justified because their proposed Solar Micrositing Area would have minimal impacts on other resources protected by Council standards since it would avoid sensitive environmental features, including Washington ground squirrel occupied habitat, FEMA 100-year floodplains, U.S. Fish and Wildlife Service-designated critical habitat, and ODFW-designated big game winter ranges, and wetlands and waters. They contend their proposal would impact less Category 2 through 4 habitats than three other facilities to which Council granted a Goal 3 exception and that the permanent habitat loss that would occur will be mitigated according to ODFW Habitat Mitigation Policy goal.

Per ORS 469.504(2)(c) the Council may take an exception to a statewide planning goal if it finds the following standards are met:

> *(A) Reasons justify why the state policy embodied in the applicable goal should not apply;*
> *(B) The significant environmental, economic, social and energy consequences anticipated as a result of the proposed facility have been identified and adverse impacts will be mitigated in accordance with rules of the council applicable to the siting of the proposed facility; and*
> *(C) The proposed facility is compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts.*

Thus, for Council to grant an exception to Goal 3, in addition to finding there are sufficient reasons to justify taking an exception, ORS 469.504(2)(c)(B) requires Council to also find that the significant environmental, economic, social and energy consequences anticipated as a result of the facility components proposed in RFA4 have been identified and adverse impacts will be mitigated in accordance with rules of the Council. Here, because the Department believes the certificate holder had already demonstrated sufficient reasons to grant an exception to Goal 3, it recommended Council reject minimal impacts as a reason for granting an exception under ORS 469.504(2)(c)(A) and instead consider those minimal impacts and mitigation per the ODFW Habitat Mitigation Policy as meeting the mitigation requirement in

ORS 469.502(2)(c)(B).[9] This approach avoids "double counting" - *i.e.*, finding the same underlying facts and evidence as meeting two separate criteria necessary for granting an exception. Accordingly, the Department recommends Council not make any changes to the Proposed Order in response to the certificate holder's comments.

III.E. Fish and Wildlife Habitat (OAR 345-022-0060)

Issue FW-01 (McCullough, Kathryn); Adequacy of Exhibit P and Evaluation of Impacts to Wildlife
Comment ID: BCWAMD4Doc24-03 Proposed Order Public Comment McCulloughK-3 2026-01-01

Comment Summary
Ms. McCullough raises concerns regarding the adequacy of RFA4 Exhibit P and the evaluation of impacts to wildlife. She states that the Exhibit P (to the preliminary RFA4) is incomplete and appears to apply only to birds and bats, arguing that other mammals should be addressed. She provides photographic documentation of other animals in the vicinity of the site.

Department Evaluation
The Department believes RFA4 Exhibit P, and associated findings in the Proposed Order, adequately address potential impacts to fish and wildlife species, including the species identified by Ms. McCullough. Because impacts to all wildlife and wildlife habitat, not just bird and bat species, were considered in the evaluation of the RFA4, the Department does not recommend any additional changes to the Proposed Order are warranted at this time.

Under OAR 345-022-0060(3)(d) [formerly OAR 345-021-0010(1)(p)(D)], Exhibit P must identify all *state sensitive species* that might be present in the analysis area, based on consultation with ODFW and appropriate field study and literature review. Information about state sensitive species is required to be included in the Fish and Wildlife Exhibit, in part, to inform habitat categorization based and determine appropriate measures to avoid and minimize impacts in accordance with ODFW's Habitat Mitigation Policy, but the importance and use of habitat to wildlife more generally is also considered when making these determinations.

In Exhibit P, Section 6.1, of the final RFA4, the certificate holder identifies that 16 *state sensitive species* that have the potential to occur in the analysis area. This list is not intended to be a list of all species that are potentially present at the site, only those species identified by ODFW as State Sensitive, or Sensitive-Critical, which for the proposed Solar Micrositing Corridor, includes primarily bird and bat species and two reptile species.

[9] See Proposed Order, p. 146: ". . . the construction and operation of the facility components proposed in RFA4 could have significant adverse impacts on soils, fish and wildlife habitat, cultural resources, and waters of the State, but the Department recommends the Council find that existing and recommended conditions of approval are adequate to avoid, minimize, or mitigate these impacts."

As referenced by the commenter, the biologists conducting field surveys of the site also recorded non-listed species encountered during surveys in the Biological Survey Reports included in Attachment P-1, including some of the species identified in the comments and associated photographs. Impacts to non-listed species were further addressed in Exhibit P, and the Proposed Order, through the consideration of mapped Big Game Winter Range (for Elk and Mule Deer) and Priority Wildlife Connectivity Areas (based on connectivity needs for 54 surrogate species) in the categorization of habitat, which resulted in additional areas shrubland-steppe and grassland habitat being considered Category 2 "essential and limited" habitat. ODFW also recommended additional measures to protect wildlife and habitat which were incorporated into the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to the Proposed Order.

At this time, the Department does not intend to make any revisions in the draft of the Final Order based on this comment, for the reasons described above.

Issue FW-02 (Certificate Holder); Srivener's Error
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests correction of a Scrivener's error in Condition GEN-FW-02. Notes that GEN-FW-02 references Condition 63 (should now be GEN-FW-03)

Department Evaluation
The Department agrees to make the recommended change, applicable language where the change would be presented is shown below, in red underline, strikethrough font:

Condition GEN-FW-02:…

a. …
b. ….
c. … If the construction would result in additional permanent impacts, the certificate holder shall increase the area of mitigation for permanent loss of Category 3 and Category 4 habitat as described in the Habitat Mitigation Plan incorporated herein by ~~Condition 63~~ GEN-FW-03.

Issue FW-03 (Certificate Holder) Flexibility on ground clearing activities in Category 2 Habitat
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
The certificate holder comments that the proposed restrictions on vegetation removal in Category 2 habitat during the critical period for ground nesting birds (Apr 15 to Sept 1) would preclude almost all work in those areas and would incentivize grading instead of mowing or drive and crush. The certificate holder requests that the Department make the following

changes to Section 5.0, Table 4 of the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to the Proposed Order:

> ~~On or before April 15 of any year in which construction occurs within Category 2 habitat, all mowing, vegetation removal and/or ground disturbance associated with site preparation must be completed. No mowing, vegetation removal and/or ground disturbance associated with site preparation may occur within Category 2 habitat between April 15 through September 1.~~
>
> To the extent practical, mowing or other vegetation removal activities in Category 2 habitat will be scheduled to occur outside the critical period for ground nesting birds (April 15 – September 1), to avoid disturbing active nests. If mowing or other vegetation removal activities in Category 2 habitat are necessary between April 15 to September 1, the Certificate Holder shall hire a qualified biologist to conduct a clearance survey for nesting birds prior to vegetation removal. The Certificate Holder shall ensure that active nest sites identified during the clearance survey are flagged and marked as sensitive areas for avoidance on construction maps.

Department Evaluation
As explained on page 181 of the Proposed Order, the language in the draft Comprehensive Solar Revegetation and Soil Management Plan was intended to require the certificate holder to complete all initial mowing, vegetation removal and ground disturbance *associated with site preparation* in Category 2 habitat before April 15 or after September 1, and not to prohibit any subsequent vegetation management activities such as mowing. The location and extent of Category 2 habitat is isolated, within a distinct location expanding 20 acres.

The Department agrees that the flexibility requested by the certificate holder can be evaluated, but requests that the certificate holder provide reasons why, for the isolated area of Category 2 habitat, site preparation activities would not be able to planned and completed at time that would avoid the critical period for ground nesting birds.

Issue FW-04 (Certificate Holder); Recommended edits to Draft Habitat Mitigation Plan
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder provides additional recommended edits to the Draft Habitat Mitigation Plan presented as Attachment F to the Proposed Order.

Department Evaluation
The Department reviewed the certificate holder's proposed changes to the draft Habitat Mitigation Plan and considers the changes not to modify the substantive intent of the plan, but rather clarify to ensure appropriate approach for evaluating success for noxious weed control

and shrub planting. The Department is reviewing the proposed changes with ODFW and will provide any agreed upon changes in the draft Final Order.

III.F. Historic, Cultural and Archaeological Resources (OAR 345-022-0090)

Issue HCA-01 (Certificate Holder): Supplement Record with Tribal Consultation Details
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests additional details about its outreach to Tribes be incorporated into the Proposed Order.

Department Evaluation
The Department appreciates the certificate holder's efforts to engage with Tribes regarding this project; however, we do not agree with the proposed additions for the draft Final Order. The Tribes themselves have had the opportunity to provide input on the record, and as described under Issue HCA-02, the Confederated Tribes of the Warm Springs Reservation of Oregon have expressed concerns with recommended conditions of approval. In the draft of the Final Order the Department will make clarifying changes to Section III.K.1 explaining that additional information regarding the certificate holder's outreach efforts is provided in Exhibit K and comments on the Proposed Order.

Issue HCA-02 (Confederated Tribes of Warm Springs) Adequacy of archaeological monitoring and protective measures
Comment ID: BCWAMD4Doc24-09 Proposed Order Public Comment CTWS 2026-01-15

Comment Summary
CTWS express concerns that the certificate holder characterized archaeological monitoring as limited in scope and duration, focused on a single location, rather than implementing monitoring for all ground-disturbing activities within proximity to recorded cultural resources, as recommended. CTWS requests that the full suite of cultural resource protection measures identified through survey and consultation be implemented."

Department Evaluation
There are two proposed conditions that require avoidance and monitoring.

- Recommended Historic, Cultural, and Archaeological Condition 1 (GEN-HC-02) requires the certificate holder to avoid ground disturbing activities within 20-meters of all sites and isolates identified as eligible for, or likely eligible for, listing on the National Register of Historic Places during construction and operation of the proposed solar facility.
- Recommended Historic, Cultural, and Archaeological Condition 2 (GEN-HC-03) requires the certificate holder to submit a Cultural Resources Monitoring Plan demonstrating that an Oregon Qualified Archaeologist or Tribal Cultural Resource Monitor will be onsite during ground disturbing activities that would occur within the 20-meter buffer.

The Cultural Resources Survey Report provided as Attachment S-1 to RFA4 Exhibit S, includes several recommendations for monitoring, including the following:

> "GeoVisions recommends a monitoring plan and Inadvertent Discovery Plan be in place prior to Project construction, that an archaeological monitor who meets the standards of "qualified archaeologist" as defined by the existing site certificate be present during and observe all ground disturbing activities, as well as construction activities in and around recorded archaeological sites and isolates, as well as the probable location of the Oregon Trail, and that a tribal monitor is present for all construction activities within 20 meters of sites and isolates with precontact or culturally important material to ensure that no identified or unidentified archaeological sites are "excavat[ed], injur[ed], destroy[ed] or alter[ed]," (ORS 358.920(1)(a) to identify and to ensure that any subsurface archaeological objects, sites, and/or historic properties be properly identified and preserved over the course of Project construction activities and uphold the intent of the State of Oregon (ORS 358.910(2))." RFA4, Att S-1, pg. 102.

The Department acknowledges that the monitoring requirements of these conditions are more limited than what was recommended by Geovisions, which recommends that a Qualified Archaeologist be on site during all ground disturbing activities and that a Tribal Cultural Resource Monitor be present when ground disturbing activities occur within a 20-meter avoidance buffer. The Department believes the request to have a qualified archaeologist on site during ground disturbing activities is reasonable given the history of the area and potential for additional unidentified pre-contact sites or isolates to be present at the site documented in the cultural resources survey report. Accordingly, the Department requests that the certificate holder provide a draft Cultural Resources Monitoring Plan that is consistent with the recommendations included in the Geovisions Report. The Department may recommend additional changes to conditions based on the draft Plan and any replies on the record.

III.G. Public Services (OAR 345-022-0110)

Issue PS-01 (McCullough, Kathryn); Concerns about capacity of local fire responders to fight fire at energy facility
Comment ID: BCWAMD4Doc24-05 Proposed Order Public Comment McCulloughK-5 2026-01-06

Comment Summary
Commenter raises concerns about the adequacy of fire protection services at the site and potential risks to volunteer firefighters, particularly risks associated with fighting fire involving BESS components. Provides examples of risks, including toxic fumes, thermal runaway, and the ineffectiveness of water-based firefighting, in combination with challenging fire environment and rural setting.

Department Evaluation

In Section 4.4.7 of RFA4 Exhibit V, PGE explains that it would provide the North Sherman County Rural Fire Protection District with construction plans, schedules, and locations prior to the start of construction and that the Construction and Operations Wildfire Management Plans required under Wildfire Prevention and Risk Mitigation Condition 1 to 4 would address structural, BESS, and wildfire scenarios, and would include provider training on facility-specific hazards, established communication channels, site access, and firefighting resources. The Department will consider whether to include any changes to findings or conditions of approval associated with these plans in the draft Final Order based on all responses and replies on the record.

Issue PS-02 (McCullough, Kathryn); Concern that local fire responders do not have adequate training to respond to fire at energy facility or BESS
Comment ID: BCWAMD4Doc24-05 Proposed Order Public Comment McCulloughK-5 2026-01-06

Comment Summary
Ms. McCullough provides specific recommendations for improving training and recruitment of volunteer firefighters:

- Provide specialized (NFPA-855 compliant) training to local firefighters for BESS response.
- Fund and/or create a dedicated BESS response unit within existing RFPDs.
- Conduct annual drills at BESS site, simulating windy conditions.
- Conduct outreach to improve volunteer recruitment/retention.
- Conduct community outreach to increase awareness/transparency around BESS Safety Issues.
- Require facility staff to have BESS-fire response capability until firefighters arrive.
- Provide insurance coverage and financial incentives to volunteer firefighters that respond to BESS fires.
- Supply RFPDs with SCBA, foam kits, and hazmat suits
- Create a community fund to cover:
    - Emergency payouts for injured/killed volunteers' families.
    - Training and equipment upgrades.
    - Community wildfire prevention (e.g., vegetation control).

Department Evaluation
As described in the Proposed Order Section III.M, the certificate holder provided a record of correspondence documenting coordination with the North Sherman Rural Fire Protection District (NSRFPD) Fire Board and Chief Jacob Burbank indicating that NSRFPD raised several concerns about access considerations, training, and equipment needed to address fire risk associated with the facility components proposed in RFA4. In response the certificate holder indicated that they intend to provide annual training that would cover response procedures, the risks associated with PV and BESS systems, and protocols for both fire and non-fire emergencies. Training would be provided by Coffman Engineers.

Some of the mitigation proposed by Ms. McCullough, such as providing insurance coverage, financial incentives, and emergency payouts to volunteer firefighters that respond to BESS fires, may be outside of the scope of the Council's authority, but others, including providing training and equipment needed to respond to fires at the site would be established under the Wildfire Mitigation Plans required under recommended Wildfire Prevention and Risk Mitigation Conditions 1 to 4. The Department will consider whether to include any changes to findings or conditions of approval associated with these plans in the draft Final Order based on all responses and replies on the record.

III.H. Wildfire Prevention and Risk Mitigation (OAR 345-022-0115)

Issue WF-01 (McCullough, Kathryn); Concerns about burn probability data in fire risk analysis
Comment ID: BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05

Comment Summary
Ms. McCullough raises concerns about the adequacy of the wildfire risk analysis provided in RFA4, Exhibit V. Specifically, she takes issue with the estimate of burn probability in Section 2.1.5. of Exhibit V.

Department Evaluation
Commenter takes issue with the description of burn probability in RFA4 Exhibit V, stating "high burn probability is much higher than 66%, but 66% is very high, especially in an area that already has 6-10 fires in a normal year…"

Ms. McCullough did not identify a recommended finding of fact, conclusion of law or condition of approval identified in the Proposed Order to which she objects but instead takes issue with evidence in the record provided to support the evaluation of wildfire risk at the site. In preliminary RFA4 Exhibit V, the certificate holder noted that 66 percent of the Solar Micrositing Area was rated with "a High to Very High (1-in-100 to 1-in-50) burn probability." In the complete RFA4, this estimate was revised to 98 percent of the wildfire analysis area based on the refined Solar Micrositing Area. The Department notes that the revised estimate is derived from the 2023 Pacific Northwest Quantitative Wildfire Risk Assessment (McEvoy, Andy; Dunn, Christopher; Rickert, Ian), and not the certificate holder's own data or methods.

The Department generally considers the Pacific Northwest Quantitative Wildfire Risk Assessment to be a reputable source of data for wildfire risk, and as noted above, the revised estimate that resulted from its use includes a larger portion of analysis area than the initial estimate. As a result, the Department does not intend to make changes in the draft Final Order based on this comment.

Issue WF-02 (McCullough, Kathryn); Concerns about use of climate normal for fire risk analysis
Comment ID: BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05

Comment Summary
Ms. McCullough objects to use of "climate normal" to reflect temperature data of site in RFA4 Exhibit V Section 2.1.4 and Table V-4. Ms. McCullough asserts that use of the climate normals "effectively lower the high temperatures" experienced in the area. As an example, the she provides data showing high temperatures of 101 – 103° F measured at the Arlington Weather Station in July 2018, compared to the 1991-2020 Average (normal) maximum temperature for July of 88.9° F at the Arlington Station.

Department Evaluation
The Department believes that climate normals, published by the National Oceanic and Atmospheric Administration in accordance with global climate data reporting standards, are a reputable source of climate data. As an average, the data does not reflect extreme temperatures that may occur in a given year, but they still provide valuable data on seasonal conditions at the site that can be used to inform the overall risk analysis. The Department also notes that the draft Construction Wildfire Mitigation Plan also accounts for extreme weather events by imposing work restrictions and additional requirements during fire weather watches and red flag warning events. As such, no substantive changes are recommended but the Department will consider including clarifying changes in the draft Final Order explaining the limitations on the climate normal data.

Issue WF-03 (McCullough, Kathryn); Concerns about fuel models used for fire risk analysis
Comment ID: BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05

Comment Summary
Ms. McCullough objects to fuel models used in RFA4 Exhibit V Section 2.1.2. She notes that Fuel Models 102 and 93 used for agricultural lands in the site do not reflect fallow conditions at the site.

Department Evaluation
In the complete RFA4, the certificate holder notes that 93 percent of the proposed solar Micrositing Area is described by Fuel Model 102 or 242, which reflect low load, dry climate grasses and burnable wheat fields, respectively. These fuel models are derived from data from the Community Wildfire Protection Plan (CWPP) Planning Tool (Oregon Explorer 2025), which in turn, is based on the 2023 Pacific Northwest Quantitative Wildfire Risk Assessment (McEvoy, Andy; Dunn, Christopher; Rickert, Ian).

The Department generally considers the Pacific Northwest Quantitative Wildfire Risk Assessment to be a reputable source of data for wildfire risk. Accordingly, the Department does not intend to make changes in the draft Final Order based on this issue.

Issue WF-04 (Certificate Holder); Request for flexibility in road design standards for roads not needed for fire access
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests clarification of design standards for internal access roads. States that exterior roads and other roads designated for emergency access will be designed in accordance with 2022 Oregon Fire Code Section 503. Certificate holder requests that other interior roads not intended for fire access not be required to comply with Oregon Fire Code Standards.

Department Evaluation
The Department appreciates the clarification of conflicting statements in RFA4. To assist in the evaluation of this issue, the Department requests the certificate holder provide the site plan showing the designated emergency access roads and documentation of any additional correspondence with the North Sherman Rural Fire Protection District other than what was included in RFA4 Attachment U-1.

Issue WF-05 (McCullough, Kathryn); Recommendations for BESS design criteria to minimize fire risk
Comment ID: BCWAMD4Doc24-05 Proposed Order Public Comment McCulloughK-5 2026-01-06

Comment Summary
Ms. McCullough recommends specific design criteria that could be incorporated into the design of the BESS to minimize fire risk. Specifically, the commenter recommends:

- That BESS enclosures be made of metal or fiberglass with steel reinforcements to resist turbine debris impacts
- That windbreaks (e.g., berms, fences) be installed around BESS components to reduce debris and ember spread
- That multiple generators/solar-powered cooling units be installed to prevent overheating.

Department Evaluation
The Department will evaluate these recommendations after considering the information provided by the certificate holder in its response to this comment.

Issue WF-06 (Certificate Holder); Request for clarification of setback requirement
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests clarification that perimeter fencing must be set back 50 feet from property line of *non-participating* landowner.

Department Evaluation
The Department agrees to make the requested change in Section III.N.1 of the draft Final Order and Section 4.1.3 of the draft Construction Wildfire Mitigation Plan.

Issue WF-07 (Multiple Commenters); Concerns about adequacy of 50-foot fire setbacks
(Commenters include: Kathryn McCullough; Kevin McCullough; Colton McCullough; Sherman County Soil and Water Conservation District, Whitman, A.; Irene Gilbert)
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15

Comment Summary
Commenters raise concerns with the adequacy of 50-foot setbacks imposed in recommended Land Use Condition 1. Suggests that larger setbacks may be needed.

Department Evaluation
The commenters have identified an issue related to a condition of approval but have not provided sufficient evidence to 1) support the claim that the 50-foot setback does not provide adequate protection from wildfire or access to emergency responders; or 2) support the imposition of a greater setback. The Department will consider any additional evidence provided in the applicant's response and subsequent replies regarding this issue.

Issue WF-08 (Multiple Commenters); Concern about adequacy of 20-foot fuel breaks
(Sherman County Soil and Water Conservation District, Irene Gilbert)
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15

Comment Summary
Commenters raise concern about adequacy of 20-foot fire break around the perimeter of the facility to stop fire from spreading from the facility. Recommends additional research is needed. Sherman County Soil and Water Conservation District suggests that 30-foot is minimum recommended by NRCS. Ms. Gilbert recommends that 30-feet may not be adequate, and that additional research is needed.

Department Evaluation
The commenters have identified an issue related to a condition of approval but have not provided sufficient evidence to 1) support the claim that the 20-foot fuel break does not provide adequate protection from wildfire; or 2) support the imposition of a greater setback. The Department is also not clear on what NRCS standard was referenced or how it is applied to utility facilities. The Department will consider any additional evidence provided in the applicant's response and subsequent replies regarding this issue.

Issue WF-09 (McCullough, Colton); Support for recommended vegetation maintenance standards for wildfire season
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15

Comment Summary
Mr. McCullough supports recommendation that vegetation be maintained at 1 to 3 inches during fire season to mitigate fire risk. The recommended finding in the Proposed Order, pg. 233, for a 1 to 3 inch vegetation height is not reflected in the draft Comprehensive Solar

Revegetation and Soil Management Plan. He requests that the requirement be binding through construction and operation.

Department Evaluation
The Department is evaluating several comments related to the recommendation that vegetation within the solar facility and other vegetation clearance areas be maintained at 1 to 3 inches during fire season to mitigate fire risk. Mr. McCullough recommends the recommendation be implemented throughout the life of the facility. The Sherman County Weed Control District recommends that the vegetation height standard be increased to 4 to 8 inches to support erosion control and enhance viability of bunchgrass species. The certificate holder requests that the height standard be increased to 10 to 12 inches year-round.

The Department will continue to evaluate these recommendations, along with any additional evidence submitted in replies, to identify vegetation management standards that provide adequate fuel management to minimize wildfire risk while maintaining appropriate conditions for beneficial vegetation.

Issue WF-10 (Certificate Holder); Objection to Vegetation Maintenance Standards for Wildfire Season
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder objects to the Department's recommendation that vegetation be maintained at 1 to 3 inches during fire season to mitigate fire risk. Requests that the vegetation height requirements be set to limit a height of 10 to 12 inches year-round.

Department Evaluation
The Department is evaluating several comments related to the recommendation that vegetation within the solar facility and other vegetation clearance areas be maintained at 1 to 3 inches during fire season to mitigate fire risk. Mr. McCullough recommends the recommendation be implemented throughout the life of the facility. The Sherman County Weed Control District recommends that the vegetation height standard be increased to 4 to 8 inches to support erosion control and enhance viability of bunchgrass species. The Certificate Holder requests that the height standard be increased to 10 to 12 inches year-round.

The Department will continue to evaluate these recommendations, along with any additional evidence submitted in replies, to identify vegetation management standards that provide adequate fuel management to minimize wildfire risk while maintaining appropriate conditions for beneficial vegetation.

Issue WF-11 (Certificate Holder); Request to remove requirement for drip can with fire suppression equipment.
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests that the Department remove a requirement in the Construction WMP that a 5-gallon Drip Can be carried in maintenance vehicles and stored on-site at the O&M building. Certificate holder clarifies that the project would not conduct activities requiring use of drip cans, and that workers would not have adequate experience to use drip cans.

Department Evaluation
Inclusion of drip cans in the draft Construction WMP was a representation made by the certificate holder, versus a recommended requirement. Given that the certificate holder seeks to clarify equipment that would not be needed or appropriate for the site, the Department agrees to remove the requirement as requested.

Issue WF-12 (McCullough, Kathryn; Gilbert, Irene); Concern about lack of availability of Operational Wildfire Mitigation Plan.
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15; BCWAMD4Doc24-06 Proposed Order Public Comment McCulloughK-6 2026-01-09

Comment Summary
Commenters raise concern about lack of availability of Operational Wildfire Mitigation Plan for review as part of Proposed Order.

Department Evaluation
Under OAR 345-022-0115(1)(b), the Council must find that a proposed facility will be designed, constructed, and operated in compliance with a Wildfire Mitigation Plan approved by the Council. The rule sets forth the requirements that must be met in the plan. While it is preferred that draft plans for both the construction and operations phases of a facility be included in an application or request for amendment, it is not required by the standard. The Department has described the requirements that must be satisfied in Section III.N of the Proposed Order.

The Department will not make any revisions in the draft of the Final Order based on this comment because the comment has not been made with sufficient specificity – *i.e.*, the commenter does not "[i]dentify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object." OAR 345-027-0367(7), (8).

III.I. Siting Standards for Transmission Lines (OAR 340-035-0090)

Issue TL-01 (Certificate Holder); Request for additional flexibility in transmission line siting
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests changes to recommended Amended Condition 119 to provide additional flexibility in transmission line siting, as presented in red underline, strikeout font below:

> ~~(119) OAR 345-027-0023(5): If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a pipeline or transmission line, the Council shall specify an approved corridor in the site certificate and shall allow t~~ The certificate holder ~~to~~ shall construct the ~~pipeline or~~ 230-kV transmission line connecting the Biglow Canyon Substation to the Solar Substation ~~anywhere~~ within a 150-foot corridor, as identified in the final site design ~~presented in Figure 2 of the Amended Site Certificate identified in the final site design the corridor, subject to the conditions of the site certificate. If the applicant has analyzed more than one corridor in its application for a site certificate, the Council may, subject to the Council's standards, approve more than one corridor.~~

Department Evaluation
Under OAR 345-025-0010(5), the Council must specify an approved corridor for any transmission line approved in a site certificate. The Department disagrees with the certificate holder's proposed changes. The certificate holder only included one proposed corridor for the 600-foot segment of 230 kV transmission line, which was presented in RFA4 Figure 2.2. If the certificate holder wishes to change the alignment of the transmission line it must present the alternate corridors so that they can be evaluated for compliance with applicable laws, rules and standards.

III.J. Noise Control Regulation (OAR 340-035-0035)

Issue NC-01 (Certificate Holder) Requests Proposed Order Table 26 be revised to add NSR13 and reference to RFA Exhibit Y Table Y-7.
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests for Table 26, *Modeled Operational Noise of the Facility, As Amended*, to be revised to include NSR 13, and requests for Table 26 to include Table Y-7 as a source included in the noise modeling.

Department Evaluation
RFA4 Exhibit Y includes Tables Y-6 and Y-7. Both tables include 6 NSRs, including NSR 13. The data from Tables Y-6 and Y-7 are represented in the Proposed Order Table 26, but NSR is

omitted and reference to RFA4 Exhibit Y Table Y-7 is also omitted, as indicated by the certificate holder.

Changes to Proposed Order Table 26 will be incorporated into the draft Final Order to be consistent with RFA4 Exhibit Y, as requested by certificate holder.

Issue NC-02 (Certificate Holder) Requests revisions to recommended Noise Control Condition 2 (PRE-NC-02) allowing for general waiver versus solar specific
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary
Certificate holder requests that Noise Control Condition 2 (PRE-NC-02) be amended to allow any waivers needed to demonstrate compliance be general, rather than specifically reference the solar facility, consistent with the fact that the noise analysis is based on the facility as a whole.

Department Evaluation
As presented in Section IV.A Noise Control Regulation, the existing, operational wind facility relies on noise waivers to comply with the antiambient degradation standard. The addition of the facility components proposed in RFA4 would not change or increase the predicted exceedances of the existing, operational wind facility; however, the facility, as amended, must demonstrate compliance with the regulation (i.e., obligation to have an executed waiver where exceedances occur).

To ensure that the facility maintains compliance but is not obligated to update waivers solely to refer to a wind and solar facility, the Department agrees to modify recommended Noise Control Condition 2, as provided below in red, underline/strikeout, to be able to accept noise waivers that are applicable to the "facility." The intent of the condition is to receive waivers that align with the NSR ID's and property owners with exceedances identified in RFA4 for compliance verification.

> **Recommended Noise Control Condition 2 (PRE-NC-02)**: Prior to construction of the solar facility, the certificate holder must submit to the Department copies of executed legally effective easement(s) or real covenant(s) for all Noise Sensitive Properties impacted by the ~~solar~~ facility with noise exceedance. ~~The easement or covenant must authorize the solar energy facility to increase the ambient statistical noise levels, L10 or L50, on the sensitive property by more than 10 dBA at the appropriate measurement point.~~
> [PRE-NC-01; OAR 340-035-0035(1)(b)(B)(iii)~~(III)~~; Final Order on AMD4]

III.K. Water Rights (OAR Ch. 690)

Issue WR-01 (Certificate Holder); Requests Revisions to recommended Amended Water Rights Condition 1 (PRE-WR-01) to Clarify Well Log Submission Timing
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests to modify the language of recommended Water Rights Condition 1 (PRE-WR-01) to clarify that the obligation to submit a well leg to Oregon Water Resources Department (OWRD) applies within 30-days of well construction rather than prior to well construction. Certificate holder describes that the requested changes are consistent with ORS 537.765.

Department Evaluation
The Department agrees with the certificate holder as ORS 537.765(2) states:

> *(2) The business or activity of constructing new wells or altering, abandoning or converting existing wells is declared to be a business or activity affecting the public welfare, health and safety. In order to enable the state to protect the welfare, health and safety of its residents, any licensed or permitted person shall keep a log of each well constructed, altered, abandoned or converted and shall electronically file a certified copy of the log with the Water Resources Department within 30 days after the completion of the construction, alteration, abandonment or conversion.*

Based on the above statutory language, in the draft Final Order the Department will include the condition language changes, as presented in red, underline/strikeout font below, as requested.

> **Recommended Water Rights Condition 1 (~~PRE~~CON-WR-01)**
> No later than 30 days after completing construction ~~prior to construction~~ of any new well, the certificate holder shall provide the Department a copy of the map, well log and all other information it provided to OWRD pursuant to ORS 537.545 and ORS 537.765 to qualify for an exempt ground water use for any onsite exempt wells.
> [Final Order on AMD4]

Issue WR-02 (Certificate Holder); Requests Revisions to recommended Amended Condition 75 (OPR-WR-01) on Applicability of Groundwater Usage Monitoring
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests for recommended Amended Condition 75 (OPR-WR-01) to be amended to clarify that onsite well usage monitoring will not be required until a new well is installed, at which point meters would be installed.

Department Evaluation

Recommended Amended Condition 75 (OPR-WR-01) is intended to limit onsite well groundwater usage to 5,000 gallons per day and establishes a requirement for daily monitoring and usage recordkeeping. The recommended amended condition requiring use of flow meters to monitor combined water usage is intended to apply if new well(s) are constructed to support construction and operation of the facility components proposed in RFA4. Therefore, the Department agrees with the certificate holder and recommends that the applicability of the monitoring requirements be clarified. In the draft Final Order, the Department will include the condition language changes, as presented in red, underlined font below.

Recommended Amended Condition 75 (OPR-WR-01)

a. For any onsite exempt wells, ~~Before beginning operation of the facility, the certificate holder shall have in operation a well suitable for delivering water,~~ combined water usage shall not exceed~~ing~~ 5,000 gallons per day~~,~~ for domestic use at the facility's O&M buildings and~~, provided the rate of extraction would not exceed 5,000 gallons per day,~~ solar panel and blade-washing activities.
b. If new exempt well(s) are constructed for the solar facility, certificate holder shall install flow meters on the existing and new well(s); monitor the volume of groundwater used from all onsite wells on a daily basis; maintain a record of such use; and, make the monitoring records available to the Department upon request. ~~The certificate holder shall not change the source of water for the facility's domestic use without prior Council approval.~~

[Final Order on AMD4]

Issue WR-03 (Certificate Holder); Requests Revisions to recommended Amended Condition 75 (OPR-WR-01) on Applicability of 5,000 gallon/day limit

Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Comment Summary

Certificate holder seeks clarification that the 5,000 gallon per day limitation on groundwater usage only applies to onsite exempt wells.

Department Evaluation

The Department confirms that recommended Amended Condition 74 (OPR-WR-01) is only applicable to exempt wells. In the draft Final Order, the Department will add reference to "exempt wells" to the condition, as presented in the Department Evaluation of Issue WR-02.

From:	CLARK Christopher * ODOE
Sent:	Thursday, February 12, 2026 3:39 PM
To:	CLARK Christopher * ODOE
Cc:	CORNETT Todd * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe
Bcc:	admin@owgl.org; amanda.whitman@shermancountyswcd.com; captainkathymccullough@gmail.com; dan.wilson@pgn.com; duradan@cox.net; jeredwreid@gmail.com; Jessica Metta; justinscharffarms@gmail.com; kathleen.campanella@brightnightpower.com; Kristen.Sheeran@pgn.com; lawrence.squiemphen@ctwsbnr.org; Lenna.Cope@pgn.com; mcculloctloc@gmail.com; nickw@shermancountyor.gov; ott.irene@frontier.com; todd.ellwood@brightnightpower.com; vonborstelranch@gmail.com; Ziola, Kiana; Albrich, Elaine; Richard George; olivierjamin
Subject:	ODOE Responses to Public Comments on Proposed Order on Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm.
Attachments:	BCWAMD4Doc26-01 ODOE Public Comment Evaluation Cover Letter and Response 2026-02-12.pdf; BCWAMD4 Amendment Comment Review Process Doc Navigation Help Cover Letter 2026-02-06.pdf

Hello,

You are receiving this message because you provided comments on the Proposed Order on Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm. The Department's responses to all comments provided on the record are attached (Department Response). In the Department's Response, we have included an explanation of how the document is organized, and how to locate the issues identified by the Department as having been raised in your comments. The certificate holder, Portland General Electric Company, will be providing its responses directly to commenters by February 13, 2026, as required by OAR 345-027-0367.

The Department has also created an OneDrive folder that includes all copies of all comments provided on the Proposed Order. The attached "Amendment Comment Review Process Doc Navigation Help Letter" provides more information on how to access the OneDrive, the Department's file management system, and how to navigate PDF documents. The OneDrive can be accessed via the links in this email or by accessing the Biglow Canyon Wind Farm Webpage.

Please "reply all" to this email message when providing any replies to either the Department's or certificate holder's responses to your comments. Reply and sur-reply documents from the certificate holder and participants can also be uploaded directly to the OneDrive.
Replies must be received by **5:00 pm on February 27, 2026**, to be included in the record. Participants to the public comment process may request more time to submit their replies. The Council Chair may grant a requested extension on a showing of good cause. Please note the Department will only consider replies to issues raised in your own comments in preparing the draft Final Order.

Please note, I will be out of the office from February 13 to February 23, 2026. If you have questions about the process or how to submit replies to the Department or certificate holder's responses to your comments during this timeframe, please contact Sarah Esterson at sarah.esterson@energy.oregon.gov or call (503) 559-9218.

Thank you,

OREGON DEPARTMENT OF ENERGY

Christopher M. Clark
Senior Siting Analyst
550 Capitol St. NE | Salem, OR 97301
P: 503-871-7254
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Stay connected!

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:18 PM
To: vonborstelranch@gmail.com
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - von Borstel
Attachments: BIGL RFA4_Comment Letter to Alan von Borstel_02132026.pdf

Dear Mr. von Borstel,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
Pronouns: she/her
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February 13, 2026

VIA EMAIL (vonborstelranch@gmail.com)

Alan von Borstel
56712 von Borstel Road
Grass Valley, OR 97029

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-11)

Dear Mr. Von Borstel,

The Oregon Department of Energy (ODOE) shared with us your comment letter on the NOI for the Speedway Energy Facility and indicated that you also wanted to include the comments in the record of the Proposed Order on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate. PGE and the project developer BrightNight (BN) recognize the importance of dryland wheat production to Sherman County and values your perspective on agricultural viability, impacts to wildlife, and wildfire risk as a community member and past president of the Oregon Wheat Growers League.

OAR 345-027-0367(8) requires PGE to respond to all comments that are made with "sufficient specificity," as that term is defined in OAR 345-027-0367(7)(a). We note that your comments do not necessarily meet that standard but are valuable to inform the process, and we offer this response to the issues you raised in your letter, even if none specifically referenced Biglow Solar. The responses below are organized by the interpretations of your comments received and are further identified with the same issue identification number provided in Table 1: List of Issues and Commenters, in the Oregon Department of Energy's Response to Comments document dated February 12, 2026.

1. Impacts on Dryland Wheat Lands (LU-06)

We recognize your concerns regarding the conversion of agricultural lands to renewable energy development and hope the robust Community Investment Plan (CIP) contained in the Proposed Order helps with those concerns as they may relate to Biglow Solar. The CIP was developed based on outreach with agricultural organizations including the Oregon Wheat Commission, Mid-Columbia producers, and regional grain cooperatives to better understand grower perspectives on agricultural mitigation, soil health, and wildfire risk. The CIP proposes mitigation projects that will offset the impacts of removing land from dryland wheat production, as described in the Agricultural and Fiscal Impact Analysis included as BCWF RFA4 Attachment K-2. The mitigation dollars proposed in the CIP are intended to confirm that there is no negative impact on the Sherman County agricultural economy. Further, landowner participation in renewable energy development in Sherman County provides an opportunity to diversify finances and invest additional capital in their farming businesses, as described in the Biglow record. Finally, the Facility will be decommissioned at the end of its useful life, and the land will be restored and

returned to agricultural use. The Proposed Order imposes a financial assurance obligation to guarantee that the Facility is successfully decommissioned, and the site is restored.

2. Public Safety and Wildfire Risk (LU-06)

You noted Sherman County's elevated wildfire risk and expressed concern regarding wildfire risk mitigation, the development and use of wildfire mitigation plans, and the adequacy of buffers to prevent wildfire spread. Wildfire mitigation plays a critical role in how the proposed Biglow solar facility is designed, constructed, and operated.

The wildfire mitigation measures outlined in the Construction Wildfire Mitigation Plan (WMP) included as Proposed Order Attachment G, the forthcoming Operations WMP, and the vegetation management measures outlined in the Comprehensive Solar Revegetation and Soil Management Plan (Proposed Order Attachment D) are intended to protect agricultural operations, nearby homes, and natural areas in Sherman County. Dry vegetation, high summer temperatures, and windy conditions increase fire risk, so these plans include soil and vegetation management to reduce the introduction and spread of weeds, maintenance buffers around the site perimeter and along roads to serve as firebreaks.

In closing, PGE and BN appreciate your comments and hope these responses help alleviate concerns as they may relate to the Biglow Solar project. PGE and BN welcome any additional questions you may have regarding the project.

Sincerely,

Lenna Cope

Kathleen Campanella

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:16 PM
To: chad.higgins@oregonstate.edu
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Higgins
Attachments: BIGL RFA4_Comment Letter to Chad Higgins_02132026.pdf

Dear Mr. Higgins,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
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Inlet Beach, FL 32461
info@brightnightpower.com

February 13, 2026

VIA EMAIL (Chad.higgins@oregonstate.edu)

Chad Higgins
38056 Kelly Rd.
Scio, OR 97379

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc25-03-P5)

Dear Mr. Higgins,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your oral comments regarding the Oregon Department of Energy's Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate.

PGE and BN appreciate your perspective and expertise on the topic of agrivoltaics systems. We value your insight on ways to integrate solar energy production into agricultural communities while mitigating potential conflict between renewable energy and agricultural production. In your comments, you assert that a strong agricultural system depends on quality land and soil, skilled farmers, access to supplies and markets, and flexible rules that let farmers adapt to change. We agree with your assessment about the many factors that contribute to the strength of an agricultural system and appreciate your acknowledgment of our efforts to respectfully balance farming needs with renewable energy development.

We appreciate your comments and look forward to continued coordination as the project moves forward.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 4:57 PM
To: mcculloctloc@gmail.com
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Chris Bozzini; Kathleen Campanella; Ziola, Kiana
Subject: FW: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Colton McCollough
Attachments: BIGL RFA4_Comment Letter to Colton McCullough_02132026.pdf

Dear Mr. McCullough,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

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February 13, 2026

VIA EMAIL (mcculloctloc@gmail.com)

Colton McCullough

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Proposed Order Response to Comment (BCWAMD4Doc25-03-P3)

Dear Mr. McCullough,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your comments regarding the Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF) Site Certificate. Oregon Administrative Rule (OAR) 345-027-0367(8) requires PGE to respond to all comments that are made with "sufficient specificity," as that term is defined in OAR 345-027-0367(7)(a). We note that your comments may not necessarily meet that standard but are valuable to inform the process and offer the following response.

The responses below are organized by the interpretations of your comments received and are further identified with the same issue identification number provided in Table 1: List of Issues and Commenters in the Oregon Department of Energy's Response to Comments document dated February 12, 2026. As we have previously committed, PGE and BN are dedicated to the responsible management of vegetation and soil health at the site, as well as minimizing fire risk. We recognize that these issues are closely interconnected and have been consistently identified by both you and the broader community as primary concerns.

1. Vegetation Management and Fire Prevention (WF-09, WF-12, SP-04)

The Proposed Order provides a comprehensive vegetation and fire risk management structure from construction through operational phases of Biglow Solar. The Oregon Department of Energy (ODOE), recognizing neighbor concerns, recommended conditions of approval that go above and beyond other existing site certificates. PGE and BN provided comments to ODOE on the plans and conditions contained in the Proposed Order to ensure that there was common understanding of the requirements and that the plans and conditions contained best practices, informed by local stakeholders.

You requested in your testimony that the vegetation height and clearance recommendations be implemented into the Operational Wildfire Mitigation Plan (WMP). These clearances are documented in the Operations and Maintenance Framework Plan (Proposed Order, Attachment C) and the Comprehensive Solar Revegetation and Soil Management Plan (Proposed Order, Attachment D) that are required to be finalized per Site Certificate conditions PRO-OE-01 and PRE-SP-01, respectively. The Draft Construction WMP (Proposed Order, Attachment G) also includes these vegetation management requirements; Condition PRE-WF-01 requires finalization of the Construction WMP prior to construction. The site-specific Operations WMP currently under development for the Biglow Solar facility will also incorporate these requirements and will be

submitted to ODOE for review and approval prior to beginning operation of the solar facility, per PRO-WF-01.

You may have seen the comment in the record from the Sherman County Weed District (BCWAMD424-15) stating that maintaining vegetation at 1 to 3 inches does not appear feasible if erosion control is a priority. The Weed Supervisor recommended, instead, a grass height of 4 to 8 inches during the dry season. PGE and BN recognize the Weed District's local expertise regarding appropriate vegetation height standards; we believe this input contributes meaningfully to the broader discussion regarding wildfire risk reduction, erosion control, and long-term vegetation health.

To address your concerns about accountability, the Proposed Order contains conditions that have greater severity. Conditions of approval require compliance and accountability with the requirements of these plans. For example, CON-SP-02 requires all work during and following construction to be conducted in compliance with the Comprehensive Solar Revegetation and Soil Management Plan, and OPR-SP-06 requires adherence to the plan during operation of the facility and includes reporting requirements as outlined under OPR-OE-01. CON-WF-01 requires onsite contractors and employees to adhere to the Construction WMP during construction, and OPR-WF-01 requires adherence to the Operational WMP during operation of the facility.

We also want Biglow Solar to be an asset to the community by helping with fire prevention and response by providing 20-foot fire breaks around the perimeter of the Solar Micrositing Area and 10 feet on each side of all roads; emergency vehicle access roads that are 20-feet wide; graveled areas around O&M buildings, substations, and battery energy storage system (BESS) with no vegetation; a 50-foot setback from all non-participating landowner properties; and placing water tanks at three locations around the site to support firefighting efforts.

The proposed BESS uses advanced fire safety and containment systems designed to detect, isolate, and neutralize potential thermal events before they can spread. These systems are built with multiple layers of protection, including thermal sensors, automatic shutdown systems, and dedicated containment compartments to prevent propagation. The units are UL 9540A tested, which means they've been stress-tested under extreme conditions to meet national safety standards. The BESS system design uses a central BESS yard where all batteries will be housed and uses containerized batteries, each with monitoring and alarming capabilities to support preventative measures during operation. The BESS yard will also be graveled and designed to maintain non-combustible clear zones, eliminating available fuel and limiting fire spread potential.

Our communities' concerns are very important to us, and we are committed to operating this facility in a way that reflects our shared interest in protecting people, property, and the landscape we all value.

Please reach out if you have questions or would like to discuss further. As previously discussed, there will be continued engagement of the community and neighbors as this project moves forward.

Sincerely,





Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:18 PM
To: duradan@cox.net
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Dan Hilderbrand
Attachments: BIGL RFA4_Comment Letter to Dan Hilderbrand_02132026.pdf

Dear Mr. Hilderbrand,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
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Inlet Beach, FL 32461
info@brightnightpower.com

February 13, 2026

VIA EMAIL (duradan@cox.net)

Dan Hilderbrand
P.O. Box 326
Wasco, OR 97065

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc25-03-P7)

Dear Mr. Hilderbrand,

Portland General Electric (PGE) and project developer BrightNight (BN) appreciate your oral comments regarding the Oregon Department of Energy's Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate.

PGE and BN appreciate your perspective as a fourth-generation farmer in Sherman County and recognize the challenges facing many family farms today. We value your insight into how projects like the Biglow Solar facility can provide a stable, predictable source of income that makes farming a more sustainable career. PGE and BN agree that renewable energy development can support a strong agricultural system and contribute to the economic diversification and long-term resilience of Sherman County, and we value your support for this project.

We appreciate your comments and look forward to continued coordination as the project moves forward.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:22 PM
To: jeredwreid@gmail.com
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Reid/Don Hilderbrand
Attachments: BIGL RFA4_Comment Letter to Donald Hilderbrand_02132026.pdf

Dear Mr. Reid,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

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February 13, 2026

VIA EMAIL (jeredwreid@gmail.com)

Jered Reid
Law Offices of Jered Reid
35 SE C Street, Suite D,
Madras, OR 97741

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-16)

Dear Mr. Reid,

The Oregon Department of Energy (ODOE) provided Portland General Electric (PGE) and project developer BrightNight with your January 29, 2025, letter submitted on behalf of Donald Hilderbrand regarding the Proposed Order on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (Facility) Site Certificate. We appreciate the opportunity to respond. While your letter does not raise comments specific to the proposed addition of solar photovoltaic generation and battery energy storage to the existing Facility, we offer the following clarification for the record.

As described in RFA 4, submitted on December 16, 2025, and reflected in the Proposed Order (Section III.E.1), the proposed solar and battery facilities are located entirely on lands owned by PGE and Scharf, R & A LLC. No portion of the proposed facilities described in RFA 4, or associated infrastructure, is planned on property owned by Mr. Hilderbrand, nor does the request contemplate the inclusion of non-participating landowners' property.

Thank you for your time and participation in this process.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 5:18 PM
To: Irene
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: RE: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Gilbert
Attachments: BIGL RFA4_Comment Letter to Irene Gilbert_02132026.pdf

Ms. Gilbert,

While preparing to upload our response letter to your comments I realized the letter attached to the previous email did not contain my signature. Please find attached the same comment response letter, but containing my signature.

Thank you.

Lenna Cope, P.E. Senior Environmental Specialist | 503-464-2634

From: Lenna Cope
Sent: Friday, February 13, 2026 4:53 PM
To: Irene <ott.irene@frontier.com>
Cc: 'CLARK Christopher * ODOE' <christopher.clark@energy.oregon.gov>; 'ESTERSON Sarah * ODOE' <sarah.esterson@energy.oregon.gov>; 'Patrick G Rowe' <patrick.g.rowe@doj.oregon.gov>; 'Kathleen Campanella' <kathleen.campanella@brightnightpower.com>; Chris Bozzini <Chris.Bozzini@pgn.com>; 'Ziola, Kiana' <kiana.ziola@tetratech.com>
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Gilbert

Dear Ms. Gilbert,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
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February 13, 2026

VIA EMAIL (ott.irene@frontier.com)

Irene Gilbert
Co-Chair of Stop B2H
2310 Adams Ave.
La Grande, OR 97850

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc25-03-P9)

Dear Ms. Gilbert,

Portland General Electric (PGE) and project developer BrightNight (BN) appreciate your oral comments regarding the Oregon Department of Energy's (ODOE's) Proposed Order on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate. OAR 345-027-0367(8) requires PGE to respond to all comments that are made with "sufficient specificity," as that term is defined in OAR 345-027-0367(7)(a). We note that your comments do not necessarily meet that standard but are valuable to inform the process.

The responses below are organized by the interpretations of your comments received and are further identified with the same issue identification number provided in Table 1: List of Issues and Commenters, in the Oregon Department of Energy's Response to Comments document dated February 12, 2026. PGE and BN understand your testimony to focus on two primary topics: noxious weed control and wildfire risk, which are captured on ODOE's Issues List under LU-07, WF-07, WF-08, and WF-12.

1. Vegetation Management and Weed Control

You expressed concern regarding vegetation management, noxious weed control, and not placing an undue burden on neighboring landowners. PGE and BN recognize the importance of proper soil and vegetation management to maintain native vegetation for watershed health, prevent the spread of noxious weeds, and reduce fuels to mitigate wildfire risk. The Biglow Comprehensive Solar Revegetation and Soil Management Plan is included in the Proposed Order as Attachment D, and contains considerable detail regarding the required measures to manage vegetation and prevent the introduction or spread of weeds:

- Use Best Management Practices to minimize erosion and prevent the introduction or spread of noxious weeds and invasive plants. Appendix C addresses best practices for preventing erosion and managing sediment at the site during construction and is enforceable by Oregon Department of Environmental Quality through the site's 1200-C construction stormwater permit. Appendix D Table D-1 describes the Reasonable Available Control Measures to control dust at the site, such as daily monitoring and sweeping, graveling and stabilizing all access roads with water or palliative, restricting construction access and limiting vehicle speeds on access roads, and minimizing

disturbance areas and soil exposure. A dust inspection log will be completed following dust inspections and made available to ODOE upon request.

- Pre-construction compliance, including coordination with the County and ODOE; soil compaction testing; installation of stormwater, erosion, and sediment controls as required by the 1200-C construction stormwater permit; and conducting noxious weed surveys and maintaining weed control activities until just prior to construction. (Section 4.0 Table 3)
- Construction compliance activities to limit soil disturbance, control dust, and prevent the introduction or spread of noxious weeds. Soil stabilization and reclamation activities will take place during and following construction, and disturbed areas will be revegetated using approved seed mixes appropriate for the local soils and climate. (Section 5.0 Table 4)
- Vegetation health at the Biglow Solar site will be maintained through proper care to prevent erosion, while ongoing weed monitoring throughout the life of the facility will identify and treat problem areas using appropriate methods before they have a chance to spread. Section 6.0 Table 5 includes regular inspection and monitoring actions during the first year of operations and annual monitoring of revegetated areas in years 2 through 6 compared against success criteria outlined in the plan; regular reporting to ODOE, the Oregon Department of Agriculture, and the Sherman County Weed District are outlined to ensure compliance requirements are met.

Appendix F outlines specific required actions for soil stabilization and reclamation, site preparation, revegetation methods (including an approved seed mix for revegetating disturbed areas, seeding methods, and shrub planting requirements), and criteria for determining revegetation success. Appendix G outlines the state and county regulatory framework for weed control, lists the individual weed species found at the site, and describes the biological, mechanical, and chemical control methods and species-specific treatment plan that will be used to treat weeds and prevent their spread. Weed control will be paired with ongoing consultation with the Sherman County Weed Board.

The draft Comprehensive Solar Revegetation and Soil Management Plan in Attachment D combines erosion control, soil management, site revegetation, and noxious weed control in one plan to ensure consistency in soil and vegetation management from pre-construction preparation, through construction, and during operation of the Facility. The actions in this draft plan are detailed and specific, and only minor changes are expected prior to finalization. Site condition PRE-SP-01 mandates finalization of this plan prior to construction; conditions CON-SP-02 and OPR-SP-06 require adherence to the final plan during construction and operations of the facility, respectively.

2. Public Safety and Wildfire Risk (WF-07, WF-08, WF-12)

You noted Sherman County's elevated wildfire risk and expressed concern regarding wildfire risk mitigation, the development and use of wildfire mitigation plans, and the adequacy of buffers and fuel breaks to prevent wildfire spread. The Council's public safety standard requires that facilities be designed and operated to protect public health and safety. Consistent with this standard, the Proposed Order requires development and approval of wildfire mitigation and emergency response measures prior to construction, including coordination with local fire agencies. These

requirements are sufficiently specific to guide on-site implementation and coordinated response and are enforceable through ongoing compliance obligations. These concerns are addressed through PRE-WF-01 / PRO-WMP-01 (Wildfire Mitigation Planning) and OPR-WF-01 (Operational Wildfire Mitigation), as well as incident reporting and corrective action requirements under GEN-OE-05 through GEN-OE-07.

PGE and BN recognize that vegetation management is integral to wildfire mitigation and serves as a primary risk-reduction measure during both construction and operations. The recommended setbacks and vegetation management buffers reflected in the ODOE's Proposed Order were carefully developed to integrate industry best practices, applicable regulations, and relevant operational experience. These setbacks and buffers are incorporated into the associated draft plans and site design and will be carried out through implementation.

- Vegetation will be managed in accordance with the applicable provisions of the Oregon Fire Code:
    - Non-combustible buffer (10 feet) shall be required around either side of the perimeter fence
    - A maintained vegetative surface or non-combustible base shall be installed and maintained under the photovoltaic arrays and associated electrical equipment
- Vegetation standards apply (in addition to the above):
    - Within the solar arrays – vegetation maintained at a height of less than 12 inches, with a minimum vertical clearance of 12 inches from all electrical and mechanical equipment
    - Along access roads – 10-foot low-growing, fire-resistant vegetation buffer on either side
    - The BESS yard is designed with non-combustible materials (e.g., metal, etc.). No vegetation is allowed inside the BESS yard, and all surfaces are gravel or pavement.
    - The areas surrounding the O&M, BESS, and substations and within defensible space areas will implement a 20-foot non-vegetated perimeter buffer maintained as graveled or earthen surface

In closing, PGE and BN share your goal of ensuring that renewable energy development proceeds responsibly and with strong natural resource protections in place. Thank you for taking the time to offer comments.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:16 PM
To: Metta Jessica
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Metta/MCEDD
Attachments: BIGL RFA4_Comment Letter to Jessica Metta MCEDD_02132026.pdf

Dear Ms. Metta,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
Pronouns: she/her
Senior Environmental Specialist | 503-464-2634 | 503-313-5022
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Inlet Beach, FL 32461
info@brightnightpower.com

February 13, 2026

VIA EMAIL (jessica@mcedd.org)

Jessica Metta
Executive Director
Mid-Columbia Economic Development District
802 Chenowith Loop Road
The Dalles, OR 97058

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-07)

Dear Ms. Metta,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your written comments regarding the Oregon Department of Energy's Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate.

PGE and BN appreciate Mid-Columbia Economic Development District's (MCEDD) efforts to work collaboratively, in coordination with the Sherman County Court, to develop a Community Investment Plan. PGE and BN agree that the memorandum of understanding reflects collaboration among the parties and demonstrates our shared commitment to supporting economic development and community investment. We appreciate MCEDD's willingness to serve as administrator of the Community Investment Fund and believe that MCEDD's experience and established working relationship with the Sherman County Court provide a strong foundation for effective administration of the fund. PGE and BN value our partnership with MCEDD and look forward to continued coordination on the Community Investment Plan.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:17 PM
To: john@oregon.ag
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Langdon
Attachments: BIGL RFA4_Comment Letter to John Langdon_02132026.pdf

Dear Mr. Langdon,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
Pronouns: she/her
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Inlet Beach, FL 32461
info@brightnightpower.com

February 13, 2026

VIA EMAIL (john@oregon.ag)

John Langdon
30574 Diamond Hill Drive.
Harrisburg, Oregon 97446

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc25-03-P6)

Dear Mr. Langdon,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your oral comments regarding the Oregon Department of Energy's Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate.

In your comments, you discussed your efforts to learn about how solar development and agricultural systems can work together and to implement vegetation management practices. PGE and BN value your expertise and the work you have done to educate others about the benefits of renewable energy development to agricultural systems. We share your goal of ensuring that renewable energy development proceeds responsibly and with strong natural resource protections in place.

We appreciate your comments and look forward to continued coordination as the project moves forward.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:17 PM
To: justinscharffarms@gmail.com
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Justin Scharf
Attachments: BIGL RFA4_Comment Letter to Justin Scharf_02132026.pdf

Dear Mr. Scharf,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

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February 13, 2026

VIA EMAIL (justinscharffarms@gmail.com)

Justin Scharf

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-19)

Dear Mr. Scharf,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your written comments regarding the Oregon Department of Energy's Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm (BCWF) Site Certificate.

PGE and BN appreciate your perspective as a fourth-generation farmer in Sherman County and recognize the challenges facing many family farms today. We value your insight into how projects like Biglow Solar can help provide farmers with diversified and reliable income, which supports long-term farm viability, succession planning, and the ability to keep family farms intact and in agricultural production. In your letter, you note PGE and BN's efforts to address concerns about past management of BCWF and potential wildfire risk posed by the solar facility. We take these concerns seriously. PGE and BN appreciate your confidence in our plan to manage the solar facility and your support of our work to mitigate wildfire risk.

We appreciate your comments and look forward to continued coordination as the project moves forward.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Daniel Wilson <Dan.Wilson@pgn.com>
Sent: Friday, February 13, 2026 5:00 PM
To: Kathryn McCullough
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Chris Bozzini; Kathleen Campanella; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Kathy and Kevin McCollough
Attachments: BIGL RFA4_Comment Letter to Kathy and Kevin McCullough_02132026 (1).pdf

Dear Mr. and Mrs. McCullough,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Dan Wilson
Director, Renewable Operations
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February 13, 2026

VIA EMAIL (captainkathymccullough@gmail.com**)**

Kevin and Kathy McCullough
Wasco, OR

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order

Dear Mr. and Mrs. McCullough,

Portland General Electric (PGE) and project developer BrightNight (BN) appreciate your comments regarding the Oregon Department of Energy's Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF) Site Certificate. Oregon Administrative Rule (OAR) 345-027-0367(8) requires PGE to respond to all comments that are made with "sufficient specificity," as that term is defined in OAR 345-027-0367(7)(a).

We note that your comments contained in the 13 written comment letters and oral testimony provided at the public hearing may not necessarily meet that standard but are valuable to inform the process. PGE and BN reviewed your comments carefully and offer the following responses, organized into five categories of issues that we hope accurately respond to your concerns. The responses below are organized by the interpretation of your comments received and are further identified with the same issue identification number provided in Table 1: List of Issues and Commenters in the Oregon Department of Energy's (ODOE) Response to Comments document dated February 12, 2026.

1. Organizational Expertise (OE-01)

PGE recognizes that one of your primary concerns regarding RFA 4 relates to maintenance issues at the existing BCWF. PGE acknowledges the operational incidents documented at the BCWF and has implemented targeted improvements specific to the BCWF, including changes to internal management structure and personnel; a change in the turbine operations and maintenance provider with a newly negotiated contract to mitigate future technical challenges and better align with site-specific performance goals; and improved monitoring of contractor performance. Improved preventative maintenance, robust monitoring, and corrective action planning will be the result of these changes, which are still ongoing.

As we talked about with you previously, and addressed during our public testimony at the hearing, lessons learned from past challenges have resulted in more robust preventative maintenance and corrective action protocols, stronger vendor performance accountability, clearer performance standards tied to equipment health, and improved quality assurance and quality control oversight. These lessons have informed the design, operational planning, and compliance framework for the proposed solar and battery energy storage systems under RFA 4 (Solar Components or Biglow Solar).

Most notably, the Proposed Order introduces a new requirement for a Comprehensive Operations and Maintenance Plan (O&M Plan) for the Solar Components (*see* Proposed Order

Attachment C; and draft amended Site Certificate conditions OPR-OM-01 through OPR-OM-03). This O&M Plan is intended to serve as the governing operational document for the Solar Components and must be finalized and approved by ODOE prior to commencement of operations.

Under draft amended condition OPR-OM-01, PGE must submit a final O&M Plan consistent with the framework outlined in Attachment C and Table 5 of the Proposed Order. The O&M Plan consolidates and carries forward commitments from multiple operational plans introduced under RFA 4, including:

- The Operational Wildfire Mitigation Plan;
- The Comprehensive Solar Revegetation and Soil Management Plan; and
- Hazardous materials management and emergency response plan requirements.

The O&M Plan establishes preventive maintenance procedures, monitoring protocols, documentation standards, emergency preparedness measures, and regulatory compliance procedures that will govern the facility throughout its operational life. It also requires submission to ODOE of contact information, qualifications, and defined roles for primary vendors, contractors, and management personnel responsible for operations.

In addition, draft amended condition OPR-OM-02 requires annual reporting to ODOE that includes detailed information regarding facility status, power production reliability and efficiency, monitoring results, compliance activities, and any facility modifications. While annual reporting has existed previously, the scope and specificity of the required documentation under RFA 4 are expanded and more detailed.

Draft amended condition OPR-OM-03 strengthens incident reporting requirements by requiring timely notification to ODOE, written documentation within defined timelines, and tracking of corrective actions. Significant events require root cause analysis and documentation of corrective measures. ODOE retains inspection and enforcement authority and may require additional corrective actions, if warranted. Retirement and restoration surety requirements (RET-01 through RET-03) remain in place to ensure financial resources are available for remediation or decommissioning, if necessary.

The O&M Plan Framework (Attachment C and Table 5 of the Proposed Order) establishes enforceable requirements in the following areas:

a. Preventive Maintenance and Asset Monitoring (Section 3.4)
    - Routine, scheduled inspections and condition-based maintenance consistent with manufacturer specifications and industry standards;
    - Supervisory control and data acquisition (or SCADA)–based monitoring of solar arrays, substations, and battery energy storage system (BESS) components; and
    - Documentation and tracking of maintenance activities in auditable logs.

b. Regulatory Compliance and Site Certificate Conditions (Section 3.5; OPR-OE-01)
    - Integration of all applicable Site Certificate conditions into day-to-day operational procedures;
    - Clear assignment of roles and responsibilities, including required submission of

contact information and qualifications for key personnel and contractors; and

- Requirement that material plan changes be submitted to ODOE for review and approval.

c. Emergency Preparedness and Incident Response (Section 3.6; PRO-OE-01; OPR-OE-01)

- A site-specific Emergency Response Plan prior to operations;
- Fire detection, alarms, and shutdown capabilities integrated with monitoring systems;
- Mandatory incident reporting to ODOE "as soon as reasonably possible," followed by written documentation within defined timelines; and
- Required root cause analysis and documented corrective action tracking for significant events.

d. Monitoring, Reporting, and Public Accountability (OPR-OM-02 and OPR-OM-03)

- Mandatory annual reporting to ODOE detailing facility status, reliability and efficiency metrics, compliance activities, and any facility modifications;
- Expanded scope and specificity of reporting compared to the legacy wind facility;
- Defined reporting timelines and written documentation requirements; and
- ODOE inspection authority and enforcement authority, including the ability to require corrective actions, additional inspections, or modifications if warranted.

e. Long-Term Operational Continuity and Transition Planning (Section 4.0)

- Defined roles during the initial Build-Transfer Agreement period;
- Clear transition of full O&M responsibility to PGE after Year 5; and
- Ongoing regulatory responsibility always remains with PGE as Certificate Holder.

These requirements are enforceable through the amended Site Certificate. Noncompliance may result in inspection findings, corrective action requirements, or enforcement action by ODOE. In addition, retirement and restoration surety requirements (RET-01 through RET-03) remain in place to ensure financial resources are available if remediation or decommissioning becomes necessary.

Your comments under the Energy Facility Siting Council (EFSC or Council) Organizational Expertise Standard express concerns regarding whether the facility will be adequately maintained and whether there will be accountability for operational issues. The Proposed Order and the implementing plans and conditions directly address those concerns through mandatory reporting, defined timelines, corrective action tracking, inspection authority, and enforceable Site Certificate conditions. We hope this response helps address your concerns regarding organizational expertise and PGE's ongoing accountability and compliance.

2. Wildfire Prevention and Risk Mitigation (issue numbers identified in subsections)

PGE and BN recognize that another one of your primary concerns regarding RFA 4 is wildfire prevention and risk mitigation. Living and farming next to new energy infrastructure raises

important questions, especially about safety and wildfire risk. Wildfire mitigation plays a critical role in how Biglow Solar is designed, constructed, and operated. The Proposed Order contains integrated requirements, both in conditions and in plans, to ensure that wildfire risks are managed to acceptable levels.

a. Construction Phase Wildfire Mitigation (PS-01, PS-02, SP-01, SP-04)

The Draft Construction Wildfire Mitigation Plan (WMP; Attachment G of the Proposed Order) includes the following actions and information to mitigate wildfire risk during construction:

- Onsite training that covers best practices to prevent fire ignition; type, location, and proper use of fire protection equipment; location of water sources and proper usage; and specific procedures and actions applicable during fire season and red-flag warnings (Attachment G, Section 3.1).
- Facility design features intended to reduce fire risk, with a section dedicated to BESS fire protection that describes BESS components, all applicable standards and codes that must be followed, and other facility components installed to ensure proper testing, handling, and back-up protection (Attachment G, Section 4.1.4).
- Specifications for fire protection equipment to ensure firefighter safety (Attachment G, Section 4.2).
- Vehicle use Best Management Practices to minimize fire risk from vehicle travel, equipment use, and fueling activities (Attachment G, Section 4.4).
- Fire weather monitoring and restrictions during fire season (Attachment G, Section 4.5).
- Vegetation management (Attachment G, Section 4.6), aligned with the draft Comprehensive Solar Revegetation and Soil Management Plan (Attachment D of the Proposed Order), to ensure consistent vegetation management that prevents erosion, supports native vegetation for watershed health, reduces wildfire fuels, and prevents the introduction or spread of noxious weeds. This includes vegetation height restrictions, especially around electrical equipment; non-combustible buffers around buildings, roads and the site perimeter; and weed monitoring and removal in coordination with the Sherman County Weed Board and Oregon Department of Agriculture.

PGE and BN acknowledge ODOE's recommendation in the Proposed Order to maintain vegetation at a reduced height of 1 to 3 inches during the dry season (June–October). PGE and BN also note the comment submitted by the Sherman County Weed District (BCWAMD424-15), which advises that maintaining vegetation at 1 to 3 inches may not be feasible if erosion control is a priority and instead recommends a grass height of 4 to 8 inches during the dry season for the proposed bunchgrass species. We recognize the Weed District's local expertise regarding soil stability and vegetation performance and appreciate the perspective provided.

The vegetation height standards identified in the draft Comprehensive Vegetation and Soil Management Plan and draft Construction Wildfire Mitigation Plan (WMP) provide for vegetation to be maintained below 10 to 12 inches year-round. These standards were developed based on practical vegetation management considerations intended to support long-term wildfire risk reduction while maintaining vegetation health and site stability. Maintaining vegetation at 1 to 3

inches during the dry season presents several practical and ecological considerations:

GE and BN acknowledge ODOE's recommendation in the Proposed Order to maintain vegetation at a reduced height of 1 to 3 inches during the dry season (June–October) and request that the vegetation height requirements be limited to a height of 10 to 12 inches year-round. Based on practical vegetation management considerations, this approach best supports wildfire risk reduction for the following reasons:

- Repeated low mowing to such reduced heights would be detrimental to perennial grasses included in the approved seed mix, as repeated damage to bunchgrass crowns would likely result in plant mortality within a few growing seasons.
- Extremely low mowing would favor the establishment of annual grasses, thereby increasing fine fuels rather than reducing fire risk.
- Low mowing would significantly reduce or eliminate wildlife habitat, particularly for ground-nesting birds and beneficial insects.
- Mowing at such low heights at the beginning of the dry season increases the risk of fire ignition due to sparks generated when mowing equipment contacts rocks or hard surfaces.
- Maintaining vegetation at a 1- to 3-inch height would substantially increase vegetation management costs without providing commensurate fire-risk reduction benefits.

The draft Construction WMP will be finalized prior to construction as required by draft amended condition PRE-WF-01, and contractors and employees must adhere to the plan pursuant to CON-WF-01.

a. Operational Phase Wildfire Mitigation (WF-12)

Wildfire mitigation does not end at construction. PGE is developing a site-specific Operational WMP, which will provide any site-specific information outlined in ODOE's Operational WMP template that is not already addressed in PGE's 2026-2028 Corporate WMP which was filed with the Oregon Public Utility Commission on December 31, 2025. The Operational WMP will include the same components as described for the Construction WMP above; however, the construction-specific actions will be replaced with site-specific operations and maintenance actions.

The site-specific Operational WMP under development for the Biglow Solar facility will be submitted to ODOE for review and approval prior to beginning operation of the solar facility, as required by PRO-WF-01; onsite contractors and employees will adhere to this plan as required by OPR-WF-01, as well as incident reporting and corrective action requirements under GEN-OE-05 through GEN-OE-07. Importantly, wildfire prevention and response measures are also integrated into the enforceable O&M Plan required under draft amended conditions OPR-OM-01 through OPR-OM-03. The O&M Plan:

- Incorporates operational wildfire mitigation requirements into day-to-day procedures;
- Requires ongoing vegetation management to reduce fuel loads and maintain defensible space;
- Integrates fire detection, alarm systems, and shutdown capabilities with 24/7 monitoring systems;

- Establishes incident reporting, documentation, and corrective action requirements if a fire-related event occurs; and
- Subjects wildfire-related operations to mandatory annual reporting, inspection, and enforcement oversight by ODOE.

Through this integrated framework, wildfire mitigation is not a stand-alone document, but an ongoing operational obligation embedded within the broader compliance and accountability structure governing the facility.

b. Setbacks and Vegetation Management Buffers (WF-07, WF-08)

PGE and BN recognize that vegetation management is integral to wildfire mitigation and serves as a primary risk-reduction measure during both construction and operations. The recommended setbacks and vegetation management buffers reflected in ODOE's Proposed Order were carefully developed to integrate industry best practices, applicable regulations, and relevant operational experience. These setbacks and buffers are incorporated into the associated draft plans and site design and will be carried out through implementation.

- Vegetation will be managed in accordance with the applicable provisions of the Oregon Fire Code:
    - Non-combustible buffer (10 feet) shall be required around either side of the perimeter fence.
    - A maintained vegetative surface or non-combustible base shall be installed and maintained under the photovoltaic arrays and associated electrical equipment.
- Vegetation standards apply (in addition to the above):
    - Within the solar arrays – vegetation maintained at a height of less than 12 inches, with a minimum vertical clearance of 12 inches from all electrical and mechanical equipment.
    - Along access roads – 10-foot low-growing, fire-resistant vegetation buffer on either side.
    - The BESS yard is designed with non-combustible materials (e.g., metal, etc.). No vegetation is allowed inside the BESS yard, and all surfaces are gravel or pavement.
    - The areas surrounding the O&M, BESS, and substations and within defensible space areas will implement a 20-foot non-vegetated perimeter buffer maintained as graveled or earthen surface.

c. Coordination with Local Fire Authorities (PS-01, PS-02)

PGE and BN have conducted extensive outreach in the community and with local emergency responders. On August 12, 2025, BN presented at a North Sherman County Rural Fire Protection District Board meeting, where proposed project details were shared alongside an overview of planned fire prevention and wildfire mitigation measures (presentation as given at the meeting is provided as Attachment A to this comment letter). In addition to this presentation, the project team has been coordinating closely with Sherman County Emergency Services and the North Sherman County Rural Fire Protection District, and has met multiple times, both in person and

over the phone, with Fire Chief Burbank to review site-specific fire mitigation measures, including:

- Adequate perimeter access for firefighting equipment;
- Placement of three on-site water tanks, including one located at the BESS yard; and
- Support for firefighter training and equipment through the Proposed Community Investment Fund (Proposed Order, Attachment E).

Feedback provided by Chief Burbank on the Construction Wildfire Mitigation Plan indicates that the plan is sufficient to address and mitigate wildfire risk during construction.

d. Fire Risk Analysis (WF-01, WF-02, WF-03)

Your comments raised several questions concerning the wildfire risk analysis included in the record. The first was related to burn probability data, the second was use of climate normals, and the third was in regard to fuel models.

With respect to climate normals, the data used to describe climate normals in BCWF RFA 4 Exhibit V are published by the National Oceanic and Atmospheric Administration, a widely accepted and respected source of climate data. These data indicate seasonal average temperatures which, when combined with precipitation and wind speed data, can be used to paint a full picture of wildfire risk at a given site. Wildfire mitigation actions described in the Construction WMP and the Certificate Holder's system-wide Operational WMP take into account high summer temperatures, low precipitation, and other factors (including extreme weather events) that affect the risk of wildfire ignition and spread.

With respect to burn probability and fuel models, BCWF RFA 4 Exhibit V Section 2.1.2 describes the fuel models used to analyze risk of wildfire within the Biglow Solar Micrositing Area. Including Fuel Models 102 (low load, dry climate grass) and 242 (burnable wheat fields), which describe 93 percent of the Solar Micrositing Area, in the risk analysis establishes a more conservative model than the existing conditions and overestimates the fuel load due to current fallow practices on fields at the Biglow Solar site, including chemical fallow, as you noted in your comment. Thus, the analysis results indicating a high burn probability may be greater than the actual risk at the Biglow site. The data and models used for the Biglow Solar burn probability analysis were developed by Oregon State University, the Oregon Department of Forestry, the Washington Department of Natural Resources, the U.S. Forest Service, the U.S. Bureau of Land Management, and Pyrologix, a company that supports wildfire mitigation. This collaborative effort described in "PNW Quantitative Wildfire Risk Assessment Methods" McEvoy, Dunn, and Rickert 2023[1]). is considered sufficient for developing accurate burn probability analyses.

e. Battery Energy Storage System Fire Safety Design and Risk Minimization (WF-05)

We appreciate your detailed recommendations regarding BESS design criteria to minimize fire risk. Public safety and wildfire risk reduction are central considerations in the design of the Biglow Solar facility, including the BESS.

Consistent with the EFSC Wildfire Prevention and Risk Mitigation, Public Services, and Soil Protection standards, the Proposed Order requires that facility components be designed,

[1] McEvoy, A., C. Dunn, and I. Rickert. 2023. PNW Quantitative Wildfire Risk Assessment Methods. Unpublished Manuscript. Available online at the website https://oe.oregonexplorer.info/externalcontent/wildfire/PNW_QWRA_2023Methods.pdf.

constructed, and operated to protect public health, safety, soils, and nearby agricultural lands.

We note that the design of all Solar Components and the proposed BESS incorporates multiple layers of engineered fire prevention and containment protections, including:

- BESS enclosures are manufactured to meet applicable building, electrical, and fire code standards, including resistance to environmental stressors. The centralized BESS yard layout further reduces exposure to potential turbine debris compared to dispersed configurations and site design maintains appropriate setbacks from turbines (520 feet).
- Each BESS unit includes thermal sensors, continuous monitoring, alarm systems, and automatic shutdown capabilities. These systems are designed to detect overheating or abnormal operating conditions early and initiate protective measures. The system is UL 9540A tested, meaning it has undergone rigorous fire propagation testing under nationally recognized safety standards.
- BESS will be housed in enclosed, containerized units located within a centralized BESS yard. Each unit includes internal separation and dedicated monitoring systems designed to detect abnormal conditions and isolate potential thermal events before propagation. The containerized configuration localizes any potential incident within an individual unit.

The wildfire mitigation measures outlined in the Construction and Operational WMPs, as well as the vegetation management measures outlined in the Comprehensive Solar Revegetation and Soil Management Plan and the enforceable O&M Plan requirements, and the engineered safety features incorporated into the BESS design, are intended to protect nearby homes, agricultural lands, and natural areas in Sherman County, where dry vegetation, high summer temperatures, and windy conditions increase fire risk.

In Proposed Order Section III.N.2, ODOE recommends that EFSC find that these plans sufficiently characterize wildfire risk within the analysis area using current data from reputable sources and that the facility components will be designed, constructed, and operated in compliance with wildfire mitigation plans.

Your comments related to fire risk, while relevant under the EFSC Wildfire Prevention and Risk Mitigation Standard, the EFSC Land Use Standard, and the EFSC Public Services Standard, are addressed by the Proposed Order and its recommended plans and conditions. We hope these responses help alleviate your concerns related to wildfire risk because it has been the subject of much discussion, input, and scrutiny throughout the EFSC review process.

3. Land Use

PGE recognizes your concern regarding the conversion of agricultural lands to renewable energy development.

a. *Loss of Agricultural Land*

With respect to the first concern, we hope the findings from the Agricultural and Fiscal Impact Analysis (AIA) included as BCWF RFA4 Attachment K-2 and the Community Investment Plan (Proposed Order, Attachment E), help alleviate these concerns. The AIA quantifies direct, indirect, and induced impacts from removing land from agricultural production, and then the CIP proposes mitigation measures to offset impacts. The AIA demonstrates that land removed from agricultural production by Biglow Solar represents 0.6 percent and 1 percent of the average annual acres of winter wheat harvested in Sherman County and Oregon, respectively. The CIP

incorporates many ideas provided by the community, including yours, that direct mitigation dollars to help fund important projects that benefit the local agricultural economy and offset impacts.

In addition, because issues relating to agricultural land supply, tenant farming, and agricultural impacts were raised in the record by your family, PGE and BN acknowledge that land ownership and agricultural operations are not always the same, and that project impacts may differ between landowners and tenant operators. BN worked closely with both the landowner and the tenant farmer to address the early conclusion of the existing lease. The parties reached a mutually agreed-upon lease termination arrangement.

The negotiated compensation reflects a private resolution between the parties and considered the remaining lease term, anticipated agricultural use, and other relevant factors. The agreed-upon amount was intended to provide substantial consideration in excess of several years of projected farming revenue, mitigating potential losses while allowing the farmer to continue agricultural operations elsewhere.

b. Wildfire Risk to Agricultural Neighbors (LU-07)

We feel it necessary to document for the record that PGE and BN have agreed to honor your request to impose a half-mile setback from your property line, which goes above and beyond any setback standard in code. This request was honored in response to concerns about wildfire mitigation, along with visibility of the facility from your property. As committed previously, this Micrositing Corridor setback will be included in the Biglow Solar final design and is memorialized by the First Amendment to Option and Land Lease with John Scharf.

Further, as discussed during the public hearing, liability matters are not within the jurisdiction of EFSC; and therefore, comments regarding liability do not address a Council Standard.

Your comments related to land use, while relevant under the EFSC Land Use Standard, are already addressed by the Proposed Order and its recommended plans and conditions, or by the private agreements already reached by your family.

4. Fish and Wildlife Habitat (FW-01)

Your comment letter submitted January 1, 2026, expresses concern that some wildlife species were not addressed in BCWF RFA 4 Exhibit P. The analysis in Exhibit P focuses on impacts to wildlife habitat, and the analysis in Exhibit Q focuses on threatened and endangered species as required by the following OARs governing issuance of site certificates by the Council.

OAR 345-022-0060 requires that in order for the Council to issue a site certificate, "the Council must find that the design, construction and operation of the facility, taking into account mitigation, are consistent with the general fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025 (Implementation of Department Habitat Mitigation Recommendations) (1) through (6) in effect as of February 24, 2017." OAR 345-022-0070 requires that in order for the Council to issue a site certificate, they must find (after consultation with the Oregon Department of Agriculture and/or Oregon Fish and Wildlife Commission) that the design, construction, and operation of the proposed facility, taking into account mitigation, are not likely to cause a significant reduction in the likelihood of survival or recovery of state-listed threatened or endangered species. The analysis in Exhibit Q determined that no state listed or candidate species are expected to be affected by the Biglow Solar Components.

The Biglow Solar Components have been designed to avoid many habitat impacts. The Draft Habitat Mitigation Plan included in Proposed Order (Attachment F) addresses the potential temporary and permanent impacts to wildlife habitat from the Biglow Solar Components that cannot be avoided and establishes a habitat mitigation area (HMA) adjacent to the Carty Generating Facility in Morrow County. PGE discussed the location of the HMA with the Oregon Department of Fish and Wildlife and received assurance that the mitigation goals for in-kind and in-proximity habitat can be met.

Your comments, while relevant under the EFSC Fish and Wildlife Habitat and Threatened and Endangered Species standards, are already addressed by the Proposed Order and its recommended plans and conditions.

5. Vegetation Management and Soil Protection (SP-01)

Your comment letter submitted on January 29, 2026, expresses concern about soil and vegetation quality at the end of the solar facility's life. Tetra Tech, on behalf of PGE and BN, conducted a literature review of the effects of solar energy facility development on vegetation and soils, focusing on impacts experienced in arid grassland and shrubland-type environments compared to preexisting agricultural land use. The resulting memo and copies of the reviewed publications are included as an attachment to this letter (Attachment B) and outline benefits such as microhabitats around solar panels with lower air temperatures and evapotranspiration rates, higher soil water content, and additional surface roughness that slows wind speeds and protects against erosion. Planting native vegetation with deeper roots around the panels protects soil from erosion and allows nutrients to be cycled into the soils to greater depths. This improves soil structure, soil organic matter content, nutrient levels, and subsequently, the ability of the soil to sequester carbon. Any negative effects from the solar panels, as outlined in the memo, would be addressed through mitigation actions outlined in the Comprehensive Solar Revegetation and Soil Management Plan.

Your comments, while relevant under the EFSC Soil Protection Standard, are already addressed by the Proposed Order and its recommended plans and conditions. It is our position that none of your comments under the EFSC Soil Protection Standard rise to the level of requiring modifications to the Proposed Order.

6. Good-Faith Participation and Record of Outreach

PGE and BN have made extensive, sustained efforts over multiple years to engage with you directly, respond to questions, and provide access to project information and technical resources. Separate and apart from the RFA 4 amendment process, the Operations Manager of the existing BCWF facility has also maintained communication with you regarding operational and maintenance concerns, ensuring that your feedback was heard and addressed where appropriate.

Since fall of 2024, BN has dedicated significant time and resources to supporting a constructive relationship with you. These efforts have included repeated meetings, phone calls, written correspondence, and the availability of subject matter experts to address your specific concerns, including fire-safety engineers, agricultural mitigation specialists, and project design personnel. We also provided written follow-up and technical materials when you were unable to attend scheduled discussions. We recognize that meaningful engagement and thoughtful project refinement do not occur overnight; accommodations require study, engineering review, coordination with landowners, and regulatory alignment. Nevertheless, we have consistently

worked to respond to your concerns in a deliberate and substantive manner.

In addition to studies required by EFSC rules, BN voluntarily elected to prepare detailed visual simulations from your residence and from specific viewpoints you identified as being of greatest interest to you. These simulations were not required under the EFSC rules or any applicable Site Certificate condition. BN undertook this additional effort solely to provide you with site-specific, location-based information regarding potential visual impacts and to ensure that your concerns could be evaluated using accurate, project-specific renderings rather than generalized assumptions. This work reflects our commitment to transparency and good-faith engagement beyond what is required by the regulatory process.

We are committed to continuing to work with you and your family constructively. Given the accommodations implemented and the enhanced regulatory requirements included in the Proposed Order, we believe the record demonstrates that substantial and meaningful efforts have been made to address the concerns raised.

Please reach out if you have questions or would like to discuss further. We are committed to continuous engagement of the community and neighbors as this project moves forward.

Sincerely,

Dan Wilson

Daniel Wilson
Director, Renewable Operations
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

Attachments:
Attachment A: BrightNight Presentation to Sherman County Emergency Services Providers
Attachment B: Memo – Effects of Solar Energy Development on Vegetation and Soils

Attachment A: BrightNight Presentation to Sherman County Emergency Services Providers



BRIGHTNIGHT
Power when you need it

North Sherman County Fire Board

MEETING

AUGUST 2025

TODAY'S GOAL

- **Progress Update:** Share overview of the project and update you on our progress
- **Safety:** Discuss the safety measures planned for construction, design, and operation
- **Experience:** Review how BrightNight has worked with first responders in other project communities
- **Feedback:** Learn what else we can do to align our work with Sherman County's emergency safety preferences. Wrap up with a list of discussion topics.

WHO'S HERE?

BrightNight

- Kathleen – Lead developer
- Tamara – Development support
- Michael – Project Delivery
- Ranjith – BESS Engineering
- Arturo – Solar Engineering

Coffman Engineers

- Mark Gouveia

AGENDA/PURPOSE

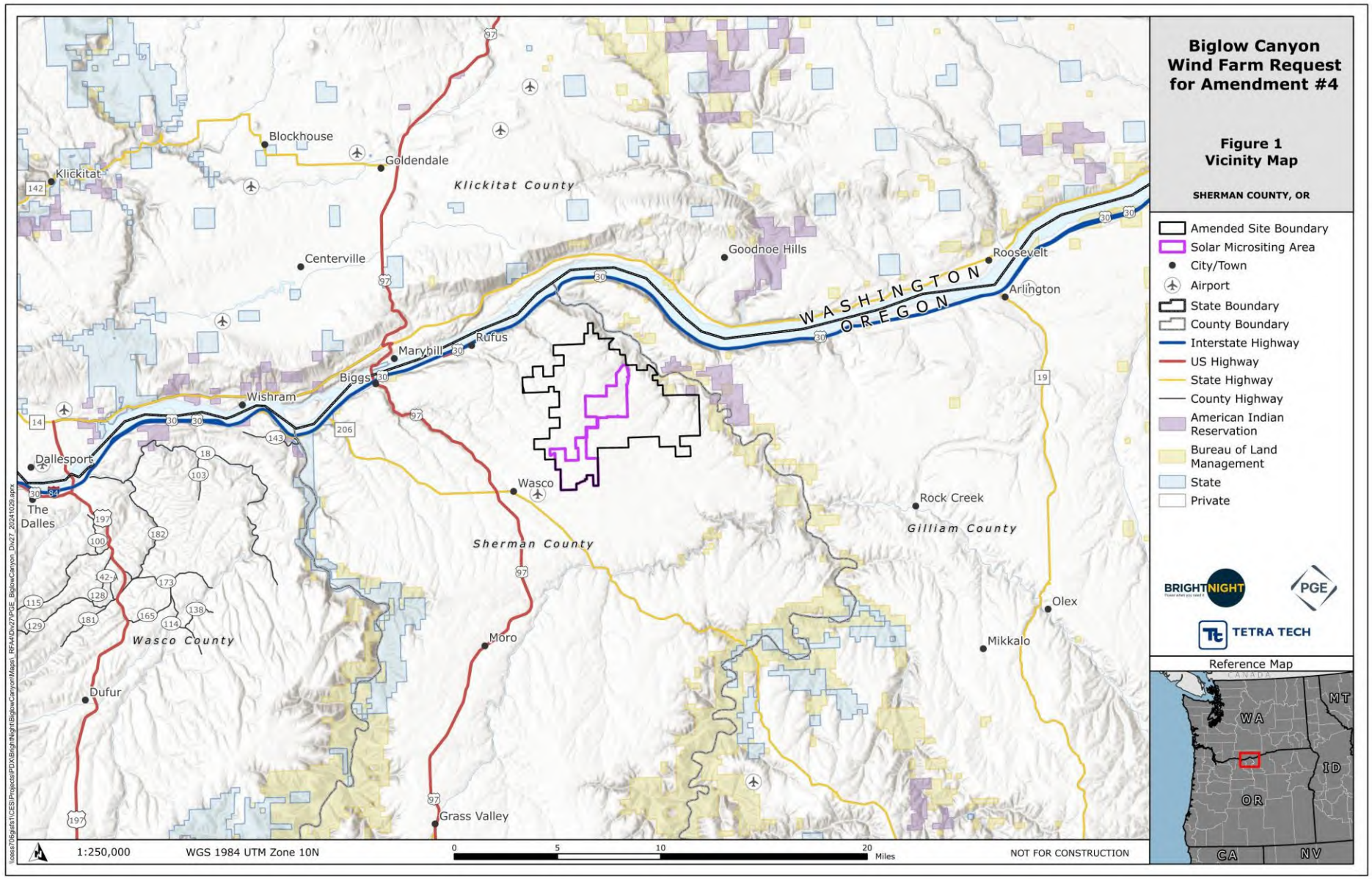
- Project Description
- Site Layout Review
- Schedule Overview
- Emergency Response Plan Overview
- Share Wildfire Mitigation Plan (WMP) measures for construction
- Ensure coordination with Sherman County responders

01

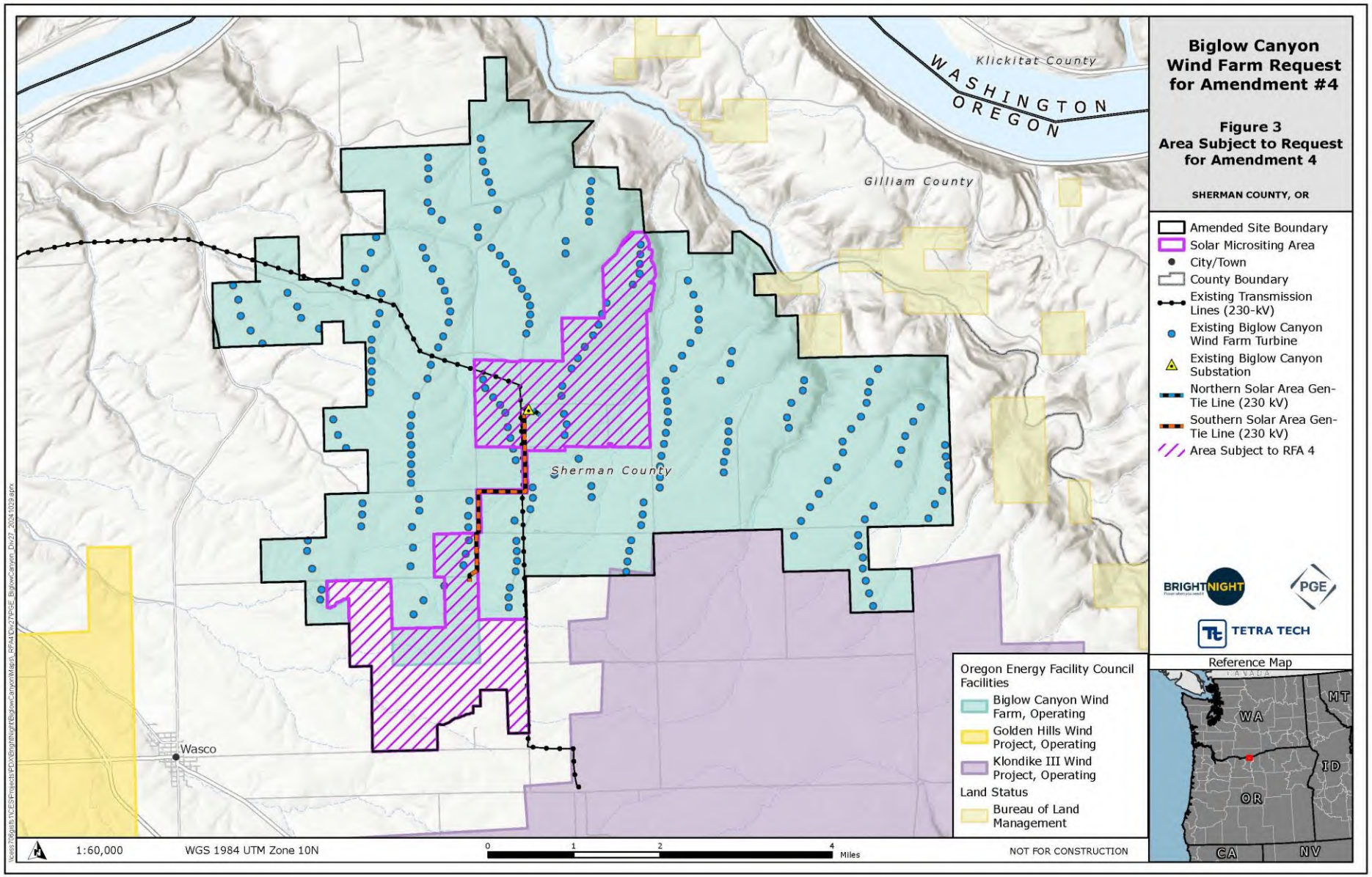
DEVELOPMENT UPDATE

Kathleen

Project Description



Project Description



Biglow Solar + Storage Project Overview

OVERVIEW
PGE and BrightNight have partnered to bring a solar and storage project to the existing Biglow Canyon Windfarm in Sherman County, Oregon.

CAPACITY
385-Megawatts in two phases. Today, we're discussing phase 1 (125 MW PV and 125 MW BESS).

FOOTPRINT
Study area is 3,980 acres. Actual project footprint is ~676 acres.

INTERCONNECTION
Utilizing the existing Biglow Canyon Substation. Ideal optimization of existing infrastructure to reduce project impact.

PERMITTING
Currently moving through the Oregon EFSC process.

Tax Revenue
At least $40,000,000 in tax revenue generated over the life of the project.

Schedule Overview

2024

April-Sept

- Survey Complete (cultural resources, habitat, raptor, wetlands, botanical)
- Meetings with community leaders
- Initial tribal outreach

2025

April

- Application for Amendment for existing EFSC Site Certificated deemed published and complete by ODOE

July

- Preliminary layout
- Technology selection
- Agricultural mitigation meetings

August

- Sponsorship of the Sherman County Fair
- Open house, Aug. 19

September

- Anticipate completing EFSC application submission

November

- EFSC issues "draft proposed order," tentative hearing date set

2026

January

- Council review and determination

Q2

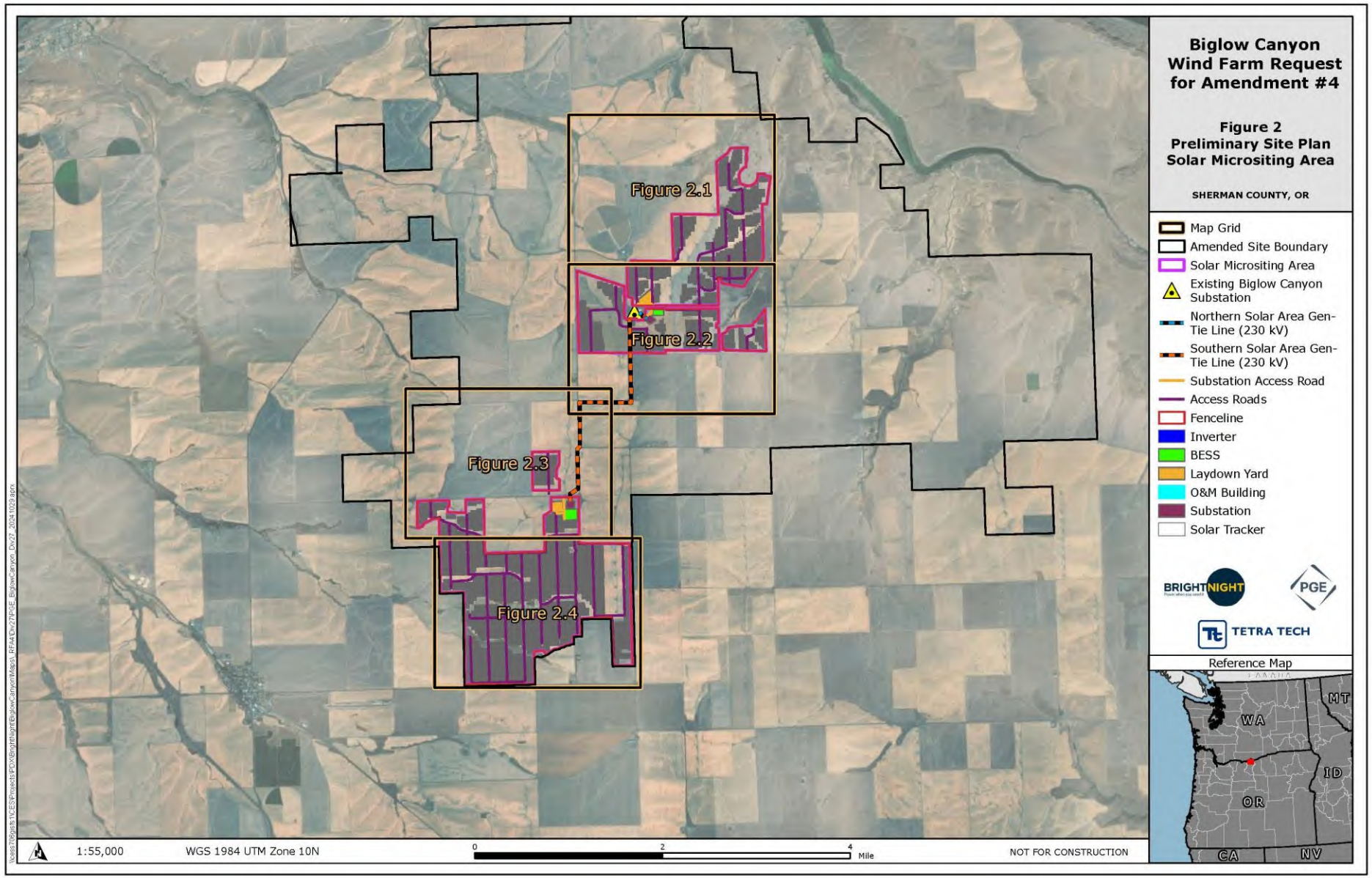
- Construction of phase 1

2027

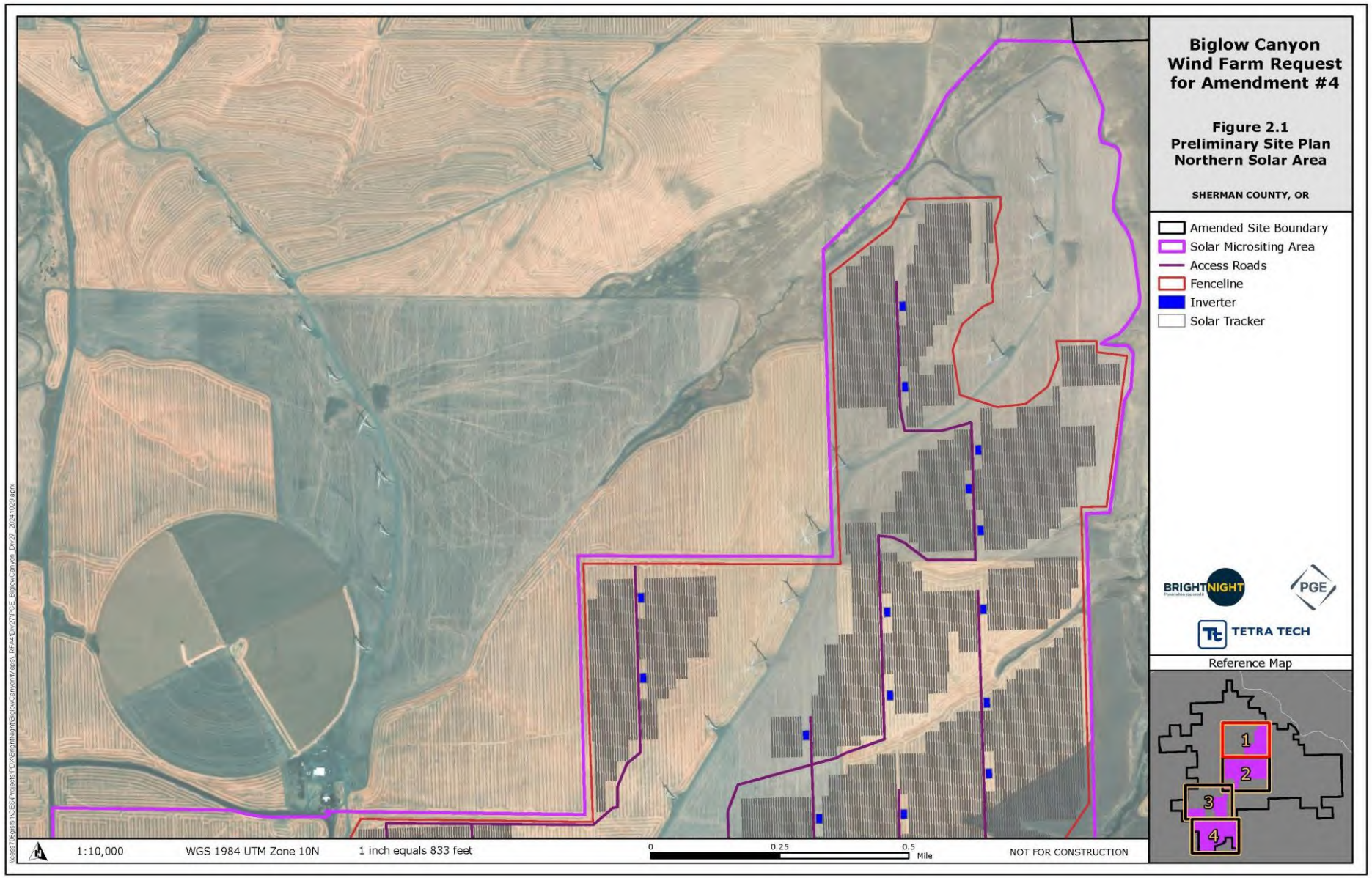
Q4

- Anticipated construction of phase 2

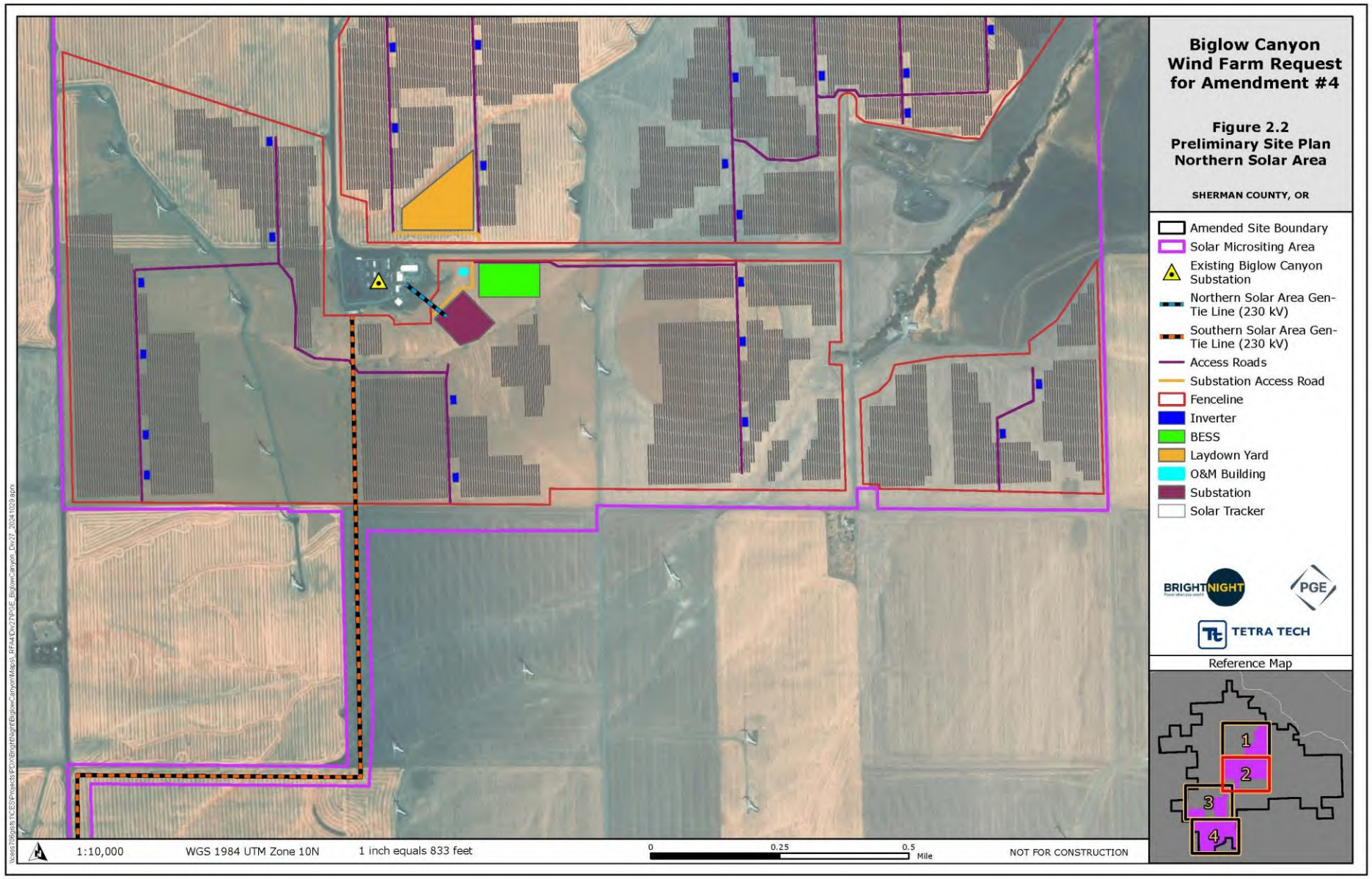
Project Description



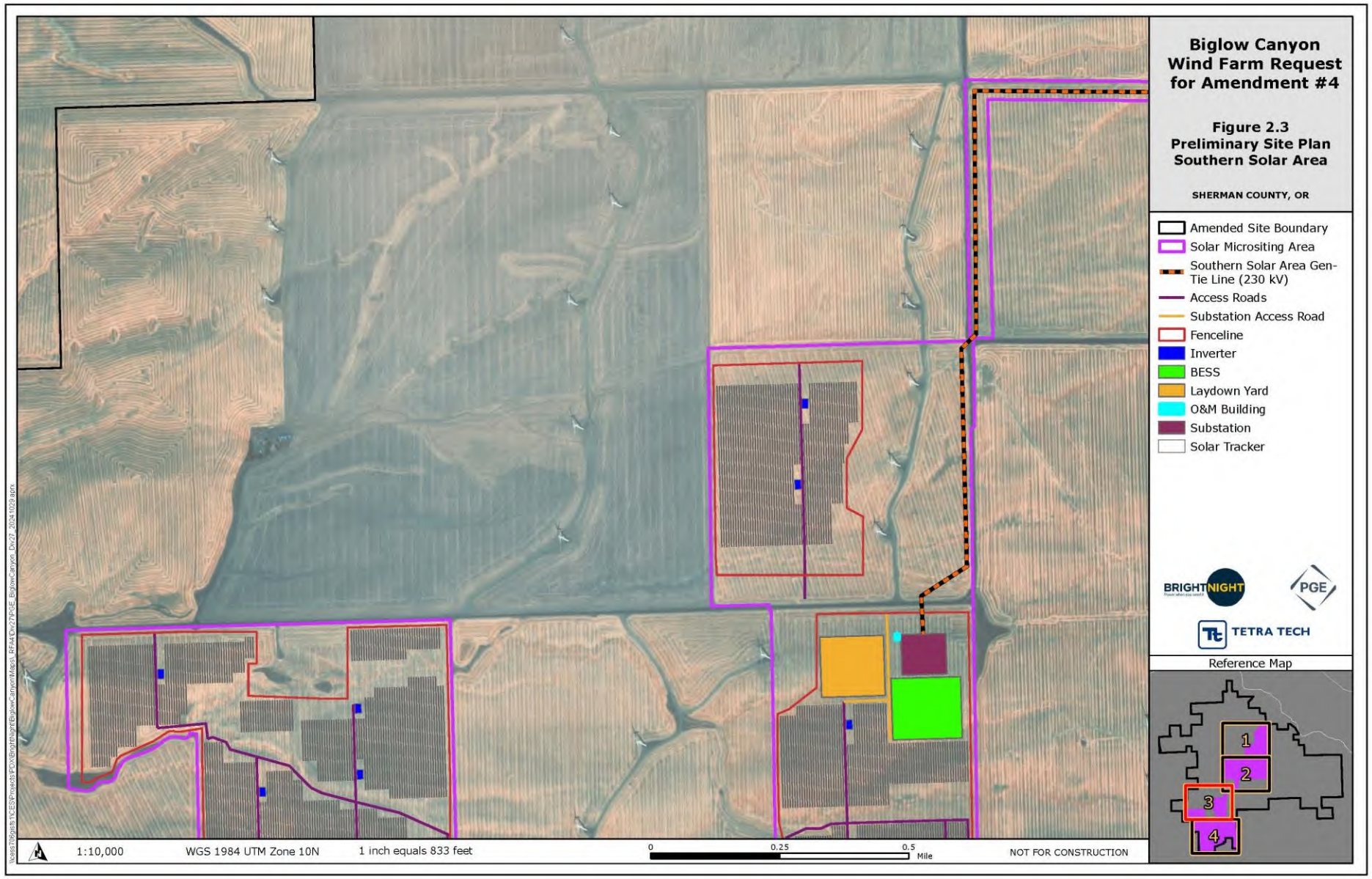
Project Description



Project Description



Project Description



Project Description



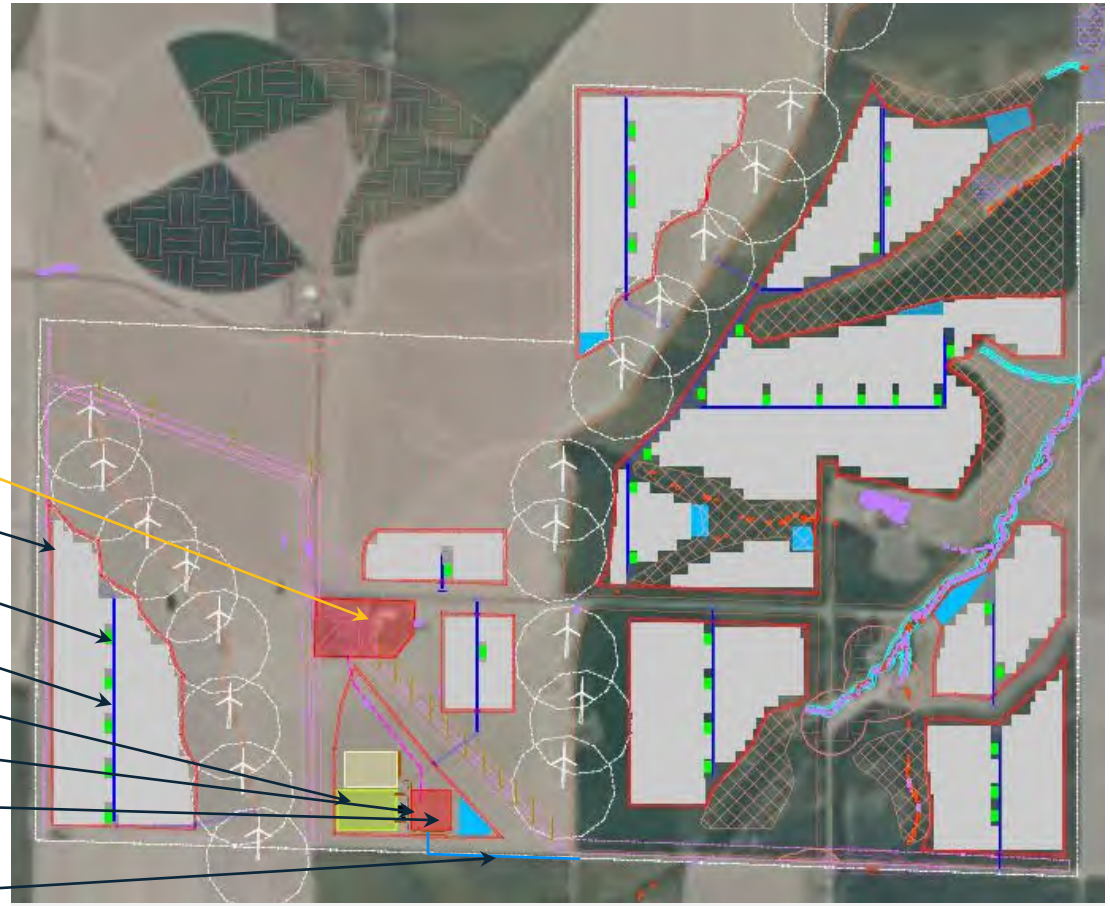
02

ENGINEERING

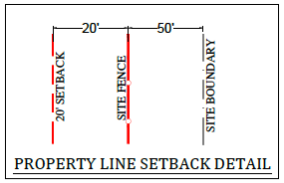
Ranjith (BESS)
Arturo (PV)

Overall Site Layout

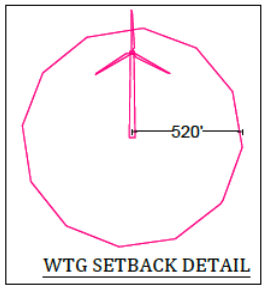
- Wind substation
- Fence line
- Inverters
- Improved roads 16ft
- BESS
- O&M Building
- Project substation
- Substation Access road 24ft, with 20 ft internal roads



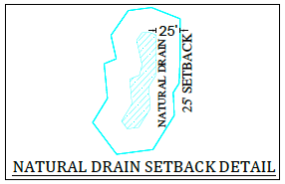
16’ interior access roads and 20’ perimeter setback for access



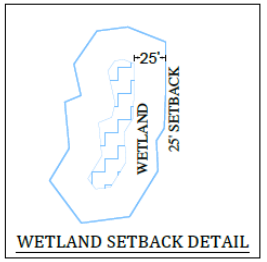
PROPERTY LINE SETBACK DETAIL



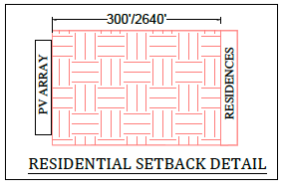
WTG SETBACK DETAIL



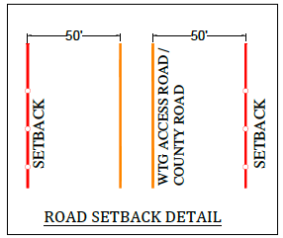
NATURAL DRAIN SETBACK DETAIL



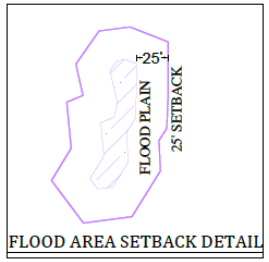
WETLAND SETBACK DETAIL



RESIDENTIAL SETBACK DETAIL



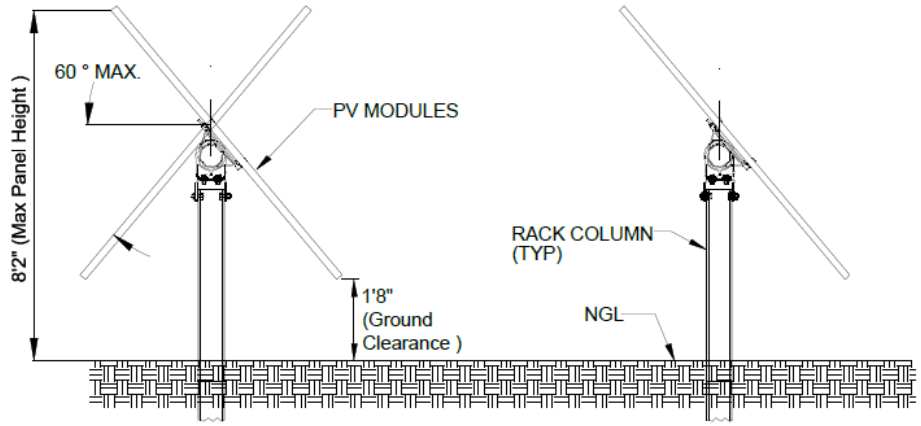
ROAD SETBACK DETAIL



FLOOD AREA SETBACK DETAIL

Solar PV Arrays





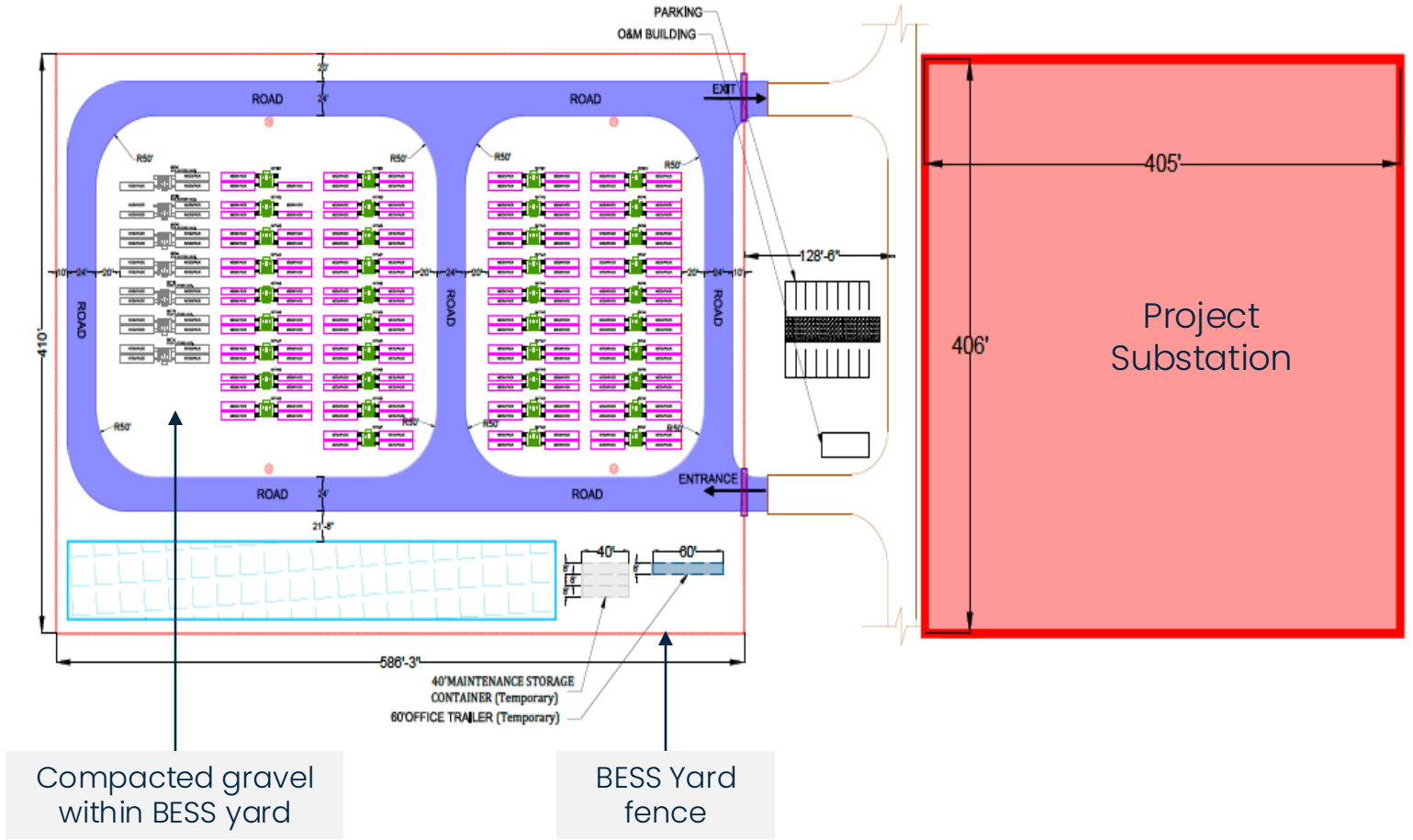
TYPICAL RACK NORTH/SOUTH END ELEVATION





BESS Site Layout and General Arrangement

BESS YARD



Compacted gravel within BESS yard

BESS Yard fence

Project Specifications - 125MW / 500 MWh BESS coupled to 125MW PV

Equipment Clearances:

- Minimum 8' clearance between front faces of battery enclosures for O&M access and UL 9540A fire propagation prevention guidelines
- Minimum 10' clearance between side faces of battery enclosures

Access Roads

- 24' interior access roads and perimeter road for firetruck access
- 50' internal turning radius

Minimum 10' setback from fence to BESS yard perimeter road

BESS Equipment Details

Subtitle goes here



Manufacturer and Model – Tesla Megapack 2XL

Fully integrated AC battery enclosure with battery modules, string inverters, thermal management system and fire safety systems

Proprietary fire detection and suppression system

Over 14 GWh in operation

Proposed Equipment Quantities

- Initial Install – 154 Megapacks and 39 Medium Voltage Transformers
- Future Augmentation – 29 Megapacks and 7 Medium Voltage Transformers
- Medium Voltage Transformers – 39
- Note that equipment quantities could change as design progresses

Equipment Specifications:

Mechanical

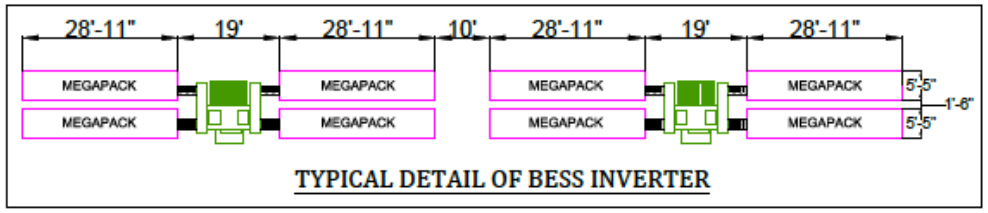
- IP66/ NEMA 3R
- L x D x H - 8.8m x 1.6m x 2.7m
- 84,000 lbs
- Operating Temperature Range: -30C to 50C

Electrical

- Output voltage: 480V AC 3 phase
- Power Rating: 979 kW
- Energy Rating: 3916 kWh

Codes and Certifications

- System – UL 9540, UL 9540A, UL 1973, UL 1741, IEC 62619, IEEE1547
- Battery Cells – UL 1642



BRIGHTNIGHT
Power when you need it

03

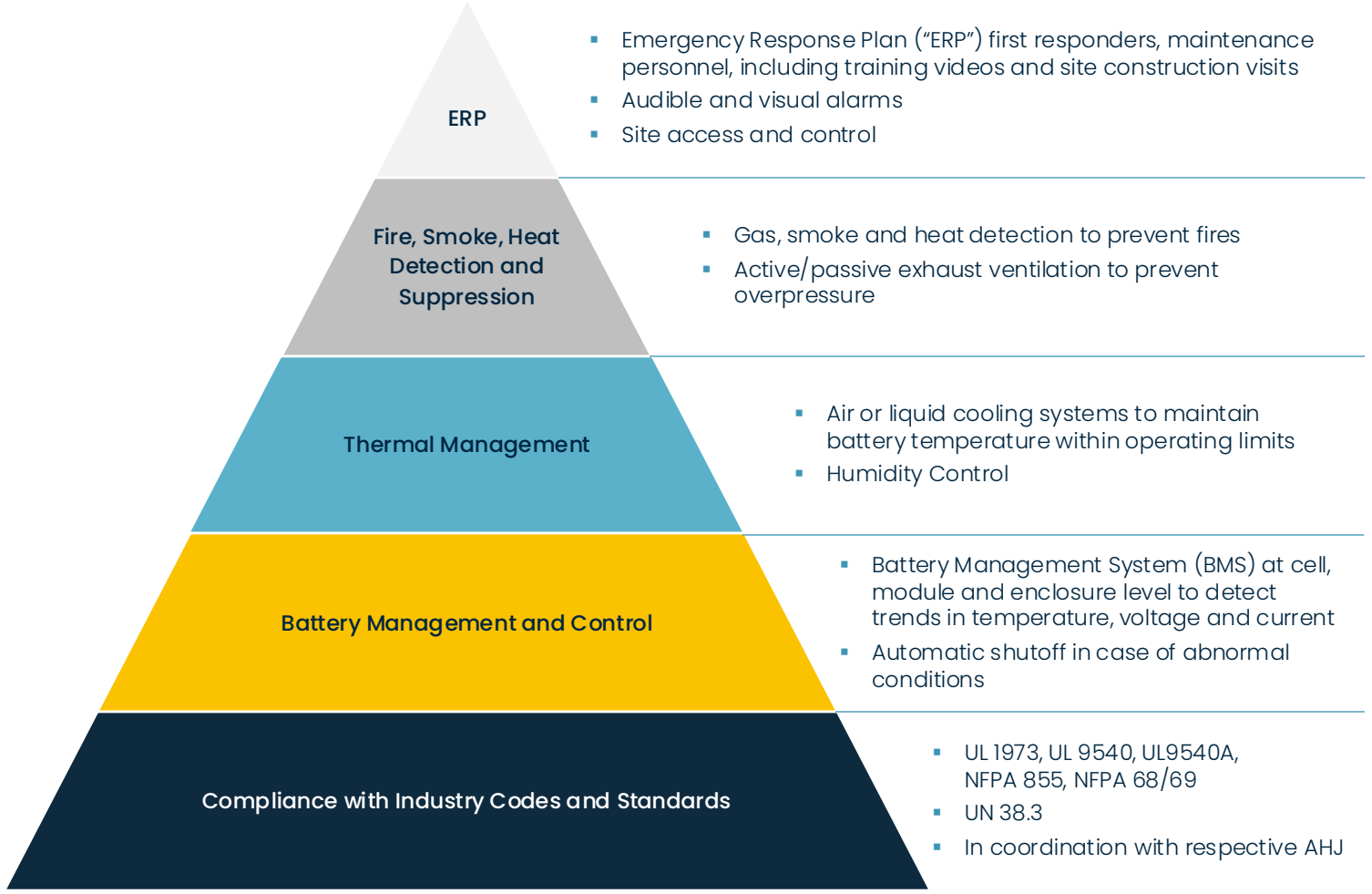
SAFETY & EMERGENCY RESPONSE

Kathleen
Coffman Engineers

BrightNight ensures safety at every level of design and operation

Foundations of BrightNight's Safety Program

- Work closely with customer design and operations teams to exceed customer's safety expectations
- Community engagement
- Rigid procurement and contracting standards with Suppliers, EPCs and Integrators
- In-depth safety review at every phase of project design
- Robust project execution process that considers safety from Cradle to Grave (design, engineering, testing, installation, commissioning, operation, service and disposal)
- 24/7 visibility to personnel, equipment and environment safety, planned PMs and Service during project operation
- Continuous learning through education, training, communication and continuous improvement process



Coffman Energy Storage Experience

Supporting developers, EPCs, utilities, and OEMs

At all stages of the project life cycle

- CUP application, permitting, utility interface
- Configurational design, Third Party Review
- 30-60-90-IFC Construction Documentation
- Fab Shop Inspections / SAT / Commissioning

Experience with all types of energy storage

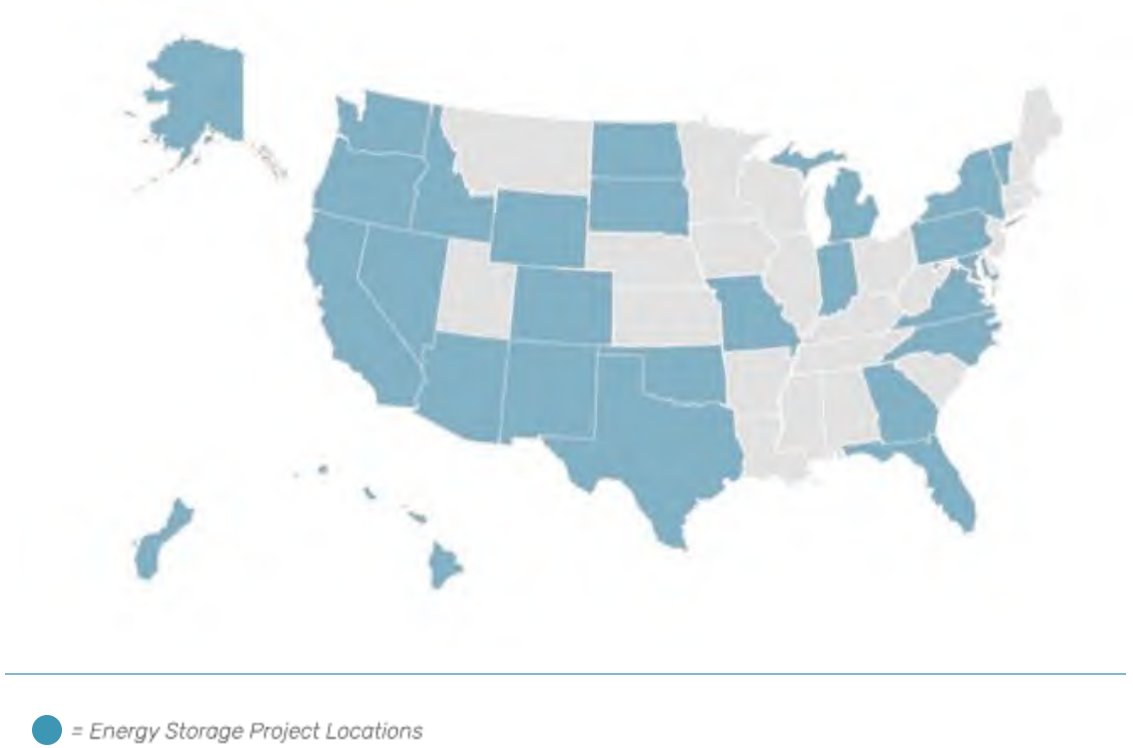
- Lithium-ion Battery Storage
- Flow Batteries / Metal-air / Non-Lithium
- Gravity Systems, Flywheel
- Compressed Air (CAES)
- Thermal Energy Storage (TES)

Services: Engineer of Record, OE, Third Party Review

Containers, Buildings, Custom Enclosures

150+ currently active projects

350+	9.5 GWh	32+
total projects	operating plants	states & territories



= Energy Storage Project Locations

Fire Prevention

BrightNight plans to use the "Tesla Megapack" battery system at the Biglow Solar and Storage Project. This industry-leading equipment features exceptional safety and prevention technology:

Noise

The Megapack is self-contained and operational noise levels are designed to minimize noise pollution. The Greenwater project will abide by all local noise ordinances.

Emissions

In the unlikely event of a fire, emissions are extremely limited. Any emissions would originate from the plastic enclosures, not the batteries. Concentrations are so small there would would be no negative impact to air quality in the surrounding area

Proactive Fire Control

Megapack is designed to prevent battery fires and be resilient if they occur. Fires are extremely rare. Testing has shown that if one occurs, Megapack safety systems can control and contain a fire within the unit.

Containment

Each Megapack unit is self-contained. This important safety feature helps prevent potential soil or water contamination and prevents the spread of an unlikely fire event.

Water Runoff

Megapacks are designed to make it difficult for water to come in contact with the enclosed battery cells.



Lithium Batteries





Tesla Megapack Fire Protection Systems

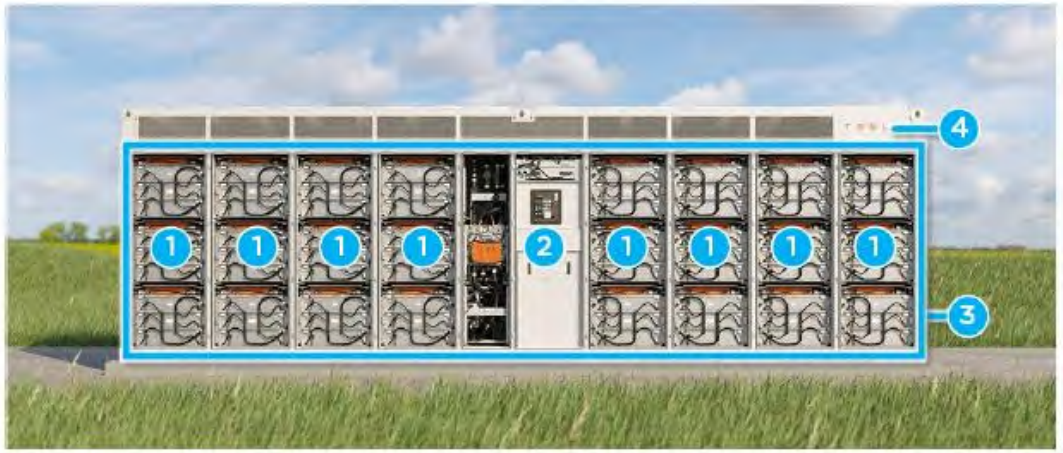
BESS projects are safe for the environment. Self contained systems with no emissions during normal operation.

24/7 Monitoring. Megapack installations are remotely monitored by Tesla 24/7, allowing for early detection, diagnosis and troubleshooting of system errors while providing live support to first responders when needed.

Proactive Fire Control. Megapack is designed to prevent battery fires and be resilient if they occur. Fires are extremely rare. Testing shows that if one occurs, Megapack safety systems can control and contain a fire within the unit. Typically contained to a single module with no visible flames on the exterior.

Recyclable at End of Life. At the end of the system's lifetime BrighNight will safely remove the battery enclosures and recycle the majority of components.





1. Battery modules with active and passive fuses – externally serviceable
2. Touch-safe Customer Interface Bay
3. Non-walk-in IP66 enclosure and deflagration mitigation
4. Thermal roof with overpressure vents

UL Listed Equipment. Equipment is fully test and listed by the UL testing company for the products in your house.

Fire Event Gas Byproducts. Gases resulting from a Megapack fire are similar to those of a typical structure fire: hydrogen, carbon dioxide, carbon monoxide and methane. Expected fire size is less than a house or vehicle fire.

Fire Event Water Runoff. Megapack units are designed to make it difficult for water to come in contact with the enclosed battery cells. Fire water runoff testing has shown no harmful levels of contaminants. (Note: Tesla's Emergency Response Guide recommends no direct water application to a Megapack fire.)

Discussion

Emergency Response Plan

Construction Wildfire Mitigation Plan

Operations Wildfire Mitigation Plan


THANK YOU

Sherman County Emergency Services Meeting
August 2025

Today's Goal

- **Progress Update:** Share overview of the project and update you on our progress
- **Safety:** Discuss the safety measures planned for construction, design, and operation
- **Experience:** Review how BrightNight has worked with first responders in other project communities
- **Feedback:** Learn what else we can do to align our work with Sherman County's emergency safety preferences. Wrap up with a list of discussion topics.

Who's Here?

BrightNight
- Kathleen – Lead developer
- Tamara – Development support
- Michael – Project Delivery
- Ranjith – BESS Engineering
- Arturo – Solar Engineering

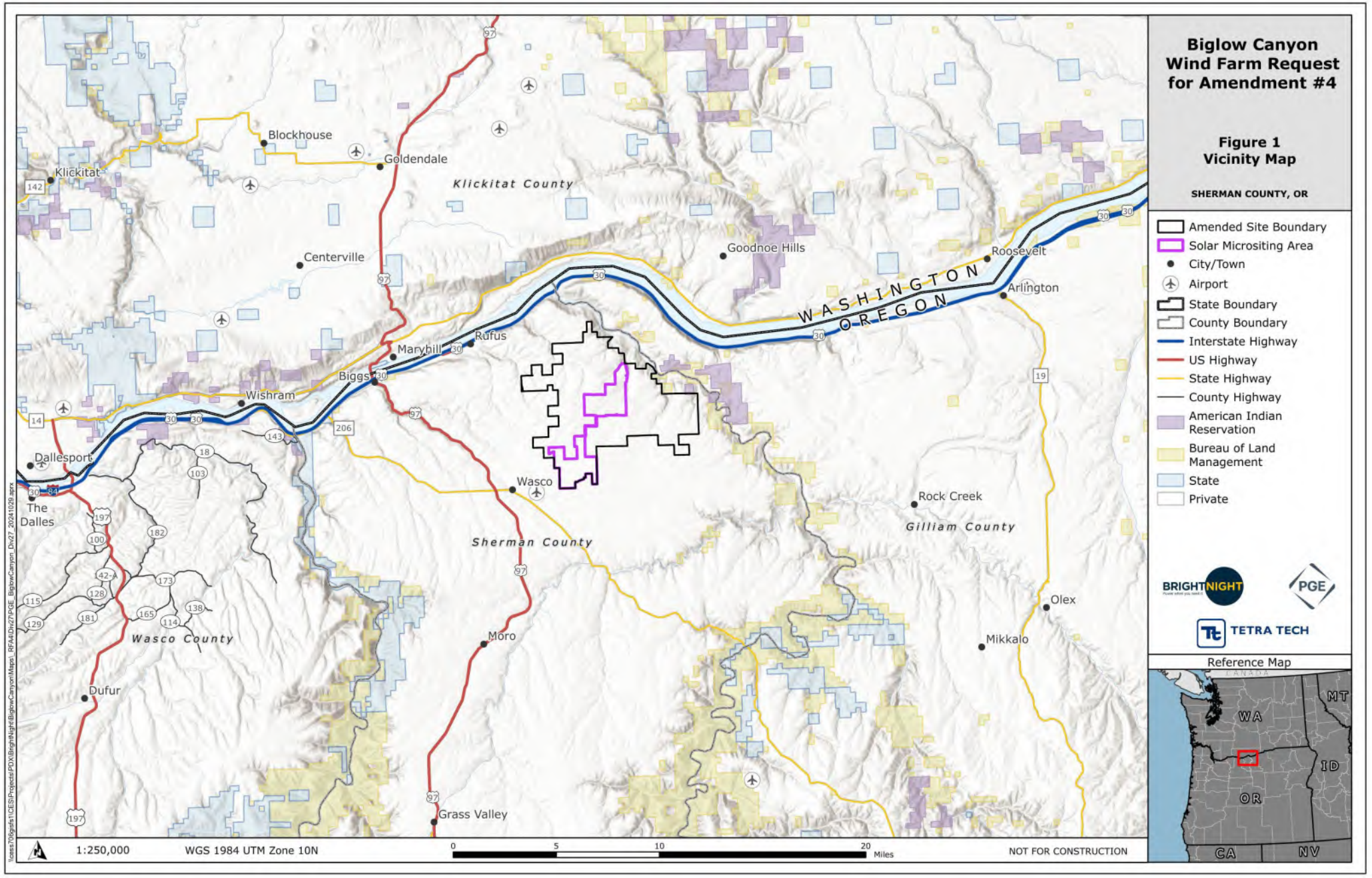
Coffman
- Mark Gouveia

Agenda/Purpose

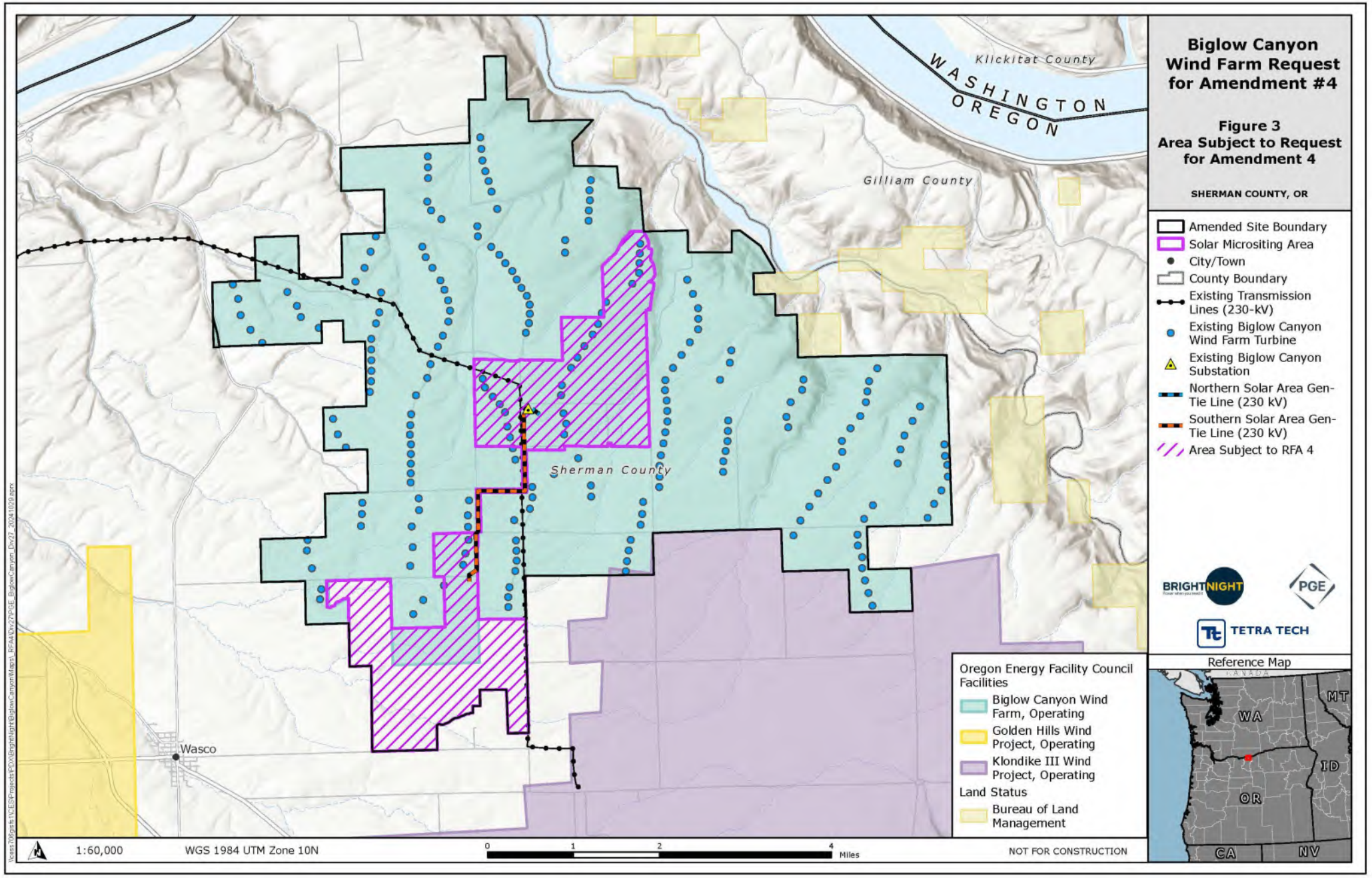
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- Schedule Overview
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- Ensure coordination with Sherman County responders

- DEVELOPMENT UPDATE

- Kathleen



Project Description



TETRA TECH

Project Description

Biglow Solar + Storage Project Overview

✓ OVERVIEW

PGE and BrightNight have partnered to bring a solar and storage project to the existing Biglow Canyon Windfarm in Sherman County, Oregon.

✓ CAPACITY

385-Megawatts in two phases. Today, we're discussing phase 1.

✓ FOOTPRINT

Study area is 3,980 acres. Actual project footprint is ~676 acres.

✓ INTERCONNECTION

Utilizing the existing Biglow Canyon Substation. Ideal optimization of existing infrastructure to reduce project impact.

✓ PERMITTING

Currently moving through the Oregon EFSC process

Schedule Overview

TETRA TECH

April - Sept 2024

- Survey Complete (cultural resources, habitat, raptor, wetlands, botanical)
- Meetings with community leaders
- Initial tribal outreach

April 2025

- RFA Submittal

July 2025

- Preliminary layout
- Technology selection
- Agricultural mitigation meetings

August 2025

- Sponsorship of the Sherman County Fair
- Open house, Aug. 19

January 2026

- Council review and determination

Q2 2026

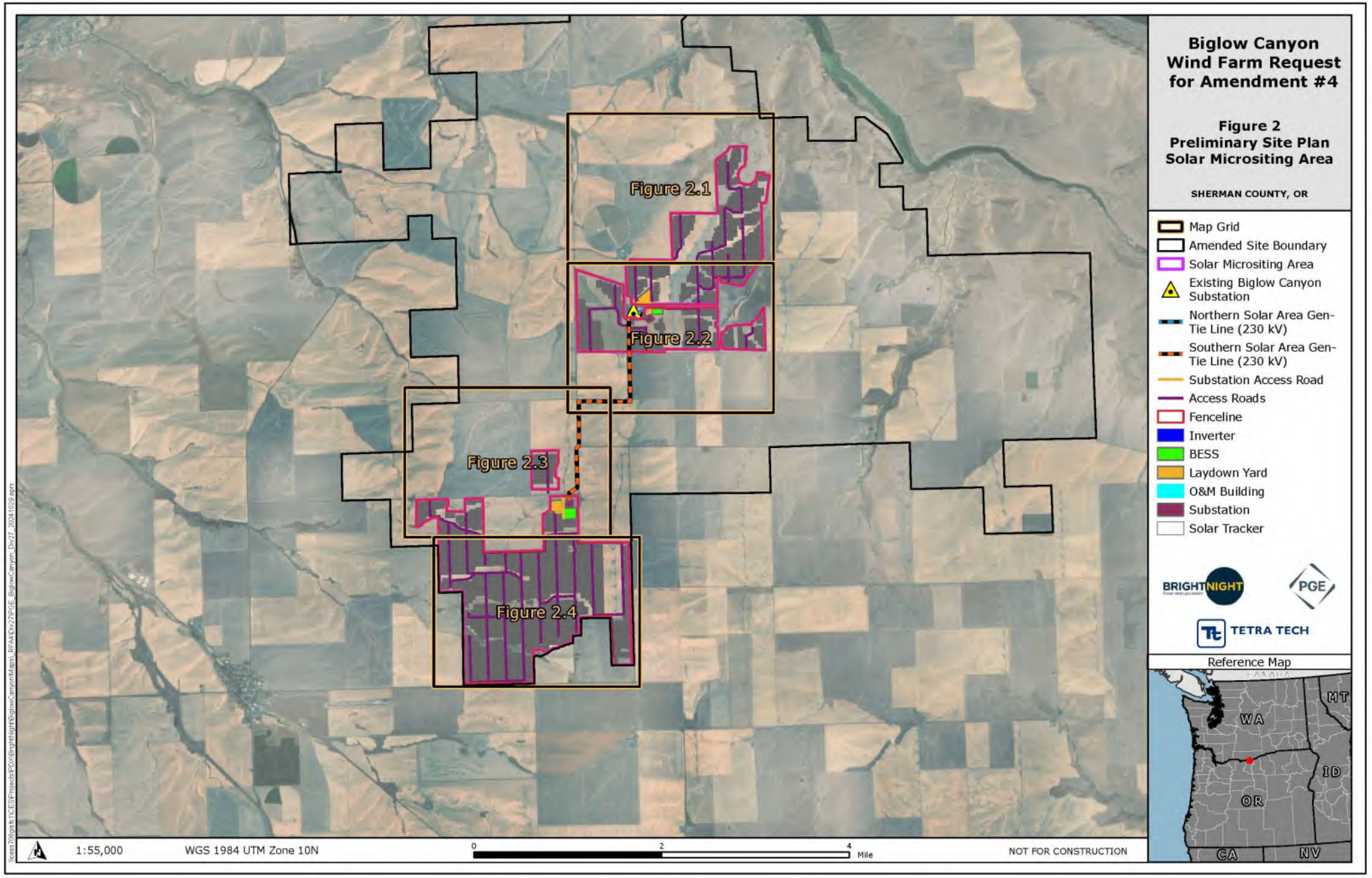
- Construction of phase 1

Q4 2027

- Anticipated construction of phase 2

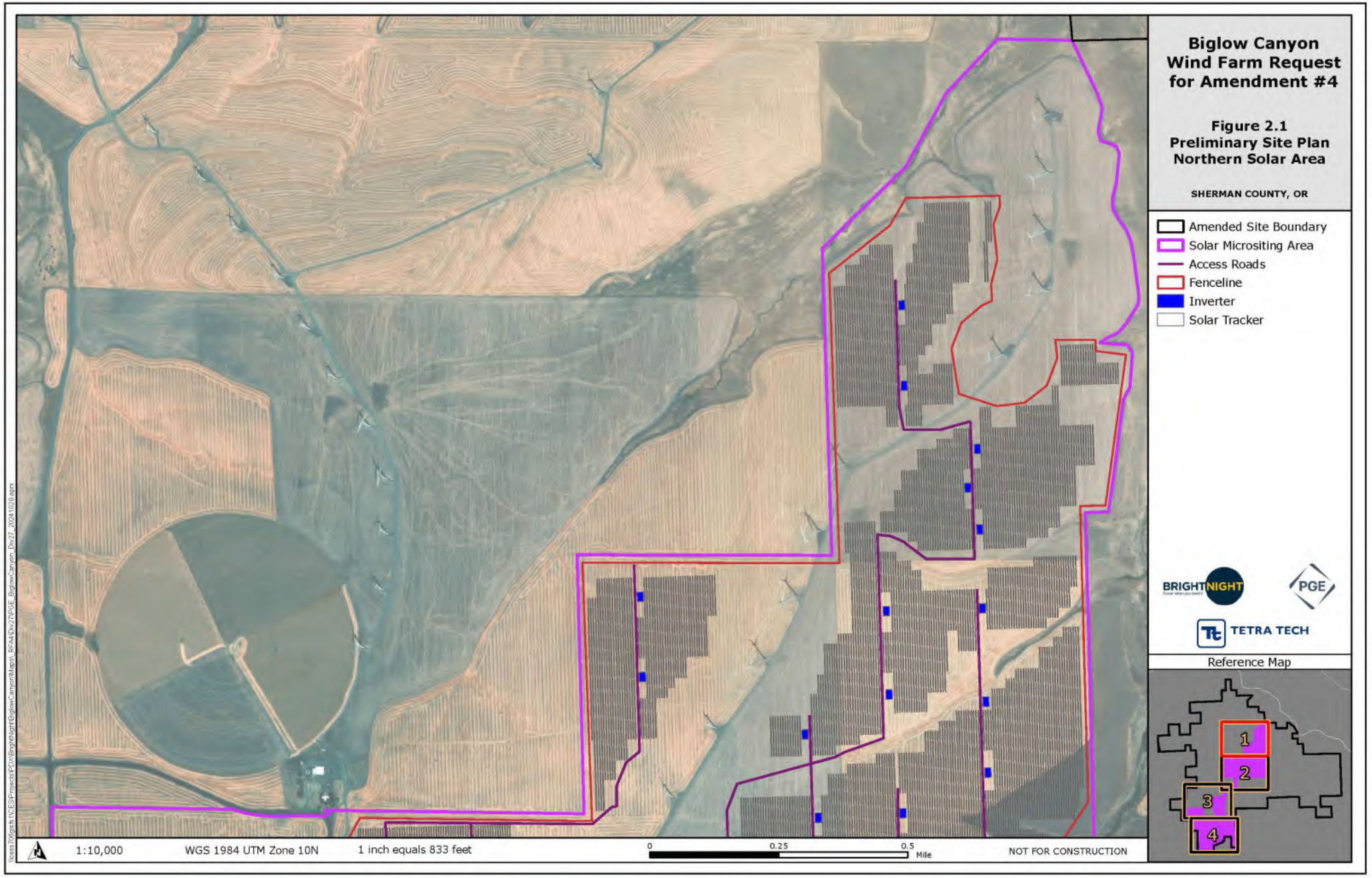
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November
EFSC issues “draft proposed order,” tentative hearing date set



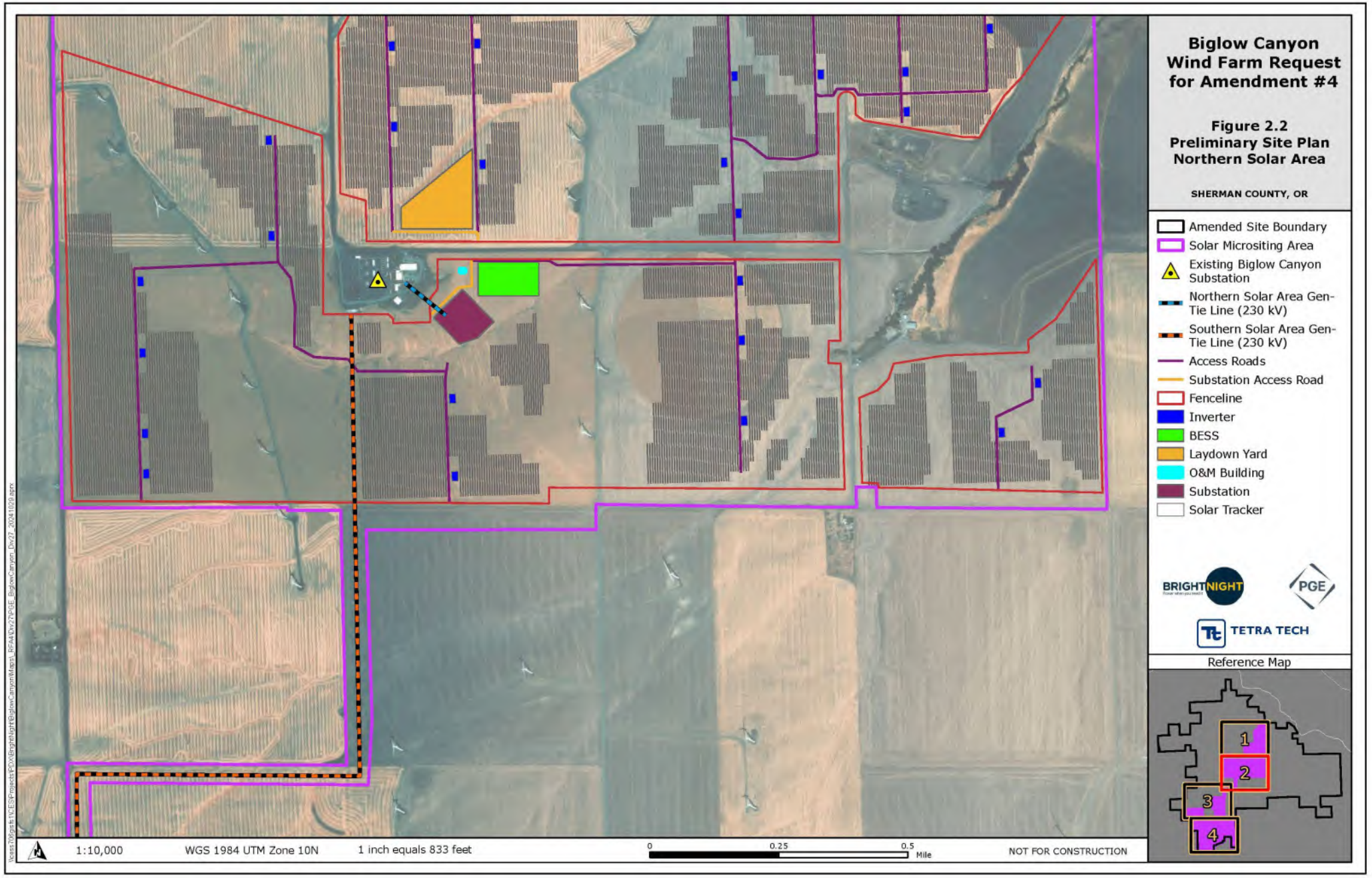
TETRA TECH

Project Description



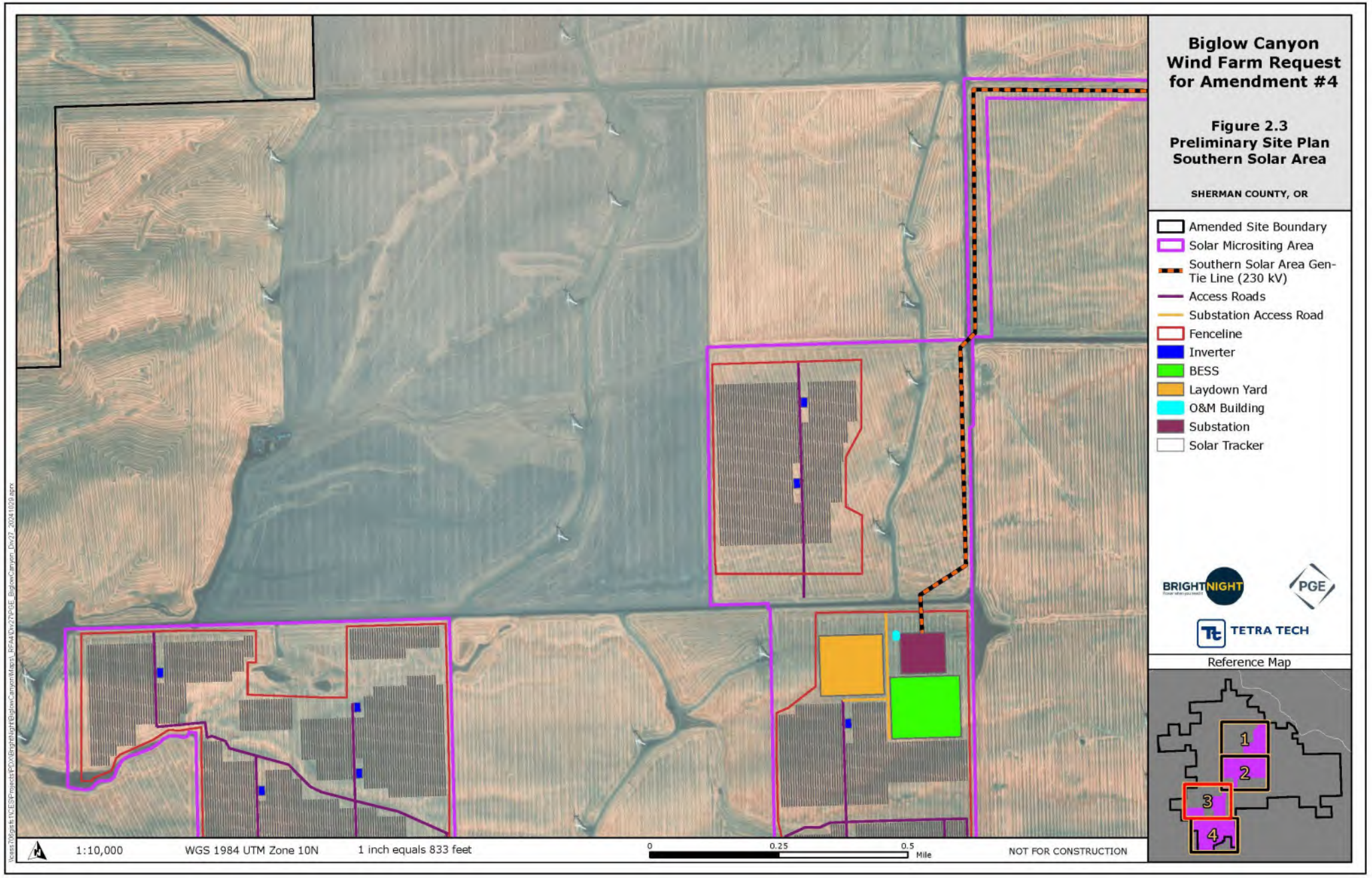
TETRA TECH

Project Description



TETRA TECH

Project Description



TETRA TECH

Project Description



TETRA TECH

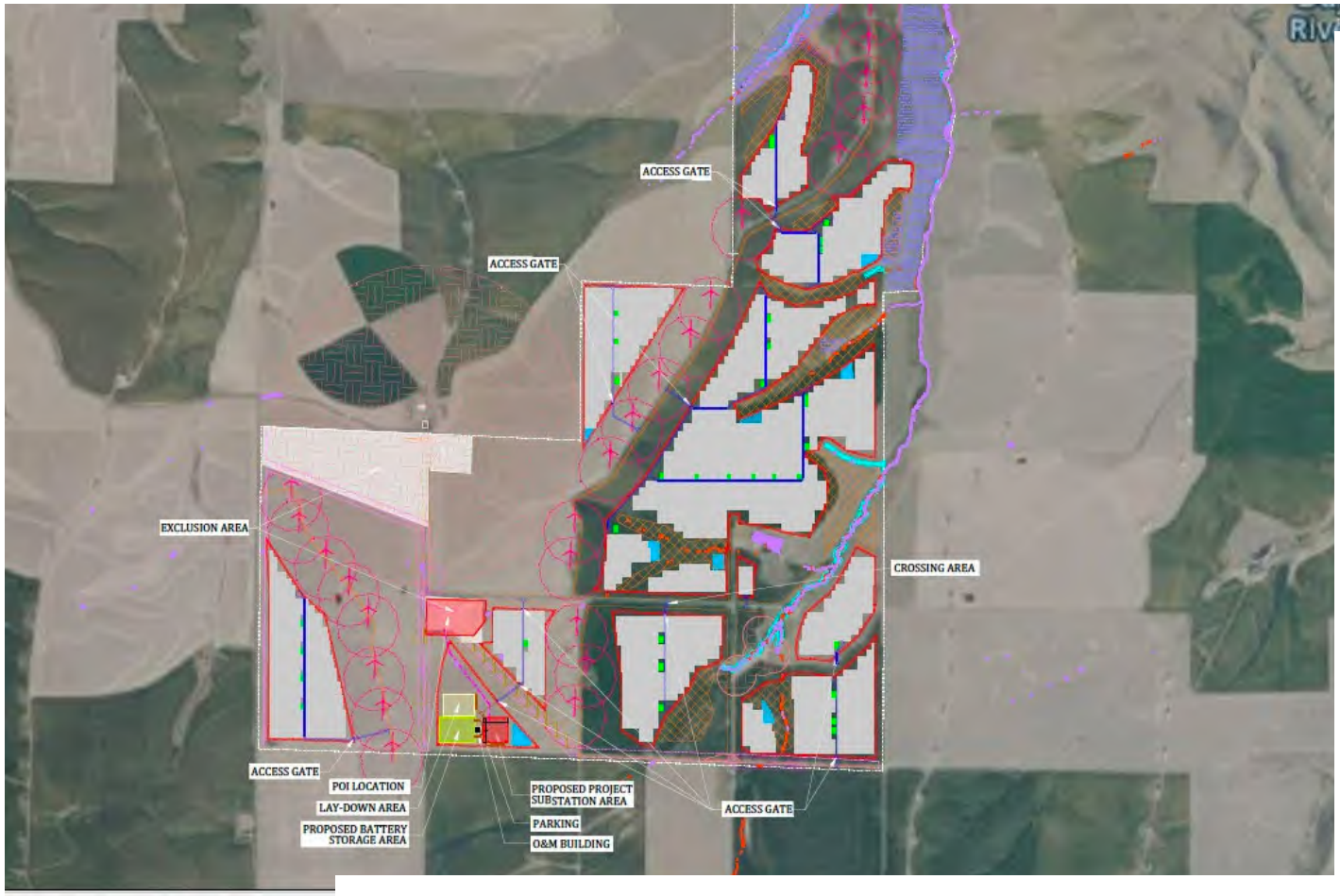
Project Description

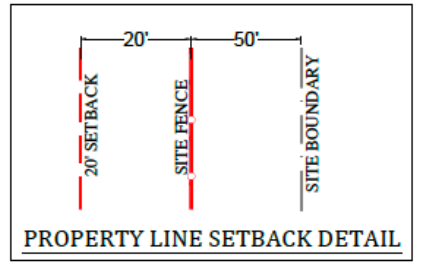
- Engineering

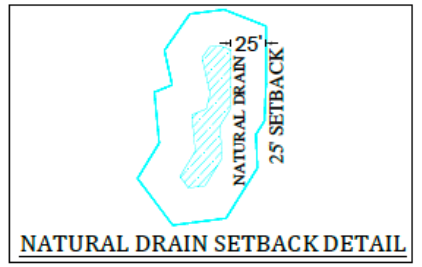
- Ranjith (BESS)
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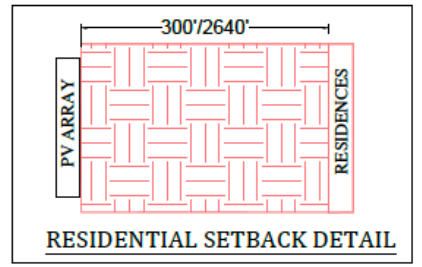
Overall Site Layout

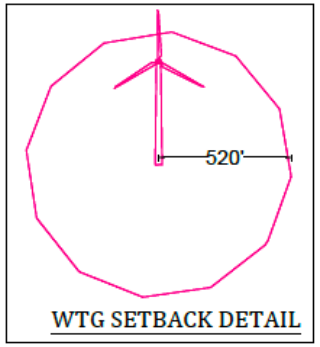
Kathleen/Arturo
to update further

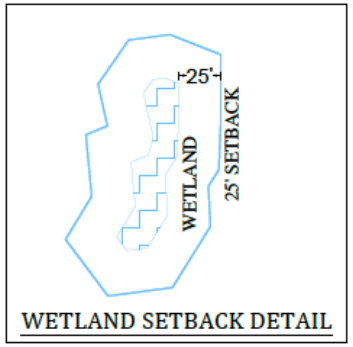


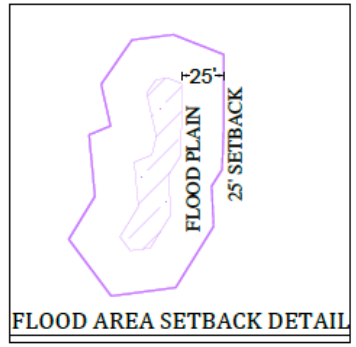


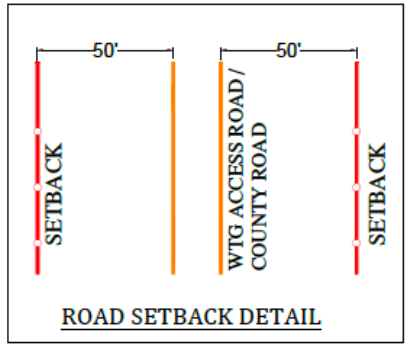








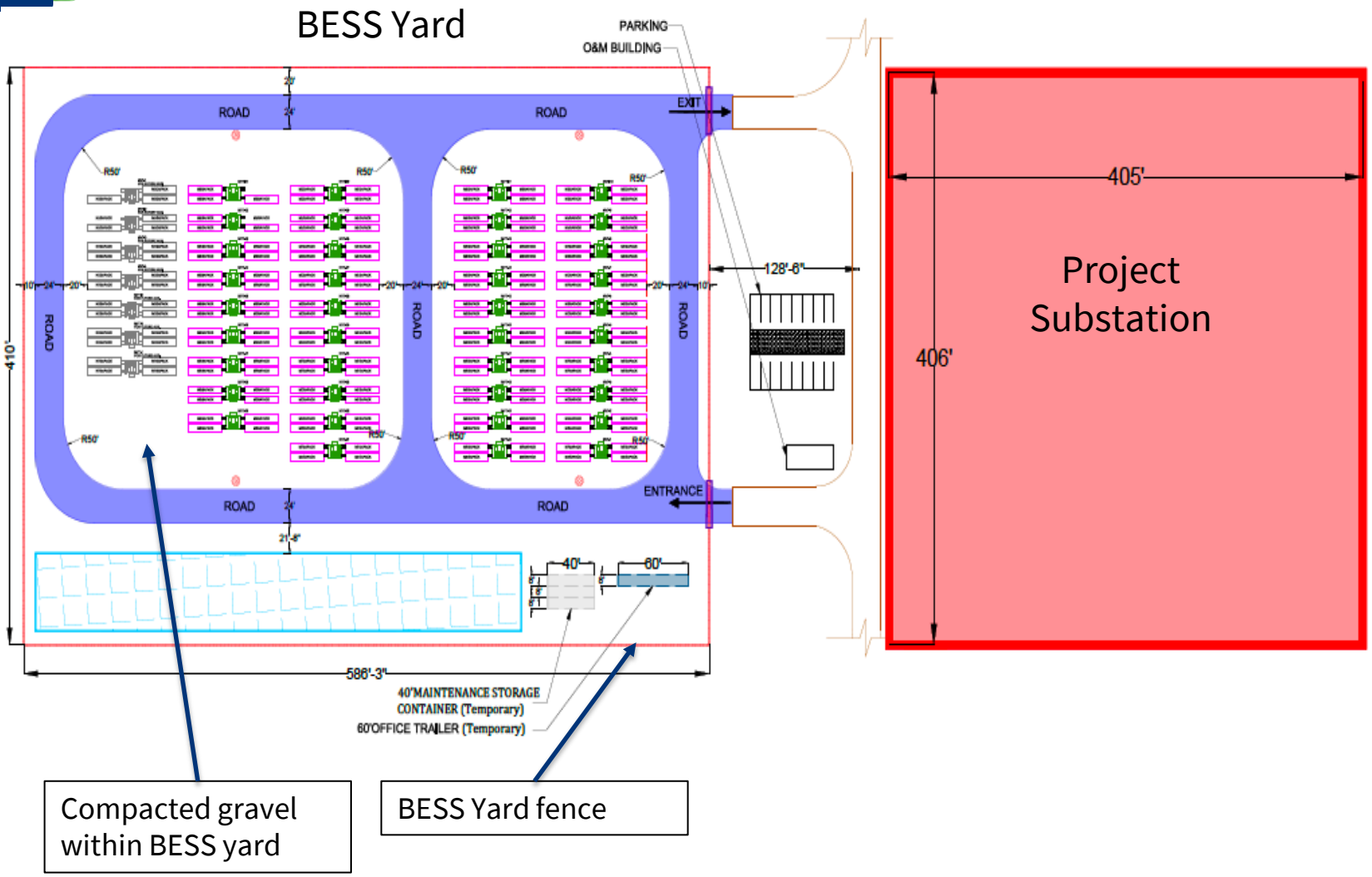




Add solar (expected component)

Arturo to update

BESS Site Layout and General Arrangement



- Project Specifications - 125MW / 500 MWh BESS coupled to 125MW PV
- Equipment Clearances:
  - Minimum 8’ clearance between front faces of battery enclosures for O&M access and UL 9540A fire propagation prevention guidelines
  - Minimum 10’ clearance between side faces of battery enclosures
- Access Roads
  - 24’ interior access roads and perimeter road for firetruck access
  - 50’ internal turning radius
- Minimum 10’ setback from fence to BESS yard perimeter road

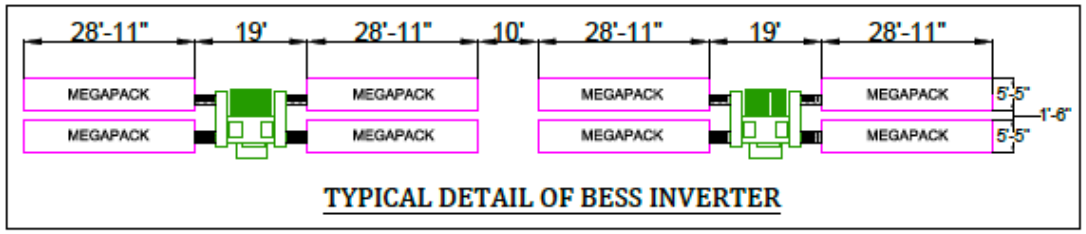
BESS Equipment Details



- Manufacturer and Model – Tesla Megapack 2XL
- Fully integrated AC battery enclosure with battery modules, string inverters, thermal management system and fire safety systems
- Proprietary fire detection and suppression system
- Over 14 GWh in operation
- Proposed Equipment Quantities
  - Initial Install – 154 Megapacks and 39 Medium Voltage Transformers
  - Future Augmentation – 29 Megapacks and 7 Medium Voltage Transformers
  - Medium Voltage Transformers – 39
  - Note that equipment quantities could change as design progresses

Equipment Specifications:

- Mechanical
  - IP66/ NEMA 3R
  - L x D x H - 8.8m x 1.6m x 2.7m
  - 84,000 lbs
  - Operating Temperature Range: -30C to 50C
- Electrical
  - Output voltage: 480V AC 3 phase
  - Power Rating: 979 kW
  - Energy Rating: 3916 kWh
- Codes and Certifications
  - System – UL 9540, UL 9540A, UL 1973, UL 1741, IEC 62619, IEEE1547
  - Battery Cells – UL 1642



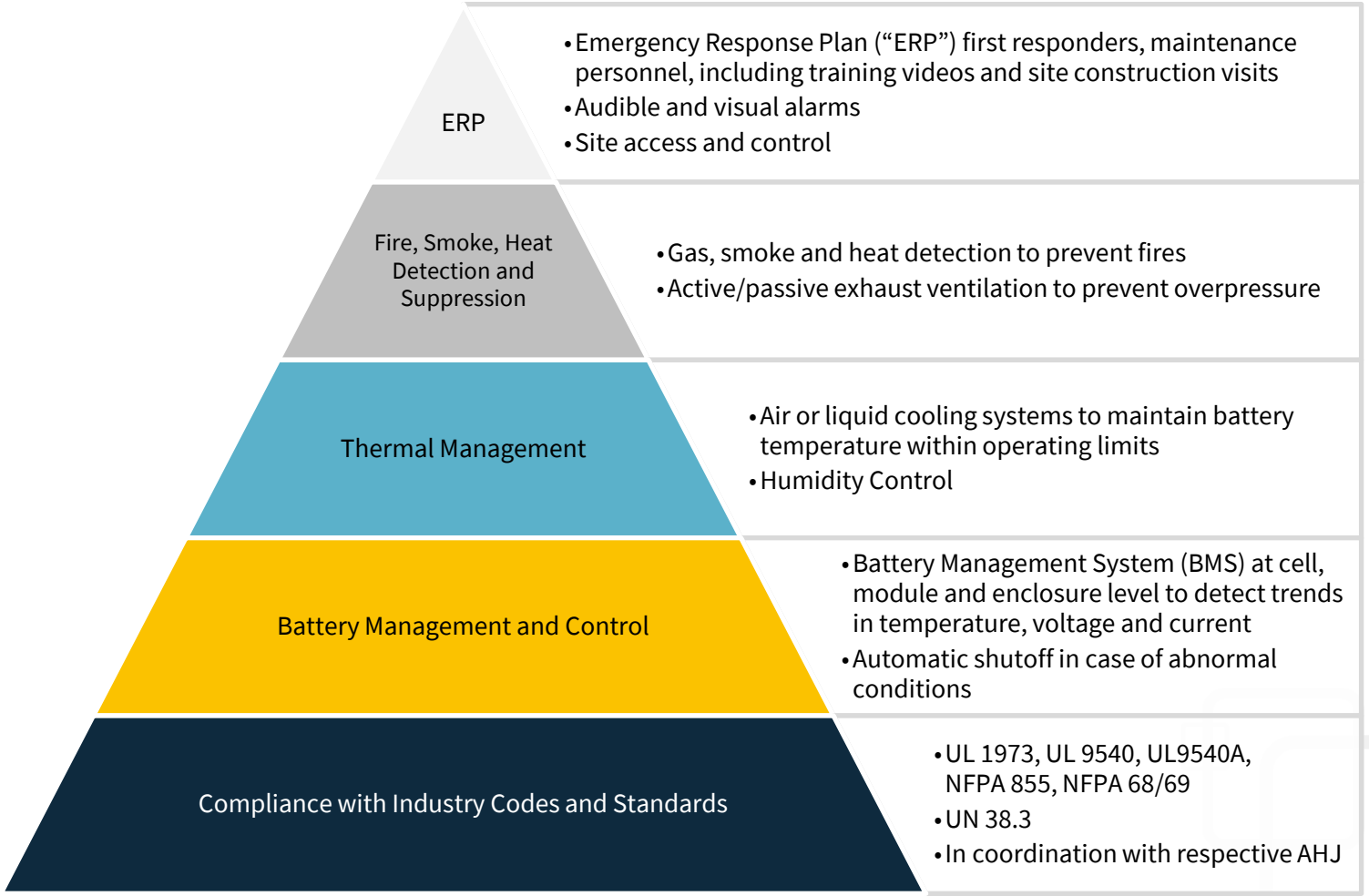
TYPICAL DETAIL OF BESS INVERTER

- Safety & Emergency Response
- Kathleen + Coffman

BrightNight ensures safety at every level of design and operation

Foundations of BrightNight's Safety Program

- Work closely with customer design and operations teams to exceed customer's safety expectations
- Community engagement
- Rigid procurement and contracting standards with Suppliers, EPCs and Integrators
- In-depth safety review at every phase of project design
- Robust project execution process that considers safety from Cradle to Grave (design, engineering, testing, installation, commissioning, operation, service and disposal)
- 24/7 visibility to personnel, equipment and environment safety, planned PMs and Service during project operation
- Continuous learning through education, training, communication and continuous improvement process



Coffman Energy Storage Experience

TETRA TECH

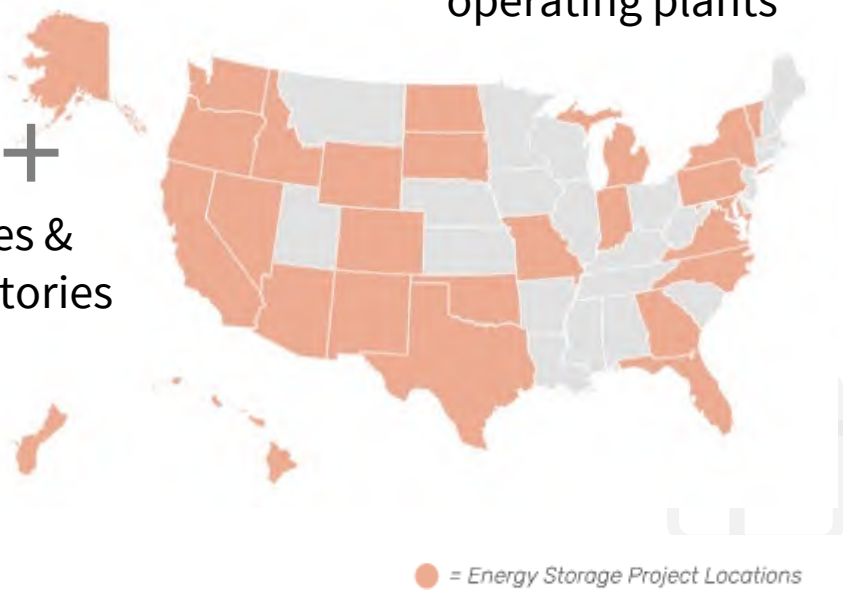
- Supporting developers, EPCs, utilities, and OEMs
- At all stages of the project life cycle
  - CUP application, permitting, utility interface
  - Configurational design, Third Party Review
  - 30-60-90-IFC Construction Documentation
  - Fab Shop Inspections / SAT / Commissioning
- Experience with all types of energy storage
  - Lithium-ion Battery Storage
  - Flow Batteries / Metal-air / Non-Lithium
  - Gravity Systems, Flywheel
  - Compressed Air (CAES)
  - Thermal Energy Storage (TES)
- Services: Engineer of Record, OE, Third Party Review
- Containers, Buildings, Custom Enclosures

150+
currently active projects

350+
total projects

9.5 GWh
operating plants

32+
states & territories



Fire Prevention

BrightNight plans to use the “Tesla Megapack” battery system at the Biglow Solar and Storage Project. This industry-leading equipment features exceptional safety and prevention technology:

Noise

The Megapack is self-contained and operational noise levels are designed to minimize noise pollution. The Greenwater project will abide by all local noise ordinances.

Emissions

In the unlikely event of a fire, emissions are extremely limited. Any emissions would originate from the plastic enclosures, not the batteries. Concentrations are so small there would would be no negative impact to air quality in the surrounding area

Proactive Fire Control

Megapack is designed to prevent battery fires and be resilient if they occur. Fires are extremely rare. Testing has shown that if one occurs, Megapack safety systems can control and contain a fire within the unit.

Containment

Each Megapack unit is self-contained. This important safety feature helps prevent potential soil or water contamination and prevents the spread of an unlikely fire event.

Water Runoff

Megapacks are designed to make it difficult for water to come in contact with the enclosed battery cells.



Lithium Batteries





Tesla Megapack Fire Protection Systems

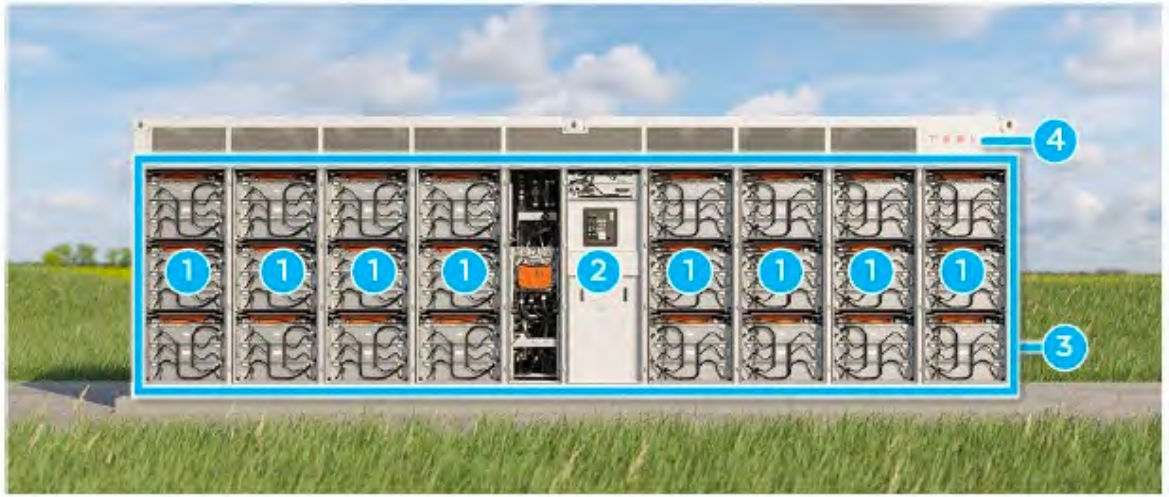
BESS projects are safe for the environment. Self contained systems with no emissions during normal operation.

24/7 Monitoring. Megapack installations are remotely monitored by Tesla 24/7, allowing for early detection, diagnosis and troubleshooting of system errors while providing live support to first responders when needed.

Proactive Fire Control Megapack is designed to prevent battery fires and be resilient if they occur. Fires are extremely rare. Testing shows that if one occurs, Megapack safety systems can control and contain a fire within the unit. Typically contained to a single module with no visible flames on the exterior.

Recyclable at End of Life. At the end of the system's lifetime BrighNight will safely remove the battery enclosures and recycle the majority of components.





1. Battery modules with active and passive fuses – externally serviceable
2. Touch-safe Customer Interface Bay
3. Non-walk-in IP66 enclosure and deflagration mitigation
4. Thermal roof with overpressure vents

UL Listed Equipment. Equipment is fully test and listed by the UL testing company for the products in your house.

Fire Event Gas Byproducts. Gases resulting from a Megapack fire are similar to those of a typical structure fire: hydrogen, carbon dioxide, carbon monoxide and methane. Expected fire size is less than a house or vehicle fire.

Fire Event Water Runoff Megapack units are designed to make it difficult for water to come in contact with the enclosed battery cells. Fire water runoff testing has shown no harmful levels of contaminants. (Note: Tesla's Emergency Response Guide recommends no direct water application to a Megapack fire.)

Discussion

- Emergency Response Plan (finalize prior to construction)
- Construction Wildfire Mitigation Plan (finalize prior to construction)
- Operations Wildfire Mitigation Plan (finalize prior to operations)

Attachment B: Memo – Effects of Solar Energy Development on Vegetation and Soils

TETRA TECH

Memo

To:	Kathleen Campanella
Cc:	Maribeth Sawchuk
From:	Anjali Manoj, GIT (Tetra Tech); Kiana Ziola (Tetra Tech)
Date:	July 2, 2025
Subject:	Effects of Solar Energy Facilities Development on Vegetation and Soils

Several research publications were reviewed to determine the impacts of the development of solar energy facilities to the vegetation and soils at these sites. A specific emphasis was given to impacts experienced in arid grassland and shrubland type environments and the impacts were primarily compared to a pre-existing agricultural land use context as these are the typical scenarios applicable to the most solar energy facilities in Washington and Oregon.

Per Natural Resource Conservation Service published data about soil health in the Inland Northwest, in areas dominated by agriculture, especially monoculture crops like wheat, the soils typically have low organic matter, are depleted of nutrients, and have reduced water retention capacity due to the deteriorated soil structure (NRCS 2025). Repeated tillage combined with the shallow rooting depth of crops like wheat when compared to native plants often results in highly compacted layers at the tillage depth and interruptions to natural nutrient cycling processes. These are results Tetra Tech has consistently seen during soil monitoring at various renewable energy sites across eastern Washington and Oregon. The dominant monoculture crops in these regions also implies reduced vegetation diversity as compared to the native grassland and shrubland ecosystems that historically stood in the place of these agricultural lands. Therefore, multifunctional land uses such as the conversion to solar energy facilities have the potential to improve the provision of a variety of ecosystem services (Walston et al, 2021). This is especially true when the solar energy infrastructure in these facilities is interspersed with native vegetation between the photovoltaic (PV) arrays.

In the case of when pre-existing agricultural lands are converted to solar energy facilities with native grassland and shrubland vegetation interspersed, most research indicate that vegetation and soils improve on numerous metrics primarily due to the effect of the PV panels. PV panels favor the creation of heterogeneous microhabitats with lower air temperatures, lower evapotranspiration rates, and higher soil water content as a result of shading. Additionally, the PV panels create surface roughness that slow down wind speed and therefore add protection to vulnerable soils from wind erosion. These conditions can be beneficial to native plants that are seeded to establish in between the PV panels as they provide a better scenario for plant growth, especially in the initial stages of the vegetation efforts (Liu et al, 2019). When native vegetation establishes, the roots penetrate deeper into the soil as compared to crops like wheat. This serves to protect the soils better from erosion by wind and water and allows nutrients to be cycled in the soils to greater depths. Native grasslands and shrublands also feature increased litter that is protected from wind erosion. This further helps in improving soil structure, soil organic matter content, nutrient levels, and subsequently, the ability of the soil to sequester carbon (Liu et al, 2019; Lambert et al, 2021). The increased biodiversity through the re-establishment of native grassland and shrubland vegetation provides some landscape level benefits as well including improved pollinator supply which can benefit agriculture in the surrounding areas (Walston et al, 2019).

Research also points to how the development of solar energy facilities can have some disadvantages. For vegetation seeking to establish under or within the shade radius of the PV panels, the PV panels will intercept sunlight and impact the amount of solar radiation available to plants for photosynthesis in these areas (Sarr et al, 2023). As a result, vegetation communities may struggle to take hold and establish around the panels. The consequence of this is that the

growth of dominant plant species may be inhibited while subdominant species and weeds may take over (Gómez-Catasús et al, 2024). Another likely negative effect of the PV panels noted by some research is the alteration of the local distribution of precipitation. During precipitation, the areas under the panel receive lesser water inputs while areas along the edges of the panels may receive much high-water inputs from the runoff of the PV panels. This effect is only in the period immediately post precipitation and eventually stabilizes between all areas around the panels as the excess water received in the runoff areas of the panels is made up for by the decreased water loss from evaporation experienced under the panels from shading (Gómez-Catasús et al, 2024). Another concern from the development of solar energy facilities is compaction of soils, especially during construction. This is a well-known potential impact in anticipation of which several best management practices, monitoring programs, and adaptive management measures are designed and implemented under the guidance of appropriate authorities ahead of beginning any construction activities of these facilities. Ultimately, the potential disadvantages posed by the development of solar facilities can be mitigated and prevented by a large extent. The ability of the development of solar energy facilities to ameliorate vegetation and soil conditions is dependent on the successful implementation of revegetation efforts post the development of solar energy facilities combined with effective soil protection and reclamation measures.

While the points noted above are primarily investigating the case of agricultural fields that are converted to solar energy facilities with native grasslands and/shrublands interspersed, they are similarly applicable to the case of agricultural fields that are converted to solar energy facilities with agriculture interspersed (Walston et al, 2021). Apart from the shading effect of panels reducing the available area for crop production, there are no significant detriments noted to the crops or the soil from solar energy facilities (Sarr et al, 2023). It is important to note however that the benefits to vegetation and soils noted above will be seen to a much smaller degree due to the nature of crop plants as opposed to native vegetation (Walston et al, 2021).

Overall, research indicates that the development of solar energy facilities serves a net benefit effect to vegetation, soils, and in turn, the ecosystem in the long term by providing an opportunity for the rehabilitation of soils and vegetation that have been affected by agriculture-related interruptions to natural nutrient cycling. When the energy facilities are eventually decommissioned, the improved vegetation communities and soil quality can be a great benefit to continue the establishment of the native grasslands and shrublands or to return the land to agriculture in the future, should the need arise.

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Full Length Article

Modeling the ecosystem services of native vegetation management practices at solar energy facilities in the Midwestern United States

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Solar energy
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Native grassland
Restoration
Vegetation management

ABSTRACT

The increasing pressure on land resources for food and energy production along with efforts to maintain natural systems necessitates the development of compatible land uses that maximize the co-benefits of multiple ecosystem services. One such land sharing opportunity is the restoration and management of native grassland vegetation beneath ground-mounted solar energy facilities, which can both protect biodiversity and restore related ecosystem services. In this paper, we applied the InVEST modeling framework to investigate the potential response of four ecosystem services (carbon storage, pollinator supply, sediment retention, and water retention) to native grassland habitat restoration at 30 solar facilities across the Midwest United States. Compared to pre-solar agricultural land uses, solar-native grassland habitat produced a 3-fold increase in pollinator supply and a 65% increase in carbon storage potential. We also observed increases in sediment and water retention of over 95% and 19%, respectively. We applied these results to project the potential benefits of adoption of native grassland management practices in current and future solar energy buildout scenarios. Our study demonstrates how multifunctional land uses in agriculture-dominated landscapes may improve the provision of a variety of ecosystem services and improve the landscape compatibility of renewable energy and food production.

1. Introduction

Solar photovoltaic (PV) energy technologies have exponentially increased across the globe over the past decade (Kabir et al., 2018; Irsyad et al., 2019). Currently, there are over 33 gigawatts (GW) of ground-based large-scale (>1 MW) solar PV energy production in the U.S. (EIA, 2019a), representing about 1.5% of total U.S. electricity generation in 2018 (EIA, 2019b). The proliferation of large-scale solar energy developments is expected to continue across the U.S. over the next decade. For example, the U.S. Department of Energy's National Renewable Energy Laboratory, through its Standard Scenarios Report, estimates around 200 GW of installed electric capacity among ground-mounted solar facilities by 2040 under its Mid-Case scenario, and more than 500 GW of ground-mounted solar facilities by 2040 under its Low-PV Cost scenario (Cole et al., 2019). Like other forms of energy development, land use represents a major challenge for future solar energy deployment. Ground-based solar energy developments require between 2.5 and 3.5 ha per megawatt (MW) (Ong et al., 2013; Hernandez et al., 2014), and approximately 7500 km^2 of total land will be needed to meet 2030 projected solar energy production (Hartmann et al., 2016), roughly the combined size of the states of Delaware and Rhode Island.

Given their large land requirements, questions about the sustainability of solar energy developments have emerged in terms of their compatibility with other land uses such as agriculture (Moore-O'Leary et al., 2017; Hernandez et al., 2019). Ground-based solar energy developments are increasing in agricultural landscapes, due in large part to the siting of utility-scale solar energy developments on former agricultural fields (Adelaja et al., 2010; Adeh et al., 2019). Croplands are generally flat, open, and relatively undeveloped, making them ideal locations for solar energy development (Adeh et al., 2019). This pattern of conversion from agriculture to solar energy development can represent a land use tradeoff between food production and renewable energy production (e.g., Krishnan and Pearce, 2018). As the pressure intensifies on land resources for energy and food production, greater emphasis has been placed on solutions that maximize mutual benefits of multiple

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ecosystem services. Recent approaches have suggested the integration of solar energy with food production, biodiversity conservation, and other ecosystem services (i.e., the energy-food-ecology nexus; Moore-O'Leary et al., 2017; Hernandez et al., 2019). For example, the co-location of solar energy and agriculture, often termed as "agrivoltaic systems", could improve the land-use potential of solar sites for energy and food production (Ravi et al., 2016; Dinesh and Pearce, 2016; Hoffacker et al., 2017; Barron-Gafford et al., 2019). In one study, Barron-Gafford et al. (2019) found that shading by solar PV arrays benefitted the production of crops such as Chiltepin peppers (*Capsicum annuum var. glabriusculum*), jalapenos (*C. annuum* var. *annuum*), and tomatoes (*Solanum lycopersicum var. cerasiforme*) by increasing yields and reducing water requirements while also creating cooler microclimate conditions that improved solar energy production.

Other research surrounding the energy-food-ecology nexus of solar energy has focused on the restoration of native grassland vegetation at ground-mounted solar facilities ("solar-native vegetation") to improve biodiversity and other ecosystem services such as pollination of adjacent croplands (Moore-O'Leary et al., 2017; Walston et al., 2018; Hernandez et al., 2019). In the United States, this approach has focused on vegetation management efforts at solar facilities aimed at establishing native grassland vegetation, such as milkweed (*Asclepias* spp.), native forbs and wildflowers, and other pollinator-friendly vegetation, either among the solar PV arrays or elsewhere within the solar facility footprint area, that attract and support native insect pollinators and other beneficial insect predators by providing food resources, refugia, and nesting habitat. Highlighting the potential significance of this approach, recent research found that over 3500 km^2 of agricultural land near existing solar energy facilities in the U.S. may benefit from increased pollination services through the establishment of solar-native vegetation (Walston et al., 2018).

Conventional ground management approaches at solar facilities often involve the establishment and management of low-growing turfgrass (Walston et al., 2018). While turfgrass provides some ecosystem service value for biodiversity and soil and water control, shifting to native grassland management practices at these locations has the potential to improve the ecosystem services potential of solar energy facilities. Compared to conventional turfgrass approaches, native grassland vegetation may improve ecosystem services related to biodiversity, carbon storage, water conservation, soil retention, and pollination of nearby croplands. Favorable microclimate conditions created by solar PV arrays, such as lower temperatures and greater soil moisture, can improve the performance of native grasses, which increases aboveground biomass and related carbon sequestration (Armstrong et al., 2016; Adeh et al., 2018). In addition, native grasses and forbs typically have deeper root systems than row crop agriculture and turfgrass (Schenk and Jackson, 2002), with root depths of some native grassland species exceeding 2–5 m (Packard and Mutel, 1997). Deeper root systems create the potential for improved soil stabilization and reduced water runoff (Hernandez-Santana et al., 2013). To date, however, these solar-native vegetation ecosystem service benefits have not been adequately quantified or evaluated in a common framework that allows for an understanding of a suite of ecosystem services. Thus, to build upon the previous efforts to understand the ecosystem service benefits of solar-native vegetation, this paper focuses on modeling the potential supply of ecosystem services resulting from different vegetation management approaches at solar energy facilities. Specifically, we were interested in addressing the following question: *What are the multiple ecosystem service benefits of solar-native vegetation compared to pre-existing land uses and other types of vegetation management practices at solar facilities*? To address this question, we conducted a geospatial land use change assessment for solar energy facilities in the Midwest and we developed spatially-explicit models at a regional scale aimed at quantifying differences in the following ecosystem services associated with solar-vegetation management options: pollinator supply, carbon storage, soil retention, and water yield. We then project these results to examine ecosystem service implications of future solar energy development within the region.

2. Methods

2.1. Study area

We examined ecosystem services associated with vegetation management practices at solar energy facilities within the Midwestern region of the United States (Fig. 1). This region is approximately 1.1 million km^2 in size and includes the states of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin. The predominant land use in this region is agriculture (37% of the study area), followed by forest (33%) and grasslands and other herbaceous land cover types (17%). The climate is humid temperate, with an average annual precipitation of 725 to 1100 mm (USDA, 2019). Average annual minimum and maximum temperatures in the region are −9 degrees Celsius (°C) and 29 °C, respectively (USDA, 2019).

Euro-American settlement and associated agricultural intensification has resulted in the decline of the region's grasslands, a diverse vegetation system that was much more dominant and widespread throughout the region prior to the mid-1800s. For example, over 99% of the tallgrass prairie in Illinois, Indiana, Iowa, Minnesota, and Missouri have been lost primarily due to agricultural expansion (Samson and Knopf, 1994). As such, many of the current terrestrial ecological restoration objectives within the region focus on restoration of native grassland and prairie systems. For solar sites in the Midwest, increasing emphasis has been placed on native grassland restoration among the PV arrays (Clean Energy States Alliance, 2020), which is a more compatible habitat type for solar energy development than other habitat types such as forests or wetlands.

2.2. Identification of solar energy facilities and data preparation

We identified the location of large-scale ground-based solar energy facilities (>1 MW) from the U.S. Energy Information Administration (EIA) for the year 2018 (EIA, 2019). The EIA reports generator-level specific information on electricity production facilities, including latitude and longitude information for facility locations and nameplate electricity capacity (MW). We queried the EIA database to only those sectors that were utility or industrial ground-based facilities (sectors 1 and 2). By doing so, we omitted large commercial rooftop facilities from our study. We then used a Geographic Information System (GIS; ArcGIS version 10.6.1) to map the approximate point location of each facility using the latitude and longitude coordinates reported by the EIA. We overlaid these points with the latest online World Imagery basemap within ArcGIS (ESRI, 2019) and digitized the footprint boundaries of all solar sites observable in the imagery. Solar facility polygons were drawn to include the PV panel area plus other areas observable within the fenced area of the facility (e.g., disturbed soil, laydown areas, operations facilities). Most of the World Imagery available for the region was obtained in 2018. We then calculated the size (ha) of each digitized solar facility's footprint polygon. For these facilities, we correlated facility electric capacity (MW) and footprint size (ha) and we used this relationship to estimate the footprint size for solar facilities that were not observed or incomplete in the satellite imagery. The 2018 list of all solar energy facilities in the Midwest, along with corresponding footprint sizes, is provided in Supplement 1.

We conducted a land use change assessment to determine what percentage of solar facilities in the Midwest were developed on former agricultural fields or other land use-land cover (LULC) types. We performed this assessment only for those solar facility footprints that could be delineated in a GIS. Because large-scale solar energy development largely did not appear in the Midwest until 2012, we used 2010 LANDFIRE Existing Vegetation Types (http://www.landfire.gov/evt.php) as the pre-solar land use dataset and determined the composition

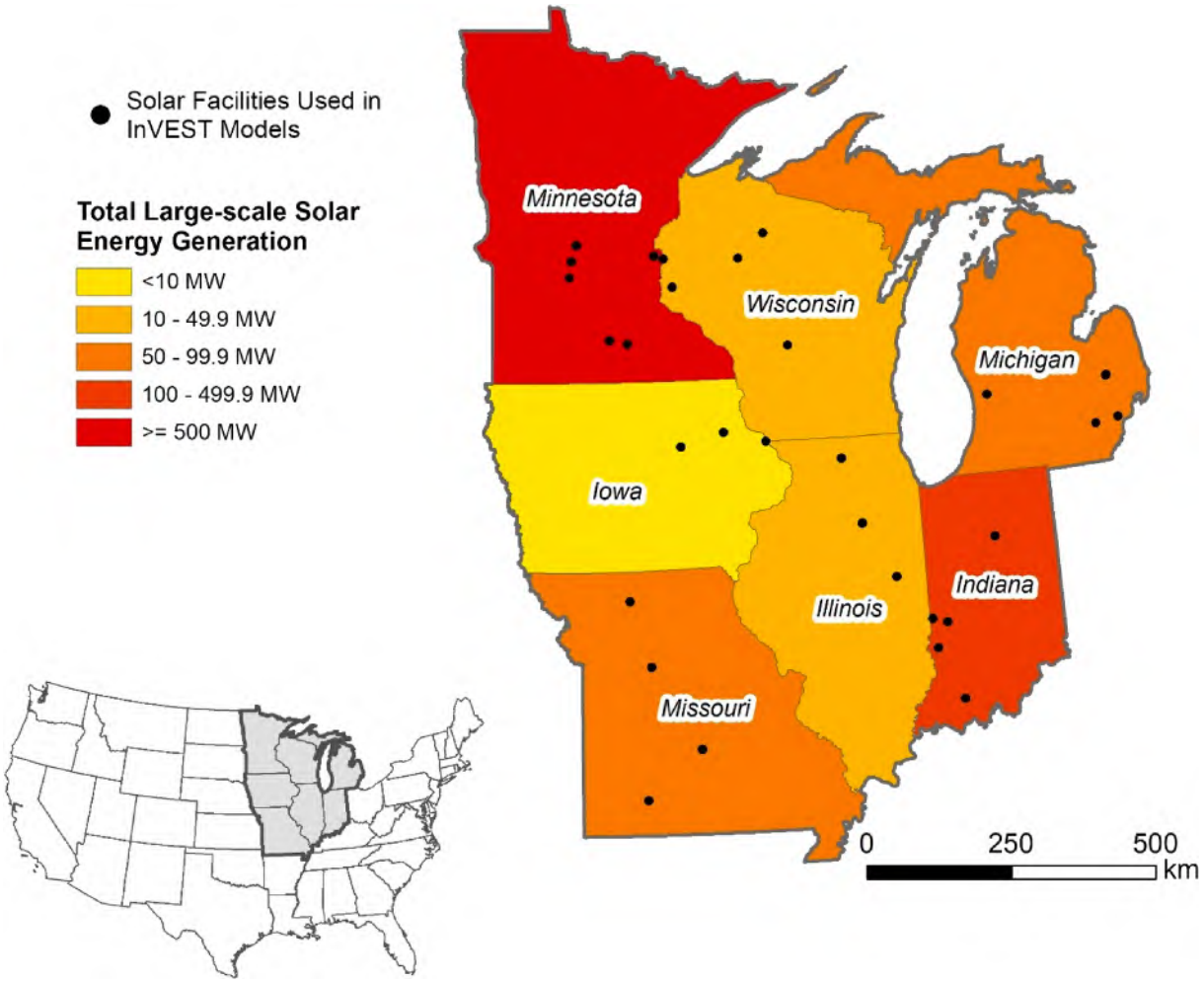


Fig. 1. Total 2018 large-scale (>1 MW) solar energy generation in States of the Midwest region of the United States (source: EIA, 2019). Locations of the thirty solar energy facilities used in InVEST modeling are shown in black.

of 2010 land use types intersecting the solar facility footprints as the measure of LULC change (see Supplement 1).

2.3. Scenarios

To determine the ecosystem services among vegetation management activities at mapped solar energy facilities, we designed three land use scenarios for the solar energy facility footprints: an agriculture scenario (the baseline "pre-solar development" land use) and two solar energy development scenarios – a solar-turfgrass scenario and a solar-native grassland scenario (Fig. 2). Because we assumed the majority of solar facilities in the region were previously under corn-soybean agricultural production (Supplement 1), we replaced all land uses in the solar footprint polygons with agriculture to represent the pre-solar land use. We considered this scenario to be the baseline scenario for comparison. The second scenario we evaluated was a solar-turfgrass vegetation scenario in which we assumed the sodding of cool-season turfgrass within the solar facility. This scenario also involves regular vegetation maintenance at the solar facility such as active mowing and herbicide applications to minimize or prohibit the growth of vegetation (<0.3 m high) within the solar facility footprint. Turfgrass is a common vegetation management practice at solar facilities and this scenario was considered to be the business as usual ("BAU") scenario for operating solar facilities. The third scenario we evaluated was a solar-native grassland scenario in which we assumed the intentional establishment of native prairie grasses and forbs in the solar facility footprint that provide forage and nesting habitat for native insect pollinators. Compared to the turfgrass scenario, the solar-native grassland scenario involves management activities that allow the vegetation to flower and reach heights up to 1 m within the solar PV arrays (the maximum height typically allowed at solar PV arrays to avoid shading of the panels). Because native grasses and forbs typically have deeper root systems than turfgrass (Schenk and Jackson, 2002), we assumed greater above- and below-ground vegetation biomass under the solar-native grassland scenario compared to the solar-turfgrass scenario.

2.4. Modeling framework

We used a multiple service model called Integrated Valuation of Environmental Services and Tradeoffs (InVEST, version 3.6; Sharp et al., 2018) to evaluate ecosystem services under each of the three land use scenarios at the Midwest solar energy facilities. The InVEST suite of tools has been developed to assist decision makers in comparing the impacts of different land use scenarios on the provision of ecosystem services. To our knowledge, this is the first application of InVEST to examine ecosystem service response to solar energy land uses. We used the following four existing InVEST models: Pollinator Model (for pollinator habitat quality), Carbon Storage Model, Sediment Delivery Ratio (SDR) Model (for soil retention), and Water Yield Model (for water retention). A detailed description of our modeling methods and parameters can be found in Supplement 2. Each of these InVEST models incorporate spatial datasets on land use-land cover (LULC) and some of them use elevation,

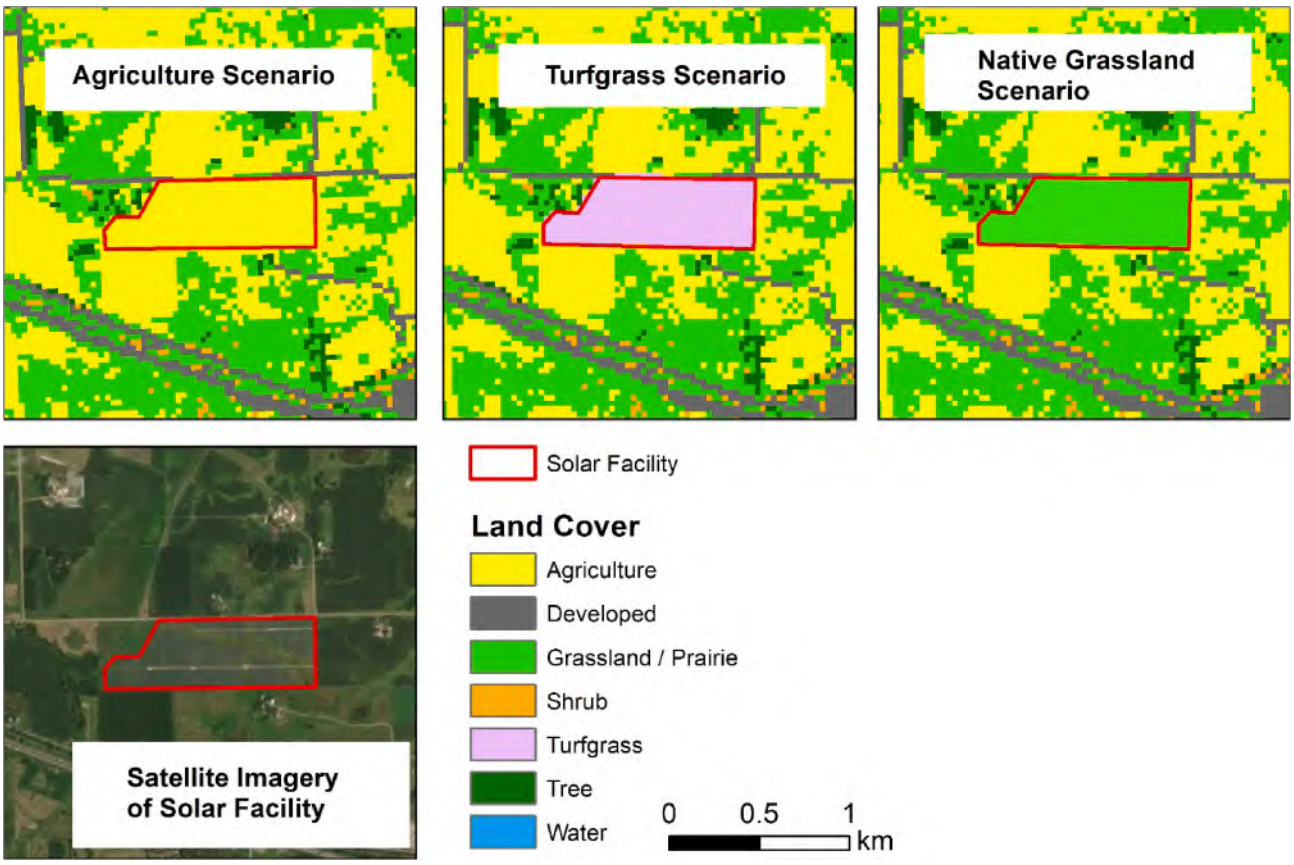


Fig. 2. Vegetation scenarios evaluated in this study. The agriculture scenario represents the pre-solar land use.

rainfall, and soil and vegetation properties, along with tabular biophysical parameters, to conduct spatially-explicit assessments of ecosystem services. The spatial datasets used in the models are also described in Supplement 2.

For this LULC dataset, we used a 30 m raster dataset of vegetated land cover from the 2014 LandFire Program (Existing Vegetation Types; http://www.landfire.gov/evt.php). We initially summarized the LULC map across the entire Midwest region into seven broad LULC classifications based on vegetation life form: developed, agriculture, barren or sparsely vegetated, grassland, shrubland, forested, and water and wetlands. We then updated the LULC map to create an eighth LULC classification representing solar energy facility developments using the footprint polygons delineated from satellite imagery. We selected a total of 30 solar facility footprint polygons, with a minimum of 3 footprints in each state, to update the LULC raster dataset (Fig. 1). This LULC update was performed by overlaying the facility footprint polygons on the initial LULC map and reclassifying the underlying pixels of the LULC map to a unique solar-specific LULC code.

All of the InVEST models also require tabular biophysical parameters to relate land cover types from the LULC map to the individual ecosystem service processes. We reviewed the existing literature to identify studies utilizing these InVEST models in the United States to parameterize each model. Surrogate vegetation and LULC types were used to identify the biophysical parameters to include in each scenario (Table 1).

We used the surrogate LULC types to review existing literature from previous InVEST modeling studies in the United States and summarize the biophysical parameters for each model (Table 2). We ran each model using upper- and lower-bound parameter values based on the 25% and 75% quartile range of values reported in the literature. We used this range to estimate the uncertainty in models and we used the midpoint (average) values in comparing ecosystem services across scenarios. For

Table 1
Land use-land cover (LULC) surrogates for the three land use scenarios modeled in this study.

Scenario	Surrogate LULC types
Agriculture (baseline pre-solar land use)	Row crop agriculture LULC types (e.g., corn-soybeans).
Solar-turfgrass	Residential, suburban, and turfgrass LULC types.
Solar-native grassland	Native grassland and prairie LULC types.

all ecosystem service estimates, we focused on the change in the service delivery for the solar-native grassland scenario compared with the solar-turfgrass scenario and the baseline agriculture scenario. For each scenario, we assumed the surrogate vegetation (Table 1) was consistently and uniformly distributed across all solar facilities. We were not able to use InVEST to model the effect of solar panels on these ecosystem services so we assumed this effect to be constant across all three land use scenarios.

The InVEST Carbon Storage Model is a carbon stock estimation model that is explicitly connected to land cover type. This model calculates total carbon storage (Mg C/ha) for each land cover type based on the aggregation of four carbon pools: aboveground carbon density, belowground carbon density, soil organic carbon density, and dead organic matter carbon density (Sharp et al., 2018). We used this model to examine differences in total carbon storage associated with each scenario.

The InVEST Pollinator Model was designed to model and map patterns of pollinator habitat quality and potential pollination service values across landscapes (Sharp et al., 2018). This model utilizes information on floral resource availability (associated with each LULC type), along with tabular inputs on nesting and foraging parameters for individual pollinator species or species groups, to estimate the supply,

Table 2
Biophysical parameters used in the InVEST Models. The range represents the upper- and lower-bound parameter values used in the models

	Carbon storage model[a]	Pollinator model[b]		Sediment (SDR) model[c]	Water yield model[d]	
Scenario	Total carbon storage (Mg C/ha)	Ground nest availability	Floral resource availability	USLE C-factor	Root restricting layer (mm)	Kc
Agriculture	68.0–88.6	0.137–0.213	0.270–0.400	0.30–0.43	775–925	0.55–0.60
Solar-turfgrass	87.0–104.4	0.310–0.530	0.460–0.580	0.03–0.08	775–925	0.65–0.75
Solar-native grassland	108.0–148.1	0.430–0.570	0.675–0.825	0.01–0.03	1250–1750	0.75–0.85

[a] Sources: Grafius et al. (2016); Johnson et al. (2012); Kovacs et al. (2013); Liebman et al. (2013); Polasky et al. (2011); Sharp et al. (2018); Sun et al. (2018).
[b] Sources: Davis et al. (2017); Kennedy et al. (2013); Zhao et al. (2019). Cavity nest availability assumed to be 0 in all scenarios.
[c] Sources: Bai et al. (2019); Chaplin-Kramer et al. (2016); Grafius et al. (2016) Sharp et al. (2018); Sun et al. (2018).
[d] Sources: Bai et al. (2019); Redhead et al. (2016); Sharp et al. (2018). Kc = Plant Evaporation Coefficient.

abundance, and service value of insect pollinators across the landscape. In this study, we used the pollinator supply InVEST output to assess the ability of each scenario vegetation type to support insect pollinators. As described by the InVEST model (Sharp et al., 2018), pollinator supply is a unitless index (between 0 and 1) indicating where pollinators originate on the landscape. For the purpose of comparing the different vegetation scenarios, we used native bumblebees (Family Apidae) and native sweat bees (Family Halictidae) as the modeled guilds (Supplement 2).

The InVEST Sediment Delivery Ratio (SDR) Model estimates the overland movement of sediment based on topography, climate, soil, and land cover properties. The SDR model is a spatially-explicit model working at the spatial resolution of the input digital elevation model raster (Sharp et al., 2018). For each pixel, the model computes the amount of annual soil loss from that pixel based on a revised Universal Soil Loss Equation (USLE). It then calculates the SDR, which is the proportion of soil loss that reaches the catchment. Finally, the model uses the USLE and SDR to calculate erosion as total catchment sediment export (tons/ha). Inputs for the SDR model include raster maps for LULC, elevation, rainfall, and soil erodibility, along with tabular biophysical attributes related to sediment retention based on land cover type (Supplement 2). We used this model to estimate the amount of surface soil erosion associated with each vegetation scenario. Because sediment erosion represents a negative impact on the landscape, we considered erosion to be the inverse of a positive ecosystem service – soil retention, or the ability of a modeled vegetation type to retain soil.

The InVEST Water Yield Model calculates the net water yield at pixel-based and watershed scales based on the difference between precipitation and actual evapotranspiration. Actual evapotranspiration is a function of reference evapotranspiration, root restricting layer depth, plant available water content, and land cover type (Sharp et al., 2018). Following the methods described by Bai et al. (2019), we used the Water Yield model as an interim step in quantifying water retention: the ability of the modeled land cover type to intercept water from runoff. Water retention is calculated by subtracting runoff from water yield as follows:

$$WR_{ij} = WY_{ij} - Runoff_{ij}$$

where WR_i is the annual water retention (mm/yr) for pixel i on LULC type j, WY_{ij} is the annual water yield (mm/yr) for pixel i on LULC type j (calculated from InVEST), and $Runoff_{ij}$ is the annual surface runoff (mm/yr) for pixel i on LULC type j. Runoff is a product of annual precipitation and a runoff coefficient for each LULC type based on slope and soil type (Supplement 2). Because most solar energy developments are constructed on low slopes (<10%; Hartmann et al., 2016) and most agricultural areas in the region are loamy soils (Hollinger, 1995), we calculated LULC-specific erosion coefficients based on assumed slope of <10% and loamy soil properties.

2.5. Synthesis

We compared the output from the four InVEST models among the three vegetation scenarios. These comparisons were made on a unit-area basis for the 30 modeled solar energy developments and projected to the current amount of large-scale solar energy development in the Midwest region. We also explored the future potential for these ecosystem services by projecting these results to a future solar energy development scenario. Based on solar energy targets identified from state legislation and energy websites (e.g., Illinois Future Energy Jobs Act [S.B. 2814, 2016]; SEIA, 2019; MISO, 2019), we estimated the total foreseeable potential large-scale solar energy development within the Midwest region in the next 10–15 years (2030–2034). Using a solar land use-MW relationship calculated from delineated existing solar footprints in the region (Supplement 1), we estimated the future aggregate solar footprint size and projected our InVEST model results to this scenario.

3. Results

3.1. Solar energy development

We identified 276 large-scale solar facilities in the Midwest region that were operating in 2018, representing a total nameplate electricity capacity of 1183.8 MW (Supplement 1). The state of Minnesota contained most of the region's solar energy development both in terms of the number of facilities and total electricity capacity (Fig. 1; Table 3). Approximately 59% of the solar facilities and over 62% of the region's solar electricity capacity occurred in Minnesota. The state of Iowa contained the fewest number of solar facilities (n = 5) and the lowest amount of large-scale solar electricity generation (9.2 MW).

We identified and mapped the facility footprints of 192 solar facilities from the ESRI World Imagery. The remaining 84 solar facilities were either incomplete or not yet constructed at the time the satellite imagery was collected. We determined a land use-MW relationship of 3.0 ha per MW for all 192 delineated solar facilities (Supplement 1) and applied this relationship to estimate the footprint sizes for the remaining 84 solar facilities. Using the GIS-derived and estimated solar footprint sizes, we determined the total current footprint size among all solar facilities in the Midwest to be approximately 3416 ha (34.2 km^2).

Table 3
Summary of current (2018) large-scale solar energy development in the Midwest region.[a]

State	Current number of solar facilities	Current total nameplate capacity (MW)	Total current estimated footprint size (ha)[b]
Illinois	6	38.5	86.7
Indiana	60	214.3	574.2
Iowa	5	9.2	15.9
Michigan	13	98.3	250.1
Minnesota	163	741.5	2252.7
Missouri	17	61.1	173.2
Wisconsin	14	20.9	63.2
Regional total	276	1183.8	3416.0

[a] Sources: Data for 2018 solar facility development obtained from EIA (2019).
[b] Estimated total footprint size was based on solar footprint polygons digitized in GIS (for those facilities that could be mapped and located with satellite imagery) a land use relationship of 3.0 ha per MW of nameplate capacity for those facilities that could not be located within satellite imagery (Supplement 1).

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We determined the pre-solar construction land uses by identifying and quantifying the amount of 2010 LULC types within the 192 delineated solar facility footprints. By far, the dominant pre-construction LULC type converted to solar energy was row crop agriculture, comprising 70% of the 2010 LULC types within the solar footprint polygons (Supplement 1). This represents a conversion of approximately 2391 ha (23.9 km^2) of row crop agriculture to current ground-based solar energy development. Other forms of LULC conversion included developed areas (15.0%, 512.4 ha), pasture and hay fields (5.4%, 184.5 ha), and forest and riparian areas (4.5%, 153.7 ha).

3.2. InVEST model results

Ecosystem service model results for the 30 Midwest solar facilities, averaged by state, are presented in Table 4 (see Supplement 2 for more detailed results). Differences in modeled ecosystem service results among scenarios were primarily related to LULC changes. We used the variability in reported biophysical parameter values (Table 2) to calculate the range (and midpoint average) of ecosystem service results under each scenario. We found the patterns of ecosystem service provision among scenarios were consistent for the entire Midwest (Fig. 3). For example, the solar-native grassland scenario retained more water than the solar-turfgrass scenario, which retained more water than the agriculture scenario (solar-native grassland > solar-turfgrass > agriculture). We therefore present remaining results using the regional averages of modeled ecosystem services.

Carbon Storage. On average for the entire Midwest region, the solar-native grassland scenario had a potential carbon storage capacity of 129.3 Mg C/ha, which was 65% and 35% greater than the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Pollinator Supply. On average, the solar-native grassland scenario improved pollinator supply by 3-fold and 30% compared to the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Sediment Export. On average, sediment export under the solar-native grassland scenario was 0.007 tons/ha/year, which was a reduction of over 95% and 77% compared to the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Water Retention. On average, water retention under the solar-native grassland scenario was 885.0 mm/yr, which was 19% and 9.5% greater than the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Table 4
State and Midwest regional average ecosystem service results.

State	Agriculture scenario	Turfgrass scenario	Native grassland scenario
Carbon storage (Mg C*ha^{-1})			
All States	78.3	95.7	129.3
Pollinator supply (unitless index)			
Illinois	0.032	0.071	0.094
Indiana	0.032	0.072	0.094
Iowa	0.032	0.074	0.093
Michigan	0.032	0.076	0.095
Minnesota	0.033	0.074	0.098
Missouri	0.034	0.076	0.101
Wisconsin	0.034	0.079	0.100
Regional average	0.033	0.074	0.096
Sediment export (tons*ha^{-1}*yr^{-1})			
Illinois	7.084	0.536	0.131
Indiana	2.935	0.237	0.062
Iowa	2.165	0.168	0.041
Michigan	0.837	0.065	0.017
Minnesota	3.449	0.258	0.063
Missouri	10.252	1.061	0.263
Wisconsin	0.528	0.039	0.009
Regional average	0.327	0.030	0.007
Water retention (mm*ha^{-1}*yr^{-1})			
Illinois	832.3	910.0	1007.4
Indiana	740.3	812.6	900.1
Iowa	666.8	725.0	791.5
Michigan	733.0	783.2	842.4
Minnesota	748.3	803.2	869.3
Missouri	748.9	820.5	907.3
Wisconsin	762.2	824.7	904.1
Regional average	744.3	808.0	885.0

3.3. Projections to current and future energy scenarios

Using the Midwest regional averages for all calculations, the solar-native grassland scenario for all existing solar facilities (3416 ha) had the potential above- and below-ground carbon storage capacity of 267,473 Mg C, which was 174,216 Mg and 114,778 Mg greater than the agriculture and solar-turfgrass scenarios, respectively (Table 5). The solar-native grassland scenario conserved over 1000 tons more sediment from erosion than the agriculture scenario and 79 tons more sediment than the solar-turfgrass scenario. For existing solar energy developments, the solar-native grassland scenario retained over 4,800,000 m^3 and 2,600,000 m^3 more water than the agriculture and solar-turfgrass scenarios, respectively (Table 5). Because InVEST calculates pollinator supply as a unitless index value, we did not make future projections for pollinator habitat quality.

Based on solar energy targets identified from state legislation and energy websites (e.g., Illinois Future Energy Jobs Act [S.B. 2814, 2016]; SEIA, 2019; MISO, 2019), we conservatively estimated the amount of large-scale solar energy development for a future 2030–2034 time period to be approximately 10,000 MW (10 GW). This represents about 5% of the national 2030 goal for ground-mounted solar set forth by the U.S. Department of Energy (U.S. Department of Energy, 2012). Several Midwestern states such as Minnesota, Illinois, Indiana, and Wisconsin already have a queue of expected solar projects that would collectively reach this level of development in the next 5 years. Based on our calculated regional solar land use estimate of 3.0 ha per MW (Supplement 1), we estimated this future regional solar development footprint to occupy approximately 30,000 ha (300 km^2). If all solar facilities incorporated native grassland vegetation management strategies under this future energy scenario, the total above- and below-ground carbon storage potential of these facilities could exceed 3,800,000 Mg C, which would represent 1,500,000 Mg C and 1000,000 Mg C greater storage potential than agriculture and solar-turfgrass scenarios, respectively (Table 5). Under this future energy scenario, region-wide adoption of solar-native grassland management strategies has the potential to conserve over 9000 tons of sediment loss from erosion annually and retain over 40,000,000 m^3 of water from runoff annually (Table 5).

4. Discussion

Ecosystem services of vegetation management options at solar energy facilities are an emerging field of study. Our study demonstrates how multifunctional land uses in agricultural-dominated landscapes have the potential to improve the provision of a variety of ecosystem services. Numerous studies have demonstrated the effectiveness of native grassland restoration in agricultural landscapes in conserving insect pollinators and restoring important ecosystem services (e.g., Hernandez-Santana et al., 2013; Blaauw and Isaacs, 2014; Schulte et al., 2017). While field studies at solar facilities are currently under way to measure the ecosystem services of different vegetation management options, it will take several years for these field data to become available. To obtain initial estimates, we focused on examining the potential ecosystem services in a spatially-explicit manner using secondary data sources and scaled our model results to regional estimates. Our models included input parameters from previous studies in the U.S. that evaluated ecosystem service tradeoffs among various land uses, including

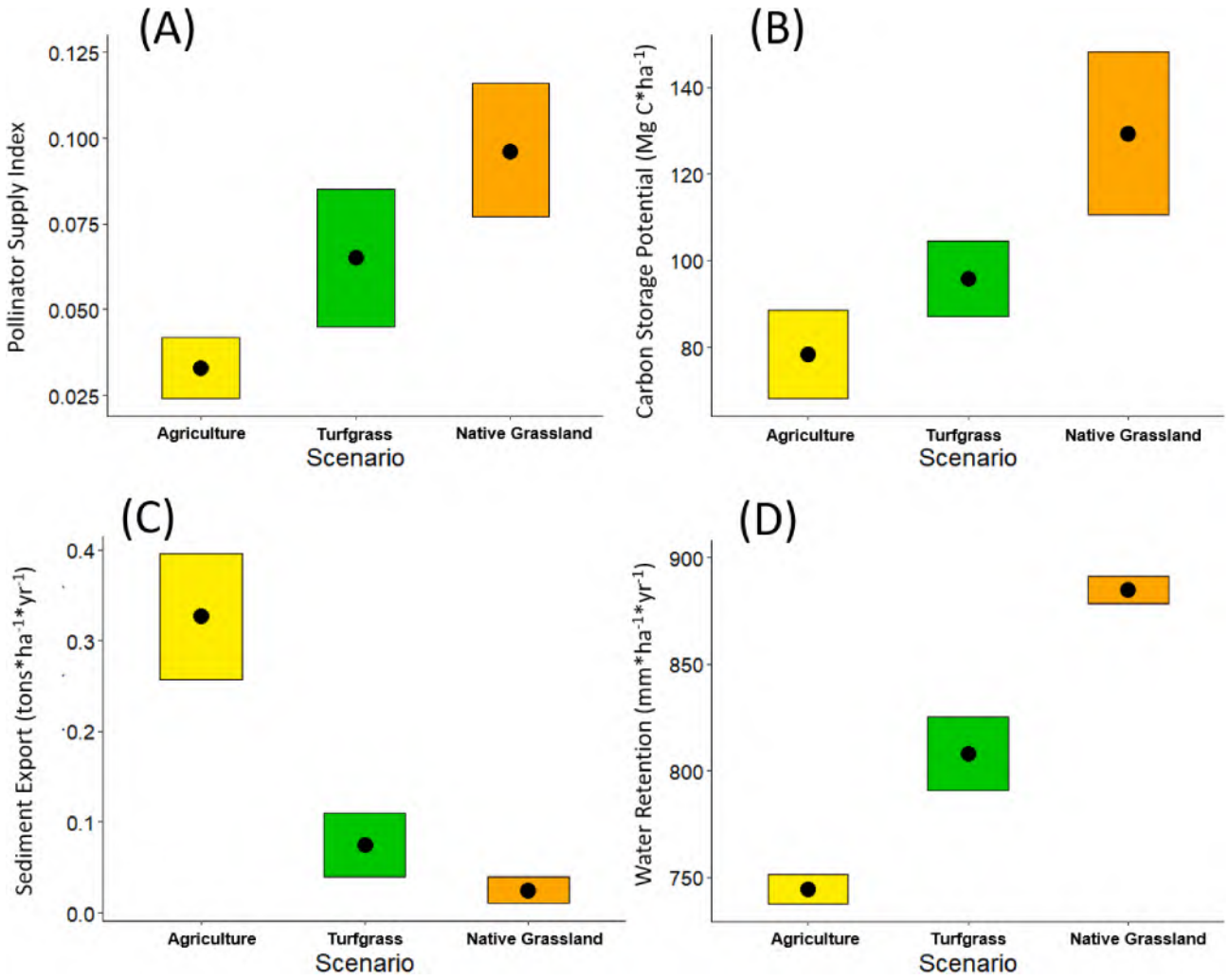


Fig. 3. Average ecosystem service values for the thirty Midwest solar facilities modeled with InVEST: (A) pollinator supply, (B) carbon storage, (C) sediment export, and (D) water retention. Tiles represent the upper- and lower-bound estimates based on the 25% and 75% quartiles. Points represent the midpoint average values.

Table 5
Ecosystem services projected to the entire current and future solar energy development footprints in the Midwestern U.S.

Solar development time peirod[a]	Agriculture scenario	Turfgrass scenario	Pollinator scenario
Carbon storage (Mg C)			
Current	267,473	326,911	441,689
Future	2,349,000	2,871,000	3,879,000
Sediment export (tons*yr^{-1})			
Current	1117.0	102.5	23.9
Future	9810.0	900.0	210.0
Water retention (m^3*yr^{-1})			
Current	25,425,300	27,601,300	30,231,600
Future	223,290,000	242,400,000	265,500,000

[a] Current time period refers to existing solar energy facilities in the Midwest as of 2018 (1.2 total GW), with a total estimated footprint size of 3416 ha (34.2 km^2) (EIA, 2019). Future time period refers to a future solar energy development scenario (10 GW), with an estimated footprint size of 30,000 ha (300 km^2).

our land use surrogates (agriculture, native grassland and prairie, and turfgrass/suburban land use types). This approach allowed us to examine the potential tradeoffs in vegetation management land uses at solar energy facilities.

There is ample research supporting the InVEST ecosystem service model parameters and output related to our surrogate land cover types (see Table 2 and Supplemental 2). For example, in a study of land use impacts on ecosystem services in Minnesota, Johnson et al. (2012) examined tradeoffs in total carbon storage using estimates of 108 Mg C * ha^{-1}, 100 Mg C * ha^{-1}, and 67.7 Mg C * ha^{-1} for native grassland, developed, and agricultural land use types, respectively. In Wisconsin, Meehan et al. (2013) used the InVEST pollinator model with biophysical parameters similar to ours to associate pollinator habitat with LULC types. They found that switching from annual row crop agriculture (corn) to perennial grasses in Wisconsin would increase pollinator abundance by an average of 11%. In Iowa, Schulte et al. (2017) discovered that prairie strips in corn-soybean dominated agricultural settings reduced total water runoff from catchments by 37%, resulting in the retention of 20 times more soil as compared to an agricultural baseline scenario.

As expected, our models suggest that solar-native grassland improves habitat for local insect pollinators. Overall, we detected a 3-fold increase in pollinator supply under the solar-native grassland scenario compared to the pre-solar development land use scenario (agriculture) and a 30% increase in pollinator supply compared to the solar-turfgrass scenario. The implementation of pollinator-friendly vegetation at current and future solar energy facilities has the potential to benefit biodiversity by providing habitat for insect pollinators and other wildlife (e.g., birds; Clean Energy States Alliance, 2020). In addition, increased abundance and diversity of native pollinators associated with solar-native grassland could improve the services these organisms provide for pollination of

nearby agriculture. A number of studies have found direct correlations between pollinator habitat enhancements in agricultural settings and improved agricultural production associated with beneficial increases in pollinator services (Blaauw and Isaacs, 2014; Pywell et al., 2015; Venturini et al., 2017). In the Midwest, dominant crops such as soybeans may benefit from the presence of native pollinators. For example, pollinator habitat enhancement around soybean fields in Ohio increased native pollinator visitation to soybean flowers and increased soybean yields by up to 23% (Cunningham-Minnick et al., 2019). There are nearly 400 km^2 of soybean fields within 1.5 km of existing solar facilities across the seven Midwest states in this study (Walston et al., 2018), highlighting the potential agricultural pollinator service implications of solar-native grassland.

Compared to baseline agricultural land uses, our models suggest that solar-native grassland has the potential to increase the total carbon storage capacity of all current and future solar energy sites in the Midwest by over 170,000 Mg C and 1,500,000 Mg C, respectively. Putting these estimates into context, compared to the agricultural baseline scenario, the potential total future solar-native grassland carbon storage benefit is equivalent to offsetting the CO_2 emissions from over 5000 GWh of electricity generated from coal-fired power plants (World Nuclear Association, 2011). There are also future implications of solar-native grassland for sediment and water retention. The future solar-native grassland scenario has the potential to reduce over 9000 tons of sediment loss as a result of surface erosion annually and retain over 40,000,000 m^3 of surface water runoff annually from future solar sites. These increases in ecosystem services are equivalent to offsetting the amount of erosion and runoff of over 1000 ha (10 km^2) of row crop agriculture in the Midwest annually (NRCS, 2010).

It is important to clarify that the full ecosystem service benefits modeled in our study may not be immediately observed after the establishment of solar-native grassland. Rather, ecosystem services may gradually increase over time as the native grassland community matures. For example, soil organic carbon accumulates at former row-crop agricultural fields that have been restored to native prairie grasses at a rate of approximately 0.68 Mg C*ha^{-1}*yr^{-1} (McLauchlan et al., 2006). At this rate, an average 10 MW solar facility (30 ha) situated on land formerly used for agriculture that has been planted with native grassland vegetation will accumulate over 200 Mg of soil organic carbon after 10 years of operation. Over the timeframe of a solar energy facility lease period (which may be 20–30 years), therefore, we expect the site's ecosystem service potential to increase and more closely resemble modeled outcomes. Nevertheless, some ecosystem service benefits of solar-native grassland may be more quickly realized. For example, in as little as 3 years post-seeding, newly established native grasslands in Iowa are capable of reducing erosion and runoff in agricultural landscapes (Hernandez-Santana et al., 2013). In another study in Michigan, the establishment of native wildflowers in agricultural systems doubled the abundance of native bees and increased their visitation to nearby blueberry crops by 25% in less than 3 years after wildflower planting (Blaauw and Isaacs, 2014).

Our study focused on comparing the potential ecosystem services of different land management scenarios at solar energy facilities. We recognize some practical considerations in our study that warrant further investigation. First, the InVEST models we used have unique assumptions that relate land use classifications to ecosystem services (Sharp et al., 2018). Therefore, our modeling results were limited by the accuracy of the 30 m land use raster dataset we used and the general ecosystem service relationships that have been developed for those land use classifications. Second, our models did not incorporate sensitivity analyses or field-based validation efforts with primary data collected at solar facilities. Instead, we focused on examining a range of possible ecosystem service outcomes based on secondary sources of data from previous InVEST studies that examined surrogate land use types. This approach allowed us to understand the uncertainty in model results and we used average values to compare scenarios. Validation of our models consisted of comparisons to other InVEST studies that evaluated our land use surrogates. As discussed above, the relative differences in our model results were consistent with these previous studies. Third, we were not able to measure how solar panels may influence the modeled ecosystem services so we assumed the influence of solar panels to be constant. However, the presence of solar panels may influence ecosystem processes. For example, soil evapotranspiration processes may decline by 10–30% under solar panels compared to open sites (Marrou et al., 2013). For these reasons, greater emphasis should be placed on interpreting the relative implications of our results rather than the actual ecosystem service value calculations. Additional work is needed to collect the primary data on ecosystem services at solar energy facilities, collect data on the temporal patterns of these ecosystem services in relation to habitat establishment, and examine the effects of solar panels on processes such as runoff, erosion, and carbon storage.

5. Conclusions

The establishment of native grassland vegetation at solar energy facilities is a strategic land use practice to improve the landscape compatibility of solar energy development (Walston et al., 2018; Hernandez et al., 2019). Recent attention on this strategy from the solar industry, natural resource agencies, conservation organizations, and state governments underscores the amount of multidisciplinary coordination involved in implementing solar-native grassland (EPRI, 2019; Clean Energy States Alliance, 2020). In regions where native grasslands have been lost to other human activities such as agriculture, native grassland restoration at solar energy facilities represents a win-win solution for energy and the environment through the improved ecosystem services provided by the native habitat that may encourage future solar energy adoption. While several states have passed legislation and scorecards to guide the implementation of solar-native vegetation habitat standards, decisions regarding establishment of solar-native grassland also consider the costs of particular seed mixes and costs of seedling establishment, vegetation height restrictions, and long-term maintenance needs (Clean Energy States Alliance, 2020).

This paper is the first to compare the potential ecosystem services related to vegetation management practices at solar energy facilities. Since none of the calculated ecosystem service benefits of solar-native grassland accrue solely to the solar industry or any other group of stakeholders, the calculated values may be better considered as benefits for society-as-a-whole. These findings may be used to build cooperative relationships between the solar industry and surrounding communities to better integrate solar energy into agricultural landscapes. We focused on the potential non-monetary aspects of these ecosystem services in this study. Additional work is needed to collect the primary data that would support economic evaluations to inform solar-native grassland business decisions for the solar industry and quantify the economic benefits of services provided to nearby farmers, landowners, and other stakeholders.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to have influenced the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ecoser.2020.101227.

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RESEARCH ARTICLE

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Solar photovoltaic panels significantly promote vegetation recovery by modifying the soil surface microhabitats in an arid sandy ecosystem

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Abstract

The arid sandy areas have great potential for producing solar power, and a large number of solar photovoltaic (PV) power (SPP) stations have been set-up in these regions across the world. Construction of SPP at large scale certainly changes the land surface with consequences on the local ecosystem. However, few studies have focused on these impacts. This study explored the influence of SPP on vegetation by modifying microhabitats. The soil water content (SWC), evaporation, photosynthetically active radiation (PAR), soil and air temperature (AT), vegetation coverage, biomass, and species richness were measured under different positions of the SPP and outside. The results showed that SWC in the station was much higher than that observed outside the SPP, and the evaporation in the SPP was lower than outside ($P < .05$). The PAR below the PV panel line zone is much lower than the interval (IT) zone. The surface coverage, biomass, and species richness were significantly higher in the SPP than outside the IT zone and outside the SPP ($P < .05$). The AT under the panel was 1.67 times lower than above during the plant growing season. The microhabitat index has a high correlation with biomass, coverage, and species richness. PV panels could impact microhabitat in arid sandy areas and accelerate vegetation recovery progress and quality. The SPP construction would not only supply clean energy but also bring unintended ecological benefits in the future.

KEYWORDS

microhabitats, photovoltaic panels, sandy ecosystem, soil water content, vegetation recovery

1 | INTRODUCTION

Fossil fuels, such as coal, oil, and natural gas, dominate worldwide electricity generation, as well as transportation, heating, and industrial energy demands since the 20th century. This dependence on fossil fuels deepens the impact of global warming and boosts climate change risks. Compared with fossil fuels and other energy sources, such as nuclear power, renewable energy sources, such as solar and wind power, provide viable options for energy supply because of their abundant provision and wide availability on earth (Barthelmie et al., 2014; Miller, Gans, & Kleidon, 2011; MacDonald et al., 2016). Related to multiple climate benefits and sustainable development, renewable energy sources have been widely embraced as a primary solution to the current challenges of global energy demand, climate change, and environmental and societal sustainability (Dincer, 2000; Panwar, Kaushik, & Kothari, 2011). Solar energy is considered as one of the

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most promising alternatives due to its characteristics: inexhaustible, carbon-emission free, and nongenerating liquid or solid waste products (Ito et al., 2003; Tsoutsos, Frantzeskaki, & Gekas, 2005; Ahmed, Al Amin, Hasanuzzaman, & Saidur, 2013; Solangi, Islam, Saidur, Rahim, & Fayaz, 2011). By using solar photovoltaic (PV) panels, solar energy could be translated to electricity and grid connected though PV power stations (Singh, 2013; Sahu, 2016). The solar energy market has got extensive attention from worldwide governments (Creutzig, 2017). Updated to 2017, the total global PV installed capacity already reached 404.5 GW, nearly 225-times higher than the capacity in 2000 (1.8 GW). In 2017, China had installed 53.3% of the world's solar capacity, with an increase of 52.8 GW to its capacity in 2016 (Europe Solar Power, 2018). The United States was the world's second largest PV market and increased 10.6 GW compared with its capacity in 2017. In the same year, Japan holds 12.2% of the global share, whereas Germany took up to 10.6% (Europe Solar Power, 2018). Thus, the PV industry has become a fast-growing industry that has gradually developed a huge market worldwide.

The PV installed capacity of Africa and the Middle East region has also developed very strongly due to their high solar radiation potential. The regional radiation potential values are the most significant data for locating solar power stations (Janke et al., 2010; Sánchez-Lozano, Teruel-Solano, Soto-Elvira, & García-Cascales, 2013; Jahangiri, Ghaderi, Haghani, & Nematollahi, 2016). Other semiarid and arid areas of the world, such as Nevada (USA), Baja California (Mexico), Atacama (Chile), Southern Spain (Organization for Economic Cooperation and Development—Europe), Empty Quarter (Arabian Peninsula), Gobi (China and Russia), Rajasthan (India), Sahara (North Africa), Kalahari (South Africa), and Great Victoria, Gibson, and Tanami (Australia), have a great potential for installing large-scale PV power stations due to the combined conditions of a large amount of available land and areas with high air optical quality (Ito et al., 2003; Muneer, Asif, & Kubie, 2003).

In the latest years, the Chinese Government has prompted plenty of efforts to maintain and develop the solar industry. The solar recourses are unevenly distributed throughout China, which decreases from northwest to southeast. The provinces located in the northwestern part, such as Xizang, Qinghai, Gansu, Xinjiang, and Ningxia concentrate most of the solar energy and thus are considered as the future energy base of China (Wu et al., 2014). Due to the low density of solar energy in nature, and the current transfer efficiency of the solar PV power (SPP; Ito et al., 2003), the solar PV stations need a large land area to install PV panels. Compared with the densely populated and land-scary east part of China, the northwest region of the Country is highly suited to install solar electric stations when considering both land use efficiency and solar energy distribution. Nonetheless, most parts of these regions are plateauing and desert, such as the Gobi and the steppes, which have the most sensitive ecological vulnerability in the whole state (Du, Zuo, Li, Wang, & Xue, 2019). SPP construction would cause significant soil surface disturbances that increase the risk of land degradation of the fragile arid ecosystem.

Some studies have evaluated the environmental impacts of the SPPs during their life cycle, including metrics about the energy payback time and greenhouse gases emissions (Northrup & Wittemyer, 2013). Emissions reduction and health benefits brought by the SPP's establishment are not open to question (Hosenuzzaman et al., 2015). Visual impacts, air pollution, and natural resource depletion associated with the installation of PV panels were also evaluated (Tsoutsos, Frantzeskaki, & Gekas, 2005). Some researchers have mentioned that SPP could impact and modify landscape during their construction through activities, such as earth movement and by equipment and facilities transportation (Tsoutsos, Frantzeskaki, & Gekas, 2005, Hernandez, Hoffacker, & Field, 2015). Besides, Wu et al. (2014) reported that large-scale concentrated solar power plants in Northwest China had huge and positive influences on the ecological environment, especially in alleviating soil erosion. The ecological impacts of PV panels are often assumed to be negligible, and thus, few studies in the literature investigate the influence of SPP's establishment on the local sandy ecosystem. Besides, many of these effects are hypothesized with little peer-reviewed evidence (Northrup & Wittemyer, 2013). Li et al. (2018) used a climate model with dynamic vegetation to estimate the unintended climate consequences led by large-scale installations of wind and solar farms. These studies indicated that the effects of large-scale solar farms are consistently conducted with significant locally, and further studies are required to assess the impacts of smaller solar farms installed at specific locations (Li et al., 2018). Nevertheless, the environmental and ecological impacts of PV panels are still unresolved questions. The previously available studies about PV panels have not dealt in detail with the impacts on ecological effects in the arid sandy ecosystem.

The study aim is to highlight both the ecological effects and the vegetation changes brought by SPP installed in an arid and sandy landscape of Western China. The SPP located in Yinchuan City was chosen for this study because it is located on the border of the Mu Us Desert. This is a transitional region and is highly sensitive to human activities, such as land use changes (Cao, Yu, Georgescu, Han, & Wu, 2015), and natural factors (Liang et al., 2016). The main contribution of this study is the quantification of the effects of the PV panel establishment on the soil water content (SWC), evaporation, soil and air temperature (AT), surface coverage, biomass, and species richness. The results of this study will enable to ascertain the ecological significance of solar PV station in arid and sandy regions.

2 | MATERIALS AND METHODS

2.1 | Study sites

This study was carried out in the SPP (38°31′57″N, 106°36′47″E; 1,222 m a.s.l.) constructed near Yinchuan City, at Xingqing District (Figure 1a). This area is located in the southwest border of the Mu Us Desert, in the Ningxia Hui Autonomous Region, China. The study area is part of the wind erosion zone, and it has a moderate temperate continental monsoon climate. The average annual precipitation is ~200 mm, and the annual evaporation is ~2,250 mm. The mean annual temperature is 8.4°C. The annual hours of sunshine are 3,075.5 hr, and the mean annual frost-free period is ~160 days. The most

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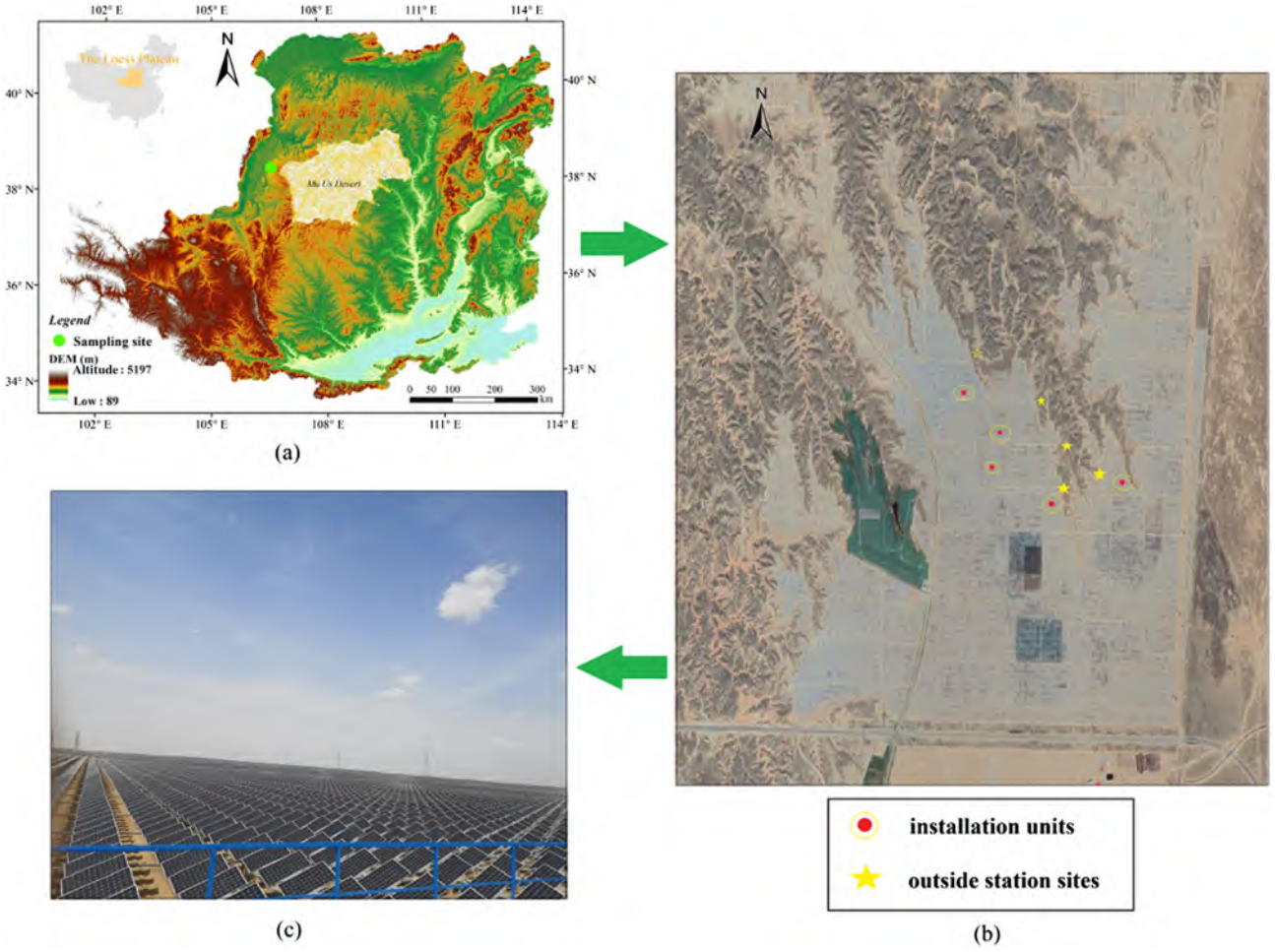


FIGURE 1 (a) The lactation of Baofeng solar photovoltaic (PV) power station. (b) The ichnography of Baofeng solar PV power station and the experiment sites. (c) The large-scale view of the solar PV panels constructed in the arid area. DEM, digital elevation model [Colour figure can be viewed at wileyonlinelibrary.com]

maximum wind frequency is the west wind. The annual daily maximum wind speed (>5 m s^{-1}) days were 167 days in the region. The region's annual solar radiation value could reach 5,600 MJ m^{-2}. The soil type is light sierozem. Natural vegetation is scarce without the presence of forest. Dominant plant species in this area are mainly psammophytic shrubs and herbaceous plants, including *Halogeton arachnoideus*, *Artemisia scoparia*, *Artemisia ordosica*, and *Artemisia sphaerocephala*. All the experiments were conducted in the Baofeng SPP station, which was constructed in 2016. This station occupies an area of about 15.33 km^2 and has an installed capacity of 640 MW.

2.2 | Field experiments

The PV power station was constructed by a vast installation unit, which is 7-m long in the east–west direction, 6.8-m width in the south–north direction, and 2.15-m height above the ground. The PV panels in the installation unit were controlled by an automatic optical tracking system (single axis), which can rotate in the east–west direction. The schematic diagram of the installation unit is shown in Figure 2c–e. We defined three kinds of districts in this study. In one installation unit, the area district vertically below the PV panel line (axis horizontality) in south–north direction was defined as the below line (BL) zone, and the area district between two PV panel lines was defined as the interval (IT) zone. The area district 30 m nearby solar power station was defined as the outside (OS) zone. We randomly selected five installation units in the SPP to stand for the BL zone (5 points) and the IT zone (5 points), and the other 5 points around the SPP stands for the OS zone. All 15 points are shown in Figure 1b. The vegetation in and around SPP is natural growing without any type of grazing (Figure 2a,b). Microhabitat indicators such as soil moisture, soil temperature (ST), evaporation, and photosynthetically active radiation (PAR) were measured in each zone. The AT above and below the PV panel was monitored by temperature sensors throughout the year. An intensive field study was conducted to examine the aboveground biomass, vegetation coverage, and plant species in the three zones. All soil and plant samples were collected from July 23 to 27, 2018.

2.3 | Sampling and measurements

A dual-range digital thermometer (OS542, OMEGA, USA) was used to measure the ST at every point. ST was measured three times every

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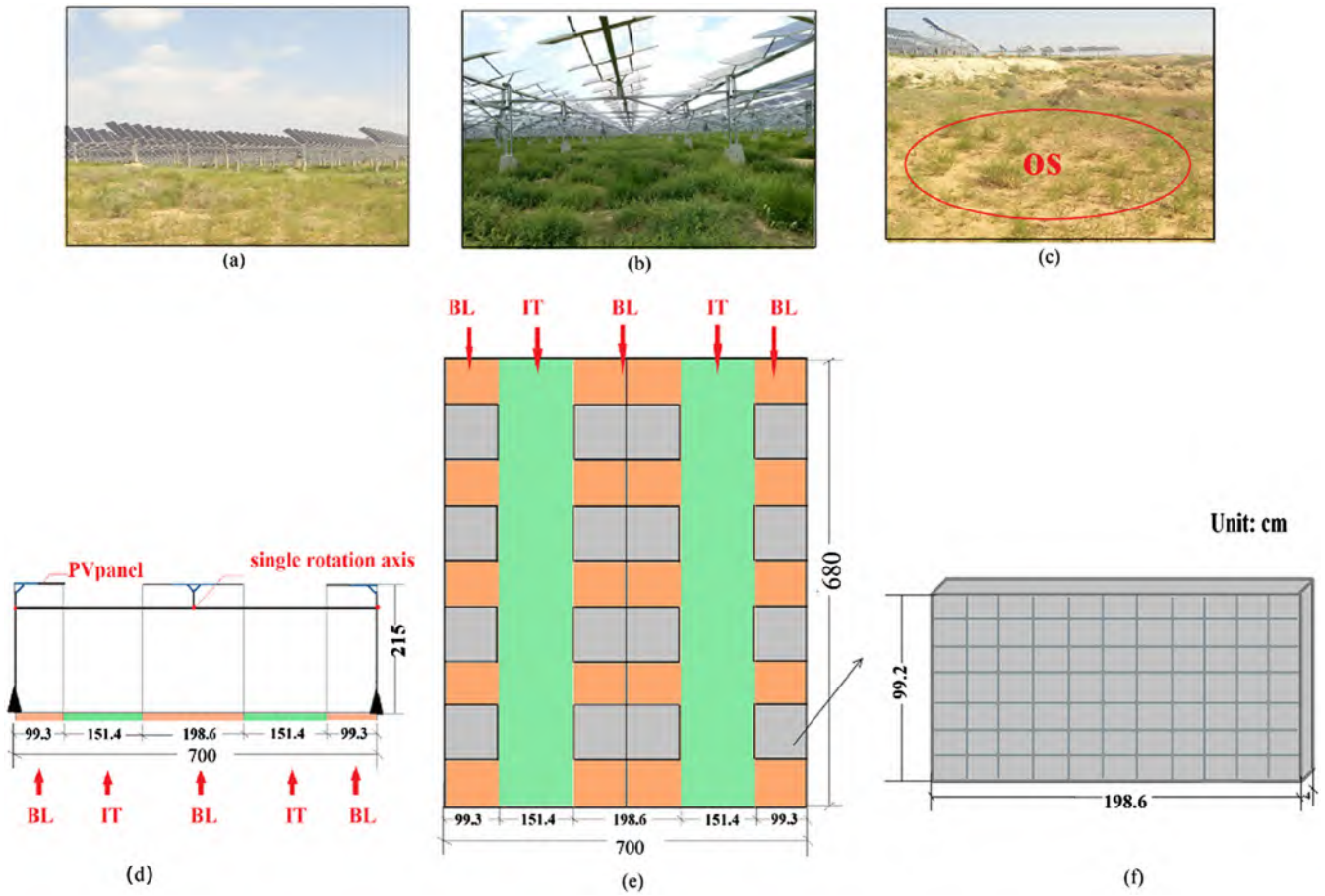


FIGURE 2 (a, b) The vegetation conditions inside and outside the photovoltaic (PV) power station. (c) Example of outside (OS) station zone. (d) The front view (in south–north direction) of an installation unit; (e) the top view of an installation unit. (f) The size of one PV panel. The area district vertically below the PV panel line (axis horizontality) in south–north direction was defined as the below line (BL) zone (orange strip), and the area district between two PV panel lines was defined as the interval (IT) zone (green strip). The area district 30 m nearby solar power station was defined as the outside (OS) zone [Colour figure can be viewed at wileyonlinelibrary.com]

2 hr from 10:00 a.m. to 6:00 p.m. at each point (same location). The position to measure ST is randomly selected at each point about 5-cm height above the ground. The ST of each zone is the average value of 5 points in 6 hr. PAR was also measured three times every 2 hr from 10:00 a.m. to 6:00 p.m. at each point (same location). PAR was measured randomly by a canopy effective radiation recorder (ECA-GG01, Beijing ECOA Company, China) under the vegetation canopy (10 cm above the ground) in the three zones. The average value in 6 hr of 5 points for each zone stands for the PAR of the three zones.

The AT above (10 cm above the panel) and under (100 cm above the ground) the PV panels were monitored with a temperature sensor (S-THB-M002, HOBO, USA) from August 2017 to July 2018. The sensor reads the AT every 5 min. After outliers rejection, we group the AT value in 24 hr day^{-1} and use the daily mean temperature to calculate monthly mean AT. Temperature variation is observed in July 2018. Temperature variation is the difference value of AT above panel and under the panel in 24 hr (the average AT value in 24 hr of July 2018).

Three culture dishes (internal diameter of 150 mm) were utilized as evaporation pan to measure the evaporation of two consecutive days at each point: July 24 and 25. The position of dishes is randomly selected at each point. The culture dishes were filled with water and weighed twice: just before installing and then 24 hr later. The evaporation capacity (*EC*; mm) was calculated as follows:

$$EC = (W_1 - W_2)\rho_w / S_b, \quad (1)$$

where W_2 (g) is the weight of the dish with the remaining water after 24 hr, W_1 (g) is the weight of the dish with the water when it was settled, ρ_w is 1 g cm^{-3}, and S_b is the base area of the standard small evaporation pan (r = 10 cm).

The gravimetric SWC (%) of the 0- to 100-cm soil depth range was measured every 10-cm soil layer by a 4-cm diameter and 20-cm height soil auger at each point. Soil samples were collected in a 1.0m × 1.0m quadrat at each point. A total of 150 soil samples were taken in the three zones. The soil samples were stored in aluminum specimen boxes and weighed immediately after collection (using an electronic balance) and then weighed again after the samples were dried at 105°C for 24 hr. The SWC of each soil layer was calculated as follows:

$$SWC_i = (m_{i1} - m_{i2})/m_2\, 100\%, \quad (2)$$

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where m_1 (g) is the soil sample weight after collection, and m_2 (g) is the weight of the dried soil samples. i is the number of the soil layer, i = 1, 2, 3, ..., 10.

Mean SWC of 0–100 cm (%) was calculated below:

$$SWC = (SWC_1 + SWC_2 + SWC_3 + \ldots + SWC_{10})/10. \quad (3)$$

Plant coverage and species richness were estimated by using five quadrats of 1.0m × 1.0 m. The position of quadrats was randomly selected in each point. All the aboveground plant parts were collected and dried at 75°C for 72 hr in each quadrat, and then the dry mass in each quadrat was weighed. The average value of the dry mass represents the biomass of vegetation in the three zones. The number of species and vegetation coverage was estimated at each quadrat, and the species richness and vegetation coverage of each zone were calculated as the mean value of species number and vegetation coverage obtained in the five quadrats.

2.4 | Data preprocessing and statistical analyses

All data preprocessing was performed using Excel 2013 worksheet software (Microsoft Office Suite, USA). The one-way analysis of variance, Pearson correlation analysis, and the tests of significance were conducted by using SPSS 22.0 software (IBM, Montauk, NY, USA). Significant differences were determined at a significance level of .05. The figures were plotted by using SIGMAPLOT 12.5 software (Systat Software Inc., San Jose, CA, USA), and the table was produced with Excel 2016.

3 | RESULTS

3.1 | Effects of solar PV panels on surface microhabitats

The results showed clear differences in the SWC, evaporation, soil temperature (ST), and PAR between the BL, IT, and OS zones. One the one hand, the spatial pattern of SWC in 0- to 100-cm depth of the three zones was all decreased with increasing soil depth (Figure 3a). However, SWC in the OS zone was always lower than the values in the BL and IT zones considering within 100-cm soil layer. ST has the highest value (33.4°C) in the OS zone, whereas the BL zone had the lowest (30.2°C). The ST of the IT and OS zones is about 3°C higher than the BL zone (Figure 3c). The evaporation and PAR of the three zones were depicted in Figure 3b,d. The evaporation in the OS zone was significantly higher than in the other two zones in the SPP (P < .05), which was two times higher than the BL zone and 1.5 times higher than the IT zone, whereas inside SPP, the evaporation of the IT

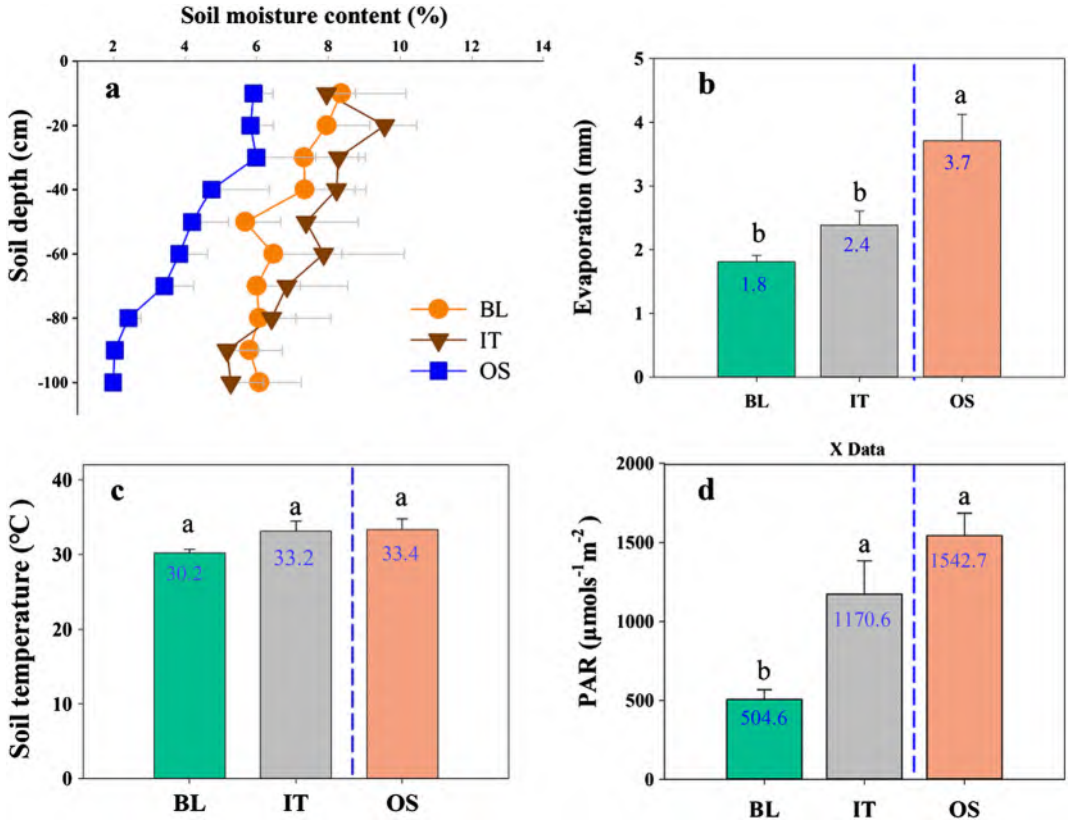


FIGURE 3 Soil moisture (0–100 cm in depth), soil temperature, evaporation, and photosynthetically active radiation (PAR) in the area district vertically below the photovoltaic panel line (axis horizontality) in south–north direction (BL), area district between two photovoltaic panel lines (IT), and area district 30 m nearby solar power station (OS) zones. Means with different letters are significantly different (P < .05) between the three zones. The error bars indicate standard errors [Colour figure can be viewed at wileyonlinelibrary.com]

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zone was 33% higher than the evaporation in the BL zone. Concerning PAR, the highest to lowest PAR values of the three zones was OS > IT > BL. The PAR of the BL zone was significantly lower than the other two zones ($P < .05$): 56.9% and 67.4% lower than in the IT and OS zones, respectively. Besides, the PAR in the OS zone is higher than the IT zone, but between them, there was no significant difference ($P > .05$).

The monthly average AT above the PV panel mirrored the trend of the AT under the panels: In both cases, AT started rising in February and reached the peak values in July (Figure 4a). Between September and November, the AT above and under the PV panel showed little difference. However, during the remaining 9 months, the monthly average AT of above panel was higher than under the panel. During the plant growing season (from April to August), above the panel's average AT of growing season was 36.21°C, whereas under the panel, the average temperature was only of 21.78°C. AT above the panel was ~1.67 times higher than that under the panel during the growing seasons. This AT above and under the PV panel also changed within a day (Figure 3b). We pick July 2018 to observe the daily AT difference between above and under the PV panel. From 12:00 p.m. to 6:00 p.m., AT was strongly reduced by PV panels. During these 6 hr, the temperature variation was above the mean AT variation estimated for the 24-hr period (19.27°C) and reached the biggest temperature variation time period within 1 day.

3.2 | Effects of solar PV panels on vegetation recovery

The biomass and surface coverage in the BL and IT zones were higher than the values in the OS zone (Figure 5a,b). The biomass of the BL and IT zones was 30 and 15.4-times higher than that in the OS zone, whereas the surface coverage was 6.8 and 6.2 times higher than in the OS zone, respectively ($P < .05$). Inside the solar station, the BL and IT zones did not have significant differences in the coverage ($P > .05$), whereas the biomass in the BL zone was nearly 2-times higher than in the IT zone ($P < .05$). The species richness of the three zones showed clear differences between the areas inside and outside the SPP (Figure 5c). The IT zone presented the highest species richness (5.5), the BL zone showed intermediate values (4.5), and the OS zone had the lowest values (2.6). There was no significant difference between the two zones inside the SPP; however, both the BL and IT zones had significant differences ($P < .05$) compared with the OS zone in species richness.

3.3 | The correlation between microclimate and vegetation

The results of correlation analysis for the ecological and vegetation indices are set out in Table 1. The correlation between biomass and ST, evaporation, and SWC was significant ($P < .05$). Besides, biomass between PAR was highly significant ($P < .01$), and its coefficient of correlation was more than −.76. Coverage also had a highly significant correlation with evaporation, PAR, and SWC ($P < .01$). Species richness had a significant correlation with SWC ($P < .05$) and a highly significant correlation with PAR ($P < .01$), and its coefficient of correlation reached −.81. We also concluded that evaporation was negatively correlated with coverage and biomass; SWC was positively correlated with coverage, biomass, and species richness, whereas PAR was negatively correlated with coverage, biomass, and species richness; and ST was also negatively correlated with biomass.

4 | DISCUSSION

Large-scale SPP has been mainly installed in the areas that have minimal competition for land surface against natural and other human land uses, such as deserts like the Gobi, and steppes (Hernandez, Hoffacker, Murphy-Mariscal, Wu, & Allen, 2015). These regions are sensitive to environmental changes where wind erosion might be intensified and sandstorm probability could be increased due to land use changes. Multiple environment impacts may change a lot during

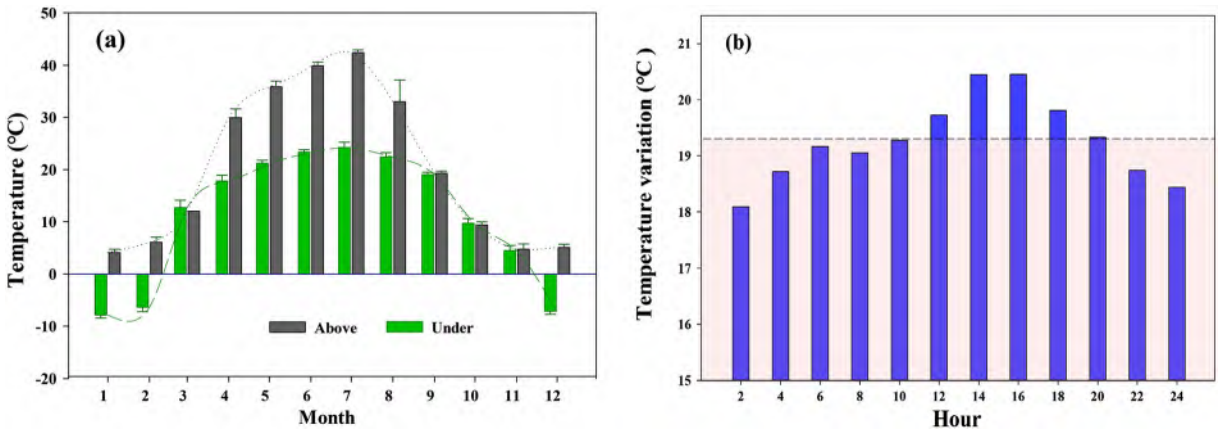


FIGURE 4 (a) Monthly average temperature above and under the solar photovoltaic panels in 1 year. (b) Daily average temperature variation between above and under the solar photovoltaic panels in July. The dash line is the mean temperature variation (19.27°C) in 24 hr [Colour figure can be viewed at wileyonlinelibrary.com]

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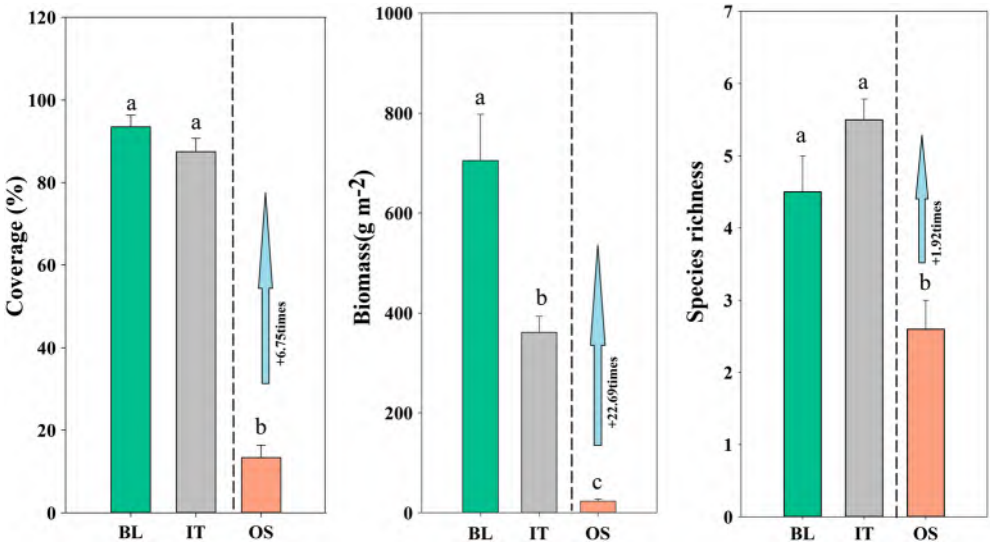


FIGURE 5 Differences in vegetation coverage, biomass, and species richness between the area district vertically below the photovoltaic panel line (axis horizontality) in south–north direction (BL), area district between two photovoltaic panel lines (IT), and area district 30 m nearby solar power station (OS) zones. Different letters indicate that means are significantly different at .05 level ($P < .05$). The error bars indicate standard errors. The blue upward arrows represent the multiplicative increase in coverage, biomass, and species richness between the OS zone and average value of the BL and IT zones [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 1 Pearson correlations between the microhabitat and vegetation indices

Variation	ST (°C)	Evaporation (mm)	PAR (μ $mols^{-1}$ m^{-2})	SWC (%)	Coverage (%)	Biomass (g m^{-2})	Species richness
ST	1.00	0.10	0.71**	−0.04	−0.36	−0.56*	−0.19
Evaporation		1.00	0.36	−0.60*	−0.79**	−0.74*	−0.50
PAR			1.00	0.33	−0.65**	−0.76**	−0.81**
SWC				1.00	0.72**	0.53*	0.62*
Coverage					1.00	0.86**	0.78**
Biomass						1.00	0.45
Species richness							1.00

Note. Microhabitat indices include soil temperature (ST), evaporation, photosynthetically active radiation (PAR), and mean soil water content of 0- to 100-cm soil layer (SWC). Vegetation indices include coverage, biomass, and species richness.

*Correlation is significant at 0.05 level.

**Correlation is significant at 0.01 level.

the SPP's life cycle, especially during the beginning stage. Our study indicates that the existence of SPP would influence the local environmental and ecological status quo. The panels created a heterogeneous radiation habitat and covered ground owing to the fluctuant shading, thus leading a changing energy cycle (Cossu et al., 2014). The changing of the energy cycle led to the variation of the environmental factors. Previous studies have shown that PV panels of large-scale solar farms in the Sahara directly reduced the surface albedo, creating positive albedo–precipitation–vegetation feedback, which triggered an increasing temperature and precipitation (Li et al., 2018). On a smaller scale, this study has shown that the presence of PV panels changed the microhabitat factors in different ways. PV panels convert solar radiation into electricity (Lewis et al., 2006), according to the law of conservation of energy, and the land surface under the power station would receive less radiation than the uncover land (Zhou et al., 2012). Besides, the vegetation coverage in the SPP is much higher than the outside, which further reduced the solar radiation reaching the surface. Hence, the PAR in the station was significantly lower than the PAR outside the station, especially in the BL zone.

ST changed in a quite different way due to the influence of the PV panels, and the ST of the BL zone is still 3°C lower than the IT and OS zones, which was still influenced by the PV panel (Figure 2c). The AT under the panels differed from the AT above the PV panels. AT under the panels was suitable for plants during their growing season. From April to August, the average temperature of the panel was only 21.78°C. A likely explanation is that the radiative balance was modified by the panel shelter, the panels directly decrease solar energy transfer of heat energy through electricity converting and shading

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effect, which provided an open structure with sufficient air circulation (Marrou, Dufour, & Wery, 2013). Plants in arid sandy areas always facing heat stress conditions and in most cases leaves are dried during the growing season. High temperatures could cause serious physiological injuries to plants, such as scorching of leaves and stems, leaf abscission, and senescence (Wahid, Gelani, Ashraf, & Foolad, 2007). Moreover, high temperatures could affect the shoot net assimilation rates that reduce the plant growth, which consequently leads to a decrease in the total dry weight of the plant (Bita & Gerats, 2013). The results of this study showed that PV panels could effectively reduce the temperature during both the growing season and the hottest time of the day, which could to some extent let plants alleviate heat stress and prevent plant productivity decrease.

The water condition was also influenced by the PV panels. The SWC in the SPP was higher than in the area out of it, whereas evaporation just showed the opposite trend. SWC is only recharged by rainfall in the study region. However, the PV panel has changed this process in two aspects. For one thing, the panels directly intercepted part of the precipitation, which could vertically fall into the BL zone without panels. Besides, rainfall could be temporally stored in the panels, and then due to its inclination, the rainfall would redistribute to the soil surface (Armstrong, Waldron, Whitaker, & Ostle, 2014). Thus, SWC in the IT zone was slightly higher than in the BL zone (Figure 2a). The shading effect of the panels explained the significantly lower evaporation that was observed in the SPP (Figure 2b). These results agreed with the study of Marrou, Guilioni, Dufour, Dupraz, and Wery (2013) who found that the shadow of the panels could save up to 14–29% of evapotranspired water in vegetable crops. Furthermore, the shading effects can increase the sensible heat flux of the ground layer, encouraging a decrease of the latent heat flux and soil heat flux, thus limiting evaporation (Coutts, Daly, Beringer, & Tapper, 2013). All these effects caused the observed heterogeneity of SWC distribution. SPPs are usually located in areas that lack water and accompanied by high potential evaporation. Through Pearson correlation analysis, it was shown that there was a high correlation between vegetation coverage, SWC, and evaporation ($P < 0.01$), and its coefficient of correlation was more than 0.72 and −0.79, respectively. Plants that grow in arid areas are highly affected by both temperature (Beedlow, Lee, Tingey, Waschmann, & Burdick, 2013) and water availability (Zhou, Zhang, Ji, Downing, & Serpe, 2011). When vegetation is facing prolonged drought stress, SWC would strongly control the spatiotemporal patterns of biomass (Kammann, Linsel, Gößling, & Koyro, 2011). In water-limited areas, water is the foundation of vegetation planting (Kammann, Linsel, Gößling, & Koyro, 2011). Besides, good water conditions have positive effects on juvenile crop stages, which is vital to vegetation establishment (Marrou, Dufour, & Wery, 2013). The mean vegetation fractional coverage in middle Asia, where Northwestern China is included, ranges from 3% to 33% (Zhang et al., 2016). In our study, we found that the vegetation coverage of the OS zone was 13.4%, just among the average level of coverage. However, the vegetation coverage in the SPP was about 85% lower than that of the BL zone (93.5%), which is a value much higher than the average level of vegetation coverage at a regional scale. At the same time, the biomass and species richness were significantly higher in the SPP than in the area outside. The construction of SPP destroyed the low coverage of natural vegetation; however, after 2 years (2016–2018) of recovery, significant differences in vegetation characteristics had already shown. The vegetation in the SPP had shown a better recovery in terms of quality and speed, which got highly correlation with microhabitat indices SWC and evaporation. This study has indicated that SPP can provide a better water condition for plant growth in arid sandy ecosystems. Under the context of global warming and water resource shortage, the effects of panels could maintain a relatively higher SWC in the soil and lower evaporation, leaving more water for plant growth, and thus facilitate the destroyed vegetation recovery or improve the vegetation coverage in sandy areas. These benefits provide a consistent advantage in the near future.

Prior studies focused on dryland and desert ecosystems have noted the importance of vegetation coverage and biomass to provide important ecological services such as soil protection and animal feeding (Jiang, Liu, Zhang, Zhang, & Wang, 2019). The soil erosion process is influenced by natural and human factors, and thus, it has a close-fitting connection with climate conditions, such as precipitation and temperature, ground cover (e.g., vegetation cover), and land uses (Li et al., 2017; Wei et al., 2017). The ultimate means to combat desertification and protect soil from wind erosion is vegetation construction (Su et al., 2007). Vegetation cover has a lower and upper threshold for controlling wind erosion. A plant coverage lower than 10% has little ability to reduce wind velocity at the soil surface, whereas the effect of vegetation on reducing wind erosion has basically reached the maximum when plant cover is ~40% or above (Jiang, Liu, Zhang, Zhang, & Wang, 2019). This study has indicated that PV panels favored the development of a microhabitat with lower evaporation and higher SWC, moderate temperature, and PAR, which enabled vegetation development with high coverage, biomass, and biodiversity in SPP. The average vegetation coverage in the SPP was 90.5%, which could effectively destroy the wind–sand flow structure. Meanwhile, the PV panels covered more land, modifying the land surface properties, in particular, increasing the surface roughness, which could slow down wind speed. In these two aspects, wind erosion could be efficiently reduced and controlled. Moreover, the higher biomass in the station could let more litter get into the soil, which provides nutrition and improves the soil structure (Jia, Huang, Miao, Lu, Li, Liu, Shen, He, & Wu, 2018; Jia, Liu, He, Miao, Huang, Zheng, Han, & Wu, 2018) that enhances the soil water holding capacity. Meanwhile, the observed better soil water conditions could provide a better scenario for the plant growth, higher biomass production, and total coverage. These changes created positive vegetation–water feedback associated with the other influence brought by SPP. Altogether, these results reflected that the establishment of SPP enhances the resistance capacity of an area against wind erosion and has positive ecological effects under adverse climatic conditions. SPP's installation in arid sandy areas could provide not only electricity energy but also huge ecological benefits brought by a good vegetation condition, which could help other researchers and policy-makers to pay more attention to the ecological benefits besides the economic profits. Our study was just a primary

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research of the PV panel's ecological effects, and further studies will be needed in more sites to gather large datasets that can support sound conclusions.

5 | CONCLUSIONS

SPP in arid areas could perpetuate the efficient use of regional solar recourses and bring both economic and ecological benefits. SPP installation had a big influence on the surface microhabitat in the arid sandy ecosystem of Western China. Higher SWC and lower evaporation constitute better water conditions, which were the key factors of improving the ecological environment in the sandy areas. Moreover, the PV panels could relieve heat stress by adjusting the air and ground temperature during the plants' growing season. This hydrological process and the modified temperature conditions supported the plant growth and thus accelerated vegetation recovery. After 2 years (2016–2018) of recovery, vegetation coverage in the station reached a very high value (90.5%), which could provide effective protection to soil against wind erosion. Furthermore, biomass and species diversity increased owing to the combined influences of the PV panels. Therefore, PV panels made the surface microhabitats different to some extent, and positive vegetation–microhabitat feedback thus could promote the ecological restoration in the arid sandy region.

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REVIEW

Solar photovoltaic energy development and biodiversity conservation: Current knowledge and research gaps

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Abstract

Solar photovoltaic (PV) has become the second renewable energy source, giving rise to potential conflicts with biodiversity conservation. However, the information available about the impacts and mitigation measures of solar PV energy is scarce and scattered, and a rigorous and comprehensive review on the topic is lacking. Here, we review the state of knowledge on its impacts and mitigation measures and identify main knowledge gaps. For that, we reviewed more than 2000 articles, out of which only 180 assessed the impacts of solar PV ($N = 138$) and/or propose mitigation measures (65). Even though Asia and Europe head the list of regions with the highest PV installed capacity (59% and 22%, respectively), a large portion of the existing knowledge is drawn from North American environmental contexts (48% of the studies), specifically from deserts (41%). Impacts were addressed on plants (26%), arthropods (14%), birds (10%), microorganisms (10%), reptiles (7%), mammals (4%), and bats (1%), but also on abiotic factors (e.g., humidity and temperature; 20%) and ecosystem services (3%). Most studies addressed the impact of PV on habitat alteration at landscape (33%) and microhabitat scale (20%), and on microclimate at microhabitat scale (17%), but other topics have been scarcely addressed (e.g., impact on microclimate at landscape scale or the potential of agrivoltaic systems). Lastly, 53% of the studies employed a single PV facility, and preconstruction situations were rarely reported (8%). There is a strong environmental context bias in the current understanding of PV impacts, which might not be extrapolable to other environmental situations like farmlands, where most of the solar PV capacity is being installed. Moreover, standardized and robust sampling designs are lacking to address cumulative, long-term, and long-scale impacts and produce comparable findings across contexts. Given the lack of empirical evidence and the irrepressible development of PV energy, it is advisable to apply an iterative monitoring and adaptive process

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to guarantee a safe energy transition. This review may provide useful guidance on prioritizing research efforts for a smooth shift to renewable energy.

KEYWORDS
ecological impacts, renewable energies, solar panel, utility-scale solar energy, wildlife

1 | INTRODUCTION

Renewable energy is expanding rapidly, reaching an installed global energy capacity of around 3400 GW in 2022 (EI, 2023). These trends are expected to accelerate in the coming years, as an increase of about 1400 GW is forecasted by 2027 (IEA, 2023). The main driving force of this development has been the need to meet the increase in energy demand of a growing human population while meeting the goals set by the Paris Agreement to reduce carbon emissions and mitigate the impacts of climate change (IPCC, 2023; UNFCCC, 2015). Solar photovoltaic (PV) has recently experienced the most notable increase among all renewable energies (Figure 1) (Ritchie et al., 2023) and is projected to surpass natural gas and coal by 2026 and 2027, respectively, becoming the largest energy source (EI, 2023). Nowadays, Asia has the largest installed capacity of PV in the world (618.8 GW in 2022), followed by Europe (227.3), North America (128.9), South America (32.7), Oceania (27.4), and Africa (11.6) (Figure 1), with China (392.4 GW), United States (111.5), and Japan (78.8) being the top three countries (EI, 2023; Ritchie et al., 2023).

PV production costs have decreased rapidly, emerging as one of the most cost-effective technologies for generating electricity worldwide and one of the most promising potentials for mitigating climate change (IPCC, 2022). The establishment of large-scale PV projects comes with a wide range of environmental consequences, including pollution, erosion, and the occupation of land, which stands out as a prominent concern due to the impacts it triggers on biodiversity (Hernandez, Easter, et al., 2014). The viability of PV projects depends on multiple factors (economic, social, technical, and environmental; Wang et al., 2009), and current site planning is often guided by cost–benefit analysis, prioritizing cheap lands close to the transmission network, in detriment of environmental and landscape attributes in some cases, such as seminatural and agricultural habitats in Japan and Korea (Kim et al., 2021). Indeed, a large portion of PV facilities has been installed in agricultural lands, followed by natural and seminatural habitats (Kim et al., 2021; Kruitwagen et al., 2021; Ortiz et al., 2022)—especially arid lands and grasslands—and a clear overlap exists with important conservation areas (Kiesecker et al., 2019; Pérez-García et al., 2022), with the largest conflict occurring in Eastern Asia, Western Europe, and North America (Rehbein et al., 2020). This fact, together with the forecasted increase on PV (EI, 2023), raises concerns about potential conflicts between PV development and biodiversity conservation goals. The current challenge is that the assessment of environmental impacts and the implementation of measures to minimize them keep up with the fast rate of solar PV development for a sustainable energy transition that integrates biodiversity conservation.

The information available about the impacts and mitigation measures of PV energy is scarce and scattered, and some of the potential impacts described are based on hypotheses with little evidence support or on extrapolation from other human infrastructures (Lafitte et al., 2022). Although previous studies have attempted to compile the available information, most have a strong focus on specific contexts (e.g., deserts in the United States; Cypher et al., 2021; Hernandez, Easter, et al., 2014; Lovich & Ennen, 2011) and/or impacts (e.g., collision with PV panels; Kosciuch et al., 2020; Smallwood, 2022; Walston et al., 2016) and thus, a rigorous and comprehensive overall review is lacking. The aim of this study is to review the state of knowledge about impacts and mitigation measures of PV energy on wildlife and ecosystems and to identify the methodological limitations and knowledge gaps where future research efforts should be invested. For that, we reviewed research articles published in peer-reviewed scientific journals, identifying the geographic location, study contexts, ecosystem components, and impacts covered to get a thorough view on the knowledge and claims about PV impacts. Moreover, we assessed whether the number of research studies by world regions has been proportional to the expansion of PV energy to detect where PV development has surpassed the pace of research progress, posing a greater risk to the preservation of biodiversity. The results of this work will help to gain insight into the impacts of PV energy, as well as to guide future research efforts prioritizing knowledge gaps.

2 | METHODS

Following the practical guide for systematic searching and study screening for literature reviews suggested by Foo et al. (2021), we conducted a rapid evidence assessment

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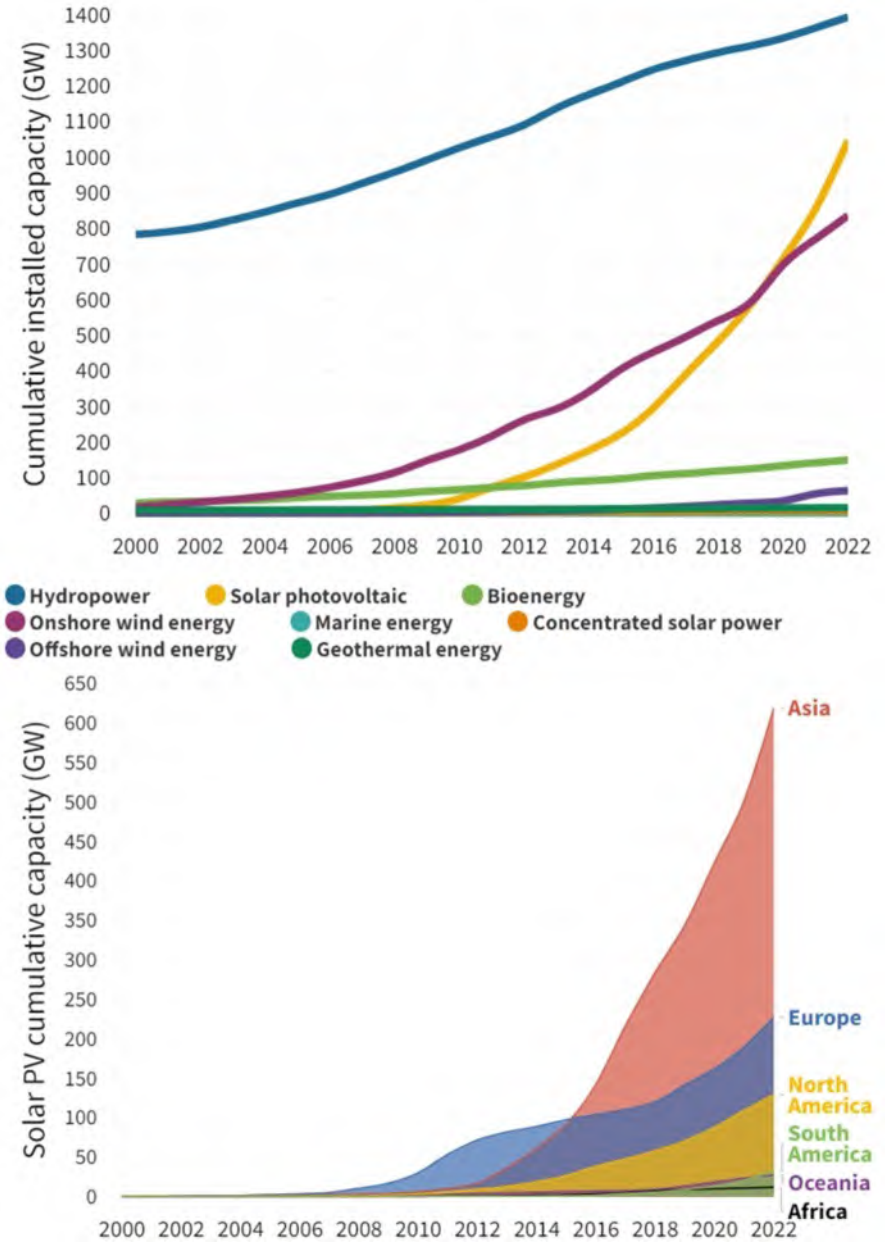


FIGURE 1 Installed global renewable energy capacity by technology from 2000 to 2022 (top) and solar photovoltaic (PV) cumulative capacity from 2000 to 2022 per continent (bottom). *Source*: EI (2023) and Ritchie et al. (2023).

(REA) in September 2023 using all databases in ISI Web of Science (WOS). This REA followed the following steps:

- Search of research articles based on explicit evidence search criteria (see below);
- Systematically collecting data;
- Synthesizing the data.

This was supplemented by searching reference lists and citations of included studies and relevant reviews. Our search was limited to title, abstract, and keywords, and included the following terms: ("photovoltaic energ*" OR "photovoltaic panel*" OR "solar array*" OR "solar development" OR "solar energ*" OR "solar facilit*" OR "solar farm*" OR "solar installation*" OR "solar panel*" OR "solar park*" OR "solar plant*" OR "solar power" OR "utility-scale solar") AND ("*diversity" OR "ecosystem*" OR "*habitat*" OR "wild*"). From the search terms and resulting number of articles in WOS, we excluded records that did not directly address the impacts of PV energy. Although the review was focused on PV energy, we also kept those studies addressing the impacts of concentrating solar energy (CSP) when impacts could be relevant or comparable to PV energy. We only kept those articles based on

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empirical data and removed perspective and policy pieces. The remaining articles were assessed for relevant information and characterized according to broad category classes (Table 1).

First, we divided the articles into the main topics addressed in this review: impact on biodiversity, mitigation of biodiversity impacts, or both. In studies evaluating mitigation measures, we specified the level within the mitigation hierarchy (i.e., avoidance, minimization or compensation of impacts), and we briefly described the mitigation measured applied. To evaluate the environmental contexts underlying current knowledge on impact and mitigation measures of PV energy, we noted the studied topic as well as the geographic location (continent and country), climate (according to Köppen climate classification system), study context (e.g., habitat) covered by each study, and the targeted ecosystem components (biotic or abiotic factors and ecosystem services). Lastly, to assess the methodological limitations of current research, we noted the scale of the studies (whether they covered one or more PV facilities), the study design employed (before-after-control-impact [BACI]; control-impact [CI]; impact [I]; before-after [BA]; Table 1). Further explanation of the compiled information can be found in Table 1.

3 | RESULTS AND DISCUSSION

3.1 | Mismatch between PV deployment and impact research

We found 180 articles assessing the impacts of PV energy on biodiversity (N = 138) and/or proposing mitigation measures (65) (Table S1). These references can be consulted at the "Observatory of Scientific Literature Related to Photovoltaic Solar Energy and Biodiversity", published and updated by the Steppe-Forward Chair. The number of studies has increased significantly from 2015 onwards, with a notable increase from 2022 in Asian and European countries (Figure 2).

Most of the research has been carried out in North America (N = 75; 48.1% of the studies)—with the United States (73, 46.8%) being the main contributor—followed by Europe (34, 21.8%), Asia (26, 16.7%), Africa (6, 3.8%), South America (3, 1.9%), Antarctica, and Oceania (1, 0.6%; Figures 2 and 3). Therefore, even though Asia and Europe head the list of regions with the highest PV installed capacity (59.1% and 21.7%, respectively), a large proportion of the existing knowledge is drawn from North American contexts, which only hold the 12.3% of PV energy installed worldwide (Figures 2 and 3).

Of the empirical studies with specific information on the covered habitats (N = 92), 38 (41.3%) were carried out

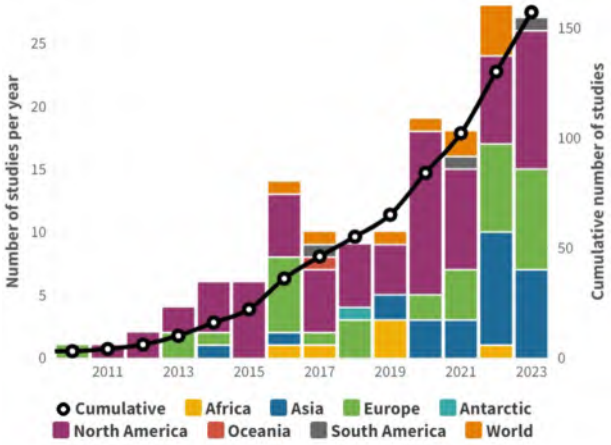


FIGURE 2 Number of studies reviewed assessing the impacts of photovoltaic (PV) energy or measures to minimize them from 2010 to September 2023 per region. Studies carried out under lab conditions (1) and reviews on specific impacts without a geographic focus (23) were removed, totaling 156 articles. "World" refers to studies carried out at global scale.

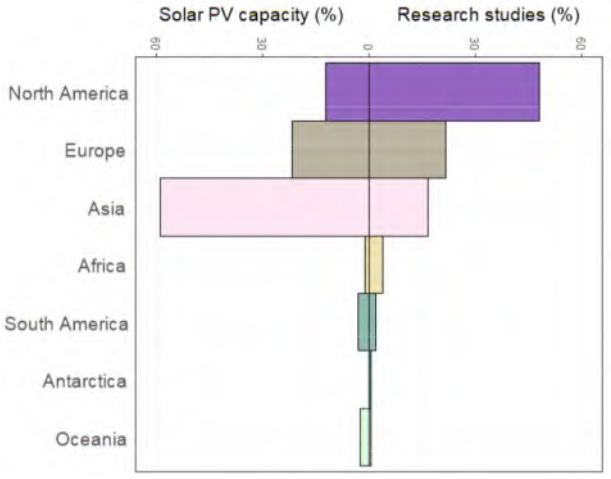


FIGURE 3 Proportion of research studies assessing the impacts of photovoltaic (PV) energy or measures to minimize them (right) and of cumulative installed capacity (left) per region. The percentage of studies is calculated from a total of 156, after removing those carried out under lab conditions (1) and reviews on specific impacts without a geographic focus (23).

in desert ecosystems, 20 in agroecosystems (21.7%; vineyards, abandoned or active fields, and pasturelands), 17 in grasslands (18.5%), and eight in urban environments (8.7%; quarries and waste dumps). Forest, shrubland, and tundra habitats were represented by no more than five studies (<5.5%), and nine studies (9.8%) were experimental tests. A high proportion of studies focused on abiotic factors (e.g., microclimate and soil properties; N = 27 out of 132 empirical studies, 20.4%) and to a lesser extent on ecosystem services (N = 4, 3.0%), whereas most studies

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TABLE 1 Information collected on each of the articles reviewed.

Information	Categories	Explanation
Year of publication		
Approach	Empirical (132)	
	Methodological (3)	
	Review (45)	
Topic	Impact (115)	
	Mitigation (42)	
	Impact and mitigation (23)	
Mitigation hierarchy	Avoidance (26)	Not specified for reviews
	Minimization (29)	
	Compensation (1)	
Mitigation measure		Brief description of the mitigation measure addressed
Geographic location		Region and country
Köppen climate classification*	Tropical (1)	
	Arid (55)	
	Temperate (44)	
	Continental (21)	
	Polar (1)	
	Regional or global scale (29)	
Study context*		
	Agroecosystem (20)	
	Desert (38)	
	Forest (5)	
	Grassland (17)	
	Laboratory (1)	
	Not specified (3)	
	Not specified: Experimental (9)	Experimental studies (other than those carried out in the laboratory) with no habitat specifications
	Regional or global scale (38)	The study context is not specified because the study has a regional or global focus
	Shrubland (5)	
	Tundra (1)	
	Urban (8)	
Ecosystem component*	Bats (3)	
	Birds (19)	
	Ecosystem services (4)	
	Invertebrates (22)	Distinguishing between arthropods (8), aquatic arthropods (7), and pollinators (7)
	Mammals (6)	
	Microclimate (22)	
	Microorganisms (13)	
	Plants (36)	
	Reptiles (11)	
	Soil (22)	
Scale	One-solar facility or experimental array (56)	It is not specified for studies with a regional or global focus
	Several solar-facilities or experimental arrays (49)	

(Continues)

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TABLE 1 (Continued)

Information	Categories	Explanation
Study design	BA (7)	Before-after only in impacted areas
	BACI (2)	Before-after-control-impact
	CI (50)	Control-impact only after PV construction
	I (50)	Impact (e.g., studies addressing the impact of collision with PV panels)
Studied topic*	Agrivoltaics (7) Collision/mortality (9) Habitat fragmentation (11) Habitat loss or alteration at landscape scale (4) Habitat loss or alteration at microhabitat scale (28) Lake effect[a] (6) Land-use planning (26) Microclimate at landscape scale (5) Microclimate at microhabitat scale (24) Soil properties (14)	
Summary of results		

Note: Wherever applicable, the categories defined for each parameter are specified, as well as a brief explanation. We highlight with an asterisk the fields that were duplicated in case a study addressed more than one topic, ecosystem component, or study context. Lastly, we indicate between brackets the number of studies under each category, considering only the articles incorporated in this study.

Abbreviation: PV, photovoltaic.

[a]The "lake-effect" hypothesis suggests that waterbirds and aquatic insects mistake solar arrays for water bodies, colliding with the infrastructure as they attempt to land. This could either result in direct mortality or leave individuals injured or stranded. See the main text for more information.

addressed biotic components ($N = 80$, 60.6%). Plants were the most studied group ($N = 35$, 26.5%), followed by arthropods ($N = 19$, 14.4%), birds and microorganisms ($N = 13$, 9.8%), reptiles ($N = 9$, 6.8%), mammals ($N = 5$, 3.8%), and bats ($N = 2$, 1.5%). When we cross-reference this information, we observe that the knowledge about the different ecosystem components is not evenly based in all habitats or study contexts. For instance, most information for reptiles comes from deserts, but information for mammals in this ecosystem is lacking as well as for arthropods in grasslands (Figure 4). Similarly, little information is available on bats, and knowledge on aquatic arthropods is mainly drawn from experimental assays.

Most studies addressed the impact of PV energy on habitat loss or alteration at both landscape ($N = 43$, 32.6% of the 132 empirical studies) and microhabitat scales ($N = 27$, 20.4%), and on microclimate at microhabitat scale ($N = 23$, 17.4%) (Figure 5). Furthermore, a high proportion of studies addressed land-use planning, aiming to identify compatible areas for PV development and biodiversity conservation ($N = 25$, 18.9%). As the number of studies per topic decreases, the context bias in current knowledge becomes more evident. For example, most studies addressing the impact of PV energy on collision rates and microclimate at landscape scale have mainly been carried out in deserts and arid climates, and little knowledge exists about the potential of agrivoltaic systems (Figure 5). Moreover, the lake effect hypothesis has been tested mainly under experimental conditions. Regarding methodological aspects, a total of 56 studies (53.3% out of 105 empirical studies with this methodological information) were focused on a single PV facility or experimental array, and 49 studies (46.7%) were based on more than one. Only two (1.9%) studies used a BACI design and seven (6.7%) used a BA design.

3.2 | Impacts of PV energy

The available information to date on the potential impacts of PV energy on biodiversity is summarized in Figure 6. As highlighted in Figure 5, some of these impacts have been addressed in specific environmental contexts and climates (e.g., heat island effect) and should therefore be treated with caution.

3.3 | Impacts on microclimate and soil properties

There is a lack of research on the microclimate impacts of PV energy, and current knowledge is mainly based on

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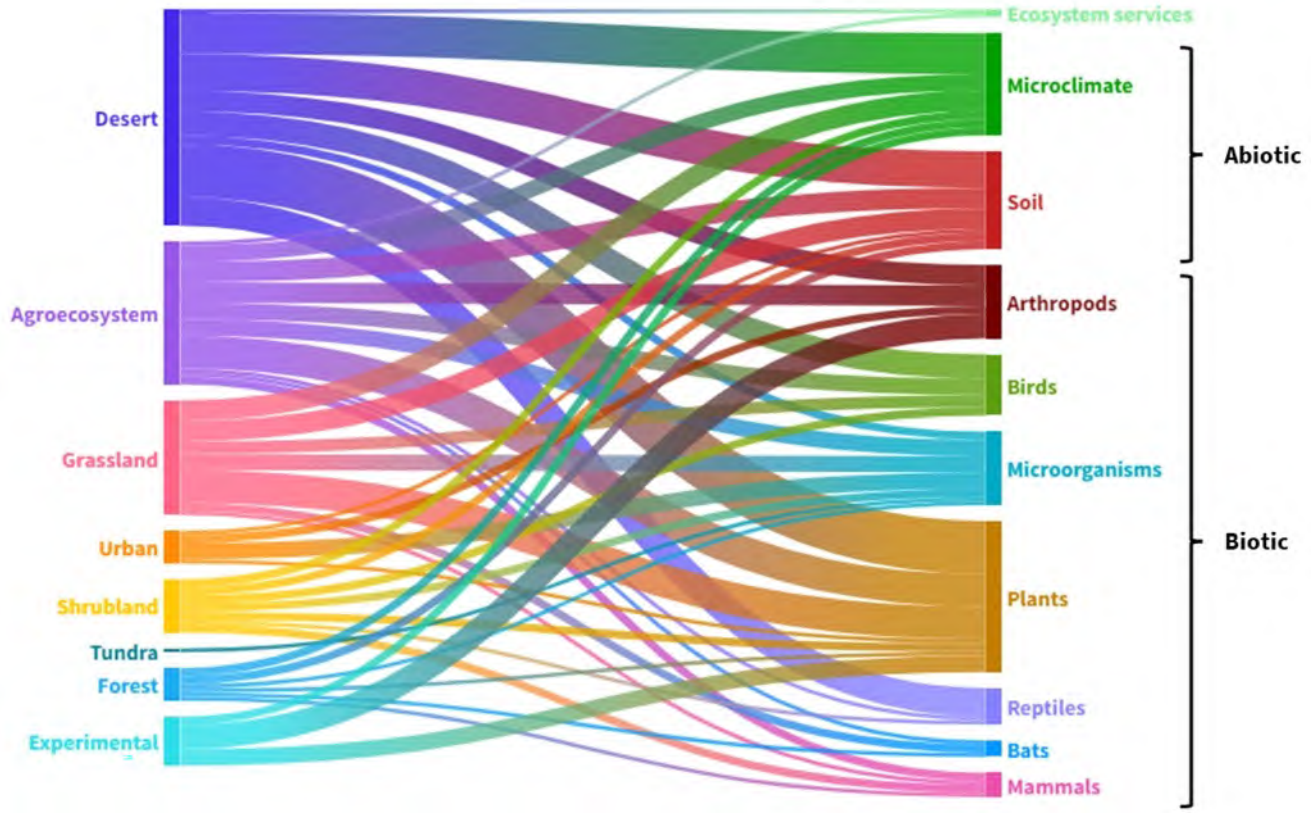


FIGURE 4 Study contexts (left-hand side) and ecosystem components (abiotic, biotic, and ecosystem services; right-hand side) covered in the research literature on the impacts of photovoltaic (PV) energy or measures to minimize them. Colored bands indicate relationships between them. Some investigations cover more than one ecosystem component or study context.

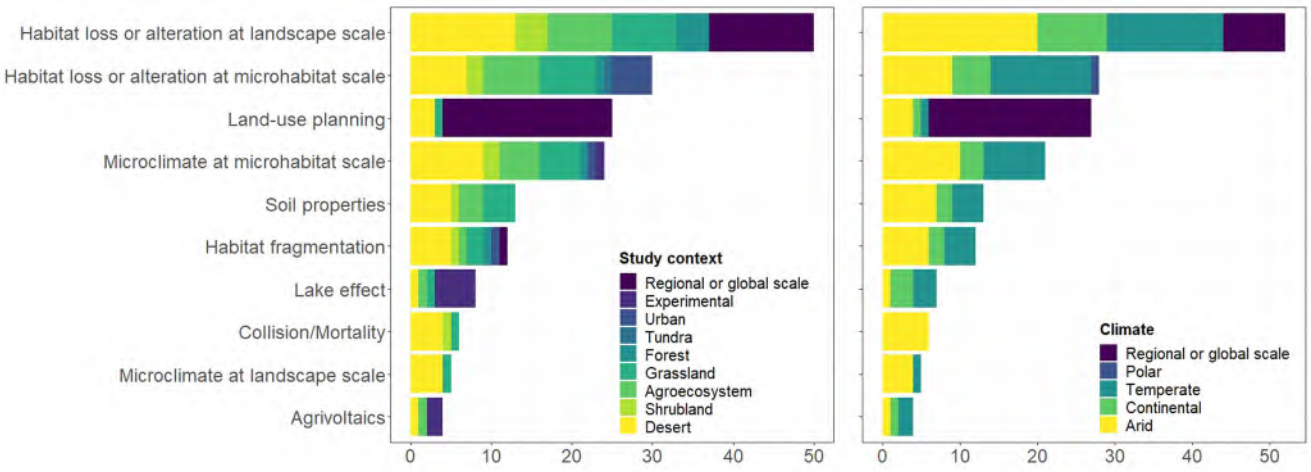


FIGURE 5 Topics addressed in the literature according to study contexts (left) and climates (right).

arid climates (Figure 5). In this climate contexts, PV facilities can alter the energy balance of short- and long-wave radiation by the introduction of darker and less reflective surfaces, which reduce albedo and increase the absorbed solar insolation (Barron-Gafford et al., 2016). Besides, vegetation removal reduces heat dissipation through transpiration and enhances heat gain and storage in soils, energy that will be later re-radiated in the form of heat (Barron-Gafford et al., 2016). Consequently, nighttime temperatures within PV facilities rise 3–4°C compared to surrounding (dryland) ecosystems, thereby inducing a "Heat Island" effect (Barron-Gafford et al., 2016). At a finer

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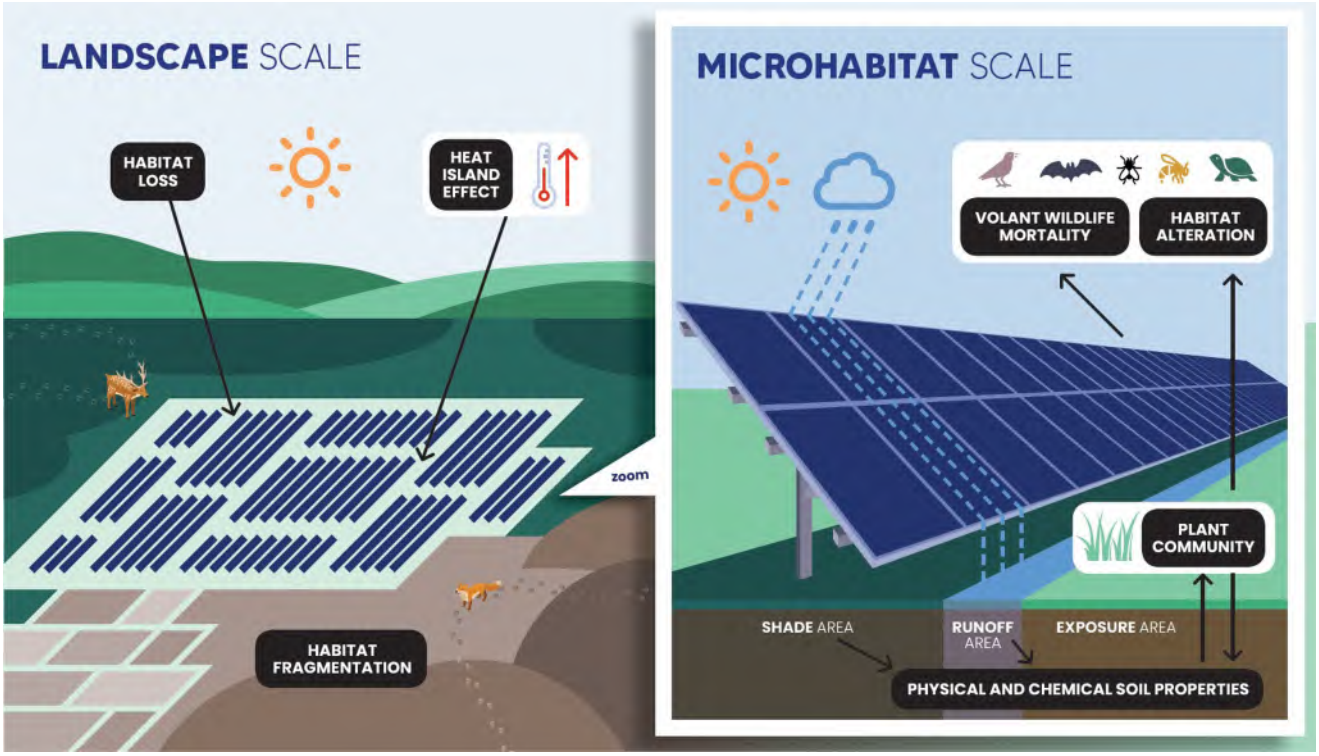


FIGURE 6 Impacts of photovoltaic (PV) energy at landscape (left) and microhabitat (right) scale. At landscape scale, PV facilities produce habitat loss and fragmentation, and alter the microclimate by inducing a heat island effect at nighttime, at least in arid and temperate climates (see Figure 5). At microhabitat scale, PV panels alter the physical and chemical properties of soils and create novel shade, runoff, and radiation exposure gradients, altering microclimate and ultimately microsite habitat conditions. Given that temperature, water, and light are three key determinants for plant growth, novel conditions trigger a cascade of processes that impact on the plant community, but it can also result on habitat alteration for myriad of taxa (microorganisms, pollinators, birds, bats, and mammals). Lastly, mortality of volant wildlife through collision with PV panels or associated power lines is one of the most recorded PV impacts.

scale, PV panels intercept sunlight, reducing photosynthetically active radiation and creating novel shade conditions underneath (Tanner, Moore-O'Leary, et al., 2020; Wu et al., 2022), thereby decreasing air, surface, and soil temperature and variation as compared to the interval (IT) zone (i.e., area between panel arrays) and control sites during warm seasons (Armstrong et al., 2016; Lambert et al., 2021; Liu et al., 2019; Suuronen et al., 2017; Tsafack et al., 2022). However, this pattern is reversed during nighttime and in cold seasons, partly due to the inhibition of dew formation (Marrou, Guilioni, et al., 2013) and/or to the heat re-radiated from the soil and trapped under PV arrays (Barron-Gafford et al., 2016). Panels also alter the local distribution of precipitation, reducing water inputs below the panels but increasing them in the edge via storm runoff of PV panels. Even though humidity and soil moisture might be higher in runoff areas immediately after rainfall (Moscatelli et al., 2022; Tanner, Moore-O'Leary, et al., 2020), the shielding effect of PV panels reduces water loss by evaporation (Liu et al., 2019, 2022) and evapotranspiration (Marrou, Dufour, et al., 2013), ultimately increasing soil moisture (Suuronen et al., 2017) or smoothing the differences with the IT, runoff, and control sites (Choi et al., 2020). Other factors such as air circulation and turbulence, soil properties, and PV systems (e.g., tracking vs. fixed panels) might shift these microclimate patterns (Moscatelli et al., 2022; Suuronen et al., 2017; Yuan et al., 2022; Yue et al., 2021). More studies are needed to confirm whether these effects can be extrapolated to other environmental contexts and climates.

PV construction can also alter the physical and chemical soil properties, but these effects are highly dependent on land-use history, vegetation management, and control sites used in the comparison. Physical soil quality is degraded after PV installation since it reduces soil aggregate stability, a key factor of soil functioning (Lambert et al., 2021). Chemical soil quality also seems to be degraded in PV facilities (decreased in organic carbon, total carbon, and total nitrogen) as compared to seminatural habitats, but it is similar to that observed in other anthropogenic soils (e.g., abandoned vineyards) (Choi et al., 2020; Lambert et al., 2021). However, other studies have reported higher nitrogen and carbon values in IT soils than under PV panels or arable control sites (Moscatelli et al., 2022) and higher

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electrical conductivity, phosphorus, potassium, soil organic matter, and fast-acting potassium in vegetated PV parks compared to bare land controls (Bai et al., 2022; Yuan et al., 2022). Similarly, another study observed that phosphorus, potassium, nitrate nitrogen, and soil pH increased 6 years after PV installation (Liu et al., 2022). Further research is needed to understand the mechanisms underlying these changes on soil properties.

3.4 | Habitat fragmentation, loss, or alteration

Habitat destruction and/or alteration occur at both broad scale (i.e., landscape) and fine scale (i.e., microhabitat). The physical onsite footprint and spacing of PV has been estimated at 1 ha for a 0.12–0.83 MW/ha (Grippo et al., 2015; Hernandez, Hoffacker, et al., 2014; Wu et al., 2014). At landscape scale, habitat loss due to PV construction has been described to be a threat for several taxonomic groups such as reptiles (Averill-Murray et al., 2013), arthropods (McCoshum & Geber, 2020), bats (Szabadi et al., 2023), and birds (Haga et al., 2020). In terrestrial animals, it can also impact broad-scale ecological processes such as daily, seasonal, and migratory movements through the creation of connectivity barriers (i.e., non-permeable perimetral fencing) (Averill-Leskova et al., 2022; Murray et al., 2013; Sawyer et al., 2022). At finer scale, PV panels per se represent a harsh environment, which can be colonized by a highly diverse microbial community composed of drought-, heat-, and radiation-adapted species (Moura et al., 2021; Tanner et al., 2018; Tanner, Molina-Menor, et al., 2020). Moreover, PV panels create novel shade and moisture gradients (see above), ultimately altering microsite habitat conditions with both winner and loser species resulting from the new PV ecosystem. The diversity and activity of soil fungi and prokaryotes seem to be higher in PV parks, especially in runoff areas, than in bare ground and arable controls (Bai et al., 2022; Moscatelli et al., 2022), and soil extracellular enzyme activity, an indicator of microbial function capacity, might increase after installation (Liu et al., 2022). However, soil archaea community structure and diversity does not differ between PV soils and adjacent deserts (Yuan et al., 2022). Future research should deepen on the impact of PV construction across the microclimate-soil-microorganism system due to its role in biological processes and ecosystem functioning (Bai et al., 2022).

PV panels can also impact on the plant community, although the responses might vary between habitats, seasons, and species, let alone vegetation management strategies (Tanner et al., 2021; Tanner, Moore-O'Leary, et al., 2020). In hydric stressful climates, PV panels could soften the harsh environmental conditions and alleviate heat stress, thereby increasing seed bank survival and aboveground plant productivity and diversity (Liu et al., 2019; Tanner, Moore-O'Leary, et al., 2020). However, the opposite effect might be found in communities that benefit from rainfall and sun exposure, reaching the lowest rates of photosynthesis and plant biomass under PV panels and their maximum productivity and diversity values at the runoff or IT zones (Bai et al., 2022; Moscatelli et al., 2022; Tanner et al., 2021). Overall, plant community composition might change by inhibiting the growth of dominant species and leaving room for subdominant ones (Bai et al., 2022; Uldrijan et al., 2022). Moving up the trophic chain, we find that arthropod pollinators use IT and under-panel habitats interchangeably, even though abundance and diversity tend to be lower under PV panels (Graham et al., 2021). Other authors have found that induced changes on the plant community and microclimate, together with targeted management measures (see *Mitigation hierarchy* below), might convert PV installations on invertebrate refuges (Jeal, Perold, Seymour, et al., 2019; Suuronen et al., 2017).

Overall, both habitat destruction (landscape) and the alteration of the abiotic conditions (microhabitat) result in habitat modification, loss and/or fragmentation for myriad of species (McClung et al., 2019). These changes combined with displacement due to visual or noise disturbances, might trigger behavioral responses (i.e., perception and habitat-use; Chock et al., 2021), ultimately resulting in population-level impacts across many taxa (Smallwood, 2022). A lower bat activity (Szabadi et al., 2023; Tinsley et al., 2023) and bird diversity and/or density has been found within PV parks (DeVault et al., 2014; Jeal, Perold, Ralston-Paton, et al., 2019; Visser et al., 2019), but no differences have been observed on bird reproductive success (Kitazawa et al., 2019). Conversely, PV panels might provide perches and thermal refuges that would be otherwise limited in specific contexts (e.g., deserts), or they could even offer foraging, roosting, sheltering, and nesting habitats (DeVault et al., 2014; Gerringer et al., 2022; Nordberg et al., 2021; Visser et al., 2019). Further research is needed to understand the consequences of habitat alteration following PV installation on wildlife habitat-use patterns and populations.

3.5 | Wildlife mortality

Direct mortality of flying wildlife (bats, birds, and aquatic insects) through collision with PV panels and other infrastructures (i.e., power lines and perimetral fences) is one of the most addressed impacts of PV energy, but most information comes from unpublished reports that employ non-standardized methodologies (Smallwood, 2022). Bird mortality rates at PV projects have been estimated between

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2.49 and 10.7 fatalities/MW/year (Kosciuch et al., 2020; Visser et al., 2019; Walston et al., 2016). A recent work provides more accurate estimates by adjusting the results of previous reports performed from 1982 to 2018 for the effect of body size on carcass detectability, obtaining a mortality rate of 11.61 (95% CI = 8.37–17.56) bird fatalities/MW/year and 0.06 (95% CI = 0.01–0.1) bats/MW/year at 11 PV projects (Smallwood, 2022), considering only collision with PV panels and ignoring other sources of mortality (i.e., power lines and perimetral fences). Future studies should account for other sources of bias on carcass counts, such as carcass disappearance due to decomposition or removal by scavengers, in order to obtain more accurate quantifications of mortality (see for example Gómez-Catasús et al., 2021). Moreover, mortality estimates alone do not say much about their ecological and conservation significance, which depends on their larger-scale, population-level consequences, which are influenced by population descriptors (i.e., size and trends) and life-history traits (e.g., pace of life and reproductive strategy). A recent study found that of 23 priority species colliding at wind and solar facilities, 11 (48%) were vulnerable to population-level effects (Katzner et al., 2020), especially non-local, nocturnal migrant species.

Information on the factors influencing collision risk and fatality estimates is scarce. In relation to species-specific factors, songbirds (Passeriformes), pigeons, and doves (Columbiformes) seem to suffer the highest mortality rates (Kosciuch et al., 2020; Smallwood, 2022). These species groups are generally abundant in the studied regions, and they share several traits (e.g., ground dwelling and inhabit anthropogenic landscapes). Migratory and aquatic birds also suffer high collision rates, although their contribution to mortality rates seem to vary with the occurrence of water bodies, wintering grounds and migration routes in the surroundings, suggesting that their collision risk is context-dependent (Walston et al., 2016; Kosciuch et al., 2020). Moreover, collision rates vary with phenology, being more frequent in fall and winter, coinciding with the higher abundance of birds following the breeding season and with migratory movements to the wintering grounds (Kosciuch et al., 2020). We found no studies evaluating the effect of site descriptor factors on fatality rates, and only one study addressed PV park attributes, showing a negative effect of PV capacity (Kosciuch et al., 2020).

The mechanisms underlying collision events are poorly understood. The most discussed hypothesis is that aquatic insects might mistake solar panels as natural water bodies (i.e. "lake effect" hypothesis) due to polarization of light reflected, which they used to locate water bodies for egg-laying (Horváth et al., 2010), turning into ecological traps (Horváth et al., 2009, 2010). More recently, it has been observed that solar panels can polarize not only visible light (390–700 nm), but also ultraviolet light (<380 nm), which is also a cue used in habitat selection for some aquatic insects (Fraleigh et al., 2021). Although the "lake effect" hypothesis has been widely exposed as a potential mechanism underpinning also bird and bat collisions (PV panels might provide analogous reflections of echolocation calls than water bodies; Greif & Siemers, 2010; Russo et al., 2012), there is little evidence proving this causal factor. Other potential explanation widely discussed is that insectivorous wildlife might be attracted to PV panels due to the higher abundance of insect prey (Diehl et al., 2016; Horváth et al., 2010), being stranded, injured, or killed at solar panels (Smith & Dwyer, 2016), but we have found no evidence for this hypothesis either. Further research is needed to test these hypotheses and to understand how these organisms perceive solar energy infrastructures.

3.6 | Mitigation hierarchy: From prevention to compensation

The implementation of PV facilities must follow the mitigation hierarchy procedure to avoid, reduce, and ultimately offset its negative impacts on wildlife. First, proactive land-use planning is essential, considering ecological and conservation attributes in deciding project locations that secure wildlife habitat preservation as well as the maintenance of other important land-uses such as agricultural land (Hermoso et al., 2023). Land sparing (i.e., the promotion of PV sprawl in urban areas or degraded lands) has been proposed as an alternative to mitigate habitat loss and soil degradation in natural and semi-natural habitats (DeVault et al., 2014; Hernandez et al., 2015; Kim et al., 2021; Lambert et al., 2021) rather than PV construction in remote areas, which requires additional transmission infrastructure with further impacts on biodiversity (Biasotto & Kindel, 2018).

In a second step, PV projects should contemplate minimization measures for those impacts that are unavoidable. The concept of *conservoltaic* consists on the combination of PV energy production and biodiversity conservation (Nordberg & Schwarzkopf, 2023). For instance, lessening vegetation disturbance during construction or the application of habitat restoration practices might help to combat desertification (Xia et al., 2022), alleviate soil degradation (Ormeño et al., 2016), or minimize habitat loss (Armstrong, Kulikowski, et al., 2021; Cypher et al., 2021; Gerringer et al., 2022), and targeted vegetation management during operation can create habitat islands for wildlife (Blaydes et al., 2021, 2022; Guiller et al., 2017). The installation of permeable security fencing or the translocation of sensitive species outside the project's footprint are other potential mitigation measures (Agha et al., 2020; Brand et al.,

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2016; Cypher et al., 2021). Another emerged land sharing strategy is the co-location of PV energy with agricultural practices, such as crop cultivation or animal husbandry (so-called "*agrivoltaic systems*"), which promises to maximize food and energy production while minimizing the impacts on ecosystems (e.g., water use efficiency and erosion prevention; Barron-Gafford et al., 2019; Hernandez et al., 2019; Vaverková et al., 2022), even increasing PV panel efficiency through dust accumulation and cooling (Hernandez et al., 2019; Nordberg et al., 2021). However, the potential of this land sharing strategy to mitigate impacts on biodiversity and to be considered within the mitigation hierarchy deserves more attention. Overall, if properly managed, PV farms have the potential to promote important ecosystem services (e.g., carbon storage and biological pest control; Armstrong, Brown, et al., 2021; Barron-Gafford et al., 2019; Randle-Boggis et al., 2020; Semeraro et al., 2018; Walston et al., 2018, 2021, 2022) and even to enhance or restore previous ecosystem goods and services in degraded lands (Hernandez et al., 2019). However, further research is needed to empirically test these potential synergies and to verify whether they are generalizable or not to all climatic-environmental contexts (Figure 5).

Mortality due to collision (both with power lines and PV panels) is another impact to mitigate in PV facilities. First, the widely known power line collision mitigation measures should be implemented (Bernardino et al., 2018). On the other hand, PV panel collision mitigation has been studied in aquatic invertebrates, suggesting that specific panel designs might be effective tools to disarm the panel-induced ecological trap (e.g., employment of a white, non-polarizing gridding; Black & Robertson, 2020; Horváth et al., 2010) and matte colors or anti-reflective coatings (Száz et al., 2016; Horváth et al., 2020; but see Blaho et al. [2014]). Further research is needed to find effective tools that mitigate collision impacts across taxa. Finally, offsite compensatory mitigation is employed as last resort to offset for unavoidable impacts, including land acquisition and the restoration of off-site habitats. We have not found any reference evaluating the effectiveness of these measures in PV facilities specific contexts, but it is recommended to use the available scientific knowledge on similar conservation strategies so that they can be conveniently designed and implemented, always supported by a monitoring of their effectiveness to achieve adaptive management.

3.7 | Conclusions and research gaps

Research on PV impacts on biodiversity have not increased proportionally to its development, with a significant knowledge deficit compared to other currently less widespread energies, such as wind energy (e.g., Marques et al., 2014; Nazir et al., 2020; Peste et al., 2015; Powlesland, 2009; Wang et al., 2015; Wang & Wang, 2015). Besides, there is a notable decoupling between PV development and progress of research on its impacts by region: although PV capacity is concentrated in Asia and Europe (ca. 59% and 22%, respectively), where the greatest conflicts with conservation areas occur (Rehbein et al., 2020), most of the knowledge on PV impacts comes from North American contexts (48%). This inevitably leads to a bias in the current knowledge about PV impacts (41% in deserts), which might not be extrapolated to other environments like farmland, where most of the PV capacity is sited (Kruitwagen et al., 2021). We detail below the *main conclusions drawn* and the *knowledge gaps* where research efforts should be invested so that biodiversity conservation can keep up with the accelerating development of this renewable energy:

- **Adaptive, collaborative strategies to avoid and compensate PV impacts.**
  The urgent call to combat the impacts of climate change makes the advance of PV energy inevitable. However, given the lack of empirical evidence found in this review for some PV impacts and mitigation measures (see Figure 5), the development of PV should be accompanied by adaptive planning and management, applying an iterative process where every new facility is accompanied by extensive monitoring, contributing for the acquisition of new knowledge that will be applied in future installations in close collaboration with stakeholders (Köppel et al., 2014). Further research is needed on: 1) wildlife use of PV facilities; 2) the impacts of specific configurations (e.g., landscape context); and 3) the effectiveness of management and mitigation/compensation schemes applied within and outside the PV facilities to maximize the benefits on biodiversity and ecosystem services. This knowledge is essential to identify optimal locations and land sharing opportunities of 'conservoltaic' systems (Nordberg & Schwarzkopf 2023). Lastly, the increasing efficiency of PV panels allows foreseeing an optimization of land surface occupied by facilities.
- **Need for diversification of environmental contexts and ecosystem components.**
  Most information available on the impacts of PV comes from desert ecosystems (41%), but there is a lack of research in grasslands and farmland. Moreover, only 80 studies reviewed have focused on specific species or groups of species, even in regions with good scientific knowledge of species ecology and threats like the EU where 76 species (mainly birds and reptiles; 48%

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and 38%, respectively) included in the Birds and Habitat Directives are reported threatened by solar power development (European Environment Agency, 2023). Given that most PV impacts are context-dependent, future research efforts should be invested in those contexts and ecosystem components for which the greatest knowledge gaps have been found (e.g., microclimate impacts on agroecosystems, grasslands, or shrublands in continental climates or the effectiveness of agrivoltaics in arid and continental climates; Figure 5), diversifying environmental conditions and prioritizing those species that are more threatened by PV development.

- **Lack of standardized and robust sampling designs**. A large portion of the studies were carried out on a single PV project (53%), and preconstruction estimation of baseline situations was rarely reported (8%), with only two studies employing a strict BACI framework. There is a need to use comprehensive BACI designs that provide critical information on the direct responses of sensitive wildlife, including a large number of years and facilities (i.e., long-term and large-scale studies) as well as preconstruction and control-site data for interpreting postconstruction changes. Moreover, the employment of standardized protocols—especially for collision studies—would allow findings to be comparable across contexts, opening the way to more robust and generalizable conclusions (Conkling et al., 2021).
- **Lack of knowledge regarding the cumulative and synergistic ecological impacts.** Recent studies have proven that medium-sized PV plants result in higher loss of seminatural habitats than large-sized PV plants, probably due to more strict environmental impact assessment on mega-solar PV facilities, which might lead to the fragmentation of large projects (Kim et al., 2021). The scattered distribution of small facilities might result in a high cumulative environmental impact that would not be detected by independent assessments, supporting the need for cumulative and synergistic environmental impact assessments (Serrano et al., 2020).
- **Disentangling the mechanisms underlying wildlife collision with PV panels is mandatory to design effective mitigation measures.** There is an urgent need to identify the species (e.g., morphological and local abundance), site (e.g., landscape context), and PV facility (e.g., size) specific factors determining collision events to improve our understanding of this process and properly design mitigation measures. In addition, more research is needed to understand how species perceive PV facilities in relation to surrounding landscape elements and the mechanisms underpinning maladaptive behaviors such as the attraction to PV panels suffered by some taxonomic groups (Chock et al., 2021). Lastly, to properly disentangle these mechanisms, an accurate quantification of casualty estimates is mandatory, which should be corrected by all bias sources when counting carcasses, including imperfect detection and carcass disappearance due to decomposition or removal by scavengers, as well as the underlying potential factors influencing these bias sources (e.g., vegetation structure, carcass age, carcass size, and observer) (see Gómez-Catasús et al. [2021] for an example with power lines).

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The dataset and all code for figures and analyses in this manuscript will be archived on a public repository such as Github.

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Review

Agrivoltaic, a Synergistic Co-Location of Agricultural and Energy Production in Perpetual Mutation: A Comprehensive Review

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Abstract: Agrivoltaic systems, which consist of the combination of energy production by means of photovoltaic systems and agricultural production in the same area, have emerged as a promising solution to the constraints related to the reduction in cultivated areas due to solar panels used in agricultural production systems. They also enable optimization of land use and reduction in conflicts over land access, in order to meet the increasing demand for agricultural products and energy resulting from rapid population growth. However, the selected installation configurations, such as elevation, spacing, tilt, and choice of panel technology used, can have a negative impact on agricultural and/or energy production. Thus, this paper addresses the need for a review that provides a clear explanation of agrivoltaics, including the factors that impact agricultural and energy production in agrivoltaic systems, types of panel configurations and technologies to optimize these systems, and a synthesis of modelling studies which have already been conducted in this area. Several studies have been carried out in this field to find the appropriate mounting height and spacing of the solar panels that optimize crop yields, as this later can be reduced by the shade created with the solar panels on the plants. It was reported that yields have been reduced by 62% to 3% for more than 80% of the tested crops. To this end, an optimization model can be developed to determine the optimal elevation, spacing, and tilt angle of the solar panels. This model would take into account factors that influence crop growth and yield, as well as factors that affect the performance of the photovoltaic system, with the goal of maximizing both crop yield and energy production.

Keywords: energy-water-agriculture nexus; agrivoltaics; combined model; optimization; arrangement; yields

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1. Introduction

Of all natural resources, water, energy, and food are the most essential to sustain life on earth [1,2]. Water, energy, and food share common challenges of limited accessibility, increasing global demand, and sustainability constraints [3]. Moreover, these essential resources are expected to face a significant surge in demand due to rapid population growth, in order to meet the basic needs of the population [4]. Indeed, according to UN projections, the world's population will increase from 8.5 billion in 2030 to 9.7 billion in 2050 and reach about 10.4 billion in the 2080s [5]. Moreover, according to the FAO [6], agricultural production will have to be doubled to meet demand in developing countries, while these countries will have to face constraints related to increased competition for access to water and energy and the impacts of climate change. To this end, it has been predicted that production needs to be increased by 60% [7] or even doubled to meet the

population's needs in the face of population growth and changing diets [8]. The major constraints to agricultural development are related to access to water and energy for irrigation. Irrigation is the controlled delivery of water for agriculture through artificial systems to meet water needs not met by rainfall for crop growth and development [9]. Sophisticated and water-efficient irrigation techniques have significantly increased energy requirements. The energy cost required to operate these systems compromises the viability of many irrigation networks [10]. To this end, new perspectives have emerged, namely the use of renewable energy in irrigation systems as an alternative to pumping systems powered by fossil fuels [11,12], bearing in mind that the high cost of fuels and the lack of electricity, especially in rural areas, are factors that negatively affect the functioning of irrigation systems [13]. Solar PV panels are utilized due to their environmental benefits, cost-effectiveness, and ability to address issues of fossil fuel scarcity and unavailability in certain regions. The energy sector has seen significant and accelerated progress in terms of innovations observed with the use of renewable energy. A total of 20% of global energy consumption in the world comes from renewables, and about 30% of investment in renewables is in wind power and 60% in solar power [14].

Solar photovoltaic energy has emerged as an environmentally friendly and economically viable alternative with lower energy costs [9,13]. In addition, photovoltaic panels are among the leading renewable energy technologies in the world and have seen continuous decrease in costs over the years. It is predicted that 25% of the electricity needed in 2050 will come from solar PV, with a reduction of 4.9 Gt of CO_2 corresponding to a 21% decrease in emissions in the energy sector [15].

Nevertheless, using solar panels to pump water for irrigation can significantly reduce cultivated areas due to the space occupied by the solar panels [16]. One solution to this problem is, therefore, the adoption of agrivoltaic systems. These dual-use systems involve raising the PV panels to use the space under the panels for agricultural purposes [17]. Thus, this system reduces the issue of conflicts regarding land access [18,19]. Agrivoltaics can also significantly reduce the constraints on access to electricity for populations. According to Jamil et al. [20], agrivoltaic practices on only 1% of cultivated land can satisfy the energy demands of at least one-quarter of the population in Canada. However, solar panels installed in an area can impact microclimate, temperature, and solar radiation distribution, water, biodiversity, air quality, and ecosystem-energy balances [21,22]. Given the impact of solar panels on crops, several studies have investigated the optimal panel layout to maximize crop production in the presence of the panels. These studies have mainly focused on determining the height and spacing of the panels to create a suitable environment for crops under the panels. However, these arrangements were determined through studies that primarily focused on the irradiation received under the PV array and the resulting shading on the crops, with specific arrangements being tested [23–25]. Other studies have examined panel orientation through field experiments [26]. Kim et al. [27] worked on modeling the hybrid performance of an agrivoltaic system in South Korea. Their model focused on the variation of the amount of electricity generated and the crop yield obtained based on the incident radiation, as well as the impact of atmospheric conditions on the radiation. Three different shading ratios were tested to compare the levels of shading (21.3%, 25.6%, and 32%), with the shading ratio calculated as the panel area divided by the system area. A height of 5.42 m was used for all three tests and the shading rate was based on the density of the modules. However, there is still limited research and decision-making tools to determine the appropriate configuration for the crop being grown. Thus, modeling studies to determine the optimal height, spacing, and inclination of the panels to maximize growth and development for a given crop and the performance of the panels would help users to find the right configuration.

In order to achieve our purpose, this review focuses on a clear explanation of agrivoltaic systems and the functioning of its different components, as well as the factors that affect each of them. We believe that a large literature review will allow us to identify the most important parameters to consider for the design of the optimization model. The present paper will also summarize the studies carried out on the possible configurations of agrivoltaic systems, as well as the overall successes and failures of the arrangements and orientation.

2. Definition and Terminology

An agrivoltaic practice is a concept that originated in 1980 [23]. It is defined as a land-use concept that directly integrates solar energy production and agricultural activities, which are practiced under the photovoltaic field installation, both of which are highly dependent on sunlight [28]. Agrivoltaics has several names that vary according to region and application, such as "dual-use", "co-location", "agri-PV", "agri-solar", "solar sharing", "pollinator-friendly solar", etc. [29]. Indeed, it is a symbiotic relationship in which both activities interact directly and benefit from this co-location [30]. This practice leads to synergies by optimizing the potential offered by both production systems [31], especially in agroforestry systems [32].

Agrivoltaic practices can be carried out in different ways depending on the activities carried out by the population in a given area (Figure 1). Agrivoltaic applications represent the combination of energy production with (i) agricultural production in the field or (ii) agricultural production in greenhouses or livestock rearing, or (iii) provision of ecosystem services through vegetation management or (iv) different agricultural practices combined [29].

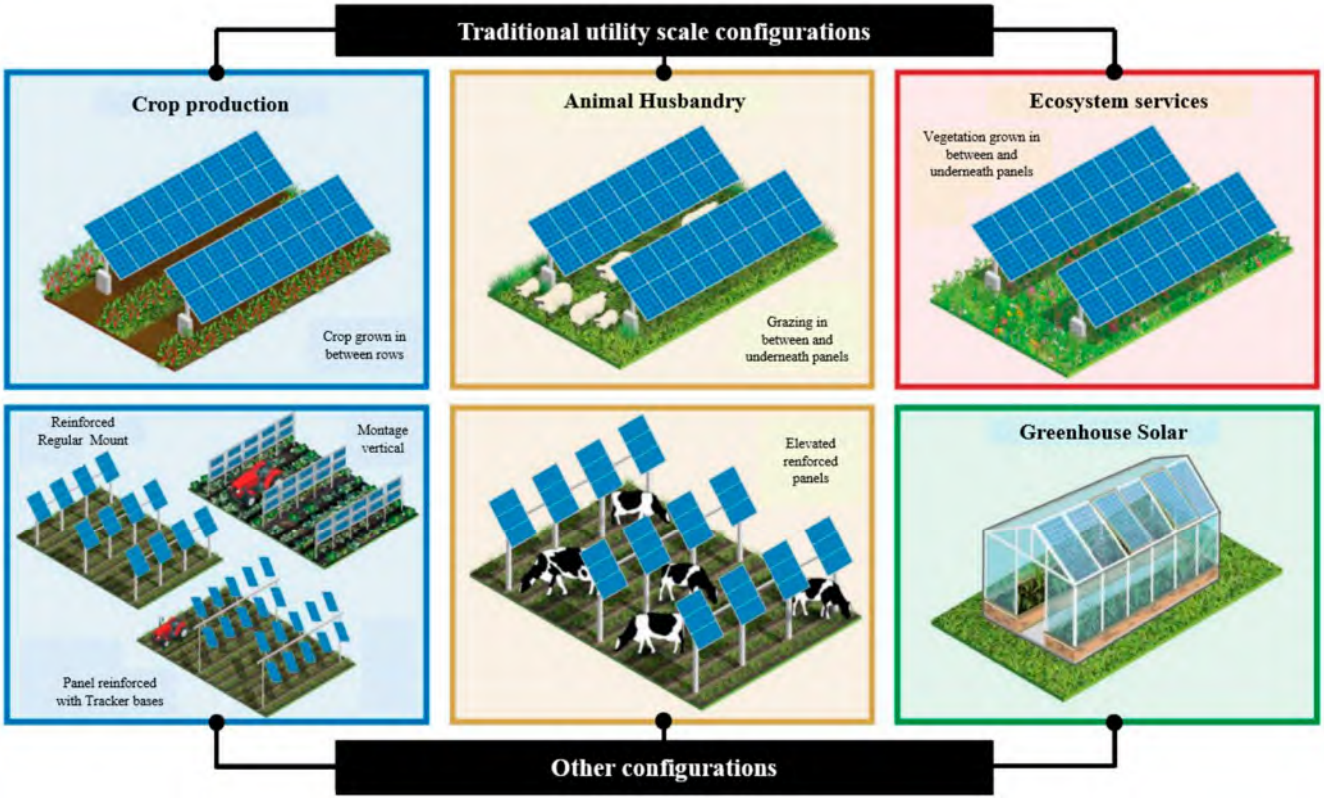


Figure 1. The different agrivoltaic systems [29].

Agrivoltaic technology has an important role in strengthening the water–energy–food relationship [33], given the increasing future need for energy and food production in the face of population demand [34]. Indeed, one of the constraints on the development of PV systems is the increased competition for land due to high population growth and rising food demand [35]. Although land resources are limited, the need for energy and food is increasing, leading to increased competition for land between the two sectors. In response to this growing competition, agrivoltaics was conceived to keep the two activities in balance [36]. Due to their dual use, agrivoltaics would mitigate competition for space and offers the possibility to install large PV systems, while keeping the land accessible for food production [37]. Thus, agrivoltaics system reduces land constraints concerning the placement of solar PV plants for electricity generation [38]. Moreover, this system has proven to be a particularly effective way to increase land use efficiency [32]. Land use efficiency is determined by the so-called parameter Land Equivalence Ratio (LER). The method of measuring land use in integrated agricultural and electricity production systems was originally derived from the intercropping method applied in the farming sector to increase land yield and total income [39]. The LER is a function of the area of the PV system and the total area needed to meet the agricultural and electricity production of the system [40]. Agrivoltaic systems can increase overall land productivity by 35–73%, thus they avoid using land solely for energy production at the expense of agricultural production [41]. According to Lee et al. [42] and Weselek et al. [31], agrivoltaics can increase land productivity by 60–70%, and for Dinesh and Pearce [38], it can increase the economic value of land by more than 30% by minimizing yield losses due to shading effects through appropriate crop selection. According to Trommsdorff et al. [43], land use efficiency varies depending on time and climate. In 2017, the Land Equivalence Ratio (LER) in Germany indicated an increase in land productivity from 56% to 70%, and this value reached 90% during the dry and hot summer of 2018. Abidin et al. [39] reported that applying agrivoltaics to less than 1% of the world's cultivated land could offset the global energy demand. Although agrivoltaics may reduce the efficiency of electricity generation or agriculture when viewed in isolation, studies have shown that the synergy between the two activities can lead to increased overall efficiency. For example, the combination of two hectares of land (1 ha of crops and 1 ha of solar panels each considered individually) corresponds to 100% of crops and 100% of solar energy. However, the use of agrivoltaics in two hectares of land corresponds to 160% cultivation and 160% energy (i.e., 80% of crop and 80% of energy in only 1 ha of land) [39].

As reported by Trommsdorff et al. [43], Formula 1 is used to calculate LER. However, Formula (2) can be used to take into account the high land loss due to the surface occupied by the mounting structure of the solar PV panels.

$$LER = \frac{Yeild_x(dual)}{Yeild_x(mono)} + \frac{Yeild_y(dual)}{Yeild_y(mono)} \quad (1)$$

$$LER = \frac{Yeild_x(dual)}{Yeild_x(mono)} + \frac{Yeild_y(dual)}{Yeild_y(mono)} - 8.3\% \quad (2)$$

x is the cultivated crop and y is the electricity.

3. Solar Panel Installation Techniques to Optimize Agrivoltaic Systems

3.1. Classification of the Different Agrivoltaic Installations

The module configurations in agrivoltaic systems can be categorized into elevated and inter-row systems. The modules are installed above the crop at more than 1.8 m in elevated systems. Growing crops under elevated solar panel installations typically leads to a decrease in the amount of solar radiation they receive, which can cause shading and reduced exposure to sunlight. The main crops used in this type of agrivoltaic system are grapes, small fruit trees, and delicate vegetables. In contrast, inter-row PV systems are systems in which agricultural production is usually carried out in the space between the rows of

panels. The distance between two consecutive rows of the panels can be considerable in this type of installation to facilitate the passage of large agricultural machinery. The most common crops in inter-row solar systems are grasses, hardy vegetables, and higher-value horticultural crops [29]. The different configurations are established to compare their impact on the level of shading created by the panels and their consequences on crop yields to determine the optimal density for an agrivoltaic installation [44]. Another way to increase the efficiency of a PV system is to install double-sided PV panels [45]. Figure 2 summaries the different configurations.

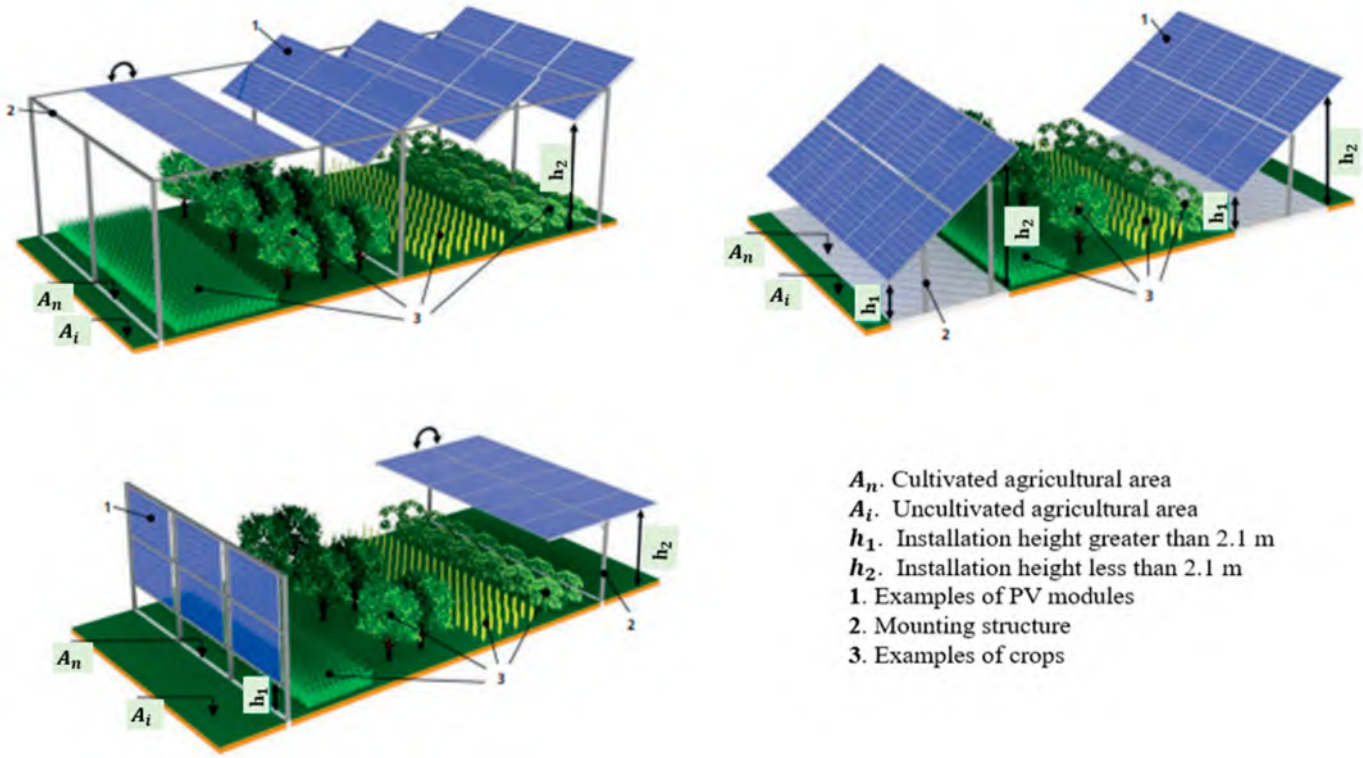


Figure 2. Overview of different configurations of agrivoltaic installations [44].

Several configurations and technologies have been developed and tested to optimize production in agrivoltaic systems. Therefore, the installation must meet the requirements of both the crop and the photovoltaic panels, which can be achieved by using optimal panel spacing and installation height that also allows the passage of agricultural machinery and appropriate panel technology [44]. Macknick et al. [46] have identified three types of approaches for the implementation of agrivoltaic systems: (i) the energy production approach, which focuses on optimizing the solar energy produced (thus minimizing changes in standard solar development practices), while cultivating between and/or under the panels, (ii) the agricultural production approach which focuses on optimizing biomass production (minimizing changes in existing vegetation management activities), while taking energy production into account, and (iii) the integrated agricultural and energy production approach (incorporating vegetation and energy priorities into system design).

These approaches are based on implementing one of the two installation techniques: open agrivoltaic systems, in which the PV module are installed at the ground level via support, and closed agrivoltaic systems, in which the modules are installed on greenhouses, thus serving as a cover [44]. However, only open agrivoltaic systems are considered in this paper. For this purpose, a general classification of the different agrivoltaic systems is proposed in Figure 3.

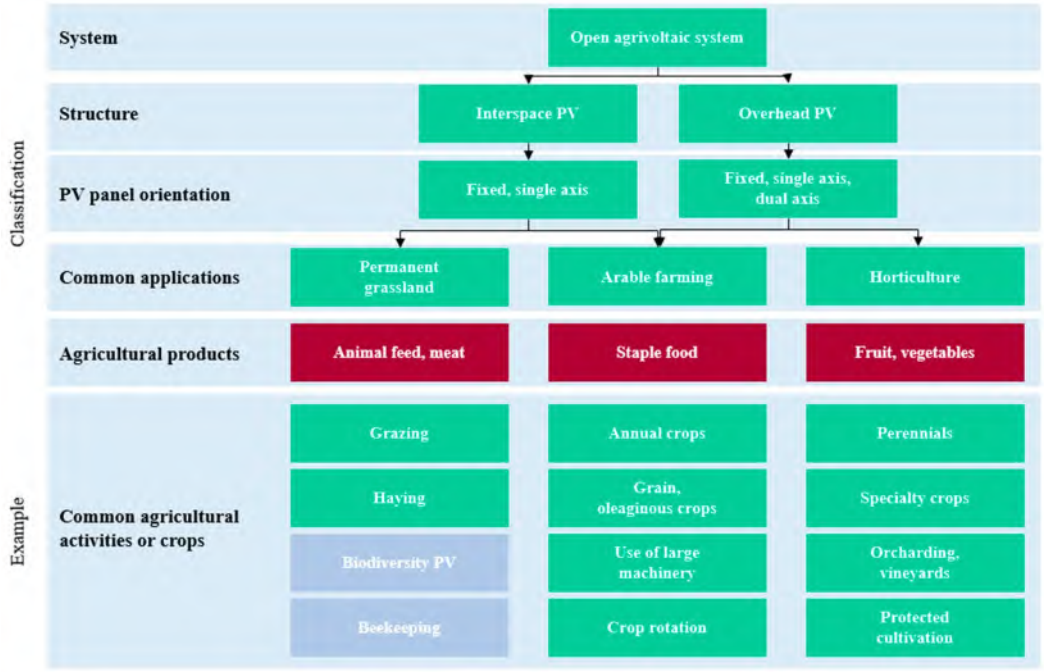


Figure 3. Summary of different agrivoltaic field systems [44,47].

3.2. Installation Techniques to Optimize the Agrivoltaic System

3.2.1. Mounting Height or Overhead of Agrivoltaic Systems Installation

The first agrivoltaic installation in the world was developed by Goetzberger and Zastrow at the Fraunhofer Institute (Germany) in 1980. It employed a height of 2 m and a spacing of 6 m between panel rows [23]. Since then, several studies have been carried out to determine the optimal elevation and spacing of solar photovoltaic modules to maximize energy and agricultural production. The ability of crops to grow and develop underneath PV modules raises structural issues in the case of aerial systems [44]. The height of the panels is an essential factor in the success of the various agrivoltaic practices. However, there are no recommendations for the panels' ideal height for an agrivoltaic installation. The height of the PV panels depends on several factors, including the geographical location of the site, the crop to be cultivated, the soil types, and financial resources. Thus, the height of the panels defines the crop to be grown on the site, the location of the crops in the systems (between the rows of panels or under the PV panels), and the equipment that can be used. Moreso, the solar panels installed in the agrivoltaic systems can have different configurations depending on the climate and soil to protect the structures from certain climatic hazards, namely high winds and freezing. For this purpose, a height of 1.8 m of the tubes supporting the PV panels is considered the minimum viable height for vegetable production under the panels. However, a tube height of 2.4 m is preferable for crops. This is because crops are grown between rows of panels at heights below 1.8 m, except for low-lying crops that appreciate shade. The elevation of the modules promotes a more even distribution of sunlight under the solar PV panels. In addition, these higher installations also allow the movement of equipment and people under the modules [29].

According to Trommsdorff et al. [44], overhead systems should be mounted at a minimum height of 2.1 m from the ground. In 2004, agrivoltaic systems started to be installed in Japan with installation heights of 3 m [31]. Dupraz et al. [24] used a 4 m elevation to assess the impact of this configuration on crop yields at Montpellier in 2010. This height was chosen to ensure access to large agricultural machinery on the site. In Germany, the impact of shading of the panels on crops was studied in 2016 by installing the PV panels at a distance of 5 m from the ground. In the USA, a 3.3 m high system was installed over the same period to assess the impact of agrivoltaic systems in arid environments [33]. Kim et al. [48] investigated the effect of agrivoltaic systems in South Korea using an

elevation of 5.2 m. Several studies were undertaken involving a range of configurations of agrivoltaic systems on different crops [28,38,49–59]. In addition, standard heights of solar panels can be used for sheep grazing whereas higher panel heights are required for cattle grazing [29]. Figure 4 gives two example of elevated agrivoltaic installation.



Figure 4. (**a**) Panels installed at the height of 4 m in Montpellier © Dupraz, (**b**) Panels installed at the height of 5 m in Germany © Fraunhofer ISE [33].

For traditional industrial-scale solar installations, minimal spacing is required between rows to avoid the shading of one onto another, but spacing between PV modules of a same row is not necessary. For an open agrivoltaic system, the spacing between rows on the one hand and the spacing between modules in the same row on the other hand must be carefully determined according to the type of crop. A wide panel spacing increases the capacity and uniformity of solar radiation penetration to the crop, thus reducing the impact of shading from the panels. Spacings tested ranged from 0.2 m [29] to 6.4 m [50]. A typical image concerning the spacing between modules is depicted on Figure 5. The spacing between rows of panels increases the efficiency of elevated agrivoltaic systems (Figure 6). In addition to enhancing the uniformity of solar radiation distribution to the crops, this configuration also increases the number of crop rows under the panels, facilitates the movement of large farm machinery, and increases the space available for farm workers. The spacing between rows in the aerial systems tested in the field ranged from 0.71 m [55] to 9.5 m [58].



Figure 5. Panels spacing for an experiment in the USA [29].



Figure 6. Spacing between rows of panels allowing movement of farm machinery under the PV panels © Fraunhofer ISE [44].

Another method of optimizing elevated agrivoltaic systems is to use an optimal tilt angle and orientation to increase the yield of the solar panels and the crops grown under them (Figure 7). Various tilts and orientations have been tested for different locations for fixed installations. According to Trommsdorff et al. [44], solar tracking modules allow for more flexible light management under the panels. The process of tracking PV systems involves installing a mechanical system that can adjust the orientation and tilt of the modules at different times of the day, with the goal of optimizing energy production. Two categories of solar tracking systems are used: single-axis trackers and dual-axis trackers. In the first configuration, the PV module array tracks the sun horizontally according to its angle of incidence (altitude) or vertically according to its orbit (azimuth). The second configuration combines the two, producing a more significant amount of energy. These mobile systems optimize crop yields through greater light availability during critical growth periods. In addition, the flexibility of the tilt angle provides constructive protection against hail or extreme radiation by adjusting their orientation as required.



(**a**) (**b**)

Figure 7. (**a**) Single-axis solar tracker module [44] and (**b**) dual-axis solar tracker module [60].

One of the main constraints of installing aerial agrivoltaic systems is the high investment and maintenance cost. The wide spacing of the panels can create favorable conditions for crop growth and development, but it leads to a reduction in energy density due to the reduced number of panels installed on the plot. Also, the spacing between rows of panels can increase the investment cost in areas with high land costs and limited land availability [29]. However, these systems face shading constraints [33], so these installations are favorable for viticulture. Moreover, dual-axis systems with large arrays of PV modules can

create shading under the panels, while other parts of the ground surface receive maximum sunlight [44].

3.2.2. Vertically Mounted Agrivoltaic Systems

The mounting of solar panels vertically to the ground is also a method of optimizing agrivoltaic systems (Figure 8). It consists of an installation technique in which the modules are oriented in the east–west direction, which has proved to be more efficient for permanent crops, or in the north–south direction, where energy production is a priority [61]. These systems require a significant distance between consecutive rows of vertical supports. For example, [62] studied vertical arrays using a 10 m spacing between the rows. A report by [26] showed that the yield of oats and potatoes decreased by 50% when the distance between rows was decreased in length from 20 to 5 m. In addition, [26] reported that 10% of the land near the panels does not have to be cultivated and can be used as ecological zones. Bifacial panels are widely used in these systems.



Figure 8. Vertical agrivoltaic installation with bifacial modules in Sued [62].

Vertical panels are favorable to crops as they allow a homogeneous distribution of sunlight, facilitate farm machinery movement, cleaning of solar panels, and access to crop rainwater. It is more economical, as it reduces the support cost, which is lower than that of aerial systems [39]. However, according to Katsikogiannis et al. [61], the constraint of its usage is the reduction in the electrical energy produced. Indeed, these systems allow for a 50% increase in LER and for a 33% reduction in electrical production compared to conventional single PV systems. According to Reagan and Kurtz [63], electrical production can be increased by 10–20% compared to traditional techniques by using a 2 m spacing between the supports, which results in a substantial reduction in crop yield [26].

Table 1 gives the strengths and weaknesses of the different installations.

Table 1. Summary of the strengths and weaknesses of the different installations.

Type of Installation	Strengths	Weakness
Inter-row systems	• Considerable space in this type of installation facilitates the passage of large agricultural machinery • Low investment cost	• Crop yield reduction due to uncultivated space

Table 1. *Cont.*

Type of Installation	Strengths	Weakness
Elevated systems with spacing between rows of panels	• Spacing between rows of panels and between panels enhance the uniformity of solar radiation • Can create crop protection in temperate zones • Crops under panels increase crop yields • Facilitates the movement of large farm machinery • Increases the space available for farm workers	• High investment and maintenance cost • Can create a shadow under the panels • Reduction in energy density due to the reduced number of panels installed
Tracking systems	• Greater light availability during critical growth periods • Constructive protection against hail or extreme radiation	• High investment and maintenance cost • Dual-axis systems with large arrays of PV modules can create irregular distribution of light to crops
Vertical mounting systems	• Homogeneous distribution of sunlight • Facilitate farm machinery movement • Cleaning of solar panels • Access to crop rainwater • Reduced cost of the installation structure • Increased electricity production for small distances between installation structures	• Reduction in agricultural production for small distances between installation structures (2 m) • Reduction in electricity production for large distances between the installation structures (20 m)

4. Factors Affecting the Operation of Photovoltaic Systems

Agrivoltaics relies mainly on the distribution of sunlight for photovoltaic energy production and photosynthesis. Therefore, the solar radiation spectrum is shared between the solar panels and the crops underneath [34]. Indeed, the principle of photovoltaics is the conversion of sunlight into direct current electricity. This production of electrical energy is the result of the absorption of photons from photovoltaic cells exposed to the sun, which in turn release free electrons to produce electrical energy [64–68]. Furthermore, the solar cell is the main component of the solar photovoltaic system [69].

Solar cells can be grouped into four generations based on the specific constituent elements and their periods. The first generation of PV cells is based on silicon wafer technology, including monocrystalline and polycrystalline cells [70]. The cells have an efficiency of between 18% and 20%, depending on the quality of the silicon used. However, according to Blakers et al. [71], the maximum efficiency reported for polycrystalline silicon cells could be as high as 26–27%. The theoretical maximum efficiency of monojunction silicon cells is around 30% and is called the Shockley–Queisser limit. The basic structure of these cells usually consists of a glass front and back cover, encapsulation layers, a solar cell matrix, and solder joints to electrically connect the individual cells [72]. Second-generation solar cells are thin-film cells that have a reduced maximum thickness of a few nanometers or tens of micrometers, compared to first-generation cells. This reduction in thickness helps to decrease the material usage and cost of silicon solar cells. These cells are made of two heterojunction layers squeezed between two contact layers. Efficiencies of 22.6% have been achieved with cadmium telluride (CdTe) thin films [73]. Third-generation cells consist of dye-sensitized solar cells (DSSCs), perovskite, and organic solar cells. DSSCs are limited by the synthesis of organic dyes and their chemical stability. For this reason, perovskite has been used as an alternative to DSSCs, and more than 21% efficiencies have been achieved in a very small area. The fourth-generation tandem solar cells are made of composite materials, consisting of polymers mixed with nanoparticles to have the properties of a single absorbing layer. The tandem solar cell is characterized by a top and bottom solar cell and an intermediate buffer layer. The upper GaAs cells absorb solar radiation, which is then transmitted to the Si of the lower cells [74]. The electrodes extract the generated charge carriers, and a photo-current flows through the thin buffer layer between the two solar cells [75]. The four generations mentioned are shown in Figure 9.

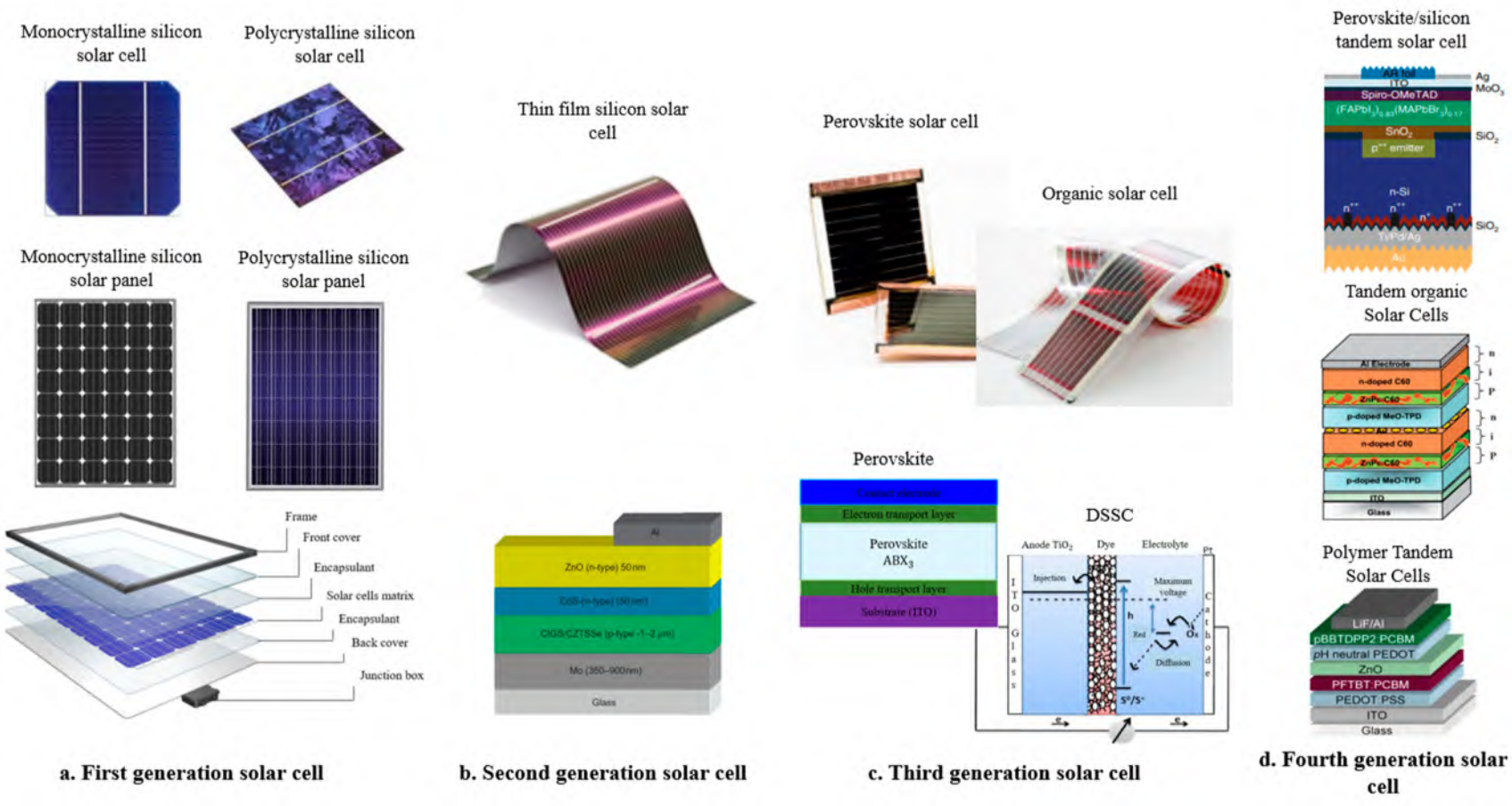


Figure 9. The four different generations of solar cells and their structures [74,76–80].

First-generation solar cells, namely monocrystalline and polycrystalline silicon-based cells, are the most commonly available in the commercial world [74]. According to Zhang et al. [76] and Rabanal-Arabach [77], 80–85% of the panels on the market belong to silicon technology.

In temperate regions with much sunshine, solar radiation is often too intense for some crops, especially in the summer. Shading screens are often installed in the systems to reduce the intensity of this radiation. These are semi-transparent solar panels [28,81,82]. Indeed, different opaque, transparent, and semi-transparent technologies are used in agrivoltaic systems and lead to different changes in sunlight availability throughout the day [29]. Bifacial panels are also widely used in agrivoltaic systems, as they use the light from the ground side (opposite side of the module) to generate electricity. Depending on the level of radiation on the back side, this can increase electricity production by up to 25% [44]. Agrivoltaic systems must be designed to grow appropriate vegetation depending on the available solar energy, soil, ambient climate, and other conditions. Therefore, the optimal conditions in agrivoltaic systems should be specific to the area where the system is implemented.

The PV module energy production mainly depends on the cells' temperature and the solar radiation. These parameters are related to the following factors: azimuth, tilt, latitude, solar declination, the slope, vertical shadow angle, hourly angle, zenith angle, elevation height, presence of vegetation at the bottom of the panels. The performance of a solar panel is determined by the amount of solar radiation it receives, whereas the temperature can create power losses (high temperature) or enhance the power (low temperature). The amount of solar radiation that the PV array receives changes depending on the geographical location, the sun's movement, the climatic conditions of the area, and the orientation of the panels [83]. Ideally, a photovoltaic installation should have the incident solar flux perpendicular to the array surface to maximize the panels' energy potential [84,85]. Thus, the optimal orientation must be determined due to the perpetual movements of the sun.

The orientation of the panels is determined through two parameters i.e., the azimuth and the tilt. The movement of the sun is a function of its elevation which depends on two parameters, namely the latitude and the solar declination. Furthermore, according to Jafarkazemi and Saadabadi [86], the azimuth angle of the surface, latitude, time of day, slope or tilt angle, day of the year, and incident radiation angle determine the amount of solar radiation received by the PV panels installed on a given area (Figure 10).

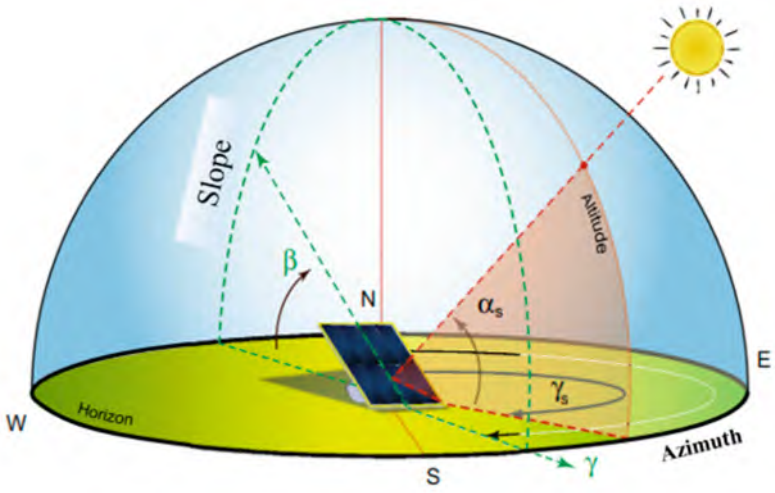


Figure 10. Factors affecting the performance of solar PV panels [87].

In particular, the electrical energy resulting from the transformation of the solar energy absorbed by the panels is strictly related to the slope (the tilt angle) and the azimuth angle [88]. The tilt angle (elevation angle) represents the angle formed by the horizontal

plane of the installation and the PV panels for a fixed structure [85,89]. A change in the tilt angle simultaneously leads to a change in the amount of radiation reaching the surface of the PV panels [89]. However, as a general rule, the tilt angle for a PV array installation is nearly equivalent to the latitude of the area [90,91]. The solar azimuth is the horizontal angle between the vertical plane normal to the surface and the vertical plane in which the center of the solar disc is contained, oriented in the north–south direction [91]. For this purpose, the azimuth values of 90°, 0°, +90°, 180° correspond to the positions east, south, west, and north of the panels, respectively [85,92]. Thus, the panels are oriented to the north in the southern hemisphere and the south in the northern hemisphere [93].

Other parameters that can likely affect the performance of photovoltaic modules are (i) the albedo, which is the amount of radiation reflected from the ground surface across the solar spectrum and (ii) the vertical shadow angle, sometimes referred to as the vertical profile angle, which is the direction in degrees of rotation of the center of the solar disc [91]. To these parameters, Oudrane et al. [94] and Nfaoui and El-Hami [95] added the hourly angle, which is a function of the daily spinning of the earth with respect to its axis, and the declination, which is the angle between the "center of the earth-sun" vector and the equatorial surface of the earth. Yilmaz et al. [96] considered in addition to these parameters the zenith angle which is the angle between the sun's direction and the vertical of the location.

In addition, the elevation height and the occupation of the surface where the PV array is installed can have an impact. These factors have been highlighted by Chemisana and Lamnatou [97], Ogaili and Sailor [98], Alshayeb and Chang [99], and Osma-Pinto and Ordóñez-Plata [100]. They evaluated the electrical energy generated by a photovoltaic array on rooftops using different elevations and different ground level supports. According to Alshayeb and Chang [99], the presence of vegetation at the bottom of the panels can be advantageous, resulting in an increase of 0.25 to 0.4% in the efficiency of the solar panels when the panels are installed at the height of 50 to 75 cm from the roof [100]. According to Chemisana and Lamnatou [97], vegetation below the panels leads to a decrease in ambient temperature that can cause an increase of 1.29–3.33% in the maximum power output of the PV array. Furthermore, Ogaili and Sailor [98] showed that the presence of vegetation could cause an increase in the energy output of 0.8% to 1.2% compared to a white or black colored substrate, respectively, when the panels were elevated at 18 cm from the roof.

5. Impact of Agrivoltaic Systems on Crops

5.1. Importance of Solar Radiation on the Process of Photosynthesis

Sunlight is the key factor in photosynthesis. Photosynthesis consists of the production of oxygen and glucose that crops can use for growth and development [101,102] as a result of the reaction between water and carbon dioxide absorbed through the stomata, which are small holes in the lower epidermis, and controlled by sunlight [103]. Equation (3) is a summary of the photosynthetic reaction.

$$6H_2O + 6CO_2 \overset{Solar\ energy}{\rightarrow} C_6H_{12}O_6 + 6O_2 \quad (3)$$

$$\Delta_rG^{o'} = +2870\ kJ/mol, \Delta_rG^{o} = +2875\ kJ/mol = \Delta_rG^{O''} \quad (4)$$

Photosynthesis can be broken down into two stages. The first step, called the light reaction, consists of the absorption of sunlight by the chlorophyll pigments [104], resulting in the production of electrons and protons, which are responsible for the production of adenosine triphosphate (ATP) and nicotinamide adenine dinucleotide phosphate (NADPH) at the thylakoid membrane [103]. The second step is the dark reaction in which NADPH and ATP generated in the light reaction is used to produce carbohydrate from CO_2 through the Calvin–Benson cycle in the chloroplast stroma [104–106]. Figure 11 gives an overview of the importance of light in the process of photosynthesis.

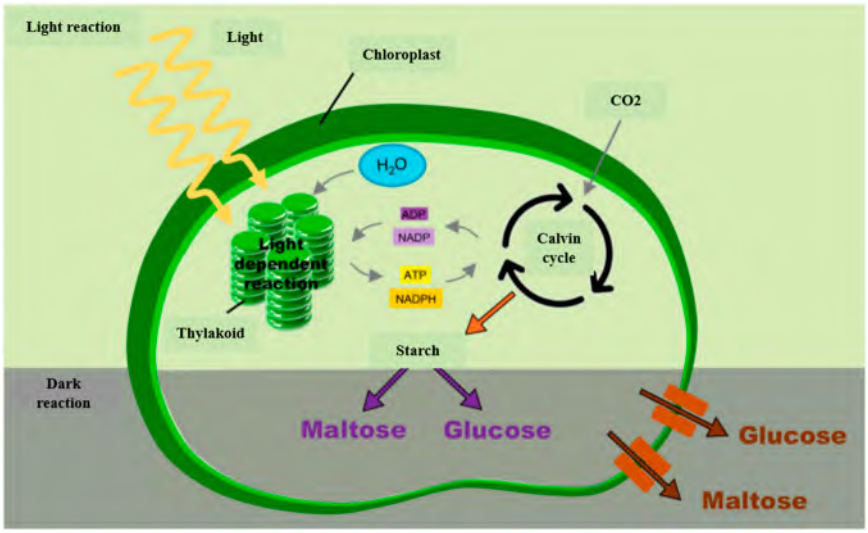


Figure 11. The overall process of photosynthesis at the chloroplast level [107].

Chlorophylls are the primary pigments in crop cells that absorb sunlight in the blue (450 nm) and red (650 nm) wavelengths and give the crop its green color. However, there are other pigments in crop cells, namely carotenoids, which absorb blue light and give the leaves their yellow color. Furthermore, the excitation of ions in the process of photosynthesis is driven by the absorption of specific wavelengths of light in the visible range [103], as shown in Figure 12.

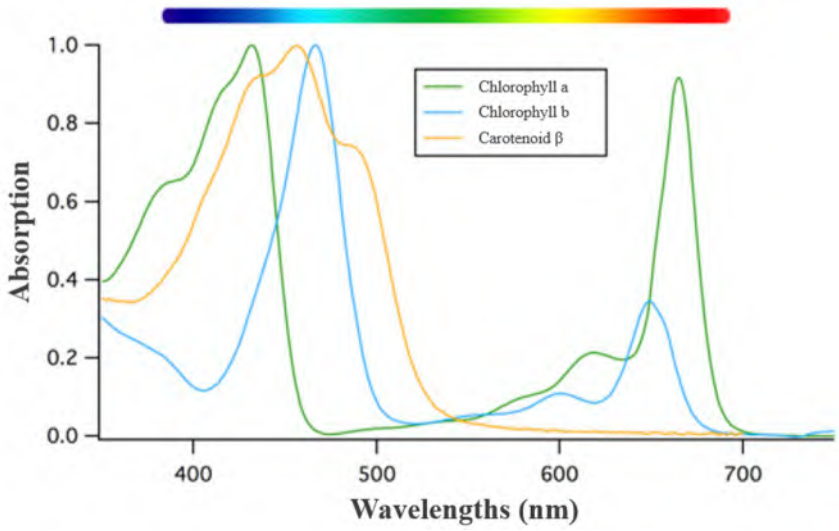


Figure 12. Basic absorption spectra of crops' main chlorophyll and carotenoid pigments [103].

Indeed, wavelengths from 430 to 500 nm are effective in chloroplast development and photosynthetic function [106,108]. In addition to promoting photosynthetic activity, wavelengths from 640 to 670 nm are necessary for leaf growth and crop biomass production [106,109]. Furthermore, according to Wang and Folta [110], the wavelengths 500–600 nm are of great importance in chlorophyll content, photosynthetic function, and consequently crop growth.

This part of the solar radiation of wavelength 400–700 nm is called photosynthetically active radiation and represents the part of solar radiation mainly used for photosynthesis [111,112]. However, the total proportion of solar energy in the photosynthetically active band represents only 48.7% of the average solar spectrum measured at the Earth's surface. At the same time, the chlorophyll pigment is considered as an imperfect radiation absorber

in the 400–700 nm band because it weakly absorbs solar radiation in the green band. Therefore, it is estimated that 90% of the radiation is photosynthetically absorbed by vegetation, and 10% is reflected [113]. According to Amthor [114], the solar radiation intercepted at the Earth's surface depends on the area's location, the presence or absence of clouds in the sky, and the sun's elevation. In addition, the fraction of incident solar radiation intercepted by crops is a function of leaf area and orientation. Furthermore, the total photosynthetically active radiation absorbed by chlorophyll pigments for a crop that has reached whole leaf area development is estimated at 92%.

5.2. Factors That Can Affect Crop Growth in Agrivoltaic Systems

Agrivoltaic systems are systems in which crops are grown, considering factors that may affect crop growth, including the level of shade, climatic factors, and water consumption [115].

Access to the limited amount of sunlight needed for the photosynthetic process is the main challenge for crop productivity under PV panels [24,116], as sunlight is the key factor playing a significant role in crop growth and development [117].

Touil et al. [118] reported that PV panels can cause a reduction of over 40% in the amount of solar radiation received by crops. A coverage rate of 50% or more can also hinder crop growth. For example, a panel-induced shading level of 50% led to a decrease in crop height and stalk diameter, and a decrease in net leaf photosynthesis rate, leaf specific weight, dry matter accumulation on leaves and stalks, and grain number of maize. To this end, the optimal level of shading to ensure energy requirements for photosynthesis consists of a level of photosynthetic photon flux density capable of both saturating CO_2 assimilation and favoring the stabilization of shading conditions and reducing photoinhibition [24].

Nevertheless, the shading induced by the photovoltaic field can be beneficial by reducing the amount of water lost through evaporation and therefore increasing water use efficiency [119]. To this end, these devices are favorable in drought-prone areas during hot periods, as they reduce crop water demands due to reduced evapotranspiration [38,53,54,120]. According to Yue et al. [121], agrivoltaic systems can increase soil moisture by 14.7% for fixed installations and 11.1% for mobile installations. Moreover, based on a study conducted by Adeh et al. [52], panels in agrivoltaic systems allow for more efficient water use (estimated at 328%) by maintaining higher soil moisture levels compared to soil moisture in a full-sun growing area. Barron-Gafford et al. [54] showed that the positive effect of agrivoltaic systems on water conservation is exacerbated by applying water to the crops based on a two-day irrigation frequency that maintains 15% higher soil moisture compared to the soil under full sun. However, although soil moisture remained higher under the panels, it was reduced by 10% based on a daily application of the crop's water requirements. Furthermore, studies conducted in dryland environments on the impact of agrivoltaic systems on specific crops showed that water use efficiency under the panels was estimated at 157%, 65%, and 12% for chili, tomato, and lettuce, respectively, for a 4 m panel elevation [50,118]. Furthermore, a simulation study by Elamri et al. [40] showed a reduction of less than 20% in the water requirement of lettuce as a result of the effect of panel shading.

The shading caused by the panels and the increase in soil moisture affects the microclimate of the area cultivated under the panels. Adeh et al. [52] established that the elevation of the PV panels by 1.2 to 2 m causes a considerable change in air temperature, relative humidity, and wind speed on the surfaces near the PV panels. In a study conducted in the USA on tomato cultivation, it was observed that the air temperature varied between 21.5 °C and 22.3 °C in the subplots cultivated in the open air, whereas it decreased to 19.8 °C under the panels (for an elevation of 2.2 m and a tilt angle of 18°). The rows had the highest average relative humidity at 79.38%, followed by sub-plots cultivated in the open air at 74.63%, and sub-plots located under the panels had an estimated humidity of 73.54%. The soil temperature was estimated to be 20 °C, 24.7 °C, and 25.6 °C under the PV panels, between the panel rows and the control, respectively. In addition, the wind

speed was lower (0.65 m/s) between the rows of panels, whereas it was 0.89 m/s in the open field [119]. According to Noor and Reeza [122], the microclimate under the panels varies differently depending on the area's climate and the land's topography. Their study in the tropics showed that the air temperature was the same in the open field and the higher and middle areas under the panels. However, it was higher in the areas of lower topography under the PV panels. Regarding relative humidity, these studies showed that relative humidity was higher under the PV panels, estimated at 65%, compared to 63.7% between the rows of PV panels and 53.5% in full sun.

The panels reduced the average soil temperature of 5.2 °C in summer with a minimum of 3.5 °C and a maximum of 7.6 °C, and an increase of 1.7 in winter in the UK [21,121]. Abu-Hamdeh [123] showed that the soil temperature under the panels recorded a decrease of 3.1 °C in arid zones and 1.1 in equatorial and temperate zones. Moreso, the soil temperature can vary depending on the installation technology. For example, the ground temperature under fixed panels was found to be lower than under mobile panels since the radiation intercepted by the panels is higher for mobile technologies [51,121]. Weinstock and Appelbaum [124] showed that agrivoltaic systems can lead to a reduction in soil temperature of 4 °C for fixed and 1.5 °C for mobile installations.

5.3. Impact of Solar Panels on Crops

The success of production in agrivoltaic systems is highly dependent on the choice of crops to be grown. Crops grown under PV panels are often subject to different climatic conditions than those grown in full sun because of the shading created by the solar panels. Furthermore, crops of different varieties of the same species may respond differently under the same conditions [29]. For this purpose, the impact of agrivoltaic systems on crops is summarized in Table 2, considering different crops and locations.

Table 2. Impact of photovoltaic panels on different crops in different localities.

Crops	Study Area	Height and/or Spacing or Shading Rate	Impact on Culture	Sources
Durum wheat	Montpelier, France	Height of 4 m Spacing 1.64 m (distance between the lower side of two consecutive panels) Tilt of 25°	• 11–29% reduction in dry matter • 8 to 11% reduction in yield	[24]
Lettuce and cucumber	Montpelier, France	Height of 4 m Tilt of 25°	• Reduction of evapotranspiration by 62% and 70% for lettuce and 73% to 81% for cucumber • Crop cover was significantly higher in the shaded treatments (150% between days 124 and 144)	[50]
Lettuce	Montpelier, France	Height of 4 m Two spacings: 1.6 m in full density and 3.2 m between rows in half density Tilt of 25°	• Crop axis under PV panels was 7.4 cm with 2.0 g dry matter per axis compared to 6.6 cm and 2.5 g per axis in full sun • Significantly reduced number of leaves in the shade • Increased leaf area	[49]
Lettuce	Kansas, USA state	Height of 4 m Two spacings: 6.4 m in half density and 3.2 m between rows in full density	• 42% reduction in yields for the 3.2 m spacing and 19% for the 6.4 m spacing in summer • No impact on yield for the 6.4 m spacing in spring but 21% reduction for the 3.2 m spacing	[38]

Table 2. *Cont.*

Crops	Study Area	Height and/or Spacing or Shading Rate	Impact on Culture	Sources
Chili and tomato	Tucson, USA	Height of 3.3 m above the soil surface at their lowest point Spacing of 1 m Tilt of 32°	• For Capsicum annuum var. glabriusculum, production is three times higher under the panels • For C. annuum var. annuum, there is no impact • For S. lycopersicum var. cerasiforme, production is two times higher under the panels	[54]
Maize	Chiba Prefecture, Japan	Height of 2.7 m Two row spacings: 0.71 m for high-density and 1.67 m for low-density Tilt of 30°	• Yields of 3.54 kg/m^2, 3.35 kg/m^2 and 3.23 kg/m^2 at a distance of 1.67 m in full sun and at a distance of 0.71 m, respectively	[55]
Grape	Ongjin-Gun, Republic of Korea	Height of 2 m Tilt of 15° Shading level of 30 of the total roof area	• Germination period, number of flowers and grape growth are identical in all treatments	[56]
Basil and spinach	Italy	-	• Reduction in marketable biomass yield by 15% and 26% for basil and spinach, respectively	[28]
Sesame, mung bean, kidney bean, corn and soybean	Jeollanam-do, South Korea	Height of 5.42 m Shading rates of 32%, 25.6% and 21.3%	• Yield reductions for all crops except maize at 21.3% shade • At 21.3%, yields increased by 6% for maize and decreased by 7%, 13%, 21% and 26% for sesame, soybean, mung bean and kidney bean, respectively • At 25.6%, yield reduction of 14% for sesame and 35–44% for beans • At 32%, yield reduction of 53% for sesame and 30–44% for other crops	[48]
Oilseed rape, onion, faba bean and forage maize in rotation with potato melon, carrot, onion and dry pea in rotation with tomato	Sevilla, Spain	Height of 5 m Spacing of 9.5 m between suppoted structure Tilt of 27°	• Reduction in crop yields under shade following a correlation of studies already carried out on the effect of shade on the area (reduction of 10%, 7%, 17%, 6%, 20%, 23%, 15% and 5% for carrot, maize, melon, onion, rape, potato, dry pea and tomato, respectively)	[58]
Celery	Southwest Germany	Row distance: 9.5 m (2.8 times module row width)Height (free space in the direction of the work/top edge): 5.5 m/8 m	• Crop height was 30.6% and 14% higher under panels in 2018 and 2017, respectively • Dry matter yield of above-ground biomass was 48% and 31.9% higher under panels • Bulb yield decreased by 18.9% in 2017 and increased by 11.8% in 2018	[59]

Table 2. *Cont.*

Crops	Study Area	Height and/or Spacing or Shading Rate	Impact on Culture	Sources
Red beet, winter wheat, potato and red clover	Southwest Germany	Height of 5 mSpacing of 6.3 mTilt of 20°	• Increase in crop height for all crops • Between 2017 and 2018: −19 to +3% for winter wheat, −20 to +11% for potato and −8 to −5% for red clover and	[125]
Rice, onion, garlic, rye, soybean, bean, maize, forage crop	South Korea	Height of 3.3 mSpacing of 1.5 mShading rate of 30%	• For rice, stem height was 3.8 cm higher under the panels and yields decreased by 18.7% in 2018 and 8.9% in 2019 • For soybeans and beans, yields decreased by 68.7% and 73.3%, respectively • For garlic and onions, yields decreased by 18.7% and 14.6%, respectively • For fodder crops, the height was 7.4 m higher under the panels, nevertheless the yield decreased by 3.1 t/ha	[126]
Rice, potato, sesame, and soybean	South Korea	Height between 4 m and 4.5 m	• No impact on growth except for sesame (lower stem length, number of branches and 1000 seed weight) • Yield reduction of 3% for potato, 19% for sesame, 18–20% for soybean and 13–30% for rice	[42]
Soybean	Monticelli d'Ongina, Italy	Height of 4 to 4.5 mSpacing between rows of trackers of panels of 12 mfour treatments: 27%, 16%, 9% and 18% shading	• Crop height of 98.25 cm at 27%, 90.81 cm at 18%; 86.95 cm at 16% and 85.04 cm at 9% shade under panels and 87.8 cm in full sun • Number of pods reduced by 19.4% at 27% shade and 18.2% at 18% shade compared to treatments with 16% or less shade • Grain yield reduced by 8%, 4.6% and 11.8% for 27%, 9% and 18% shade respectively compared to full sun versus 4.4% increase for 16% shade	[127]

6. Influence of Agrivoltaics Systems on PV Module Performance

Few studies have focused the impact of agrivoltaic systems on the performance of solar panels. This is because crops are most affected by these types of installations. However, Table 3 gives an overview of some of the advantages and disadvantages of these installations on solar panels highlighted by some authors.

Table 3. Impacts of agrivoltaic systems on the performance of solar PV panels.

Advantages/Disadvantages	Description	Source
Advantages on PV panel	Increase energy production due to increased area through the LER	[39,117]
	Decrease in temperature of solar panels could be achieved by using agricultural moisture, evaporation from agricultural activities, and transpiration from crops which results in the increase in electricity generation	[128]
	PV panels in agrivoltaic systems can generate between 3.05% and 3.2% more energy compared to PV installations without cultivated crops	[129]
	Decrease in ambient temperature can cause an increase of 1.29–3.33% in the maximum power output of the PV array	[97]
	The presence of surface green due to vegetation at the bottom of the panels can results in an increase of 0.25 to 0.4% in the efficiency of the solar panels	[99]
Disadvantages on PV panel	Agrivoltaic can reduce the efficiency of electricity generation or agriculture when taken separately	[39]
	Decrease in the electricity produced with the reduction in the density of solar PV panels	[38,48,55]

7. Models Already Developed in the Agrivoltaic Field

One of the first models developed to optimize agrivoltaics was carried out in Montpelier by [24]. This is a model for intercepting the radiation available on the panels (developed on R software) and simulating the crop's development (generic crop model STICS). The light interception model calculates the daily radiation at any point on the ground using a ray-tracing algorithm. The crop simulation model was used to predict the behavior of crops under the panels. For the light simulation, ray tracing algorithm was used to make the simulation. The daily direct and diffuse radiation quantity striking any point of the ground below the array consisted of the output.

The authors of [38] utilized the STICS model, which comprises four primary modules. These modules include the crop growth module, soil interaction module, crop management module, and microclimate module. The crop model determines the effects of climate and soil moisture content on the immediate microclimate surrounding the crops. Indeed, they set up a solar PV system model and a crop model to optimize the performance of the agrivoltaic system. In their PV model, they formulated an optimization problem whose objective was to maximize the incident solar irradiance on the PV, while considering the additional land cost due to minimizing inter-row shading. They proposed to reduce panel density or use semi-transparent panels to reduce the effects of shading. In order to optimize the geometry of an agrivoltaic system, the crop, solar irradiance, mounting height, environmental climate, and tilt angle are crucial. The module production model was developed on PVsyst.

The use of the STICS model is advantageous because it allows the assessment of the impact of the configuration of a given agrivoltaic installation on crop growth. Therefore, real data from field experiments are required to use the model.

Amaducci et al. [120] had developed a software platform on Scilab by coupling the radiation and shading model to the generic crop growth simulator (GECROS). The GECROS crop model predicts crop biomass and yields as a function of climatic factors such as radiation, temperature, wind speed, and partial vapor pressure, as well as the amount of water and nitrogen available in the soil. Regarding the shading radiation model, it consisted of calculating direct and diffuse radiation at ground level with a time step ts = 0.5 h and a spatial resolution of 0.12 m by developing a procedure to calculate whether a portion of soil that is shaded or that receives direct radiation. This study was conducted using a tracking system.

Malu et al. [130] carried out agrivoltaic system modeling to study the electrical performance of agrivoltaic systems when combining grape and energy production in the Nashik

District of Maharashtra State in India using the National Renewable Energy Lab's System Advisory Model (SAM) version 2014.1.14, which uses weather data, location of the study area, PV array size, DC/AC ratio, azimuth angle, required axis type, and tilt angle. Inputs data consist of the weather data, the ratio of DC to AC power, the azimuth angle, the tilt angle, the type of axis required, the size of the system array, and the tilt angle. However, the study focused more on energy production.

Elamri et al. [40] investigated the variations of water in soil and the productivity of crops under PV panels. For this purpose, they used a model called "AVirrig" adapted based on the existing "Optirrig" model. Optirrig was built to generate and optimize irrigation scenarios that operate at a daily time step. The inputs used in this model are rainfall, radiation, air temperature, reference evapotranspiration, soil water reserves, leaf area index, dry matter, and crop yield. "AVirrig", which also includes the "AVrain" model that describes the redistribution of rainfall by solar panels depending on the method of panel installation, consists of a reservoir model that assumes the presence of three water reserves in the soil. This is a specific adaptation of "Optirrig" for AV installations that take into account the fluctuation of the shadow created by the PV modules. In opposition to Malu et al. [130], this study focused more on agricultural production.

Similar to Amaducci et al. [120], Potenza et al. [127], performed modeling to optimize the growth of crops under panels in Italy by coupling the GECROS crop growth model with a set of algorithms to estimate and specialized shading, radiation, and crop-related parameters. The system simulates the entire crop growth cycle, carbohydrate distribution, and grain yield of crops under the panels. Crop height, leaf chlorophyll content, leaf area index, and specific leaf area were measured throughout the experiment. Radiation mapping, calculated on the cells with a resolution of 0.12 m $\times$ 0.12 m and a time step of 30 min, was used to determine the shadow depth. GECROS is advantageous because it allows the prediction of biomass and yield based on the knowledge of climatic parameters. Thus, a knowledge of the variation of climatic parameters under the panels allows to determine the adequate configuration of an agrivoltaic system.

Trommsdorff et al. [43] investigated the electrical efficiency of PV systems applied to crops and the behavior and productivity of crops under panels in Germany's largest agrivoltaic research facility. The study was conducted according to the variation of solar radiation available to the PV panels and the crops. All light simulations for the PV modules were performed with Radiance, which is a back ray tracer for optical calculations in virtual environments that takes into account both direct and diffuse fractions of the irradiance, allowing the simulation of ground reflections to analyze the electrical gains on the back side of the PV panels. In addition, they used ZENIT software tool, which considers, among other things, temperature coefficients, specific efficiency curves, maximum power points, and inverter power limitations to evaluate the overall electrical efficiency. Virtual sensors measured the radiation under the panels. Simulations were performed for different orientations of the APV field between South and South–West (0°, 15°, 30°, 45°) and different distances between rows of panels. Moreso, the photosynthetically active radiation under the panels was converted into biomass yield.

Kim et al. [48] focused on the electricity production of agrivoltaic systems and the increase in revenue when implementing such a system. Thus, they implemented a polynomial regression to develop a model for estimating the system's electricity production using machine learning. The model considered eight (8) parameters, including solar radiation, daily minimum and maximum temperature, daily rainfall, humidity, wind speed, shading ratio, and type of solar panel. However, the shading data used in the study was calculated as panel area over the system area. Therefore, the model does not provide an indication of the optimal configuration in terms of spacing, elevation, and inclination for the crop to be grown.

Pulido-Mancebo et al. [131] have developed a model for optimizing agricultural production under the panels to convert photovoltaic power crops into agrivoltaic systems. It consists of a mathematical model that simulates the solar incidence in a network of

representative points on the ground, depending on the geometry and design of the PV crop to be converted to agrivoltaics. The study focused on photovoltaic installations with rectangular collector planes inclined towards the south and one side of the rectangle (wider) oriented in an east–west direction and parallel to the ground and with the shorter side oriented in a north–south direction. The model is based on the representation of the sun's position with respect to the geometry of the collector array (latitude of the location, solar declination, day angle, and solar time) as well as the geometry of the PV system itself (a rectangle represents the system). The model geometrically determines the shading at any point on the ground by determining the direct and diffuse radiation on the horizontal ground without obstacles. The inputs were the declination, the latitude, solar time, and daily angle. This model is advantageous because it allows a quick overview of the radiation in the ground in agrivoltaic systems.

Nevertheless, these models do not directly give a specific elevation, spacing, and inclination for a given crop and given locality. These models are used to determine whether or not a selected configuration is suitable for a given crop and need to be optimize. All these modeling studies have been set up to study and verify the performance of a specific installation to see the impact of this installation on the yield of the crop being grown in this system. Moreover, Pulido-Mancebo et al. [131] have developed that simulates the solar incidence in a network of representative points on the ground; nevertheless, it does not directly give the optimal spacing between rows of panels and between panels and the elevation to choose for a given crop.

Therefore, considering the limited number of decision support studies that have been conducted to determine the ideal configuration, i.e., elevation, panel row spacing, and panel spacing and tilt for any given crop, this review article has been developed to clearly explain agrivoltaics. We believe that this review can be used as a guide to set up a model that will take into account geometric, geographical, climatic, crop, and PV panel factors which will have as outputs the optimal spacing between panels, elevation, and tilt that will result in maximizing the crop yield and power of the PV system in agrivoltaic systems.

8. Conclusions

The agrivoltaic system was first used in 1980. However, only a few studies were carried out in this field during this period. It is only since 2011 that many have started to work in this field. To this end, several studies have emerged in this field in recent years. These studies have mainly focused on implementing a given configuration of photovoltaic solar panels to reduce the effects of shading on crops. Several panel elevations and spacings were tested on several crops in different areas. However, these proposed arrangements were specific to the site and crop being tested. Thus, no study has been carried out to establish a model that allows for optimal panel elevation and spacing for a given area and crop. It is within this framework that this review was carried out. It gives a clear explanation of the agrivoltaic systems in full sunlight, the principle of operation of the panels, and the photosystem, both of which depend on solar radiation, as well as the factors that can affect their operation. It also shows the key factors that should be considered in an optimization model. This review examined the strengths and weaknesses of each type of installation to better select the system to be used and to optimize both the yield of the crops to be planted under the panels and the yield of the solar panels installed. For this purpose, the choice of an optimal elevation height, spacing, and tilt of the solar panels will reduce the impact of shading and increase crop yields, but also increase the power output of the solar photovoltaic panels, which is a twofold benefit. According to us, setting up a model that can be used for any area to find an optimal panel arrangement in the locality being studied would be an innovative solution that will be of high interest, especially in areas where the agrivoltaic system has never been tested. Furthermore, in the future, other studies may be conducted in the field of agrivoltaics, namely the evaluation of the environmental impact of the use of the panel structure which is becoming more imposing in elevated systems. Moreover, further research could also explore the economic implications of using

agrivoltaics for pumping water to support crop production and generating electricity for sale by small-scale farmers in rural areas where electricity access is limited.

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Nomenclature

β	Slope
γ	Azimuth
α_s	Coordinates of solar altitude
γ_s	Solar azimuth
AC	Alternating current
A_i	Uncultivated agricultural area
A_n	Cultivated agricultural area
ATP	Adenosine triphosphate
CdTe	Cadmium telluride
DC	Direct current
DSSCs	Dye-sensitized solar cells
E	East
GECROS	Genotype-by-Environment interaction on CROp growth Simulator
h_1	Installation height greater than 2.1 m
h_2	Installation height less than 2.1 m
LER	Land Equivalence Ratio
N	North
NADPH	Nicotinamide adenine dinucleotide phosphate
PV	Photovoltaic
S	South
SAM	System Advisory Model
STICS	Simulateur mulTIdisciplinaire pour les Cultures Standard, or multidisciplinary simulator for standard crops
W	West
x	cultivated crop
y	electricity

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RESEARCH ARTICLE

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Effects of solar park construction and solar panels on soil quality, microclimate, CO_2 effluxes, and vegetation under a Mediterranean climate

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Abstract

Solar energy is increasingly used to produce electricity in Europe, but the environmental impact of constructing and running solar parks (SP) is not yet well studied. Solar park construction requires partial vegetation removal and soil leveling. Additionally, solar panels may alter soil microclimate and functioning. In our study of three French Mediterranean solar parks, we analyzed:(1) effects of solar park construction on soil quality by comparing solar park soils with those of semi-natural land cover types (pinewood and shrubland) and abandoned croplands (former vineyards); and (2) the effect of solar panels on soil microclimate, CO_2 effluxes, and vegetation. We measured 21 soil properties of physical, chemical, and microbiological soil quality in one solar park and its surroundings to calculate integrated indicators of soil quality. We surveyed soil temperature and moisture, CO_2 effluxes, and vegetation below and outside solar panels of three solar parks. Soil aggregate stability was reduced by SP construction resulting in a degradation of soil physical quality. Soil chemical quality and a general indicator of soil quality were lower in anthropogenic (SP and abandoned vineyards) than in semi-natural (pinewood and shrubland) land cover types. However, differences between abandoned vineyards representing the preconstruction land cover type and solar parks were not significant. Solar panels reduced the soil temperature by 10% and soil CO_2 effluxes by 50% but did not affect early successional plant communities. Long-term monitoring is needed to evaluate the effects of solar panels on vegetation.

KEYWORDS
land cover, microclimate, plant communities, renewable energy, soil functions, soil respiration

1 | INTRODUCTION

The use of solar energy to produce electricity is increasingly common in Europe and requires large areas in order to be cost-effective (Murphy et al., 2015; Ong et al., 2013). Solar park construction involves clearing and grading the soil surface, burying of electric cables, vegetation removal, and soil compaction increasing runoff and erosion. Grading, compaction, and erosion change the physical and chemical properties of the soil and thus reduce its quality. Since solar park construction destroys the vegetation and affects the soil, a careful analysis of the environmental impact of solar parks is needed (Armstrong et al., 2016; Hernandez et al., 2015). Although soil quality is an important indicator of ecosystem functioning, the effect of solar park construction on soil quality has not yet been reported elsewhere. After the installation of solar panels, the vegetation is regularly mown or grazed limiting vegetation height to prevent shading of panels. The solar panels also change the microclimate such as temperature, humidity, and solar radiation (Armstrong et al., 2016; Tanner

et al., 2020). Such changes in microclimate may affect soil processes and plant communities under panels, in particular, in the European Mediterranean with high solar irradiation compared to temperate regions.

Soil quality is "...the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality and support human health and habitation" (Karlen et al., 1997). Three soil quality indicator groups are commonly used: physical, chemical, and biological soil properties (Bünemann et al., 2018; Costantini et al., 2016; Maurya et al., 2020). Physical properties, such as bulk density and texture, influence water holding capacity and plant communities by modulating root growth (Lampurlanés & Cantero-Martínez, 2003; Scarpare et al., 2019). Chemical properties, such as inorganic N, total C, and pH, control plant nutrition and microbiological activity. Biological indicators include the activity of decomposers such as invertebrates or microorganisms. These organisms control organic matter decomposition and nutrient cycling (Maurya et al., 2020).

Velasquez et al. (2007) developed a single general indicator of soil quality (GISQ) that integrates a set of physical, chemical, and biological soil properties. Such soil properties are chosen and measured to evaluate multifaceted aspects of soil functions and further combined to calculate sub-indicators of physical quality, chemical fertility, and biological functioning. The GISQ combines the subindicators to provide a global assessment of soil quality based on soil ecosystem services and facilitates the comparison of soils between different sites/habitats. In a comparative study on four land use types, (Raiesi & Salek-Gilani, 2020) showed, using an adapted GISQ, that soil quality was 1.5-times lower in anthropogenic than in natural soils. Joimel et al. (2016) observed a decrease in soil physico-chemical quality along an anthropization gradient from forest to urban soils, whereas Joimel et al. (2017) did not find any difference in biological quality of these soils. The construction of solar parks on natural and semi-natural land use types (e.g. forest, shrubland, and abandoned vineyards) may reduce soil quality and affect ecosystem functions such as infiltration and storage of water, fertility and plant reestablishment, soil organic matter, and nutrient cycling (Khare & Goyal, 2013; Romero-Díaz et al., 2017; Rutgers et al., 2009; Scarpare et al., 2019; Yin et al., 2020).

Plant communities and soil functioning may also be affected by changes in microclimate under solar panels. Solar panels reduce solar radiation, air humidity, and soil temperatures, but in winter, soil temperatures are generally higher under panels (Armstrong et al., 2016). Adeh et al. (2018) reported highest soil moisture and local heterogeneity of soil water conditions under solar panels. Such changes in microclimate may alter plant community composition and soil respiration that can be measured as CO_2 release. Mediterranean plant communities are dominated by heliophilous plants (Bagella & Caria, 2012). The reduction of solar radiation under solar panels may thus result in a plant community shift toward shade-tolerant species. Seed germination of Mediterranean species may be limited by light reduction (Gresta et al., 2010), and the mortality of heliophilous plants increases in competition to shade-tolerant species. (de Dato et al., 2010; Novara et al., 2012). The change in air and soil microclimate under panels reduced the soil respiration under temperate oceanic climate (Armstrong et al., 2016). Under Mediterranean climate with higher annual temperatures and summer drought, changes in microclimate under solar panels may be higher resulting in a strong disturbance of seasonal soil respiration dynamics (González-Ubierna & Lai, 2019). Plant communities contribute to soil CO_2 release by respiration of roots and rhizosphere microorganisms (Raich & Tufekciogul, 2000) but also by changes in soil structure (Yang et al., 2009; Zou et al., 2005). Furthermore, plants are the principal carbon source of decomposer microorganisms (Wall et al., 2012). Thus, solar panels may also change soil conditions indirectly by a shift in plant community composition since plants are very sensitive to change in microclimate.

The aims of our study were to assess: (1) the effect of solar park construction on soil quality in comparing solar parks with semi-natural land cover types (pinewood and shrubland) and abandoned vineyards; and (2) the effects of solar panels on soil microclimate, CO_2 effluxes, and vegetation under Mediterranean climate. We expected that: (1) solar park construction reduces physical, chemical, and biological soil quality; (2) solar panels change soil microclimate and plant community composition; and (3) solar panels change soil respiration according to the season.

2 | MATERIAL AND METHODS

2.1 | Study sites

Two studies were conducted in three solar parks (SP) located in Southern France (La Calade, Pouzols-Minervois and Roquefort des Corbières, Figure 1a.) with a distance of 10 to 30 km from one another (Table 1). These SP were constructed in 2011, 2014, and 2016, respectively, covered between 8.5 and 16 ha and used ground-fixed photovoltaic (PV) systems carrying the solar panels at a fixed inclination. The solar panels are aligned to form rows (height of 0.6 m min and 2 m max) exposed to the south, with a gap of 4 m between rows. The study region is characterized by typical Mediterranean climate with summer drought and mild, wet winters. The SP are mainly bordered by pinewood (*Pinus halepensis*), shrublands, and vineyards. The soils of the SPs are characterized by carbonatic pedofeatures (i.e., fine calcareous silty clay soil).

2.2 | Sampling designs

2.2.1 | Study 1: Effect of solar park construction

To study the effects of solar park construction on soil quality, four sampling plots (50 × 2 m) separated by 150 m were randomly chosen within the SP at Roquefort des Corbières (inter-rows between solar panels). In the surroundings of the SP, we randomly selected four sampling plots (100 m^2) for each of the three dominant habitat types in the study region: pinewood, shrubland, and abandoned vineyards (Figure 1b).

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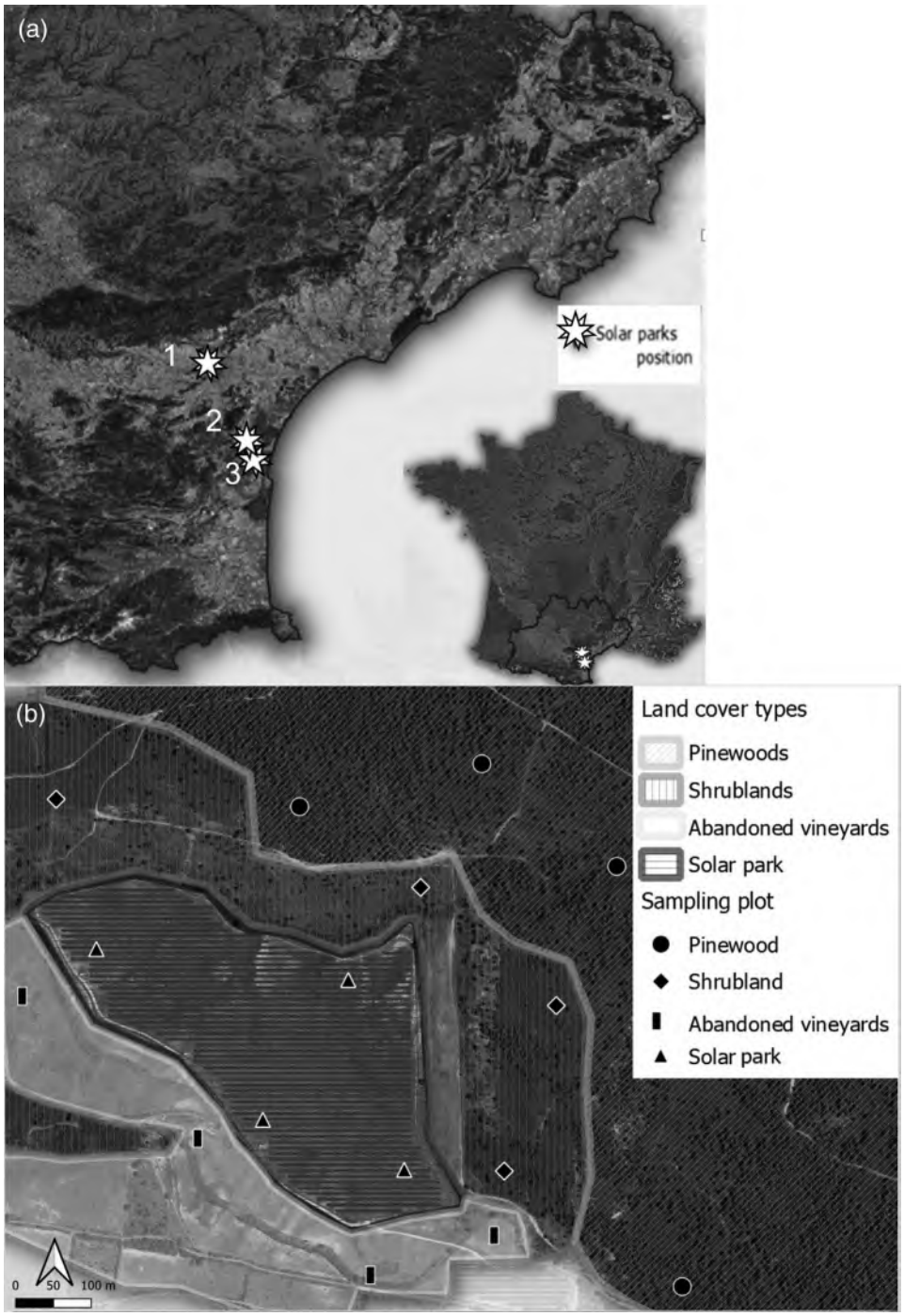


FIGURE 1 (a) Position of the three solar parks with 1: Pouzols-Minervois, 2: Roquefort-des-Corbières, and 3: La Calade (a), (b) the Roquefort-des-Corbières solar park in detail with surrounding land use types and sampling points

These three land cover types are also representative of regional land use (forestry, ancient pastures, and viticulture), and the studied SP was constructed on an abandoned vineyard. The plots were at least 200 m apart from each other and not more than 400 m from the SP. The pinewood is essentially composed of *P. halepensis and Quercus coccifera*. The shrublands are dominated by *Quercus coccifera*, *Pistacia lentiscus*, *Rosmarinus officinalis*, *Myrtus communis*, *Genista scorpius*, *Brachypodium retusum*, and *Cistus monspelliensis*. The vineyards had been abandoned for 5 years before solar park construction and were dominated by grapevine, *Anisantha rubens*, *Dittrichia viscosa*, and *Lysimachia arvensis*. In March 2016, 10 soil samples were randomly collected (10 cm depth) within each plot, mixed to one composite sample per plot. Composite samples were sieved (mesh size: 2 mm) prior to analyses. An aliquot of samples was air-dried (1 week, 30°C). For each sample, another aliquot was stored at 4°C for microbial analyses.

2.2.2 | Study 2: Effect of solar panels

To study the effect of solar panels on soil respiration, temperature, and moisture and on plant communities, we randomly selected within each of the three SP four sampling plots (50 × 2 m) below the solar

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TABLE 1 Environmental and technical characteristics of solar parks

	La Calade	Pouzols-Minervois	Roquefort des Corbières
Altitude (m)	77	100	62
Slope (%)	5	5	5
Temperature (annual mean, °C)	15.5	13.6	15.5.
Precipitation (annual mean, mm)	557	648	557
Sunshine duration (annual mean, hr)	2465	2119	2324
Soil texture	Loamy soil	Loamy soil	Loamy soil
Land cover before construction	Shrubland	Abandoned Vineyards and shrublandsQ	Abandoned Vineyards
Commissioning of the SP	2011	2014	2016
Maximum power (Kwc)	5102	4950	11,152
Solar panel soil localisation	Ground-fixed		
Solar panel cell technologies	Crystalline		
A solar panel power (Wc)	180	250	260
Number of solar panels	26,856	19,800	46,473
Area of the SP (ha)	8.5	10.7	16

panels, both separated by at least 100 m, and four adjacent sampling plots (50 × 2 m) in the inter-rows between the solar panel.

2.3 | Measurements of soil physico-chemical and microbiological quality

2.3.1 | Soil physical properties

Water content (g kg ^{1}) was determined after drying samples (24 h, 105°C). Water holding capacity (WHC) was analyzed according to Saetre (1998) but using a modified protocol. Ten grams of dried soil were weighted in a PVC cylinder and saturated with water. WHC was defined as the water content remaining in the soil after 12 h (4°C). The different soil fractions (i.e., sand, silt, clay) were determined using the Robinson's pipette method (Olmstead et al., 1930) after organic matter removal by oxidation with H_2O_2 (30%, 48 h). Bulk density (BD) was determined by measuring dried soil mass sampled in a Siegrist's cylinder. According to Huang et al. (2004), a value of 2.65 g cm^{-3} was assumed for real soil density (RD). Soil porosity was calculated using the following equation.

$$\text{Soil porosity} = 100 \times \frac{\text{RD} - \text{BD}}{\text{RD}} \quad (1)$$

Mean weight diameter (MWD) of soil aggregates was measured according to Kemper & Rosenau (1986).

2.3.2 | Soil chemical properties

The soil pH was measured in distilled water and KCL (1 M) (Aubert, 1978). Total carbon (TC) and Nitrogen (TN) content were determined by combustion in an elemental analyzer CN FlashEA 1112 (ThermoFisher) (NF ISO 10694, NFISO 13878). Calcium carbonate ($CaCO_3$) content was measured using a Bernard calcimeter (Müller & Gastner, 1971) and the percentage of C in $CaCO_3$ (C—$CaCO_3$) was determined as C—$CaCO_3$ = 11.991/100 × $CaCO_3$. Inorganic nitrogen (NH_4^+ and NO_3^-) was extracted in KCL solution (1 M) and analyzed calorimetrically using the nitroprusside-salicylate and nitrosalicylic acid method according to Mulvaney (1996) and Keeney & Nelson (1983), respectively.

2.3.3 | Soil microbiological properties

Microbial biomass (MB) was measured using substrate-induced respiration (SIR) rates (Anderson & Domsch, 1978). Basal respiration was determined without adding glucose to calculate the metabolic quotient qCO_2 (the ratio of basal respiration to microbial biomass), which is a sensitive ecophysiological indicator of soil stress (Anderson, 2003). Three enzyme activities (i.e., fluorescein diacetate hydrolase, phosphatase and tyrosinase) involved in carbon and phosphorous cycles were assessed (n = 3 per sample) to determine the catabolic potential of microbial communities. Fluorescein diacetate hydrolase (FDase, U g^{-1} dry weight) was measured according to Green et al. (2006), phosphatase (U g^{-1} dry weight) according to Tabatabai and Bremner (1969) and the activity of tyrosinase (μmol min^{-1} g^{-1} dry weight) according to Saiya-Cork et al. (2002).

2.4 | Measurements of solar panel effects on soil moisture, temperature, and in situ respiration

Soil respiration, temperature, and moisture were recorded in March and June 2017 in each sampling plot of the study on solar panel

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effects. In situ CO_2 release (g CO_2 m^{-1} hr^{-1}) from soils, plant roots, soil organisms, and chemical oxidation of C compounds was measured after removal of aboveground vegetation, using a portable gas analyzer (IRGA, EGM-4, PP-system). The device was connected to a closed soil respiration chamber (SRC-1, PP systems, Massachusetts). To prevent leakage of CO_2 when placing the chamber on the soil, a PVC tube (10 cm × 11 cm) was buried 1 cm deep into the soil prior to measurements. Soil temperature was recorded in a depth of 7 cm using the soil temperature probe (STP-1, PP-system) connected to the respirometer. Soil moisture was recorded on four points at 7 cm depth using a portable time-domain reflectometry (TDR) device (Delta-T Devices, ML2 Theta Probes).

2.5 | Measurements of solar panel effects on vegetation

In the sampling plots of the study on solar panel effects, vegetation surveys were carried out in 2016 and 2017. Three rectangular subplots of 10 m^2 (2 m × 5 m) were placed at the ends and the centre of each plot. Percentage cover of all occurring vascular plant species was estimated as the vertical projection of aboveground plant organs. A ratio of shadow-tolerant (sciaphilous) to hemi-heliophilous and heliophilous plant species (Julve, 2020) was calculated.

2.6 | Statistical analyses

We calculated a general indicator of soil quality (GISQ) according to Velaquez et al. (2007). Information on 21 variables of physical, chemical, and microbiological soil properties was used to create three subindicators related to main soil functions: (1) physical properties that determine the infiltration and storage of water, (2) chemical properties that affect fertility and plant reestablishment in solar parks, and (3) microbiological properties that drive soil organic matter decomposition and nutrient cycling. For each group of variables (physical, chemical, and microbiological), a principal component analysis (PCA) with data scaled to unit of variance was run using "FactoMineR" (Husson et al., 2008) and "Factoextra" (Kassambara & Mundt, 2020) packages. The Kaiser-Meyer-Olkin measure (>0.50) and Bartlett's test of sphericity (0.05) were used to test the sampling adequacy of variables included in the PCA. Variables with communality values <0.05 were removed, and main components were identified using the latent root criterion (eigenvalues >1.0). A synthetic index of quality for each group of variables at a plot *i* (Iq_i) was calculated as the sum of *n* variables (*vi*) multiplied by their respective weight (*wi*) in the determination of axes 1 and 2 of the PCA [Equation (2)].

$$Iq_i = \sum_{i=1}^{n} w_i v_i \quad (2)$$

The values of Iq_i were then reduced to a common range (0.1 to 1.0) using a homothetic transformation to obtain the sub-indicators of physical, chemical, and microbiological soil quality [hereafter pSQ, cSQ, and mSQ, respectively, Equation (3)]. In this equation, a is the maximal and b the minimal *Iq* value for the plot *i*.

$$p,c\,\text{or}\,mSQ = 0.1 + \frac{Iq_i - b}{a - b} \times 0.9 \quad (3)$$

Finally, a PCA was run with the three sub-indicators. The GISQ was obtained by summing the products of the respective contributions of variables to factors 1 and 2 by the % inertia explained by factors, respectively. Finally, the sum of these products gave the following formula for the GISQ [Equation (4)]:

$$\text{GISQ} = 0.29\,\text{pSIq} + 0.28\,\text{cSIq} + 0.33\,\text{mSIq} \quad (4)$$

All data were analyzed using R software (3.6.1, R Core Team, 2013). Effects of land cover type on soil physical, chemical, and microbiological properties, sub-indicators of soil quality, and GISQ were assessed using one way-analysis of variance (ANOVA). In the case of a significant land cover type effect, a Tukey HSD post hoc test was used to analyze differences between specific land cover types. To analyze the effect of solar panels on soil temperature, water content, CO_2 effluxes, and vegetation, linear mixed-effect models (LMMs) (R package "lme4") were applied including month and treatment (below vs outside panels) as fixed factors and solar park identity as a random factor. Assumptions of ANOVA were checked by Shapiro–Wilks test for normality and by Levene test for homoscedasticity. When necessary, data were transformed using the "bestNormalize" package (Peterson, 2021) to meet these assumptions. Effects of solar panels on plant communities were visualized by nonmetric multidimensional scaling (nMDS) based on the Bray–Curtis dissimilarity. Differences in plant community composition were tested using permutational multivariate analysis (PERMANOVA) in R package "vegan" (Oksanen et al., 2007). A subsequent pairwise post hoc test was conducted to analyze differences between factor levels. False discovery rate was used to correct for multiple comparisons.

3 | RESULTS

3.1 | Effects of solar park construction on soil properties

Seven of the eight tested physical soil properties were significantly different between land cover types (Table 2). Among these seven properties, only two showed a significant difference between the two semi-natural (pinewood and shrubland) land cover types and the SP. Soil water content was 5.5% lower in the SP ($p < 0.01$) than in shrubland. The mean weight diameter of aggregates was twice as high in abandoned vineyards as in SP and three times higher in pinewood and shrubland than in SP ($p < 0.001$). Organic carbon was about 2.5 times higher in semi-natural than in anthropogenic land cover types ($p < 0.001$). Sand and silt content, soil porosity, and bulk density were

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TABLE 2 Soil physical, chemical, and microbiological properties in each type of land cover

	Properties	Pinewood	Shrubland	Abandoned vineyards	Solar park	*p* value
Physical	Sand (%)	35.13 (5.07)[a]	45.91 (8.96)[ab]	47.78 (4.34)[b]	42.68 (2.58)[ab]	0.04
	Silt (%)	47.32 (8.63)[a]	35.81 (6.67)[ab]	33.16 (2.97)[b]	35.97 (1.03)[ab]	0.03
	Clay (%)	17.54 (4.70)	18.28 (6.33)	19.06 (1.37)	21.35 (1.57)	0.59
	BD (g cm^{-3})	1.11 (0.18)[a]	1.13 (0.17)[a]	1.47 (0.10)[b]	1.32 (0.13)[ab]	0.02
	WC (%)	19.55 (3.78)[ab]	22.14 (3.15)[a]	16.67 (2.01)[ab]	16.36 (0.44)[b]	0.03
	WHC (%)	65.66 (12.46)	70.81 (15.30)	51.93 (13.03)	59.24 (9.06)	0.23
	Porosity (%)	58.15 (6.95)[a]	57.54 (6.38)[a]	44.69 (3.92)[b]	50.19 (4.88)[ab]	0.02
	MWD (mm)	2626.47 (260.47)[a]	2618.40 (223.73)[a]	1593.30 (194.09)[b]	879.22 (271.43)[c]	<0.001
Chemical	OC (%)	4.92 (0.62)[a]	4.13(0.70.64)[a]	1.46(0.19)[b]	1.61 (0.17)[b]	<0.001
	TC (%)	8.59 (0.35)[a]	8.07 (1.28)[a]	5.63 (0.46)[b]	5.93 (0.71)[b]	<0.001
	TN (%)	0.22 (0.06)[a]	0.20 (0.07)[a]	0.09 (0.03)[b]	0.10 (0.02)[b]	<0.01
	Soil pH in water	8.03 (0.04)[ab]	8.02 (0.03)[b]	8.11 (0.05)[a]	8.06 (0.04)[ab]	0.03
	Soil pH in KCl	7.45 (0.04)	7.48 (0.06)	7.52 (0.06)	7.49 (0.05)	0.38
	Nitrate (μg μg $N\text{-}NO_3^+$ g^{-1})	1.34 (0.32)	1.06 (0.80)	0.72 (0.26)	1.71 (0.61)	0.12
	Ammonium (μg $N\text{-}NH_4^+$ g^{-1})	2.90 (0.17)[a]	2.92 (0.19)[a]	2.65 (0.14)[b]	2.65 (0.04)[b]	0.03
Microbiological	BR (μg $C\text{-}CO_2$ g^{-1} hr^{-1})	1.28 (0.33)[a]	1.31 (0.61)[a]	0.61 (0.36)[b]	0.60 (0.07)[b]	0.03
	MB (μg $C\text{-}CO_2$ g^{-1} hr^{-1})	0.40 (0.10)	0.37 (0.15)	0.24 (0.12)	0.20 (0.07)	0.07
	qCO_2	3.20 (0.26)	3.48 (0.56)	3.33 (2.68)	3.38 (1.28)	0.99
	FDAse (μ g^{-1})	0.0007 (0.0001)[ab]	0.0008 (0.0003)[a]	0.0004 (0.0001)[b]	0.0004 (0.0002)[b]	0.02
	Tyrosinase (μ g^{-1})	0.0526 (0.0144)	0.0321 (0.0061)	0.0504 (0.0084)	0.0438 (0.0154)	0.11
	Phosphatase (μ g^{-1})	0.0067 (0.0004)	0.0058 (0.0015)	0.0046 (0.0024)	0.0053 (0.0005)	0.28

Note: Mean values with SEs in parentheses. Different letters indicate significant differences between land cover types (significant *p*-values in bold)
Abbreviations: BD, bulk density; BR, basal respiration; FDAse, fluorescein diacetate hydrolase; MB, microbial biomass; MWD, mean weight diameter; OC, organic carbon; qCO_2, metabolic quotient; TC, total carbon; TN, total nitrogen; WC, water content; WHC, water holding capacity

significantly different between abandoned vineyards and pinewood (Table 2). Silt content and soil porosity were 1.4- and 1.3-times lower in abandoned vineyards than in pinewood, respectively. Sand content and BD were about 1.5-times higher in abandoned vineyards than in pinewood. Pinewood and shrubland showed similar physical properties without significant differences.

For most soil chemical properties, SP showed significant differences to pinewood and shrubland but not to abandoned vineyards (Table 2). Total carbon contents were 1.44-times higher in semi-natural land cover types than in anthropogenic land cover types ($p < 0.01$). Organic carbon contents were about 2.76-times higher in semi-natural land cover types than in anthropogenic land cover types ($p < 0.01$). Total nitrogen (TN) content showed the same pattern. TN was twice as high in pinewood and shrubland as in the SP and abandoned vineyards ($p < 0.001$). The water pH ranged between 8.02 and 8.11 and showed a small but significant difference between shrubland and abandoned vineyards.

Two microbiological properties were significantly different between land cover types (Table 2). Land cover type had a significant influence on basal respiration ($p < 0.03$) being two times lower in the SP and abandoned vineyards than in forest and shrubland. The FDAse activity was two times higher in shrubland and pinewood than in the SP and abandoned vineyards. Microbial biomass was twice as low (marginally significant) in SP and abandoned vineyards as in the semi-natural land cover types.

3.2 | Effects of solar park construction on soil quality

The first two axes of the PCA run on physical properties explained 80.56% of the total variance (see A.1.A in Appendix S1). The semi-natural land cover types are separated from the anthropogenic soils along the first axis. Silt, water content, water holding capacity, and mean weight diameter of aggregates had the highest score on the first PCA axis, while soil porosity was strongly correlated with the second axis (see A.1.A, Appendix S1). The highest physical quality index of 0.92 was measured in pinewood and shrubland being two times higher than in abandoned vineyards ($p < 0.001$). The pSQ (Figure 2a) was two times and four- times lower in SP than in the abandoned vineyards and semi-natural land cover types, respectively ($p < 0.01$).

The first two axes of the PCA used to calculate the sub-indicator of soil chemical quality (cSQ) explained 80.98% of the total variance (see A.1.B, Appendix S1). The semi-natural land cover types are

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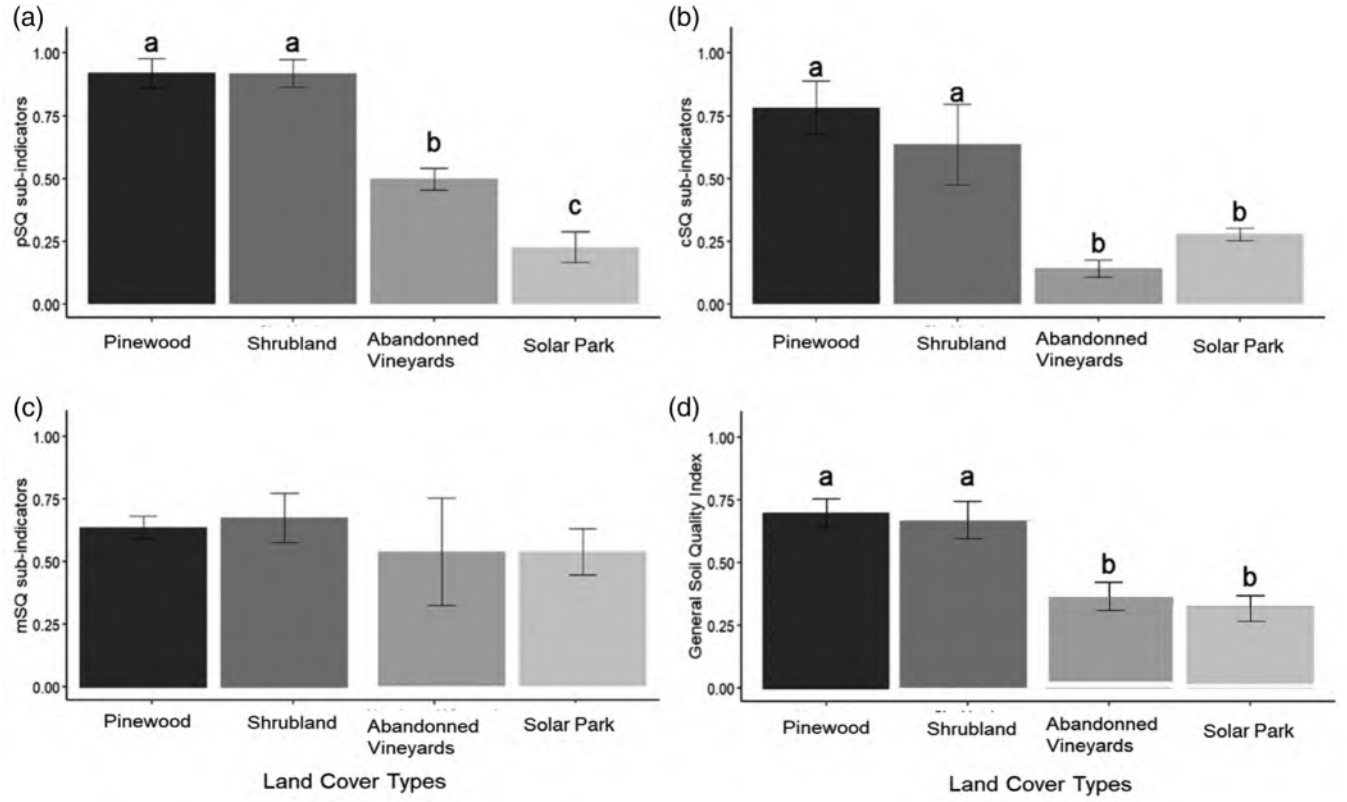


FIGURE 2 Sub-indicators of soil physical (a), chemical (b), and microbiological (c) quality and general soil quality indicator (d) for different types of land cover. Error bars are means ± SE. Different letters indicate significant differences ($p < 0.05$)

separated from the anthropogenic soils along the first axis. Total carbon, organic carbon, TN, and ammonium were most correlated with the first axis and nitrate with the second axis (see A.1.B, Appendix S1). With a value of 0.18, the cSQ was four times lower in the SP and abandoned vineyards than in shrubland and pinewood ($p < 0.001$, Figure 2b).

The first two axes of the PCA used to calculate the sub-indicator of soil microbiological quality explained 80.28% of the total variance (see A.1.C, Appendix S1). Basal respiration, microbial biomass, FDAse, and phosphatase were highly correlated with the first PCA axis, while the qCO_2 was correlated with the second one (see A.1.C, Appendix S1). The mSQ was not significantly different between land cover types ($p = 0.74$) (Figure 2c).

The General Indicator of Soil Quality was four-times lower in the SP and abandoned vineyards than in the pinewood and shrubland ($p < 0.001$).

3.3 | Effects of solar panels on soil temperature, water content and in situ CO_2 effluxes

Soil temperature and water content were significantly different between months ($p < 0.05$; Figure 3a,b). Solar panels significantly decreased soil temperature in March and June (Figure 3a) but did not affect soil water content ($p = 0.79$). Soil CO_2 effluxes did not change between months but were twice as high outside solar panels than below solar panels ($p < 0.001$).

3.4 | Effects of solar panels on plant communities

Neither the species richness nor the total cover of plant community was significantly affected by the solar panels (Table 3). A marginally significant difference was detected for the ratio 'Sciaphile: Heliophile plants,' being higher below than outside solar panels. The NMDS and PEMANOVA did not reveal any significant solar panel effect on plant community composition ($p = 0.3461$, Figure 4). However, community composition was significantly different between the solar parks ($p < 0.001$). No significant difference was detected between observation years (data not shown).

4 | DISCUSSION

Solar park (SP) construction reduced physical and chemical soil quality compared with semi-natural land cover types (forest and shrubland) but not biological soil quality. A change in soil temperature and CO_2 effluxes also demonstrated a negative solar panel effect on soil microclimate and functioning. However, in early stages of plant succession following solar park construction, plant community composition below and outside solar panels was not significantly different.

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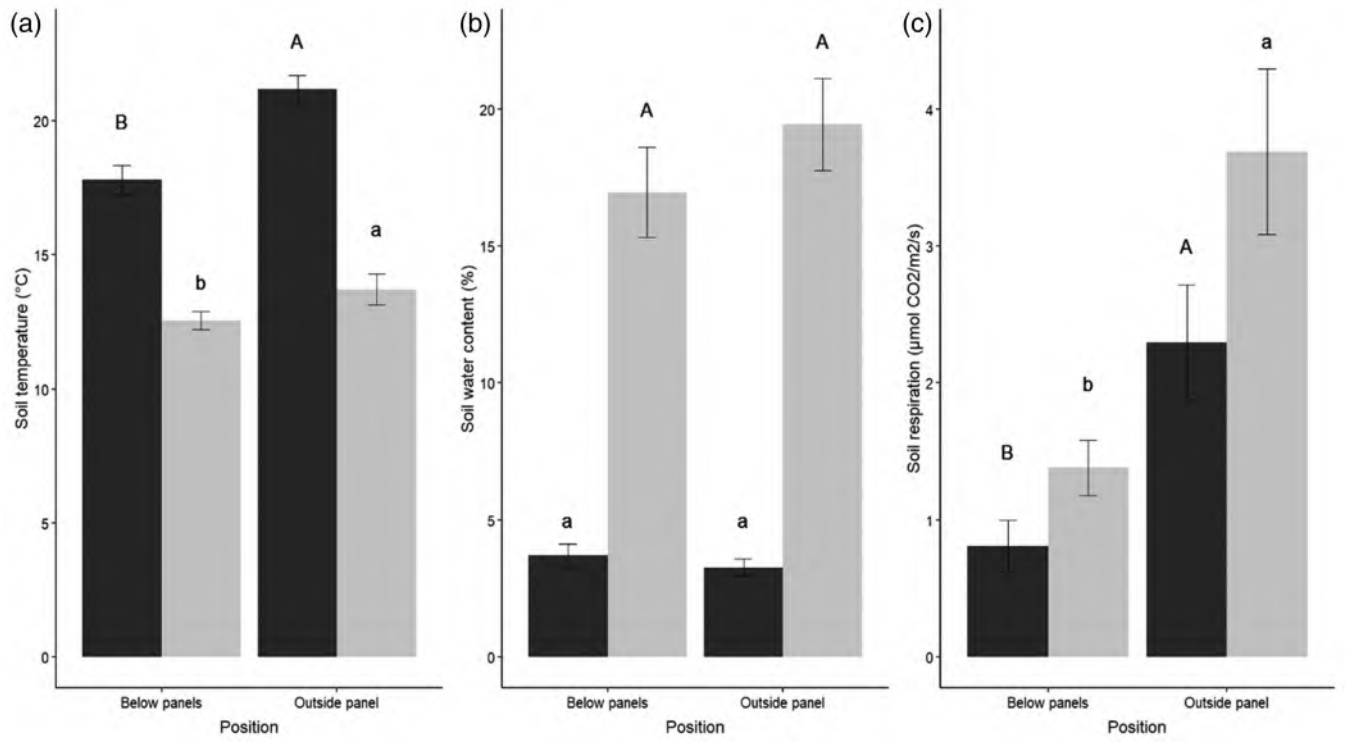


FIGURE 3 Soil temperature (a), water content (b), and CO_2 effluxes in March (black bars) and June (grey bars) below and outside solar panels. Error bars are means ± SE; different capital and lower-case letters indicate significant differences under and outside panels in March and June, respectively

TABLE 3 Effects of solar panels on plant communities

Parameters	Below solar panels	Outside solar panels	*p*
Species richness	12.56 (5.92)	13.25 (5.49)	0.29
Total cover (%)	351.2 (165.12)	379.97 (183.31)	0.22
Hemi-heliophilous: Heliophilous ratio	0.12 (0.14)	0.10 (0.10)	0.09

Note: Mean values with SEs in parentheses

4.1 | Effects of solar park construction on soil quality

Soil quality assessments require the measurement of a wide range of physical, chemical, and biological properties involving a high complexity of potential analyses (Maurya et al., 2020). In this study, we assessed soil quality using a multiproxy approach including 21 soil properties. The reduction of the number of variables using PCA to group these properties allows an integrated evaluation of soil quality based on their main functions, such as infiltration and storage of water, soil fertility, plant reestablishment and soil organic matter and nutrient cycling. We found that two of three integrated sub-indicators and the general indicator of soil quality were lower in SP than in the semi natural land cover types.

Among the physical soil properties, the aggregate MWD was 1.5-times lower in the SP than in the semi-natural land cover types (Table 2). A low MWD may result in a low aggregate stability. Similarly, Kabir et al. (2017) showed that the MWD decreases in anthropogenic soils associated with a degraded vegetation. In our study, soil leveling and vegetation removal prior to SP construction may have decreased soil organic matter (SOM) content reducing MWD. By binding colloids and stabilizing soil structure, SOM plays a key role in soil physical properties and nutrient cycling (Six et al., 2004). Telak & Bogunovic (2020) showed a decrease in SOM and MWD in a vineyard of Croatia after intensive and frequent tillage. Such mechanical disturbance for many years may have affected soil structure of the vineyard on which the studied SP (Roquefort des Corbières) was constructed. Accordingly, overall physical soil quality of SP was lower than that of abandoned vineyards, which was in turn lower than that of semi-natural land cover types. The physical soil quality index (Figure 2a) revealed that the construction of a SP increased the degradation of the physical soil quality of habitats already degraded by land management (abandoned vineyards). In particular, the stability of the soil, key factor of soil functioning, was lower in SP than in abandoned vineyards. Moreover, a lower SOM affects microbial activity and production of mucus resulting in a decrease of aggregate MWD and thus a soil more sensitive to erosion (Blavet et al., 2009; Le Bissonnais et al., 2018). The soil leveling and vegetation removal during SP

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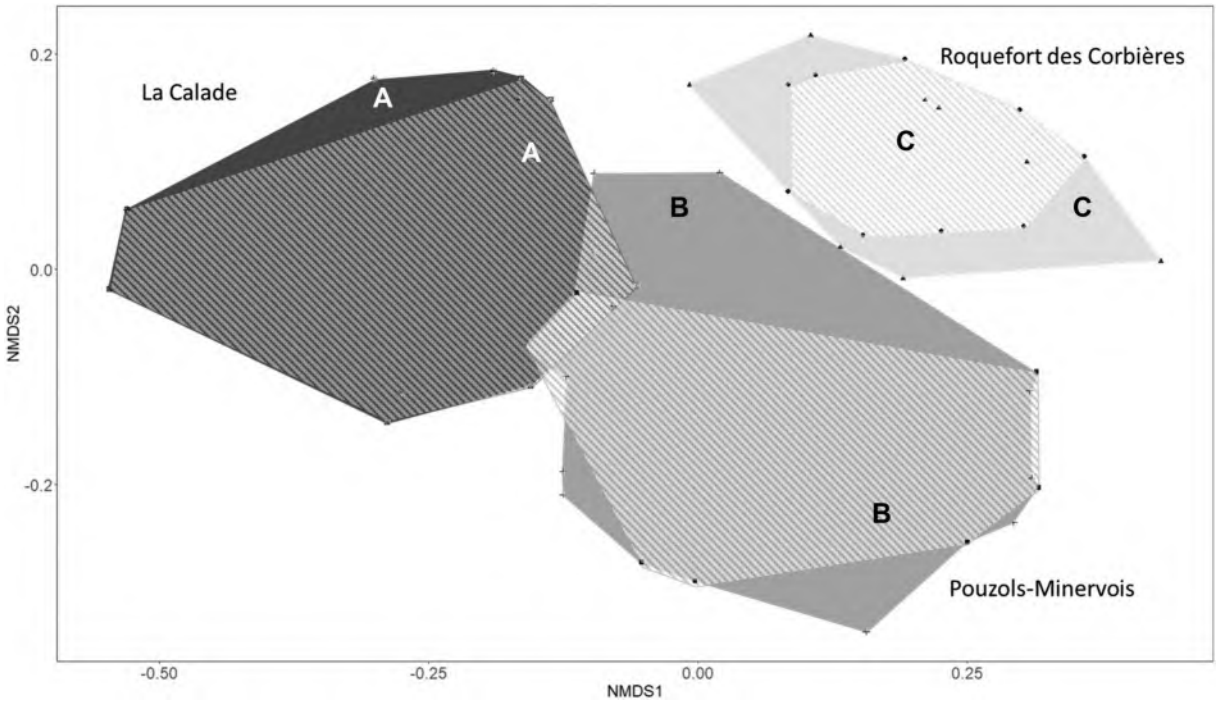


FIGURE 4 Nonmetric multidimensional scaling (NMDS) plot with polygons indicating the plant species composition of the three solar parks under (hatched polygon) and outside (solid polygon) solar panels, NMDS stress: 0.084. Different letters indicate significant differences after pairwise post hoc test ($p < 0.05$)

construction may have increased surface runoff and soil erosion (Rabaia et al., 2021).

In contrast to our expectations, the SP construction did neither increase soil bulk density nor decrease porosity compared to the abandoned vineyards (Table 2). In our study, soil bulk density was found to be lower in abandoned vineyards than in semi-natural land cover types. The past land management of vineyards may have degraded these properties before SP construction limiting effects of construction work. It is well known that the use of agricultural machinery considerably increases the soil bulk density (Dunjó et al., 2003). Under similar Mediterranean climate and land use history in Spain, the bulk density was 30% higher in vineyards than in pinewood (Dunjó et al., 2003). Such changes in soil physical properties can reduce the infiltration and storage of water. To improve the process of water infiltration and the capacity of water storage, a decompaction of the soil surface may be useful in particular if soils were already compacted by previous land management. Such decompaction also facilitates the germination and establishment of plant species (Bassett et al., 2005). The resulting improved revegetation may limit erosion and protect functions supported by soil physical quality (Beatty et al., 2017).

Soil chemical properties, such as total and organic carbon and TN are directly linked to soil fertility and plant growth (Liu et al., 2014). In our study, these properties showed lower values in anthropogenic soils than in semi-natural land cover types (Table 2). Joimel et al. (2016) obtained similar results along a gradient from natural to anthropogenic habitats in which total carbon and nitrogen decreased significantly from forests to vineyards. Soil disturbance such as soil tillage in vineyards or construction activities increases mineralization of organic matter reducing organic C and N (Brantley & Young, 2010). Accordingly, Choi et al. (2020) found a significantly lower C and N content in SP than in grassland soil. In our study, SP construction did not reduce neither C and N content nor soil chemical quality compared to degraded vineyard soil (Table 2). Consequently, the construction of SP did not further degrade the soil chemical properties. The low index of chemical quality (Figure 2b) is thus most likely related to the past vineyard management. Low C and N content suggest that nutrient cycling was lower in vineyards and SP soils and that several SP soil functions (carbon sequestration, soil structure, biological processes) were hampered compared to semi-natural soils. Appropriate site selection may limit such a loss of key soil functions by SP construction (Choi et al., 2020).

Soil microorganisms (i.e. bacteria and fungi) contribute actively to soil nutrient cycling (Schimel & Schaeffer, 2012). Thus, their genetic and physiologic characteristics are important indicators of ecosystem functioning such as nutrient cycling (Ranjard et al., 2011). Microbiological soil properties showed differences between land cover types for fluorescein diacetate hydrolase (FDAse) activity and basal respiration. FDAse is an appropriate proxy to evaluate soil microbial activities because the ubiquitous esterase enzymes (e.g., lipase, protease) are involved in the hydrolysis of FDA (Schnürer & Rosswall, 1982). In our study, the FDAse was two times lower in anthropogenic soils (Table 2) suggesting a reduction of microbiological activity and nutrient cycling. Soil basal respiration showed the same pattern confirming

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a degradation of soil functions compared to semi-natural soils (Sparling, 1997). Under a similar Mediterranean climate in Italy, basal respiration was three to four-times lower in vineyards than in coniferous forests, mixed forests, and shrublands (Marzaioli et al. (2010). The decrease in soil respiration may be related to the lower organic carbon and nitrogen content or the decrease in microbial biomass (Fernandes et al., 2005). Previous vineyard management, in particular, soil tillage, may have severely decreased microbial biomass resulting in low microbial activity. Five years of abandonment was probably not sufficient to entirely reestablish microbial communities (Quintana et al., 2021). Despite the reduction of microbial properties in abandoned vineyards and solar park soils, the microbiological soil quality index (mSiQ) was not significantly different between land cover types (Figure 2c). Other microbiological properties (BM and phosphatase) mainly contributing to the first PCA axis were hardly affected by land cover type and thus overruled significant response variables in mSiQ calculation.

As a consequence of lower physical and chemical sub-indicators, the general indicator of soil quality was about three times lower in SP compared to semi-natural land cover types (Figure 2d). The key processes involved in degradation of soil quality were soil tillage, partial topsoil removal increasing erosion (Quinton et al., 2010), and organic matter mineralization. Reduced organic matter content and increase of soil compaction decrease water holding capacity (Mujdeci et al., 2017) and soil stability (Simansky et al., 2013). Soil restoration by revegetation may improve soil physical and microbiological qualities of solar parks (Hernandez et al., 2019). Revegetation may increase the stability of aggregates by increasing root biomass and the production of binding agents (Erktan et al., 2016). The root exudates can also stimulate microbial biomass and activity and thus improve nutrient cycling (Eisenhauer et al., 2010; Feng et al., 2019).

4.2 | Effects of solar panels on soil microclimate, vegetation, and in-situ CO_2 effluxes

Climatic conditions influence both soil microbial activities (Shao et al., 2018) and plant communities (García-Fayos & Bochet, 2009). In our study, solar panels reduced the soil temperature in spring and in summer by about 5°C (Figure 3a). Similarly, Armstrong et al. (2016) found a soil temperature reduction of 2°C under solar panels during the summer (UK). The lower temperature under solar panels was the direct effect of shading although night temperatures may be higher (Tanner et al., 2020). Solar panels also intercept precipitation, and Tanner et al. (2020) found a significant reduction in soil humidity under solar panels in the Mojave Desert. However, we did not find any significant soil humidity difference under solar panels and outside (Figure 3b). The result may be explained by a lower evapotranspiration limiting humidity losses during drought periods as suggested by Tanner et al. (2020).

Mediterranean vegetation is dominated by heliophilous plants (Bagella & Caria, 2012). So we expected that light reduction by solar panels strongly affects plant communities. However, we did not find a significant effect of solar panels on plant community composition and structure (Figure 4). The effect of solar panels on the ratio of shadow-tolerant to heliophilous species was only marginally significant and no influence on plant species richness was detected (Table 3). Other studies showed, however, a reduction in plant cover and species richness under solar panels resulting from lower germination and higher mortality (Armstrong et al., 2016). Due to light limitation, heliophilous plants are expected to be less competitive under solar panels (Chen et al., 2004). However, protection against strong solar radiation and drought during Mediterranean summer may have compensated for reduction of light and precipitation in our study. Accordingly, Tanner et al. (2020) observed that in a desert plant richness was marginally greater under their solar panels than in the control. In our study, the absence of a solar panel effect on the vegetation (Figure 4, Table 3) may also be explained by the low age of our solar parks limiting differential effects on the vegetation. In early successional stages, the vegetation is dominated by ubiquitous annual species germinating and developing under a great variety of environmental conditions. Responses to the specific microclimate under solar panels may be slow in Mediterranean vegetation types (Coiffait-Gombault et al., 2012; Kinzig et al., 1999). Long-term monitoring is required to finally evaluate the influence of solar panels on plant communities.

A lower soil respiration is an indicator of lower litter decomposition and nutrient cycling suggesting that these ecosystem functions may be reduced under solar panels (Incerti et al., 2011). In our study, soil respiration was highly affected by solar panels (Figure 3c). Half of the CO_2 fluxes from soils are produced by heterotrophic organisms (Bond-Lamberty et al., 2004). Heterotrophic respiration, but also plant respiration, is driven by environmental factors, mainly temperature and moisture, explaining the strong influence of solar panels (Francioni et al., 2020; Moinet et al., 2019). Accordingly, Armstrong et al. (2016) found a reduction of soil CO_2 effluxes under solar panels in May and June. We already detected a reduced CO_2 efflux from March onward suggesting that the warm Mediterranean spring results in earlier temperature differences between soils under and outside solar panels compared to temperate oceanic climate. This early decrease in temperature under solar panels compared to controls outside solar panels may have reduced microbial activity and thus heterotrophic respiration. The reduction of CO_2 effluxes under solar panels may also be the result of light reduction reducing plant growth and root respiration.

5 | CONCLUSIONS

Physical, chemical, and general soil quality indexes were lower in a solar park than in semi-natural land cover types. Clearing and grading the soil surface during solar park construction resulted in a strong degradation of soil physical quality, especially of soil structure, but did neither disturb soil chemical quality nor global quality compared to abandoned vineyards. These results suggest that solar parks should be preferably constructed on anthropogenic soils or that construction must be accompanied by environmental compensation measures

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and/or ecological restoration. At our Mediterranean study sites, solar panels reduced soil temperature from spring onward. Neither light nor spring temperature reduction under solar panels altered plant communities in early stages of plant succession but reduced CO_2 effluxes. Our study demonstrated that solar park construction and solar panels changed soil quality and microclimate to a magnitude known to affect key soil functions. Long-term monitoring including different seasons is required to evaluate the final response of soil properties and vegetation to solar panels.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Lambert, Q., Bischoff, A., Cueff, S., Cluchier, A., & Gros, R. (2021). Effects of solar park construction and solar panels on soil quality, microclimate, CO_2 effluxes, and vegetation under a Mediterranean climate. *Land Degradation & Development*, *32*(18), 5190–5202. https://doi.org/10.1002/ldr.4101

1099145x, 2021, 18, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/ldr.4101 by University Of Arizona Library, Wiley Online Library on [02/07/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:18 PM
To: admin@owgl.org
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Eakin/OWGL
Attachments: BIGL RFA4_Comment Letter to Oregon Wheat Growers_02132026.pdf

Dear Mr. Eakin,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
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February 13, 2026

VIA EMAIL (admin@owgl.org)

Thad Eakin
President
Oregon Wheat Growers League
115 SE 8th St
Pendleton, OR 97801

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-20)

Dear Mr. Eakin,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate the comments from the Oregon Wheat Growers League (OWGL) regarding the Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF) Site Certificate. PGE recognizes the importance of dryland wheat production to Sherman County and values OWGL's perspective on agricultural viability and community impacts.

OAR 345-027-0367(8) requires PGE to respond to all comments that are made with "sufficient specificity," as that term is defined in OAR 345-027-0367(7)(a). We note that OWGL's comments may not necessarily meet that standard but are valuable to inform the process, and we offer the following in response to your concerns. The responses below are organized by the interpretation of your comments received and are further identified with the same issue identification number provided in Table 1: List of Issues and Commenters in the Oregon Department of Energy's Response to Comments document dated February 12, 2026.

1. Direct Agricultural Impacts (LU-16)

OWGL expressed concern regarding statements in the Proposed Order suggesting that lost agricultural production revenue by the landowner/farmer may be replaced by lease payments, noting that landowners and farmers are not always the same entity. PGE and BN acknowledge that land ownership and agricultural operators are not always the same entity, and that impacts may differ between landowners and tenant operators. BN worked closely with the landowner and the tenant farmer to address the early conclusion of the existing lease. The parties reached a mutually agreed-upon termination arrangement. The compensation reflects a negotiated resolution between the private parties and considers the remaining lease term, anticipated agricultural use, and other relevant factors. The agreed-upon amount was designed to provide substantial consideration in excess of several years of farming revenue, which would mitigate any farm losses while still allowing the farmer to conduct farming operations and earn additional revenue elsewhere.

The agricultural economic analysis presented in BCWF RFA 4 Attachment K-2 of Exhibit K and referenced the Proposed Order evaluates direct, indirect, and induced impacts from removing

land from agricultural production. Impacts to the agricultural economy are assessed in terms of employment, labor income, and economic output using the IMPLAN economic modeling package The Community Investment Plan (CIP) then ensures that the rural local economic benefits will offset potential adverse impacts the development of BCWF RFA 4 may have on Sherman County's agricultural economy. Mitigation under the Energy Facility Siting Council (EFSC) Land Use Standard and the CIP address local agricultural community and economic impacts at a county and community level, rather than compensating individual producers for lost production. That type of impact is handled by private agreement, as mentioned above.

2. Indirect and Induced Impacts (LU-10)

OWGL raised concerns regarding indirect impacts associated with loss of funding from wheat assessments that support research, market development, and grower services. Based on the estimated average annual reduction in wheat production and an assessment fee of $0.05 per bushel, Biglow Solar may result in an annual reduction of $2,241 in wheat assessment revenues.

The Economic Impact Analysis in the record (Attachment K-2, Agricultural and Fiscal Impact Analysis) evaluates indirect and induced impacts to the local agricultural economy using an established input-output modeling framework. The analysis is conducted for Sherman County and specifically assesses impacts to the local agricultural economy. The analysis captures changes in agricultural production and associated multiplier effects for the grain sector in Sherman County, and informed the mitigation funding amount provided through the Community Investment Fund.

The analysis is based on the estimated direct economic output (sale) value that would be foregone as a result of removing land from production for the life of the project. IMPLAN models the impact of this reduction to the local economy in terms of indirect and induced impacts. Indirect impacts capture the associated reduction in expenditures on goods and services related to the production process. Modeled relationships are linear and based on spending. Because the relationships are linear, the analysis captures the impacts of any reduction in spending in Sherman County that may occur as a result of forgone wheat assessment revenues.

The CIP was developed through outreach with agricultural organizations and producers, including representatives of the Oregon Wheat Commission and regional grain cooperatives. The CIP is designed to offset indirect and induced agricultural impacts at a sector-wide level and includes investments supporting long-term agricultural resilience, soil health, workforce development, and wildfire risk reduction.

Accordingly, while wheat assessment revenues were not evaluated as a discrete category, the indirect impacts to the local agricultural economy in Sherman County associated with changes in production were estimated and mitigated through the sector-based approach reflected in the record (Attachment K-2, Agricultural and Fiscal Impact Analysis). As discussed below, we propose revisions to the final CIP to address OWGL's concern regarding selecting mitigation projects and ensuring input from wheat growers.

3. Agricultural Mitigation and Community Investment Plan (LU-9, LU-11, LU-12, LU-13, LU-14, LU-15)

PGE and BN address each of OWGL's points on the CIP in turn:

- Administration: PGE and BN support revising the final CIP to include a representative from the OWGL on the Selection Committee. PGE requests that ODOE acknowledge this request and recommend to EFSC that the CIP be revised in Section 4.2.1 to identify the addition of one representative from the OWGL.

- Farm production: The record reflects outreach efforts to date and use of the best available county-level and state-level data and analysis tool to ensure that the economic modeling adequately accounted for indirect and induced impacts to the agricultural economy. PGE and BN maintain that the evidence provided in the record, and the stakeholders consulted, adequately inform the market conditions for Sherman County wheat growers. If other potential indirect impacts are observed, anyone may apply to the CIP as a project proponent for funding, including OWGL.

- Agrivoltaics: The proposed pre-screened agrivoltaics research project in the CIP focuses on collecting data to inform new techniques and advances for dryland wheat farming, specifically Project 1: Dryland Wheat Agrivoltaics Research in Sherman County (Project 1). We too think OWGL's input would be valuable in the development of this project and anticipate that a project proponent for this funding would seek the input from OWGL when developing the project proposal to ensure that the research directly benefited the Sherman County wheat economy. PGE requests that ODOE acknowledge this request and recommend to EFSC that the final CIP be revised at Section 5 to require the project proponent (for Project 1) to consult OWGL when developing the project proposal to include in the CIP funding application.

- Weed Control: We agree with OWGL that weed control is not a separate mitigation effort, but a mandatory and integral part of project construction and operation. See Section 4 below.

- Fire: We agree with OWGL that fire risk minimization and mitigation is not a separate mitigation effort, but a mandatory and integral part of project construction and operation. See Section 5 below.

4. Weed Control

Weed control is a requirement for the life of the facility, from construction through operation and decommissioning. The Proposed Order requires maintenance of vegetative cover beneath and between solar panels, implementation of weed management measures, and monitoring to ensure ongoing compatibility with agricultural uses through the Comprehensive Solar Revegetation and Soil Management Plan. The following Site Certificate conditions require defined practices and compliance demonstrations, providing sufficient specificity to protect soil productivity and watershed function over the life of the Facility: PRE-SP-01 (finalization of the plan referenced above), CON-SP-02 (adherence to the plan during construction), and OPR-SP-06 (adherence to the plan during operation of the facility).

5. Wildfire Risk Mitigation

We recognize wildfire risk is of the utmost concern to the community and have worked with ODOE to develop robust revegetation and wildfire mitigation plans that are separate and distinct from agricultural mitigation. The Proposed Order requires development and approval of wildfire

mitigation and emergency response measures prior to construction, including coordination with local fire agencies. These requirements are sufficiently specific to guide on-site implementation and coordinated response and are enforceable through ongoing compliance obligations. These concerns are addressed through Site Certificate conditions PRE-WF-01 / PRO-WMP-01 (Wildfire Mitigation Planning) and OPR-WF-01 (Operational Wildfire Mitigation), as well as incident reporting and corrective action requirements under GEN-OE-05 through GEN-OE-07.

In closing, thank you for your comments and we hope we have addressed OWGL's concerns. We are happy to engage directly if additional conversations are helpful; our contact information is above. PGE and BN look forward to continued coordination with OWGL on Biglow Solar.

Sincerely,

Lenna Cope

Kathleen Campanella

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:17 PM
To: ormandh@gmail.com
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Ormand Hilderbrand
Attachments: BIGL RFA4_Comment Letter to Ormand Hilderbrand_02132026.pdf

Dear Mr. Hilderbrand,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

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February 13, 2026

VIA EMAIL (ormandh@gmail.com)

Ormand Hilderbrand

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc25-03-P4)

Dear Mr. Hilderbrand,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your oral comments regarding the Oregon Department of Energy's Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate.

PGE and BN appreciate your perspective as a farmer in Sherman County and recognize the challenges facing many family farms today. We also value the insight you shared regarding your own experience with other renewable energy projects in the area. In your comments, you noted that thoughtfully planned renewable energy projects can help secure a more diversified and resilient future for Sherman County, and that, in some cases, solar can save farms. We agree that renewable energy development can coexist with ongoing agricultural use while contributing to the economic diversification and long-term resilience of Sherman County, and we value your support. PGE and BN share your goal of ensuring that renewable energy development proceeds responsibly and with strong natural resource protections in place.

We appreciate your comments and look forward to continued coordination as the project moves forward.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:18 PM
To: randyghilderbrand@gmail.com
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Randy Hilderbrand
Attachments: BIGL RFA4_Comment Letter to Randy Hilderbrand_02132026.pdf

Dear Mr. Hilderbrand,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

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February 13, 2026

VIA EMAIL (randyghilderbrand@gmail.com)

Randy Hilderbrand
P.O. Box 326
Wasco, OR 97065

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-14)

Dear Mr. Hilderbrand,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your written comments regarding the Oregon Department of Energy's Proposed Order on the Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate.

PGE and BN appreciate your perspective as a fourth-generation farmer in Sherman County and recognize the challenges facing many family farms today. We value your insight into how projects like Biglow can provide a stable, predictable source of income through lease payments and community mitigation benefits that are not tied to crop yields or market conditions. PGE and BN agree that renewable energy development can coexist with ongoing agricultural use, while contributing to the economic diversification and long-term resilience of Sherman County. PGE and BN share your goal of ensuring that renewable energy development proceeds responsibly and with strong natural resource protections in place.

We appreciate your comments and look forward to continued coordination as the project moves forward.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:18 PM
To: nickw@shermancountyor.gov
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Weis/Sherman Co Weed District
Attachments: BIGL RFA4_Comment Letter to Sherman Co Weed District_02132026.pdf

Dear Mr. Weis,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

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February 13, 2026

VIA EMAIL (nickw@shermancountyor.gov)

Nick Weis
Sherman County Weed District
66143 Lone Rock Road
Moro, OR 97039

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Proposed Order Response to Comment (BCWAMD4Doc24-15)

Dear Mr. Weis,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your comments regarding the Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate. PGE and BN recognize the importance of managing vegetation and fire risk for the Facility and look forward to continued collaboration and coordination with Sherman County Weed District. The response below is identified with the same issue identification number provided in Table 1: List of Issues and Commenters, in the Oregon Department of Energy's Response to Comments document dated February 12, 2026.

Vegetation Management (SP-04)

The Proposed Order provides a comprehensive vegetation and fire risk management structure for all phases of project development. The Oregon Department of Energy (ODOE), recognizing neighbor concerns, recommended conditions of approval that go above and beyond other existing site certificates. PGE and BN provided comments to ODOE on the plans and conditions contained in the Proposed Order to ensure that there was a common understanding of the requirements and that the plans and conditions contained best practices, informed by local stakeholders. Of particular importance is the Comprehensive Solar Revegetation and Soil Management Plan that outlines actions taken in preparing the site prior to construction, throughout construction, and during operation of Biglow Solar that support native vegetation for watershed health, control erosion, and prevent the introduction or spread of noxious weeds.

You expressed concern in your comment letter with the proposed vegetation heights of 1 to 3 inches during the dry season, as represented in Section III.N.1 of the Proposed Order, because several bunchgrass species proposed for planting could be negatively impacted by maintaining vegetation at such a low height. You proposed that, in your professional opinion, allowing a grass height of 4 to 8 inches during the dry season would better support continued establishment, promote a stronger root system, and result in healthier long-term growth.

PGE and BN appreciate your professional input on this matter as the supervisor of the Sherman County Weed District. PGE is requesting that ODOE take your professional recommendation into consideration and revise the Proposed Order and implementing plans accordingly to require management of grass height at 4 to 8 inches during dry season.

We look forward to coordinating with you to ensure vegetation is managed properly at the Biglow Solar facility. We are committed to listening to community concerns and to operating this facility in a way that reflects our shared interest in protecting people, property, and the landscape we all value.

Please reach out if you have questions or would like to discuss further. As previously discussed, there will be continued engagement of the community and neighbors as this project moves forward.

Sincerely,

Lenna Cope

Lenna Cope

Senior Environmental Specialist

Portland General Electric Company

Kathleen Campanella

Kathleen Campanella

Senior Director, Development

BrightNight

cc: Chris Bozzini, PGE

Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Lenna Cope <Lenna.Cope@pgn.com>
Sent: Friday, February 13, 2026 3:18 PM
To: amanda.whitman@shermancountyswcd.com
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Kathleen Campanella; Chris Bozzini; Ziola, Kiana
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Whitman/SWCD
Attachments: BIGL RFA4_Comment Letter to SWCD_02132026.pdf

Dear Ms. Whitman,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you.

Lenna Cope, P.E.
Pronouns: she/her
Senior Environmental Specialist | 503-464-2634 | 503-313-5022
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An Oregon kind of energy.

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13123 E Emerald Coast Pkwy
Ste B #158
Inlet Beach, FL 32461
info@brightnightpower.com

February 13, 2026

VIA EMAIL (amanda.whitman@shermancountyswcd.com)

Amanda Whitman
District Manager
Sherman County Soil and Water Conservation District
P.O. Box 405
Moro, OR 97039

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-21; BCWAMD4DOC25-03-P8)

Dear Ms. Whitman,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate the oral and written comments from the Sherman County Soil and Water Conservation District (SWCD) regarding the Proposed Order on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate. OAR 345-027-0367(8) requires PGE to respond to all comments that are made with "sufficient specificity," as that term is defined in OAR 345-027-0367(7)(a). We note that your comments may not necessarily meet that standard but are valuable to inform the process, and we offer the following responses. The responses below are organized by the interpretation of your comments received and are further identified with the same issue identification number provided in Table 1: List of Issues and Commenters in the Oregon Department of Energy's (ODOE) Response to Comments document dated February 12, 2026.

PGE and BN agree with SWCD that proactive planning, accountability, and long-term protection for Sherman County soil, water, and other natural resources is very important. We also recognize the importance of a strong working relationship; we apologize if we did not adequately engage you throughout the process despite our attempts to speak with you by phone or in person. We may have misunderstood your desired engagement when you indicated during our phone call on June 18, 2025, that you did not support Biglow Solar and would not discuss ideas regarding agricultural mitigation unless, or until, the project was approved. SWCD plays an important role within the agricultural community, and we hope to develop this strong working relationship with you to foster watershed health for the benefit of Sherman County. PGE and BN are committed to working with SWCD as the plans are finalized prior to construction.

1. Soil Resources, Erosion and Vegetation Management (SP-08, SP-11, SP-12)

PGE and BN recognize the challenges of siting a solar facility on agricultural lands with high erosion hazard due to runoff on steep slopes and high winds, and we also recognize the long history of ongoing support that the SWCD has provided to the community to address issues related to erosion and weed control. We believe the soil protection, vegetation management, and mitigation measures outlined in the Proposed Order protect against adverse impacts to the local natural resources that SWCD works to protect.

SWCD expressed concern regarding soil disturbance, compaction, erosion, and the loss of irreplaceable topsoil as well as potential compaction and erosion from traffic and maintenance

activities. In response, the Comprehensive Solar Revegetation and Soil Management Plan includes specific requirements for topsoil protection and long-term soil stability, including segregation and replacement of topsoil during construction, pre- and post-construction soil compaction testing, and mechanical decompaction where necessary prior to revegetation. These measures are intended to minimize impacts on soil productivity and reduce the potential for long-term loss of topsoil, particularly in agricultural areas.

These concerns are addressed under the Energy Facility Siting Council (EFSC) Soil Protection Standard, which requires that construction and operation of the Facility be conducted to avoid or minimize adverse impacts on soil resources. Compliance with the Biglow Comprehensive Solar Revegetation and Soil Management Plan serves as the primary regulatory mechanism for ODOE, as recommended in the Proposed Order, to ensure coordinated implementation of soil protection, erosion control, and vegetation management measures under EFSC standards.

BCWF RFA4 Proposed Order Attachment D includes a draft of the Comprehensive Solar Revegetation and Soil Management Plan. The plan requires, among other things, the following actions to mitigate potential impacts to soil resources:

- Use of best management practices (BMPs) during construction to minimize erosion, control dust, and prevent the introduction or spread of noxious weeds and invasive plants. (Attachment D: Section 3.0, Appendices D and F)
- Pre-construction compliance, including coordination with the County and ODOE; soil compaction testing; installation of stormwater, erosion, and sediment controls as required by the 1200-C construction stormwater permit; and conducting noxious weed surveys and maintaining weed control activities until just prior to construction (Table 3 in Section 4.0 of Attachment D).
- Construction compliance activities designed to limit soil disturbance and compaction, manage dust, and prevent the introduction or spread of noxious weeds. Soil stabilization and reclamation activities will occur during and following construction, and disturbed areas will be revegetated using approved seed mixes appropriate for the local soils and climate (Table 4 in Section 5.0 of Attachment D).
- Specified access routes for construction and operational activities, to reduce the potential for soil compaction and erosion during ongoing maintenance activities. Operational requirements addressing these concerns are included in OPR-SP-01 through OPR-SP-03.
- Long term vegetation and weed management, including monitoring throughout the life of the facility to identify and treat problem areas using appropriate methods before they have a chance to spread (Attachment D: Appendices C and G).

Site Certificate condition PRE-SP-01 mandates finalization of this plan prior to construction; conditions CON-SP-02 and OPR-SP-06 require adherence to the final plan during construction and operations of the facility, respectively.

With implementation of these measures, potential impacts on soil resources will be avoided or minimized to the extent practicable and mitigated consistent with EFSC's Soil Protection Standard.

2. Water Resources and Stormwater Management (SP-11)

SWCD raised concerns regarding altered drainage patterns, concentrated runoff, sediment delivery, and downstream water quality impacts. Stormwater and runoff control are addressed through the approved draft Comprehensive Revegetation and Soil Management Plan, including PRE-SP-01 and associated construction and operational soil protection conditions, which require identification of drainage patterns, implementation of BMPs, and ongoing monitoring to minimize sediment transport to ditches, streams, and waterways.

3. Agricultural Compatibility and Weed Management (SP-08, SP-12)

SWCD identified concerns related to the conversion of agricultural land, loss of vegetative cover, and long-term stewardship. The EFSC Land Use Standard requires that Biglow Solar be compatible with existing land uses and that impacts to agricultural lands be minimized and mitigated. As discussed above, the Proposed Order requires maintenance of vegetative cover beneath and between solar panels, implementation of weed management measures, and monitoring to ensure ongoing compatibility with agricultural uses. Site Certificate conditions (PRE-SP-01, CON-SP-02, OPR-SP-06) require defined practices and compliance demonstrations, providing sufficient specificity to protect soil productivity and watershed function over the life of the Facility.

4. Public Safety, Wildfire Risk, and Hazardous Materials (SP-07)

SWCD noted Sherman County's elevated wildfire risk and expressed concern regarding firefighter safety and potential impacts on soils and waterways from damaged project components. The EFSC Soil Protection, Public Services, and Wildfire Prevention and Risk Management standards collectively require that facilities be designed and operated to protect public health and safety.

Consistent with these standards, the Proposed Order requires development and approval of wildfire mitigation and emergency response measures prior to construction, including coordination with the local fire district. These concerns are addressed through Site Certificate conditions PRE-WF-01 / PRO-WMP-01 (Wildfire Mitigation Planning) and OPR-WF-01 (Operational Wildfire Mitigation), as well as incident reporting and corrective action requirements under GEN-OE-05 through GEN-OE-07.

With respect to project design, Biglow Solar plans to deploy crystalline photovoltaic (PV) modules which are glass encapsulated. The glass encapsulation limits the potential dispersal of internal materials, reducing the risk of toxin release beyond toxic hazards of standard structure fire smoke. The proposed battery energy storage system (BESS) uses advanced fire safety and containment systems designed to detect, isolate, and neutralize potential thermal events before they can spread. These systems are built with multiple layers of protection, including thermal sensors, automatic shutdown systems, and dedicated containment compartments to prevent propagation. The units are UL 9540A tested, which means they've been stress-tested under extreme conditions to meet national safety standards. The BESS system design uses a central BESS yard where all batteries will be housed and containerized batteries, each with monitoring and alarming capabilities to support preventative measures during operation.

The BESS yard will also be graveled and designed to maintain non-combustible clear zones, eliminating available fuel and limiting fire spread potential. In the event of battery failure, the containerized design, internal separation, and emergency response protocols are intended to localize impacts within individual units and prevent migration of materials beyond the immediate

footprint. Any damaged components would be promptly secured, removed, and disposed of in accordance with applicable hazardous materials regulations, thereby minimizing the potential for impacts to underlying soils or adjacent waterways.

These requirements guide on-site implementation, coordinated emergency response, and are enforceable through ongoing compliance obligations under the Site Certificate.

5. Compliance, Monitoring, and Enforcement (SP-06, SP-08)

SWCD emphasized the importance of accountability and enforceable commitments. Facilities approved by EFSC are subject to enforceable Site Certificate conditions, routine compliance reporting, inspections, and corrective action requirements. The Proposed Order contains numerous mandatory conditions, including the following conditions that implement the standards discussed above and ensure that commitments related to erosion control, weed management, fire prevention, and natural resource protection are enforceable for the life of the project.

- Organizational Expertise:
  - PRO-OE-01 (Final Operations and Maintenance (O&M) Plan)
  - OPR-OE-01 (Requirement to adhere to O&M plan)

- Wildfire Mitigation
  - PRO-WF-01 (Final Operational Wildfire Mitigation Plan)
  - OPR-WF-01 (Requirement to adhere to Operational Wildfire Mitigation Plan)

- Soil Protection and Vegetation Management
  - PRE-SP-01 (Final Comprehensive Solar Revegetation and Soil Management Plan)
  - OPR-SP-06 (Monitor and maintain vegetation and erosion controls according to above plan)

6. Pre-Construction Planning and Timing

SWCD requested assurance that construction would not proceed before adequate natural resource protection plans are in place. Biglow Solar will not begin construction until approved plans are in place. Under the Proposed Order's recommended pre-construction condition PRE-SP-01, ground-disturbing activities are prohibited until required plans are finalized, reviewed, and approved, ensuring sufficient specificity, accountability, and protection of natural resources before construction begins.

In closing, PGE and BN share SWCD's goal of ensuring that renewable energy development proceeds responsibly and with strong natural resource protections in place. Consistent with our commitment to develop a strong working relationship with SWCD to foster watershed health to benefit Sherman County, PGE will continue coordinating with SWCD as protection plans are developed finalized prior to construction and implemented during project execution. We appreciate SWCD's comments and welcome any additional questions or comments SWCD may have regarding these responses. PGE and BN look forward to continued coordination with SWCD as detailed planning and implementation proceed.

Sincerely,





Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

ESTERSON Sarah * ODOE

From: Kenny Gunn <kenny.gunn@pgn.com>
Sent: Friday, February 13, 2026 4:34 PM
To: lawrence squiemphen
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Chris Bozzini; Kathleen Campanella; Ziola, Kiana; Lenna Cope
Subject: Biglow Canyon RFA4 Response to Certificate Holder Response to Public Comment - Squiemphen III/CTWSRO
Attachments: BIGL RFA4_Comment Letter to Warm Springs_02132026_ODOE.pdf; BCWF RFA4 COMMENT LETTER_Confidential Materials Letter_BIGLOW RFA4.pdf

Some people who received this message don't often get email from kenny.gunn@pgn.com. Learn why this is important

Dear Larry,

Thank you for your comments regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate. As required by Oregon Administrative Rule 345-027-0367(8)(a), please find attached Portland General Electric's and the project developer, BrightNight's, written responses to your comments. Yesterday you should have received an email from Christopher Clark, the Oregon Department of Energy (the Department) Senior Siting Analyst for this amendment. The email contains the Department's Responses to comments and, should you choose to, directions for how to reply to our comment responses. Please refer to that email for guidance.

Thank you,
Kenny

Kenny Gunn
Cultural Resources Lead | 503-550-5822 | kenny.gunn@pgn.com
portlandgeneral.com | Explore PGE History

Portland General Electric
121 SW Salmon Street • Portland, Ore. 97204
PortlandGeneral.com

February 13, 2026
Biglow

VIA EMAIL

Christopher Clark, Senior Siting Analyst
Oregon Department of Energy
550 Capitol St. NE 1st Floor
Salem, OR 97301

Re: Confidential Submittal for the Request for Amendment (RFA) 4 to the Site Certificate for the Biglow Canyon Wind Farm

Dear Mr. Clark

Portland General Electric Company (PGE or Certificate Holder) requests that the Oregon Department of Energy keep the enclosed information confidential to the extent permitted by law. The enclosed information includes a copy of the PowerPoint that presented during the November 2025 meeting with the Confederated Tribes of Warm Springs Reservation of Oregon, which includes map of the recorded archaeological sites.

As required, the following paragraph is included:

We request that the Oregon Department of Energy treat these records as confidential and exempt from disclosure to the extent permitted by law, and that the records be kept separate from the public record of the Biglow Canyon Wind Farm Request for Amendment 4 to the Site Certificate, with the further understanding that the records will not be disclosed unless required by law. In the event of a public records request for the information, we request that the Applicant be notified.

Thank you for your consideration of our request.

Sincerely,

Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech
Kathleen Campanella, BrightNight

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February 13, 2026

VIA EMAIL (lawrence.squiemphen@ctwsbnr.org)

Lawrence Squiemphen III, Tribal Historic Preservation Officer
Confederated Tribes of Warm Springs Reservation of Oregon
Branch of Natural Resources
P.O. Box C
Warm Springs, OR 97761

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order (BCWAMD4Doc24-09)

Dear Mr. Squiemphen, III,

Portland General Electric (PGE) and project developer BrightNight (BN) appreciate receipt of your comment letter on behalf of the Confederated Tribes of Warm Springs Reservation of Oregon (CTWSRO), dated January 15, 2026, regarding the Oregon Department of Energy's (ODOE) Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm Site Certificate.

PGE and BN acknowledge that the proposed solar components under RFA 4 are located within the ceded lands of CTWSRO and an area of ongoing cultural, historical, and archaeological importance. We appreciate CTWSRO's continued participation in government-to-government consultation with the State of Oregon.

PGE is committed to cultural resource protection, implemented to be consistent with the Amended Site Certificate and the Energy Facility Siting Council's (Council) Historic, Cultural, and Archaeological Resources standard (OAR 345-022-0090). Archaeological monitoring, inadvertent discovery procedures, and continued Tribal consultation are being applied to ensure appropriate protection of cultural resources during ground-disturbing activities, consistent with approved plans and Site Certificate assumptions.

In your letter you stated:

> […] *recent communications from the applicant and its consultants suggest a narrowing of cultural resource compliance measures that does not appear to align with the recommendations documented in the survey or with the substance of consultation discussions. Specifically, the applicant has characterized archaeological monitoring as limited in scope and duration, focused on a single location, rather than implementing monitoring for all ground-disturbing activities occurring within proximity to recorded cultural resources as recommended.*

As explained later in this letter, ODOE did not recommend monitoring during all ground-disturbing activities as a condition of the Site Certificate, and PGE agrees with that finding. However, we would like to clarify that archaeological monitoring, if required, would not be focused on a single location; it would be focused for all ground-disturbing actions within 20-meters of eligible and unevaluated sites, as defined by the GeoVisions report and the State

Historic Preservation Office's (SHPO) concurrence. The project has been designed to avoid all such sites with a 20-meter buffer; thus, monitoring of the 20-meter buffers is not expected to be necessary. If project design changes, or in the event of inadvertent discoveries during construction, then monitoring would be implemented and impacts would be evaluated.

In your letter you also state:

> […] *the survey concludes that the current construction plan would result in an adverse effect to archaeological resources. CTWSRO is concerned that this determination, and the associated recommendation for monitoring, inadvertent discovery response, and Tribal involvement, are not being fully reflected in how the applicant is proposing to implement cultural resource protection measure as the Project moves toward construction.*

Based on the results of the GeoVisions report, which "recommends the client avoid all sites and isolates in the process of construction and operation for the project," PGE and BrightNight modified the proposed design to include avoidance of all sites determined eligible or unevaluated, including a 20-meter buffer. Based on the avoidance measures and the concurrence from SHPO on eligibility, it was our understanding that the project would be avoiding all possible adverse effects pending any inadvertent discoveries during construction. If the concern is that it is the recommendation of the CTWSRO to monitor all project activities regardless of the results of the GeoVisions report or the associated SHPO concurrence, PGE and BrightNight welcome continued consultation to identify specific or expanded areas of concern within the current design.

On July 10, 2025, SHPO concurred with GeoVisions' eligibility recommendations and further clarified that the recommended 20-meter avoidance buffer applies to National Register of Historic Places (NRHP)-eligible and unevaluated, but not ineligible, resources. The current project design avoids all NRHP-eligible and unevaluated resources by at least 20 meters, based on the results of the GeoVisions report and SHPO concurrence. One NRHP-ineligible resource is being impacted as allowed for by SHPO's response and draft Proposed Order. This design, including the avoidance measures and lack of impacts to all identified eligible or unevaluated archaeology sites, is the same as that shared with you during our November 2025 meeting at your offices (see attached **confidential** PowerPoint presentation for reference). Following the presentation, which included GeoVisions staff, it was our understanding that since no concerns were raised with the proposed avoidance measures, there was no discussion or assumption of monitoring during construction.

This approach is consistent with ODOE's siting standard for Historic, Cultural, and Archaeological Resources (OAR 345-022-0090(1)(a)–(c)) and established practice for evaluating significant impacts. Under OAR 345-022-0090(1)(a), impact determinations focus on NRHP-eligible and unevaluated resources. With respect to Siting Standard B (OAR 345-022-0090(1)(b)), which applies to archaeological resources on private land, ODOE considers impacts to NRHP-ineligible resources to be mitigated through documentation and recordation completed during pre-construction surveys.

Consistent with this framework, PGE and BrightNight are prioritizing development of the final RFA 4 design to avoid archaeological resources identified by GeoVisions as NRHP-eligible or unevaluated by a minimum of 20 meters. However, PGE notes that while GeoVisions' recommendations for avoidance of NRHP-ineligible resources and for archaeological monitoring during all ground-disturbing activities, including within 20 meters of those resources, may be in line with conditions imposed for the existing wind facility, those conditions are inconsistent with

the SHPO concurrence.

The Proposed Order further recommends replacing prior wind-facility cultural resource conditions with new, project-specific conditions applicable to the solar components, including conditions requiring avoidance of identified significant resources and updated cultural resources monitoring and inadvertent discovery procedures. As described in the Proposed Order (Section III.J, Historic, Cultural, and Archaeological Resources), the cultural resource conditions imposed for the existing wind facility (Conditions 69 through 73) were developed for a different facility type and relied on a broader, less resource-specific compliance framework. ODOE explains that those legacy conditions are not fully consistent with the level of specificity now required for the solar components proposed under RFA 4 or with current agency approaches to cultural resource avoidance, monitoring, and inadvertent discovery.

Accordingly, ODOE recommended replacing the legacy conditions with new, solar-specific Historic, Cultural, and Archaeological Site Certificate conditions, including GEN-HC-02 and GEN-HC-03 (resource-specific avoidance requirements), PRE-HC-01 (updated Inadvertent Discovery Plan), CON-HC-01 (construction-phase compliance), and OPR-HC-01 (operational compliance). These conditions identify individual resources, establish defined avoidance buffers, and require updated monitoring and inadvertent discovery procedures. The recommended changes are intended to align the Site Certificate with current standards and practices, not to reduce cultural resource protections.

PGE understands that GeoVisions prepared the cultural resources survey report to support consultation and regulatory review, and the survey's conclusions do not necessarily reflect the views or positions of the CTWSRO Tribal Historic Preservation Office (THPO). PGE does not have record of a request from CTWSRO THPO, through informal coordination or at our November 2025 meeting at CTWSRO's offices or formal government-to-government consultations, for protective measures beyond those reflected in the Proposed Order and draft Amended Site Certificate. If the CTWSRO THPO believes that certain resources should be managed differently or that additional protection measures should be required, PGE supports continued government-to-government consultation between CTWSRO THPO and ODOE, as determinations regarding applicable standards, conditions, and mitigation requirements fall within the Council's and ODOE's purview.

PGE agrees with CTWSRO that cultural resource protection measures should not be reduced through project-level interpretation or contractor scoping decisions. However, based on the results of the GeoVisions report, the design was modified to avoid all impacts to identified archaeology sites, including a 20-meter buffer. Construction planning and contractor requirements will be structured to ensure consistency with Site Certificate obligations and approved plans, and continued consultation with CTWSRO THPO will remain an essential component of that process as construction planning advances.

PGE appreciates CTWSRO's engagement in this proceeding and its efforts to ensure that the consultation record is accurately reflected. Due to the avoidance measures implemented within the modified design, it is our understanding, based on the GeoVisions report, that the proposed solar components will not have any impact on any NHRP-eligible or unevaluated sites, eligibility as concurred with by the Oregon SHPO. In the event of inadvertent discoveries during construction, the project will pause, and the appropriate consultations will occur in order to evaluate potential effects and next steps, as determined by the Inadvertent Discovery Plan.

Please do not hesitate to contact us if further discussion would be helpful.

Sincerely,

Kenny Gunn
Cultural Resources Lead
Portland General Electric Company

Cc: Chris Bozzini, PGE
Lenna Cope, PGE
Kiana Ziola, Tetra Tech
Kathleen Campanella, BrightNight

Attachment: Biglow Solar and Battery Storage Project Presentation **(Confidential materials provided under separate cover)**

Attachment: Biglow Solar and Battery Storage Project Presentation

BRIGHTNIGHT
Power when you need it

BIGLOW SOLAR AND BATTERY STORAGE PROJECT

November 20th, 2025



BrightNight: “Who We Are”

Portfolio Overview

- BrightNight designs, develops, and operates safe, reliable, large-scale renewable power projects.
- 2.7 GW of projects with PPAs or under negotiation
- 300 MW Box Canyon solar project in Arizona to start construction in early 2024
- 100 MW Wind/Solar project in construction in India
- 1 GW in construction by 2025

20 GW
Project portfolio

6.3 GW
PNW is BN’s Priority Market





Differentiated customer solutions for renewable power

Operating under an integrated development & IPP model



Integrated Solar & Storage



Hybrid Projects (Complementary Resources)



Dispatchable Solutions

PowerAlpha™
Hybrid Design & Dispatch
Our proprietary software provides a **tailored analysis for customers** to uncover the highest value project and to optimize asset management

Customer-centric
We learn about your goals and challenges to design a **renewable solution** not just a project



World-class team led by **Martin Hermann**

Deep Experience and Depth across renewables, software, finance, and operations

152 Employees with deep expertise in utilities and power markets

Some recent hires within last 12 weeks:

- VP of Permitting (15+ yrs in power. Previous: Terra-Gen)
- VP of Development (15+ yrs in power, Calpine)
- VP of Asset Management and O&M (20+ yrs, Fluence)
- VP, Development (13+ yrs in power, NextEra)
- VP Procurement (15+ yrs in power, Clenera)
- VP Development (16 yrs in power at NextEra)
- VP Development (20+ yrs in power at Terra-Gen)
- Senior Director Development (15+ yrs in power, Terra-Gen)

With $1B in committed capital BrightNight is well-capitalized to grow its asset base of power plants

GLOBAL INFRASTRUCTURE PARTNERS
CPP INVESTMENT BOARD

BRIGHTNIGHT
Power when you need it

Biglow Solar + Storage Project Overview

OVERVIEW
PGE and BrightNight have partnered to bring a solar and storage project to the existing Biglow Canyon Windfarm in Sherman County, Oregon.

CAPACITY
385-Megawatts in two phases. Today, we're discussing phase 1 (125 MW PV and 125 MW BESS).

FOOTPRINT
Overall study area is 3,980 acres. Actual project footprint for Phase 1 is ~750 acres (Phase 1 study area 1,409 acres).

INTERCONNECTION
Utilizing the existing Biglow Canyon Substation. Ideal optimization of existing infrastructure to reduce project impact.

PERMITTING
Currently moving through the Oregon EFSC process.

Tax Revenue
At least $40,000,000 in tax revenue generated over the life of phase 1 of the project.

Schedule Overview

2024

April-Sept

- Surveys Complete (cultural resources, habitat, raptor, wetlands, botanical)
- Meetings with community leaders
- Initial tribal outreach

2025

April

- Application for Amendment to existing EFSC Site Certificate deemed published and complete by ODOE

July

- Preliminary layout
- Technology selection
- Agricultural mitigation meetings

August

- Sponsorship of the Sherman County Fair
- Open house, Aug. 19

November

- Anticipate completing EFSC application submission

December

- EFSC issues "draft proposed order," tentative hearing date set

2026

March

- Council review and determination

Q2

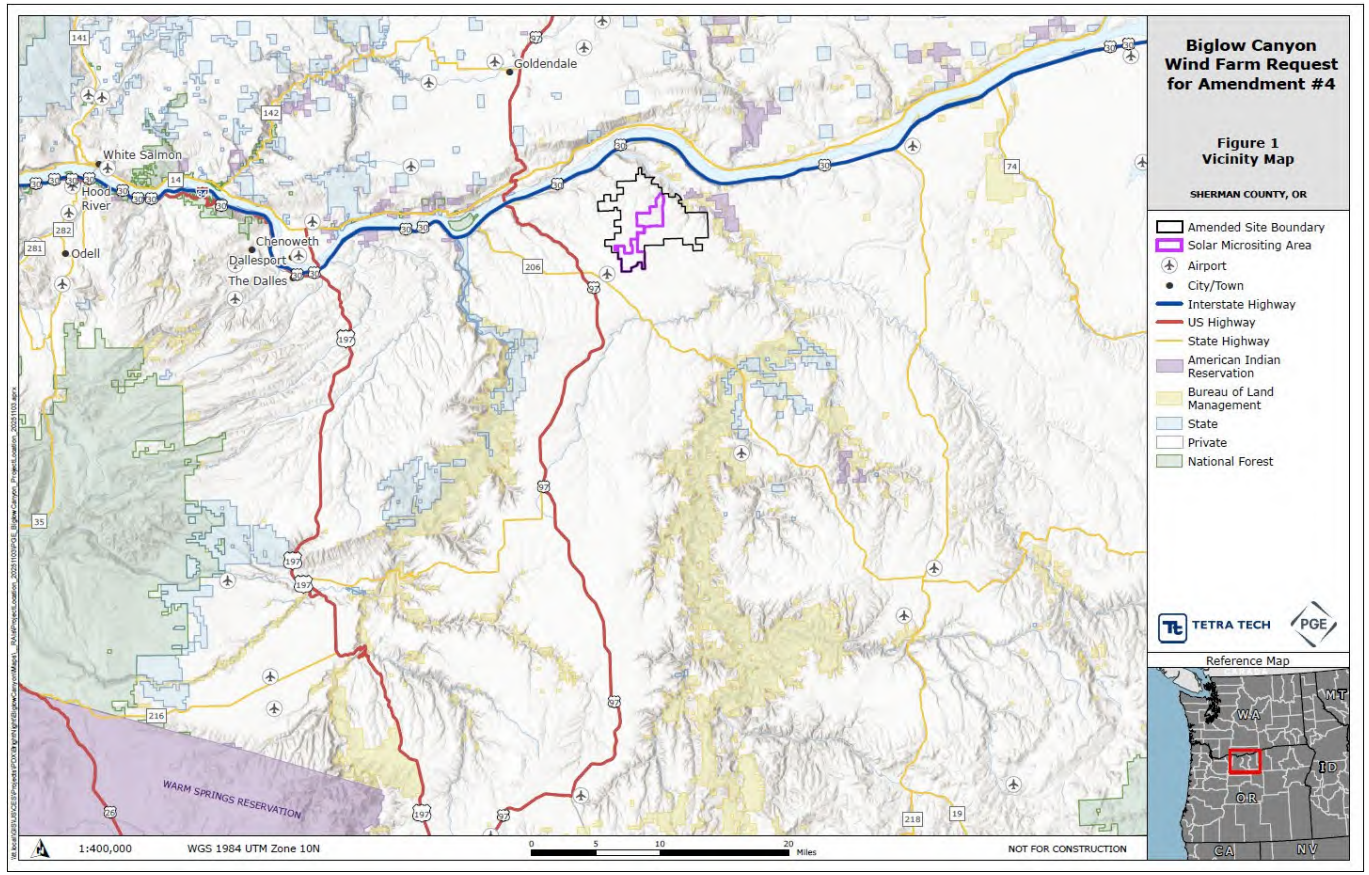
- Construction of phase 1

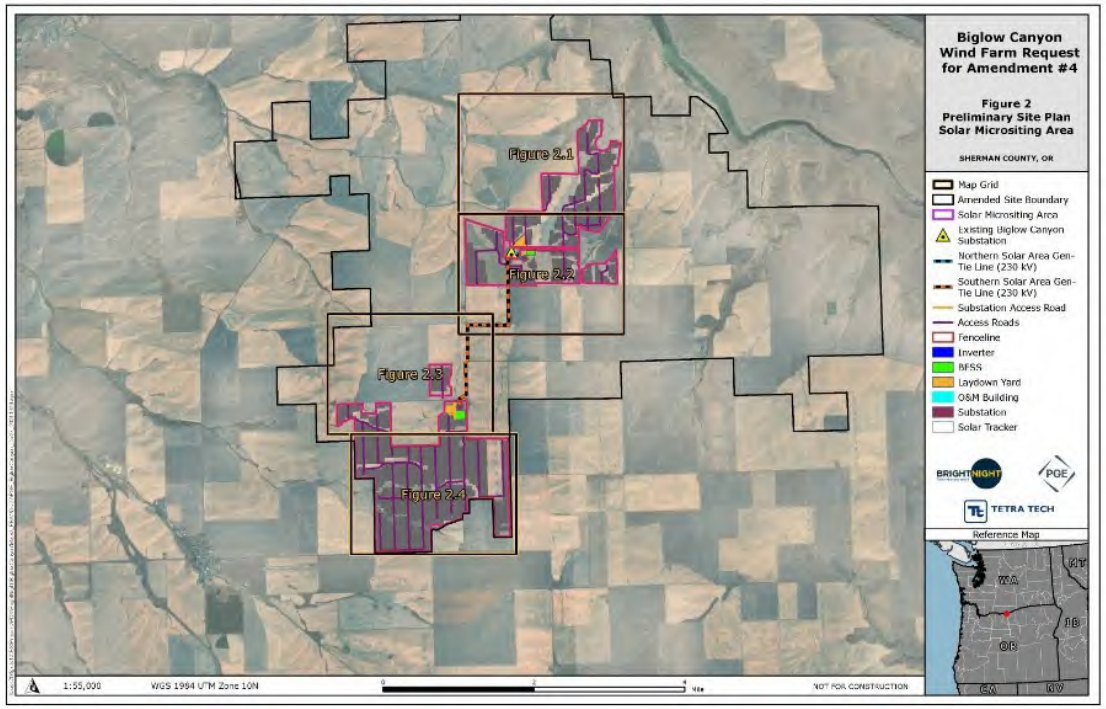
2027

Q2

- Anticipated construction of phase 2

RFA Site Boundary and Micrositing Corridor





Phase I Preliminary Site Layout

Existing Biglow Canyon Substation

New solar array fence line

New inverters

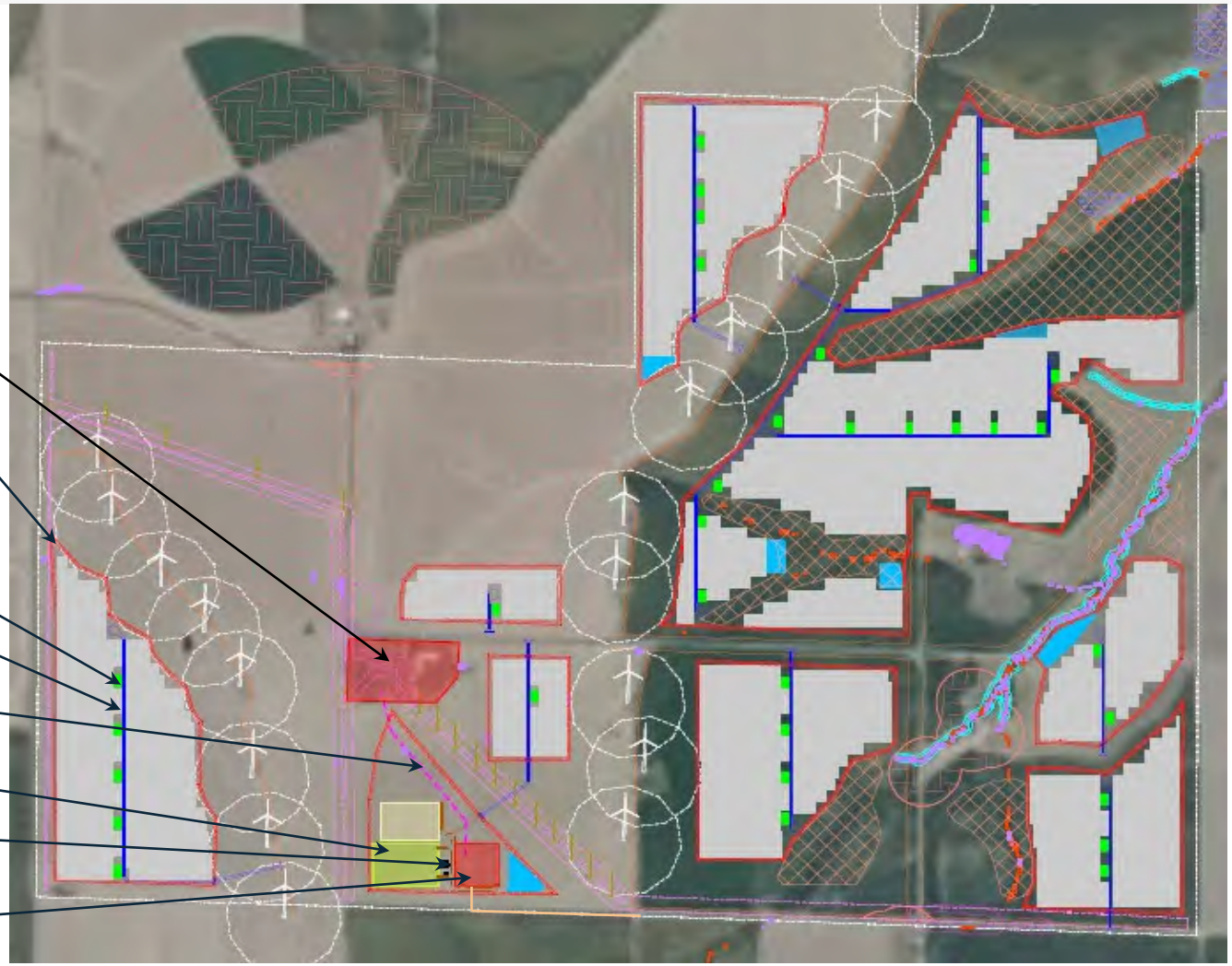
New interior roads 16’

New onsite gen-tie

New BESS

New O&M building

New project substation w/ 24’ entry road and 20’ internal roads



Environmental Diligence cont'd

- Special Status Species Surveys and Habitat Categorization (Tetra Tech)
  - No listed plant or animal species observed
  - Land use predominately dry land wheat (Category 6 habitat)
  - Minimal impacts to Category 2 and 3 habitats mitigated at an offsite HMA
  - Preconstruction surveys will be implemented
- Wetland Delineation (Tetra Tech)
  - 3 wetlands (1 jurisdictional), 4 waterways (1 jurisdictional)
  - ODSL approved delineation results on 8/12/2025
  - Project will be micro-sited to avoid all impacts to wetlands and waters

BRIGHTNIGHT
Power when you need it

From: Kathryn McCullough
Sent: Tuesday, February 24, 2026 8:26 AM
To: CLARK Christopher * ODOE
Subject: RESPONSE to ODOE and PGE
Attachments: Response to ODOE PGE due 2272026.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Chris, I sent three documents up to the portal, including this one. Can you make sure I did it right? Hope you had a good vacation! Kathy

We will be satisfied with the 4-6" weed height under the solar panels and around the fencing if ODOE promises to add it to the site certificate and add teeth to the site certificate. Our main concern is still fire.

The fact remains that there is enough room on the Biglow transmission lines for solar because the wind towers have not been maintained. Biglow Wind Farm Phase 3 continues to have major issues, and 50 towers are still not operating. It has been four years since the blade drop, and PGE estimates another three years before all the towers in Phase One are repaired and operational. We do not trust their operational expertise.

PGE/BrightNight included 50 pages on agrivoltaics in their rebuttal. This is another concern. Where is the common sense? We have no water. We are basically a desert. A windy desert.

Merriam-Webster: The meaning of **DESERT** is arid land with usually sparse vegetation; especially: such land having a very warm climate and receiving less than 25 centimeters (10 inches) of sporadic rainfall annually.

Our rainfall averages 7-10 inches a year. Does OSU really believe another five inches will mysteriously appear under the solar panels when they implement agrivoltaics?

The CIP plan in Amendment E includes plans to study agrivoltaics, with a cost estimate of $100,000-$300,000. (Annually?!) This is a waste of money. I doubt PGE will have enough funds and water to keep the panels clean and working optimally. This money could be better spent on real mitigation: fire mitigation.

The five-person board is cherry-picked by a lead county commissioner (Joe Dabulskis, not a lawyer) who wants the income from solar and is the Chair of CREA (a direct conflict of interest IMHO), an association that lobbies for green energy in Salem. OSU will be paid, and the rest of the committee are all pro-solar, ie. stand to profit and make money off solar. This is not a fair fight or an unbiased board.

I object to PGE's claim that it has addressed the wildfire issue. They have not addressed it with specificity to this project, but rather in general in the entire state of Oregon.

Solar has a much larger footprint and a much higher fire risk. Why aren't PGE and BrightNight developing a more robust fire plan? We are at the end of the Columbia Gorge (a venturi). The winds are stronger in northern Sherman County (hence a wind farm), and we are a dry tinderbox (desert).

The management at PGE has not recognized our concerns or been proactive. They have given us lip service, and won't even agree to the 4-6" for fire, much less a hold harmless clause. They have not operated in good faith at the Biglow Wind Farm. Even if there isn't enough "specificity" to address many of the comments from *multiple agencies*, this has to be addressed before we have another 80,000-acre fire like 2018.

The Certificate Holder requests that these terms be replaced with "low-growing, fire-resistant vegetation," or that the documents otherwise clarify that these buffer areas are intended to be maintained with low-growing, fire-resistant vegetation rather than fully devoid of vegetation.

This shows the *magical thinking* behind this amendment in the wildfire section. There is no fire-resistant vegetation. Nothing stays green out here year-round. A fire travels a half mile in ten minutes or less in our conditions.

Ten feet is a joke. Fifty feet is barely enough to turn a fire truck around (Fire Chief Bert Norris), according to our fire marshals, *who are all volunteers and change frequently.* Chief Burbank is a great guy who has been here about three years and he is not on board with this. BrightNight has talked with the fire chiefs, but that doesn't mean the fire chiefs are okay with the fire plan. We and hundreds of other farmers have been fighting fire here for over 40 years. We are the experts. The certificate holder held one meeting did a presentation with the North Sherman Fire Department. The meeting was not well-publicized or attended. Further dialogue and input from volunteer firefighters is needed.

5. Maintaining vegetation at a 1- to 3-inch height would substantially increase vegetation management costs without providing commensurate fire-risk reduction benefits.

Actually, 1"- 3" is the only height that would provide commensurate fire-risk reduction. But we will be happy with 4" - 6"! Too much erosion? Too hard to maintain? Only because this is a dangerous place for a solar project. Gravel? Sheep? The compelling and well-voiced concerns of our county's Conservation Department were dismissed for not enough specificity.

Well, this should be enough specificity to warrant extreme concern. But the game is rigged, and the criteria have already been determined despite common sense and facts. ODOE needs to reexamine its criteria for inclusion in challenging the site certificate. Their requirements are too rigorous, and we all feel dismissed without being heard.

The Certificate Holder requests the following changes to the first bulleted item in Section

3.4.2 PV System:
• Routine module inspections and annual infrared/aerial thermal imaging with anomalies detected via SCADA generating corrective work orders within 48 hours according to the final Operations and Maintenance Plan.

No - routine is not defined… every day, multiple times a day during fire season! And 48 hours is too long for corrective work orders during fire season. PGE is laden with bureaucracy *instead of common sense.*

Section 4.2 Specifications for Fire Protection Equipment:

The Certificate Holder requests to remove Drip Can: 5 gallon capacity from the list of fire suppression equipment required to be carried in maintenance vehicles and stored on-site at the O&M building. O&M staff are not expected to have experience using this type of equipment and will not be conducting activities requiring the use of drip cans.

This is precisely my worry. In a nutshell. PGE has never trained its people in firefighting and appears to have no intention of doing so. Instead, they are relying on volunteer firemen – us, the farmers and citizens of Sherman County. We are the experts in this drama, and our concerns are falling on deaf ears.

Comprehensive Solar Revegetation and Soil Management Plan
Biglow Canyon Wind Farm F-8
Vegetation Management Objectives for Permanent Disturbance Areas
During the operation of the Solar Components, vegetation under the solar panels will be managed to minimize fire risk and erosion by maintaining low-growing vegetation.
Prohibition on Use of Domestic Sheep and Goats for Vegetation Management
The Certificate Holder may not keep or use domestic sheep, goats, or other livestock at the Facility for vegetation control or other purposes without written approval from ODOE. Any request to use domestic sheep, goats, or other livestock at the Facility must be accompanied by a description of practices and controls that will be implemented to prevent zoonotic disease transmission to wild sheep populations. ODOE may impose additional requirements to prevent zoonotic disease transmission based on consultation with ODFW. This prohibition does not apply to landowners grazing livestock outside the Solar Components in accordance with their leases.

Success Criteria for Permanent Disturbance Areas
The Certificate Holder will establish uniform (i.e., evenly distributed, without large bare areas) perennial, non-invasive vegetation that provides 70 percent or more cover on all exposed areas within the Solar Components in compliance with the soil protection standard (Oregon Administrative Rule [OAR] 345-022-0022); National Pollutant Discharge Elimination System 1200-C permit requirements; and Sherman County requirements.

Integrated Vegetation Management Measures

To support reclamation success and reduce wildfire risk throughout all phases (i.e., both construction and operations) of the Solar Components, vegetation management will be implemented consistent with the draft Construction Wildfire Mitigation Plan and anticipated Operations Wildfire Management Plan. In the interim, while those plans are being finalized, this section establishes the minimum vegetation management and fire prevention requirements that will apply during the construction and operation of the Solar Components. Vegetation will be managed in accordance with the applicable provisions of the 2025 Oregon Fire Code, Section 1205.5.1

(Oregon State Fire Marshall 2025):

"A clear brush free area of 10 feet shall be required around the perimeter of the ground-mounted photovoltaic arrays or as determined by the fire code official. A maintained vegetative surface or noncombustible base, approved by the fire code official, shall be installed and maintained under the photovoltaic arrays and associated electrical equipment installations."

These measures are intended to minimize ignition potential, maintain defensible space, support consistent vegetation control, and outline inspection practices that will contribute to long-term fire resiliency. At a minimum, the following criteria will be met:

a. Vegetation Height and Clearance
b. Vegetation within and adjacent to the Solar Components will be maintained at a height of less than 12 inches, with a minimum vertical clearance of 12 inches from all electrical and mechanical equipment.

High wind, low humidity, and high fuels are nearly unstoppable conditions for a fire. I *do not* believe that the plan has done a good job of addressing this danger. Ten feet? Ten feet might work in the Willamette Valley, but not in our location in eastern Oregon. Fire lines around the project, and much lower fuel loads within the project, are not sufficient for our winds.

Ten inches? Twelve inches? That is too high a fuel load. There are very few volunteers in our county stupid enough to go into a solar farm to fight a fire. PGE/BrightNight needs to train and pay its employees to fight fire. They need to have them on site during the fire season 24/7. The Avangrid project in Gilliam County has learned this the hard way, with five fires in its facility in one fire season!

Background
Oregon adopted legislation in 1993 and updated it in 1995 and 2001 to protect farm and forest practices from adjacent conflicting issues. The program is called Oregon's Right to Farm laws. It protects farmers from claims over smell, dust, noise, and other trespass or nuisances associated with farming.

Oregon Department of Agriculture Literature
https://www.oregon.gov/oda/shared/Documents/Publications/NaturalResources/RightToFarm.pdf

ORS 30.930 to 30.947, Farming and Forest Practices
ORS 30.936 and 30.937, Immunity from private action based on farming practices

For EFSC certificates, the project Owners must sign and record a covenant acknowledging these laws.

These laws need to be updated for fire before the Biglow Project and other solar facilities in Sherman County are constructed.

Falling pieces
Request for Amendment 4 for Biglow Canyon Wind Farm
Page 23 Long Term Facility Maintenance Plan
4.2.1 Long-term Facility Maintenance Plan

"Over the course of more than 15 years of operation at the Existing Facility, the Certificate Holder has encountered technical challenges that have offered valuable insights into both technical and procedural vulnerabilities and informed continuous improvement efforts. The Certificate Holder has implemented targeted improvements specific to the Existing Facility, including changes to internal management structure and personnel, a change in the turbine O&M provider with a newly negotiated contract to mitigate future technical challenges and better align with site-specific performance goals, and improved monitoring of contractor performance. Improved preventative maintenance, robust monitoring, and corrective action planning will result from these ongoing changes.

The specific types of technical challenges with the Existing Facility would be unlikely to occur with the Solar Components due to the difference in technology. Lessons learned from more than a decade of wind facility operations at BCWF are being directly integrated into the planning and management of the proposed Solar Components. Past challenges have informed the adoption of more robust preventative maintenance and corrective action protocols, improvements to vendor contracts to ensure the contracts use asset management and equipment health as the measure for vendor performance, stronger consequences for poor performance, and improved quality control and assurance oversight of vendors.

This response is inadequate.

Replace the words "falling pieces" with "FIRE".

If PGE can't run a safe wind farm, how can they be trusted to maintain a safe solar facility? We are still in the middle of nowhere, with no housing for personnel. The workers drive in every day, and the remote monitoring at this site has never been reliable enough to eliminate on-site personnel. *How in the world are these concerns "UNLIKELY TO OCCUR" just because solar is a different technology?*

"…the issues do demonstrate a deficiency in the adequacy of the existing site certificate conditions in ensuring systematic oversight of vendor performance, preventive maintenance, and safe, reliable construction and operation.

The Department has recommended the Council adopt additional conditions of approval to improve oversight and ensure the safe operation of the proposed solar components, including recommended Organizational Expertise Conditions 1 and 2 which require the finalization of the Draft O&M Framework Plan included as Attachment C to the Proposed Order. The Department may consider additional changes to these conditions or plan should the commenter suggest any in their reply.

There is no doubt in my mind that PGE can maintain a solar facility. The problem is: WILL THEY? They have not maintained the wind. We have a vote of NO CONFIDENCE.

OAR 345-022-0010
Organizational Expertise Applicable and complies. The Council has previously found that the Certificate Holder has the ability to construct, operate, and retire the BCWF. As part of RFA4 the Certificate Holder has described the violations or citations issued and demonstrated how those violations or citations were addressed to the satisfaction of the issuing agencies. RFA 4 does not alter the Certificate Holder's ability to comply with the Site Certificate Conditions. See Section 5.3 above for accompanying analysis.

All you have to do is look around the wind towers. The soil was not restored to its original condition. Alkali is on top, and the wheat is sparse.

OAR 345-022-0022
Soil Protection
Applicable and complies. Permanent and temporary disturbance will occur as a result of the components proposed in RFA 4 including the solar modules, BESS, and proposed substation. RFA 4 does not alter the Certificate Holder's ability to comply with the Site Certificate conditions. See Exhibit I in Attachment 4 for accompanying analysis and Section 4.4.3 for anticipated temporary and permanent disturbance impacts.

Canyon Wind Farm in RFA 4. These changes include amending the BCWF description to incorporate the Solar Micrositing Area/RFA 4 Site Boundary, increasing the peak generating capacity for solar energy generation, increasing the area of solar photovoltaic energy generation, adding battery energy storage, and modifying the construction start and completion dates. Additionally, the BCWF description was modified to remove related or supporting facilities that were authorized by Amendment

2 but were not built by the construction start and completion timelines in the Second Amended Site Certificate, and therefore are no longer authorized to be constructed.
• Addition of new conditions to address wildfire prevention, and to specify requirements for other resources as they pertain directly to the addition of Solar Components and RFA 4 Site Boundary.

Wildfire prevention has not been addressed with specificity.

We need the completed fire plan in place before the build, not after. All my other concerns still stand, but FIRE is #1.

My concerns about climate normal were dismissed because NOAA is a government agency with expertise. I was not questioning NOAA's expertise – I am questioning the way their numbers are being used. Issue SP-05

You claim I have no proof of my 50-year soil claim, yet neither do they. Issue WF-01: Concerns about burn probability data used in fire risk analysis. Issue WF-02: Concerns about the use of climate normals for fire risk analysis. In Exhibit V, Issue WF-03: Concerns about fuel models used for fire risk analysis.

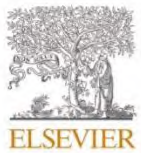
No one is taking our local knowledge or issues into consideration. **We have no paid fire department. Buying us fire trucks will not help unless someone drives them.** We used our tractors and disks to create firebreaks. We carry water on our pickups. PGE employees are not going to carry anything – not drip cans or other firefighting tools.

A few photos from the 64 pages of agrivoltaics in the *Midwest* submitted from PGE/BrightNight in their BIGL RFA4 comment letter to us. This has no bearing or validity here in Sherman County, Oregon. I would love to see what the wind will do to vertical solar panels, and it would be great to have enough water for the crops under them.

To me, this shows the disconnect we have between truth and fiction. ODOE uses specificity and OARs to approve projects. They need to inject common sense into the equation.

FSEC actually listened when we presented our concerns, and my hope is that ODOE follows through with their promise of increased monitoring of PGE's Biglow solar. This project is being rushed, whether you concur or not. Issue GS-01

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Full Length Article



Modeling the ecosystem services of native vegetation management practices at solar energy facilities in the Midwestern United States

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ABSTRACT

The increasing pressure on land resources for food and energy production along with efforts to maintain natural systems necessitates the development of compatible land uses that maximize the co-benefits of multiple ecosystem services. One such land sharing opportunity is the restoration and management of native grassland vegetation beneath ground-mounted solar energy facilities, which can both protect biodiversity and restore related ecosystem services. In this paper, we applied the InVEST modeling framework to investigate the potential response of four ecosystem services (carbon storage, pollinator supply, sediment retention, and water retention) to native grassland habitat restoration at 30 solar facilities across the Midwest United States. Compared to pre-solar agricultural land uses, solar-native grassland habitat produced a 3-fold increase in pollinator supply and a 65% increase in carbon storage potential. We also observed increases in sediment and water retention of over 95% and 19%, respectively. We applied these results to project the potential benefits of adoption of native grassland management practices in current and future solar energy buildout scenarios. Our study demonstrates how multifunctional land uses in agriculture-dominated landscapes may improve the provision of a variety of ecosystem services and improve the landscape compatibility of renewable energy and food production.

1. Introduction

Solar photovoltaic (PV) energy technologies have exponentially increased across the globe over the past decade (Kabir et al., 2018; Irsyad et al., 2019). Currently, there are over 33 gigawatts (GW) of ground-based large-scale (>1 MW) solar PV energy production in the U. S. (EIA, 2019a), representing about 1.5% of total U.S. electricity generation in 2018 (EIA, 2019b). The proliferation of large-scale solar energy developments is expected to continue across the U.S. over the next decade. For example, the U.S. Department of Energy's National Renewable Energy Laboratory, through its Standard Scenarios Report, Hernandez et al., 2014), and approximately 7500 km^2 of total land will be needed to meet 2030 projected solar energy production (Hartmann et al., 2016), roughly the combined size of the states of Delaware and Rhode Island.

Given their large land requirements, questions about the sustainability of solar energy developments have emerged in terms of their compatibility with other land uses such as agriculture (Moore-O'Leary et al., 2017; Hernandez et al., 2019). Ground-based solar energy developments are increasing in agricultural landscapes, due in large part to the siting of utility-scale solar energy developments on former agricultural fields (Adelaja et al., 2010; Adeh et al., 2019). Croplands are

BIGL RFA4_Comment Letter to Kathy and Kevin McCullough_02132026 (1).pdf
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Figure 6. Spacing between rows of panels allowing movement of farm machinery under the PV panels © Fraunhofer ISE [44].

Another method of optimizing elevated agrivoltaic systems is to use an optimal tilt angle and orientation to increase the yield of the solar panels and the crops grown under them (Figure 7). Various tilts and orientations have been tested for different locations for fixed installations. According to Trommsdorff et al. [44], solar tracking modules allow for more flexible light management under the panels. The process of tracking PV systems involves installing a mechanical system that can adjust the orientation and tilt of the modules at different times of the day, with the goal of optimizing energy production. Two categories of solar tracking systems are used: single-axis trackers and dual-axis trackers. In the first configuration, the PV module array tracks the sun horizontally according to its angle of incidence (altitude) or vertically according to its orbit (azimuth). The second configuration combines the two, producing a more significant amount of energy. These mobile systems optimize crop yields through greater light availability during critical growth periods. In addition, the flexibility of the tilt angle provides constructive protection against hail or extreme radiation by adjusting their orientation as required.



(a) (b)

Figure 7. (a) Single-axis solar tracker module [44] and (b) dual-axis solar tracker module [60].

One of the main constraints of installing aerial agrivoltaic systems is the high investment and maintenance cost. The wide spacing of the panels can create favorable conditions for crop growth and development, but it leads to a reduction in energy density due to the reduced number of panels installed on the plot. Also, the spacing between rows of panels can increase the investment cost in areas with high land costs and limited land availability [29]. However, these systems face shading constraints [33], so these installations are favorable for viticulture. Moreover, dual-axis systems with large arrays of PV modules can

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exposure to sunlight. The main crops used in this type of agrivoltaic system are grapes, small fruit trees, and delicate vegetables. In contrast, inter-row PV systems are systems in which agricultural production is usually carried out in the space between the rows of

panels. The distance between two consecutive rows of the panels can be considerable in this type of installation to facilitate the passage of large agricultural machinery. The most common crops in inter-row solar systems are grasses, hardy vegetables, and higher-value horticultural crops [29]. The different configurations are established to compare their impact on the level of shading created by the panels and their consequences on crop yields to determine the optimal density for an agrivoltaic installation [44]. Another way to increase the efficiency of a PV system is to install double-sided PV panels [45]. Figure 2 summaries the different configurations.

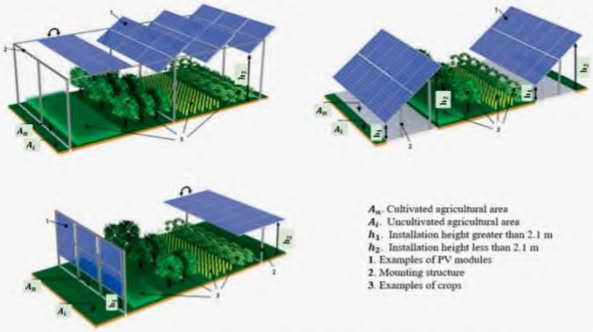


Figure 2. Overview of different configurations of agrivoltaic installations [44].

Several configurations and technologies have been developed and tested to optimize production in agrivoltaic systems. Therefore, the installation must meet the requirements of both the crop and the photovoltaic panels, which can be achieved by using optimal panel spacing and installation height that also allows the passage of agricultural machinery and appropriate panel technology [44]. Macknick et al. [46] have identified three types of approaches for the implementation of agrivoltaic systems: (i) the energy production approach, which focuses on optimizing the solar energy produced (thus minimizing changes in standard solar development practices), while cultivating between and/or under the panels, (ii) the agricultural production approach which focuses on optimizing biomass production (minimizing changes in existing vegetation management activities), while taking energy production into account, and (iii) the integrated agricultural and energy production approach (incorporating vegetation and energy priorities into system design).

These approaches are based on implementing one of the two installation techniques:

create shading under the panels, while other parts of the ground surface receive maximum sunlight [44].

3.2.2. Vertically Mounted Agrivoltaic Systems

The mounting of solar panels vertically to the ground is also a method of optimizing agrivoltaic systems (Figure 8). It consists of an installation technique in which the modules are oriented in the east–west direction, which has proved to be more efficient for permanent crops, or in the north–south direction, where energy production is a priority [61]. These systems require a significant distance between consecutive rows of vertical supports. For example, [62] studied vertical arrays using a 10 m spacing between the rows. A report by [26] showed that the yield of oats and potatoes decreased by 50% when the distance between rows was decreased in length from 20 to 5 m. In addition, [26] reported that 10% of the land near the panels does not have to be cultivated and can be used as ecological zones. Bifacial panels are widely used in these systems.



Figure 8. Vertical agrivoltaic installation with bifacial modules in Sued [62].

Monterey County declares state of emergency over Moss Landing lithium battery plant fire

Wilson Walker
Updated Thu, January 23, 2025 at 3:11 AM PST
4 min read
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Monterey County supervisors on Tuesday declared a state of emergency in response to last week's major fire at the Vistra lithium battery plant in Moss Landing.

The emergency declaration came during a special meeting where officials gave updates on the fire and ongoing response. While the fire has burned itself out, there are still a lot of questions from local leaders and neighbors about what's next.

"This was the beginning," said Josh Contreras as he showed photos he took of the incident from his houseboat.

The images show a fireball on the horizon, not even a mile away.

"I walked up the docks, and then I took more photos," he said. "Because you could see the flames, probably almost as tall as the towers that stand here."

The fire at the Moss Landing Vistra Power Plant, located about 90 miles south of San Francisco, broke out last Thursday afternoon, escalating in the early evening to the point where the incident triggered evacuations for about 1,200 Monterey County residents in the area and shut down a section of Highway 1 in both directions.



Moss Landing Power Plant fire / Credit: KION

Concerned over the potentially toxic runoff if fire crews turned hoses on the burning lithium batteries, officials instead are allowing the to burn itself out.

Officials said the fire was largely out as of late Friday morning during a press conference, but it flared up significantly for a few hours that afternoon before dying down again. Officials were eventually able to lift the evacuation orders by early Friday evening. The stretch of Highway 1 near the plant remained closed until Sunday.

Now that the fire is out, he is one of the many people living in the area what lies in the future for the facility.

"If they do battery packs, they should keep it in more deserted areas," Contreras said.

"This technology is ahead of the government's ability to regulate it," Monterey County Supervisor Glenn Church said during the emergency meeting Tuesday. "And the industry's ability to control it."

The massive fire at one of the world's largest lithium battery storage plants in Northern California has shaken a local community worried about possible long-term impacts and brought scrutiny to the emerging industry's safety practices.

The fire at a power plant and battery facility operated by Vistra Energy in the Monterey County community of Moss Landing began Thursday afternoon, forcing evacuations and the closure of coastal Highway 1. A Monterey County official on Friday called it the largest fire ever of its kind.

The Moss Landing Power Plant, about 95 miles south of San Francisco, is owned and operated by Vistra subsidiary Dynegy and also houses two independent battery storage plants. The plant that is burning is owned by Vistra Energy while a second battery storage facility on the same site is owned by Pacific Gas and Electric, which said the incident was not a PG&E event.

There have been no injuries reported in the fire, which is being allowed to burn itself out as is standard procedure for such fires, according to the Monterey County Emergency Operations Center. However, the smoke from the fire has forced other residents not under evacuation orders to close their windows and remain indoors.

Monterey County Supervisor Glenn Church called the incident a "Three Mile Island event" for the industry, referencing the 1979 partial meltdown at a Pennsylvania nuclear power plant, the worst nuclear accident in U.S. history. The battery energy storage systems industry, known by the acronym BESS, develops systems to store energy from electric, solar, electric, wind, and other energy systems.

"I think that this is, uh, can best be described as a worst-case scenario of a disaster that's happened here. Nobody really predicted anything on this line," said Church. "This is really a lot more than just a fire, it's a wake-up call for this industry. And if we're going to be moving ahead with sustainable energy we need to have safe battery systems in place."

On Tuesday, the American Clean Power Association disputed Church's Three Mile Island comparison, calling it "misleading and dangerous." ACP also noted that the risk and impact associated with the potential meltdown of a nuclear reactor and release of radioactive materials is far greater than the risk of a worst-case failure at a battery storage facility.

Massive battery projects involving hundreds of megawatts are becoming more common in the U.S. and across the globe. California law requires investor-owned utilities to store energy and the state is expected to need 50 gigawatts of battery storage to meet its 2045 goal of getting all of its power from carbon-free sources from the current 7 gigawatts today, according to Reuters.

In a statement to CBS News Bay Area, ACP spokesperson Phil Sgro said,

"We are aware of the ongoing incident at Moss Landing and are gathering additional information from our partners and stakeholders on the ground. While fire-related incidents at battery energy storage sites are rare, and investigations into historical incidents have not found health risks to neighbors or the surrounding community, we are not able to comment on the unique circumstances of this particular incident as the response is still ongoing.

"The energy storage industry works closely with fire officials and emergency responders to ensure the safety of its neighbors and appropriately respond to any safety incident. The industry is committed to meeting and exceeding the latest and most rigorous safety standards for energy storage facilities, and coordinates with local fire departments, first responders, and regulatory bodies to ensure storage projects account for the safety needs of every community.

"Safety is the first and foremost priority of the industry and, after the incident is resolved and there is a thorough investigation, the industry will ensure the lessons learned are applied to prevent future incidents and inform safety standards and best practices."

Church said he has fielded numerous questions from his constituents on why it happened, how it happened, and how to prevent a similar accident in the future. Church added it is the fourth fire at the site, a former Pacific Gas and Electric facility, since 2019 and said he and other county officials were previously assured it would not happen again. He called for increased safety protocols for the industry at federal, state, local, and private levels.

The battery plant fire on the shore of Monterey Bay is also situated next to environmentally sensitive areas such as Elkhorn Slough, designated a "wetland slough of international importance."

Church said while he understands the need for the battery industry, he said the transition to sustainable energy "cannot, will not come before the safety of families and environment."

"This never should have happened," said a visibly shaken Church. "And so, there is obviously some gaps going on here of information, there's some gaps going forth here on safety, there's gaps going here that are going to take some time to understand, but they gotta be - there's gotta be lessons that we learn from this."

Church said it was the largest fire ever of its kind and also called for an independent investigation into the incident.

"If renewable energy is going to be a future, it really needs to rest with safe energy," said Church. "And I'm not going to rest and leave this until I know we have a safe environment and a safe operation in the Moss Landing area."

Monterey County officials declared a local state of emergency over the fire on Tuesday.

Texas-based Vistra Energy senior director of community affairs Brad Watson also spoke at the press conference, saying the company considers itself part of the community and has taken the incident very seriously. Watson apologized to all those affected by the current situation.

"We are hurting today because we know primarily it's impacted and disrupted the people who live around our site, our neighbors, our friends, and businesses, and for that, we are sincerely sorry," said Watson.

Watson said it will listen to the community residents on how the company can consider ways to provide assistance. The company was contracting with an air quality monitoring company to keep residents informed of any possible health impacts from the fire's smoke and coordinate its findings with the U.S. Environmental Protection Agency.

The cause of the fire has not yet been determined.

According to ACP, fire-related incidents at BESS sites are incredibly rare, with 20 incidents in the last 10 years at U.S. operating energy storage facilities even as energy storage deployments have grown by more than 25,000% since 2018.

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February 13, 2026

VIA EMAIL (captainkathymccullough@gmail.com**)**

Kevin and Kathy McCullough
Wasco, OR

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Response to Comments on Proposed Order

Dear Mr. and Mrs. McCullough,

Portland General Electric (PGE) and project developer BrightNight (BN) appreciate your comments regarding the Oregon Department of Energy's Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF) Site Certificate. Oregon Administrative Rule (OAR) 345-027-0367(8) requires PGE to respond to all comments that are made with "sufficient specificity," as that term is defined in OAR 345-027-0367(7)(a).

We note that your comments contained in the 13 written comment letters and oral testimony provided at the public hearing may not necessarily meet that standard but are valuable to inform the process. PGE and BN reviewed your comments carefully and offer the following responses, organized into five categories of issues that we hope accurately respond to your concerns. The responses below are organized by the interpretation of your comments received and are further identified with the same issue identification number provided in Table 1: List of Issues and Commenters in the Oregon Department of Energy's (ODOE) Response to Comments document dated February 12, 2026.

1. Organizational Expertise (OE-01)

PGE recognizes that one of your primary concerns regarding RFA 4 relates to maintenance issues at the existing BCWF. PGE acknowledges the operational incidents documented at the BCWF and has implemented targeted improvements specific to the BCWF, including changes to internal management structure and personnel; a change in the turbine operations and maintenance provider with a newly negotiated contract to mitigate future technical challenges and better align with site-specific performance goals; and improved monitoring of contractor performance. Improved preventative maintenance, robust monitoring, and corrective action planning will be the result of these changes, which are still ongoing.

As we talked about with you previously, and addressed during our public testimony at the hearing, lessons learned from past challenges have resulted in more robust preventative maintenance and corrective action protocols, stronger vendor performance accountability, clearer performance standards tied to equipment health, and improved quality assurance and quality control oversight. These lessons have informed the design, operational planning, and compliance framework for the proposed solar and battery energy storage systems under RFA 4 (Solar Components or Biglow Solar).

Most notably, the Proposed Order introduces a new requirement for a Comprehensive Operations and Maintenance Plan (O&M Plan) for the Solar Components (*see* Proposed Order

Attachment C; and draft amended Site Certificate conditions OPR-OM-01 through OPR-OM-03). This O&M Plan is intended to serve as the governing operational document for the Solar Components and must be finalized and approved by ODOE prior to commencement of operations.

Under draft amended condition OPR-OM-01, PGE must submit a final O&M Plan consistent with the framework outlined in Attachment C and Table 5 of the Proposed Order. The O&M Plan consolidates and carries forward commitments from multiple operational plans introduced under RFA 4, including:

- The Operational Wildfire Mitigation Plan;
- The Comprehensive Solar Revegetation and Soil Management Plan; and
- Hazardous materials management and emergency response plan requirements.

The O&M Plan establishes preventive maintenance procedures, monitoring protocols, documentation standards, emergency preparedness measures, and regulatory compliance procedures that will govern the facility throughout its operational life. It also requires submission to ODOE of contact information, qualifications, and defined roles for primary vendors, contractors, and management personnel responsible for operations.

In addition, draft amended condition OPR-OM-02 requires annual reporting to ODOE that includes detailed information regarding facility status, power production reliability and efficiency, monitoring results, compliance activities, and any facility modifications. While annual reporting has existed previously, the scope and specificity of the required documentation under RFA 4 are expanded and more detailed.

Draft amended condition OPR-OM-03 strengthens incident reporting requirements by requiring timely notification to ODOE, written documentation within defined timelines, and tracking of corrective actions. Significant events require root cause analysis and documentation of corrective measures. ODOE retains inspection and enforcement authority and may require additional corrective actions, if warranted. Retirement and restoration surety requirements (RET-01 through RET-03) remain in place to ensure financial resources are available for remediation or decommissioning, if necessary.

The O&M Plan Framework (Attachment C and Table 5 of the Proposed Order) establishes enforceable requirements in the following areas:

a. Preventive Maintenance and Asset Monitoring (Section 3.4)
    - Routine, scheduled inspections and condition-based maintenance consistent with manufacturer specifications and industry standards;
    - Supervisory control and data acquisition (or SCADA)–based monitoring of solar arrays, substations, and battery energy storage system (BESS) components; and
    - Documentation and tracking of maintenance activities in auditable logs.

b. Regulatory Compliance and Site Certificate Conditions (Section 3.5; OPR-OE-01)
    - Integration of all applicable Site Certificate conditions into day-to-day operational procedures;
    - Clear assignment of roles and responsibilities, including required submission of

contact information and qualifications for key personnel and contractors; and

- Requirement that material plan changes be submitted to ODOE for review and approval.

c. Emergency Preparedness and Incident Response (Section 3.6; PRO-OE-01; OPR-OE-01)

- A site-specific Emergency Response Plan prior to operations;
- Fire detection, alarms, and shutdown capabilities integrated with monitoring systems;
- Mandatory incident reporting to ODOE "as soon as reasonably possible," followed by written documentation within defined timelines; and
- Required root cause analysis and documented corrective action tracking for significant events.

d. Monitoring, Reporting, and Public Accountability (OPR-OM-02 and OPR-OM-03)

- Mandatory annual reporting to ODOE detailing facility status, reliability and efficiency metrics, compliance activities, and any facility modifications;
- Expanded scope and specificity of reporting compared to the legacy wind facility;
- Defined reporting timelines and written documentation requirements; and
- ODOE inspection authority and enforcement authority, including the ability to require corrective actions, additional inspections, or modifications if warranted.

e. Long-Term Operational Continuity and Transition Planning (Section 4.0)

- Defined roles during the initial Build-Transfer Agreement period;
- Clear transition of full O&M responsibility to PGE after Year 5; and
- Ongoing regulatory responsibility always remains with PGE as Certificate Holder.

These requirements are enforceable through the amended Site Certificate. Noncompliance may result in inspection findings, corrective action requirements, or enforcement action by ODOE. In addition, retirement and restoration surety requirements (RET-01 through RET-03) remain in place to ensure financial resources are available if remediation or decommissioning becomes necessary.

Your comments under the Energy Facility Siting Council (EFSC or Council) Organizational Expertise Standard express concerns regarding whether the facility will be adequately maintained and whether there will be accountability for operational issues. The Proposed Order and the implementing plans and conditions directly address those concerns through mandatory reporting, defined timelines, corrective action tracking, inspection authority, and enforceable Site Certificate conditions. We hope this response helps address your concerns regarding organizational expertise and PGE's ongoing accountability and compliance.

2. Wildfire Prevention and Risk Mitigation (issue numbers identified in subsections)

PGE and BN recognize that another one of your primary concerns regarding RFA 4 is wildfire prevention and risk mitigation. Living and farming next to new energy infrastructure raises

important questions, especially about safety and wildfire risk. Wildfire mitigation plays a critical role in how Biglow Solar is designed, constructed, and operated. The Proposed Order contains integrated requirements, both in conditions and in plans, to ensure that wildfire risks are managed to acceptable levels.

a. *Construction Phase Wildfire Mitigation (PS-01, PS-02, SP-01, SP-04)*

The Draft Construction Wildfire Mitigation Plan (WMP; Attachment G of the Proposed Order) includes the following actions and information to mitigate wildfire risk during construction:

- Onsite training that covers best practices to prevent fire ignition; type, location, and proper use of fire protection equipment; location of water sources and proper usage; and specific procedures and actions applicable during fire season and red-flag warnings (Attachment G, Section 3.1).
- Facility design features intended to reduce fire risk, with a section dedicated to BESS fire protection that describes BESS components, all applicable standards and codes that must be followed, and other facility components installed to ensure proper testing, handling, and back-up protection (Attachment G, Section 4.1.4).
- Specifications for fire protection equipment to ensure firefighter safety (Attachment G, Section 4.2).
- Vehicle use Best Management Practices to minimize fire risk from vehicle travel, equipment use, and fueling activities (Attachment G, Section 4.4).
- Fire weather monitoring and restrictions during fire season (Attachment G, Section 4.5).
- Vegetation management (Attachment G, Section 4.6), aligned with the draft Comprehensive Solar Revegetation and Soil Management Plan (Attachment D of the Proposed Order), to ensure consistent vegetation management that prevents erosion, supports native vegetation for watershed health, reduces wildfire fuels, and prevents the introduction or spread of noxious weeds. This includes vegetation height restrictions, especially around electrical equipment; non-combustible buffers around buildings, roads and the site perimeter; and weed monitoring and removal in coordination with the Sherman County Weed Board and Oregon Department of Agriculture.

PGE and BN acknowledge ODOE's recommendation in the Proposed Order to maintain vegetation at a reduced height of 1 to 3 inches during the dry season (June–October). PGE and BN also note the comment submitted by the Sherman County Weed District (BCWAMD424-15), which advises that maintaining vegetation at 1 to 3 inches may not be feasible if erosion control is a priority and instead recommends a grass height of 4 to 8 inches during the dry season for the proposed bunchgrass species. We recognize the Weed District's local expertise regarding soil stability and vegetation performance and appreciate the perspective provided.

The vegetation height standards identified in the draft Comprehensive Vegetation and Soil Management Plan and draft Construction Wildfire Mitigation Plan (WMP) provide for vegetation to be maintained below 10 to 12 inches year-round. These standards were developed based on practical vegetation management considerations intended to support long-term wildfire risk reduction while maintaining vegetation health and site stability. Maintaining vegetation at 1 to 3

inches during the dry season presents several practical and ecological considerations:

GE and BN acknowledge ODOE's recommendation in the Proposed Order to maintain vegetation at a reduced height of 1 to 3 inches during the dry season (June–October) and request that the vegetation height requirements be limited to a height of 10 to 12 inches year-round. Based on practical vegetation management considerations, this approach best supports wildfire risk reduction for the following reasons:

- Repeated low mowing to such reduced heights would be detrimental to perennial grasses included in the approved seed mix, as repeated damage to bunchgrass crowns would likely result in plant mortality within a few growing seasons.
- Extremely low mowing would favor the establishment of annual grasses, thereby increasing fine fuels rather than reducing fire risk.
- Low mowing would significantly reduce or eliminate wildlife habitat, particularly for ground-nesting birds and beneficial insects.
- Mowing at such low heights at the beginning of the dry season increases the risk of fire ignition due to sparks generated when mowing equipment contacts rocks or hard surfaces.
- Maintaining vegetation at a 1- to 3-inch height would substantially increase vegetation management costs without providing commensurate fire-risk reduction benefits.

The draft Construction WMP will be finalized prior to construction as required by draft amended condition PRE-WF-01, and contractors and employees must adhere to the plan pursuant to CON-WF-01.

a. Operational Phase Wildfire Mitigation (WF-12)

Wildfire mitigation does not end at construction. PGE is developing a site-specific Operational WMP, which will provide any site-specific information outlined in ODOE's Operational WMP template that is not already addressed in PGE's 2026-2028 Corporate WMP which was filed with the Oregon Public Utility Commission on December 31, 2025. The Operational WMP will include the same components as described for the Construction WMP above; however, the construction-specific actions will be replaced with site-specific operations and maintenance actions.

The site-specific Operational WMP under development for the Biglow Solar facility will be submitted to ODOE for review and approval prior to beginning operation of the solar facility, as required by PRO-WF-01; onsite contractors and employees will adhere to this plan as required by OPR-WF-01, as well as incident reporting and corrective action requirements under GEN-OE-05 through GEN-OE-07. Importantly, wildfire prevention and response measures are also integrated into the enforceable O&M Plan required under draft amended conditions OPR-OM-01 through OPR-OM-03. The O&M Plan:

- Incorporates operational wildfire mitigation requirements into day-to-day procedures;
- Requires ongoing vegetation management to reduce fuel loads and maintain defensible space;
- Integrates fire detection, alarm systems, and shutdown capabilities with 24/7 monitoring systems;

- Establishes incident reporting, documentation, and corrective action requirements if a fire-related event occurs; and
- Subjects wildfire-related operations to mandatory annual reporting, inspection, and enforcement oversight by ODOE.

Through this integrated framework, wildfire mitigation is not a stand-alone document, but an ongoing operational obligation embedded within the broader compliance and accountability structure governing the facility.

b. Setbacks and Vegetation Management Buffers (WF-07, WF-08)

PGE and BN recognize that vegetation management is integral to wildfire mitigation and serves as a primary risk-reduction measure during both construction and operations. The recommended setbacks and vegetation management buffers reflected in ODOE's Proposed Order were carefully developed to integrate industry best practices, applicable regulations, and relevant operational experience. These setbacks and buffers are incorporated into the associated draft plans and site design and will be carried out through implementation.

- Vegetation will be managed in accordance with the applicable provisions of the Oregon Fire Code:
  - Non-combustible buffer (10 feet) shall be required around either side of the perimeter fence.
  - A maintained vegetative surface or non-combustible base shall be installed and maintained under the photovoltaic arrays and associated electrical equipment.
- Vegetation standards apply (in addition to the above):
  - Within the solar arrays – vegetation maintained at a height of less than 12 inches, with a minimum vertical clearance of 12 inches from all electrical and mechanical equipment.
  - Along access roads – 10-foot low-growing, fire-resistant vegetation buffer on either side.
  - The BESS yard is designed with non-combustible materials (e.g., metal, etc.). No vegetation is allowed inside the BESS yard, and all surfaces are gravel or pavement.
  - The areas surrounding the O&M, BESS, and substations and within defensible space areas will implement a 20-foot non-vegetated perimeter buffer maintained as graveled or earthen surface.

c. Coordination with Local Fire Authorities (PS-01, PS-02)

PGE and BN have conducted extensive outreach in the community and with local emergency responders. On August 12, 2025, BN presented at a North Sherman County Rural Fire Protection District Board meeting, where proposed project details were shared alongside an overview of planned fire prevention and wildfire mitigation measures (presentation as given at the meeting is provided as Attachment A to this comment letter). In addition to this presentation, the project team has been coordinating closely with Sherman County Emergency Services and the North Sherman County Rural Fire Protection District, and has met multiple times, both in person and

over the phone, with Fire Chief Burbank to review site-specific fire mitigation measures, including:

- Adequate perimeter access for firefighting equipment;
- Placement of three on-site water tanks, including one located at the BESS yard; and
- Support for firefighter training and equipment through the Proposed Community Investment Fund (Proposed Order, Attachment E).

Feedback provided by Chief Burbank on the Construction Wildfire Mitigation Plan indicates that the plan is sufficient to address and mitigate wildfire risk during construction.

d. Fire Risk Analysis (WF-01, WF-02, WF-03)

Your comments raised several questions concerning the wildfire risk analysis included in the record. The first was related to burn probability data, the second was use of climate normals, and the third was in regard to fuel models.

With respect to climate normals, the data used to describe climate normals in BCWF RFA 4 Exhibit V are published by the National Oceanic and Atmospheric Administration, a widely accepted and respected source of climate data. These data indicate seasonal average temperatures which, when combined with precipitation and wind speed data, can be used to paint a full picture of wildfire risk at a given site. Wildfire mitigation actions described in the Construction WMP and the Certificate Holder's system-wide Operational WMP take into account high summer temperatures, low precipitation, and other factors (including extreme weather events) that affect the risk of wildfire ignition and spread.

With respect to burn probability and fuel models, BCWF RFA 4 Exhibit V Section 2.1.2 describes the fuel models used to analyze risk of wildfire within the Biglow Solar Micrositing Area. Including Fuel Models 102 (low load, dry climate grass) and 242 (burnable wheat fields), which describe 93 percent of the Solar Micrositing Area, in the risk analysis establishes a more conservative model than the existing conditions and overestimates the fuel load due to current fallow practices on fields at the Biglow Solar site, including chemical fallow, as you noted in your comment. Thus, the analysis results indicating a high burn probability may be greater than the actual risk at the Biglow site. The data and models used for the Biglow Solar burn probability analysis were developed by Oregon State University, the Oregon Department of Forestry, the Washington Department of Natural Resources, the U.S. Forest Service, the U.S. Bureau of Land Management, and Pyrologix, a company that supports wildfire mitigation. This collaborative effort described in "PNW Quantitative Wildfire Risk Assessment Methods" McEvoy, Dunn, and Rickert 2023[1]). is considered sufficient for developing accurate burn probability analyses.

e. Battery Energy Storage System Fire Safety Design and Risk Minimization (WF-05)

We appreciate your detailed recommendations regarding BESS design criteria to minimize fire risk. Public safety and wildfire risk reduction are central considerations in the design of the Biglow Solar facility, including the BESS.

Consistent with the EFSC Wildfire Prevention and Risk Mitigation, Public Services, and Soil Protection standards, the Proposed Order requires that facility components be designed,

[1] McEvoy, A., C. Dunn, and I. Rickert. 2023. PNW Quantitative Wildfire Risk Assessment Methods. Unpublished Manuscript. Available online at the website https://oe.oregonexplorer.info/externalcontent/wildfire/PNW_QWRA_2023Methods.pdf.

constructed, and operated to protect public health, safety, soils, and nearby agricultural lands.

We note that the design of all Solar Components and the proposed BESS incorporates multiple layers of engineered fire prevention and containment protections, including:

- BESS enclosures are manufactured to meet applicable building, electrical, and fire code standards, including resistance to environmental stressors. The centralized BESS yard layout further reduces exposure to potential turbine debris compared to dispersed configurations and site design maintains appropriate setbacks from turbines (520 feet).
- Each BESS unit includes thermal sensors, continuous monitoring, alarm systems, and automatic shutdown capabilities. These systems are designed to detect overheating or abnormal operating conditions early and initiate protective measures. The system is UL 9540A tested, meaning it has undergone rigorous fire propagation testing under nationally recognized safety standards.
- BESS will be housed in enclosed, containerized units located within a centralized BESS yard. Each unit includes internal separation and dedicated monitoring systems designed to detect abnormal conditions and isolate potential thermal events before propagation. The containerized configuration localizes any potential incident within an individual unit.

The wildfire mitigation measures outlined in the Construction and Operational WMPs, as well as the vegetation management measures outlined in the Comprehensive Solar Revegetation and Soil Management Plan and the enforceable O&M Plan requirements, and the engineered safety features incorporated into the BESS design, are intended to protect nearby homes, agricultural lands, and natural areas in Sherman County, where dry vegetation, high summer temperatures, and windy conditions increase fire risk.

In Proposed Order Section III.N.2, ODOE recommends that EFSC find that these plans sufficiently characterize wildfire risk within the analysis area using current data from reputable sources and that the facility components will be designed, constructed, and operated in compliance with wildfire mitigation plans.

Your comments related to fire risk, while relevant under the EFSC Wildfire Prevention and Risk Mitigation Standard, the EFSC Land Use Standard, and the EFSC Public Services Standard, are addressed by the Proposed Order and its recommended plans and conditions. We hope these responses help alleviate your concerns related to wildfire risk because it has been the subject of much discussion, input, and scrutiny throughout the EFSC review process.

3. Land Use

PGE recognizes your concern regarding the conversion of agricultural lands to renewable energy development.

a. *Loss of Agricultural Land*

With respect to the first concern, we hope the findings from the Agricultural and Fiscal Impact Analysis (AIA) included as BCWF RFA4 Attachment K-2 and the Community Investment Plan (Proposed Order, Attachment E), help alleviate these concerns. The AIA quantifies direct, indirect, and induced impacts from removing land from agricultural production, and then the CIP proposes mitigation measures to offset impacts. The AIA demonstrates that land removed from agricultural production by Biglow Solar represents 0.6 percent and 1 percent of the average annual acres of winter wheat harvested in Sherman County and Oregon, respectively. The CIP

incorporates many ideas provided by the community, including yours, that direct mitigation dollars to help fund important projects that benefit the local agricultural economy and offset impacts.

In addition, because issues relating to agricultural land supply, tenant farming, and agricultural impacts were raised in the record by your family, PGE and BN acknowledge that land ownership and agricultural operations are not always the same, and that project impacts may differ between landowners and tenant operators. BN worked closely with both the landowner and the tenant farmer to address the early conclusion of the existing lease. The parties reached a mutually agreed-upon lease termination arrangement.

The negotiated compensation reflects a private resolution between the parties and considered the remaining lease term, anticipated agricultural use, and other relevant factors. The agreed-upon amount was intended to provide substantial consideration in excess of several years of projected farming revenue, mitigating potential losses while allowing the farmer to continue agricultural operations elsewhere.

b. Wildfire Risk to Agricultural Neighbors (LU-07)

We feel it necessary to document for the record that PGE and BN have agreed to honor your request to impose a half-mile setback from your property line, which goes above and beyond any setback standard in code. This request was honored in response to concerns about wildfire mitigation, along with visibility of the facility from your property. As committed previously, this Micrositing Corridor setback will be included in the Biglow Solar final design and is memorialized by the First Amendment to Option and Land Lease with John Scharf.

Further, as discussed during the public hearing, liability matters are not within the jurisdiction of EFSC; and therefore, comments regarding liability do not address a Council Standard.

Your comments related to land use, while relevant under the EFSC Land Use Standard, are already addressed by the Proposed Order and its recommended plans and conditions, or by the private agreements already reached by your family.

4. Fish and Wildlife Habitat (FW-01)

Your comment letter submitted January 1, 2026, expresses concern that some wildlife species were not addressed in BCWF RFA 4 Exhibit P. The analysis in Exhibit P focuses on impacts to wildlife habitat, and the analysis in Exhibit Q focuses on threatened and endangered species as required by the following OARs governing issuance of site certificates by the Council.

OAR 345-022-0060 requires that in order for the Council to issue a site certificate, "the Council must find that the design, construction and operation of the facility, taking into account mitigation, are consistent with the general fish and wildlife habitat mitigation goals and standards of OAR 635-415-0025 (Implementation of Department Habitat Mitigation Recommendations) (1) through (6) in effect as of February 24, 2017." OAR 345-022-0070 requires that in order for the Council to issue a site certificate, they must find (after consultation with the Oregon Department of Agriculture and/or Oregon Fish and Wildlife Commission) that the design, construction, and operation of the proposed facility, taking into account mitigation, are not likely to cause a significant reduction in the likelihood of survival or recovery of state-listed threatened or endangered species. The analysis in Exhibit Q determined that no state listed or candidate species are expected to be affected by the Biglow Solar Components.

The Biglow Solar Components have been designed to avoid many habitat impacts. The Draft Habitat Mitigation Plan included in Proposed Order (Attachment F) addresses the potential temporary and permanent impacts to wildlife habitat from the Biglow Solar Components that cannot be avoided and establishes a habitat mitigation area (HMA) adjacent to the Carty Generating Facility in Morrow County. PGE discussed the location of the HMA with the Oregon Department of Fish and Wildlife and received assurance that the mitigation goals for in-kind and in-proximity habitat can be met.

Your comments, while relevant under the EFSC Fish and Wildlife Habitat and Threatened and Endangered Species standards, are already addressed by the Proposed Order and its recommended plans and conditions.

5. Vegetation Management and Soil Protection (SP-01)

Your comment letter submitted on January 29, 2026, expresses concern about soil and vegetation quality at the end of the solar facility's life. Tetra Tech, on behalf of PGE and BN, conducted a literature review of the effects of solar energy facility development on vegetation and soils, focusing on impacts experienced in arid grassland and shrubland-type environments compared to preexisting agricultural land use. The resulting memo and copies of the reviewed publications are included as an attachment to this letter (Attachment B) and outline benefits such as microhabitats around solar panels with lower air temperatures and evapotranspiration rates, higher soil water content, and additional surface roughness that slows wind speeds and protects against erosion. Planting native vegetation with deeper roots around the panels protects soil from erosion and allows nutrients to be cycled into the soils to greater depths. This improves soil structure, soil organic matter content, nutrient levels, and subsequently, the ability of the soil to sequester carbon. Any negative effects from the solar panels, as outlined in the memo, would be addressed through mitigation actions outlined in the Comprehensive Solar Revegetation and Soil Management Plan.

Your comments, while relevant under the EFSC Soil Protection Standard, are already addressed by the Proposed Order and its recommended plans and conditions. It is our position that none of your comments under the EFSC Soil Protection Standard rise to the level of requiring modifications to the Proposed Order.

6. Good-Faith Participation and Record of Outreach

PGE and BN have made extensive, sustained efforts over multiple years to engage with you directly, respond to questions, and provide access to project information and technical resources. Separate and apart from the RFA 4 amendment process, the Operations Manager of the existing BCWF facility has also maintained communication with you regarding operational and maintenance concerns, ensuring that your feedback was heard and addressed where appropriate.

Since fall of 2024, BN has dedicated significant time and resources to supporting a constructive relationship with you. These efforts have included repeated meetings, phone calls, written correspondence, and the availability of subject matter experts to address your specific concerns, including fire-safety engineers, agricultural mitigation specialists, and project design personnel. We also provided written follow-up and technical materials when you were unable to attend scheduled discussions. We recognize that meaningful engagement and thoughtful project refinement do not occur overnight; accommodations require study, engineering review, coordination with landowners, and regulatory alignment. Nevertheless, we have consistently

worked to respond to your concerns in a deliberate and substantive manner.

In addition to studies required by EFSC rules, BN voluntarily elected to prepare detailed visual simulations from your residence and from specific viewpoints you identified as being of greatest interest to you. These simulations were not required under the EFSC rules or any applicable Site Certificate condition. BN undertook this additional effort solely to provide you with site-specific, location-based information regarding potential visual impacts and to ensure that your concerns could be evaluated using accurate, project-specific renderings rather than generalized assumptions. This work reflects our commitment to transparency and good-faith engagement beyond what is required by the regulatory process.

We are committed to continuing to work with you and your family constructively. Given the accommodations implemented and the enhanced regulatory requirements included in the Proposed Order, we believe the record demonstrates that substantial and meaningful efforts have been made to address the concerns raised.

Please reach out if you have questions or would like to discuss further. We are committed to continuous engagement of the community and neighbors as this project moves forward.

Sincerely,

Dan Wilson

Daniel Wilson
Director, Renewable Operations
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

Attachments:
Attachment A: BrightNight Presentation to Sherman County Emergency Services Providers
Attachment B: Memo – Effects of Solar Energy Development on Vegetation and Soils

Attachment A: BrightNight Presentation to Sherman County Emergency Services Providers



BRIGHTNIGHT
Power when you need it

North Sherman County Fire Board

MEETING

AUGUST 2025

TODAY'S GOAL

- **Progress Update:** Share overview of the project and update you on our progress
- **Safety:** Discuss the safety measures planned for construction, design, and operation
- **Experience:** Review how BrightNight has worked with first responders in other project communities
- **Feedback:** Learn what else we can do to align our work with Sherman County's emergency safety preferences. Wrap up with a list of discussion topics.

WHO'S HERE?

BrightNight

- Kathleen – Lead developer
- Tamara – Development support
- Michael – Project Delivery
- Ranjith – BESS Engineering
- Arturo – Solar Engineering

Coffman Engineers

- Mark Gouveia

AGENDA/PURPOSE

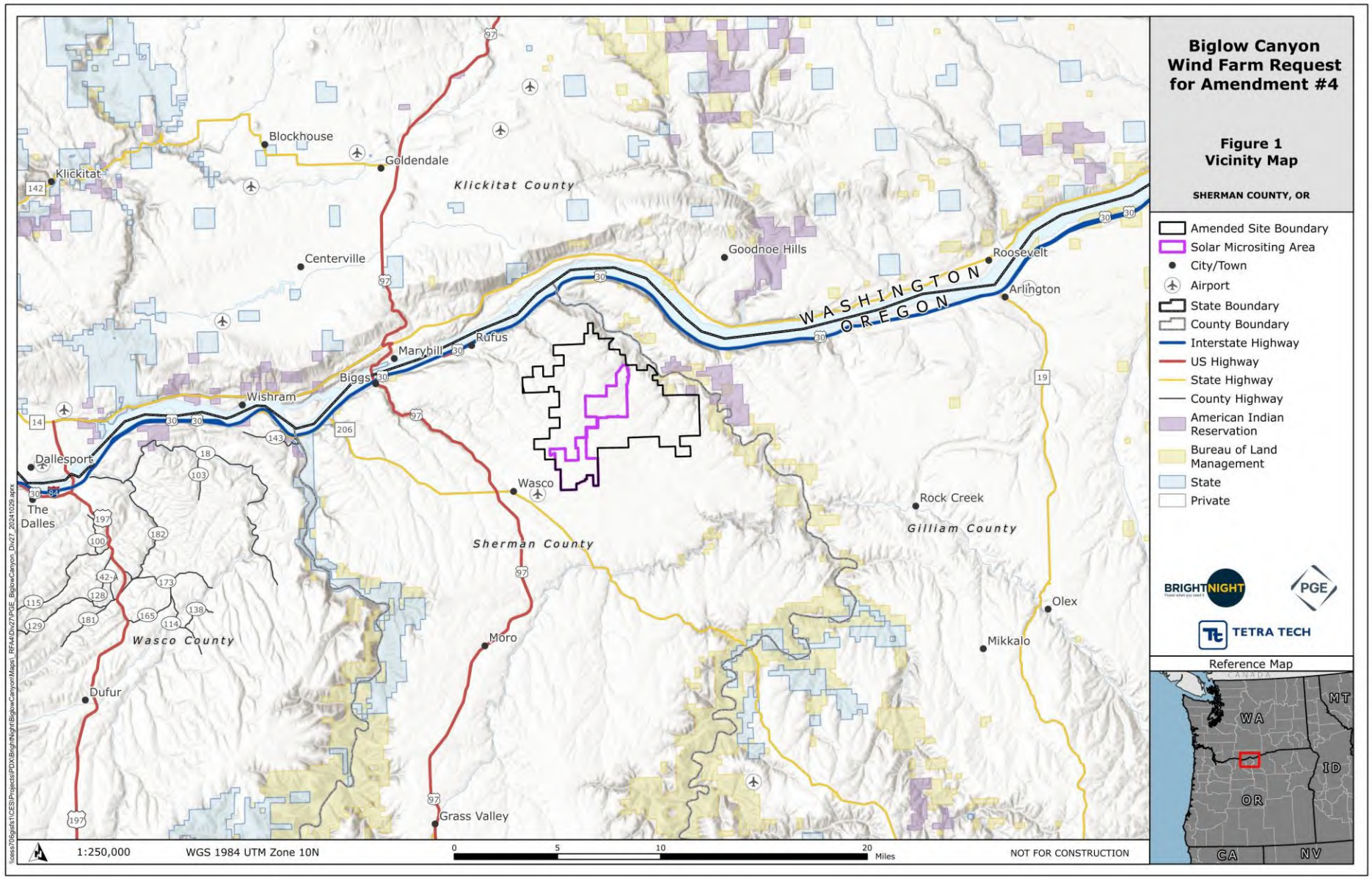
- Project Description
- Site Layout Review
- Schedule Overview
- Emergency Response Plan Overview
- Share Wildfire Mitigation Plan (WMP) measures for construction
- Ensure coordination with Sherman County responders

01

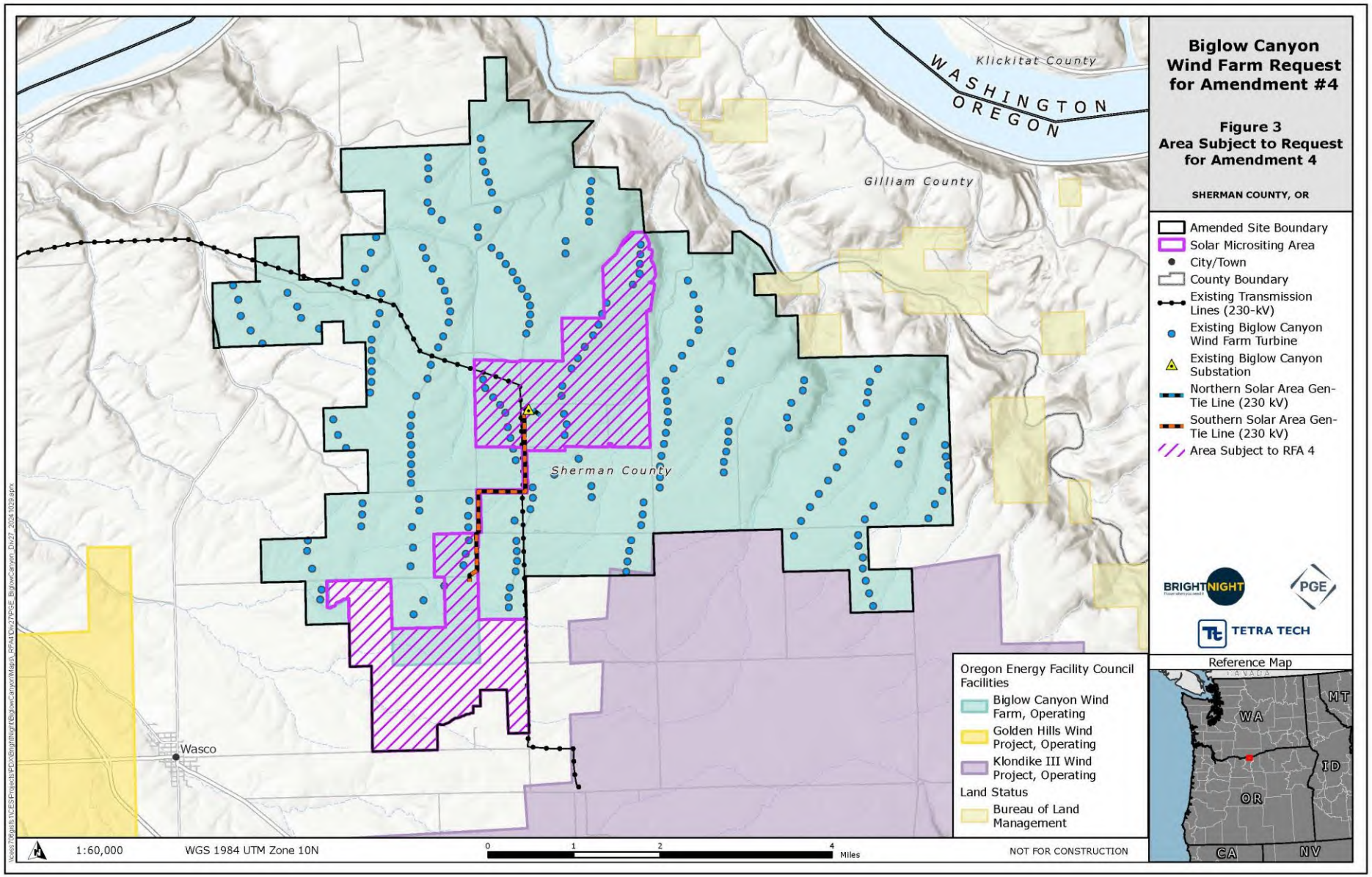
DEVELOPMENT UPDATE

Kathleen

Project Description



Project Description



Biglow Solar + Storage Project Overview

OVERVIEW
PGE and BrightNight have partnered to bring a solar and storage project to the existing Biglow Canyon Windfarm in Sherman County, Oregon.

CAPACITY
385-Megawatts in two phases. Today, we're discussing phase 1 (125 MW PV and 125 MW BESS).

FOOTPRINT
Study area is 3,980 acres. Actual project footprint is ~676 acres.

INTERCONNECTION
Utilizing the existing Biglow Canyon Substation. Ideal optimization of existing infrastructure to reduce project impact.

PERMITTING
Currently moving through the Oregon EFSC process.

Tax Revenue
At least $40,000,000 in tax revenue generated over the life of the project.

Schedule Overview

2024

April-Sept

Survey Complete (cultural resources, habitat, raptor, wetlands, botanical)

Meetings with community leaders

Initial tribal outreach

2025

April

Application for Amendment for existing EFSC Site Certificated deemed published and complete by ODOE

July

Preliminary layout

Technology selection

Agricultural mitigation meetings

August

Sponsorship of the Sherman County Fair

Open house, Aug. 19

September

Anticipate completing EFSC application submission

November

EFSC issues "draft proposed order," tentative hearing date set

2026

January

Council review and determination

Q2

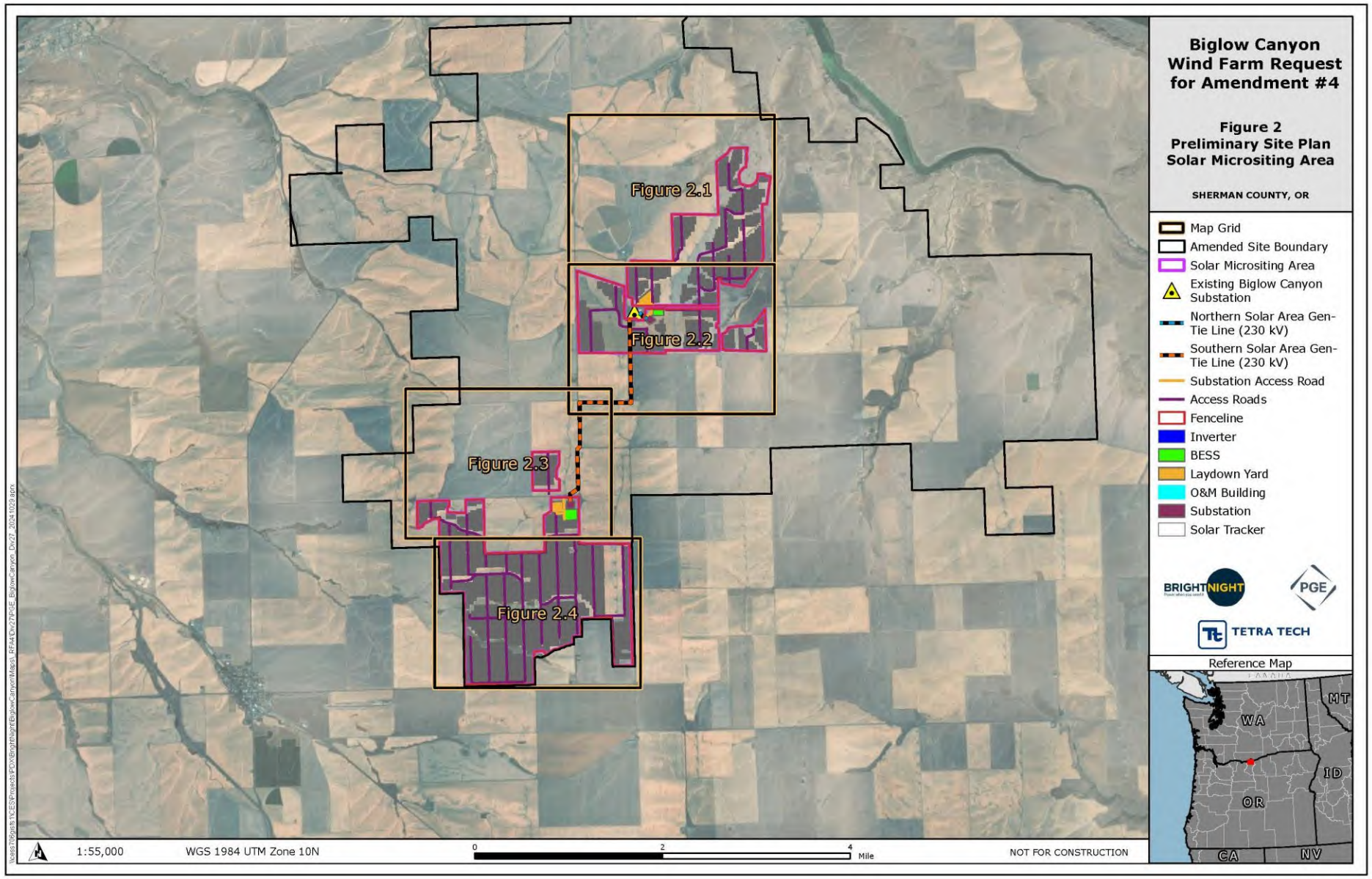
Construction of phase 1

2027

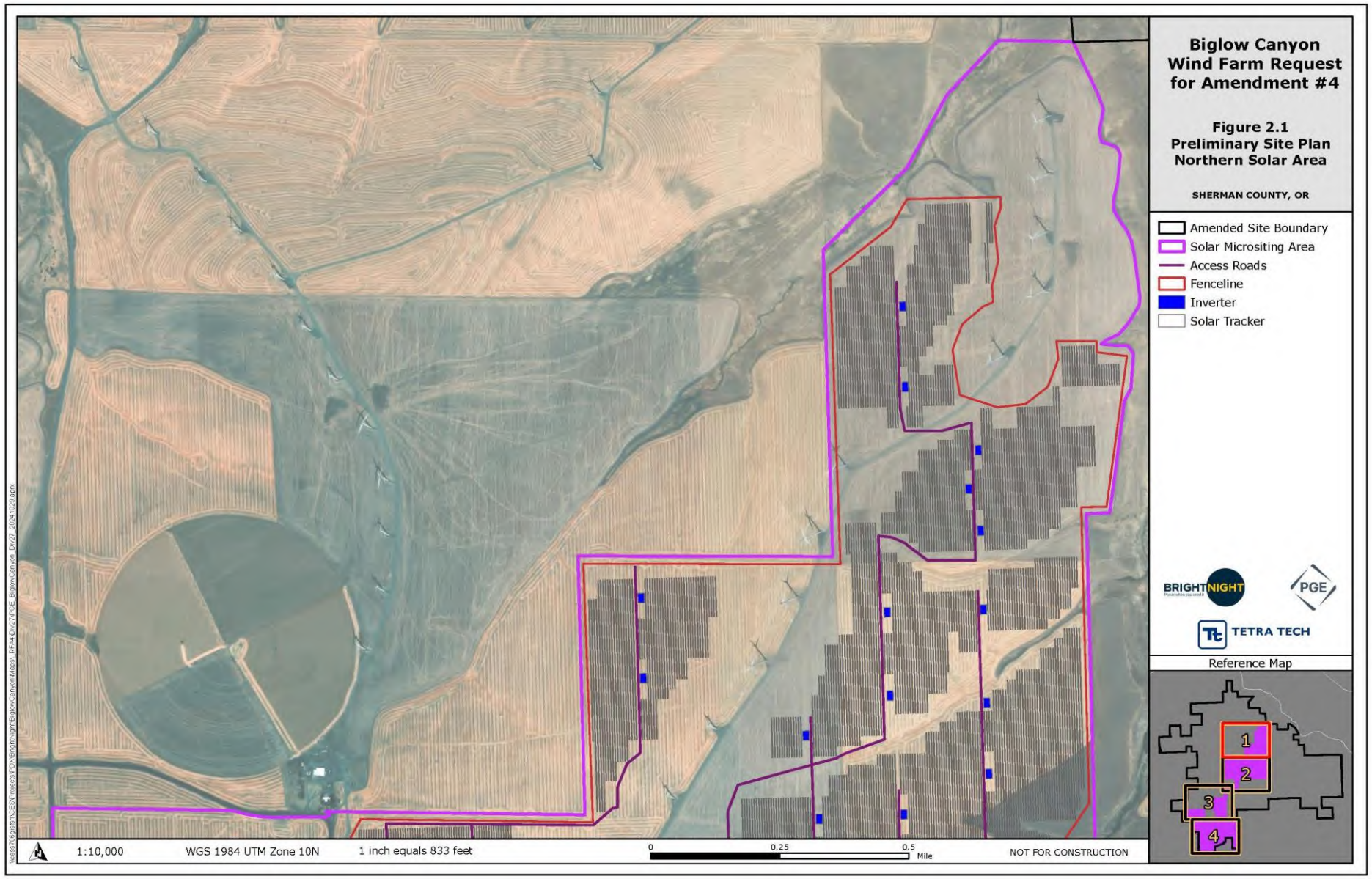
Q4

Anticipated construction of phase 2

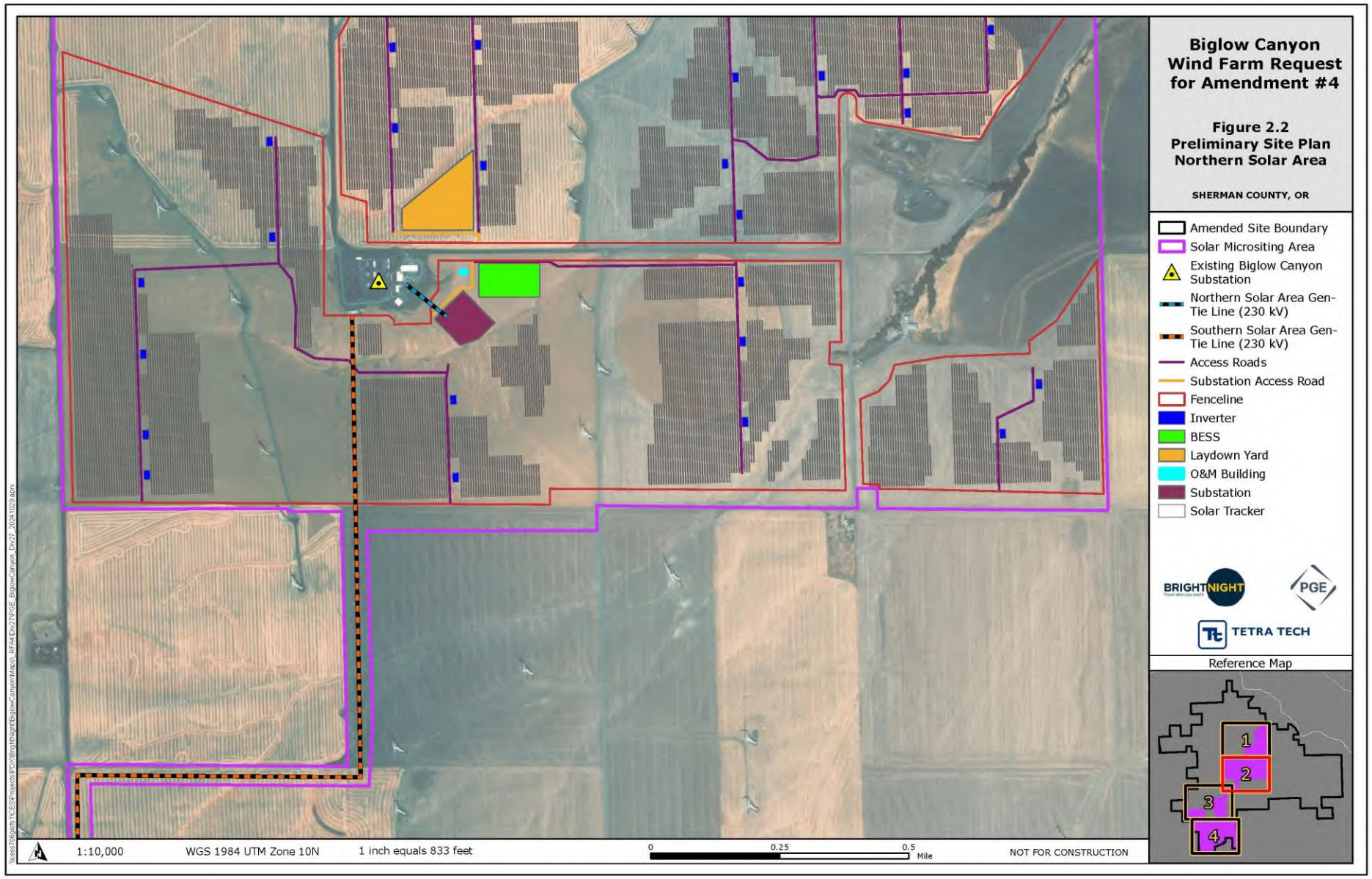
Project Description



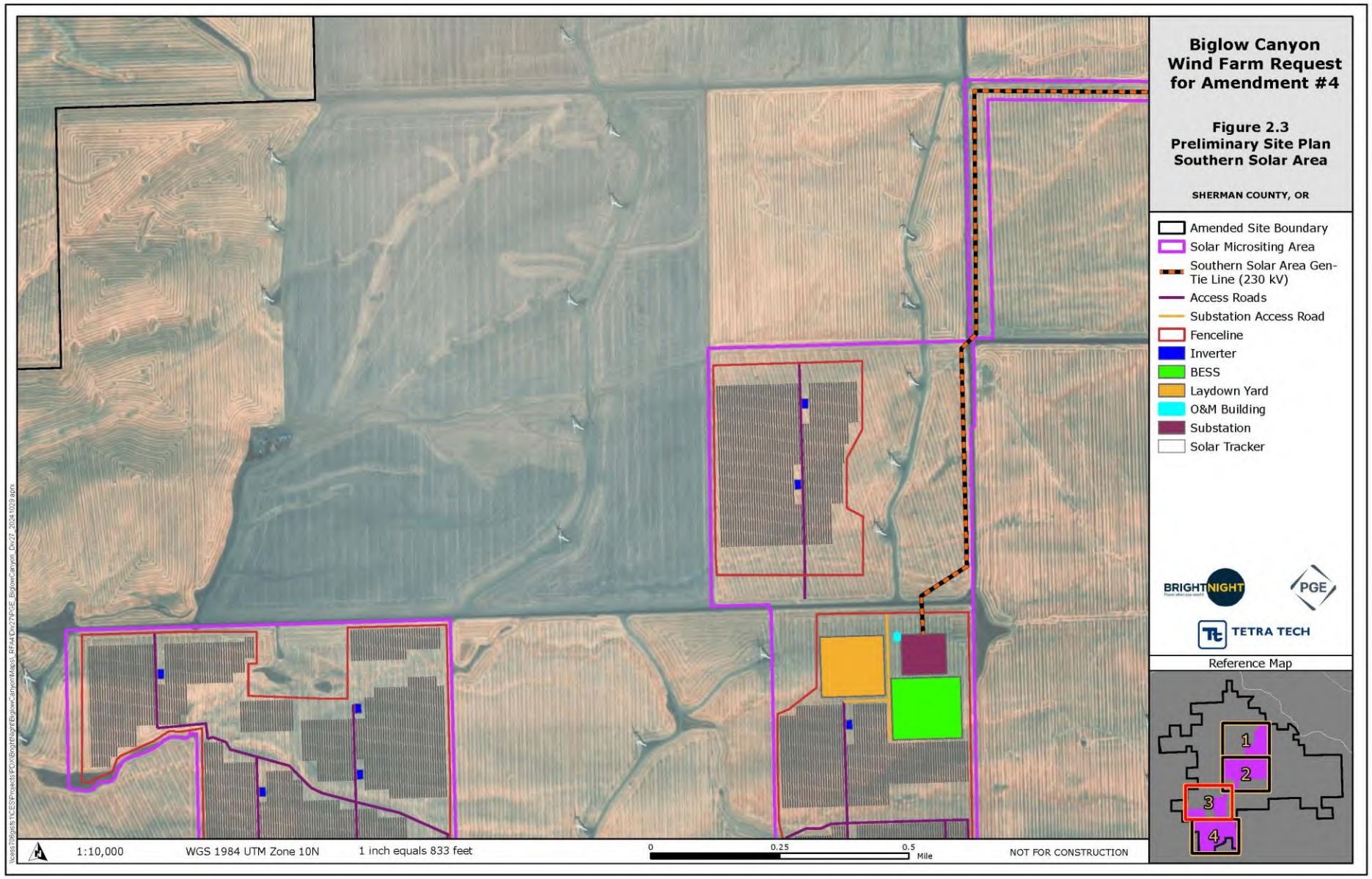
Project Description



Project Description



Project Description



Project Description



BRIGHTNIGHT
Power when you need it

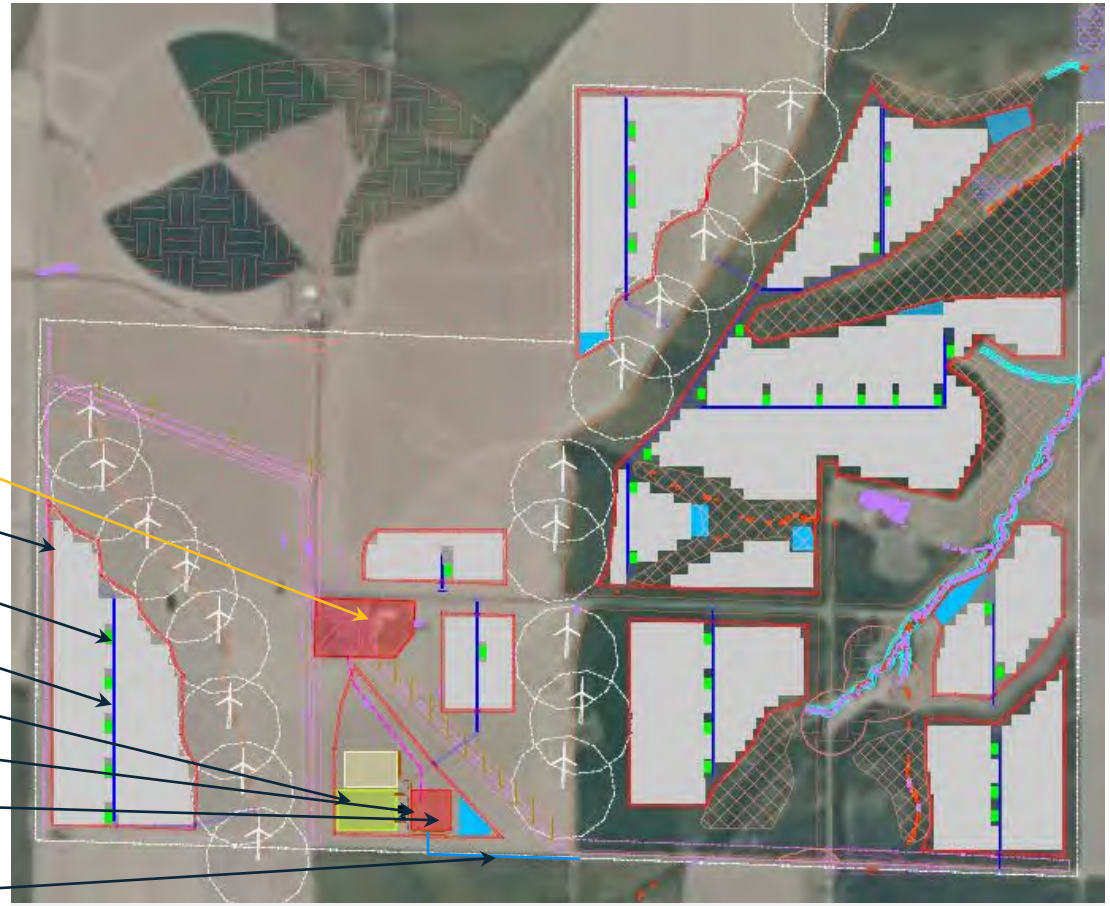
02

ENGINEERING

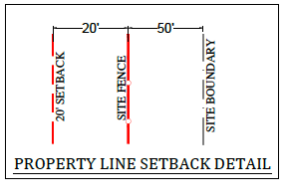
Ranjith (BESS)
Arturo (PV)

Overall Site Layout

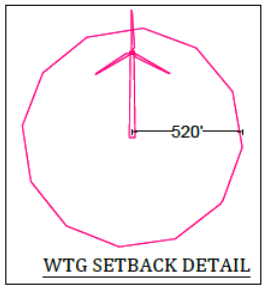
- Wind substation
- Fence line
- Inverters
- Improved roads 16ft
- BESS
- O&M Building
- Project substation
- Substation Access road 24ft, with 20 ft internal roads



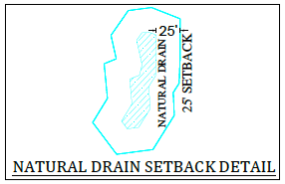
16’ interior access roads and 20’ perimeter setback for access



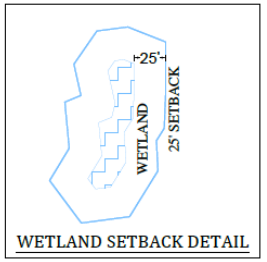
PROPERTY LINE SETBACK DETAIL



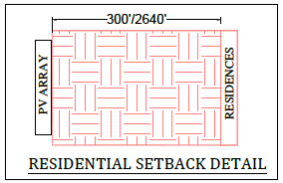
WTG SETBACK DETAIL



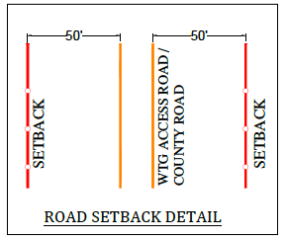
NATURAL DRAIN SETBACK DETAIL



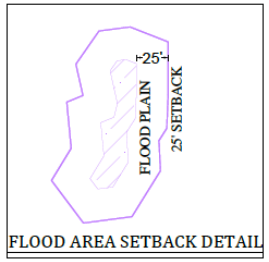
WETLAND SETBACK DETAIL



RESIDENTIAL SETBACK DETAIL



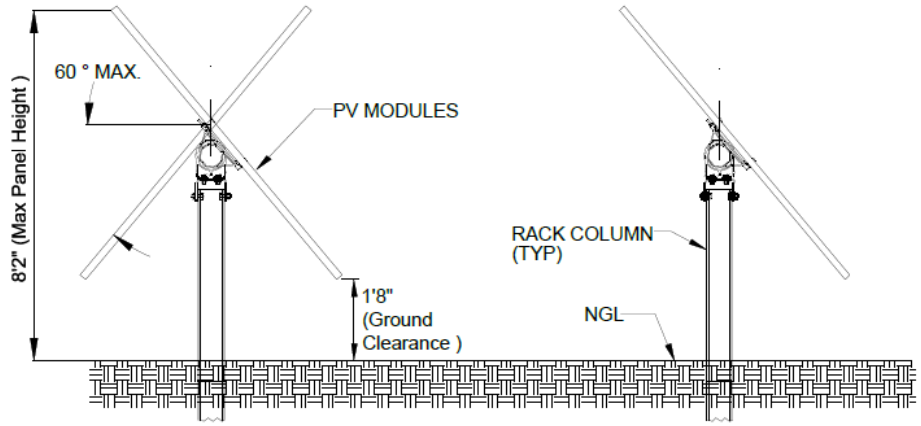
ROAD SETBACK DETAIL



FLOOD AREA SETBACK DETAIL

Solar PV Arrays





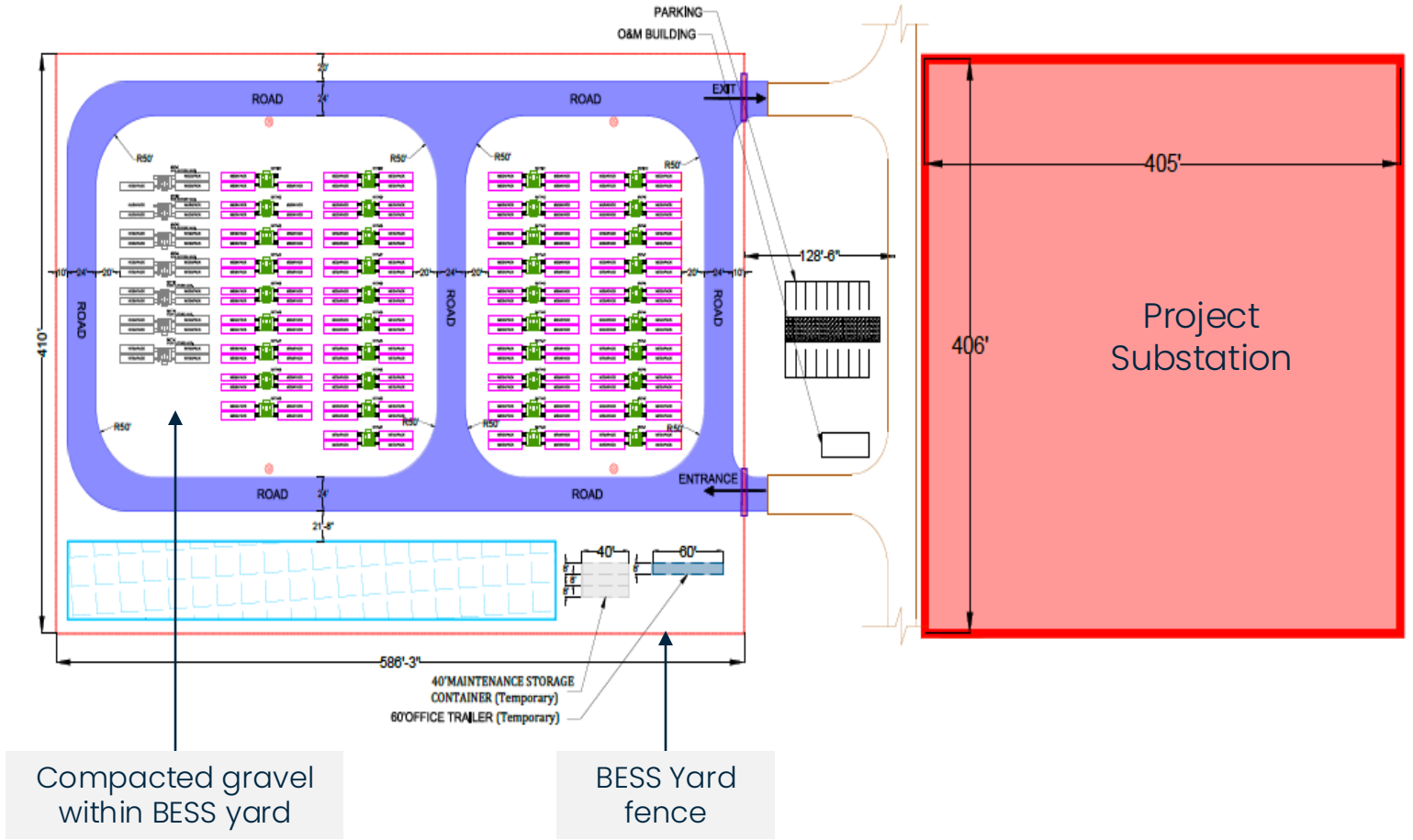
TYPICAL RACK NORTH/SOUTH END ELEVATION





BESS Site Layout and General Arrangement

BESS YARD



Project Specifications - 125MW / 500 MWh BESS coupled to 125MW PV

Equipment Clearances:

- Minimum 8' clearance between front faces of battery enclosures for O&M access and UL 9540A fire propagation prevention guidelines
- Minimum 10' clearance between side faces of battery enclosures

Access Roads

- 24' interior access roads and perimeter road for firetruck access
- 50' internal turning radius

Minimum 10' setback from fence to BESS yard perimeter road

BESS Equipment Details

Subtitle goes here



Manufacturer and Model – Tesla Megapack 2XL

Fully integrated AC battery enclosure with battery modules, string inverters, thermal management system and fire safety systems

Proprietary fire detection and suppression system

Over 14 GWh in operation

Proposed Equipment Quantities

- Initial Install – 154 Megapacks and 39 Medium Voltage Transformers
- Future Augmentation – 29 Megapacks and 7 Medium Voltage Transformers
- Medium Voltage Transformers – 39
- Note that equipment quantities could change as design progresses

Equipment Specifications:

Mechanical

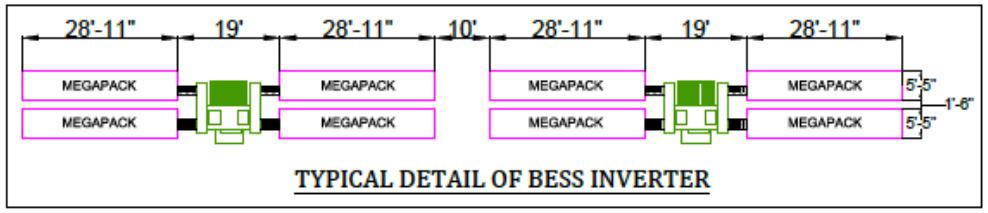
- IP66/ NEMA 3R
- L x D x H - 8.8m x 1.6m x 2.7m
- 84,000 lbs
- Operating Temperature Range: -30C to 50C

Electrical

- Output voltage: 480V AC 3 phase
- Power Rating: 979 kW
- Energy Rating: 3916 kWh

Codes and Certifications

- System – UL 9540, UL 9540A, UL 1973, UL 1741, IEC 62619, IEEE1547
- Battery Cells – UL 1642



BRIGHTNIGHT
Power when you need it

03

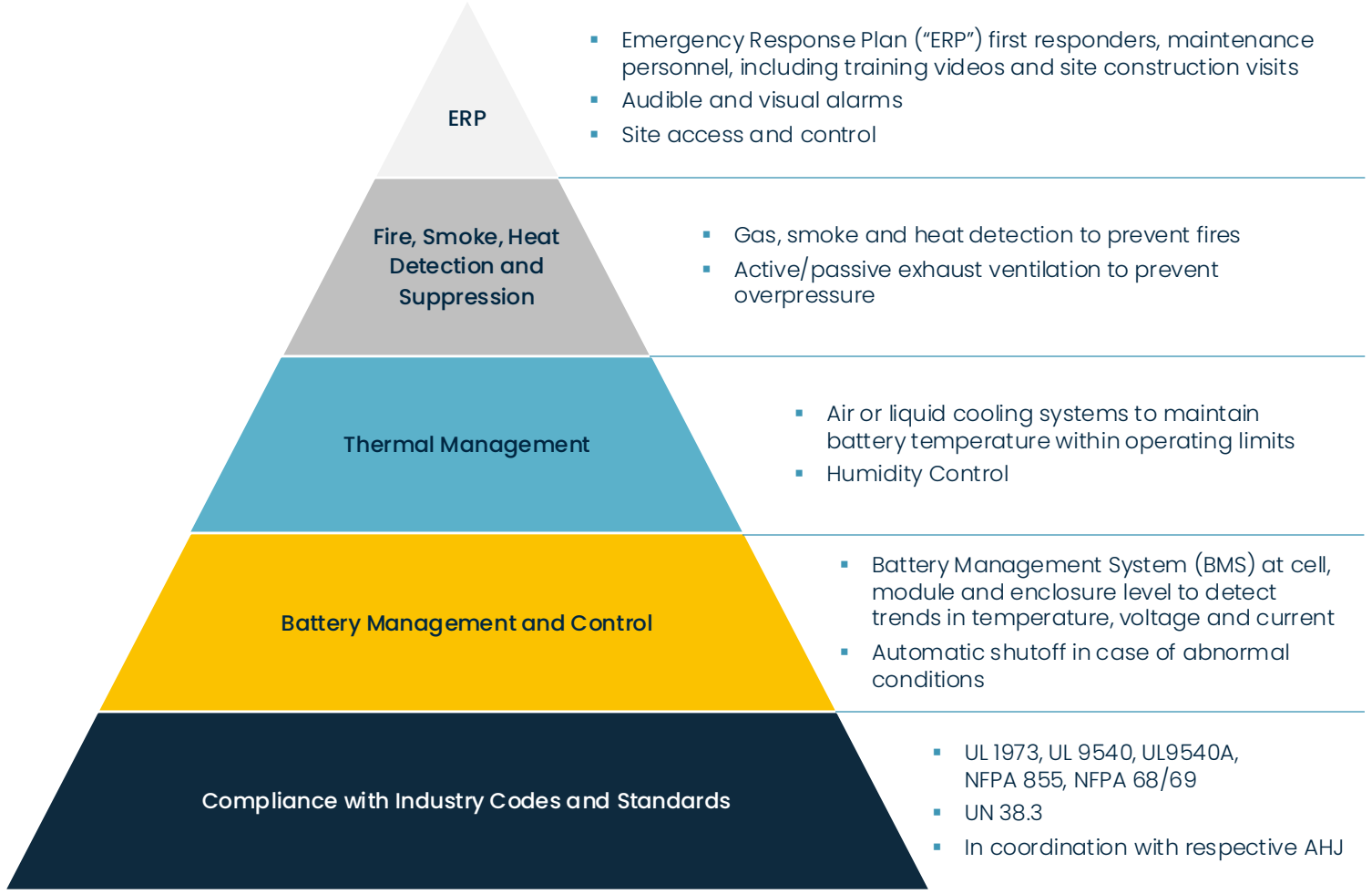
SAFETY & EMERGENCY RESPONSE

Kathleen Coffman Engineers

BrightNight ensures safety at every level of design and operation

Foundations of BrightNight's Safety Program

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Coffman Energy Storage Experience

Supporting developers, EPCs, utilities, and OEMs

At all stages of the project life cycle

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Experience with all types of energy storage

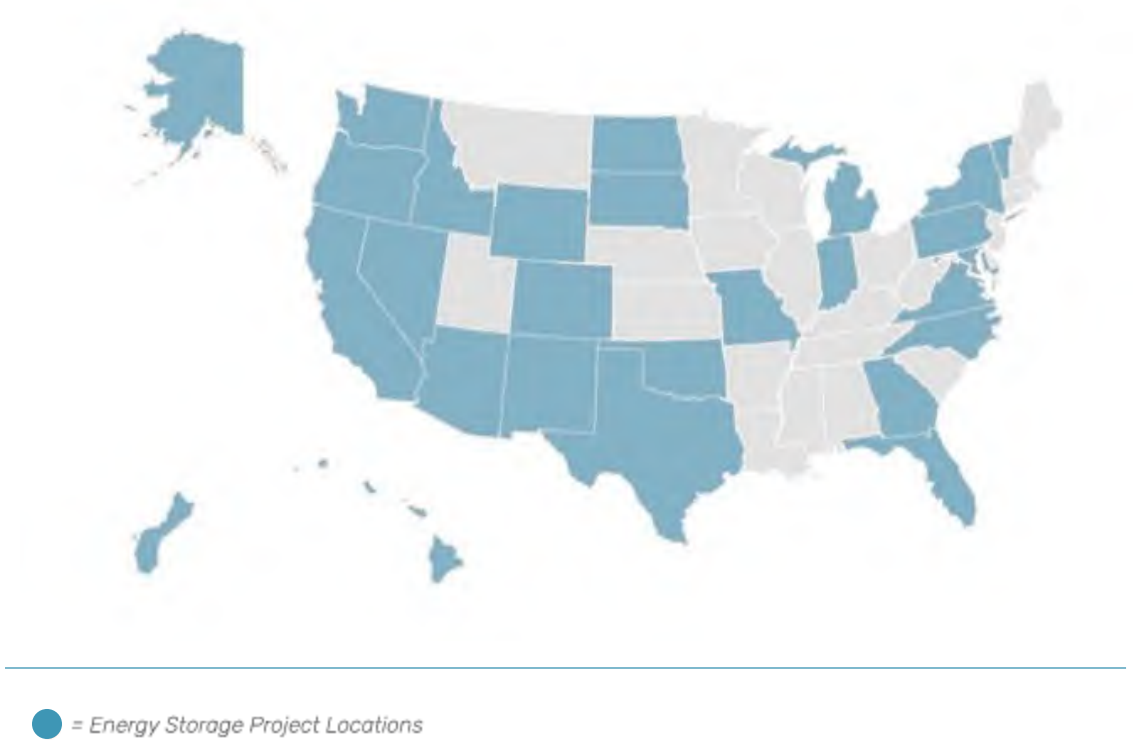
- Lithium-ion Battery Storage
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- Gravity Systems, Flywheel
- Compressed Air (CAES)
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Services: Engineer of Record, OE, Third Party Review

Containers, Buildings, Custom Enclosures

150+ currently active projects

350+	9.5 GWh	32+
total projects	operating plants	states & territories



= Energy Storage Project Locations

Fire Prevention

BrightNight plans to use the "Tesla Megapack" battery system at the Biglow Solar and Storage Project. This industry-leading equipment features exceptional safety and prevention technology:

Noise

The Megapack is self-contained and operational noise levels are designed to minimize noise pollution. The Greenwater project will abide by all local noise ordinances.

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In the unlikely event of a fire, emissions are extremely limited. Any emissions would originate from the plastic enclosures, not the batteries. Concentrations are so small there would would be no negative impact to air quality in the surrounding area

Proactive Fire Control

Megapack is designed to prevent battery fires and be resilient if they occur. Fires are extremely rare. Testing has shown that if one occurs, Megapack safety systems can control and contain a fire within the unit.

Containment

Each Megapack unit is self-contained. This important safety feature helps prevent potential soil or water contamination and prevents the spread of an unlikely fire event.

Water Runoff

Megapacks are designed to make it difficult for water to come in contact with the enclosed battery cells.



Lithium Batteries





Tesla Megapack Fire Protection Systems

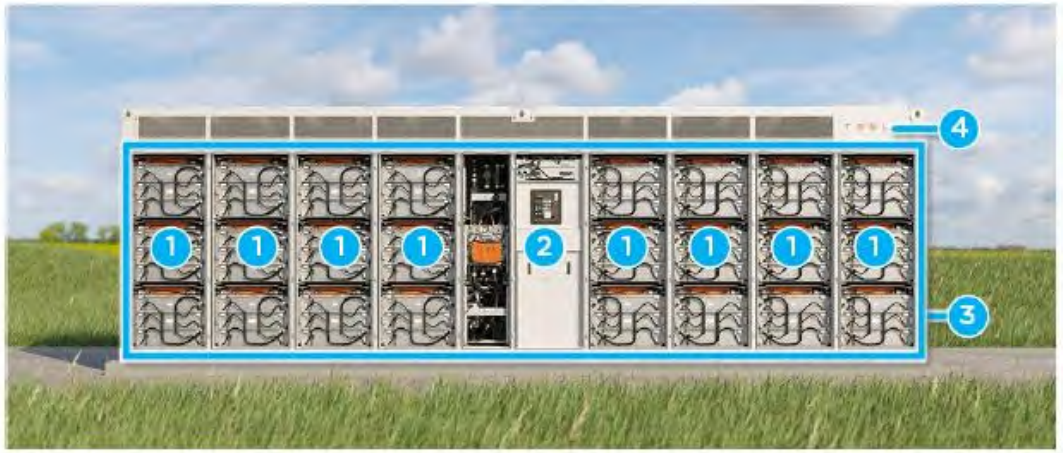
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1. Battery modules with active and passive fuses – externally serviceable
2. Touch-safe Customer Interface Bay
3. Non-walk-in IP66 enclosure and deflagration mitigation
4. Thermal roof with overpressure vents

UL Listed Equipment. Equipment is fully test and listed by the UL testing company for the products in your house.

Fire Event Gas Byproducts. Gases resulting from a Megapack fire are similar to those of a typical structure fire: hydrogen, carbon dioxide, carbon monoxide and methane. Expected fire size is less than a house or vehicle fire.

Fire Event Water Runoff. Megapack units are designed to make it difficult for water to come in contact with the enclosed battery cells. Fire water runoff testing has shown no harmful levels of contaminants. (Note: Tesla's Emergency Response Guide recommends no direct water application to a Megapack fire.)

Discussion

Emergency Response Plan

Construction Wildfire Mitigation Plan

Operations Wildfire Mitigation Plan


THANK YOU

Sherman County Emergency Services Meeting
August 2025

Today's Goal

- **Progress Update:** Share overview of the project and update you on our progress
- **Safety:** Discuss the safety measures planned for construction, design, and operation
- **Experience:** Review how BrightNight has worked with first responders in other project communities
- **Feedback:** Learn what else we can do to align our work with Sherman County's emergency safety preferences. Wrap up with a list of discussion topics.

Who's Here?

BrightNight
- Kathleen – Lead developer
- Tamara – Development support
- Michael – Project Delivery
- Ranjith – BESS Engineering
- Arturo – Solar Engineering

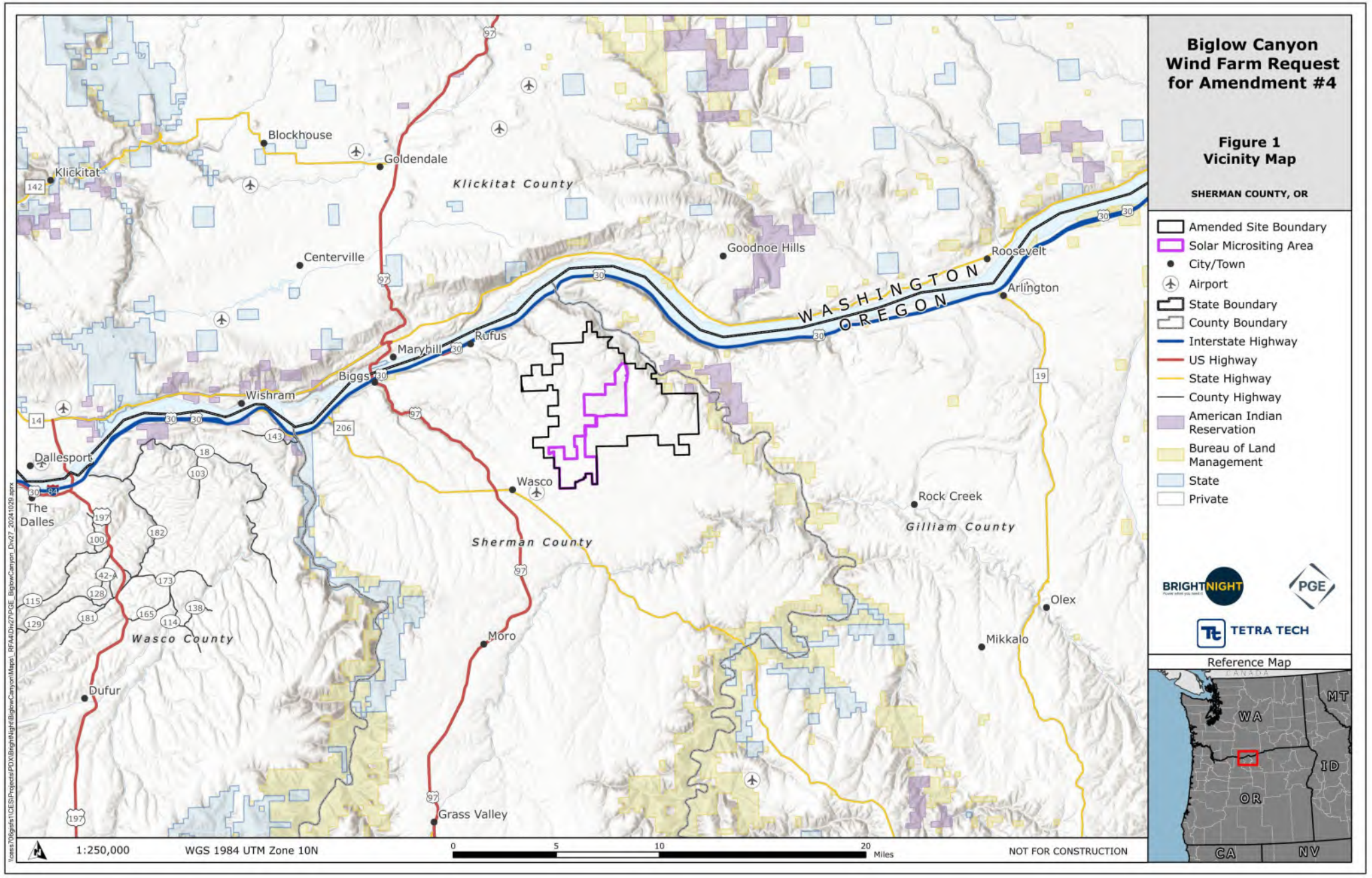
Coffman
- Mark Gouveia

Agenda/Purpose

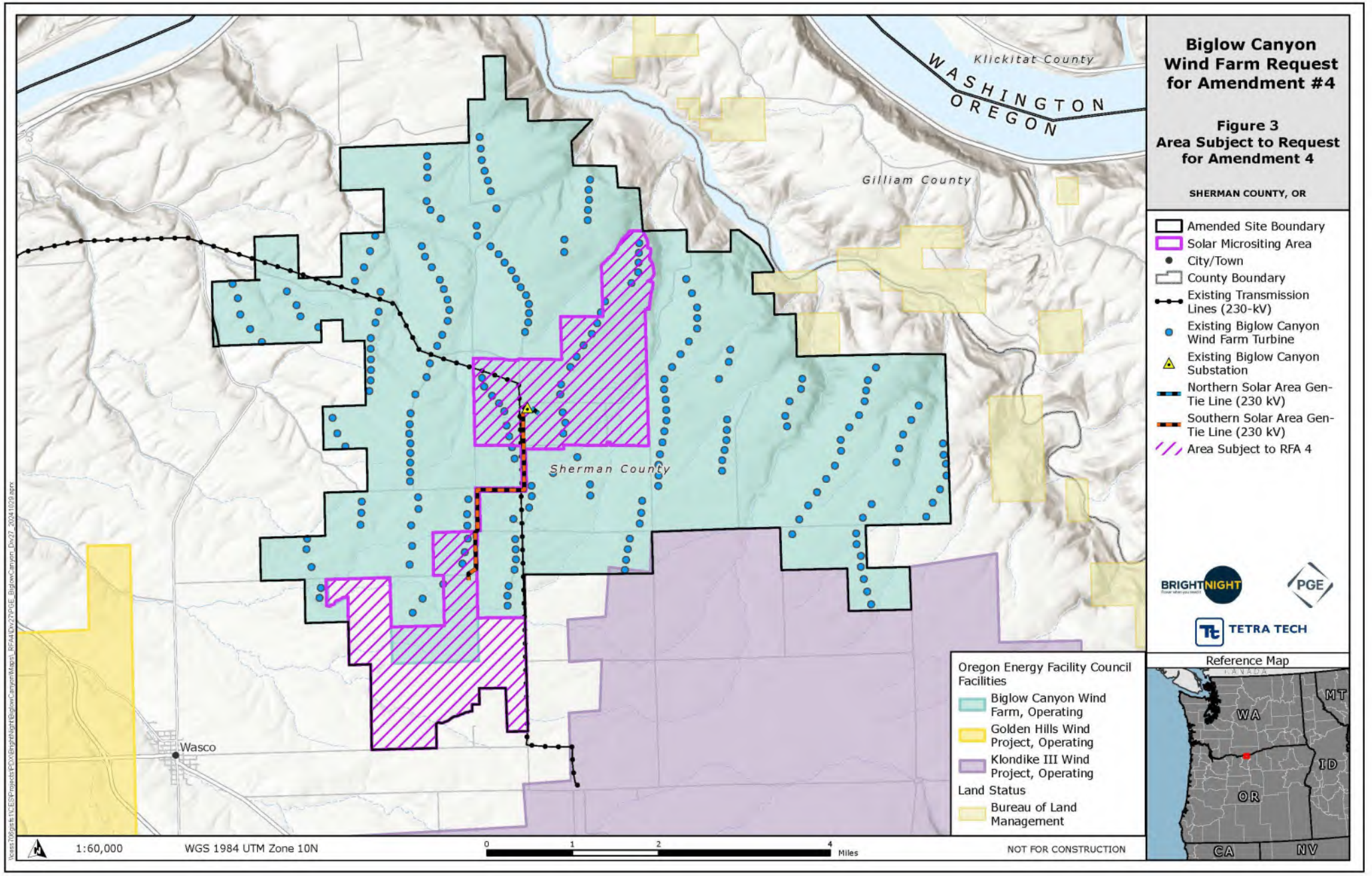
- Project Description
- Site Layout Review
- Schedule Overview
- Emergency Response Plan Overview
- Share Wildfire Mitigation Plan (WMP) measures for construction
- Ensure coordination with Sherman County responders

- DEVELOPMENT UPDATE

- Kathleen



Project Description



Project Description

Biglow Solar + Storage Project Overview

✓ OVERVIEW

PGE and BrightNight have partnered to bring a solar and storage project to the existing Biglow Canyon Windfarm in Sherman County, Oregon.

✓ CAPACITY

385-Megawatts in two phases. Today, we're discussing phase 1.

✓ FOOTPRINT

Study area is 3,980 acres. Actual project footprint is ~676 acres.

✓ INTERCONNECTION

Utilizing the existing Biglow Canyon Substation. Ideal optimization of existing infrastructure to reduce project impact.

✓ PERMITTING

Currently moving through the Oregon EFSC process

Schedule Overview

TETRA TECH

April - Sept 2024

- Survey Complete (cultural resources, habitat, raptor, wetlands, botanical)
- Meetings with community leaders
- Initial tribal outreach

April 2025

- RFA Submittal

July 2025

- Preliminary layout
- Technology selection
- Agricultural mitigation meetings

August 2025

- Sponsorship of the Sherman County Fair
- Open house, Aug. 19

January 2026

- Council review and determination

Q2 2026

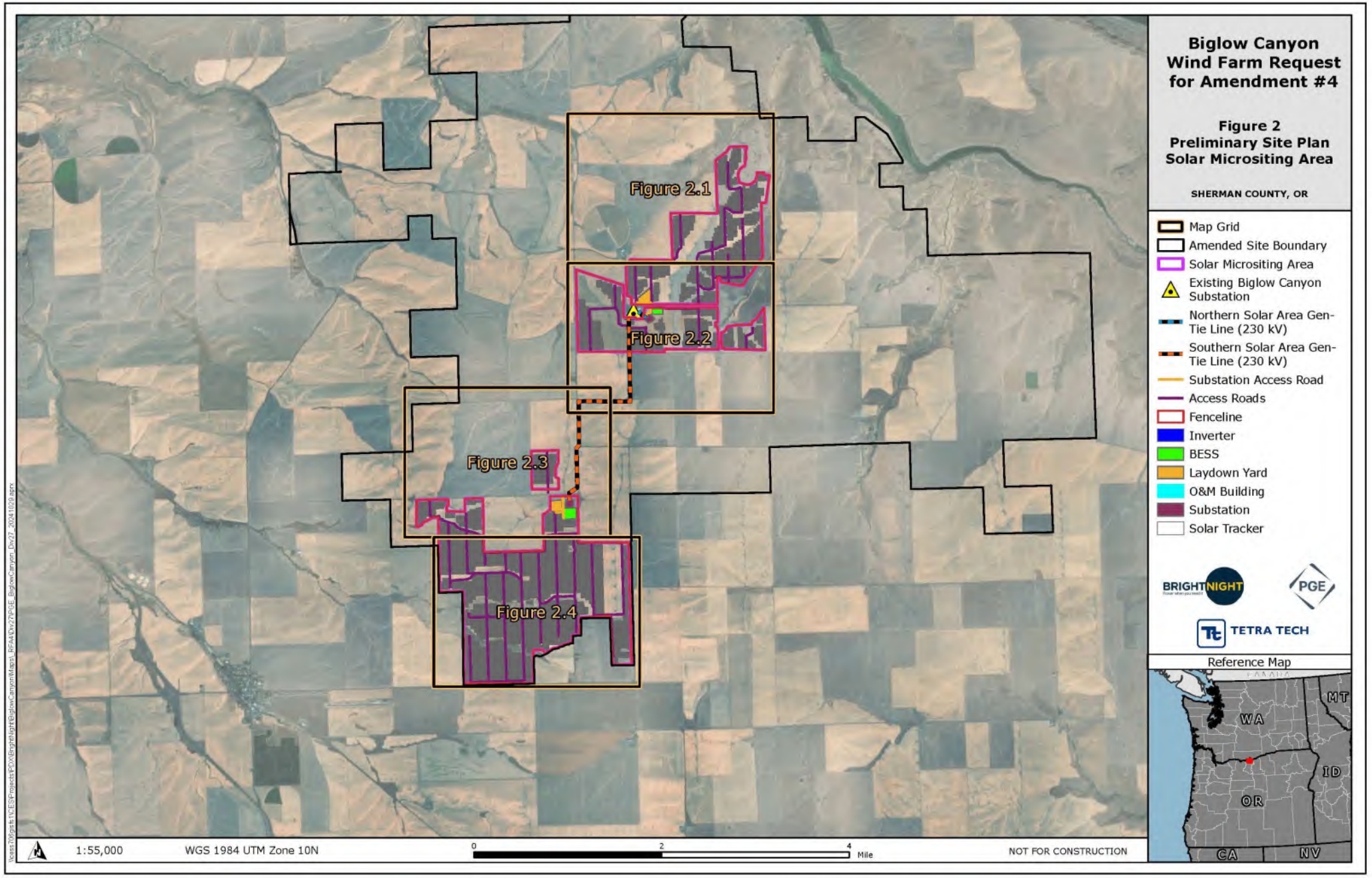
- Construction of phase 1

Q4 2027

- Anticipated construction of phase 2

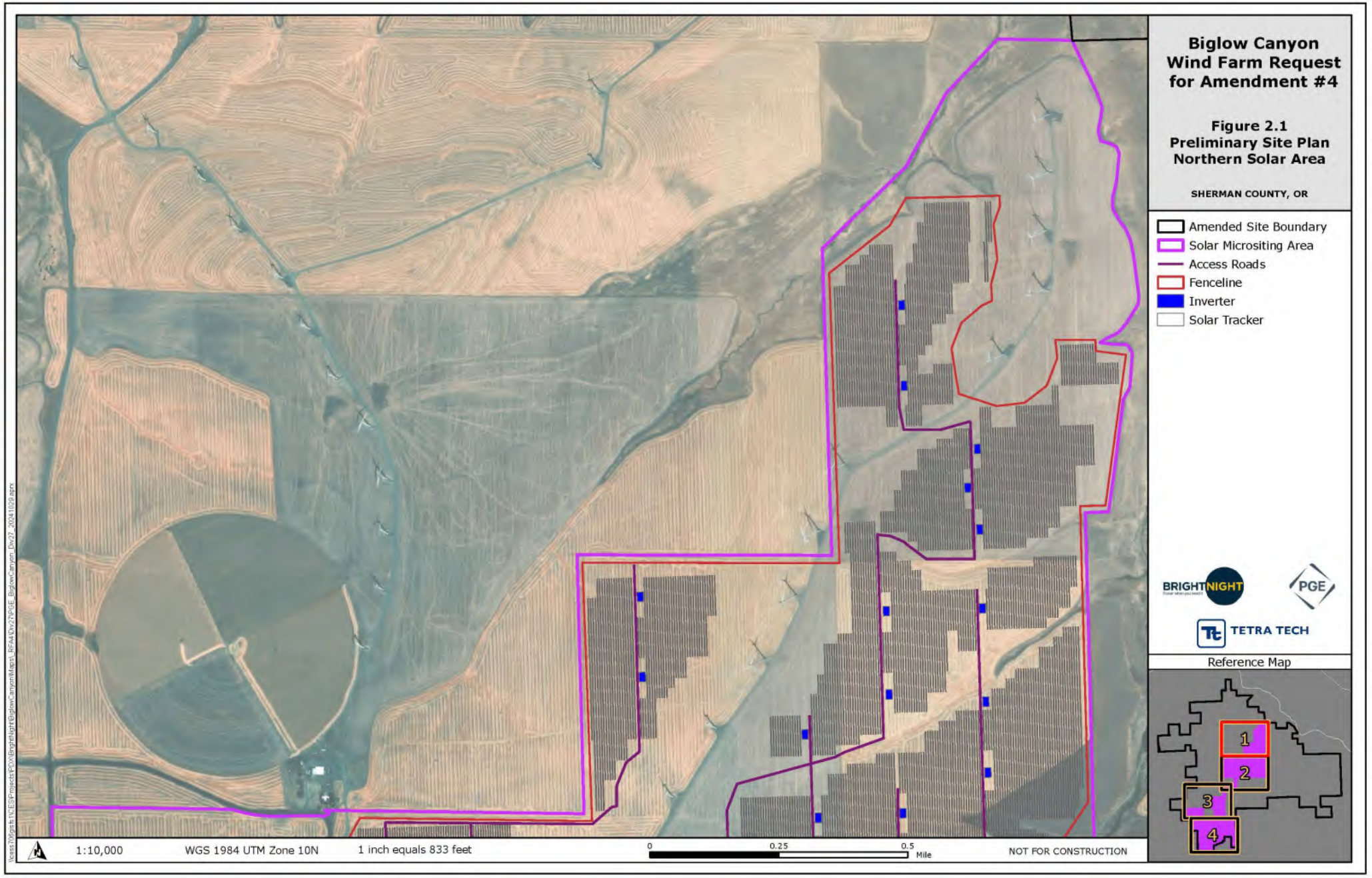
Sept
Anticipate completing our EFSC application submission

November
EFSC issues “draft proposed order,” tentative hearing date set



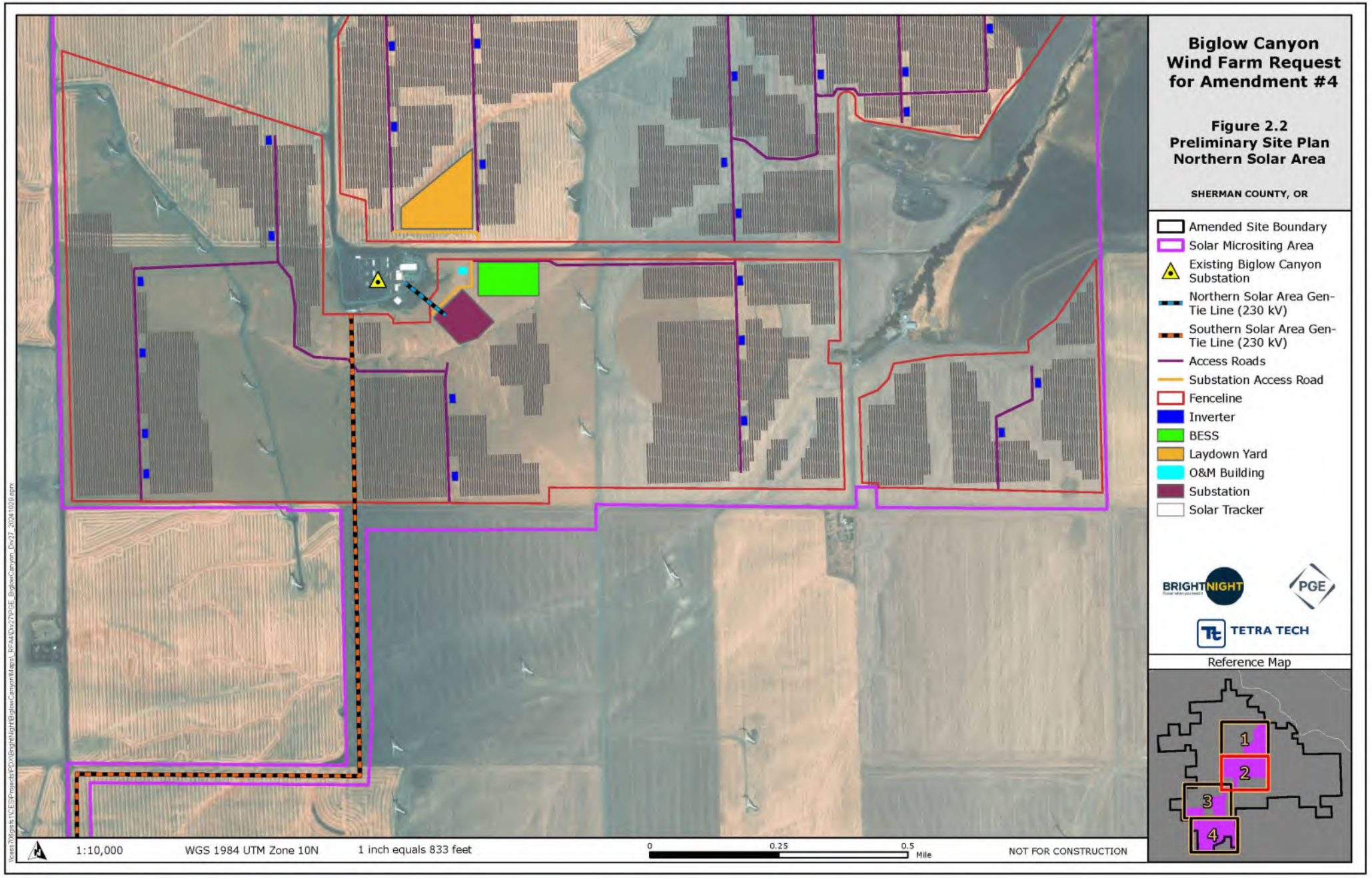
TETRA TECH

Project Description



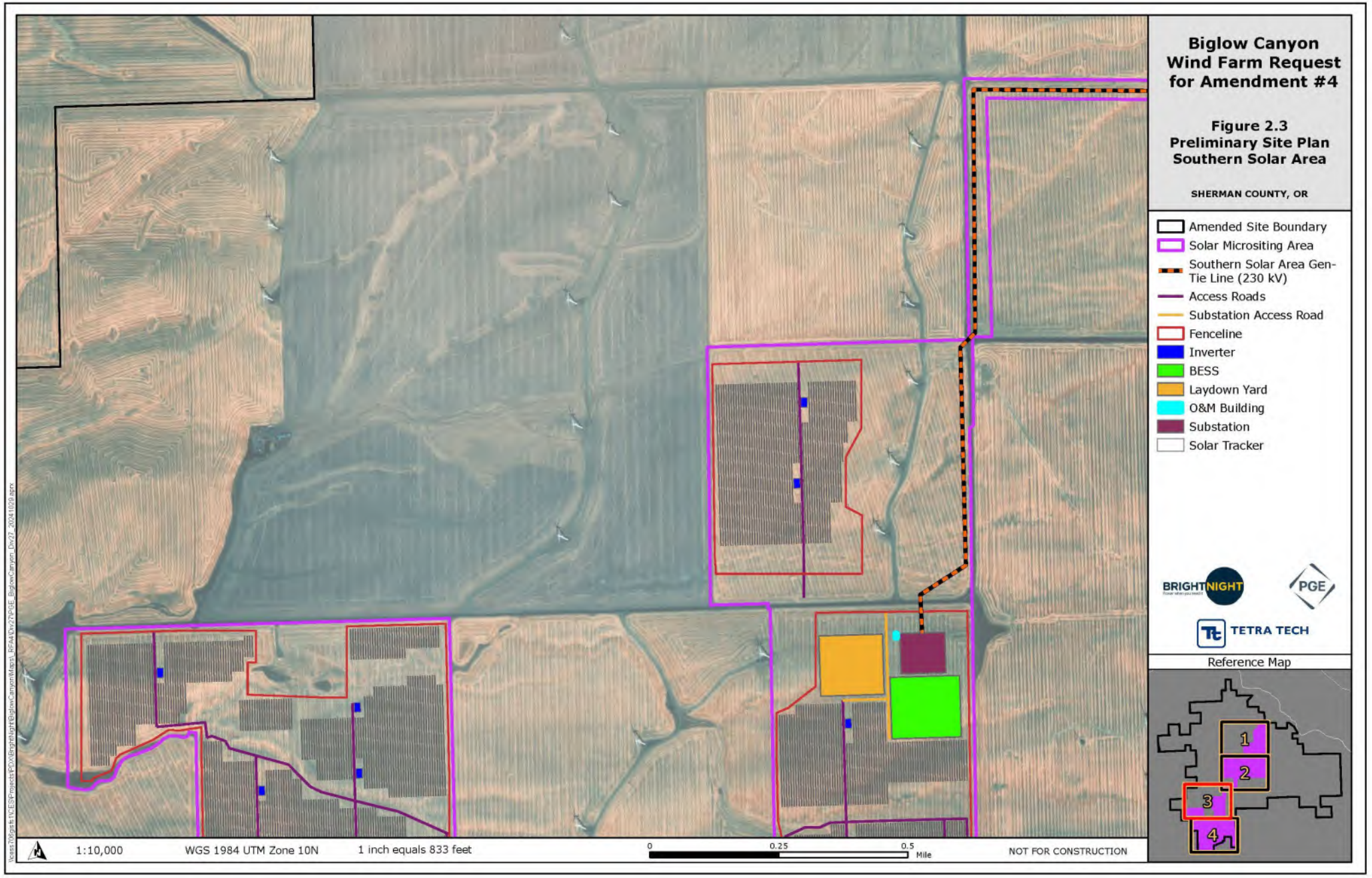
TETRA TECH

Project Description



TETRA TECH

Project Description



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Project Description



TETRA TECH

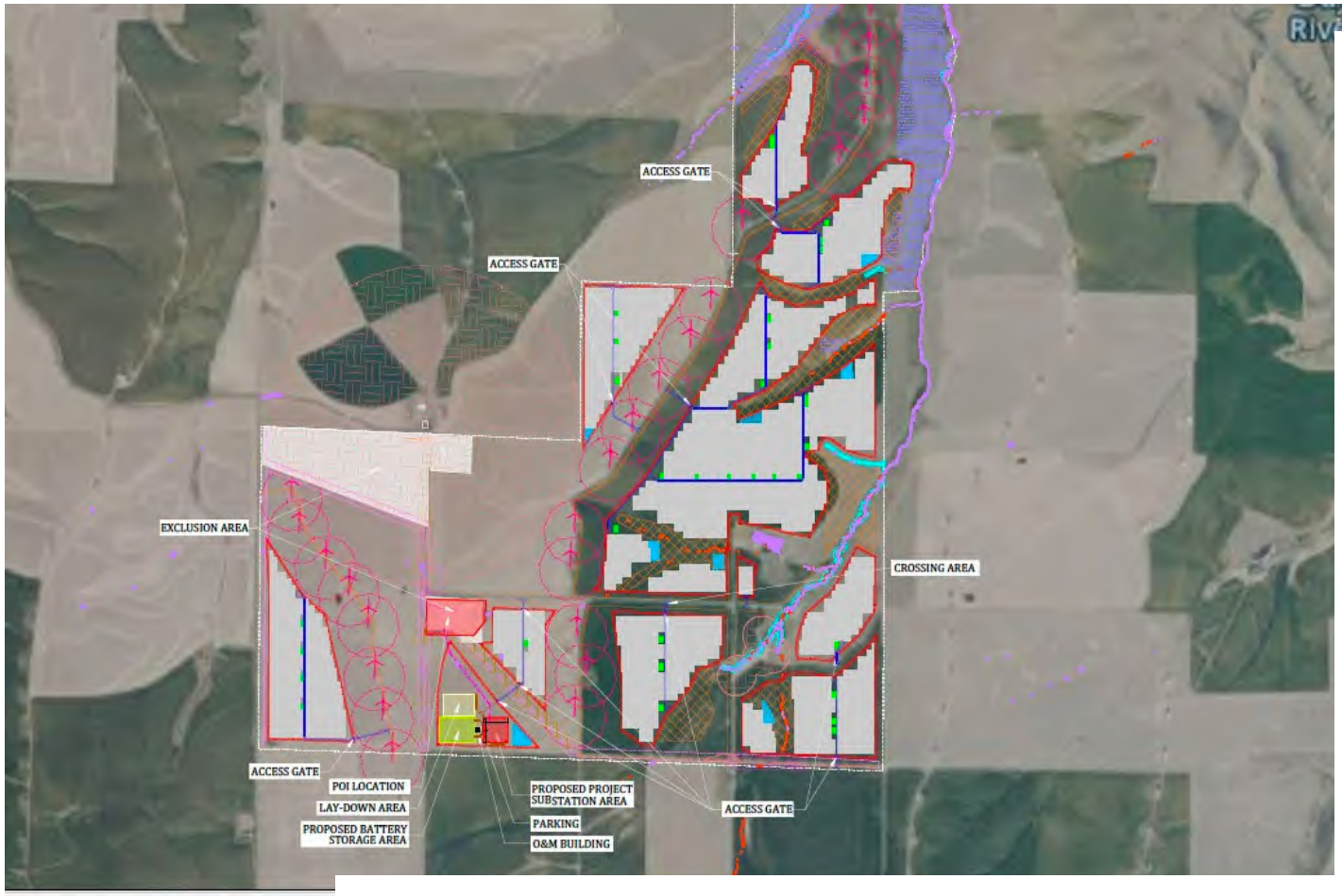
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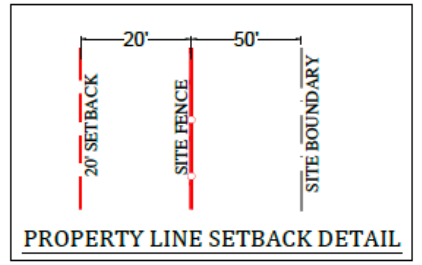
- Engineering

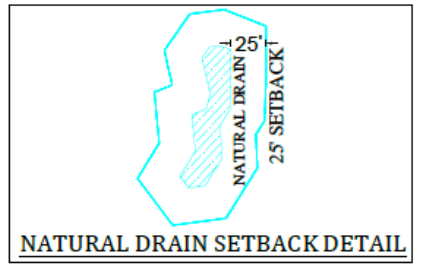
- Ranjith (BESS)
- Arturo (PV)

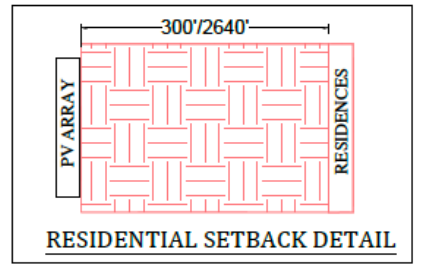
Overall Site Layout

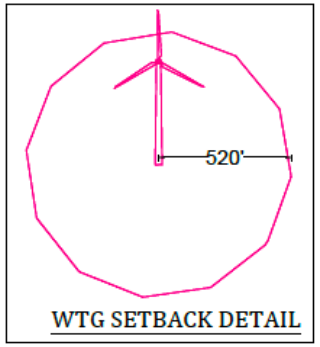
Kathleen/Arturo
to update further

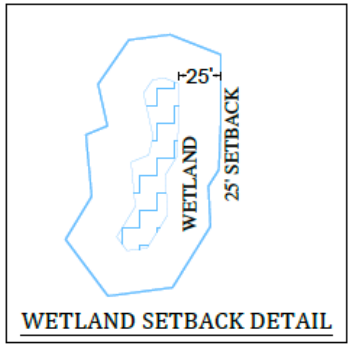


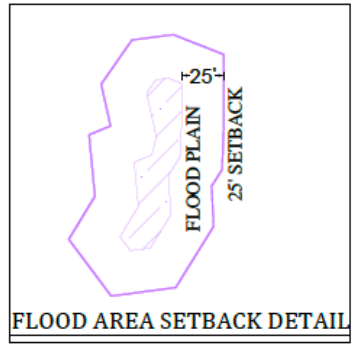


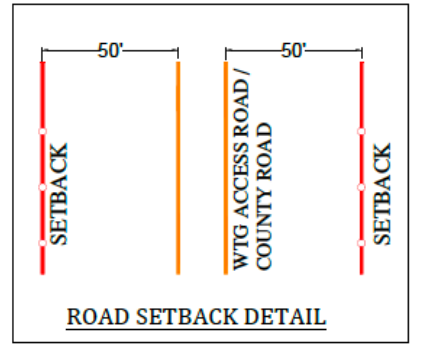








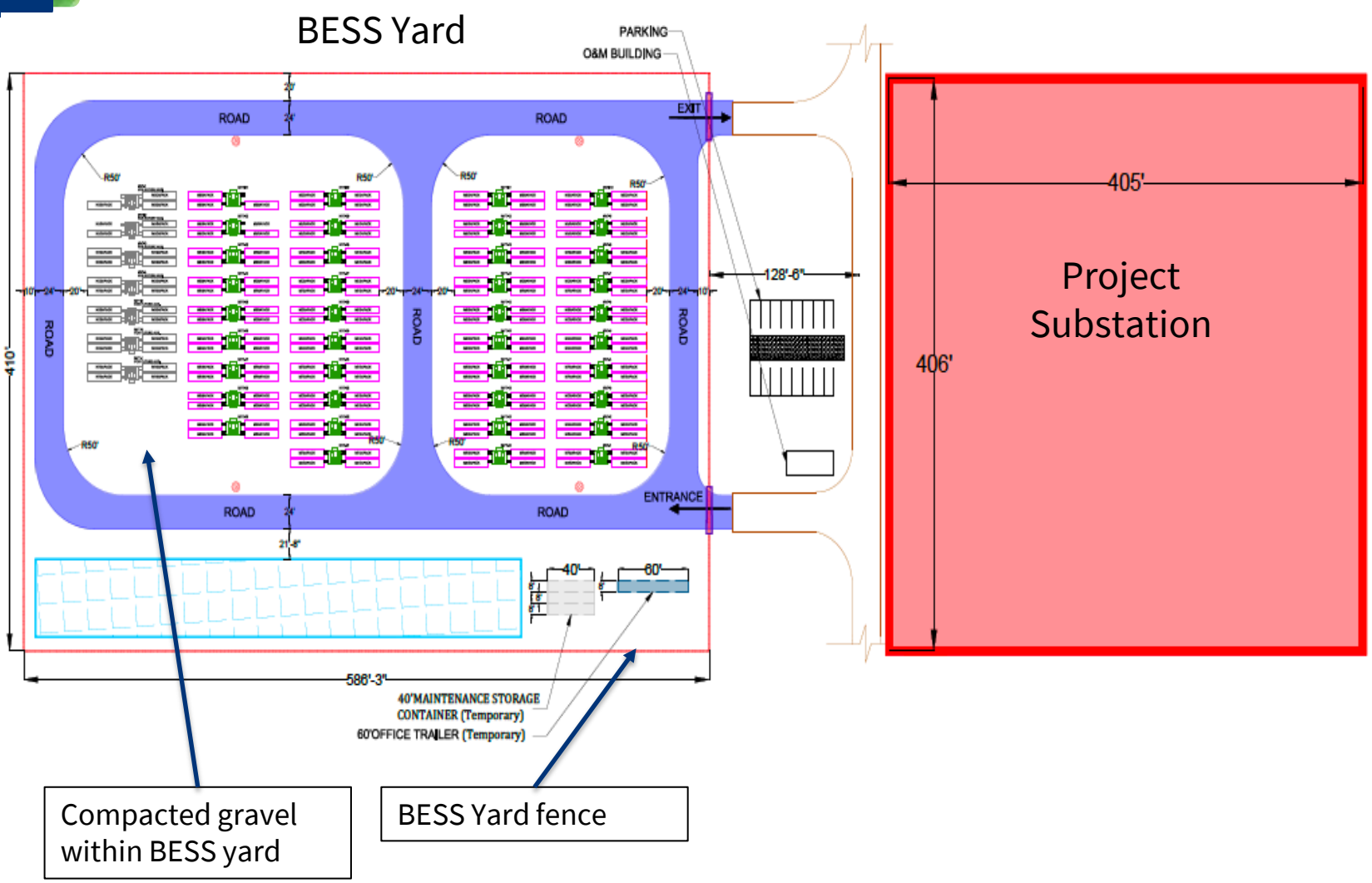




Add solar (expected component)

Arturo to update

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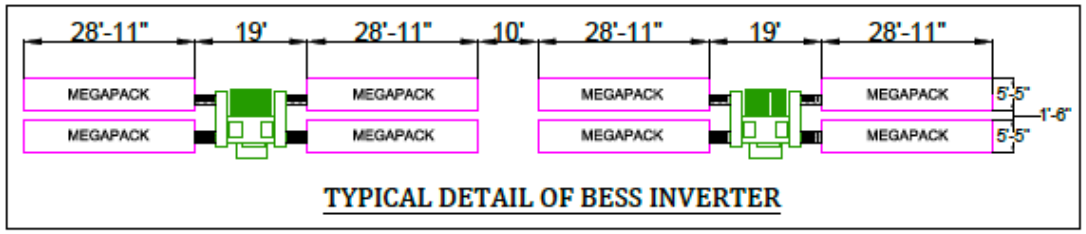
BESS Equipment Details



- Manufacturer and Model – Tesla Megapack 2XL
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  - Battery Cells – UL 1642



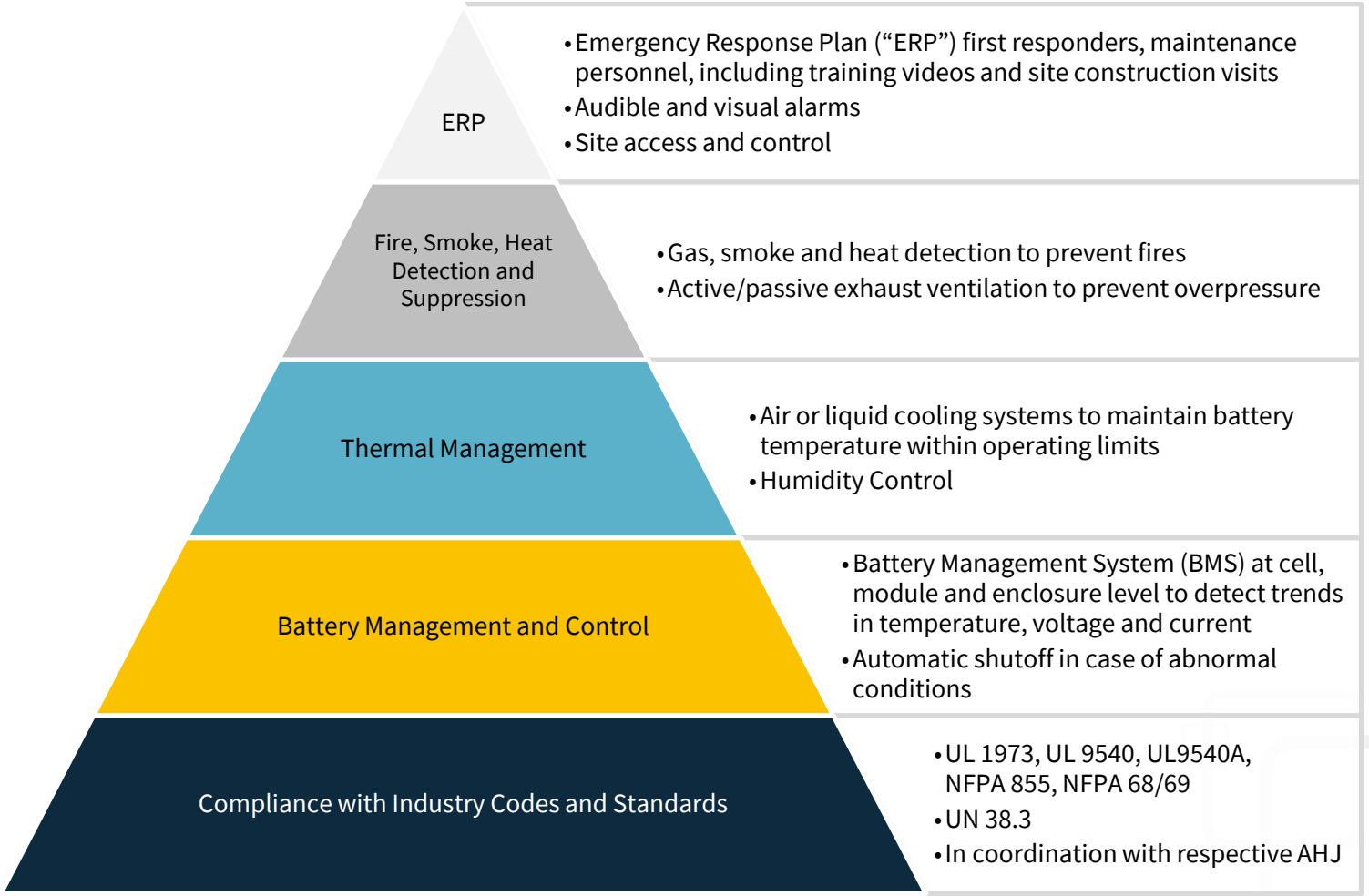
TYPICAL DETAIL OF BESS INVERTER

- Safety & Emergency Response
- Kathleen + Coffman

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Coffman Energy Storage Experience

TETRA TECH

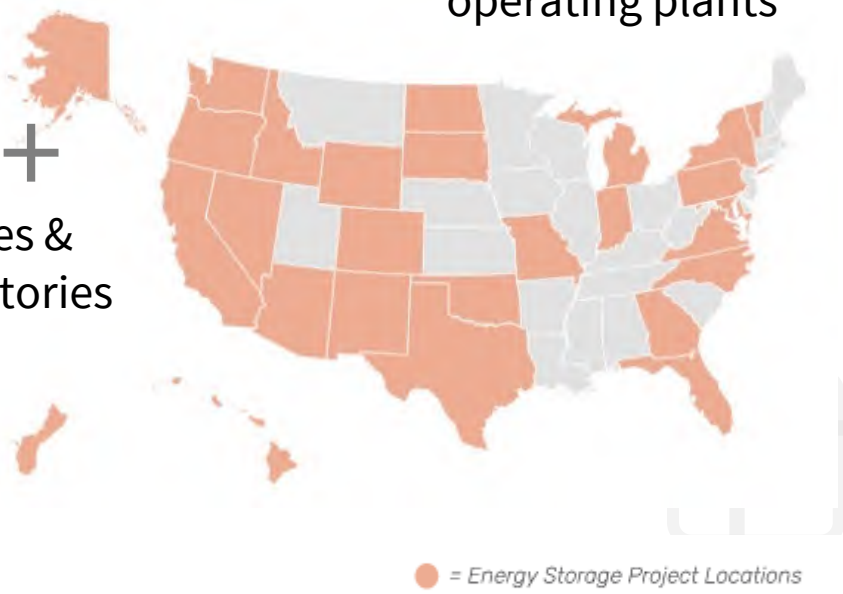
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Lithium Batteries





Tesla Megapack Fire Protection Systems

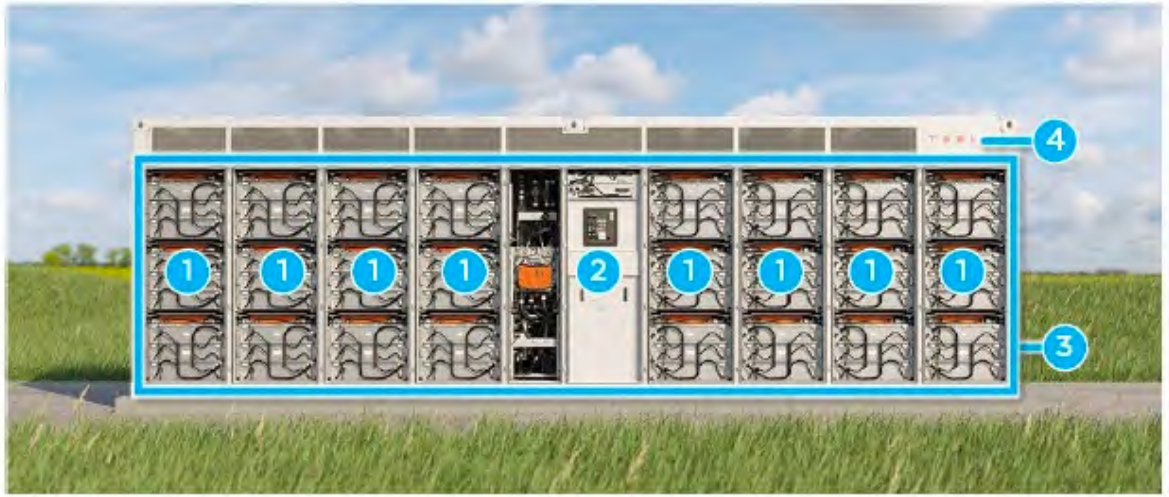
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Discussion

- Emergency Response Plan (finalize prior to construction)
- Construction Wildfire Mitigation Plan (finalize prior to construction)
- Operations Wildfire Mitigation Plan (finalize prior to operations)

Attachment B: Memo – Effects of Solar Energy Development on Vegetation and Soils

TETRA TECH

Memo

To:	Kathleen Campanella
Cc:	Maribeth Sawchuk
From:	Anjali Manoj, GIT (Tetra Tech); Kiana Ziola (Tetra Tech)
Date:	July 2, 2025
Subject:	Effects of Solar Energy Facilities Development on Vegetation and Soils

Several research publications were reviewed to determine the impacts of the development of solar energy facilities to the vegetation and soils at these sites. A specific emphasis was given to impacts experienced in arid grassland and shrubland type environments and the impacts were primarily compared to a pre-existing agricultural land use context as these are the typical scenarios applicable to the most solar energy facilities in Washington and Oregon.

Per Natural Resource Conservation Service published data about soil health in the Inland Northwest, in areas dominated by agriculture, especially monoculture crops like wheat, the soils typically have low organic matter, are depleted of nutrients, and have reduced water retention capacity due to the deteriorated soil structure (NRCS 2025). Repeated tillage combined with the shallow rooting depth of crops like wheat when compared to native plants often results in highly compacted layers at the tillage depth and interruptions to natural nutrient cycling processes. These are results Tetra Tech has consistently seen during soil monitoring at various renewable energy sites across eastern Washington and Oregon. The dominant monoculture crops in these regions also implies reduced vegetation diversity as compared to the native grassland and shrubland ecosystems that historically stood in the place of these agricultural lands. Therefore, multifunctional land uses such as the conversion to solar energy facilities have the potential to improve the provision of a variety of ecosystem services (Walston et al, 2021). This is especially true when the solar energy infrastructure in these facilities is interspersed with native vegetation between the photovoltaic (PV) arrays.

In the case of when pre-existing agricultural lands are converted to solar energy facilities with native grassland and shrubland vegetation interspersed, most research indicate that vegetation and soils improve on numerous metrics primarily due to the effect of the PV panels. PV panels favor the creation of heterogeneous microhabitats with lower air temperatures, lower evapotranspiration rates, and higher soil water content as a result of shading. Additionally, the PV panels create surface roughness that slow down wind speed and therefore add protection to vulnerable soils from wind erosion. These conditions can be beneficial to native plants that are seeded to establish in between the PV panels as they provide a better scenario for plant growth, especially in the initial stages of the vegetation efforts (Liu et al, 2019). When native vegetation establishes, the roots penetrate deeper into the soil as compared to crops like wheat. This serves to protect the soils better from erosion by wind and water and allows nutrients to be cycled in the soils to greater depths. Native grasslands and shrublands also feature increased litter that is protected from wind erosion. This further helps in improving soil structure, soil organic matter content, nutrient levels, and subsequently, the ability of the soil to sequester carbon (Liu et al, 2019; Lambert et al, 2021). The increased biodiversity through the re-establishment of native grassland and shrubland vegetation provides some landscape level benefits as well including improved pollinator supply which can benefit agriculture in the surrounding areas (Walston et al, 2019).

Research also points to how the development of solar energy facilities can have some disadvantages. For vegetation seeking to establish under or within the shade radius of the PV panels, the PV panels will intercept sunlight and impact the amount of solar radiation available to plants for photosynthesis in these areas (Sarr et al, 2023). As a result, vegetation communities may struggle to take hold and establish around the panels. The consequence of this is that the

growth of dominant plant species may be inhibited while subdominant species and weeds may take over (Gómez-Catasús et al, 2024). Another likely negative effect of the PV panels noted by some research is the alteration of the local distribution of precipitation. During precipitation, the areas under the panel receive lesser water inputs while areas along the edges of the panels may receive much high-water inputs from the runoff of the PV panels. This effect is only in the period immediately post precipitation and eventually stabilizes between all areas around the panels as the excess water received in the runoff areas of the panels is made up for by the decreased water loss from evaporation experienced under the panels from shading (Gómez-Catasús et al, 2024). Another concern from the development of solar energy facilities is compaction of soils, especially during construction. This is a well-known potential impact in anticipation of which several best management practices, monitoring programs, and adaptive management measures are designed and implemented under the guidance of appropriate authorities ahead of beginning any construction activities of these facilities. Ultimately, the potential disadvantages posed by the development of solar facilities can be mitigated and prevented by a large extent. The ability of the development of solar energy facilities to ameliorate vegetation and soil conditions is dependent on the successful implementation of revegetation efforts post the development of solar energy facilities combined with effective soil protection and reclamation measures.

While the points noted above are primarily investigating the case of agricultural fields that are converted to solar energy facilities with native grasslands and/shrublands interspersed, they are similarly applicable to the case of agricultural fields that are converted to solar energy facilities with agriculture interspersed (Walston et al, 2021). Apart from the shading effect of panels reducing the available area for crop production, there are no significant detriments noted to the crops or the soil from solar energy facilities (Sarr et al, 2023). It is important to note however that the benefits to vegetation and soils noted above will be seen to a much smaller degree due to the nature of crop plants as opposed to native vegetation (Walston et al, 2021).

Overall, research indicates that the development of solar energy facilities serves a net benefit effect to vegetation, soils, and in turn, the ecosystem in the long term by providing an opportunity for the rehabilitation of soils and vegetation that have been affected by agriculture-related interruptions to natural nutrient cycling. When the energy facilities are eventually decommissioned, the improved vegetation communities and soil quality can be a great benefit to continue the establishment of the native grasslands and shrublands or to return the land to agriculture in the future, should the need arise.

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Full Length Article

Modeling the ecosystem services of native vegetation management practices at solar energy facilities in the Midwestern United States

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ABSTRACT

The increasing pressure on land resources for food and energy production along with efforts to maintain natural systems necessitates the development of compatible land uses that maximize the co-benefits of multiple ecosystem services. One such land sharing opportunity is the restoration and management of native grassland vegetation beneath ground-mounted solar energy facilities, which can both protect biodiversity and restore related ecosystem services. In this paper, we applied the InVEST modeling framework to investigate the potential response of four ecosystem services (carbon storage, pollinator supply, sediment retention, and water retention) to native grassland habitat restoration at 30 solar facilities across the Midwest United States. Compared to pre-solar agricultural land uses, solar-native grassland habitat produced a 3-fold increase in pollinator supply and a 65% increase in carbon storage potential. We also observed increases in sediment and water retention of over 95% and 19%, respectively. We applied these results to project the potential benefits of adoption of native grassland management practices in current and future solar energy buildout scenarios. Our study demonstrates how multifunctional land uses in agriculture-dominated landscapes may improve the provision of a variety of ecosystem services and improve the landscape compatibility of renewable energy and food production.

1. Introduction

Solar photovoltaic (PV) energy technologies have exponentially increased across the globe over the past decade (Kabir et al., 2018; Irsyad et al., 2019). Currently, there are over 33 gigawatts (GW) of ground-based large-scale (>1 MW) solar PV energy production in the U.S. (EIA, 2019a), representing about 1.5% of total U.S. electricity generation in 2018 (EIA, 2019b). The proliferation of large-scale solar energy developments is expected to continue across the U.S. over the next decade. For example, the U.S. Department of Energy's National Renewable Energy Laboratory, through its Standard Scenarios Report, estimates around 200 GW of installed electric capacity among ground-mounted solar facilities by 2040 under its Mid-Case scenario, and more than 500 GW of ground-mounted solar facilities by 2040 under its Low-PV Cost scenario (Cole et al., 2019). Like other forms of energy development, land use represents a major challenge for future solar energy deployment. Ground-based solar energy developments require between 2.5 and 3.5 ha per megawatt (MW) (Ong et al., 2013; Hernandez et al., 2014), and approximately 7500 km^2 of total land will be needed to meet 2030 projected solar energy production (Hartmann et al., 2016), roughly the combined size of the states of Delaware and Rhode Island.

Given their large land requirements, questions about the sustainability of solar energy developments have emerged in terms of their compatibility with other land uses such as agriculture (Moore-O'Leary et al., 2017; Hernandez et al., 2019). Ground-based solar energy developments are increasing in agricultural landscapes, due in large part to the siting of utility-scale solar energy developments on former agricultural fields (Adelaja et al., 2010; Adeh et al., 2019). Croplands are generally flat, open, and relatively undeveloped, making them ideal locations for solar energy development (Adeh et al., 2019). This pattern of conversion from agriculture to solar energy development can represent a land use tradeoff between food production and renewable energy production (e.g., Krishnan and Pearce, 2018). As the pressure intensifies on land resources for energy and food production, greater emphasis has been placed on solutions that maximize mutual benefits of multiple

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ecosystem services. Recent approaches have suggested the integration of solar energy with food production, biodiversity conservation, and other ecosystem services (i.e., the energy-food-ecology nexus; Moore-O'Leary et al., 2017; Hernandez et al., 2019). For example, the co-location of solar energy and agriculture, often termed as "agrivoltaic systems", could improve the land-use potential of solar sites for energy and food production (Ravi et al., 2016; Dinesh and Pearce, 2016; Hoffacker et al., 2017; Barron-Gafford et al., 2019). In one study, Barron-Gafford et al. (2019) found that shading by solar PV arrays benefitted the production of crops such as Chiltepin peppers (*Capsicum annuum var. glabriusculum*), jalapenos (*C. annuum* var. *annuum*), and tomatoes (*Solanum lycopersicum var. cerasiforme*) by increasing yields and reducing water requirements while also creating cooler microclimate conditions that improved solar energy production.

Other research surrounding the energy-food-ecology nexus of solar energy has focused on the restoration of native grassland vegetation at ground-mounted solar facilities ("solar-native vegetation") to improve biodiversity and other ecosystem services such as pollination of adjacent croplands (Moore-O'Leary et al., 2017; Walston et al., 2018; Hernandez et al., 2019). In the United States, this approach has focused on vegetation management efforts at solar facilities aimed at establishing native grassland vegetation, such as milkweed (*Asclepias* spp.), native forbs and wildflowers, and other pollinator-friendly vegetation, either among the solar PV arrays or elsewhere within the solar facility footprint area, that attract and support native insect pollinators and other beneficial insect predators by providing food resources, refugia, and nesting habitat. Highlighting the potential significance of this approach, recent research found that over 3500 km^2 of agricultural land near existing solar energy facilities in the U.S. may benefit from increased pollination services through the establishment of solar-native vegetation (Walston et al., 2018).

Conventional ground management approaches at solar facilities often involve the establishment and management of low-growing turfgrass (Walston et al., 2018). While turfgrass provides some ecosystem service value for biodiversity and soil and water control, shifting to native grassland management practices at these locations has the potential to improve the ecosystem services potential of solar energy facilities. Compared to conventional turfgrass approaches, native grassland vegetation may improve ecosystem services related to biodiversity, carbon storage, water conservation, soil retention, and pollination of nearby croplands. Favorable microclimate conditions created by solar PV arrays, such as lower temperatures and greater soil moisture, can improve the performance of native grasses, which increases aboveground biomass and related carbon sequestration (Armstrong et al., 2016; Adeh et al., 2018). In addition, native grasses and forbs typically have deeper root systems than row crop agriculture and turfgrass (Schenk and Jackson, 2002), with root depths of some native grassland species exceeding 2–5 m (Packard and Mutel, 1997). Deeper root systems create the potential for improved soil stabilization and reduced water runoff (Hernandez-Santana et al., 2013). To date, however, these solar-native vegetation ecosystem service benefits have not been adequately quantified or evaluated in a common framework that allows for an understanding of a suite of ecosystem services. Thus, to build upon the previous efforts to understand the ecosystem service benefits of solar-native vegetation, this paper focuses on modeling the potential supply of ecosystem services resulting from different vegetation management approaches at solar energy facilities. Specifically, we were interested in addressing the following question: *What are the multiple ecosystem service benefits of solar-native vegetation compared to pre-existing land uses and other types of vegetation management practices at solar facilities*? To address this question, we conducted a geospatial land use change assessment for solar energy facilities in the Midwest and we developed spatially-explicit models at a regional scale aimed at quantifying differences in the following ecosystem services associated with solar-vegetation management options: pollinator supply, carbon storage, soil retention, and water yield. We then project these results to examine ecosystem service implications of future solar energy development within the region.

2. Methods

2.1. Study area

We examined ecosystem services associated with vegetation management practices at solar energy facilities within the Midwestern region of the United States (Fig. 1). This region is approximately 1.1 million km^2 in size and includes the states of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin. The predominant land use in this region is agriculture (37% of the study area), followed by forest (33%) and grasslands and other herbaceous land cover types (17%). The climate is humid temperate, with an average annual precipitation of 725 to 1100 mm (USDA, 2019). Average annual minimum and maximum temperatures in the region are −9 degrees Celsius (°C) and 29 °C, respectively (USDA, 2019).

Euro-American settlement and associated agricultural intensification has resulted in the decline of the region's grasslands, a diverse vegetation system that was much more dominant and widespread throughout the region prior to the mid-1800s. For example, over 99% of the tallgrass prairie in Illinois, Indiana, Iowa, Minnesota, and Missouri have been lost primarily due to agricultural expansion (Samson and Knopf, 1994). As such, many of the current terrestrial ecological restoration objectives within the region focus on restoration of native grassland and prairie systems. For solar sites in the Midwest, increasing emphasis has been placed on native grassland restoration among the PV arrays (Clean Energy States Alliance, 2020), which is a more compatible habitat type for solar energy development than other habitat types such as forests or wetlands.

2.2. Identification of solar energy facilities and data preparation

We identified the location of large-scale ground-based solar energy facilities (>1 MW) from the U.S. Energy Information Administration (EIA) for the year 2018 (EIA, 2019). The EIA reports generator-level specific information on electricity production facilities, including latitude and longitude information for facility locations and nameplate electricity capacity (MW). We queried the EIA database to only those sectors that were utility or industrial ground-based facilities (sectors 1 and 2). By doing so, we omitted large commercial rooftop facilities from our study. We then used a Geographic Information System (GIS; ArcGIS version 10.6.1) to map the approximate point location of each facility using the latitude and longitude coordinates reported by the EIA. We overlaid these points with the latest online World Imagery basemap within ArcGIS (ESRI, 2019) and digitized the footprint boundaries of all solar sites observable in the imagery. Solar facility polygons were drawn to include the PV panel area plus other areas observable within the fenced area of the facility (e.g., disturbed soil, laydown areas, operations facilities). Most of the World Imagery available for the region was obtained in 2018. We then calculated the size (ha) of each digitized solar facility's footprint polygon. For these facilities, we correlated facility electric capacity (MW) and footprint size (ha) and we used this relationship to estimate the footprint size for solar facilities that were not observed or incomplete in the satellite imagery. The 2018 list of all solar energy facilities in the Midwest, along with corresponding footprint sizes, is provided in Supplement 1.

We conducted a land use change assessment to determine what percentage of solar facilities in the Midwest were developed on former agricultural fields or other land use-land cover (LULC) types. We performed this assessment only for those solar facility footprints that could be delineated in a GIS. Because large-scale solar energy development largely did not appear in the Midwest until 2012, we used 2010 LANDFIRE Existing Vegetation Types (http://www.landfire.gov/evt.php) as the pre-solar land use dataset and determined the composition

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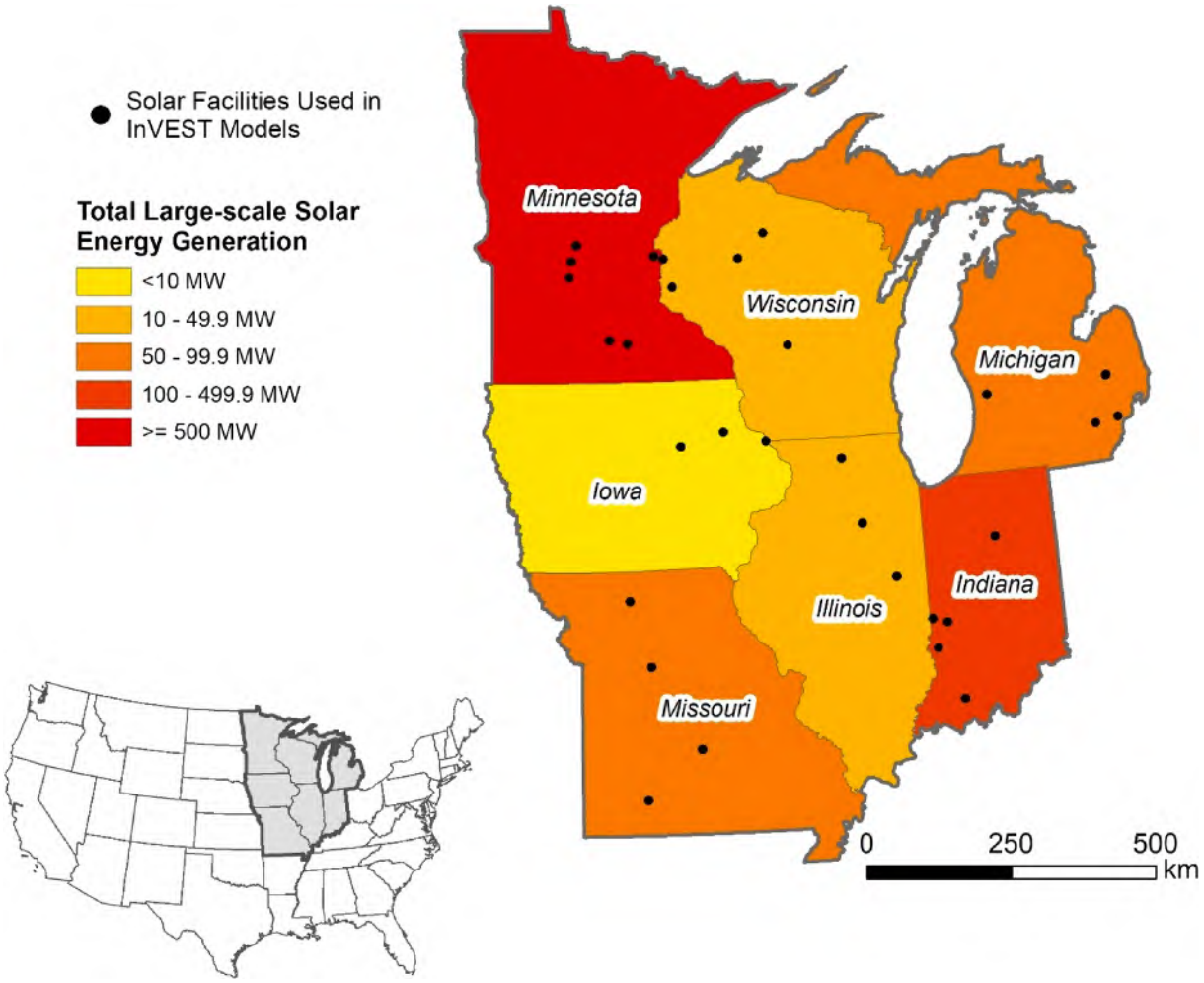


Fig. 1. Total 2018 large-scale (>1 MW) solar energy generation in States of the Midwest region of the United States (source: EIA, 2019). Locations of the thirty solar energy facilities used in InVEST modeling are shown in black.

of 2010 land use types intersecting the solar facility footprints as the measure of LULC change (see Supplement 1).

2.3. Scenarios

To determine the ecosystem services among vegetation management activities at mapped solar energy facilities, we designed three land use scenarios for the solar energy facility footprints: an agriculture scenario (the baseline "pre-solar development" land use) and two solar energy development scenarios – a solar-turfgrass scenario and a solar-native grassland scenario (Fig. 2). Because we assumed the majority of solar facilities in the region were previously under corn-soybean agricultural production (Supplement 1), we replaced all land uses in the solar footprint polygons with agriculture to represent the pre-solar land use. We considered this scenario to be the baseline scenario for comparison. The second scenario we evaluated was a solar-turfgrass vegetation scenario in which we assumed the sodding of cool-season turfgrass within the solar facility. This scenario also involves regular vegetation maintenance at the solar facility such as active mowing and herbicide applications to minimize or prohibit the growth of vegetation (<0.3 m high) within the solar facility footprint. Turfgrass is a common vegetation management practice at solar facilities and this scenario was considered to be the business as usual ("BAU") scenario for operating solar facilities. The third scenario we evaluated was a solar-native grassland scenario in which we assumed the intentional establishment of native prairie grasses and forbs in the solar facility footprint that provide forage and nesting habitat for native insect pollinators. Compared to the turfgrass scenario, the solar-native grassland scenario involves management activities that allow the vegetation to flower and reach heights up to 1 m within the solar PV arrays (the maximum height typically allowed at solar PV arrays to avoid shading of the panels). Because native grasses and forbs typically have deeper root systems than turfgrass (Schenk and Jackson, 2002), we assumed greater above- and below-ground vegetation biomass under the solar-native grassland scenario compared to the solar-turfgrass scenario.

2.4. Modeling framework

We used a multiple service model called Integrated Valuation of Environmental Services and Tradeoffs (InVEST, version 3.6; Sharp et al., 2018) to evaluate ecosystem services under each of the three land use scenarios at the Midwest solar energy facilities. The InVEST suite of tools has been developed to assist decision makers in comparing the impacts of different land use scenarios on the provision of ecosystem services. To our knowledge, this is the first application of InVEST to examine ecosystem service response to solar energy land uses. We used the following four existing InVEST models: Pollinator Model (for pollinator habitat quality), Carbon Storage Model, Sediment Delivery Ratio (SDR) Model (for soil retention), and Water Yield Model (for water retention). A detailed description of our modeling methods and parameters can be found in Supplement 2. Each of these InVEST models incorporate spatial datasets on land use-land cover (LULC) and some of them use elevation,

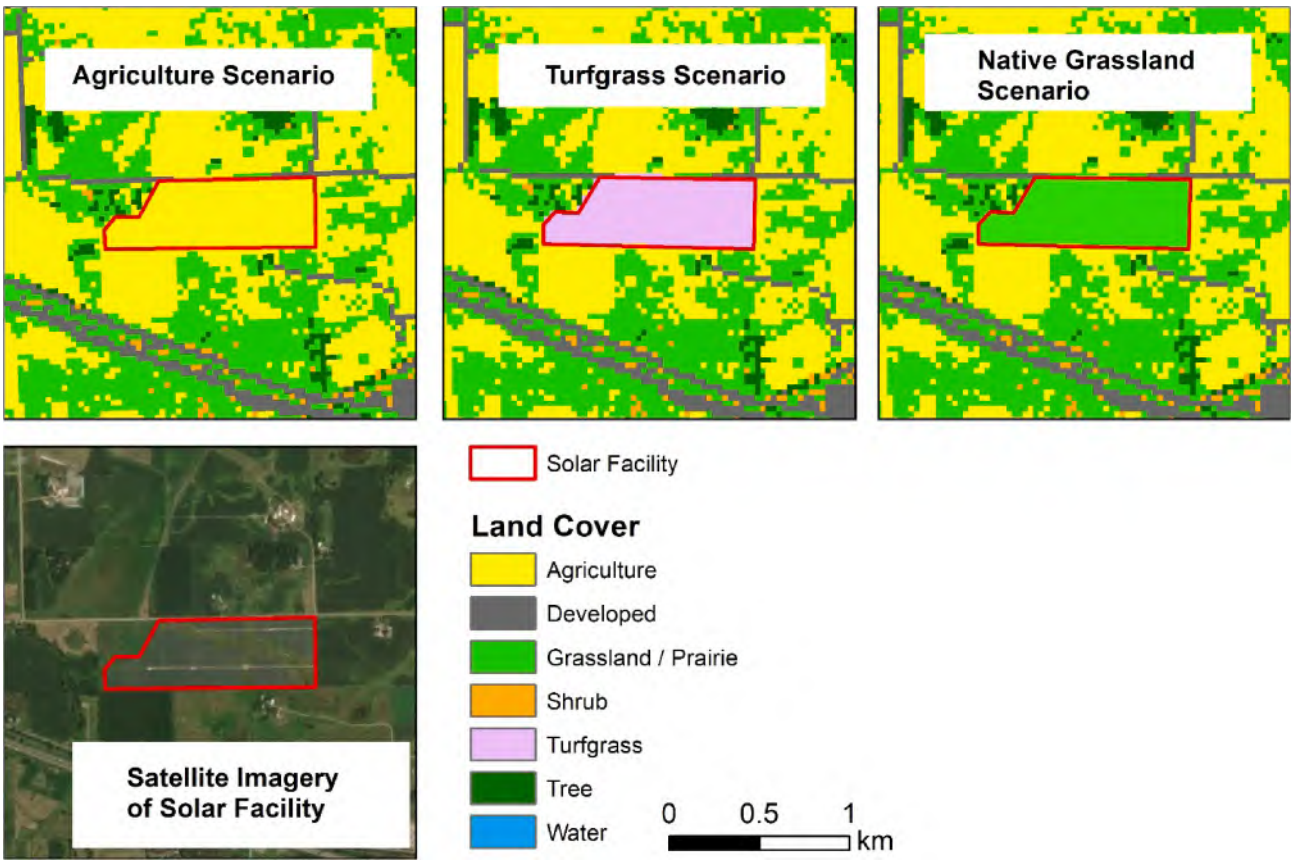


Fig. 2. Vegetation scenarios evaluated in this study. The agriculture scenario represents the pre-solar land use.

rainfall, and soil and vegetation properties, along with tabular biophysical parameters, to conduct spatially-explicit assessments of ecosystem services. The spatial datasets used in the models are also described in Supplement 2.

For this LULC dataset, we used a 30 m raster dataset of vegetated land cover from the 2014 LandFire Program (Existing Vegetation Types; http://www.landfire.gov/evt.php). We initially summarized the LULC map across the entire Midwest region into seven broad LULC classifications based on vegetation life form: developed, agriculture, barren or sparsely vegetated, grassland, shrubland, forested, and water and wetlands. We then updated the LULC map to create an eighth LULC classification representing solar energy facility developments using the footprint polygons delineated from satellite imagery. We selected a total of 30 solar facility footprint polygons, with a minimum of 3 footprints in each state, to update the LULC raster dataset (Fig. 1). This LULC update was performed by overlaying the facility footprint polygons on the initial LULC map and reclassifying the underlying pixels of the LULC map to a unique solar-specific LULC code.

All of the InVEST models also require tabular biophysical parameters to relate land cover types from the LULC map to the individual ecosystem service processes. We reviewed the existing literature to identify studies utilizing these InVEST models in the United States to parameterize each model. Surrogate vegetation and LULC types were used to identify the biophysical parameters to include in each scenario (Table 1).

We used the surrogate LULC types to review existing literature from previous InVEST modeling studies in the United States and summarize the biophysical parameters for each model (Table 2). We ran each model using upper- and lower-bound parameter values based on the 25% and 75% quartile range of values reported in the literature. We used this range to estimate the uncertainty in models and we used the midpoint (average) values in comparing ecosystem services across scenarios. For

Table 1
Land use-land cover (LULC) surrogates for the three land use scenarios modeled in this study.

Scenario	Surrogate LULC types
Agriculture (baseline pre-solar land use)	Row crop agriculture LULC types (e.g., corn-soybeans).
Solar-turfgrass	Residential, suburban, and turfgrass LULC types.
Solar-native grassland	Native grassland and prairie LULC types.

all ecosystem service estimates, we focused on the change in the service delivery for the solar-native grassland scenario compared with the solar-turfgrass scenario and the baseline agriculture scenario. For each scenario, we assumed the surrogate vegetation (Table 1) was consistently and uniformly distributed across all solar facilities. We were not able to use InVEST to model the effect of solar panels on these ecosystem services so we assumed this effect to be constant across all three land use scenarios.

The InVEST Carbon Storage Model is a carbon stock estimation model that is explicitly connected to land cover type. This model calculates total carbon storage (Mg C/ha) for each land cover type based on the aggregation of four carbon pools: aboveground carbon density, belowground carbon density, soil organic carbon density, and dead organic matter carbon density (Sharp et al., 2018). We used this model to examine differences in total carbon storage associated with each scenario.

The InVEST Pollinator Model was designed to model and map patterns of pollinator habitat quality and potential pollination service values across landscapes (Sharp et al., 2018). This model utilizes information on floral resource availability (associated with each LULC type), along with tabular inputs on nesting and foraging parameters for individual pollinator species or species groups, to estimate the supply,

Table 2
Biophysical parameters used in the InVEST Models. The range represents the upper- and lower-bound parameter values used in the models

	Carbon storage model[a]	Pollinator model[b]		Sediment (SDR) model[c]	Water yield model[d]	
Scenario	Total carbon storage (Mg C/ha)	Ground nest availability	Floral resource availability	USLE C-factor	Root restricting layer (mm)	Kc
Agriculture	68.0–88.6	0.137–0.213	0.270–0.400	0.30–0.43	775–925	0.55–0.60
Solar-turfgrass	87.0–104.4	0.310–0.530	0.460–0.580	0.03–0.08	775–925	0.65–0.75
Solar-native grassland	108.0–148.1	0.430–0.570	0.675–0.825	0.01–0.03	1250–1750	0.75–0.85

[a] Sources: Grafius et al. (2016); Johnson et al. (2012); Kovacs et al. (2013); Liebman et al. (2013); Polasky et al. (2011); Sharp et al. (2018); Sun et al. (2018).
[b] Sources: Davis et al. (2017); Kennedy et al. (2013); Zhao et al. (2019). Cavity nest availability assumed to be 0 in all scenarios.
[c] Sources: Bai et al. (2019); Chaplin-Kramer et al. (2016); Grafius et al. (2016) Sharp et al. (2018); Sun et al. (2018).
[d] Sources: Bai et al. (2019); Redhead et al. (2016); Sharp et al. (2018). Kc = Plant Evaporation Coefficient.

abundance, and service value of insect pollinators across the landscape. In this study, we used the pollinator supply InVEST output to assess the ability of each scenario vegetation type to support insect pollinators. As described by the InVEST model (Sharp et al., 2018), pollinator supply is a unitless index (between 0 and 1) indicating where pollinators originate on the landscape. For the purpose of comparing the different vegetation scenarios, we used native bumblebees (Family Apidae) and native sweat bees (Family Halictidae) as the modeled guilds (Supplement 2).

The InVEST Sediment Delivery Ratio (SDR) Model estimates the overland movement of sediment based on topography, climate, soil, and land cover properties. The SDR model is a spatially-explicit model working at the spatial resolution of the input digital elevation model raster (Sharp et al., 2018). For each pixel, the model computes the amount of annual soil loss from that pixel based on a revised Universal Soil Loss Equation (USLE). It then calculates the SDR, which is the proportion of soil loss that reaches the catchment. Finally, the model uses the USLE and SDR to calculate erosion as total catchment sediment export (tons/ha). Inputs for the SDR model include raster maps for LULC, elevation, rainfall, and soil erodibility, along with tabular biophysical attributes related to sediment retention based on land cover type (Supplement 2). We used this model to estimate the amount of surface soil erosion associated with each vegetation scenario. Because sediment erosion represents a negative impact on the landscape, we considered erosion to be the inverse of a positive ecosystem service – soil retention, or the ability of a modeled vegetation type to retain soil.

The InVEST Water Yield Model calculates the net water yield at pixel-based and watershed scales based on the difference between precipitation and actual evapotranspiration. Actual evapotranspiration is a function of reference evapotranspiration, root restricting layer depth, plant available water content, and land cover type (Sharp et al., 2018). Following the methods described by Bai et al. (2019), we used the Water Yield model as an interim step in quantifying water retention: the ability of the modeled land cover type to intercept water from runoff. Water retention is calculated by subtracting runoff from water yield as follows:

$$WR_{ij} = WY_{ij} - Runoff_{ij}$$

where WR_i is the annual water retention (mm/yr) for pixel i on LULC type j, WY_{ij} is the annual water yield (mm/yr) for pixel i on LULC type j (calculated from InVEST), and $Runoff_{ij}$ is the annual surface runoff (mm/yr) for pixel i on LULC type j. Runoff is a product of annual precipitation and a runoff coefficient for each LULC type based on slope and soil type (Supplement 2). Because most solar energy developments are constructed on low slopes (<10%; Hartmann et al., 2016) and most agricultural areas in the region are loamy soils (Hollinger, 1995), we calculated LULC-specific erosion coefficients based on assumed slope of <10% and loamy soil properties.

2.5. Synthesis

We compared the output from the four InVEST models among the three vegetation scenarios. These comparisons were made on a unit-area basis for the 30 modeled solar energy developments and projected to the current amount of large-scale solar energy development in the Midwest region. We also explored the future potential for these ecosystem services by projecting these results to a future solar energy development scenario. Based on solar energy targets identified from state legislation and energy websites (e.g., Illinois Future Energy Jobs Act [S.B. 2814, 2016]; SEIA, 2019; MISO, 2019), we estimated the total foreseeable potential large-scale solar energy development within the Midwest region in the next 10–15 years (2030–2034). Using a solar land use-MW relationship calculated from delineated existing solar footprints in the region (Supplement 1), we estimated the future aggregate solar footprint size and projected our InVEST model results to this scenario.

3. Results

3.1. Solar energy development

We identified 276 large-scale solar facilities in the Midwest region that were operating in 2018, representing a total nameplate electricity capacity of 1183.8 MW (Supplement 1). The state of Minnesota contained most of the region's solar energy development both in terms of the number of facilities and total electricity capacity (Fig. 1; Table 3). Approximately 59% of the solar facilities and over 62% of the region's solar electricity capacity occurred in Minnesota. The state of Iowa contained the fewest number of solar facilities (n = 5) and the lowest amount of large-scale solar electricity generation (9.2 MW).

We identified and mapped the facility footprints of 192 solar facilities from the ESRI World Imagery. The remaining 84 solar facilities were either incomplete or not yet constructed at the time the satellite imagery was collected. We determined a land use-MW relationship of 3.0 ha per MW for all 192 delineated solar facilities (Supplement 1) and applied this relationship to estimate the footprint sizes for the remaining 84 solar facilities. Using the GIS-derived and estimated solar footprint sizes, we determined the total current footprint size among all solar facilities in the Midwest to be approximately 3416 ha (34.2 km^2).

Table 3
Summary of current (2018) large-scale solar energy development in the Midwest region.[a]

State	Current number of solar facilities	Current total nameplate capacity (MW)	Total current estimated footprint size (ha)[b]
Illinois	6	38.5	86.7
Indiana	60	214.3	574.2
Iowa	5	9.2	15.9
Michigan	13	98.3	250.1
Minnesota	163	741.5	2252.7
Missouri	17	61.1	173.2
Wisconsin	14	20.9	63.2
Regional total	276	1183.8	3416.0

[a] Sources: Data for 2018 solar facility development obtained from EIA (2019).
[b] Estimated total footprint size was based on solar footprint polygons digitized in GIS (for those facilities that could be mapped and located with satellite imagery) a land use relationship of 3.0 ha per MW of nameplate capacity for those facilities that could not be located within satellite imagery (Supplement 1).

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We determined the pre-solar construction land uses by identifying and quantifying the amount of 2010 LULC types within the 192 delineated solar facility footprints. By far, the dominant pre-construction LULC type converted to solar energy was row crop agriculture, comprising 70% of the 2010 LULC types within the solar footprint polygons (Supplement 1). This represents a conversion of approximately 2391 ha (23.9 km^2) of row crop agriculture to current ground-based solar energy development. Other forms of LULC conversion included developed areas (15.0%, 512.4 ha), pasture and hay fields (5.4%, 184.5 ha), and forest and riparian areas (4.5%, 153.7 ha).

3.2. InVEST model results

Ecosystem service model results for the 30 Midwest solar facilities, averaged by state, are presented in Table 4 (see Supplement 2 for more detailed results). Differences in modeled ecosystem service results among scenarios were primarily related to LULC changes. We used the variability in reported biophysical parameter values (Table 2) to calculate the range (and midpoint average) of ecosystem service results under each scenario. We found the patterns of ecosystem service provision among scenarios were consistent for the entire Midwest (Fig. 3). For example, the solar-native grassland scenario retained more water than the solar-turfgrass scenario, which retained more water than the agriculture scenario (solar-native grassland > solar-turfgrass > agriculture). We therefore present remaining results using the regional averages of modeled ecosystem services.

Carbon Storage. On average for the entire Midwest region, the solar-native grassland scenario had a potential carbon storage capacity of 129.3 Mg C/ha, which was 65% and 35% greater than the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Pollinator Supply. On average, the solar-native grassland scenario improved pollinator supply by 3-fold and 30% compared to the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Sediment Export. On average, sediment export under the solar-native grassland scenario was 0.007 tons/ha/year, which was a reduction of over 95% and 77% compared to the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Water Retention. On average, water retention under the solar-native grassland scenario was 885.0 mm/yr, which was 19% and 9.5% greater than the agriculture and solar-turfgrass scenarios, respectively (Table 4; Fig. 3).

Table 4
State and Midwest regional average ecosystem service results.

State	Agriculture scenario	Turfgrass scenario	Native grassland scenario
Carbon storage (Mg C*ha^{-1})			
All States	78.3	95.7	129.3
Pollinator supply (unitless index)			
Illinois	0.032	0.071	0.094
Indiana	0.032	0.072	0.094
Iowa	0.032	0.074	0.093
Michigan	0.032	0.076	0.095
Minnesota	0.033	0.074	0.098
Missouri	0.034	0.076	0.101
Wisconsin	0.034	0.079	0.100
Regional average	0.033	0.074	0.096
Sediment export (tons*ha^{-1}*yr^{-1})			
Illinois	7.084	0.536	0.131
Indiana	2.935	0.237	0.062
Iowa	2.165	0.168	0.041
Michigan	0.837	0.065	0.017
Minnesota	3.449	0.258	0.063
Missouri	10.252	1.061	0.263
Wisconsin	0.528	0.039	0.009
Regional average	0.327	0.030	0.007
Water retention (mm*ha^{-1}*yr^{-1})			
Illinois	832.3	910.0	1007.4
Indiana	740.3	812.6	900.1
Iowa	666.8	725.0	791.5
Michigan	733.0	783.2	842.4
Minnesota	748.3	803.2	869.3
Missouri	748.9	820.5	907.3
Wisconsin	762.2	824.7	904.1
Regional average	744.3	808.0	885.0

3.3. Projections to current and future energy scenarios

Using the Midwest regional averages for all calculations, the solar-native grassland scenario for all existing solar facilities (3416 ha) had the potential above- and below-ground carbon storage capacity of 267,473 Mg C, which was 174,216 Mg and 114,778 Mg greater than the agriculture and solar-turfgrass scenarios, respectively (Table 5). The solar-native grassland scenario conserved over 1000 tons more sediment from erosion than the agriculture scenario and 79 tons more sediment than the solar-turfgrass scenario. For existing solar energy developments, the solar-native grassland scenario retained over 4,800,000 m^3 and 2,600,000 m^3 more water than the agriculture and solar-turfgrass scenarios, respectively (Table 5). Because InVEST calculates pollinator supply as a unitless index value, we did not make future projections for pollinator habitat quality.

Based on solar energy targets identified from state legislation and energy websites (e.g., Illinois Future Energy Jobs Act [S.B. 2814, 2016]; SEIA, 2019; MISO, 2019), we conservatively estimated the amount of large-scale solar energy development for a future 2030–2034 time period to be approximately 10,000 MW (10 GW). This represents about 5% of the national 2030 goal for ground-mounted solar set forth by the U.S. Department of Energy (U.S. Department of Energy, 2012). Several Midwestern states such as Minnesota, Illinois, Indiana, and Wisconsin already have a queue of expected solar projects that would collectively reach this level of development in the next 5 years. Based on our calculated regional solar land use estimate of 3.0 ha per MW (Supplement 1), we estimated this future regional solar development footprint to occupy approximately 30,000 ha (300 km^2). If all solar facilities incorporated native grassland vegetation management strategies under this future energy scenario, the total above- and below-ground carbon storage potential of these facilities could exceed 3,800,000 Mg C, which would represent 1,500,000 Mg C and 1000,000 Mg C greater storage potential than agriculture and solar-turfgrass scenarios, respectively (Table 5). Under this future energy scenario, region-wide adoption of solar-native grassland management strategies has the potential to conserve over 9000 tons of sediment loss from erosion annually and retain over 40,000,000 m^3 of water from runoff annually (Table 5).

4. Discussion

Ecosystem services of vegetation management options at solar energy facilities are an emerging field of study. Our study demonstrates how multifunctional land uses in agricultural-dominated landscapes have the potential to improve the provision of a variety of ecosystem services. Numerous studies have demonstrated the effectiveness of native grassland restoration in agricultural landscapes in conserving insect pollinators and restoring important ecosystem services (e.g., Hernandez-Santana et al., 2013; Blaauw and Isaacs, 2014; Schulte et al., 2017). While field studies at solar facilities are currently under way to measure the ecosystem services of different vegetation management options, it will take several years for these field data to become available. To obtain initial estimates, we focused on examining the potential ecosystem services in a spatially-explicit manner using secondary data sources and scaled our model results to regional estimates. Our models included input parameters from previous studies in the U.S. that evaluated ecosystem service tradeoffs among various land uses, including

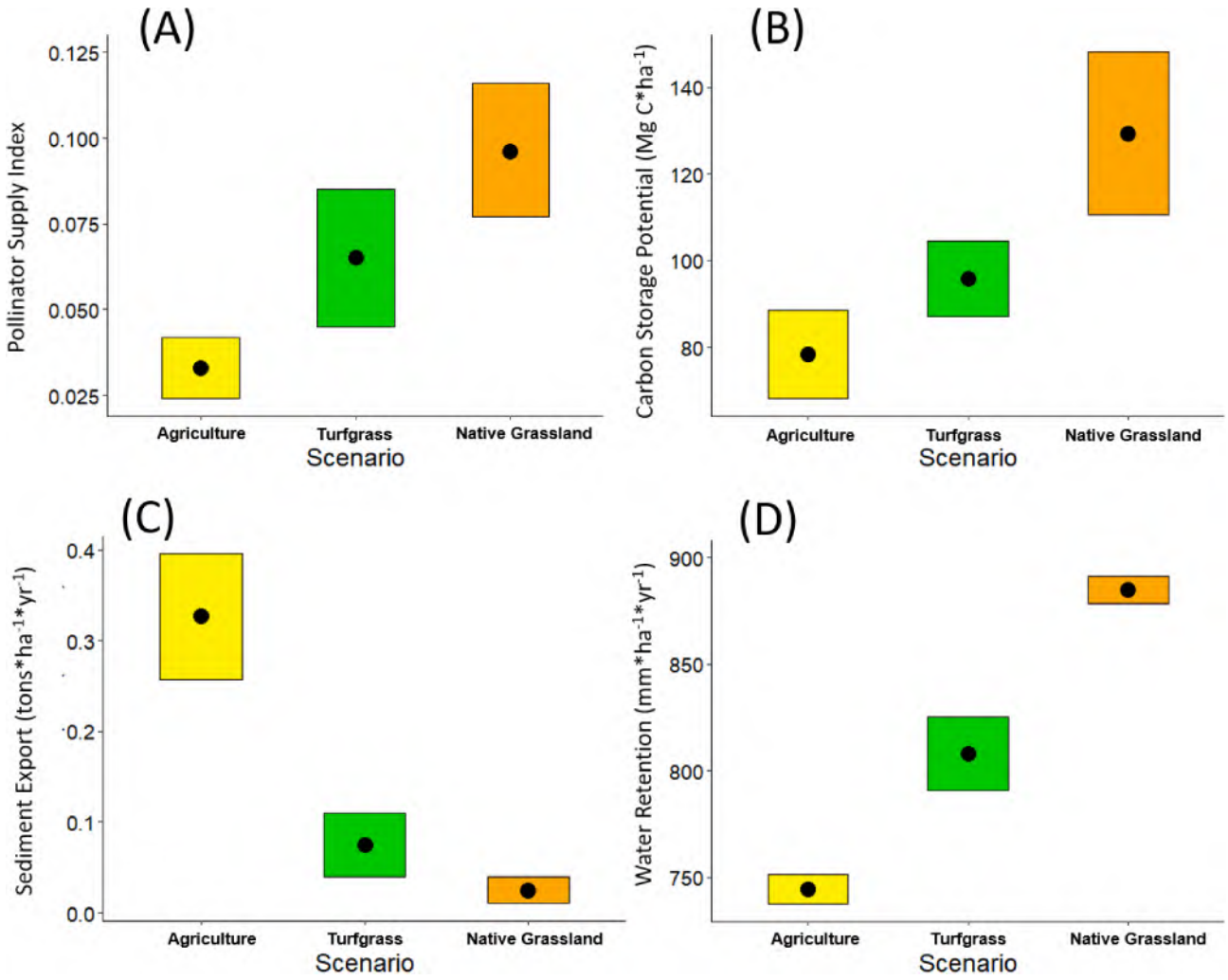


Fig. 3. Average ecosystem service values for the thirty Midwest solar facilities modeled with InVEST: (A) pollinator supply, (B) carbon storage, (C) sediment export, and (D) water retention. Tiles represent the upper- and lower-bound estimates based on the 25% and 75% quartiles. Points represent the midpoint average values.

Table 5
Ecosystem services projected to the entire current and future solar energy development footprints in the Midwestern U.S.

Solar development time peirod[a]	Agriculture scenario	Turfgrass scenario	Pollinator scenario
Carbon storage (Mg C)			
Current	267,473	326,911	441,689
Future	2,349,000	2,871,000	3,879,000
Sediment export (tons*yr^{-1})			
Current	1117.0	102.5	23.9
Future	9810.0	900.0	210.0
Water retention (m^3*yr^{-1})			
Current	25,425,300	27,601,300	30,231,600
Future	223,290,000	242,400,000	265,500,000

[a] Current time period refers to existing solar energy facilities in the Midwest as of 2018 (1.2 total GW), with a total estimated footprint size of 3416 ha (34.2 km^2) (EIA, 2019). Future time period refers to a future solar energy development scenario (10 GW), with an estimated footprint size of 30,000 ha (300 km^2).

our land use surrogates (agriculture, native grassland and prairie, and turfgrass/suburban land use types). This approach allowed us to examine the potential tradeoffs in vegetation management land uses at solar energy facilities.

There is ample research supporting the InVEST ecosystem service model parameters and output related to our surrogate land cover types (see Table 2 and Supplemental 2). For example, in a study of land use impacts on ecosystem services in Minnesota, Johnson et al. (2012) examined tradeoffs in total carbon storage using estimates of 108 Mg C * ha^{-1}, 100 Mg C * ha^{-1}, and 67.7 Mg C * ha^{-1} for native grassland, developed, and agricultural land use types, respectively. In Wisconsin, Meehan et al. (2013) used the InVEST pollinator model with biophysical parameters similar to ours to associate pollinator habitat with LULC types. They found that switching from annual row crop agriculture (corn) to perennial grasses in Wisconsin would increase pollinator abundance by an average of 11%. In Iowa, Schulte et al. (2017) discovered that prairie strips in corn-soybean dominated agricultural settings reduced total water runoff from catchments by 37%, resulting in the retention of 20 times more soil as compared to an agricultural baseline scenario.

As expected, our models suggest that solar-native grassland improves habitat for local insect pollinators. Overall, we detected a 3-fold increase in pollinator supply under the solar-native grassland scenario compared to the pre-solar development land use scenario (agriculture) and a 30% increase in pollinator supply compared to the solar-turfgrass scenario. The implementation of pollinator-friendly vegetation at current and future solar energy facilities has the potential to benefit biodiversity by providing habitat for insect pollinators and other wildlife (e.g., birds; Clean Energy States Alliance, 2020). In addition, increased abundance and diversity of native pollinators associated with solar-native grassland could improve the services these organisms provide for pollination of

nearby agriculture. A number of studies have found direct correlations between pollinator habitat enhancements in agricultural settings and improved agricultural production associated with beneficial increases in pollinator services (Blaauw and Isaacs, 2014; Pywell et al., 2015; Venturini et al., 2017). In the Midwest, dominant crops such as soybeans may benefit from the presence of native pollinators. For example, pollinator habitat enhancement around soybean fields in Ohio increased native pollinator visitation to soybean flowers and increased soybean yields by up to 23% (Cunningham-Minnick et al., 2019). There are nearly 400 km^2 of soybean fields within 1.5 km of existing solar facilities across the seven Midwest states in this study (Walston et al., 2018), highlighting the potential agricultural pollinator service implications of solar-native grassland.

Compared to baseline agricultural land uses, our models suggest that solar-native grassland has the potential to increase the total carbon storage capacity of all current and future solar energy sites in the Midwest by over 170,000 Mg C and 1,500,000 Mg C, respectively. Putting these estimates into context, compared to the agricultural baseline scenario, the potential total future solar-native grassland carbon storage benefit is equivalent to offsetting the CO_2 emissions from over 5000 GWh of electricity generated from coal-fired power plants (World Nuclear Association, 2011). There are also future implications of solar-native grassland for sediment and water retention. The future solar-native grassland scenario has the potential to reduce over 9000 tons of sediment loss as a result of surface erosion annually and retain over 40,000,000 m^3 of surface water runoff annually from future solar sites. These increases in ecosystem services are equivalent to offsetting the amount of erosion and runoff of over 1000 ha (10 km^2) of row crop agriculture in the Midwest annually (NRCS, 2010).

It is important to clarify that the full ecosystem service benefits modeled in our study may not be immediately observed after the establishment of solar-native grassland. Rather, ecosystem services may gradually increase over time as the native grassland community matures. For example, soil organic carbon accumulates at former row-crop agricultural fields that have been restored to native prairie grasses at a rate of approximately 0.68 Mg C*ha^{-1}*yr^{-1} (McLauchlan et al., 2006). At this rate, an average 10 MW solar facility (30 ha) situated on land formerly used for agriculture that has been planted with native grassland vegetation will accumulate over 200 Mg of soil organic carbon after 10 years of operation. Over the timeframe of a solar energy facility lease period (which may be 20–30 years), therefore, we expect the site's ecosystem service potential to increase and more closely resemble modeled outcomes. Nevertheless, some ecosystem service benefits of solar-native grassland may be more quickly realized. For example, in as little as 3 years post-seeding, newly established native grasslands in Iowa are capable of reducing erosion and runoff in agricultural landscapes (Hernandez-Santana et al., 2013). In another study in Michigan, the establishment of native wildflowers in agricultural systems doubled the abundance of native bees and increased their visitation to nearby blueberry crops by 25% in less than 3 years after wildflower planting (Blaauw and Isaacs, 2014).

Our study focused on comparing the potential ecosystem services of different land management scenarios at solar energy facilities. We recognize some practical considerations in our study that warrant further investigation. First, the InVEST models we used have unique assumptions that relate land use classifications to ecosystem services (Sharp et al., 2018). Therefore, our modeling results were limited by the accuracy of the 30 m land use raster dataset we used and the general ecosystem service relationships that have been developed for those land use classifications. Second, our models did not incorporate sensitivity analyses or field-based validation efforts with primary data collected at solar facilities. Instead, we focused on examining a range of possible ecosystem service outcomes based on secondary sources of data from previous InVEST studies that examined surrogate land use types. This approach allowed us to understand the uncertainty in model results and we used average values to compare scenarios. Validation of our models consisted of comparisons to other InVEST studies that evaluated our land use surrogates. As discussed above, the relative differences in our model results were consistent with these previous studies. Third, we were not able to measure how solar panels may influence the modeled ecosystem services so we assumed the influence of solar panels to be constant. However, the presence of solar panels may influence ecosystem processes. For example, soil evapotranspiration processes may decline by 10–30% under solar panels compared to open sites (Marrou et al., 2013). For these reasons, greater emphasis should be placed on interpreting the relative implications of our results rather than the actual ecosystem service value calculations. Additional work is needed to collect the primary data on ecosystem services at solar energy facilities, collect data on the temporal patterns of these ecosystem services in relation to habitat establishment, and examine the effects of solar panels on processes such as runoff, erosion, and carbon storage.

5. Conclusions

The establishment of native grassland vegetation at solar energy facilities is a strategic land use practice to improve the landscape compatibility of solar energy development (Walston et al., 2018; Hernandez et al., 2019). Recent attention on this strategy from the solar industry, natural resource agencies, conservation organizations, and state governments underscores the amount of multidisciplinary coordination involved in implementing solar-native grassland (EPRI, 2019; Clean Energy States Alliance, 2020). In regions where native grasslands have been lost to other human activities such as agriculture, native grassland restoration at solar energy facilities represents a win-win solution for energy and the environment through the improved ecosystem services provided by the native habitat that may encourage future solar energy adoption. While several states have passed legislation and scorecards to guide the implementation of solar-native vegetation habitat standards, decisions regarding establishment of solar-native grassland also consider the costs of particular seed mixes and costs of seedling establishment, vegetation height restrictions, and long-term maintenance needs (Clean Energy States Alliance, 2020).

This paper is the first to compare the potential ecosystem services related to vegetation management practices at solar energy facilities. Since none of the calculated ecosystem service benefits of solar-native grassland accrue solely to the solar industry or any other group of stakeholders, the calculated values may be better considered as benefits for society-as-a-whole. These findings may be used to build cooperative relationships between the solar industry and surrounding communities to better integrate solar energy into agricultural landscapes. We focused on the potential non-monetary aspects of these ecosystem services in this study. Additional work is needed to collect the primary data that would support economic evaluations to inform solar-native grassland business decisions for the solar industry and quantify the economic benefits of services provided to nearby farmers, landowners, and other stakeholders.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to have influenced the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ecoser.2020.101227.

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RESEARCH ARTICLE

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Solar photovoltaic panels significantly promote vegetation recovery by modifying the soil surface microhabitats in an arid sandy ecosystem

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Abstract

The arid sandy areas have great potential for producing solar power, and a large number of solar photovoltaic (PV) power (SPP) stations have been set-up in these regions across the world. Construction of SPP at large scale certainly changes the land surface with consequences on the local ecosystem. However, few studies have focused on these impacts. This study explored the influence of SPP on vegetation by modifying microhabitats. The soil water content (SWC), evaporation, photosynthetically active radiation (PAR), soil and air temperature (AT), vegetation coverage, biomass, and species richness were measured under different positions of the SPP and outside. The results showed that SWC in the station was much higher than that observed outside the SPP, and the evaporation in the SPP was lower than outside ($P < .05$). The PAR below the PV panel line zone is much lower than the interval (IT) zone. The surface coverage, biomass, and species richness were significantly higher in the SPP than outside the IT zone and outside the SPP ($P < .05$). The AT under the panel was 1.67 times lower than above during the plant growing season. The microhabitat index has a high correlation with biomass, coverage, and species richness. PV panels could impact microhabitat in arid sandy areas and accelerate vegetation recovery progress and quality. The SPP construction would not only supply clean energy but also bring unintended ecological benefits in the future.

KEYWORDS

microhabitats, photovoltaic panels, sandy ecosystem, soil water content, vegetation recovery

1 | INTRODUCTION

Fossil fuels, such as coal, oil, and natural gas, dominate worldwide electricity generation, as well as transportation, heating, and industrial energy demands since the 20th century. This dependence on fossil fuels deepens the impact of global warming and boosts climate change risks. Compared with fossil fuels and other energy sources, such as nuclear power, renewable energy sources, such as solar and wind power, provide viable options for energy supply because of their abundant provision and wide availability on earth (Barthelmie et al., 2014; Miller, Gans, & Kleidon, 2011; MacDonald et al., 2016). Related to multiple climate benefits and sustainable development, renewable energy sources have been widely embraced as a primary solution to the current challenges of global energy demand, climate change, and environmental and societal sustainability (Dincer, 2000; Panwar, Kaushik, & Kothari, 2011). Solar energy is considered as one of the

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most promising alternatives due to its characteristics: inexhaustible, carbon-emission free, and nongenerating liquid or solid waste products (Ito et al., 2003; Tsoutsos, Frantzeskaki, & Gekas, 2005; Ahmed, Al Amin, Hasanuzzaman, & Saidur, 2013; Solangi, Islam, Saidur, Rahim, & Fayaz, 2011). By using solar photovoltaic (PV) panels, solar energy could be translated to electricity and grid connected though PV power stations (Singh, 2013; Sahu, 2016). The solar energy market has got extensive attention from worldwide governments (Creutzig, 2017). Updated to 2017, the total global PV installed capacity already reached 404.5 GW, nearly 225-times higher than the capacity in 2000 (1.8 GW). In 2017, China had installed 53.3% of the world's solar capacity, with an increase of 52.8 GW to its capacity in 2016 (Europe Solar Power, 2018). The United States was the world's second largest PV market and increased 10.6 GW compared with its capacity in 2017. In the same year, Japan holds 12.2% of the global share, whereas Germany took up to 10.6% (Europe Solar Power, 2018). Thus, the PV industry has become a fast-growing industry that has gradually developed a huge market worldwide.

The PV installed capacity of Africa and the Middle East region has also developed very strongly due to their high solar radiation potential. The regional radiation potential values are the most significant data for locating solar power stations (Janke et al., 2010; Sánchez-Lozano, Teruel-Solano, Soto-Elvira, & García-Cascales, 2013; Jahangiri, Ghaderi, Haghani, & Nematollahi, 2016). Other semiarid and arid areas of the world, such as Nevada (USA), Baja California (Mexico), Atacama (Chile), Southern Spain (Organization for Economic Cooperation and Development—Europe), Empty Quarter (Arabian Peninsula), Gobi (China and Russia), Rajasthan (India), Sahara (North Africa), Kalahari (South Africa), and Great Victoria, Gibson, and Tanami (Australia), have a great potential for installing large-scale PV power stations due to the combined conditions of a large amount of available land and areas with high air optical quality (Ito et al., 2003; Muneer, Asif, & Kubie, 2003).

In the latest years, the Chinese Government has prompted plenty of efforts to maintain and develop the solar industry. The solar recourses are unevenly distributed throughout China, which decreases from northwest to southeast. The provinces located in the northwestern part, such as Xizang, Qinghai, Gansu, Xinjiang, and Ningxia concentrate most of the solar energy and thus are considered as the future energy base of China (Wu et al., 2014). Due to the low density of solar energy in nature, and the current transfer efficiency of the solar PV power (SPP; Ito et al., 2003), the solar PV stations need a large land area to install PV panels. Compared with the densely populated and land-scary east part of China, the northwest region of the Country is highly suited to install solar electric stations when considering both land use efficiency and solar energy distribution. Nonetheless, most parts of these regions are plateauing and desert, such as the Gobi and the steppes, which have the most sensitive ecological vulnerability in the whole state (Du, Zuo, Li, Wang, & Xue, 2019). SPP construction would cause significant soil surface disturbances that increase the risk of land degradation of the fragile arid ecosystem.

Some studies have evaluated the environmental impacts of the SPPs during their life cycle, including metrics about the energy payback time and greenhouse gases emissions (Northrup & Wittemyer, 2013). Emissions reduction and health benefits brought by the SPP's establishment are not open to question (Hosenuzzaman et al., 2015). Visual impacts, air pollution, and natural resource depletion associated with the installation of PV panels were also evaluated (Tsoutsos, Frantzeskaki, & Gekas, 2005). Some researchers have mentioned that SPP could impact and modify landscape during their construction through activities, such as earth movement and by equipment and facilities transportation (Tsoutsos, Frantzeskaki, & Gekas, 2005, Hernandez, Hoffacker, & Field, 2015). Besides, Wu et al. (2014) reported that large-scale concentrated solar power plants in Northwest China had huge and positive influences on the ecological environment, especially in alleviating soil erosion. The ecological impacts of PV panels are often assumed to be negligible, and thus, few studies in the literature investigate the influence of SPP's establishment on the local sandy ecosystem. Besides, many of these effects are hypothesized with little peer-reviewed evidence (Northrup & Wittemyer, 2013). Li et al. (2018) used a climate model with dynamic vegetation to estimate the unintended climate consequences led by large-scale installations of wind and solar farms. These studies indicated that the effects of large-scale solar farms are consistently conducted with significant locally, and further studies are required to assess the impacts of smaller solar farms installed at specific locations (Li et al., 2018). Nevertheless, the environmental and ecological impacts of PV panels are still unresolved questions. The previously available studies about PV panels have not dealt in detail with the impacts on ecological effects in the arid sandy ecosystem.

The study aim is to highlight both the ecological effects and the vegetation changes brought by SPP installed in an arid and sandy landscape of Western China. The SPP located in Yinchuan City was chosen for this study because it is located on the border of the Mu Us Desert. This is a transitional region and is highly sensitive to human activities, such as land use changes (Cao, Yu, Georgescu, Han, & Wu, 2015), and natural factors (Liang et al., 2016). The main contribution of this study is the quantification of the effects of the PV panel establishment on the soil water content (SWC), evaporation, soil and air temperature (AT), surface coverage, biomass, and species richness. The results of this study will enable to ascertain the ecological significance of solar PV station in arid and sandy regions.

2 | MATERIALS AND METHODS

2.1 | Study sites

This study was carried out in the SPP (38°31′57″N, 106°36′47″E; 1,222 m a.s.l.) constructed near Yinchuan City, at Xingqing District (Figure 1a). This area is located in the southwest border of the Mu Us Desert, in the Ningxia Hui Autonomous Region, China. The study area is part of the wind erosion zone, and it has a moderate temperate continental monsoon climate. The average annual precipitation is ~200 mm, and the annual evaporation is ~2,250 mm. The mean annual temperature is 8.4°C. The annual hours of sunshine are 3,075.5 hr, and the mean annual frost-free period is ~160 days. The most

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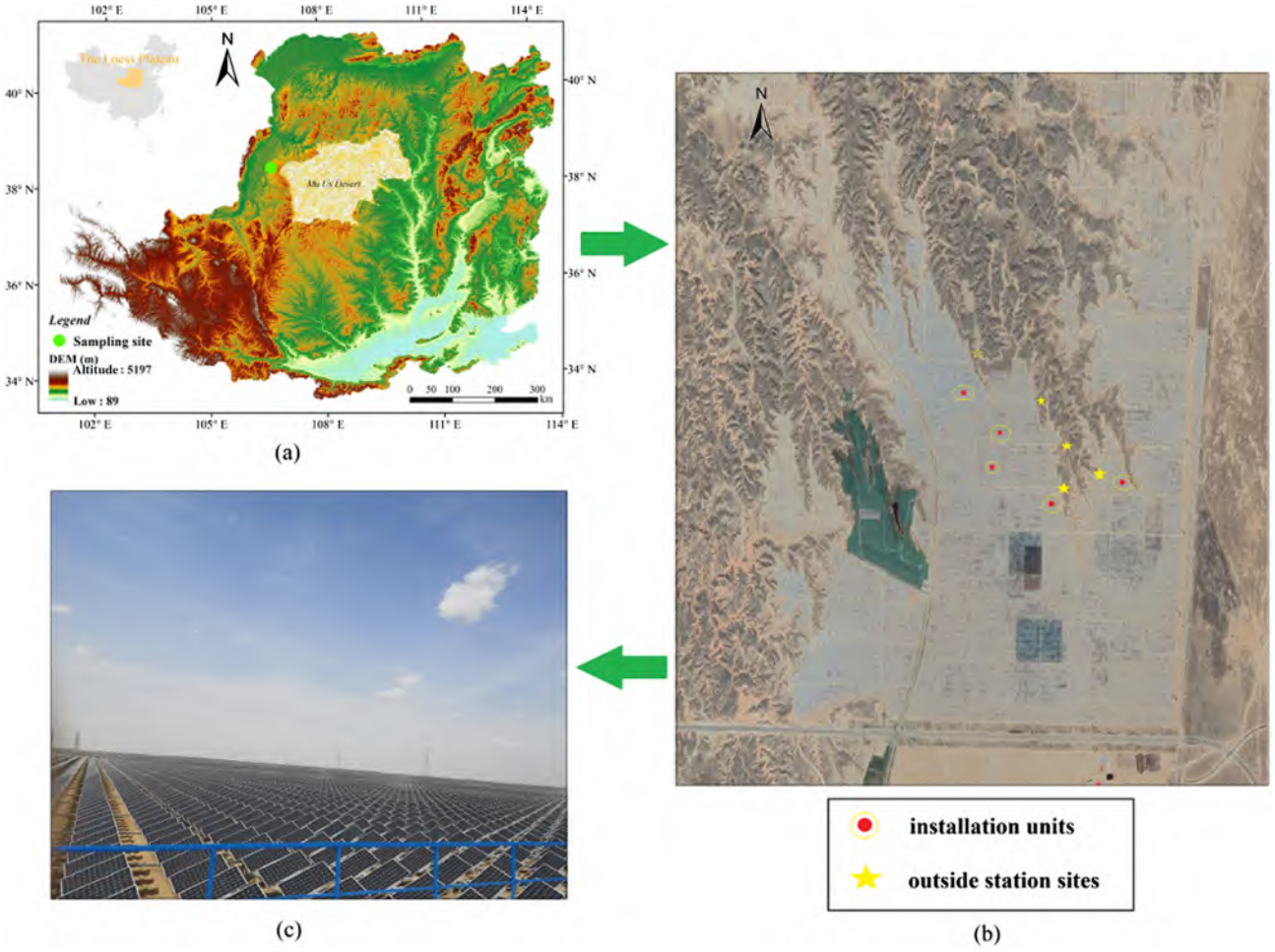


FIGURE 1 (a) The lactation of Baofeng solar photovoltaic (PV) power station. (b) The ichnography of Baofeng solar PV power station and the experiment sites. (c) The large-scale view of the solar PV panels constructed in the arid area. DEM, digital elevation model [Colour figure can be viewed at wileyonlinelibrary.com]

maximum wind frequency is the west wind. The annual daily maximum wind speed (>5 m s^{-1}) days were 167 days in the region. The region's annual solar radiation value could reach 5,600 MJ m^{-2}. The soil type is light sierozem. Natural vegetation is scarce without the presence of forest. Dominant plant species in this area are mainly psammophytic shrubs and herbaceous plants, including *Halogeton arachnoideus*, *Artemisia scoparia*, *Artemisia ordosica*, and *Artemisia sphaerocephala*. All the experiments were conducted in the Baofeng SPP station, which was constructed in 2016. This station occupies an area of about 15.33 km^2 and has an installed capacity of 640 MW.

2.2 | Field experiments

The PV power station was constructed by a vast installation unit, which is 7-m long in the east–west direction, 6.8-m width in the south–north direction, and 2.15-m height above the ground. The PV panels in the installation unit were controlled by an automatic optical tracking system (single axis), which can rotate in the east–west direction. The schematic diagram of the installation unit is shown in Figure 2c–e. We defined three kinds of districts in this study. In one installation unit, the area district vertically below the PV panel line (axis horizontality) in south–north direction was defined as the below line (BL) zone, and the area district between two PV panel lines was defined as the interval (IT) zone. The area district 30 m nearby solar power station was defined as the outside (OS) zone. We randomly selected five installation units in the SPP to stand for the BL zone (5 points) and the IT zone (5 points), and the other 5 points around the SPP stands for the OS zone. All 15 points are shown in Figure 1b. The vegetation in and around SPP is natural growing without any type of grazing (Figure 2a,b). Microhabitat indicators such as soil moisture, soil temperature (ST), evaporation, and photosynthetically active radiation (PAR) were measured in each zone. The AT above and below the PV panel was monitored by temperature sensors throughout the year. An intensive field study was conducted to examine the aboveground biomass, vegetation coverage, and plant species in the three zones. All soil and plant samples were collected from July 23 to 27, 2018.

2.3 | Sampling and measurements

A dual-range digital thermometer (OS542, OMEGA, USA) was used to measure the ST at every point. ST was measured three times every

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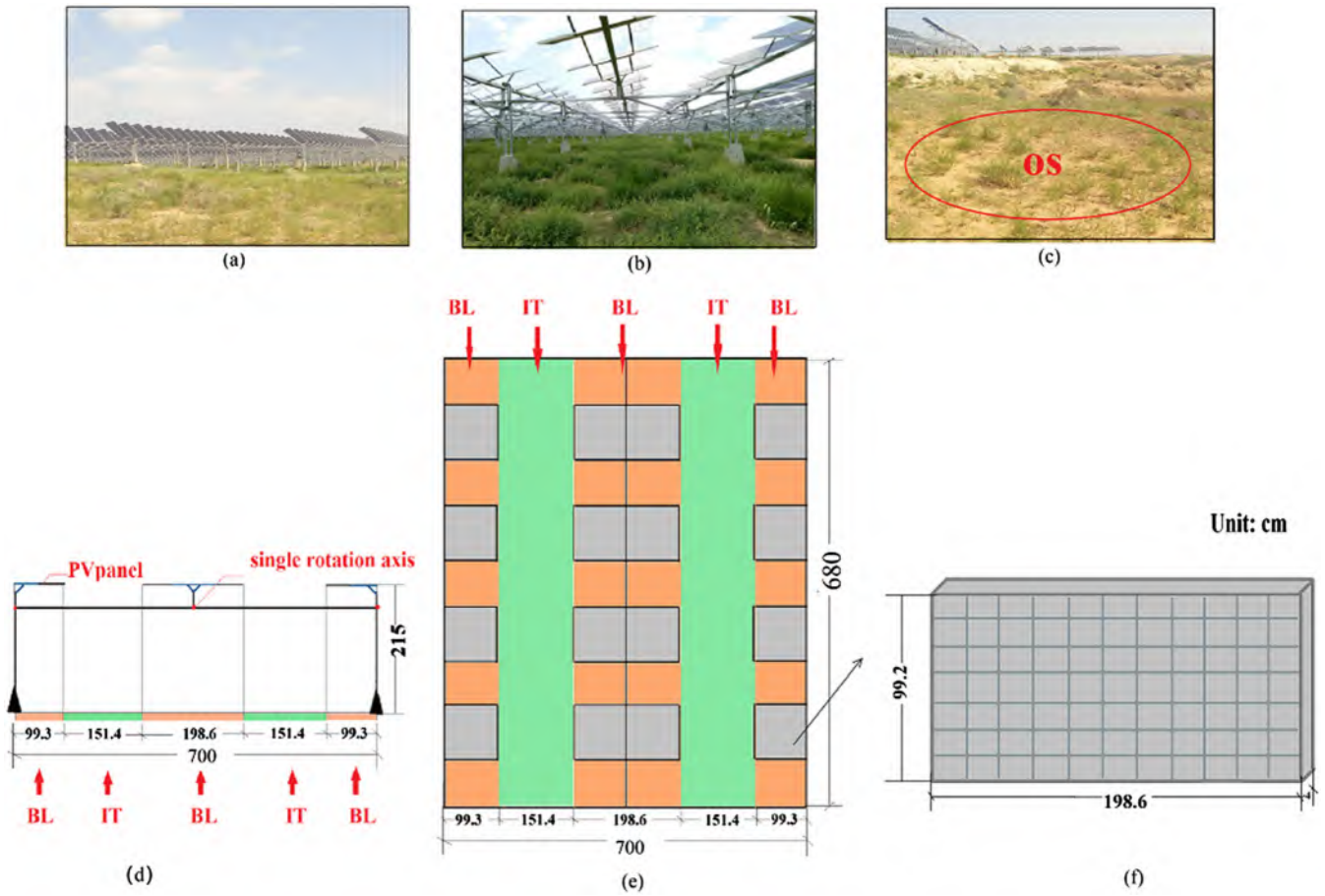


FIGURE 2 (a, b) The vegetation conditions inside and outside the photovoltaic (PV) power station. (c) Example of outside (OS) station zone. (d) The front view (in south–north direction) of an installation unit; (e) the top view of an installation unit. (f) The size of one PV panel. The area district vertically below the PV panel line (axis horizontality) in south–north direction was defined as the below line (BL) zone (orange strip), and the area district between two PV panel lines was defined as the interval (IT) zone (green strip). The area district 30 m nearby solar power station was defined as the outside (OS) zone [Colour figure can be viewed at wileyonlinelibrary.com]

2 hr from 10:00 a.m. to 6:00 p.m. at each point (same location). The position to measure ST is randomly selected at each point about 5-cm height above the ground. The ST of each zone is the average value of 5 points in 6 hr. PAR was also measured three times every 2 hr from 10:00 a.m. to 6:00 p.m. at each point (same location). PAR was measured randomly by a canopy effective radiation recorder (ECA-GG01, Beijing ECOA Company, China) under the vegetation canopy (10 cm above the ground) in the three zones. The average value in 6 hr of 5 points for each zone stands for the PAR of the three zones.

The AT above (10 cm above the panel) and under (100 cm above the ground) the PV panels were monitored with a temperature sensor (S-THB-M002, HOBO, USA) from August 2017 to July 2018. The sensor reads the AT every 5 min. After outliers rejection, we group the AT value in 24 hr day^{-1} and use the daily mean temperature to calculate monthly mean AT. Temperature variation is observed in July 2018. Temperature variation is the difference value of AT above panel and under the panel in 24 hr (the average AT value in 24 hr of July 2018).

Three culture dishes (internal diameter of 150 mm) were utilized as evaporation pan to measure the evaporation of two consecutive days at each point: July 24 and 25. The position of dishes is randomly selected at each point. The culture dishes were filled with water and weighed twice: just before installing and then 24 hr later. The evaporation capacity (*EC*; mm) was calculated as follows:

$$EC = (W_1 - W_2)\rho_w / S_b, \quad (1)$$

where W_2 (g) is the weight of the dish with the remaining water after 24 hr, W_1 (g) is the weight of the dish with the water when it was settled, ρ_w is 1 g cm^{-3}, and S_b is the base area of the standard small evaporation pan (r = 10 cm).

The gravimetric SWC (%) of the 0- to 100-cm soil depth range was measured every 10-cm soil layer by a 4-cm diameter and 20-cm height soil auger at each point. Soil samples were collected in a 1.0m × 1.0m quadrat at each point. A total of 150 soil samples were taken in the three zones. The soil samples were stored in aluminum specimen boxes and weighed immediately after collection (using an electronic balance) and then weighed again after the samples were dried at 105°C for 24 hr. The SWC of each soil layer was calculated as follows:

$$SWC_i = (m_{i1} - m_{i2})/m_2\, 100\%, \quad (2)$$

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where m_1 (g) is the soil sample weight after collection, and m_2 (g) is the weight of the dried soil samples. i is the number of the soil layer, i = 1, 2, 3, ..., 10.

Mean SWC of 0–100 cm (%) was calculated below:

$$SWC = (SWC_1 + SWC_2 + SWC_3 + \ldots + SWC_{10})/10. \quad (3)$$

Plant coverage and species richness were estimated by using five quadrats of 1.0m × 1.0 m. The position of quadrats was randomly selected in each point. All the aboveground plant parts were collected and dried at 75°C for 72 hr in each quadrat, and then the dry mass in each quadrat was weighed. The average value of the dry mass represents the biomass of vegetation in the three zones. The number of species and vegetation coverage was estimated at each quadrat, and the species richness and vegetation coverage of each zone were calculated as the mean value of species number and vegetation coverage obtained in the five quadrats.

2.4 | Data preprocessing and statistical analyses

All data preprocessing was performed using Excel 2013 worksheet software (Microsoft Office Suite, USA). The one-way analysis of variance, Pearson correlation analysis, and the tests of significance were conducted by using SPSS 22.0 software (IBM, Montauk, NY, USA). Significant differences were determined at a significance level of .05. The figures were plotted by using SIGMAPLOT 12.5 software (Systat Software Inc., San Jose, CA, USA), and the table was produced with Excel 2016.

3 | RESULTS

3.1 | Effects of solar PV panels on surface microhabitats

The results showed clear differences in the SWC, evaporation, soil temperature (ST), and PAR between the BL, IT, and OS zones. One the one hand, the spatial pattern of SWC in 0- to 100-cm depth of the three zones was all decreased with increasing soil depth (Figure 3a). However, SWC in the OS zone was always lower than the values in the BL and IT zones considering within 100-cm soil layer. ST has the highest value (33.4°C) in the OS zone, whereas the BL zone had the lowest (30.2°C). The ST of the IT and OS zones is about 3°C higher than the BL zone (Figure 3c). The evaporation and PAR of the three zones were depicted in Figure 3b,d. The evaporation in the OS zone was significantly higher than in the other two zones in the SPP (P < .05), which was two times higher than the BL zone and 1.5 times higher than the IT zone, whereas inside SPP, the evaporation of the IT

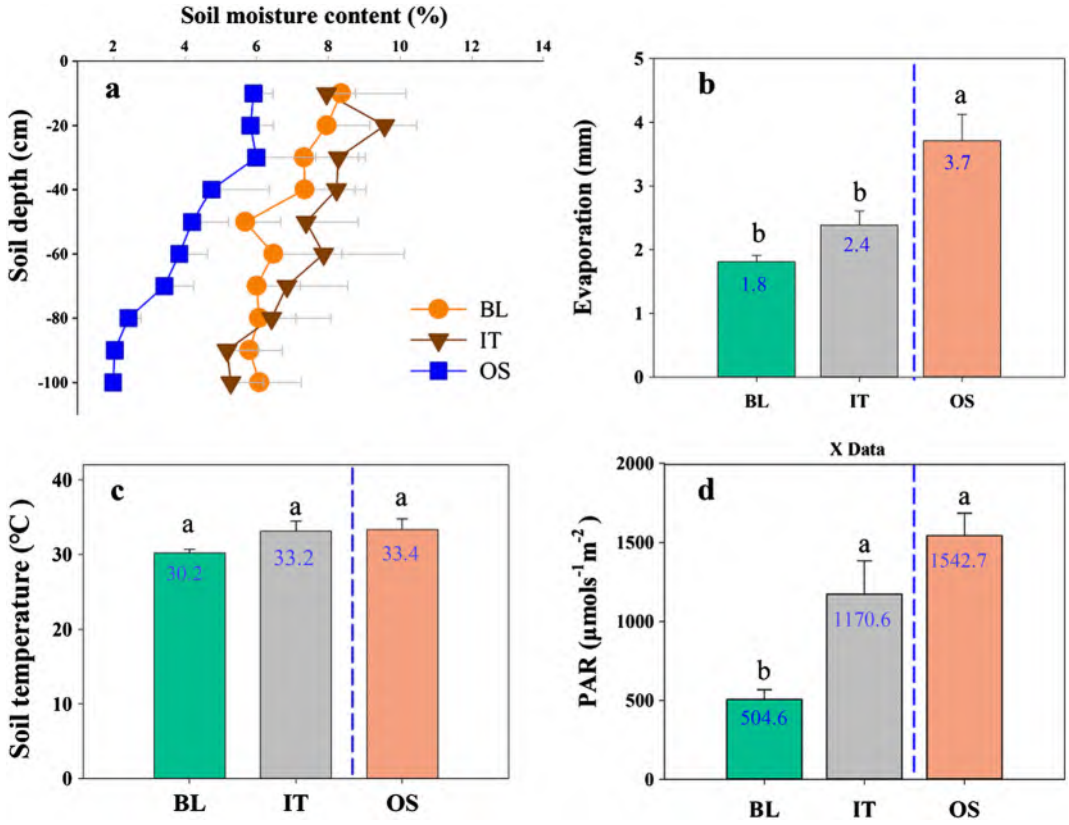


FIGURE 3 Soil moisture (0–100 cm in depth), soil temperature, evaporation, and photosynthetically active radiation (PAR) in the area district vertically below the photovoltaic panel line (axis horizontality) in south–north direction (BL), area district between two photovoltaic panel lines (IT), and area district 30 m nearby solar power station (OS) zones. Means with different letters are significantly different (P < .05) between the three zones. The error bars indicate standard errors [Colour figure can be viewed at wileyonlinelibrary.com]

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zone was 33% higher than the evaporation in the BL zone. Concerning PAR, the highest to lowest PAR values of the three zones was OS > IT > BL. The PAR of the BL zone was significantly lower than the other two zones ($P < .05$): 56.9% and 67.4% lower than in the IT and OS zones, respectively. Besides, the PAR in the OS zone is higher than the IT zone, but between them, there was no significant difference ($P > .05$).

The monthly average AT above the PV panel mirrored the trend of the AT under the panels: In both cases, AT started rising in February and reached the peak values in July (Figure 4a). Between September and November, the AT above and under the PV panel showed little difference. However, during the remaining 9 months, the monthly average AT of above panel was higher than under the panel. During the plant growing season (from April to August), above the panel's average AT of growing season was 36.21°C, whereas under the panel, the average temperature was only of 21.78°C. AT above the panel was ~1.67 times higher than that under the panel during the growing seasons. This AT above and under the PV panel also changed within a day (Figure 3b). We pick July 2018 to observe the daily AT difference between above and under the PV panel. From 12:00 p.m. to 6:00 p.m., AT was strongly reduced by PV panels. During these 6 hr, the temperature variation was above the mean AT variation estimated for the 24-hr period (19.27°C) and reached the biggest temperature variation time period within 1 day.

3.2 | Effects of solar PV panels on vegetation recovery

The biomass and surface coverage in the BL and IT zones were higher than the values in the OS zone (Figure 5a,b). The biomass of the BL and IT zones was 30 and 15.4-times higher than that in the OS zone, whereas the surface coverage was 6.8 and 6.2 times higher than in the OS zone, respectively ($P < .05$). Inside the solar station, the BL and IT zones did not have significant differences in the coverage ($P > .05$), whereas the biomass in the BL zone was nearly 2-times higher than in the IT zone ($P < .05$). The species richness of the three zones showed clear differences between the areas inside and outside the SPP (Figure 5c). The IT zone presented the highest species richness (5.5), the BL zone showed intermediate values (4.5), and the OS zone had the lowest values (2.6). There was no significant difference between the two zones inside the SPP; however, both the BL and IT zones had significant differences ($P < .05$) compared with the OS zone in species richness.

3.3 | The correlation between microclimate and vegetation

The results of correlation analysis for the ecological and vegetation indices are set out in Table 1. The correlation between biomass and ST, evaporation, and SWC was significant ($P < .05$). Besides, biomass between PAR was highly significant ($P < .01$), and its coefficient of correlation was more than −.76. Coverage also had a highly significant correlation with evaporation, PAR, and SWC ($P < .01$). Species richness had a significant correlation with SWC ($P < .05$) and a highly significant correlation with PAR ($P < .01$), and its coefficient of correlation reached −.81. We also concluded that evaporation was negatively correlated with coverage and biomass; SWC was positively correlated with coverage, biomass, and species richness, whereas PAR was negatively correlated with coverage, biomass, and species richness; and ST was also negatively correlated with biomass.

4 | DISCUSSION

Large-scale SPP has been mainly installed in the areas that have minimal competition for land surface against natural and other human land uses, such as deserts like the Gobi, and steppes (Hernandez, Hoffacker, Murphy-Mariscal, Wu, & Allen, 2015). These regions are sensitive to environmental changes where wind erosion might be intensified and sandstorm probability could be increased due to land use changes. Multiple environment impacts may change a lot during

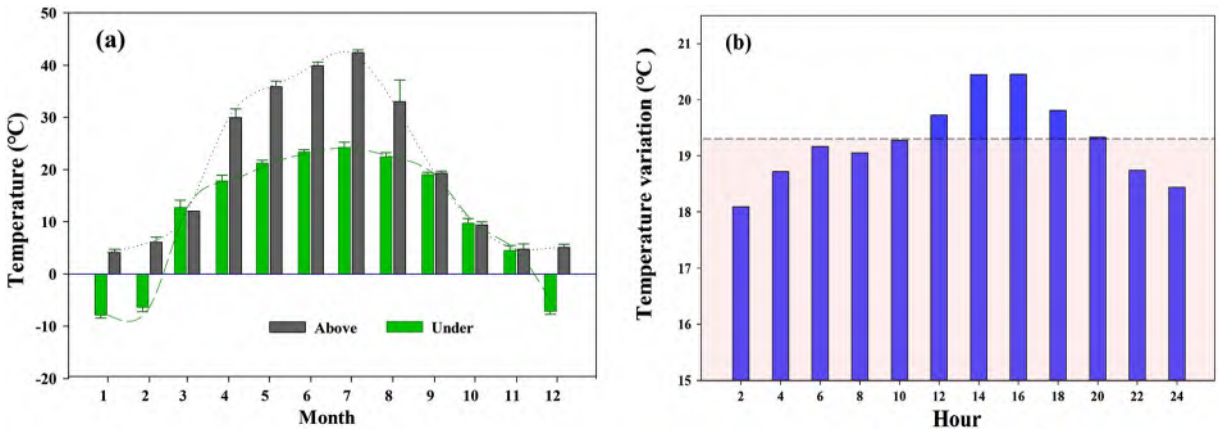


FIGURE 4 (a) Monthly average temperature above and under the solar photovoltaic panels in 1 year. (b) Daily average temperature variation between above and under the solar photovoltaic panels in July. The dash line is the mean temperature variation (19.27°C) in 24 hr [Colour figure can be viewed at wileyonlinelibrary.com]

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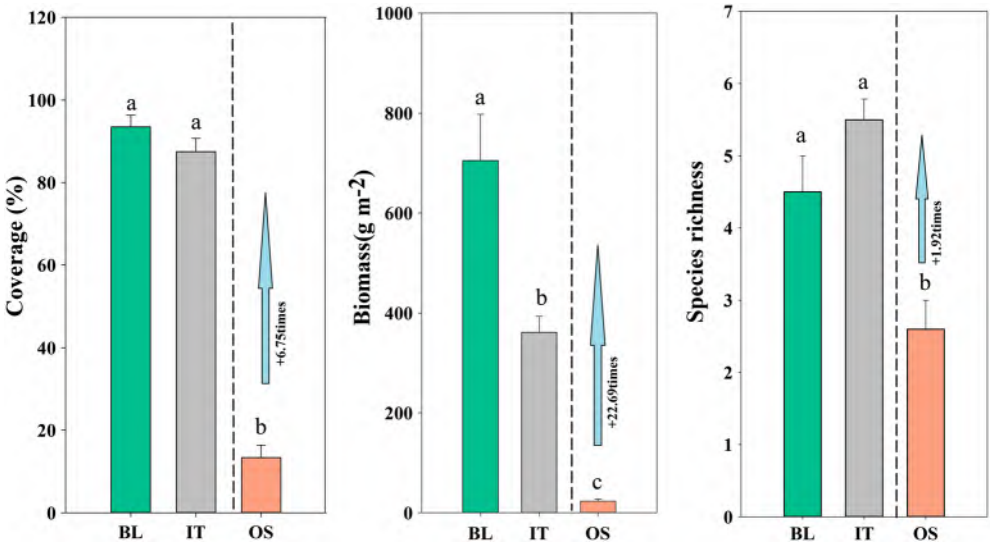


FIGURE 5 Differences in vegetation coverage, biomass, and species richness between the area district vertically below the photovoltaic panel line (axis horizontality) in south–north direction (BL), area district between two photovoltaic panel lines (IT), and area district 30 m nearby solar power station (OS) zones. Different letters indicate that means are significantly different at .05 level ($P < .05$). The error bars indicate standard errors. The blue upward arrows represent the multiplicative increase in coverage, biomass, and species richness between the OS zone and average value of the BL and IT zones [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 1 Pearson correlations between the microhabitat and vegetation indices

Variation	ST (°C)	Evaporation (mm)	PAR (μ $mols^{-1}$ m^{-2})	SWC (%)	Coverage (%)	Biomass (g m^{-2})	Species richness
ST	1.00	0.10	0.71**	−0.04	−0.36	−0.56*	−0.19
Evaporation		1.00	0.36	−0.60*	−0.79**	−0.74*	−0.50
PAR			1.00	0.33	−0.65**	−0.76**	−0.81**
SWC				1.00	0.72**	0.53*	0.62*
Coverage					1.00	0.86**	0.78**
Biomass						1.00	0.45
Species richness							1.00

Note. Microhabitat indices include soil temperature (ST), evaporation, photosynthetically active radiation (PAR), and mean soil water content of 0- to 100-cm soil layer (SWC). Vegetation indices include coverage, biomass, and species richness.

*Correlation is significant at 0.05 level.

**Correlation is significant at 0.01 level.

the SPP's life cycle, especially during the beginning stage. Our study indicates that the existence of SPP would influence the local environmental and ecological status quo. The panels created a heterogeneous radiation habitat and covered ground owing to the fluctuant shading, thus leading a changing energy cycle (Cossu et al., 2014). The changing of the energy cycle led to the variation of the environmental factors. Previous studies have shown that PV panels of large-scale solar farms in the Sahara directly reduced the surface albedo, creating positive albedo–precipitation–vegetation feedback, which triggered an increasing temperature and precipitation (Li et al., 2018). On a smaller scale, this study has shown that the presence of PV panels changed the microhabitat factors in different ways. PV panels convert solar radiation into electricity (Lewis et al., 2006), according to the law of conservation of energy, and the land surface under the power station would receive less radiation than the uncover land (Zhou et al., 2012). Besides, the vegetation coverage in the SPP is much higher than the outside, which further reduced the solar radiation reaching the surface. Hence, the PAR in the station was significantly lower than the PAR outside the station, especially in the BL zone.

ST changed in a quite different way due to the influence of the PV panels, and the ST of the BL zone is still 3°C lower than the IT and OS zones, which was still influenced by the PV panel (Figure 2c). The AT under the panels differed from the AT above the PV panels. AT under the panels was suitable for plants during their growing season. From April to August, the average temperature of the panel was only 21.78°C. A likely explanation is that the radiative balance was modified by the panel shelter, the panels directly decrease solar energy transfer of heat energy through electricity converting and shading

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effect, which provided an open structure with sufficient air circulation (Marrou, Dufour, & Wery, 2013). Plants in arid sandy areas always facing heat stress conditions and in most cases leaves are dried during the growing season. High temperatures could cause serious physiological injuries to plants, such as scorching of leaves and stems, leaf abscission, and senescence (Wahid, Gelani, Ashraf, & Foolad, 2007). Moreover, high temperatures could affect the shoot net assimilation rates that reduce the plant growth, which consequently leads to a decrease in the total dry weight of the plant (Bita & Gerats, 2013). The results of this study showed that PV panels could effectively reduce the temperature during both the growing season and the hottest time of the day, which could to some extent let plants alleviate heat stress and prevent plant productivity decrease.

The water condition was also influenced by the PV panels. The SWC in the SPP was higher than in the area out of it, whereas evaporation just showed the opposite trend. SWC is only recharged by rainfall in the study region. However, the PV panel has changed this process in two aspects. For one thing, the panels directly intercepted part of the precipitation, which could vertically fall into the BL zone without panels. Besides, rainfall could be temporally stored in the panels, and then due to its inclination, the rainfall would redistribute to the soil surface (Armstrong, Waldron, Whitaker, & Ostle, 2014). Thus, SWC in the IT zone was slightly higher than in the BL zone (Figure 2a). The shading effect of the panels explained the significantly lower evaporation that was observed in the SPP (Figure 2b). These results agreed with the study of Marrou, Guilioni, Dufour, Dupraz, and Wery (2013) who found that the shadow of the panels could save up to 14–29% of evapotranspired water in vegetable crops. Furthermore, the shading effects can increase the sensible heat flux of the ground layer, encouraging a decrease of the latent heat flux and soil heat flux, thus limiting evaporation (Coutts, Daly, Beringer, & Tapper, 2013). All these effects caused the observed heterogeneity of SWC distribution. SPPs are usually located in areas that lack water and accompanied by high potential evaporation. Through Pearson correlation analysis, it was shown that there was a high correlation between vegetation coverage, SWC, and evaporation ($P < 0.01$), and its coefficient of correlation was more than 0.72 and −0.79, respectively. Plants that grow in arid areas are highly affected by both temperature (Beedlow, Lee, Tingey, Waschmann, & Burdick, 2013) and water availability (Zhou, Zhang, Ji, Downing, & Serpe, 2011). When vegetation is facing prolonged drought stress, SWC would strongly control the spatiotemporal patterns of biomass (Kammann, Linsel, Gößling, & Koyro, 2011). In water-limited areas, water is the foundation of vegetation planting (Kammann, Linsel, Gößling, & Koyro, 2011). Besides, good water conditions have positive effects on juvenile crop stages, which is vital to vegetation establishment (Marrou, Dufour, & Wery, 2013). The mean vegetation fractional coverage in middle Asia, where Northwestern China is included, ranges from 3% to 33% (Zhang et al., 2016). In our study, we found that the vegetation coverage of the OS zone was 13.4%, just among the average level of coverage. However, the vegetation coverage in the SPP was about 85% lower than that of the BL zone (93.5%), which is a value much higher than the average level of vegetation coverage at a regional scale. At the same time, the biomass and species richness were significantly higher in the SPP than in the area outside. The construction of SPP destroyed the low coverage of natural vegetation; however, after 2 years (2016–2018) of recovery, significant differences in vegetation characteristics had already shown. The vegetation in the SPP had shown a better recovery in terms of quality and speed, which got highly correlation with microhabitat indices SWC and evaporation. This study has indicated that SPP can provide a better water condition for plant growth in arid sandy ecosystems. Under the context of global warming and water resource shortage, the effects of panels could maintain a relatively higher SWC in the soil and lower evaporation, leaving more water for plant growth, and thus facilitate the destroyed vegetation recovery or improve the vegetation coverage in sandy areas. These benefits provide a consistent advantage in the near future.

Prior studies focused on dryland and desert ecosystems have noted the importance of vegetation coverage and biomass to provide important ecological services such as soil protection and animal feeding (Jiang, Liu, Zhang, Zhang, & Wang, 2019). The soil erosion process is influenced by natural and human factors, and thus, it has a close-fitting connection with climate conditions, such as precipitation and temperature, ground cover (e.g., vegetation cover), and land uses (Li et al., 2017; Wei et al., 2017). The ultimate means to combat desertification and protect soil from wind erosion is vegetation construction (Su et al., 2007). Vegetation cover has a lower and upper threshold for controlling wind erosion. A plant coverage lower than 10% has little ability to reduce wind velocity at the soil surface, whereas the effect of vegetation on reducing wind erosion has basically reached the maximum when plant cover is ~40% or above (Jiang, Liu, Zhang, Zhang, & Wang, 2019). This study has indicated that PV panels favored the development of a microhabitat with lower evaporation and higher SWC, moderate temperature, and PAR, which enabled vegetation development with high coverage, biomass, and biodiversity in SPP. The average vegetation coverage in the SPP was 90.5%, which could effectively destroy the wind–sand flow structure. Meanwhile, the PV panels covered more land, modifying the land surface properties, in particular, increasing the surface roughness, which could slow down wind speed. In these two aspects, wind erosion could be efficiently reduced and controlled. Moreover, the higher biomass in the station could let more litter get into the soil, which provides nutrition and improves the soil structure (Jia, Huang, Miao, Lu, Li, Liu, Shen, He, & Wu, 2018; Jia, Liu, He, Miao, Huang, Zheng, Han, & Wu, 2018) that enhances the soil water holding capacity. Meanwhile, the observed better soil water conditions could provide a better scenario for the plant growth, higher biomass production, and total coverage. These changes created positive vegetation–water feedback associated with the other influence brought by SPP. Altogether, these results reflected that the establishment of SPP enhances the resistance capacity of an area against wind erosion and has positive ecological effects under adverse climatic conditions. SPP's installation in arid sandy areas could provide not only electricity energy but also huge ecological benefits brought by a good vegetation condition, which could help other researchers and policy-makers to pay more attention to the ecological benefits besides the economic profits. Our study was just a primary

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research of the PV panel's ecological effects, and further studies will be needed in more sites to gather large datasets that can support sound conclusions.

5 | CONCLUSIONS

SPP in arid areas could perpetuate the efficient use of regional solar recourses and bring both economic and ecological benefits. SPP installation had a big influence on the surface microhabitat in the arid sandy ecosystem of Western China. Higher SWC and lower evaporation constitute better water conditions, which were the key factors of improving the ecological environment in the sandy areas. Moreover, the PV panels could relieve heat stress by adjusting the air and ground temperature during the plants' growing season. This hydrological process and the modified temperature conditions supported the plant growth and thus accelerated vegetation recovery. After 2 years (2016–2018) of recovery, vegetation coverage in the station reached a very high value (90.5%), which could provide effective protection to soil against wind erosion. Furthermore, biomass and species diversity increased owing to the combined influences of the PV panels. Therefore, PV panels made the surface microhabitats different to some extent, and positive vegetation–microhabitat feedback thus could promote the ecological restoration in the arid sandy region.

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REVIEW

Solar photovoltaic energy development and biodiversity conservation: Current knowledge and research gaps

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Abstract

Solar photovoltaic (PV) has become the second renewable energy source, giving rise to potential conflicts with biodiversity conservation. However, the information available about the impacts and mitigation measures of solar PV energy is scarce and scattered, and a rigorous and comprehensive review on the topic is lacking. Here, we review the state of knowledge on its impacts and mitigation measures and identify main knowledge gaps. For that, we reviewed more than 2000 articles, out of which only 180 assessed the impacts of solar PV ($N = 138$) and/or propose mitigation measures (65). Even though Asia and Europe head the list of regions with the highest PV installed capacity (59% and 22%, respectively), a large portion of the existing knowledge is drawn from North American environmental contexts (48% of the studies), specifically from deserts (41%). Impacts were addressed on plants (26%), arthropods (14%), birds (10%), microorganisms (10%), reptiles (7%), mammals (4%), and bats (1%), but also on abiotic factors (e.g., humidity and temperature; 20%) and ecosystem services (3%). Most studies addressed the impact of PV on habitat alteration at landscape (33%) and microhabitat scale (20%), and on microclimate at microhabitat scale (17%), but other topics have been scarcely addressed (e.g., impact on microclimate at landscape scale or the potential of agrivoltaic systems). Lastly, 53% of the studies employed a single PV facility, and preconstruction situations were rarely reported (8%). There is a strong environmental context bias in the current understanding of PV impacts, which might not be extrapolable to other environmental situations like farmlands, where most of the solar PV capacity is being installed. Moreover, standardized and robust sampling designs are lacking to address cumulative, long-term, and long-scale impacts and produce comparable findings across contexts. Given the lack of empirical evidence and the irrepressible development of PV energy, it is advisable to apply an iterative monitoring and adaptive process

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to guarantee a safe energy transition. This review may provide useful guidance on prioritizing research efforts for a smooth shift to renewable energy.

KEYWORDS
ecological impacts, renewable energies, solar panel, utility-scale solar energy, wildlife

1 | INTRODUCTION

Renewable energy is expanding rapidly, reaching an installed global energy capacity of around 3400 GW in 2022 (EI, 2023). These trends are expected to accelerate in the coming years, as an increase of about 1400 GW is forecasted by 2027 (IEA, 2023). The main driving force of this development has been the need to meet the increase in energy demand of a growing human population while meeting the goals set by the Paris Agreement to reduce carbon emissions and mitigate the impacts of climate change (IPCC, 2023; UNFCCC, 2015). Solar photovoltaic (PV) has recently experienced the most notable increase among all renewable energies (Figure 1) (Ritchie et al., 2023) and is projected to surpass natural gas and coal by 2026 and 2027, respectively, becoming the largest energy source (EI, 2023). Nowadays, Asia has the largest installed capacity of PV in the world (618.8 GW in 2022), followed by Europe (227.3), North America (128.9), South America (32.7), Oceania (27.4), and Africa (11.6) (Figure 1), with China (392.4 GW), United States (111.5), and Japan (78.8) being the top three countries (EI, 2023; Ritchie et al., 2023).

PV production costs have decreased rapidly, emerging as one of the most cost-effective technologies for generating electricity worldwide and one of the most promising potentials for mitigating climate change (IPCC, 2022). The establishment of large-scale PV projects comes with a wide range of environmental consequences, including pollution, erosion, and the occupation of land, which stands out as a prominent concern due to the impacts it triggers on biodiversity (Hernandez, Easter, et al., 2014). The viability of PV projects depends on multiple factors (economic, social, technical, and environmental; Wang et al., 2009), and current site planning is often guided by cost–benefit analysis, prioritizing cheap lands close to the transmission network, in detriment of environmental and landscape attributes in some cases, such as seminatural and agricultural habitats in Japan and Korea (Kim et al., 2021). Indeed, a large portion of PV facilities has been installed in agricultural lands, followed by natural and seminatural habitats (Kim et al., 2021; Kruitwagen et al., 2021; Ortiz et al., 2022)—especially arid lands and grasslands—and a clear overlap exists with important conservation areas (Kiesecker et al., 2019; Pérez-García et al., 2022), with the largest conflict occurring in Eastern Asia, Western Europe, and North America (Rehbein et al., 2020). This fact, together with the forecasted increase on PV (EI, 2023), raises concerns about potential conflicts between PV development and biodiversity conservation goals. The current challenge is that the assessment of environmental impacts and the implementation of measures to minimize them keep up with the fast rate of solar PV development for a sustainable energy transition that integrates biodiversity conservation.

The information available about the impacts and mitigation measures of PV energy is scarce and scattered, and some of the potential impacts described are based on hypotheses with little evidence support or on extrapolation from other human infrastructures (Lafitte et al., 2022). Although previous studies have attempted to compile the available information, most have a strong focus on specific contexts (e.g., deserts in the United States; Cypher et al., 2021; Hernandez, Easter, et al., 2014; Lovich & Ennen, 2011) and/or impacts (e.g., collision with PV panels; Kosciuch et al., 2020; Smallwood, 2022; Walston et al., 2016) and thus, a rigorous and comprehensive overall review is lacking. The aim of this study is to review the state of knowledge about impacts and mitigation measures of PV energy on wildlife and ecosystems and to identify the methodological limitations and knowledge gaps where future research efforts should be invested. For that, we reviewed research articles published in peer-reviewed scientific journals, identifying the geographic location, study contexts, ecosystem components, and impacts covered to get a thorough view on the knowledge and claims about PV impacts. Moreover, we assessed whether the number of research studies by world regions has been proportional to the expansion of PV energy to detect where PV development has surpassed the pace of research progress, posing a greater risk to the preservation of biodiversity. The results of this work will help to gain insight into the impacts of PV energy, as well as to guide future research efforts prioritizing knowledge gaps.

2 | METHODS

Following the practical guide for systematic searching and study screening for literature reviews suggested by Foo et al. (2021), we conducted a rapid evidence assessment

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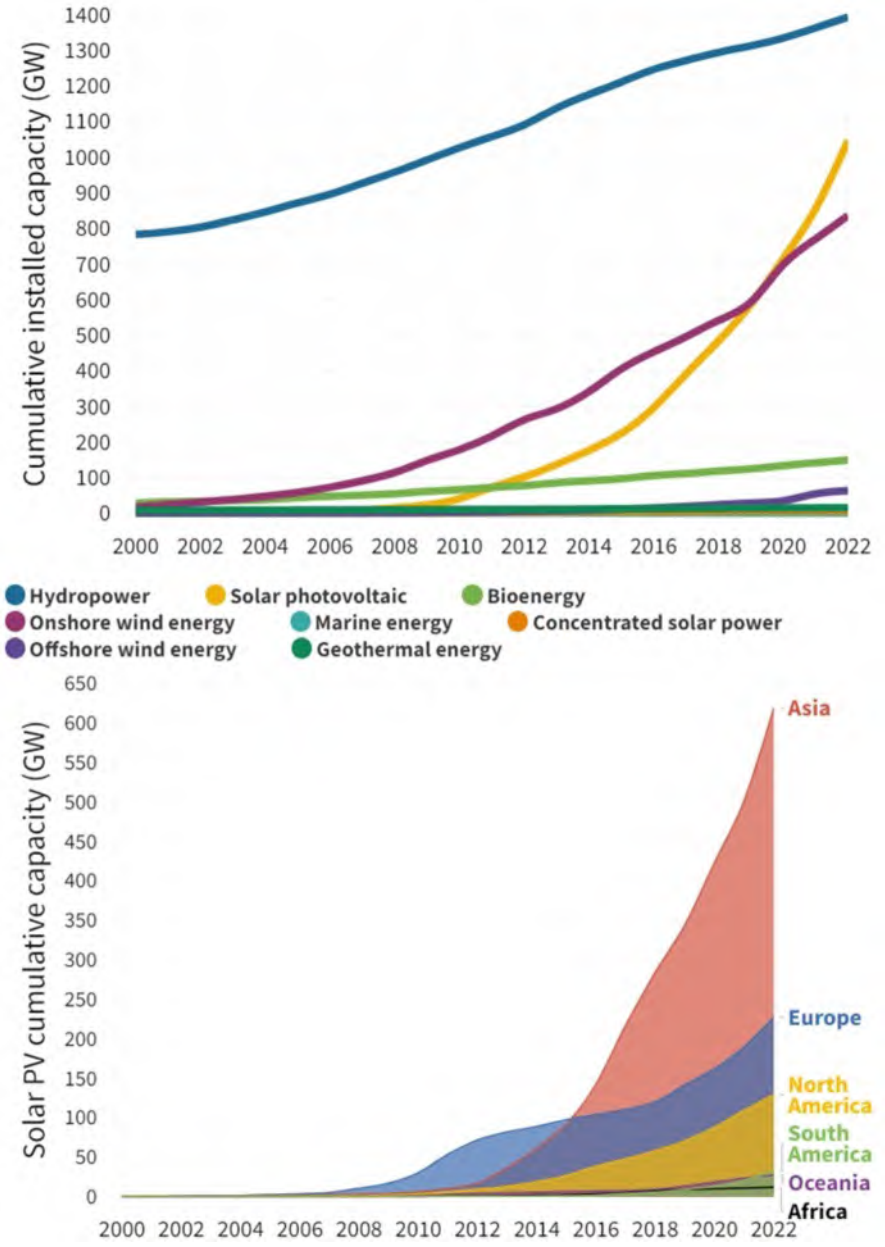


FIGURE 1 Installed global renewable energy capacity by technology from 2000 to 2022 (top) and solar photovoltaic (PV) cumulative capacity from 2000 to 2022 per continent (bottom). *Source*: EI (2023) and Ritchie et al. (2023).

(REA) in September 2023 using all databases in ISI Web of Science (WOS). This REA followed the following steps:

- Search of research articles based on explicit evidence search criteria (see below);
- Systematically collecting data;
- Synthesizing the data.

This was supplemented by searching reference lists and citations of included studies and relevant reviews. Our search was limited to title, abstract, and keywords, and included the following terms: ("photovoltaic energ*" OR "photovoltaic panel*" OR "solar array*" OR "solar development" OR "solar energ*" OR "solar facilit*" OR "solar farm*" OR "solar installation*" OR "solar panel*" OR "solar park*" OR "solar plant*" OR "solar power" OR "utility-scale solar") AND ("*diversity" OR "ecosystem*" OR "*habitat*" OR "wild*"). From the search terms and resulting number of articles in WOS, we excluded records that did not directly address the impacts of PV energy. Although the review was focused on PV energy, we also kept those studies addressing the impacts of concentrating solar energy (CSP) when impacts could be relevant or comparable to PV energy. We only kept those articles based on

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empirical data and removed perspective and policy pieces. The remaining articles were assessed for relevant information and characterized according to broad category classes (Table 1).

First, we divided the articles into the main topics addressed in this review: impact on biodiversity, mitigation of biodiversity impacts, or both. In studies evaluating mitigation measures, we specified the level within the mitigation hierarchy (i.e., avoidance, minimization or compensation of impacts), and we briefly described the mitigation measured applied. To evaluate the environmental contexts underlying current knowledge on impact and mitigation measures of PV energy, we noted the studied topic as well as the geographic location (continent and country), climate (according to Köppen climate classification system), study context (e.g., habitat) covered by each study, and the targeted ecosystem components (biotic or abiotic factors and ecosystem services). Lastly, to assess the methodological limitations of current research, we noted the scale of the studies (whether they covered one or more PV facilities), the study design employed (before-after-control-impact [BACI]; control-impact [CI]; impact [I]; before-after [BA]; Table 1). Further explanation of the compiled information can be found in Table 1.

3 | RESULTS AND DISCUSSION

3.1 | Mismatch between PV deployment and impact research

We found 180 articles assessing the impacts of PV energy on biodiversity (N = 138) and/or proposing mitigation measures (65) (Table S1). These references can be consulted at the "Observatory of Scientific Literature Related to Photovoltaic Solar Energy and Biodiversity", published and updated by the Steppe-Forward Chair. The number of studies has increased significantly from 2015 onwards, with a notable increase from 2022 in Asian and European countries (Figure 2).

Most of the research has been carried out in North America (N = 75; 48.1% of the studies)—with the United States (73, 46.8%) being the main contributor—followed by Europe (34, 21.8%), Asia (26, 16.7%), Africa (6, 3.8%), South America (3, 1.9%), Antarctica, and Oceania (1, 0.6%; Figures 2 and 3). Therefore, even though Asia and Europe head the list of regions with the highest PV installed capacity (59.1% and 21.7%, respectively), a large proportion of the existing knowledge is drawn from North American contexts, which only hold the 12.3% of PV energy installed worldwide (Figures 2 and 3).

Of the empirical studies with specific information on the covered habitats (N = 92), 38 (41.3%) were carried out

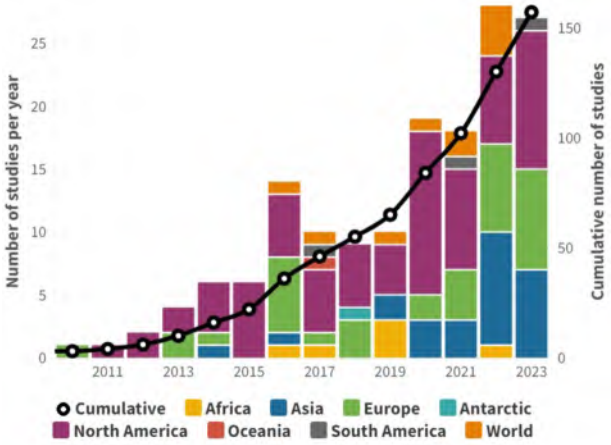


FIGURE 2 Number of studies reviewed assessing the impacts of photovoltaic (PV) energy or measures to minimize them from 2010 to September 2023 per region. Studies carried out under lab conditions (1) and reviews on specific impacts without a geographic focus (23) were removed, totaling 156 articles. "World" refers to studies carried out at global scale.

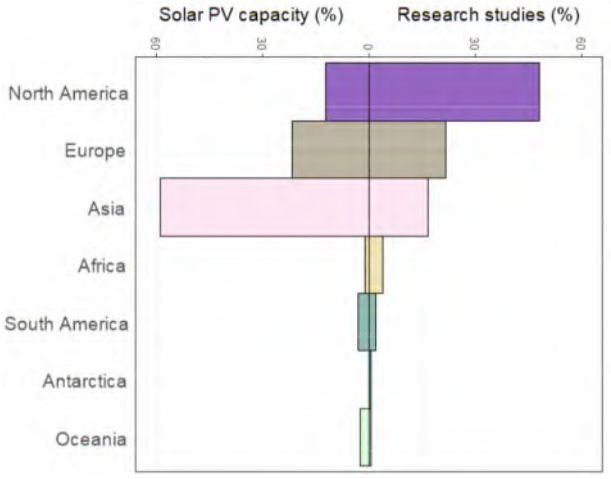


FIGURE 3 Proportion of research studies assessing the impacts of photovoltaic (PV) energy or measures to minimize them (right) and of cumulative installed capacity (left) per region. The percentage of studies is calculated from a total of 156, after removing those carried out under lab conditions (1) and reviews on specific impacts without a geographic focus (23).

in desert ecosystems, 20 in agroecosystems (21.7%; vineyards, abandoned or active fields, and pasturelands), 17 in grasslands (18.5%), and eight in urban environments (8.7%; quarries and waste dumps). Forest, shrubland, and tundra habitats were represented by no more than five studies (<5.5%), and nine studies (9.8%) were experimental tests. A high proportion of studies focused on abiotic factors (e.g., microclimate and soil properties; N = 27 out of 132 empirical studies, 20.4%) and to a lesser extent on ecosystem services (N = 4, 3.0%), whereas most studies

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TABLE 1 Information collected on each of the articles reviewed.

Information	Categories	Explanation
Year of publication		
Approach	Empirical (132)	
	Methodological (3)	
	Review (45)	
Topic	Impact (115)	
	Mitigation (42)	
	Impact and mitigation (23)	
Mitigation hierarchy	Avoidance (26)	Not specified for reviews
	Minimization (29)	
	Compensation (1)	
Mitigation measure		Brief description of the mitigation measure addressed
Geographic location		Region and country
Köppen climate classification*	Tropical (1)	
	Arid (55)	
	Temperate (44)	
	Continental (21)	
	Polar (1)	
	Regional or global scale (29)	
Study context*		
	Agroecosystem (20)	
	Desert (38)	
	Forest (5)	
	Grassland (17)	
	Laboratory (1)	
	Not specified (3)	
	Not specified: Experimental (9)	Experimental studies (other than those carried out in the laboratory) with no habitat specifications
	Regional or global scale (38)	The study context is not specified because the study has a regional or global focus
	Shrubland (5)	
	Tundra (1)	
	Urban (8)	
Ecosystem component*	Bats (3)	
	Birds (19)	
	Ecosystem services (4)	
	Invertebrates (22)	Distinguishing between arthropods (8), aquatic arthropods (7), and pollinators (7)
	Mammals (6)	
	Microclimate (22)	
	Microorganisms (13)	
	Plants (36)	
	Reptiles (11)	
	Soil (22)	
Scale	One-solar facility or experimental array (56)	It is not specified for studies with a regional or global focus
	Several solar-facilities or experimental arrays (49)	

(Continues)

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TABLE 1 (Continued)

Information	Categories	Explanation
Study design	BA (7)	Before-after only in impacted areas
	BACI (2)	Before-after-control-impact
	CI (50)	Control-impact only after PV construction
	I (50)	Impact (e.g., studies addressing the impact of collision with PV panels)
Studied topic*	Agrivoltaics (7) Collision/mortality (9) Habitat fragmentation (11) Habitat loss or alteration at landscape scale (4) Habitat loss or alteration at microhabitat scale (28) Lake effect[a] (6) Land-use planning (26) Microclimate at landscape scale (5) Microclimate at microhabitat scale (24) Soil properties (14)	
Summary of results		

Note: Wherever applicable, the categories defined for each parameter are specified, as well as a brief explanation. We highlight with an asterisk the fields that were duplicated in case a study addressed more than one topic, ecosystem component, or study context. Lastly, we indicate between brackets the number of studies under each category, considering only the articles incorporated in this study.

Abbreviation: PV, photovoltaic.

[a]The "lake-effect" hypothesis suggests that waterbirds and aquatic insects mistake solar arrays for water bodies, colliding with the infrastructure as they attempt to land. This could either result in direct mortality or leave individuals injured or stranded. See the main text for more information.

addressed biotic components ($N = 80$, 60.6%). Plants were the most studied group ($N = 35$, 26.5%), followed by arthropods ($N = 19$, 14.4%), birds and microorganisms ($N = 13$, 9.8%), reptiles ($N = 9$, 6.8%), mammals ($N = 5$, 3.8%), and bats ($N = 2$, 1.5%). When we cross-reference this information, we observe that the knowledge about the different ecosystem components is not evenly based in all habitats or study contexts. For instance, most information for reptiles comes from deserts, but information for mammals in this ecosystem is lacking as well as for arthropods in grasslands (Figure 4). Similarly, little information is available on bats, and knowledge on aquatic arthropods is mainly drawn from experimental assays.

Most studies addressed the impact of PV energy on habitat loss or alteration at both landscape ($N = 43$, 32.6% of the 132 empirical studies) and microhabitat scales ($N = 27$, 20.4%), and on microclimate at microhabitat scale ($N = 23$, 17.4%) (Figure 5). Furthermore, a high proportion of studies addressed land-use planning, aiming to identify compatible areas for PV development and biodiversity conservation ($N = 25$, 18.9%). As the number of studies per topic decreases, the context bias in current knowledge becomes more evident. For example, most studies addressing the impact of PV energy on collision rates and microclimate at landscape scale have mainly been carried out in deserts and arid climates, and little knowledge exists about the potential of agrivoltaic systems (Figure 5). Moreover, the lake effect hypothesis has been tested mainly under experimental conditions. Regarding methodological aspects, a total of 56 studies (53.3% out of 105 empirical studies with this methodological information) were focused on a single PV facility or experimental array, and 49 studies (46.7%) were based on more than one. Only two (1.9%) studies used a BACI design and seven (6.7%) used a BA design.

3.2 | Impacts of PV energy

The available information to date on the potential impacts of PV energy on biodiversity is summarized in Figure 6. As highlighted in Figure 5, some of these impacts have been addressed in specific environmental contexts and climates (e.g., heat island effect) and should therefore be treated with caution.

3.3 | Impacts on microclimate and soil properties

There is a lack of research on the microclimate impacts of PV energy, and current knowledge is mainly based on

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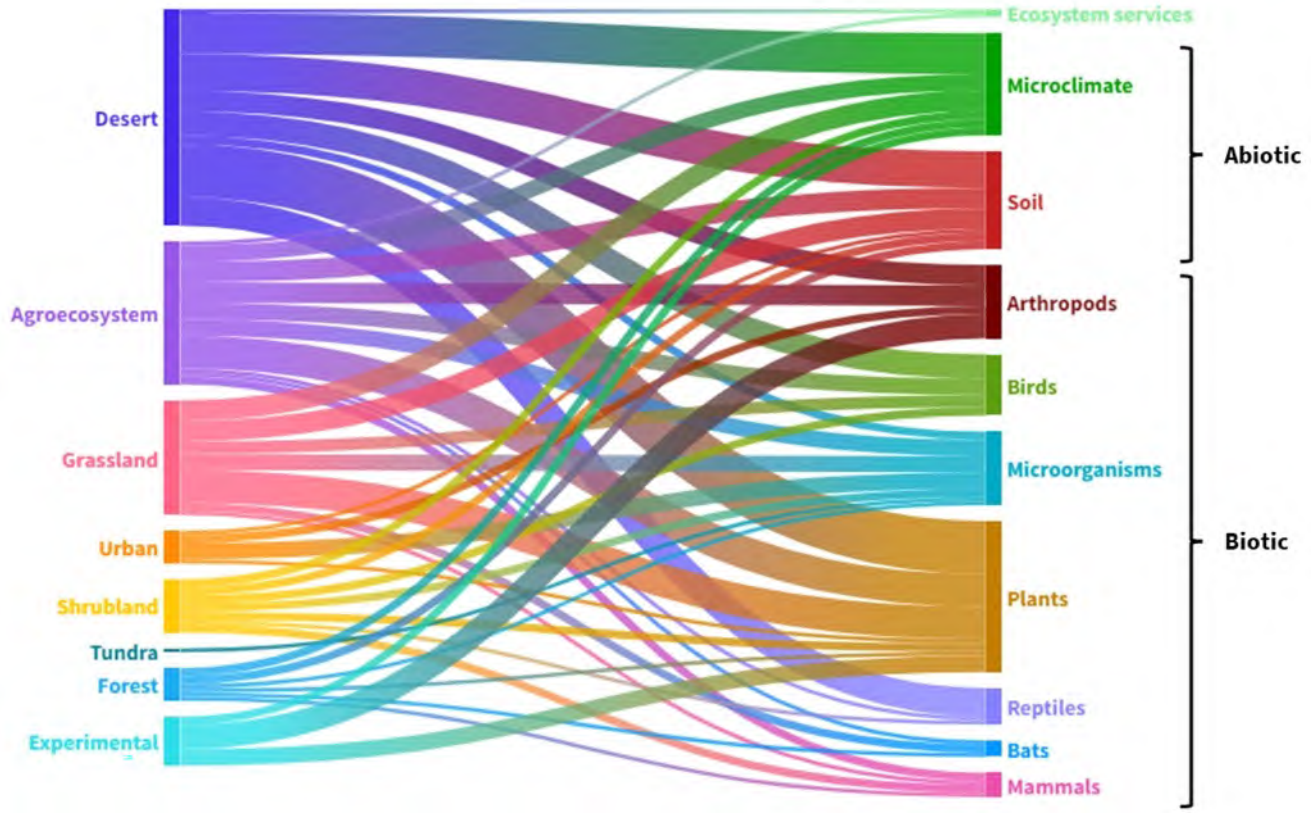


FIGURE 4 Study contexts (left-hand side) and ecosystem components (abiotic, biotic, and ecosystem services; right-hand side) covered in the research literature on the impacts of photovoltaic (PV) energy or measures to minimize them. Colored bands indicate relationships between them. Some investigations cover more than one ecosystem component or study context.

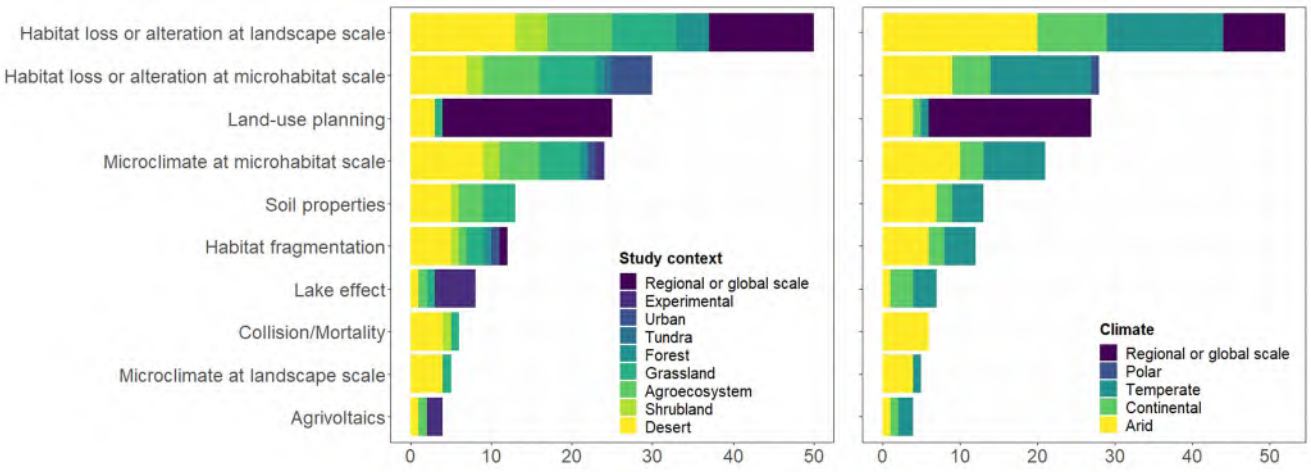


FIGURE 5 Topics addressed in the literature according to study contexts (left) and climates (right).

arid climates (Figure 5). In this climate contexts, PV facilities can alter the energy balance of short- and long-wave radiation by the introduction of darker and less reflective surfaces, which reduce albedo and increase the absorbed solar insolation (Barron-Gafford et al., 2016). Besides, vegetation removal reduces heat dissipation through transpiration and enhances heat gain and storage in soils, energy that will be later re-radiated in the form of heat (Barron-Gafford et al., 2016). Consequently, nighttime temperatures within PV facilities rise 3–4°C compared to surrounding (dryland) ecosystems, thereby inducing a "Heat Island" effect (Barron-Gafford et al., 2016). At a finer

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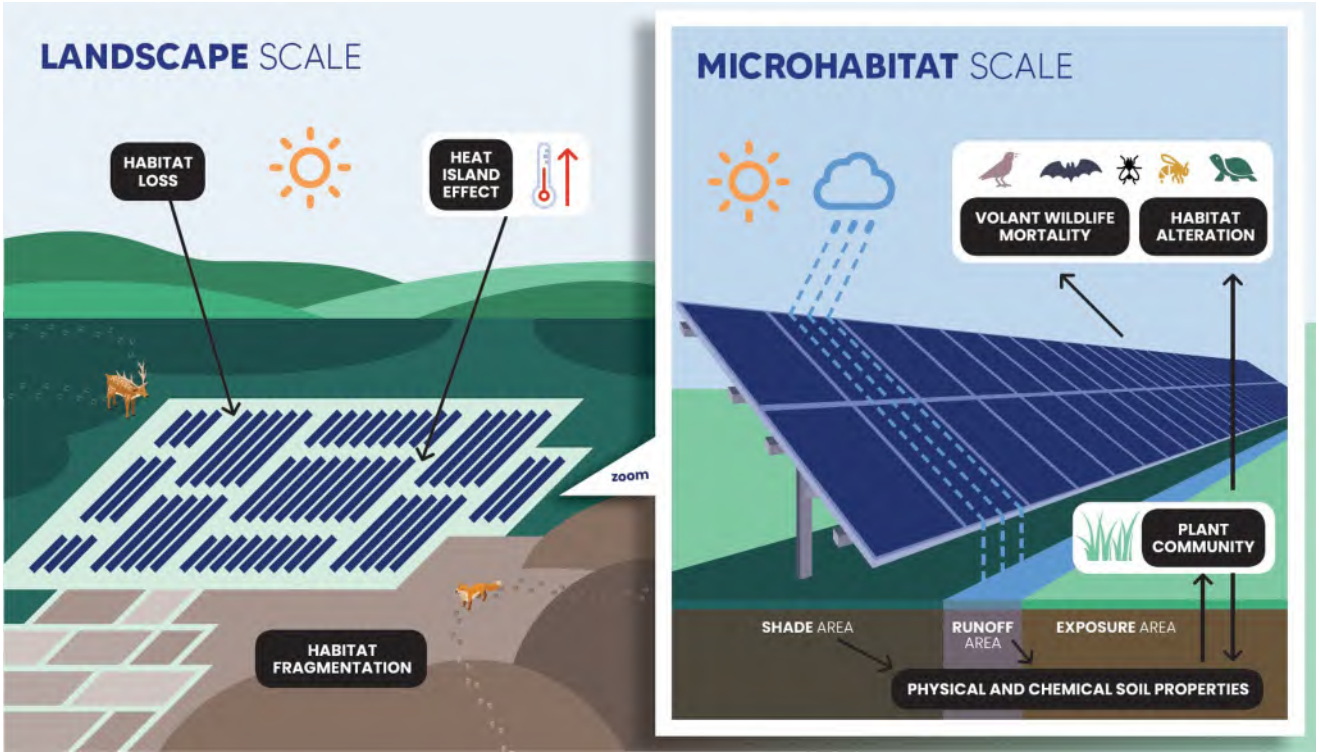


FIGURE 6 Impacts of photovoltaic (PV) energy at landscape (left) and microhabitat (right) scale. At landscape scale, PV facilities produce habitat loss and fragmentation, and alter the microclimate by inducing a heat island effect at nighttime, at least in arid and temperate climates (see Figure 5). At microhabitat scale, PV panels alter the physical and chemical properties of soils and create novel shade, runoff, and radiation exposure gradients, altering microclimate and ultimately microsite habitat conditions. Given that temperature, water, and light are three key determinants for plant growth, novel conditions trigger a cascade of processes that impact on the plant community, but it can also result on habitat alteration for myriad of taxa (microorganisms, pollinators, birds, bats, and mammals). Lastly, mortality of volant wildlife through collision with PV panels or associated power lines is one of the most recorded PV impacts.

scale, PV panels intercept sunlight, reducing photosynthetically active radiation and creating novel shade conditions underneath (Tanner, Moore-O'Leary, et al., 2020; Wu et al., 2022), thereby decreasing air, surface, and soil temperature and variation as compared to the interval (IT) zone (i.e., area between panel arrays) and control sites during warm seasons (Armstrong et al., 2016; Lambert et al., 2021; Liu et al., 2019; Suuronen et al., 2017; Tsafack et al., 2022). However, this pattern is reversed during nighttime and in cold seasons, partly due to the inhibition of dew formation (Marrou, Guilioni, et al., 2013) and/or to the heat re-radiated from the soil and trapped under PV arrays (Barron-Gafford et al., 2016). Panels also alter the local distribution of precipitation, reducing water inputs below the panels but increasing them in the edge via storm runoff of PV panels. Even though humidity and soil moisture might be higher in runoff areas immediately after rainfall (Moscatelli et al., 2022; Tanner, Moore-O'Leary, et al., 2020), the shielding effect of PV panels reduces water loss by evaporation (Liu et al., 2019, 2022) and evapotranspiration (Marrou, Dufour, et al., 2013), ultimately increasing soil moisture (Suuronen et al., 2017) or smoothing the differences with the IT, runoff, and control sites (Choi et al., 2020). Other factors such as air circulation and turbulence, soil properties, and PV systems (e.g., tracking vs. fixed panels) might shift these microclimate patterns (Moscatelli et al., 2022; Suuronen et al., 2017; Yuan et al., 2022; Yue et al., 2021). More studies are needed to confirm whether these effects can be extrapolated to other environmental contexts and climates.

PV construction can also alter the physical and chemical soil properties, but these effects are highly dependent on land-use history, vegetation management, and control sites used in the comparison. Physical soil quality is degraded after PV installation since it reduces soil aggregate stability, a key factor of soil functioning (Lambert et al., 2021). Chemical soil quality also seems to be degraded in PV facilities (decreased in organic carbon, total carbon, and total nitrogen) as compared to seminatural habitats, but it is similar to that observed in other anthropogenic soils (e.g., abandoned vineyards) (Choi et al., 2020; Lambert et al., 2021). However, other studies have reported higher nitrogen and carbon values in IT soils than under PV panels or arable control sites (Moscatelli et al., 2022) and higher

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electrical conductivity, phosphorus, potassium, soil organic matter, and fast-acting potassium in vegetated PV parks compared to bare land controls (Bai et al., 2022; Yuan et al., 2022). Similarly, another study observed that phosphorus, potassium, nitrate nitrogen, and soil pH increased 6 years after PV installation (Liu et al., 2022). Further research is needed to understand the mechanisms underlying these changes on soil properties.

3.4 | Habitat fragmentation, loss, or alteration

Habitat destruction and/or alteration occur at both broad scale (i.e., landscape) and fine scale (i.e., microhabitat). The physical onsite footprint and spacing of PV has been estimated at 1 ha for a 0.12–0.83 MW/ha (Grippo et al., 2015; Hernandez, Hoffacker, et al., 2014; Wu et al., 2014). At landscape scale, habitat loss due to PV construction has been described to be a threat for several taxonomic groups such as reptiles (Averill-Murray et al., 2013), arthropods (McCoshum & Geber, 2020), bats (Szabadi et al., 2023), and birds (Haga et al., 2020). In terrestrial animals, it can also impact broad-scale ecological processes such as daily, seasonal, and migratory movements through the creation of connectivity barriers (i.e., non-permeable perimetral fencing) (Averill-Leskova et al., 2022; Murray et al., 2013; Sawyer et al., 2022). At finer scale, PV panels per se represent a harsh environment, which can be colonized by a highly diverse microbial community composed of drought-, heat-, and radiation-adapted species (Moura et al., 2021; Tanner et al., 2018; Tanner, Molina-Menor, et al., 2020). Moreover, PV panels create novel shade and moisture gradients (see above), ultimately altering microsite habitat conditions with both winner and loser species resulting from the new PV ecosystem. The diversity and activity of soil fungi and prokaryotes seem to be higher in PV parks, especially in runoff areas, than in bare ground and arable controls (Bai et al., 2022; Moscatelli et al., 2022), and soil extracellular enzyme activity, an indicator of microbial function capacity, might increase after installation (Liu et al., 2022). However, soil archaea community structure and diversity does not differ between PV soils and adjacent deserts (Yuan et al., 2022). Future research should deepen on the impact of PV construction across the microclimate-soil-microorganism system due to its role in biological processes and ecosystem functioning (Bai et al., 2022).

PV panels can also impact on the plant community, although the responses might vary between habitats, seasons, and species, let alone vegetation management strategies (Tanner et al., 2021; Tanner, Moore-O'Leary, et al., 2020). In hydric stressful climates, PV panels could soften the harsh environmental conditions and alleviate heat stress, thereby increasing seed bank survival and aboveground plant productivity and diversity (Liu et al., 2019; Tanner, Moore-O'Leary, et al., 2020). However, the opposite effect might be found in communities that benefit from rainfall and sun exposure, reaching the lowest rates of photosynthesis and plant biomass under PV panels and their maximum productivity and diversity values at the runoff or IT zones (Bai et al., 2022; Moscatelli et al., 2022; Tanner et al., 2021). Overall, plant community composition might change by inhibiting the growth of dominant species and leaving room for subdominant ones (Bai et al., 2022; Uldrijan et al., 2022). Moving up the trophic chain, we find that arthropod pollinators use IT and under-panel habitats interchangeably, even though abundance and diversity tend to be lower under PV panels (Graham et al., 2021). Other authors have found that induced changes on the plant community and microclimate, together with targeted management measures (see *Mitigation hierarchy* below), might convert PV installations on invertebrate refuges (Jeal, Perold, Seymour, et al., 2019; Suuronen et al., 2017).

Overall, both habitat destruction (landscape) and the alteration of the abiotic conditions (microhabitat) result in habitat modification, loss and/or fragmentation for myriad of species (McClung et al., 2019). These changes combined with displacement due to visual or noise disturbances, might trigger behavioral responses (i.e., perception and habitat-use; Chock et al., 2021), ultimately resulting in population-level impacts across many taxa (Smallwood, 2022). A lower bat activity (Szabadi et al., 2023; Tinsley et al., 2023) and bird diversity and/or density has been found within PV parks (DeVault et al., 2014; Jeal, Perold, Ralston-Paton, et al., 2019; Visser et al., 2019), but no differences have been observed on bird reproductive success (Kitazawa et al., 2019). Conversely, PV panels might provide perches and thermal refuges that would be otherwise limited in specific contexts (e.g., deserts), or they could even offer foraging, roosting, sheltering, and nesting habitats (DeVault et al., 2014; Gerringer et al., 2022; Nordberg et al., 2021; Visser et al., 2019). Further research is needed to understand the consequences of habitat alteration following PV installation on wildlife habitat-use patterns and populations.

3.5 | Wildlife mortality

Direct mortality of flying wildlife (bats, birds, and aquatic insects) through collision with PV panels and other infrastructures (i.e., power lines and perimetral fences) is one of the most addressed impacts of PV energy, but most information comes from unpublished reports that employ non-standardized methodologies (Smallwood, 2022). Bird mortality rates at PV projects have been estimated between

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2.49 and 10.7 fatalities/MW/year (Kosciuch et al., 2020; Visser et al., 2019; Walston et al., 2016). A recent work provides more accurate estimates by adjusting the results of previous reports performed from 1982 to 2018 for the effect of body size on carcass detectability, obtaining a mortality rate of 11.61 (95% CI = 8.37–17.56) bird fatalities/MW/year and 0.06 (95% CI = 0.01–0.1) bats/MW/year at 11 PV projects (Smallwood, 2022), considering only collision with PV panels and ignoring other sources of mortality (i.e., power lines and perimetral fences). Future studies should account for other sources of bias on carcass counts, such as carcass disappearance due to decomposition or removal by scavengers, in order to obtain more accurate quantifications of mortality (see for example Gómez-Catasús et al., 2021). Moreover, mortality estimates alone do not say much about their ecological and conservation significance, which depends on their larger-scale, population-level consequences, which are influenced by population descriptors (i.e., size and trends) and life-history traits (e.g., pace of life and reproductive strategy). A recent study found that of 23 priority species colliding at wind and solar facilities, 11 (48%) were vulnerable to population-level effects (Katzner et al., 2020), especially non-local, nocturnal migrant species.

Information on the factors influencing collision risk and fatality estimates is scarce. In relation to species-specific factors, songbirds (Passeriformes), pigeons, and doves (Columbiformes) seem to suffer the highest mortality rates (Kosciuch et al., 2020; Smallwood, 2022). These species groups are generally abundant in the studied regions, and they share several traits (e.g., ground dwelling and inhabit anthropogenic landscapes). Migratory and aquatic birds also suffer high collision rates, although their contribution to mortality rates seem to vary with the occurrence of water bodies, wintering grounds and migration routes in the surroundings, suggesting that their collision risk is context-dependent (Walston et al., 2016; Kosciuch et al., 2020). Moreover, collision rates vary with phenology, being more frequent in fall and winter, coinciding with the higher abundance of birds following the breeding season and with migratory movements to the wintering grounds (Kosciuch et al., 2020). We found no studies evaluating the effect of site descriptor factors on fatality rates, and only one study addressed PV park attributes, showing a negative effect of PV capacity (Kosciuch et al., 2020).

The mechanisms underlying collision events are poorly understood. The most discussed hypothesis is that aquatic insects might mistake solar panels as natural water bodies (i.e. "lake effect" hypothesis) due to polarization of light reflected, which they used to locate water bodies for egg-laying (Horváth et al., 2010), turning into ecological traps (Horváth et al., 2009, 2010). More recently, it has been observed that solar panels can polarize not only visible light (390–700 nm), but also ultraviolet light (<380 nm), which is also a cue used in habitat selection for some aquatic insects (Fraleigh et al., 2021). Although the "lake effect" hypothesis has been widely exposed as a potential mechanism underpinning also bird and bat collisions (PV panels might provide analogous reflections of echolocation calls than water bodies; Greif & Siemers, 2010; Russo et al., 2012), there is little evidence proving this causal factor. Other potential explanation widely discussed is that insectivorous wildlife might be attracted to PV panels due to the higher abundance of insect prey (Diehl et al., 2016; Horváth et al., 2010), being stranded, injured, or killed at solar panels (Smith & Dwyer, 2016), but we have found no evidence for this hypothesis either. Further research is needed to test these hypotheses and to understand how these organisms perceive solar energy infrastructures.

3.6 | Mitigation hierarchy: From prevention to compensation

The implementation of PV facilities must follow the mitigation hierarchy procedure to avoid, reduce, and ultimately offset its negative impacts on wildlife. First, proactive land-use planning is essential, considering ecological and conservation attributes in deciding project locations that secure wildlife habitat preservation as well as the maintenance of other important land-uses such as agricultural land (Hermoso et al., 2023). Land sparing (i.e., the promotion of PV sprawl in urban areas or degraded lands) has been proposed as an alternative to mitigate habitat loss and soil degradation in natural and semi-natural habitats (DeVault et al., 2014; Hernandez et al., 2015; Kim et al., 2021; Lambert et al., 2021) rather than PV construction in remote areas, which requires additional transmission infrastructure with further impacts on biodiversity (Biasotto & Kindel, 2018).

In a second step, PV projects should contemplate minimization measures for those impacts that are unavoidable. The concept of *conservoltaic* consists on the combination of PV energy production and biodiversity conservation (Nordberg & Schwarzkopf, 2023). For instance, lessening vegetation disturbance during construction or the application of habitat restoration practices might help to combat desertification (Xia et al., 2022), alleviate soil degradation (Ormeño et al., 2016), or minimize habitat loss (Armstrong, Kulikowski, et al., 2021; Cypher et al., 2021; Gerringer et al., 2022), and targeted vegetation management during operation can create habitat islands for wildlife (Blaydes et al., 2021, 2022; Guiller et al., 2017). The installation of permeable security fencing or the translocation of sensitive species outside the project's footprint are other potential mitigation measures (Agha et al., 2020; Brand et al.,

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2016; Cypher et al., 2021). Another emerged land sharing strategy is the co-location of PV energy with agricultural practices, such as crop cultivation or animal husbandry (so-called "*agrivoltaic systems*"), which promises to maximize food and energy production while minimizing the impacts on ecosystems (e.g., water use efficiency and erosion prevention; Barron-Gafford et al., 2019; Hernandez et al., 2019; Vaverková et al., 2022), even increasing PV panel efficiency through dust accumulation and cooling (Hernandez et al., 2019; Nordberg et al., 2021). However, the potential of this land sharing strategy to mitigate impacts on biodiversity and to be considered within the mitigation hierarchy deserves more attention. Overall, if properly managed, PV farms have the potential to promote important ecosystem services (e.g., carbon storage and biological pest control; Armstrong, Brown, et al., 2021; Barron-Gafford et al., 2019; Randle-Boggis et al., 2020; Semeraro et al., 2018; Walston et al., 2018, 2021, 2022) and even to enhance or restore previous ecosystem goods and services in degraded lands (Hernandez et al., 2019). However, further research is needed to empirically test these potential synergies and to verify whether they are generalizable or not to all climatic-environmental contexts (Figure 5).

Mortality due to collision (both with power lines and PV panels) is another impact to mitigate in PV facilities. First, the widely known power line collision mitigation measures should be implemented (Bernardino et al., 2018). On the other hand, PV panel collision mitigation has been studied in aquatic invertebrates, suggesting that specific panel designs might be effective tools to disarm the panel-induced ecological trap (e.g., employment of a white, non-polarizing gridding; Black & Robertson, 2020; Horváth et al., 2010) and matte colors or anti-reflective coatings (Száz et al., 2016; Horváth et al., 2020; but see Blaho et al. [2014]). Further research is needed to find effective tools that mitigate collision impacts across taxa. Finally, offsite compensatory mitigation is employed as last resort to offset for unavoidable impacts, including land acquisition and the restoration of off-site habitats. We have not found any reference evaluating the effectiveness of these measures in PV facilities specific contexts, but it is recommended to use the available scientific knowledge on similar conservation strategies so that they can be conveniently designed and implemented, always supported by a monitoring of their effectiveness to achieve adaptive management.

3.7 | Conclusions and research gaps

Research on PV impacts on biodiversity have not increased proportionally to its development, with a significant knowledge deficit compared to other currently less widespread energies, such as wind energy (e.g., Marques et al., 2014; Nazir et al., 2020; Peste et al., 2015; Powlesland, 2009; Wang et al., 2015; Wang & Wang, 2015). Besides, there is a notable decoupling between PV development and progress of research on its impacts by region: although PV capacity is concentrated in Asia and Europe (ca. 59% and 22%, respectively), where the greatest conflicts with conservation areas occur (Rehbein et al., 2020), most of the knowledge on PV impacts comes from North American contexts (48%). This inevitably leads to a bias in the current knowledge about PV impacts (41% in deserts), which might not be extrapolated to other environments like farmland, where most of the PV capacity is sited (Kruitwagen et al., 2021). We detail below the *main conclusions drawn* and the *knowledge gaps* where research efforts should be invested so that biodiversity conservation can keep up with the accelerating development of this renewable energy:

- **Adaptive, collaborative strategies to avoid and compensate PV impacts.**
  The urgent call to combat the impacts of climate change makes the advance of PV energy inevitable. However, given the lack of empirical evidence found in this review for some PV impacts and mitigation measures (see Figure 5), the development of PV should be accompanied by adaptive planning and management, applying an iterative process where every new facility is accompanied by extensive monitoring, contributing for the acquisition of new knowledge that will be applied in future installations in close collaboration with stakeholders (Köppel et al., 2014). Further research is needed on: 1) wildlife use of PV facilities; 2) the impacts of specific configurations (e.g., landscape context); and 3) the effectiveness of management and mitigation/compensation schemes applied within and outside the PV facilities to maximize the benefits on biodiversity and ecosystem services. This knowledge is essential to identify optimal locations and land sharing opportunities of 'conservoltaic' systems (Nordberg & Schwarzkopf 2023). Lastly, the increasing efficiency of PV panels allows foreseeing an optimization of land surface occupied by facilities.
- **Need for diversification of environmental contexts and ecosystem components.**
  Most information available on the impacts of PV comes from desert ecosystems (41%), but there is a lack of research in grasslands and farmland. Moreover, only 80 studies reviewed have focused on specific species or groups of species, even in regions with good scientific knowledge of species ecology and threats like the EU where 76 species (mainly birds and reptiles; 48%

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and 38%, respectively) included in the Birds and Habitat Directives are reported threatened by solar power development (European Environment Agency, 2023). Given that most PV impacts are context-dependent, future research efforts should be invested in those contexts and ecosystem components for which the greatest knowledge gaps have been found (e.g., microclimate impacts on agroecosystems, grasslands, or shrublands in continental climates or the effectiveness of agrivoltaics in arid and continental climates; Figure 5), diversifying environmental conditions and prioritizing those species that are more threatened by PV development.

- **Lack of standardized and robust sampling designs**. A large portion of the studies were carried out on a single PV project (53%), and preconstruction estimation of baseline situations was rarely reported (8%), with only two studies employing a strict BACI framework. There is a need to use comprehensive BACI designs that provide critical information on the direct responses of sensitive wildlife, including a large number of years and facilities (i.e., long-term and large-scale studies) as well as preconstruction and control-site data for interpreting postconstruction changes. Moreover, the employment of standardized protocols—especially for collision studies—would allow findings to be comparable across contexts, opening the way to more robust and generalizable conclusions (Conkling et al., 2021).
- **Lack of knowledge regarding the cumulative and synergistic ecological impacts.** Recent studies have proven that medium-sized PV plants result in higher loss of seminatural habitats than large-sized PV plants, probably due to more strict environmental impact assessment on mega-solar PV facilities, which might lead to the fragmentation of large projects (Kim et al., 2021). The scattered distribution of small facilities might result in a high cumulative environmental impact that would not be detected by independent assessments, supporting the need for cumulative and synergistic environmental impact assessments (Serrano et al., 2020).
- **Disentangling the mechanisms underlying wildlife collision with PV panels is mandatory to design effective mitigation measures.** There is an urgent need to identify the species (e.g., morphological and local abundance), site (e.g., landscape context), and PV facility (e.g., size) specific factors determining collision events to improve our understanding of this process and properly design mitigation measures. In addition, more research is needed to understand how species perceive PV facilities in relation to surrounding landscape elements and the mechanisms underpinning maladaptive behaviors such as the attraction to PV panels suffered by some taxonomic groups (Chock et al., 2021). Lastly, to properly disentangle these mechanisms, an accurate quantification of casualty estimates is mandatory, which should be corrected by all bias sources when counting carcasses, including imperfect detection and carcass disappearance due to decomposition or removal by scavengers, as well as the underlying potential factors influencing these bias sources (e.g., vegetation structure, carcass age, carcass size, and observer) (see Gómez-Catasús et al. [2021] for an example with power lines).

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The dataset and all code for figures and analyses in this manuscript will be archived on a public repository such as Github.

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Review

Agrivoltaic, a Synergistic Co-Location of Agricultural and Energy Production in Perpetual Mutation: A Comprehensive Review

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Abstract: Agrivoltaic systems, which consist of the combination of energy production by means of photovoltaic systems and agricultural production in the same area, have emerged as a promising solution to the constraints related to the reduction in cultivated areas due to solar panels used in agricultural production systems. They also enable optimization of land use and reduction in conflicts over land access, in order to meet the increasing demand for agricultural products and energy resulting from rapid population growth. However, the selected installation configurations, such as elevation, spacing, tilt, and choice of panel technology used, can have a negative impact on agricultural and/or energy production. Thus, this paper addresses the need for a review that provides a clear explanation of agrivoltaics, including the factors that impact agricultural and energy production in agrivoltaic systems, types of panel configurations and technologies to optimize these systems, and a synthesis of modelling studies which have already been conducted in this area. Several studies have been carried out in this field to find the appropriate mounting height and spacing of the solar panels that optimize crop yields, as this later can be reduced by the shade created with the solar panels on the plants. It was reported that yields have been reduced by 62% to 3% for more than 80% of the tested crops. To this end, an optimization model can be developed to determine the optimal elevation, spacing, and tilt angle of the solar panels. This model would take into account factors that influence crop growth and yield, as well as factors that affect the performance of the photovoltaic system, with the goal of maximizing both crop yield and energy production.

Keywords: energy-water-agriculture nexus; agrivoltaics; combined model; optimization; arrangement; yields

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1. Introduction

Of all natural resources, water, energy, and food are the most essential to sustain life on earth [1,2]. Water, energy, and food share common challenges of limited accessibility, increasing global demand, and sustainability constraints [3]. Moreover, these essential resources are expected to face a significant surge in demand due to rapid population growth, in order to meet the basic needs of the population [4]. Indeed, according to UN projections, the world's population will increase from 8.5 billion in 2030 to 9.7 billion in 2050 and reach about 10.4 billion in the 2080s [5]. Moreover, according to the FAO [6], agricultural production will have to be doubled to meet demand in developing countries, while these countries will have to face constraints related to increased competition for access to water and energy and the impacts of climate change. To this end, it has been predicted that production needs to be increased by 60% [7] or even doubled to meet the

population's needs in the face of population growth and changing diets [8]. The major constraints to agricultural development are related to access to water and energy for irrigation. Irrigation is the controlled delivery of water for agriculture through artificial systems to meet water needs not met by rainfall for crop growth and development [9]. Sophisticated and water-efficient irrigation techniques have significantly increased energy requirements. The energy cost required to operate these systems compromises the viability of many irrigation networks [10]. To this end, new perspectives have emerged, namely the use of renewable energy in irrigation systems as an alternative to pumping systems powered by fossil fuels [11,12], bearing in mind that the high cost of fuels and the lack of electricity, especially in rural areas, are factors that negatively affect the functioning of irrigation systems [13]. Solar PV panels are utilized due to their environmental benefits, cost-effectiveness, and ability to address issues of fossil fuel scarcity and unavailability in certain regions. The energy sector has seen significant and accelerated progress in terms of innovations observed with the use of renewable energy. A total of 20% of global energy consumption in the world comes from renewables, and about 30% of investment in renewables is in wind power and 60% in solar power [14].

Solar photovoltaic energy has emerged as an environmentally friendly and economically viable alternative with lower energy costs [9,13]. In addition, photovoltaic panels are among the leading renewable energy technologies in the world and have seen continuous decrease in costs over the years. It is predicted that 25% of the electricity needed in 2050 will come from solar PV, with a reduction of 4.9 Gt of CO_2 corresponding to a 21% decrease in emissions in the energy sector [15].

Nevertheless, using solar panels to pump water for irrigation can significantly reduce cultivated areas due to the space occupied by the solar panels [16]. One solution to this problem is, therefore, the adoption of agrivoltaic systems. These dual-use systems involve raising the PV panels to use the space under the panels for agricultural purposes [17]. Thus, this system reduces the issue of conflicts regarding land access [18,19]. Agrivoltaics can also significantly reduce the constraints on access to electricity for populations. According to Jamil et al. [20], agrivoltaic practices on only 1% of cultivated land can satisfy the energy demands of at least one-quarter of the population in Canada. However, solar panels installed in an area can impact microclimate, temperature, and solar radiation distribution, water, biodiversity, air quality, and ecosystem-energy balances [21,22]. Given the impact of solar panels on crops, several studies have investigated the optimal panel layout to maximize crop production in the presence of the panels. These studies have mainly focused on determining the height and spacing of the panels to create a suitable environment for crops under the panels. However, these arrangements were determined through studies that primarily focused on the irradiation received under the PV array and the resulting shading on the crops, with specific arrangements being tested [23–25]. Other studies have examined panel orientation through field experiments [26]. Kim et al. [27] worked on modeling the hybrid performance of an agrivoltaic system in South Korea. Their model focused on the variation of the amount of electricity generated and the crop yield obtained based on the incident radiation, as well as the impact of atmospheric conditions on the radiation. Three different shading ratios were tested to compare the levels of shading (21.3%, 25.6%, and 32%), with the shading ratio calculated as the panel area divided by the system area. A height of 5.42 m was used for all three tests and the shading rate was based on the density of the modules. However, there is still limited research and decision-making tools to determine the appropriate configuration for the crop being grown. Thus, modeling studies to determine the optimal height, spacing, and inclination of the panels to maximize growth and development for a given crop and the performance of the panels would help users to find the right configuration.

In order to achieve our purpose, this review focuses on a clear explanation of agrivoltaic systems and the functioning of its different components, as well as the factors that affect each of them. We believe that a large literature review will allow us to identify the most important parameters to consider for the design of the optimization model. The present paper will also summarize the studies carried out on the possible configurations of agrivoltaic systems, as well as the overall successes and failures of the arrangements and orientation.

2. Definition and Terminology

An agrivoltaic practice is a concept that originated in 1980 [23]. It is defined as a land-use concept that directly integrates solar energy production and agricultural activities, which are practiced under the photovoltaic field installation, both of which are highly dependent on sunlight [28]. Agrivoltaics has several names that vary according to region and application, such as "dual-use", "co-location", "agri-PV", "agri-solar", "solar sharing", "pollinator-friendly solar", etc. [29]. Indeed, it is a symbiotic relationship in which both activities interact directly and benefit from this co-location [30]. This practice leads to synergies by optimizing the potential offered by both production systems [31], especially in agroforestry systems [32].

Agrivoltaic practices can be carried out in different ways depending on the activities carried out by the population in a given area (Figure 1). Agrivoltaic applications represent the combination of energy production with (i) agricultural production in the field or (ii) agricultural production in greenhouses or livestock rearing, or (iii) provision of ecosystem services through vegetation management or (iv) different agricultural practices combined [29].

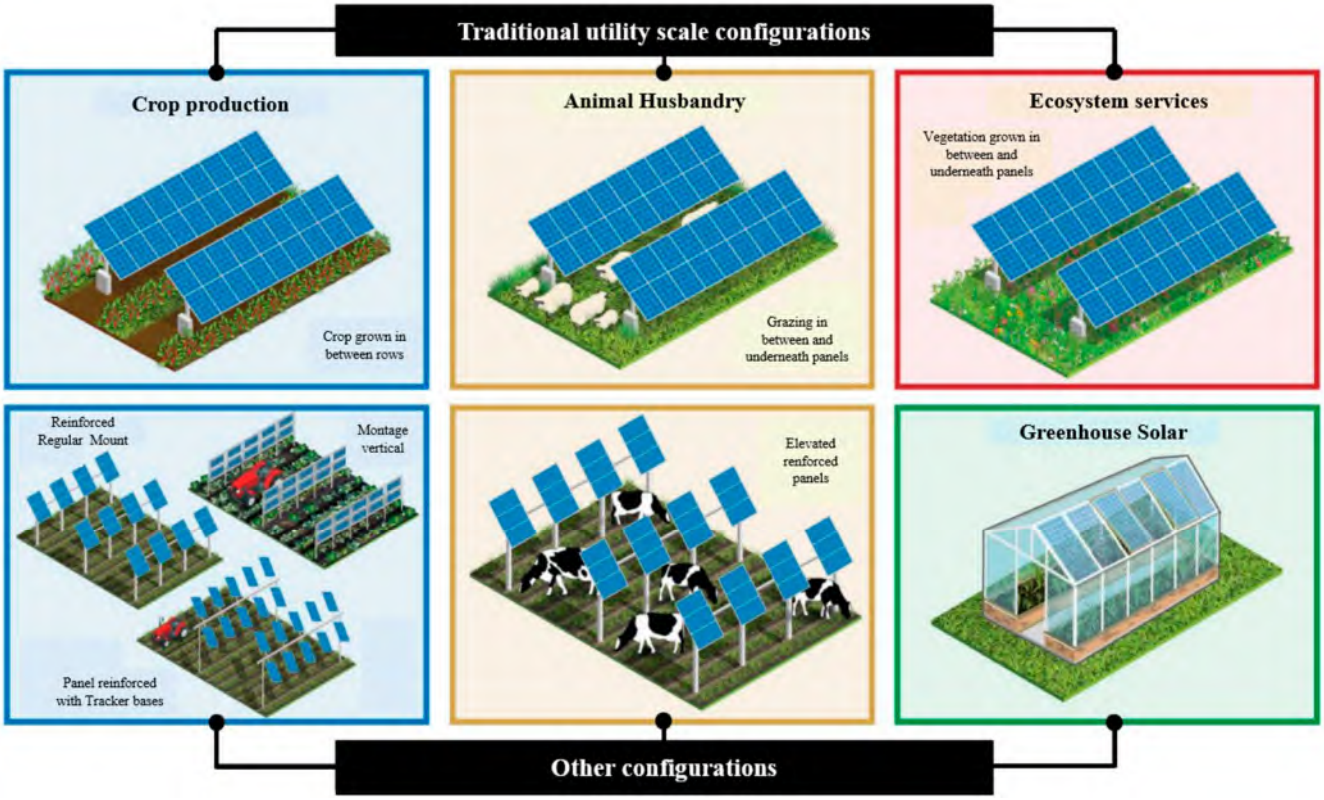


Figure 1. The different agrivoltaic systems [29].

Agrivoltaic technology has an important role in strengthening the water–energy–food relationship [33], given the increasing future need for energy and food production in the face of population demand [34]. Indeed, one of the constraints on the development of PV systems is the increased competition for land due to high population growth and rising food demand [35]. Although land resources are limited, the need for energy and food is increasing, leading to increased competition for land between the two sectors. In response to this growing competition, agrivoltaics was conceived to keep the two activities in balance [36]. Due to their dual use, agrivoltaics would mitigate competition for space and offers the possibility to install large PV systems, while keeping the land accessible for food production [37]. Thus, agrivoltaics system reduces land constraints concerning the placement of solar PV plants for electricity generation [38]. Moreover, this system has proven to be a particularly effective way to increase land use efficiency [32]. Land use efficiency is determined by the so-called parameter Land Equivalence Ratio (LER). The method of measuring land use in integrated agricultural and electricity production systems was originally derived from the intercropping method applied in the farming sector to increase land yield and total income [39]. The LER is a function of the area of the PV system and the total area needed to meet the agricultural and electricity production of the system [40]. Agrivoltaic systems can increase overall land productivity by 35–73%, thus they avoid using land solely for energy production at the expense of agricultural production [41]. According to Lee et al. [42] and Weselek et al. [31], agrivoltaics can increase land productivity by 60–70%, and for Dinesh and Pearce [38], it can increase the economic value of land by more than 30% by minimizing yield losses due to shading effects through appropriate crop selection. According to Trommsdorff et al. [43], land use efficiency varies depending on time and climate. In 2017, the Land Equivalence Ratio (LER) in Germany indicated an increase in land productivity from 56% to 70%, and this value reached 90% during the dry and hot summer of 2018. Abidin et al. [39] reported that applying agrivoltaics to less than 1% of the world's cultivated land could offset the global energy demand. Although agrivoltaics may reduce the efficiency of electricity generation or agriculture when viewed in isolation, studies have shown that the synergy between the two activities can lead to increased overall efficiency. For example, the combination of two hectares of land (1 ha of crops and 1 ha of solar panels each considered individually) corresponds to 100% of crops and 100% of solar energy. However, the use of agrivoltaics in two hectares of land corresponds to 160% cultivation and 160% energy (i.e., 80% of crop and 80% of energy in only 1 ha of land) [39].

As reported by Trommsdorff et al. [43], Formula 1 is used to calculate LER. However, Formula (2) can be used to take into account the high land loss due to the surface occupied by the mounting structure of the solar PV panels.

$$LER = \frac{Yeild_x(dual)}{Yeild_x(mono)} + \frac{Yeild_y(dual)}{Yeild_y(mono)} \quad (1)$$

$$LER = \frac{Yeild_x(dual)}{Yeild_x(mono)} + \frac{Yeild_y(dual)}{Yeild_y(mono)} - 8.3\% \quad (2)$$

x is the cultivated crop and y is the electricity.

3. Solar Panel Installation Techniques to Optimize Agrivoltaic Systems

3.1. Classification of the Different Agrivoltaic Installations

The module configurations in agrivoltaic systems can be categorized into elevated and inter-row systems. The modules are installed above the crop at more than 1.8 m in elevated systems. Growing crops under elevated solar panel installations typically leads to a decrease in the amount of solar radiation they receive, which can cause shading and reduced exposure to sunlight. The main crops used in this type of agrivoltaic system are grapes, small fruit trees, and delicate vegetables. In contrast, inter-row PV systems are systems in which agricultural production is usually carried out in the space between the rows of

panels. The distance between two consecutive rows of the panels can be considerable in this type of installation to facilitate the passage of large agricultural machinery. The most common crops in inter-row solar systems are grasses, hardy vegetables, and higher-value horticultural crops [29]. The different configurations are established to compare their impact on the level of shading created by the panels and their consequences on crop yields to determine the optimal density for an agrivoltaic installation [44]. Another way to increase the efficiency of a PV system is to install double-sided PV panels [45]. Figure 2 summaries the different configurations.

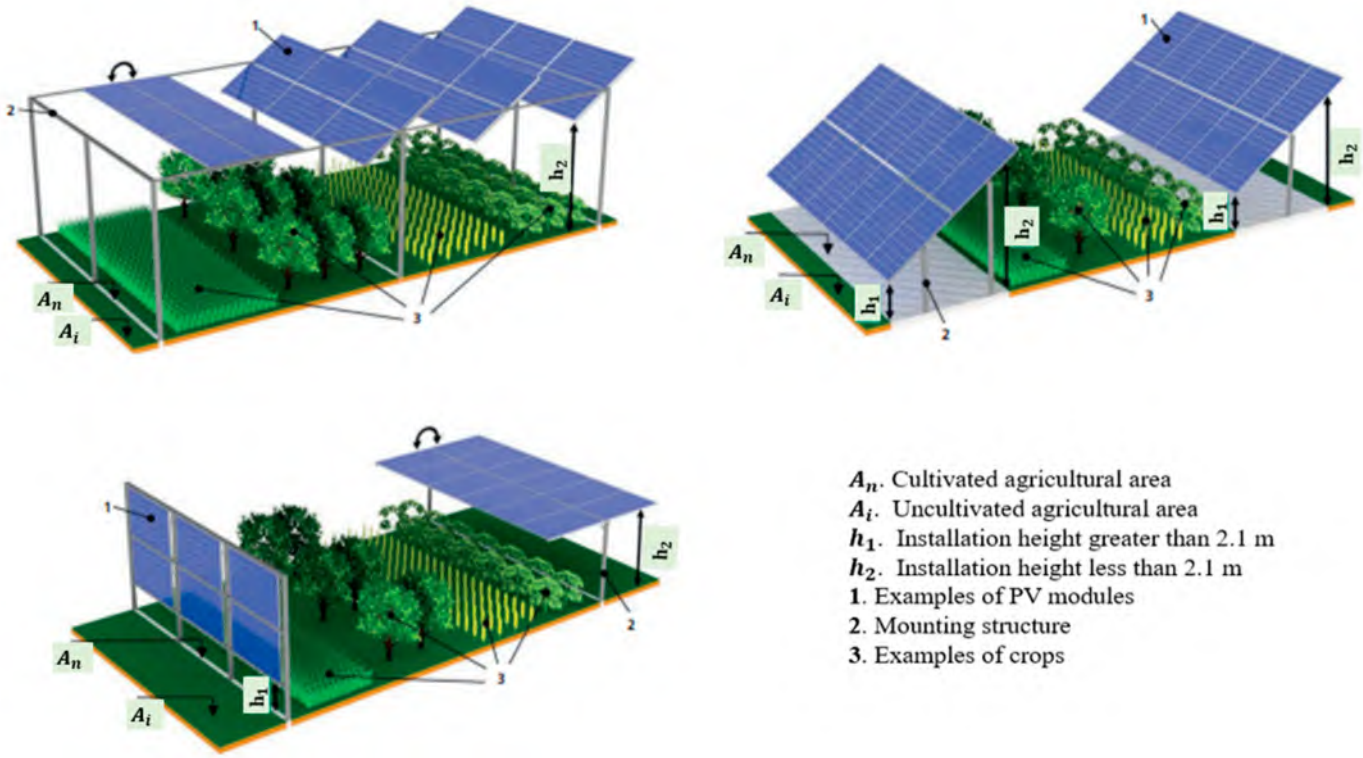


Figure 2. Overview of different configurations of agrivoltaic installations [44].

Several configurations and technologies have been developed and tested to optimize production in agrivoltaic systems. Therefore, the installation must meet the requirements of both the crop and the photovoltaic panels, which can be achieved by using optimal panel spacing and installation height that also allows the passage of agricultural machinery and appropriate panel technology [44]. Macknick et al. [46] have identified three types of approaches for the implementation of agrivoltaic systems: (i) the energy production approach, which focuses on optimizing the solar energy produced (thus minimizing changes in standard solar development practices), while cultivating between and/or under the panels, (ii) the agricultural production approach which focuses on optimizing biomass production (minimizing changes in existing vegetation management activities), while taking energy production into account, and (iii) the integrated agricultural and energy production approach (incorporating vegetation and energy priorities into system design).

These approaches are based on implementing one of the two installation techniques: open agrivoltaic systems, in which the PV module are installed at the ground level via support, and closed agrivoltaic systems, in which the modules are installed on greenhouses, thus serving as a cover [44]. However, only open agrivoltaic systems are considered in this paper. For this purpose, a general classification of the different agrivoltaic systems is proposed in Figure 3.

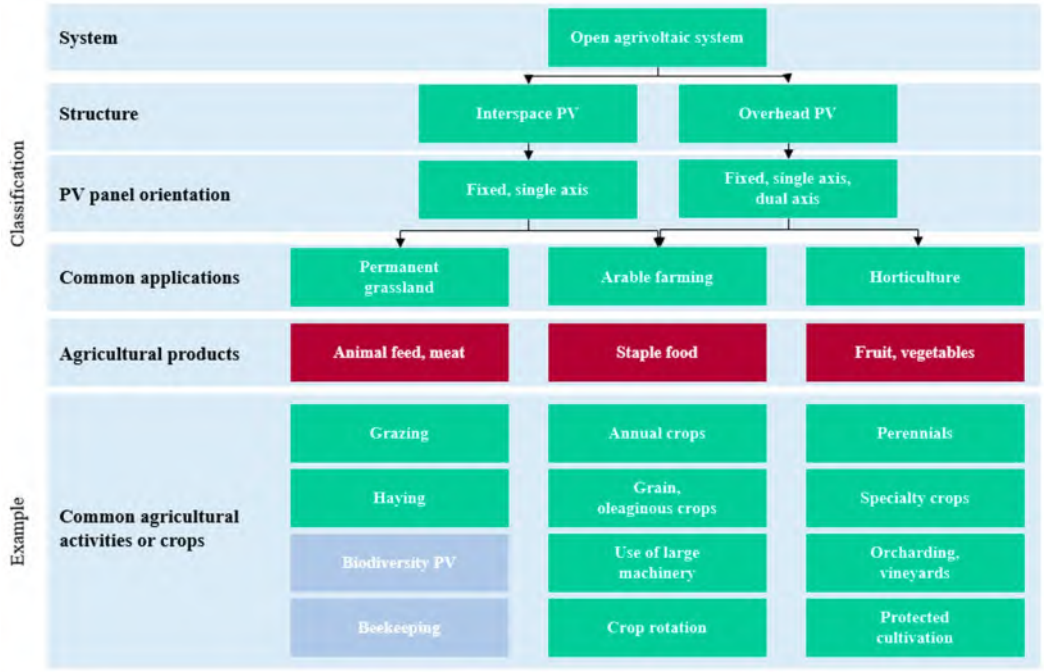


Figure 3. Summary of different agrivoltaic field systems [44,47].

3.2. Installation Techniques to Optimize the Agrivoltaic System

3.2.1. Mounting Height or Overhead of Agrivoltaic Systems Installation

The first agrivoltaic installation in the world was developed by Goetzberger and Zastrow at the Fraunhofer Institute (Germany) in 1980. It employed a height of 2 m and a spacing of 6 m between panel rows [23]. Since then, several studies have been carried out to determine the optimal elevation and spacing of solar photovoltaic modules to maximize energy and agricultural production. The ability of crops to grow and develop underneath PV modules raises structural issues in the case of aerial systems [44]. The height of the panels is an essential factor in the success of the various agrivoltaic practices. However, there are no recommendations for the panels' ideal height for an agrivoltaic installation. The height of the PV panels depends on several factors, including the geographical location of the site, the crop to be cultivated, the soil types, and financial resources. Thus, the height of the panels defines the crop to be grown on the site, the location of the crops in the systems (between the rows of panels or under the PV panels), and the equipment that can be used. Moreso, the solar panels installed in the agrivoltaic systems can have different configurations depending on the climate and soil to protect the structures from certain climatic hazards, namely high winds and freezing. For this purpose, a height of 1.8 m of the tubes supporting the PV panels is considered the minimum viable height for vegetable production under the panels. However, a tube height of 2.4 m is preferable for crops. This is because crops are grown between rows of panels at heights below 1.8 m, except for low-lying crops that appreciate shade. The elevation of the modules promotes a more even distribution of sunlight under the solar PV panels. In addition, these higher installations also allow the movement of equipment and people under the modules [29].

According to Trommsdorff et al. [44], overhead systems should be mounted at a minimum height of 2.1 m from the ground. In 2004, agrivoltaic systems started to be installed in Japan with installation heights of 3 m [31]. Dupraz et al. [24] used a 4 m elevation to assess the impact of this configuration on crop yields at Montpellier in 2010. This height was chosen to ensure access to large agricultural machinery on the site. In Germany, the impact of shading of the panels on crops was studied in 2016 by installing the PV panels at a distance of 5 m from the ground. In the USA, a 3.3 m high system was installed over the same period to assess the impact of agrivoltaic systems in arid environments [33]. Kim et al. [48] investigated the effect of agrivoltaic systems in South Korea using an

elevation of 5.2 m. Several studies were undertaken involving a range of configurations of agrivoltaic systems on different crops [28,38,49–59]. In addition, standard heights of solar panels can be used for sheep grazing whereas higher panel heights are required for cattle grazing [29]. Figure 4 gives two example of elevated agrivoltaic installation.



Figure 4. (**a**) Panels installed at the height of 4 m in Montpellier © Dupraz, (**b**) Panels installed at the height of 5 m in Germany © Fraunhofer ISE [33].

For traditional industrial-scale solar installations, minimal spacing is required between rows to avoid the shading of one onto another, but spacing between PV modules of a same row is not necessary. For an open agrivoltaic system, the spacing between rows on the one hand and the spacing between modules in the same row on the other hand must be carefully determined according to the type of crop. A wide panel spacing increases the capacity and uniformity of solar radiation penetration to the crop, thus reducing the impact of shading from the panels. Spacings tested ranged from 0.2 m [29] to 6.4 m [50]. A typical image concerning the spacing between modules is depicted on Figure 5. The spacing between rows of panels increases the efficiency of elevated agrivoltaic systems (Figure 6). In addition to enhancing the uniformity of solar radiation distribution to the crops, this configuration also increases the number of crop rows under the panels, facilitates the movement of large farm machinery, and increases the space available for farm workers. The spacing between rows in the aerial systems tested in the field ranged from 0.71 m [55] to 9.5 m [58].



Figure 5. Panels spacing for an experiment in the USA [29].



Figure 6. Spacing between rows of panels allowing movement of farm machinery under the PV panels © Fraunhofer ISE [44].

Another method of optimizing elevated agrivoltaic systems is to use an optimal tilt angle and orientation to increase the yield of the solar panels and the crops grown under them (Figure 7). Various tilts and orientations have been tested for different locations for fixed installations. According to Trommsdorff et al. [44], solar tracking modules allow for more flexible light management under the panels. The process of tracking PV systems involves installing a mechanical system that can adjust the orientation and tilt of the modules at different times of the day, with the goal of optimizing energy production. Two categories of solar tracking systems are used: single-axis trackers and dual-axis trackers. In the first configuration, the PV module array tracks the sun horizontally according to its angle of incidence (altitude) or vertically according to its orbit (azimuth). The second configuration combines the two, producing a more significant amount of energy. These mobile systems optimize crop yields through greater light availability during critical growth periods. In addition, the flexibility of the tilt angle provides constructive protection against hail or extreme radiation by adjusting their orientation as required.



(**a**) (**b**)

Figure 7. (**a**) Single-axis solar tracker module [44] and (**b**) dual-axis solar tracker module [60].

One of the main constraints of installing aerial agrivoltaic systems is the high investment and maintenance cost. The wide spacing of the panels can create favorable conditions for crop growth and development, but it leads to a reduction in energy density due to the reduced number of panels installed on the plot. Also, the spacing between rows of panels can increase the investment cost in areas with high land costs and limited land availability [29]. However, these systems face shading constraints [33], so these installations are favorable for viticulture. Moreover, dual-axis systems with large arrays of PV modules can

create shading under the panels, while other parts of the ground surface receive maximum sunlight [44].

3.2.2. Vertically Mounted Agrivoltaic Systems

The mounting of solar panels vertically to the ground is also a method of optimizing agrivoltaic systems (Figure 8). It consists of an installation technique in which the modules are oriented in the east–west direction, which has proved to be more efficient for permanent crops, or in the north–south direction, where energy production is a priority [61]. These systems require a significant distance between consecutive rows of vertical supports. For example, [62] studied vertical arrays using a 10 m spacing between the rows. A report by [26] showed that the yield of oats and potatoes decreased by 50% when the distance between rows was decreased in length from 20 to 5 m. In addition, [26] reported that 10% of the land near the panels does not have to be cultivated and can be used as ecological zones. Bifacial panels are widely used in these systems.



Figure 8. Vertical agrivoltaic installation with bifacial modules in Sued [62].

Vertical panels are favorable to crops as they allow a homogeneous distribution of sunlight, facilitate farm machinery movement, cleaning of solar panels, and access to crop rainwater. It is more economical, as it reduces the support cost, which is lower than that of aerial systems [39]. However, according to Katsikogiannis et al. [61], the constraint of its usage is the reduction in the electrical energy produced. Indeed, these systems allow for a 50% increase in LER and for a 33% reduction in electrical production compared to conventional single PV systems. According to Reagan and Kurtz [63], electrical production can be increased by 10–20% compared to traditional techniques by using a 2 m spacing between the supports, which results in a substantial reduction in crop yield [26].

Table 1 gives the strengths and weaknesses of the different installations.

Table 1. Summary of the strengths and weaknesses of the different installations.

Type of Installation	Strengths	Weakness
Inter-row systems	• Considerable space in this type of installation facilitates the passage of large agricultural machinery • Low investment cost	• Crop yield reduction due to uncultivated space

Table 1. *Cont.*

Type of Installation	Strengths	Weakness
Elevated systems with spacing between rows of panels	• Spacing between rows of panels and between panels enhance the uniformity of solar radiation • Can create crop protection in temperate zones • Crops under panels increase crop yields • Facilitates the movement of large farm machinery • Increases the space available for farm workers	• High investment and maintenance cost • Can create a shadow under the panels • Reduction in energy density due to the reduced number of panels installed
Tracking systems	• Greater light availability during critical growth periods • Constructive protection against hail or extreme radiation	• High investment and maintenance cost • Dual-axis systems with large arrays of PV modules can create irregular distribution of light to crops
Vertical mounting systems	• Homogeneous distribution of sunlight • Facilitate farm machinery movement • Cleaning of solar panels • Access to crop rainwater • Reduced cost of the installation structure • Increased electricity production for small distances between installation structures	• Reduction in agricultural production for small distances between installation structures (2 m) • Reduction in electricity production for large distances between the installation structures (20 m)

4. Factors Affecting the Operation of Photovoltaic Systems

Agrivoltaics relies mainly on the distribution of sunlight for photovoltaic energy production and photosynthesis. Therefore, the solar radiation spectrum is shared between the solar panels and the crops underneath [34]. Indeed, the principle of photovoltaics is the conversion of sunlight into direct current electricity. This production of electrical energy is the result of the absorption of photons from photovoltaic cells exposed to the sun, which in turn release free electrons to produce electrical energy [64–68]. Furthermore, the solar cell is the main component of the solar photovoltaic system [69].

Solar cells can be grouped into four generations based on the specific constituent elements and their periods. The first generation of PV cells is based on silicon wafer technology, including monocrystalline and polycrystalline cells [70]. The cells have an efficiency of between 18% and 20%, depending on the quality of the silicon used. However, according to Blakers et al. [71], the maximum efficiency reported for polycrystalline silicon cells could be as high as 26–27%. The theoretical maximum efficiency of monojunction silicon cells is around 30% and is called the Shockley–Queisser limit. The basic structure of these cells usually consists of a glass front and back cover, encapsulation layers, a solar cell matrix, and solder joints to electrically connect the individual cells [72]. Second-generation solar cells are thin-film cells that have a reduced maximum thickness of a few nanometers or tens of micrometers, compared to first-generation cells. This reduction in thickness helps to decrease the material usage and cost of silicon solar cells. These cells are made of two heterojunction layers squeezed between two contact layers. Efficiencies of 22.6% have been achieved with cadmium telluride (CdTe) thin films [73]. Third-generation cells consist of dye-sensitized solar cells (DSSCs), perovskite, and organic solar cells. DSSCs are limited by the synthesis of organic dyes and their chemical stability. For this reason, perovskite has been used as an alternative to DSSCs, and more than 21% efficiencies have been achieved in a very small area. The fourth-generation tandem solar cells are made of composite materials, consisting of polymers mixed with nanoparticles to have the properties of a single absorbing layer. The tandem solar cell is characterized by a top and bottom solar cell and an intermediate buffer layer. The upper GaAs cells absorb solar radiation, which is then transmitted to the Si of the lower cells [74]. The electrodes extract the generated charge carriers, and a photo-current flows through the thin buffer layer between the two solar cells [75]. The four generations mentioned are shown in Figure 9.

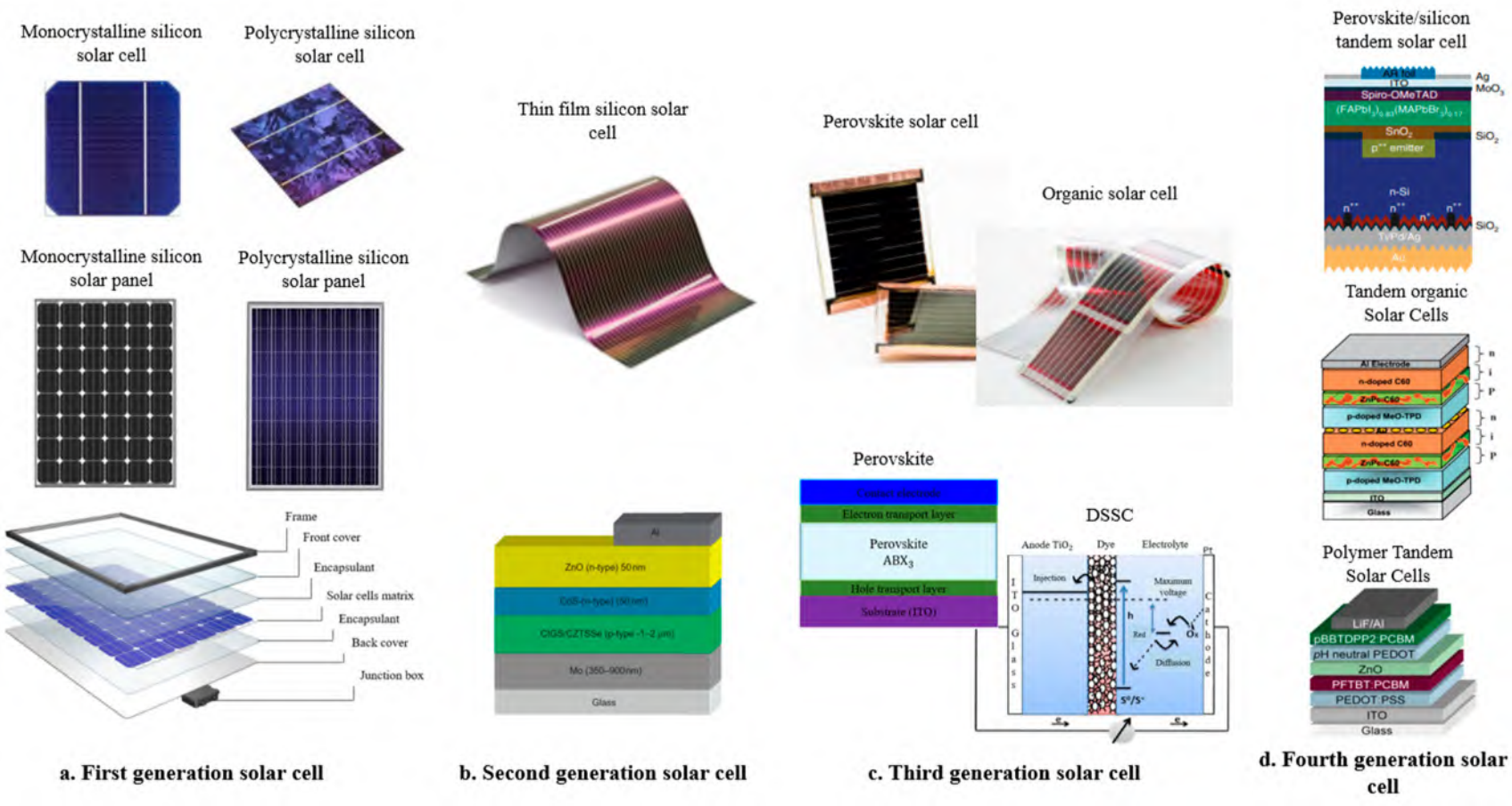


Figure 9. The four different generations of solar cells and their structures [74,76–80].

First-generation solar cells, namely monocrystalline and polycrystalline silicon-based cells, are the most commonly available in the commercial world [74]. According to Zhang et al. [76] and Rabanal-Arabach [77], 80–85% of the panels on the market belong to silicon technology.

In temperate regions with much sunshine, solar radiation is often too intense for some crops, especially in the summer. Shading screens are often installed in the systems to reduce the intensity of this radiation. These are semi-transparent solar panels [28,81,82]. Indeed, different opaque, transparent, and semi-transparent technologies are used in agrivoltaic systems and lead to different changes in sunlight availability throughout the day [29]. Bifacial panels are also widely used in agrivoltaic systems, as they use the light from the ground side (opposite side of the module) to generate electricity. Depending on the level of radiation on the back side, this can increase electricity production by up to 25% [44]. Agrivoltaic systems must be designed to grow appropriate vegetation depending on the available solar energy, soil, ambient climate, and other conditions. Therefore, the optimal conditions in agrivoltaic systems should be specific to the area where the system is implemented.

The PV module energy production mainly depends on the cells' temperature and the solar radiation. These parameters are related to the following factors: azimuth, tilt, latitude, solar declination, the slope, vertical shadow angle, hourly angle, zenith angle, elevation height, presence of vegetation at the bottom of the panels. The performance of a solar panel is determined by the amount of solar radiation it receives, whereas the temperature can create power losses (high temperature) or enhance the power (low temperature). The amount of solar radiation that the PV array receives changes depending on the geographical location, the sun's movement, the climatic conditions of the area, and the orientation of the panels [83]. Ideally, a photovoltaic installation should have the incident solar flux perpendicular to the array surface to maximize the panels' energy potential [84,85]. Thus, the optimal orientation must be determined due to the perpetual movements of the sun.

The orientation of the panels is determined through two parameters i.e., the azimuth and the tilt. The movement of the sun is a function of its elevation which depends on two parameters, namely the latitude and the solar declination. Furthermore, according to Jafarkazemi and Saadabadi [86], the azimuth angle of the surface, latitude, time of day, slope or tilt angle, day of the year, and incident radiation angle determine the amount of solar radiation received by the PV panels installed on a given area (Figure 10).

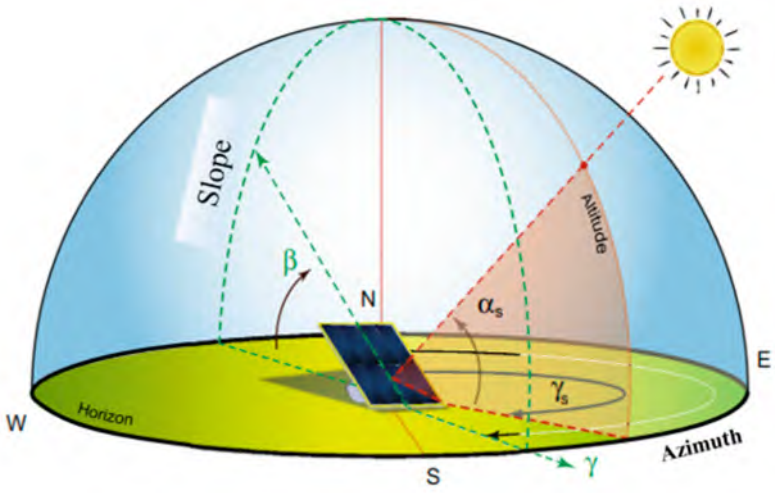


Figure 10. Factors affecting the performance of solar PV panels [87].

In particular, the electrical energy resulting from the transformation of the solar energy absorbed by the panels is strictly related to the slope (the tilt angle) and the azimuth angle [88]. The tilt angle (elevation angle) represents the angle formed by the horizontal

plane of the installation and the PV panels for a fixed structure [85,89]. A change in the tilt angle simultaneously leads to a change in the amount of radiation reaching the surface of the PV panels [89]. However, as a general rule, the tilt angle for a PV array installation is nearly equivalent to the latitude of the area [90,91]. The solar azimuth is the horizontal angle between the vertical plane normal to the surface and the vertical plane in which the center of the solar disc is contained, oriented in the north–south direction [91]. For this purpose, the azimuth values of 90°, 0°, +90°, 180° correspond to the positions east, south, west, and north of the panels, respectively [85,92]. Thus, the panels are oriented to the north in the southern hemisphere and the south in the northern hemisphere [93].

Other parameters that can likely affect the performance of photovoltaic modules are (i) the albedo, which is the amount of radiation reflected from the ground surface across the solar spectrum and (ii) the vertical shadow angle, sometimes referred to as the vertical profile angle, which is the direction in degrees of rotation of the center of the solar disc [91]. To these parameters, Oudrane et al. [94] and Nfaoui and El-Hami [95] added the hourly angle, which is a function of the daily spinning of the earth with respect to its axis, and the declination, which is the angle between the "center of the earth-sun" vector and the equatorial surface of the earth. Yilmaz et al. [96] considered in addition to these parameters the zenith angle which is the angle between the sun's direction and the vertical of the location.

In addition, the elevation height and the occupation of the surface where the PV array is installed can have an impact. These factors have been highlighted by Chemisana and Lamnatou [97], Ogaili and Sailor [98], Alshayeb and Chang [99], and Osma-Pinto and Ordóñez-Plata [100]. They evaluated the electrical energy generated by a photovoltaic array on rooftops using different elevations and different ground level supports. According to Alshayeb and Chang [99], the presence of vegetation at the bottom of the panels can be advantageous, resulting in an increase of 0.25 to 0.4% in the efficiency of the solar panels when the panels are installed at the height of 50 to 75 cm from the roof [100]. According to Chemisana and Lamnatou [97], vegetation below the panels leads to a decrease in ambient temperature that can cause an increase of 1.29–3.33% in the maximum power output of the PV array. Furthermore, Ogaili and Sailor [98] showed that the presence of vegetation could cause an increase in the energy output of 0.8% to 1.2% compared to a white or black colored substrate, respectively, when the panels were elevated at 18 cm from the roof.

5. Impact of Agrivoltaic Systems on Crops

5.1. Importance of Solar Radiation on the Process of Photosynthesis

Sunlight is the key factor in photosynthesis. Photosynthesis consists of the production of oxygen and glucose that crops can use for growth and development [101,102] as a result of the reaction between water and carbon dioxide absorbed through the stomata, which are small holes in the lower epidermis, and controlled by sunlight [103]. Equation (3) is a summary of the photosynthetic reaction.

$$6H_2O + 6CO_2 \overset{Solar\ energy}{\rightarrow} C_6H_{12}O_6 + 6O_2 \quad (3)$$

$$\Delta_rG^{o'} = +2870\ kJ/mol, \Delta_rG^{o} = +2875\ kJ/mol = \Delta_rG^{O''} \quad (4)$$

Photosynthesis can be broken down into two stages. The first step, called the light reaction, consists of the absorption of sunlight by the chlorophyll pigments [104], resulting in the production of electrons and protons, which are responsible for the production of adenosine triphosphate (ATP) and nicotinamide adenine dinucleotide phosphate (NADPH) at the thylakoid membrane [103]. The second step is the dark reaction in which NADPH and ATP generated in the light reaction is used to produce carbohydrate from CO_2 through the Calvin–Benson cycle in the chloroplast stroma [104–106]. Figure 11 gives an overview of the importance of light in the process of photosynthesis.

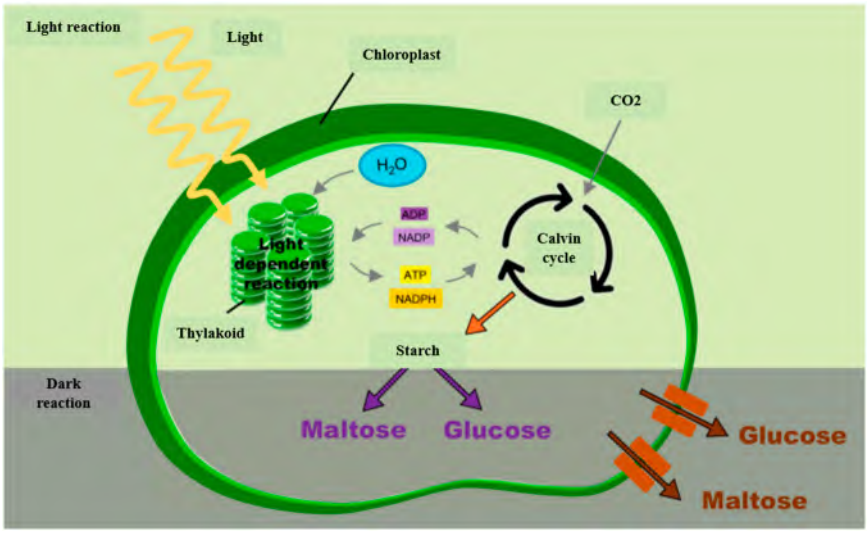


Figure 11. The overall process of photosynthesis at the chloroplast level [107].

Chlorophylls are the primary pigments in crop cells that absorb sunlight in the blue (450 nm) and red (650 nm) wavelengths and give the crop its green color. However, there are other pigments in crop cells, namely carotenoids, which absorb blue light and give the leaves their yellow color. Furthermore, the excitation of ions in the process of photosynthesis is driven by the absorption of specific wavelengths of light in the visible range [103], as shown in Figure 12.

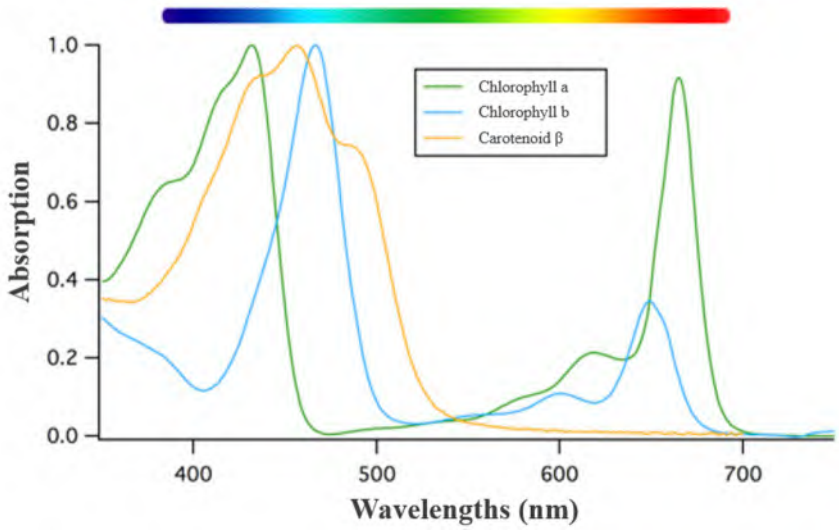


Figure 12. Basic absorption spectra of crops' main chlorophyll and carotenoid pigments [103].

Indeed, wavelengths from 430 to 500 nm are effective in chloroplast development and photosynthetic function [106,108]. In addition to promoting photosynthetic activity, wavelengths from 640 to 670 nm are necessary for leaf growth and crop biomass production [106,109]. Furthermore, according to Wang and Folta [110], the wavelengths 500–600 nm are of great importance in chlorophyll content, photosynthetic function, and consequently crop growth.

This part of the solar radiation of wavelength 400–700 nm is called photosynthetically active radiation and represents the part of solar radiation mainly used for photosynthesis [111,112]. However, the total proportion of solar energy in the photosynthetically active band represents only 48.7% of the average solar spectrum measured at the Earth's surface. At the same time, the chlorophyll pigment is considered as an imperfect radiation absorber

in the 400–700 nm band because it weakly absorbs solar radiation in the green band. Therefore, it is estimated that 90% of the radiation is photosynthetically absorbed by vegetation, and 10% is reflected [113]. According to Amthor [114], the solar radiation intercepted at the Earth's surface depends on the area's location, the presence or absence of clouds in the sky, and the sun's elevation. In addition, the fraction of incident solar radiation intercepted by crops is a function of leaf area and orientation. Furthermore, the total photosynthetically active radiation absorbed by chlorophyll pigments for a crop that has reached whole leaf area development is estimated at 92%.

5.2. Factors That Can Affect Crop Growth in Agrivoltaic Systems

Agrivoltaic systems are systems in which crops are grown, considering factors that may affect crop growth, including the level of shade, climatic factors, and water consumption [115].

Access to the limited amount of sunlight needed for the photosynthetic process is the main challenge for crop productivity under PV panels [24,116], as sunlight is the key factor playing a significant role in crop growth and development [117].

Touil et al. [118] reported that PV panels can cause a reduction of over 40% in the amount of solar radiation received by crops. A coverage rate of 50% or more can also hinder crop growth. For example, a panel-induced shading level of 50% led to a decrease in crop height and stalk diameter, and a decrease in net leaf photosynthesis rate, leaf specific weight, dry matter accumulation on leaves and stalks, and grain number of maize. To this end, the optimal level of shading to ensure energy requirements for photosynthesis consists of a level of photosynthetic photon flux density capable of both saturating CO_2 assimilation and favoring the stabilization of shading conditions and reducing photoinhibition [24].

Nevertheless, the shading induced by the photovoltaic field can be beneficial by reducing the amount of water lost through evaporation and therefore increasing water use efficiency [119]. To this end, these devices are favorable in drought-prone areas during hot periods, as they reduce crop water demands due to reduced evapotranspiration [38,53,54,120]. According to Yue et al. [121], agrivoltaic systems can increase soil moisture by 14.7% for fixed installations and 11.1% for mobile installations. Moreover, based on a study conducted by Adeh et al. [52], panels in agrivoltaic systems allow for more efficient water use (estimated at 328%) by maintaining higher soil moisture levels compared to soil moisture in a full-sun growing area. Barron-Gafford et al. [54] showed that the positive effect of agrivoltaic systems on water conservation is exacerbated by applying water to the crops based on a two-day irrigation frequency that maintains 15% higher soil moisture compared to the soil under full sun. However, although soil moisture remained higher under the panels, it was reduced by 10% based on a daily application of the crop's water requirements. Furthermore, studies conducted in dryland environments on the impact of agrivoltaic systems on specific crops showed that water use efficiency under the panels was estimated at 157%, 65%, and 12% for chili, tomato, and lettuce, respectively, for a 4 m panel elevation [50,118]. Furthermore, a simulation study by Elamri et al. [40] showed a reduction of less than 20% in the water requirement of lettuce as a result of the effect of panel shading.

The shading caused by the panels and the increase in soil moisture affects the microclimate of the area cultivated under the panels. Adeh et al. [52] established that the elevation of the PV panels by 1.2 to 2 m causes a considerable change in air temperature, relative humidity, and wind speed on the surfaces near the PV panels. In a study conducted in the USA on tomato cultivation, it was observed that the air temperature varied between 21.5 °C and 22.3 °C in the subplots cultivated in the open air, whereas it decreased to 19.8 °C under the panels (for an elevation of 2.2 m and a tilt angle of 18°). The rows had the highest average relative humidity at 79.38%, followed by sub-plots cultivated in the open air at 74.63%, and sub-plots located under the panels had an estimated humidity of 73.54%. The soil temperature was estimated to be 20 °C, 24.7 °C, and 25.6 °C under the PV panels, between the panel rows and the control, respectively. In addition, the wind

speed was lower (0.65 m/s) between the rows of panels, whereas it was 0.89 m/s in the open field [119]. According to Noor and Reeza [122], the microclimate under the panels varies differently depending on the area's climate and the land's topography. Their study in the tropics showed that the air temperature was the same in the open field and the higher and middle areas under the panels. However, it was higher in the areas of lower topography under the PV panels. Regarding relative humidity, these studies showed that relative humidity was higher under the PV panels, estimated at 65%, compared to 63.7% between the rows of PV panels and 53.5% in full sun.

The panels reduced the average soil temperature of 5.2 °C in summer with a minimum of 3.5 °C and a maximum of 7.6 °C, and an increase of 1.7 in winter in the UK [21,121]. Abu-Hamdeh [123] showed that the soil temperature under the panels recorded a decrease of 3.1 °C in arid zones and 1.1 in equatorial and temperate zones. Moreso, the soil temperature can vary depending on the installation technology. For example, the ground temperature under fixed panels was found to be lower than under mobile panels since the radiation intercepted by the panels is higher for mobile technologies [51,121]. Weinstock and Appelbaum [124] showed that agrivoltaic systems can lead to a reduction in soil temperature of 4 °C for fixed and 1.5 °C for mobile installations.

5.3. Impact of Solar Panels on Crops

The success of production in agrivoltaic systems is highly dependent on the choice of crops to be grown. Crops grown under PV panels are often subject to different climatic conditions than those grown in full sun because of the shading created by the solar panels. Furthermore, crops of different varieties of the same species may respond differently under the same conditions [29]. For this purpose, the impact of agrivoltaic systems on crops is summarized in Table 2, considering different crops and locations.

Table 2. Impact of photovoltaic panels on different crops in different localities.

Crops	Study Area	Height and/or Spacing or Shading Rate	Impact on Culture	Sources
Durum wheat	Montpelier, France	Height of 4 m Spacing 1.64 m (distance between the lower side of two consecutive panels) Tilt of 25°	• 11–29% reduction in dry matter • 8 to 11% reduction in yield	[24]
Lettuce and cucumber	Montpelier, France	Height of 4 m Tilt of 25°	• Reduction of evapotranspiration by 62% and 70% for lettuce and 73% to 81% for cucumber • Crop cover was significantly higher in the shaded treatments (150% between days 124 and 144)	[50]
Lettuce	Montpelier, France	Height of 4 m Two spacings: 1.6 m in full density and 3.2 m between rows in half density Tilt of 25°	• Crop axis under PV panels was 7.4 cm with 2.0 g dry matter per axis compared to 6.6 cm and 2.5 g per axis in full sun • Significantly reduced number of leaves in the shade • Increased leaf area	[49]
Lettuce	Kansas, USA state	Height of 4 m Two spacings: 6.4 m in half density and 3.2 m between rows in full density	• 42% reduction in yields for the 3.2 m spacing and 19% for the 6.4 m spacing in summer • No impact on yield for the 6.4 m spacing in spring but 21% reduction for the 3.2 m spacing	[38]

Table 2. *Cont.*

Crops	Study Area	Height and/or Spacing or Shading Rate	Impact on Culture	Sources
Chili and tomato	Tucson, USA	Height of 3.3 m above the soil surface at their lowest point Spacing of 1 m Tilt of 32°	• For Capsicum annuum var. glabriusculum, production is three times higher under the panels • For C. annuum var. annuum, there is no impact • For S. lycopersicum var. cerasiforme, production is two times higher under the panels	[54]
Maize	Chiba Prefecture, Japan	Height of 2.7 m Two row spacings: 0.71 m for high-density and 1.67 m for low-density Tilt of 30°	• Yields of 3.54 kg/m^2, 3.35 kg/m^2 and 3.23 kg/m^2 at a distance of 1.67 m in full sun and at a distance of 0.71 m, respectively	[55]
Grape	Ongjin-Gun, Republic of Korea	Height of 2 m Tilt of 15° Shading level of 30 of the total roof area	• Germination period, number of flowers and grape growth are identical in all treatments	[56]
Basil and spinach	Italy	-	• Reduction in marketable biomass yield by 15% and 26% for basil and spinach, respectively	[28]
Sesame, mung bean, kidney bean, corn and soybean	Jeollanam-do, South Korea	Height of 5.42 m Shading rates of 32%, 25.6% and 21.3%	• Yield reductions for all crops except maize at 21.3% shade • At 21.3%, yields increased by 6% for maize and decreased by 7%, 13%, 21% and 26% for sesame, soybean, mung bean and kidney bean, respectively • At 25.6%, yield reduction of 14% for sesame and 35–44% for beans • At 32%, yield reduction of 53% for sesame and 30–44% for other crops	[48]
Oilseed rape, onion, faba bean and forage maize in rotation with potato melon, carrot, onion and dry pea in rotation with tomato	Sevilla, Spain	Height of 5 m Spacing of 9.5 m between suppoted structure Tilt of 27°	• Reduction in crop yields under shade following a correlation of studies already carried out on the effect of shade on the area (reduction of 10%, 7%, 17%, 6%, 20%, 23%, 15% and 5% for carrot, maize, melon, onion, rape, potato, dry pea and tomato, respectively)	[58]
Celery	Southwest Germany	Row distance: 9.5 m (2.8 times module row width)Height (free space in the direction of the work/top edge): 5.5 m/8 m	• Crop height was 30.6% and 14% higher under panels in 2018 and 2017, respectively • Dry matter yield of above-ground biomass was 48% and 31.9% higher under panels • Bulb yield decreased by 18.9% in 2017 and increased by 11.8% in 2018	[59]

Table 2. *Cont.*

Crops	Study Area	Height and/or Spacing or Shading Rate	Impact on Culture	Sources
Red beet, winter wheat, potato and red clover	Southwest Germany	Height of 5 mSpacing of 6.3 mTilt of 20°	• Increase in crop height for all crops • Between 2017 and 2018: −19 to +3% for winter wheat, −20 to +11% for potato and −8 to −5% for red clover and	[125]
Rice, onion, garlic, rye, soybean, bean, maize, forage crop	South Korea	Height of 3.3 mSpacing of 1.5 mShading rate of 30%	• For rice, stem height was 3.8 cm higher under the panels and yields decreased by 18.7% in 2018 and 8.9% in 2019 • For soybeans and beans, yields decreased by 68.7% and 73.3%, respectively • For garlic and onions, yields decreased by 18.7% and 14.6%, respectively • For fodder crops, the height was 7.4 m higher under the panels, nevertheless the yield decreased by 3.1 t/ha	[126]
Rice, potato, sesame, and soybean	South Korea	Height between 4 m and 4.5 m	• No impact on growth except for sesame (lower stem length, number of branches and 1000 seed weight) • Yield reduction of 3% for potato, 19% for sesame, 18–20% for soybean and 13–30% for rice	[42]
Soybean	Monticelli d'Ongina, Italy	Height of 4 to 4.5 mSpacing between rows of trackers of panels of 12 mfour treatments: 27%, 16%, 9% and 18% shading	• Crop height of 98.25 cm at 27%, 90.81 cm at 18%; 86.95 cm at 16% and 85.04 cm at 9% shade under panels and 87.8 cm in full sun • Number of pods reduced by 19.4% at 27% shade and 18.2% at 18% shade compared to treatments with 16% or less shade • Grain yield reduced by 8%, 4.6% and 11.8% for 27%, 9% and 18% shade respectively compared to full sun versus 4.4% increase for 16% shade	[127]

6. Influence of Agrivoltaics Systems on PV Module Performance

Few studies have focused the impact of agrivoltaic systems on the performance of solar panels. This is because crops are most affected by these types of installations. However, Table 3 gives an overview of some of the advantages and disadvantages of these installations on solar panels highlighted by some authors.

Table 3. Impacts of agrivoltaic systems on the performance of solar PV panels.

Advantages/Disadvantages	Description	Source
Advantages on PV panel	Increase energy production due to increased area through the LER	[39,117]
	Decrease in temperature of solar panels could be achieved by using agricultural moisture, evaporation from agricultural activities, and transpiration from crops which results in the increase in electricity generation	[128]
	PV panels in agrivoltaic systems can generate between 3.05% and 3.2% more energy compared to PV installations without cultivated crops	[129]
	Decrease in ambient temperature can cause an increase of 1.29–3.33% in the maximum power output of the PV array	[97]
	The presence of surface green due to vegetation at the bottom of the panels can results in an increase of 0.25 to 0.4% in the efficiency of the solar panels	[99]
Disadvantages on PV panel	Agrivoltaic can reduce the efficiency of electricity generation or agriculture when taken separately	[39]
	Decrease in the electricity produced with the reduction in the density of solar PV panels	[38,48,55]

7. Models Already Developed in the Agrivoltaic Field

One of the first models developed to optimize agrivoltaics was carried out in Montpelier by [24]. This is a model for intercepting the radiation available on the panels (developed on R software) and simulating the crop's development (generic crop model STICS). The light interception model calculates the daily radiation at any point on the ground using a ray-tracing algorithm. The crop simulation model was used to predict the behavior of crops under the panels. For the light simulation, ray tracing algorithm was used to make the simulation. The daily direct and diffuse radiation quantity striking any point of the ground below the array consisted of the output.

The authors of [38] utilized the STICS model, which comprises four primary modules. These modules include the crop growth module, soil interaction module, crop management module, and microclimate module. The crop model determines the effects of climate and soil moisture content on the immediate microclimate surrounding the crops. Indeed, they set up a solar PV system model and a crop model to optimize the performance of the agrivoltaic system. In their PV model, they formulated an optimization problem whose objective was to maximize the incident solar irradiance on the PV, while considering the additional land cost due to minimizing inter-row shading. They proposed to reduce panel density or use semi-transparent panels to reduce the effects of shading. In order to optimize the geometry of an agrivoltaic system, the crop, solar irradiance, mounting height, environmental climate, and tilt angle are crucial. The module production model was developed on PVsyst.

The use of the STICS model is advantageous because it allows the assessment of the impact of the configuration of a given agrivoltaic installation on crop growth. Therefore, real data from field experiments are required to use the model.

Amaducci et al. [120] had developed a software platform on Scilab by coupling the radiation and shading model to the generic crop growth simulator (GECROS). The GECROS crop model predicts crop biomass and yields as a function of climatic factors such as radiation, temperature, wind speed, and partial vapor pressure, as well as the amount of water and nitrogen available in the soil. Regarding the shading radiation model, it consisted of calculating direct and diffuse radiation at ground level with a time step ts = 0.5 h and a spatial resolution of 0.12 m by developing a procedure to calculate whether a portion of soil that is shaded or that receives direct radiation. This study was conducted using a tracking system.

Malu et al. [130] carried out agrivoltaic system modeling to study the electrical performance of agrivoltaic systems when combining grape and energy production in the Nashik

District of Maharashtra State in India using the National Renewable Energy Lab's System Advisory Model (SAM) version 2014.1.14, which uses weather data, location of the study area, PV array size, DC/AC ratio, azimuth angle, required axis type, and tilt angle. Inputs data consist of the weather data, the ratio of DC to AC power, the azimuth angle, the tilt angle, the type of axis required, the size of the system array, and the tilt angle. However, the study focused more on energy production.

Elamri et al. [40] investigated the variations of water in soil and the productivity of crops under PV panels. For this purpose, they used a model called "AVirrig" adapted based on the existing "Optirrig" model. Optirrig was built to generate and optimize irrigation scenarios that operate at a daily time step. The inputs used in this model are rainfall, radiation, air temperature, reference evapotranspiration, soil water reserves, leaf area index, dry matter, and crop yield. "AVirrig", which also includes the "AVrain" model that describes the redistribution of rainfall by solar panels depending on the method of panel installation, consists of a reservoir model that assumes the presence of three water reserves in the soil. This is a specific adaptation of "Optirrig" for AV installations that take into account the fluctuation of the shadow created by the PV modules. In opposition to Malu et al. [130], this study focused more on agricultural production.

Similar to Amaducci et al. [120], Potenza et al. [127], performed modeling to optimize the growth of crops under panels in Italy by coupling the GECROS crop growth model with a set of algorithms to estimate and specialized shading, radiation, and crop-related parameters. The system simulates the entire crop growth cycle, carbohydrate distribution, and grain yield of crops under the panels. Crop height, leaf chlorophyll content, leaf area index, and specific leaf area were measured throughout the experiment. Radiation mapping, calculated on the cells with a resolution of 0.12 m $\times$ 0.12 m and a time step of 30 min, was used to determine the shadow depth. GECROS is advantageous because it allows the prediction of biomass and yield based on the knowledge of climatic parameters. Thus, a knowledge of the variation of climatic parameters under the panels allows to determine the adequate configuration of an agrivoltaic system.

Trommsdorff et al. [43] investigated the electrical efficiency of PV systems applied to crops and the behavior and productivity of crops under panels in Germany's largest agrivoltaic research facility. The study was conducted according to the variation of solar radiation available to the PV panels and the crops. All light simulations for the PV modules were performed with Radiance, which is a back ray tracer for optical calculations in virtual environments that takes into account both direct and diffuse fractions of the irradiance, allowing the simulation of ground reflections to analyze the electrical gains on the back side of the PV panels. In addition, they used ZENIT software tool, which considers, among other things, temperature coefficients, specific efficiency curves, maximum power points, and inverter power limitations to evaluate the overall electrical efficiency. Virtual sensors measured the radiation under the panels. Simulations were performed for different orientations of the APV field between South and South–West (0°, 15°, 30°, 45°) and different distances between rows of panels. Moreso, the photosynthetically active radiation under the panels was converted into biomass yield.

Kim et al. [48] focused on the electricity production of agrivoltaic systems and the increase in revenue when implementing such a system. Thus, they implemented a polynomial regression to develop a model for estimating the system's electricity production using machine learning. The model considered eight (8) parameters, including solar radiation, daily minimum and maximum temperature, daily rainfall, humidity, wind speed, shading ratio, and type of solar panel. However, the shading data used in the study was calculated as panel area over the system area. Therefore, the model does not provide an indication of the optimal configuration in terms of spacing, elevation, and inclination for the crop to be grown.

Pulido-Mancebo et al. [131] have developed a model for optimizing agricultural production under the panels to convert photovoltaic power crops into agrivoltaic systems. It consists of a mathematical model that simulates the solar incidence in a network of

representative points on the ground, depending on the geometry and design of the PV crop to be converted to agrivoltaics. The study focused on photovoltaic installations with rectangular collector planes inclined towards the south and one side of the rectangle (wider) oriented in an east–west direction and parallel to the ground and with the shorter side oriented in a north–south direction. The model is based on the representation of the sun's position with respect to the geometry of the collector array (latitude of the location, solar declination, day angle, and solar time) as well as the geometry of the PV system itself (a rectangle represents the system). The model geometrically determines the shading at any point on the ground by determining the direct and diffuse radiation on the horizontal ground without obstacles. The inputs were the declination, the latitude, solar time, and daily angle. This model is advantageous because it allows a quick overview of the radiation in the ground in agrivoltaic systems.

Nevertheless, these models do not directly give a specific elevation, spacing, and inclination for a given crop and given locality. These models are used to determine whether or not a selected configuration is suitable for a given crop and need to be optimize. All these modeling studies have been set up to study and verify the performance of a specific installation to see the impact of this installation on the yield of the crop being grown in this system. Moreover, Pulido-Mancebo et al. [131] have developed that simulates the solar incidence in a network of representative points on the ground; nevertheless, it does not directly give the optimal spacing between rows of panels and between panels and the elevation to choose for a given crop.

Therefore, considering the limited number of decision support studies that have been conducted to determine the ideal configuration, i.e., elevation, panel row spacing, and panel spacing and tilt for any given crop, this review article has been developed to clearly explain agrivoltaics. We believe that this review can be used as a guide to set up a model that will take into account geometric, geographical, climatic, crop, and PV panel factors which will have as outputs the optimal spacing between panels, elevation, and tilt that will result in maximizing the crop yield and power of the PV system in agrivoltaic systems.

8. Conclusions

The agrivoltaic system was first used in 1980. However, only a few studies were carried out in this field during this period. It is only since 2011 that many have started to work in this field. To this end, several studies have emerged in this field in recent years. These studies have mainly focused on implementing a given configuration of photovoltaic solar panels to reduce the effects of shading on crops. Several panel elevations and spacings were tested on several crops in different areas. However, these proposed arrangements were specific to the site and crop being tested. Thus, no study has been carried out to establish a model that allows for optimal panel elevation and spacing for a given area and crop. It is within this framework that this review was carried out. It gives a clear explanation of the agrivoltaic systems in full sunlight, the principle of operation of the panels, and the photosystem, both of which depend on solar radiation, as well as the factors that can affect their operation. It also shows the key factors that should be considered in an optimization model. This review examined the strengths and weaknesses of each type of installation to better select the system to be used and to optimize both the yield of the crops to be planted under the panels and the yield of the solar panels installed. For this purpose, the choice of an optimal elevation height, spacing, and tilt of the solar panels will reduce the impact of shading and increase crop yields, but also increase the power output of the solar photovoltaic panels, which is a twofold benefit. According to us, setting up a model that can be used for any area to find an optimal panel arrangement in the locality being studied would be an innovative solution that will be of high interest, especially in areas where the agrivoltaic system has never been tested. Furthermore, in the future, other studies may be conducted in the field of agrivoltaics, namely the evaluation of the environmental impact of the use of the panel structure which is becoming more imposing in elevated systems. Moreover, further research could also explore the economic implications of using

agrivoltaics for pumping water to support crop production and generating electricity for sale by small-scale farmers in rural areas where electricity access is limited.

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Nomenclature

β	Slope
γ	Azimuth
α_s	Coordinates of solar altitude
γ_s	Solar azimuth
AC	Alternating current
A_i	Uncultivated agricultural area
A_n	Cultivated agricultural area
ATP	Adenosine triphosphate
CdTe	Cadmium telluride
DC	Direct current
DSSCs	Dye-sensitized solar cells
E	East
GECROS	Genotype-by-Environment interaction on CROp growth Simulator
h_1	Installation height greater than 2.1 m
h_2	Installation height less than 2.1 m
LER	Land Equivalence Ratio
N	North
NADPH	Nicotinamide adenine dinucleotide phosphate
PV	Photovoltaic
S	South
SAM	System Advisory Model
STICS	Simulateur mulTIdisciplinaire pour les Cultures Standard, or multidisciplinary simulator for standard crops
W	West
x	cultivated crop
y	electricity

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RESEARCH ARTICLE

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Effects of solar park construction and solar panels on soil quality, microclimate, CO_2 effluxes, and vegetation under a Mediterranean climate

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Abstract

Solar energy is increasingly used to produce electricity in Europe, but the environmental impact of constructing and running solar parks (SP) is not yet well studied. Solar park construction requires partial vegetation removal and soil leveling. Additionally, solar panels may alter soil microclimate and functioning. In our study of three French Mediterranean solar parks, we analyzed:(1) effects of solar park construction on soil quality by comparing solar park soils with those of semi-natural land cover types (pinewood and shrubland) and abandoned croplands (former vineyards); and (2) the effect of solar panels on soil microclimate, CO_2 effluxes, and vegetation. We measured 21 soil properties of physical, chemical, and microbiological soil quality in one solar park and its surroundings to calculate integrated indicators of soil quality. We surveyed soil temperature and moisture, CO_2 effluxes, and vegetation below and outside solar panels of three solar parks. Soil aggregate stability was reduced by SP construction resulting in a degradation of soil physical quality. Soil chemical quality and a general indicator of soil quality were lower in anthropogenic (SP and abandoned vineyards) than in semi-natural (pinewood and shrubland) land cover types. However, differences between abandoned vineyards representing the preconstruction land cover type and solar parks were not significant. Solar panels reduced the soil temperature by 10% and soil CO_2 effluxes by 50% but did not affect early successional plant communities. Long-term monitoring is needed to evaluate the effects of solar panels on vegetation.

KEYWORDS
land cover, microclimate, plant communities, renewable energy, soil functions, soil respiration

1 | INTRODUCTION

The use of solar energy to produce electricity is increasingly common in Europe and requires large areas in order to be cost-effective (Murphy et al., 2015; Ong et al., 2013). Solar park construction involves clearing and grading the soil surface, burying of electric cables, vegetation removal, and soil compaction increasing runoff and erosion. Grading, compaction, and erosion change the physical and chemical properties of the soil and thus reduce its quality. Since solar park construction destroys the vegetation and affects the soil, a careful analysis of the environmental impact of solar parks is needed (Armstrong et al., 2016; Hernandez et al., 2015). Although soil quality is an important indicator of ecosystem functioning, the effect of solar park construction on soil quality has not yet been reported elsewhere. After the installation of solar panels, the vegetation is regularly mown or grazed limiting vegetation height to prevent shading of panels. The solar panels also change the microclimate such as temperature, humidity, and solar radiation (Armstrong et al., 2016; Tanner

et al., 2020). Such changes in microclimate may affect soil processes and plant communities under panels, in particular, in the European Mediterranean with high solar irradiation compared to temperate regions.

Soil quality is "...the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality and support human health and habitation" (Karlen et al., 1997). Three soil quality indicator groups are commonly used: physical, chemical, and biological soil properties (Bünemann et al., 2018; Costantini et al., 2016; Maurya et al., 2020). Physical properties, such as bulk density and texture, influence water holding capacity and plant communities by modulating root growth (Lampurlanés & Cantero-Martínez, 2003; Scarpare et al., 2019). Chemical properties, such as inorganic N, total C, and pH, control plant nutrition and microbiological activity. Biological indicators include the activity of decomposers such as invertebrates or microorganisms. These organisms control organic matter decomposition and nutrient cycling (Maurya et al., 2020).

Velasquez et al. (2007) developed a single general indicator of soil quality (GISQ) that integrates a set of physical, chemical, and biological soil properties. Such soil properties are chosen and measured to evaluate multifaceted aspects of soil functions and further combined to calculate sub-indicators of physical quality, chemical fertility, and biological functioning. The GISQ combines the subindicators to provide a global assessment of soil quality based on soil ecosystem services and facilitates the comparison of soils between different sites/habitats. In a comparative study on four land use types, (Raiesi & Salek-Gilani, 2020) showed, using an adapted GISQ, that soil quality was 1.5-times lower in anthropogenic than in natural soils. Joimel et al. (2016) observed a decrease in soil physico-chemical quality along an anthropization gradient from forest to urban soils, whereas Joimel et al. (2017) did not find any difference in biological quality of these soils. The construction of solar parks on natural and semi-natural land use types (e.g. forest, shrubland, and abandoned vineyards) may reduce soil quality and affect ecosystem functions such as infiltration and storage of water, fertility and plant reestablishment, soil organic matter, and nutrient cycling (Khare & Goyal, 2013; Romero-Díaz et al., 2017; Rutgers et al., 2009; Scarpare et al., 2019; Yin et al., 2020).

Plant communities and soil functioning may also be affected by changes in microclimate under solar panels. Solar panels reduce solar radiation, air humidity, and soil temperatures, but in winter, soil temperatures are generally higher under panels (Armstrong et al., 2016). Adeh et al. (2018) reported highest soil moisture and local heterogeneity of soil water conditions under solar panels. Such changes in microclimate may alter plant community composition and soil respiration that can be measured as CO_2 release. Mediterranean plant communities are dominated by heliophilous plants (Bagella & Caria, 2012). The reduction of solar radiation under solar panels may thus result in a plant community shift toward shade-tolerant species. Seed germination of Mediterranean species may be limited by light reduction (Gresta et al., 2010), and the mortality of heliophilous plants increases in competition to shade-tolerant species. (de Dato et al., 2010; Novara et al., 2012). The change in air and soil microclimate under panels reduced the soil respiration under temperate oceanic climate (Armstrong et al., 2016). Under Mediterranean climate with higher annual temperatures and summer drought, changes in microclimate under solar panels may be higher resulting in a strong disturbance of seasonal soil respiration dynamics (González-Ubierna & Lai, 2019). Plant communities contribute to soil CO_2 release by respiration of roots and rhizosphere microorganisms (Raich & Tufekciogul, 2000) but also by changes in soil structure (Yang et al., 2009; Zou et al., 2005). Furthermore, plants are the principal carbon source of decomposer microorganisms (Wall et al., 2012). Thus, solar panels may also change soil conditions indirectly by a shift in plant community composition since plants are very sensitive to change in microclimate.

The aims of our study were to assess: (1) the effect of solar park construction on soil quality in comparing solar parks with semi-natural land cover types (pinewood and shrubland) and abandoned vineyards; and (2) the effects of solar panels on soil microclimate, CO_2 effluxes, and vegetation under Mediterranean climate. We expected that: (1) solar park construction reduces physical, chemical, and biological soil quality; (2) solar panels change soil microclimate and plant community composition; and (3) solar panels change soil respiration according to the season.

2 | MATERIAL AND METHODS

2.1 | Study sites

Two studies were conducted in three solar parks (SP) located in Southern France (La Calade, Pouzols-Minervois and Roquefort des Corbières, Figure 1a.) with a distance of 10 to 30 km from one another (Table 1). These SP were constructed in 2011, 2014, and 2016, respectively, covered between 8.5 and 16 ha and used ground-fixed photovoltaic (PV) systems carrying the solar panels at a fixed inclination. The solar panels are aligned to form rows (height of 0.6 m min and 2 m max) exposed to the south, with a gap of 4 m between rows. The study region is characterized by typical Mediterranean climate with summer drought and mild, wet winters. The SP are mainly bordered by pinewood (*Pinus halepensis*), shrublands, and vineyards. The soils of the SPs are characterized by carbonatic pedofeatures (i.e., fine calcareous silty clay soil).

2.2 | Sampling designs

2.2.1 | Study 1: Effect of solar park construction

To study the effects of solar park construction on soil quality, four sampling plots (50 × 2 m) separated by 150 m were randomly chosen within the SP at Roquefort des Corbières (inter-rows between solar panels). In the surroundings of the SP, we randomly selected four sampling plots (100 m^2) for each of the three dominant habitat types in the study region: pinewood, shrubland, and abandoned vineyards (Figure 1b).

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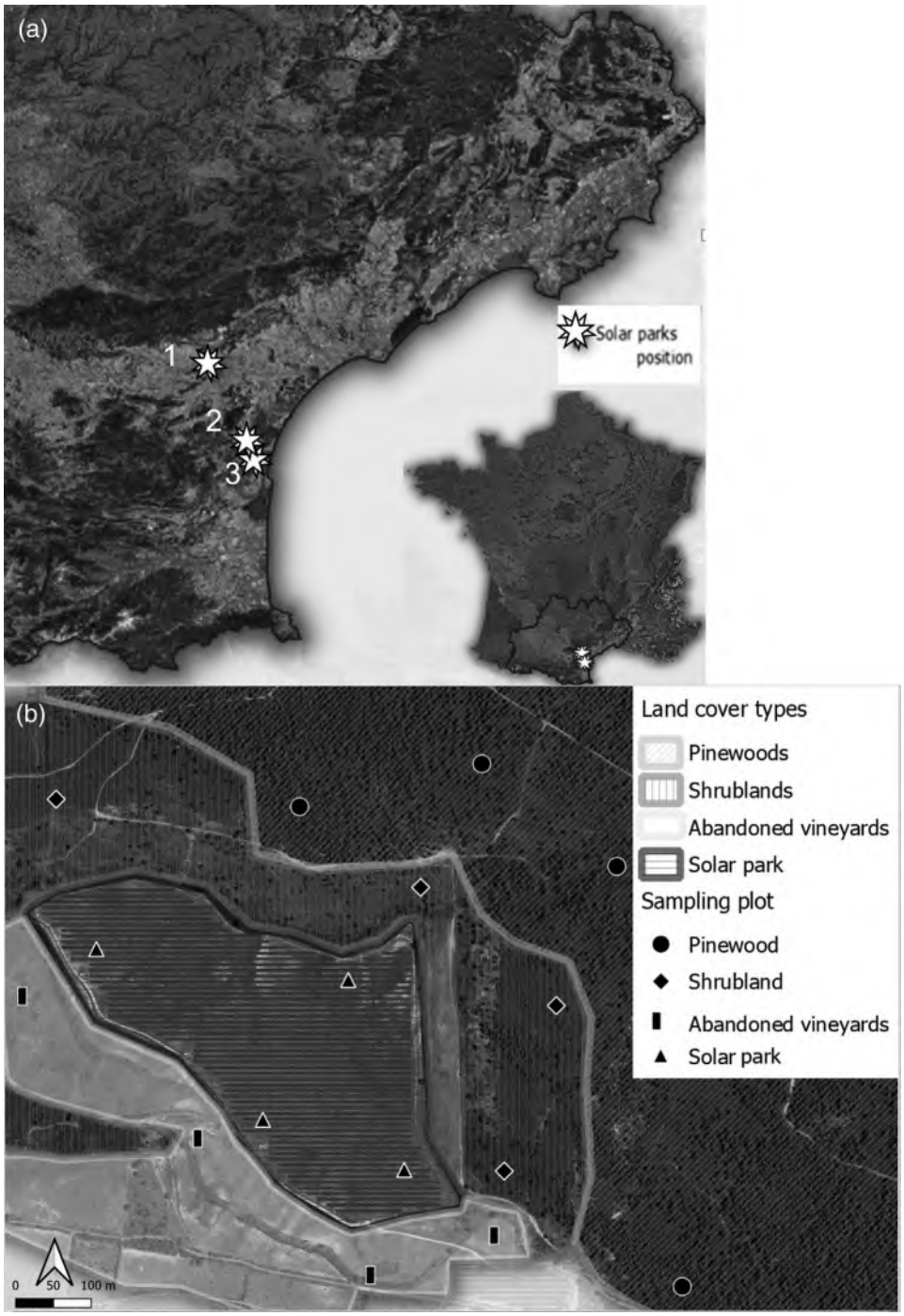


FIGURE 1 (a) Position of the three solar parks with 1: Pouzols-Minervois, 2: Roquefort-des-Corbières, and 3: La Calade (a), (b) the Roquefort-des-Corbières solar park in detail with surrounding land use types and sampling points

These three land cover types are also representative of regional land use (forestry, ancient pastures, and viticulture), and the studied SP was constructed on an abandoned vineyard. The plots were at least 200 m apart from each other and not more than 400 m from the SP. The pinewood is essentially composed of *P. halepensis and Quercus coccifera*. The shrublands are dominated by *Quercus coccifera*, *Pistacia lentiscus*, *Rosmarinus officinalis*, *Myrtus communis*, *Genista scorpius*, *Brachypodium retusum*, and *Cistus monspelliensis*. The vineyards had been abandoned for 5 years before solar park construction and were dominated by grapevine, *Anisantha rubens*, *Dittrichia viscosa*, and *Lysimachia arvensis*. In March 2016, 10 soil samples were randomly collected (10 cm depth) within each plot, mixed to one composite sample per plot. Composite samples were sieved (mesh size: 2 mm) prior to analyses. An aliquot of samples was air-dried (1 week, 30°C). For each sample, another aliquot was stored at 4°C for microbial analyses.

2.2.2 | Study 2: Effect of solar panels

To study the effect of solar panels on soil respiration, temperature, and moisture and on plant communities, we randomly selected within each of the three SP four sampling plots (50 × 2 m) below the solar

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TABLE 1 Environmental and technical characteristics of solar parks

	La Calade	Pouzols-Minervois	Roquefort des Corbières
Altitude (m)	77	100	62
Slope (%)	5	5	5
Temperature (annual mean, °C)	15.5	13.6	15.5.
Precipitation (annual mean, mm)	557	648	557
Sunshine duration (annual mean, hr)	2465	2119	2324
Soil texture	Loamy soil	Loamy soil	Loamy soil
Land cover before construction	Shrubland	Abandoned Vineyards and shrublandsQ	Abandoned Vineyards
Commissioning of the SP	2011	2014	2016
Maximum power (Kwc)	5102	4950	11,152
Solar panel soil localisation	Ground-fixed		
Solar panel cell technologies	Crystalline		
A solar panel power (Wc)	180	250	260
Number of solar panels	26,856	19,800	46,473
Area of the SP (ha)	8.5	10.7	16

panels, both separated by at least 100 m, and four adjacent sampling plots (50 × 2 m) in the inter-rows between the solar panel.

2.3 | Measurements of soil physico-chemical and microbiological quality

2.3.1 | Soil physical properties

Water content (g kg ^{1}) was determined after drying samples (24 h, 105°C). Water holding capacity (WHC) was analyzed according to Saetre (1998) but using a modified protocol. Ten grams of dried soil were weighted in a PVC cylinder and saturated with water. WHC was defined as the water content remaining in the soil after 12 h (4°C). The different soil fractions (i.e., sand, silt, clay) were determined using the Robinson's pipette method (Olmstead et al., 1930) after organic matter removal by oxidation with H_2O_2 (30%, 48 h). Bulk density (BD) was determined by measuring dried soil mass sampled in a Siegrist's cylinder. According to Huang et al. (2004), a value of 2.65 g cm^{-3} was assumed for real soil density (RD). Soil porosity was calculated using the following equation.

$$\text{Soil porosity} = 100 \times \frac{\text{RD} - \text{BD}}{\text{RD}} \quad (1)$$

Mean weight diameter (MWD) of soil aggregates was measured according to Kemper & Rosenau (1986).

2.3.2 | Soil chemical properties

The soil pH was measured in distilled water and KCL (1 M) (Aubert, 1978). Total carbon (TC) and Nitrogen (TN) content were determined by combustion in an elemental analyzer CN FlashEA 1112 (ThermoFisher) (NF ISO 10694, NFISO 13878). Calcium carbonate ($CaCO_3$) content was measured using a Bernard calcimeter (Müller & Gastner, 1971) and the percentage of C in $CaCO_3$ (C—$CaCO_3$) was determined as C—$CaCO_3$ = 11.991/100 × $CaCO_3$. Inorganic nitrogen (NH_4^+ and NO_3^-) was extracted in KCL solution (1 M) and analyzed calorimetrically using the nitroprusside-salicylate and nitrosalicylic acid method according to Mulvaney (1996) and Keeney & Nelson (1983), respectively.

2.3.3 | Soil microbiological properties

Microbial biomass (MB) was measured using substrate-induced respiration (SIR) rates (Anderson & Domsch, 1978). Basal respiration was determined without adding glucose to calculate the metabolic quotient qCO_2 (the ratio of basal respiration to microbial biomass), which is a sensitive ecophysiological indicator of soil stress (Anderson, 2003). Three enzyme activities (i.e., fluorescein diacetate hydrolase, phosphatase and tyrosinase) involved in carbon and phosphorous cycles were assessed (n = 3 per sample) to determine the catabolic potential of microbial communities. Fluorescein diacetate hydrolase (FDase, U g^{-1} dry weight) was measured according to Green et al. (2006), phosphatase (U g^{-1} dry weight) according to Tabatabai and Bremner (1969) and the activity of tyrosinase (μmol min^{-1} g^{-1} dry weight) according to Saiya-Cork et al. (2002).

2.4 | Measurements of solar panel effects on soil moisture, temperature, and in situ respiration

Soil respiration, temperature, and moisture were recorded in March and June 2017 in each sampling plot of the study on solar panel

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effects. In situ CO_2 release (g CO_2 m^{-1} hr^{-1}) from soils, plant roots, soil organisms, and chemical oxidation of C compounds was measured after removal of aboveground vegetation, using a portable gas analyzer (IRGA, EGM-4, PP-system). The device was connected to a closed soil respiration chamber (SRC-1, PP systems, Massachusetts). To prevent leakage of CO_2 when placing the chamber on the soil, a PVC tube (10 cm × 11 cm) was buried 1 cm deep into the soil prior to measurements. Soil temperature was recorded in a depth of 7 cm using the soil temperature probe (STP-1, PP-system) connected to the respirometer. Soil moisture was recorded on four points at 7 cm depth using a portable time-domain reflectometry (TDR) device (Delta-T Devices, ML2 Theta Probes).

2.5 | Measurements of solar panel effects on vegetation

In the sampling plots of the study on solar panel effects, vegetation surveys were carried out in 2016 and 2017. Three rectangular subplots of 10 m^2 (2 m × 5 m) were placed at the ends and the centre of each plot. Percentage cover of all occurring vascular plant species was estimated as the vertical projection of aboveground plant organs. A ratio of shadow-tolerant (sciaphilous) to hemi-heliophilous and heliophilous plant species (Julve, 2020) was calculated.

2.6 | Statistical analyses

We calculated a general indicator of soil quality (GISQ) according to Velaquez et al. (2007). Information on 21 variables of physical, chemical, and microbiological soil properties was used to create three subindicators related to main soil functions: (1) physical properties that determine the infiltration and storage of water, (2) chemical properties that affect fertility and plant reestablishment in solar parks, and (3) microbiological properties that drive soil organic matter decomposition and nutrient cycling. For each group of variables (physical, chemical, and microbiological), a principal component analysis (PCA) with data scaled to unit of variance was run using "FactoMineR" (Husson et al., 2008) and "Factoextra" (Kassambara & Mundt, 2020) packages. The Kaiser-Meyer-Olkin measure (>0.50) and Bartlett's test of sphericity (0.05) were used to test the sampling adequacy of variables included in the PCA. Variables with communality values <0.05 were removed, and main components were identified using the latent root criterion (eigenvalues >1.0). A synthetic index of quality for each group of variables at a plot *i* (Iq_i) was calculated as the sum of *n* variables (*vi*) multiplied by their respective weight (*wi*) in the determination of axes 1 and 2 of the PCA [Equation (2)].

$$Iq_i = \sum_{i=1}^{n} w_i v_i \quad (2)$$

The values of Iq_i were then reduced to a common range (0.1 to 1.0) using a homothetic transformation to obtain the sub-indicators of physical, chemical, and microbiological soil quality [hereafter pSQ, cSQ, and mSQ, respectively, Equation (3)]. In this equation, a is the maximal and b the minimal *Iq* value for the plot *i*.

$$p,c\,\text{or}\,mSQ = 0.1 + \frac{Iq_i - b}{a - b} \times 0.9 \quad (3)$$

Finally, a PCA was run with the three sub-indicators. The GISQ was obtained by summing the products of the respective contributions of variables to factors 1 and 2 by the % inertia explained by factors, respectively. Finally, the sum of these products gave the following formula for the GISQ [Equation (4)]:

$$\text{GISQ} = 0.29\,\text{pSIq} + 0.28\,\text{cSIq} + 0.33\,\text{mSIq} \quad (4)$$

All data were analyzed using R software (3.6.1, R Core Team, 2013). Effects of land cover type on soil physical, chemical, and microbiological properties, sub-indicators of soil quality, and GISQ were assessed using one way-analysis of variance (ANOVA). In the case of a significant land cover type effect, a Tukey HSD post hoc test was used to analyze differences between specific land cover types. To analyze the effect of solar panels on soil temperature, water content, CO_2 effluxes, and vegetation, linear mixed-effect models (LMMs) (R package "lme4") were applied including month and treatment (below vs outside panels) as fixed factors and solar park identity as a random factor. Assumptions of ANOVA were checked by Shapiro–Wilks test for normality and by Levene test for homoscedasticity. When necessary, data were transformed using the "bestNormalize" package (Peterson, 2021) to meet these assumptions. Effects of solar panels on plant communities were visualized by nonmetric multidimensional scaling (nMDS) based on the Bray–Curtis dissimilarity. Differences in plant community composition were tested using permutational multivariate analysis (PERMANOVA) in R package "vegan" (Oksanen et al., 2007). A subsequent pairwise post hoc test was conducted to analyze differences between factor levels. False discovery rate was used to correct for multiple comparisons.

3 | RESULTS

3.1 | Effects of solar park construction on soil properties

Seven of the eight tested physical soil properties were significantly different between land cover types (Table 2). Among these seven properties, only two showed a significant difference between the two semi-natural (pinewood and shrubland) land cover types and the SP. Soil water content was 5.5% lower in the SP ($p < 0.01$) than in shrubland. The mean weight diameter of aggregates was twice as high in abandoned vineyards as in SP and three times higher in pinewood and shrubland than in SP ($p < 0.001$). Organic carbon was about 2.5 times higher in semi-natural than in anthropogenic land cover types ($p < 0.001$). Sand and silt content, soil porosity, and bulk density were

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TABLE 2 Soil physical, chemical, and microbiological properties in each type of land cover

	Properties	Pinewood	Shrubland	Abandoned vineyards	Solar park	*p* value
Physical	Sand (%)	35.13 (5.07)[a]	45.91 (8.96)[ab]	47.78 (4.34)[b]	42.68 (2.58)[ab]	0.04
	Silt (%)	47.32 (8.63)[a]	35.81 (6.67)[ab]	33.16 (2.97)[b]	35.97 (1.03)[ab]	0.03
	Clay (%)	17.54 (4.70)	18.28 (6.33)	19.06 (1.37)	21.35 (1.57)	0.59
	BD (g cm^{-3})	1.11 (0.18)[a]	1.13 (0.17)[a]	1.47 (0.10)[b]	1.32 (0.13)[ab]	0.02
	WC (%)	19.55 (3.78)[ab]	22.14 (3.15)[a]	16.67 (2.01)[ab]	16.36 (0.44)[b]	0.03
	WHC (%)	65.66 (12.46)	70.81 (15.30)	51.93 (13.03)	59.24 (9.06)	0.23
	Porosity (%)	58.15 (6.95)[a]	57.54 (6.38)[a]	44.69 (3.92)[b]	50.19 (4.88)[ab]	0.02
	MWD (mm)	2626.47 (260.47)[a]	2618.40 (223.73)[a]	1593.30 (194.09)[b]	879.22 (271.43)[c]	<0.001
Chemical	OC (%)	4.92 (0.62)[a]	4.13(0.70.64)[a]	1.46(0.19)[b]	1.61 (0.17)[b]	<0.001
	TC (%)	8.59 (0.35)[a]	8.07 (1.28)[a]	5.63 (0.46)[b]	5.93 (0.71)[b]	<0.001
	TN (%)	0.22 (0.06)[a]	0.20 (0.07)[a]	0.09 (0.03)[b]	0.10 (0.02)[b]	<0.01
	Soil pH in water	8.03 (0.04)[ab]	8.02 (0.03)[b]	8.11 (0.05)[a]	8.06 (0.04)[ab]	0.03
	Soil pH in KCl	7.45 (0.04)	7.48 (0.06)	7.52 (0.06)	7.49 (0.05)	0.38
	Nitrate (μg μg $N\text{-}NO_3^+$ g^{-1})	1.34 (0.32)	1.06 (0.80)	0.72 (0.26)	1.71 (0.61)	0.12
	Ammonium (μg $N\text{-}NH_4^+$ g^{-1})	2.90 (0.17)[a]	2.92 (0.19)[a]	2.65 (0.14)[b]	2.65 (0.04)[b]	0.03
Microbiological	BR (μg $C\text{-}CO_2$ g^{-1} hr^{-1})	1.28 (0.33)[a]	1.31 (0.61)[a]	0.61 (0.36)[b]	0.60 (0.07)[b]	0.03
	MB (μg $C\text{-}CO_2$ g^{-1} hr^{-1})	0.40 (0.10)	0.37 (0.15)	0.24 (0.12)	0.20 (0.07)	0.07
	qCO_2	3.20 (0.26)	3.48 (0.56)	3.33 (2.68)	3.38 (1.28)	0.99
	FDAse (μ g^{-1})	0.0007 (0.0001)[ab]	0.0008 (0.0003)[a]	0.0004 (0.0001)[b]	0.0004 (0.0002)[b]	0.02
	Tyrosinase (μ g^{-1})	0.0526 (0.0144)	0.0321 (0.0061)	0.0504 (0.0084)	0.0438 (0.0154)	0.11
	Phosphatase (μ g^{-1})	0.0067 (0.0004)	0.0058 (0.0015)	0.0046 (0.0024)	0.0053 (0.0005)	0.28

Note: Mean values with SEs in parentheses. Different letters indicate significant differences between land cover types (significant *p*-values in bold)
Abbreviations: BD, bulk density; BR, basal respiration; FDAse, fluorescein diacetate hydrolase; MB, microbial biomass; MWD, mean weight diameter; OC, organic carbon; qCO_2, metabolic quotient; TC, total carbon; TN, total nitrogen; WC, water content; WHC, water holding capacity

significantly different between abandoned vineyards and pinewood (Table 2). Silt content and soil porosity were 1.4- and 1.3-times lower in abandoned vineyards than in pinewood, respectively. Sand content and BD were about 1.5-times higher in abandoned vineyards than in pinewood. Pinewood and shrubland showed similar physical properties without significant differences.

For most soil chemical properties, SP showed significant differences to pinewood and shrubland but not to abandoned vineyards (Table 2). Total carbon contents were 1.44-times higher in semi-natural land cover types than in anthropogenic land cover types ($p < 0.01$). Organic carbon contents were about 2.76-times higher in semi-natural land cover types than in anthropogenic land cover types ($p < 0.01$). Total nitrogen (TN) content showed the same pattern. TN was twice as high in pinewood and shrubland as in the SP and abandoned vineyards ($p < 0.001$). The water pH ranged between 8.02 and 8.11 and showed a small but significant difference between shrubland and abandoned vineyards.

Two microbiological properties were significantly different between land cover types (Table 2). Land cover type had a significant influence on basal respiration ($p < 0.03$) being two times lower in the SP and abandoned vineyards than in forest and shrubland. The FDAse activity was two times higher in shrubland and pinewood than in the SP and abandoned vineyards. Microbial biomass was twice as low (marginally significant) in SP and abandoned vineyards as in the semi-natural land cover types.

3.2 | Effects of solar park construction on soil quality

The first two axes of the PCA run on physical properties explained 80.56% of the total variance (see A.1.A in Appendix S1). The semi-natural land cover types are separated from the anthropogenic soils along the first axis. Silt, water content, water holding capacity, and mean weight diameter of aggregates had the highest score on the first PCA axis, while soil porosity was strongly correlated with the second axis (see A.1.A, Appendix S1). The highest physical quality index of 0.92 was measured in pinewood and shrubland being two times higher than in abandoned vineyards ($p < 0.001$). The pSQ (Figure 2a) was two times and four- times lower in SP than in the abandoned vineyards and semi-natural land cover types, respectively ($p < 0.01$).

The first two axes of the PCA used to calculate the sub-indicator of soil chemical quality (cSQ) explained 80.98% of the total variance (see A.1.B, Appendix S1). The semi-natural land cover types are

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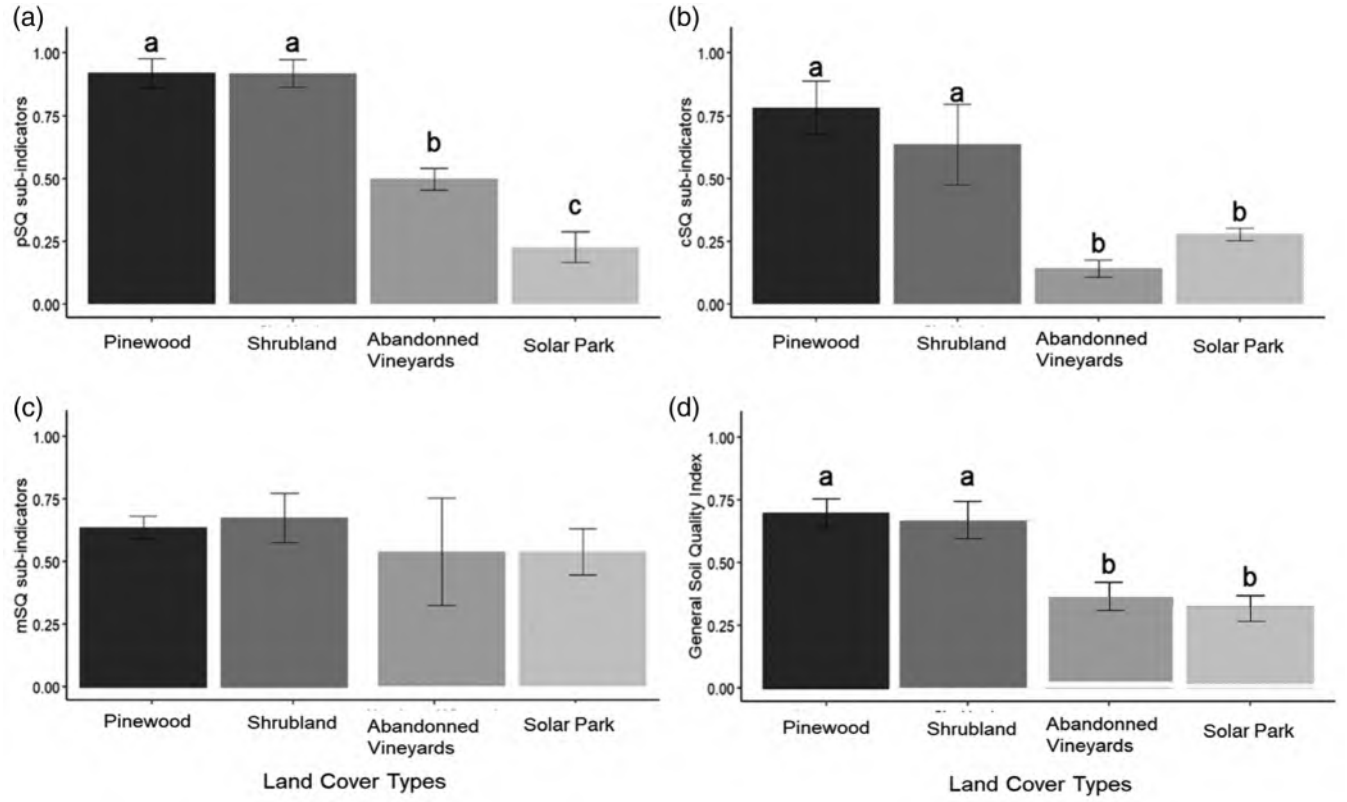


FIGURE 2 Sub-indicators of soil physical (a), chemical (b), and microbiological (c) quality and general soil quality indicator (d) for different types of land cover. Error bars are means ± SE. Different letters indicate significant differences ($p < 0.05$)

separated from the anthropogenic soils along the first axis. Total carbon, organic carbon, TN, and ammonium were most correlated with the first axis and nitrate with the second axis (see A.1.B, Appendix S1). With a value of 0.18, the cSQ was four times lower in the SP and abandoned vineyards than in shrubland and pinewood ($p < 0.001$, Figure 2b).

The first two axes of the PCA used to calculate the sub-indicator of soil microbiological quality explained 80.28% of the total variance (see A.1.C, Appendix S1). Basal respiration, microbial biomass, FDAse, and phosphatase were highly correlated with the first PCA axis, while the qCO_2 was correlated with the second one (see A.1.C, Appendix S1). The mSQ was not significantly different between land cover types ($p = 0.74$) (Figure 2c).

The General Indicator of Soil Quality was four-times lower in the SP and abandoned vineyards than in the pinewood and shrubland ($p < 0.001$).

3.3 | Effects of solar panels on soil temperature, water content and in situ CO_2 effluxes

Soil temperature and water content were significantly different between months ($p < 0.05$; Figure 3a,b). Solar panels significantly decreased soil temperature in March and June (Figure 3a) but did not affect soil water content ($p = 0.79$). Soil CO_2 effluxes did not change between months but were twice as high outside solar panels than below solar panels ($p < 0.001$).

3.4 | Effects of solar panels on plant communities

Neither the species richness nor the total cover of plant community was significantly affected by the solar panels (Table 3). A marginally significant difference was detected for the ratio 'Sciaphile: Heliophile plants,' being higher below than outside solar panels. The NMDS and PEMANOVA did not reveal any significant solar panel effect on plant community composition ($p = 0.3461$, Figure 4). However, community composition was significantly different between the solar parks ($p < 0.001$). No significant difference was detected between observation years (data not shown).

4 | DISCUSSION

Solar park (SP) construction reduced physical and chemical soil quality compared with semi-natural land cover types (forest and shrubland) but not biological soil quality. A change in soil temperature and CO_2 effluxes also demonstrated a negative solar panel effect on soil microclimate and functioning. However, in early stages of plant succession following solar park construction, plant community composition below and outside solar panels was not significantly different.

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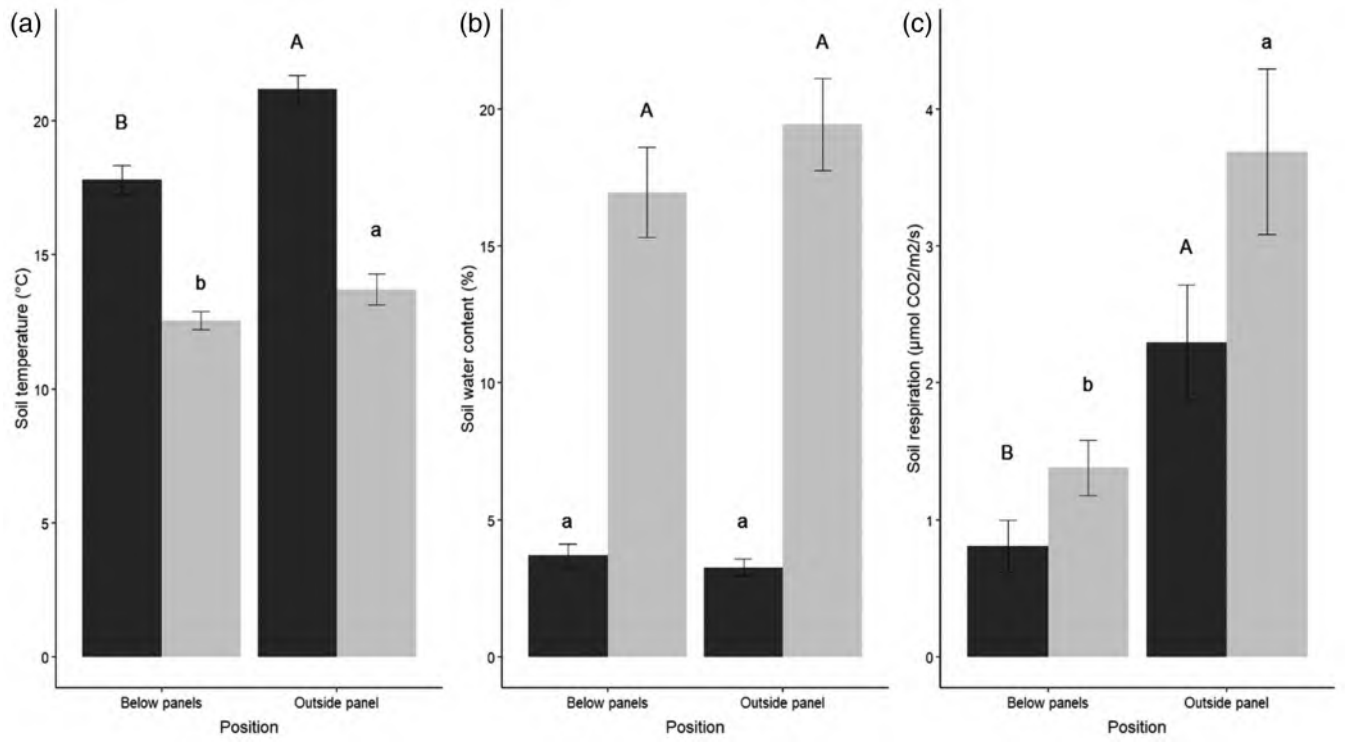


FIGURE 3 Soil temperature (a), water content (b), and CO_2 effluxes in March (black bars) and June (grey bars) below and outside solar panels. Error bars are means ± SE; different capital and lower-case letters indicate significant differences under and outside panels in March and June, respectively

TABLE 3 Effects of solar panels on plant communities

Parameters	Below solar panels	Outside solar panels	*p*
Species richness	12.56 (5.92)	13.25 (5.49)	0.29
Total cover (%)	351.2 (165.12)	379.97 (183.31)	0.22
Hemi-heliophilous: Heliophilous ratio	0.12 (0.14)	0.10 (0.10)	0.09

Note: Mean values with SEs in parentheses

4.1 | Effects of solar park construction on soil quality

Soil quality assessments require the measurement of a wide range of physical, chemical, and biological properties involving a high complexity of potential analyses (Maurya et al., 2020). In this study, we assessed soil quality using a multiproxy approach including 21 soil properties. The reduction of the number of variables using PCA to group these properties allows an integrated evaluation of soil quality based on their main functions, such as infiltration and storage of water, soil fertility, plant reestablishment and soil organic matter and nutrient cycling. We found that two of three integrated sub-indicators and the general indicator of soil quality were lower in SP than in the semi natural land cover types.

Among the physical soil properties, the aggregate MWD was 1.5-times lower in the SP than in the semi-natural land cover types (Table 2). A low MWD may result in a low aggregate stability. Similarly, Kabir et al. (2017) showed that the MWD decreases in anthropogenic soils associated with a degraded vegetation. In our study, soil leveling and vegetation removal prior to SP construction may have decreased soil organic matter (SOM) content reducing MWD. By binding colloids and stabilizing soil structure, SOM plays a key role in soil physical properties and nutrient cycling (Six et al., 2004). Telak & Bogunovic (2020) showed a decrease in SOM and MWD in a vineyard of Croatia after intensive and frequent tillage. Such mechanical disturbance for many years may have affected soil structure of the vineyard on which the studied SP (Roquefort des Corbières) was constructed. Accordingly, overall physical soil quality of SP was lower than that of abandoned vineyards, which was in turn lower than that of semi-natural land cover types. The physical soil quality index (Figure 2a) revealed that the construction of a SP increased the degradation of the physical soil quality of habitats already degraded by land management (abandoned vineyards). In particular, the stability of the soil, key factor of soil functioning, was lower in SP than in abandoned vineyards. Moreover, a lower SOM affects microbial activity and production of mucus resulting in a decrease of aggregate MWD and thus a soil more sensitive to erosion (Blavet et al., 2009; Le Bissonnais et al., 2018). The soil leveling and vegetation removal during SP

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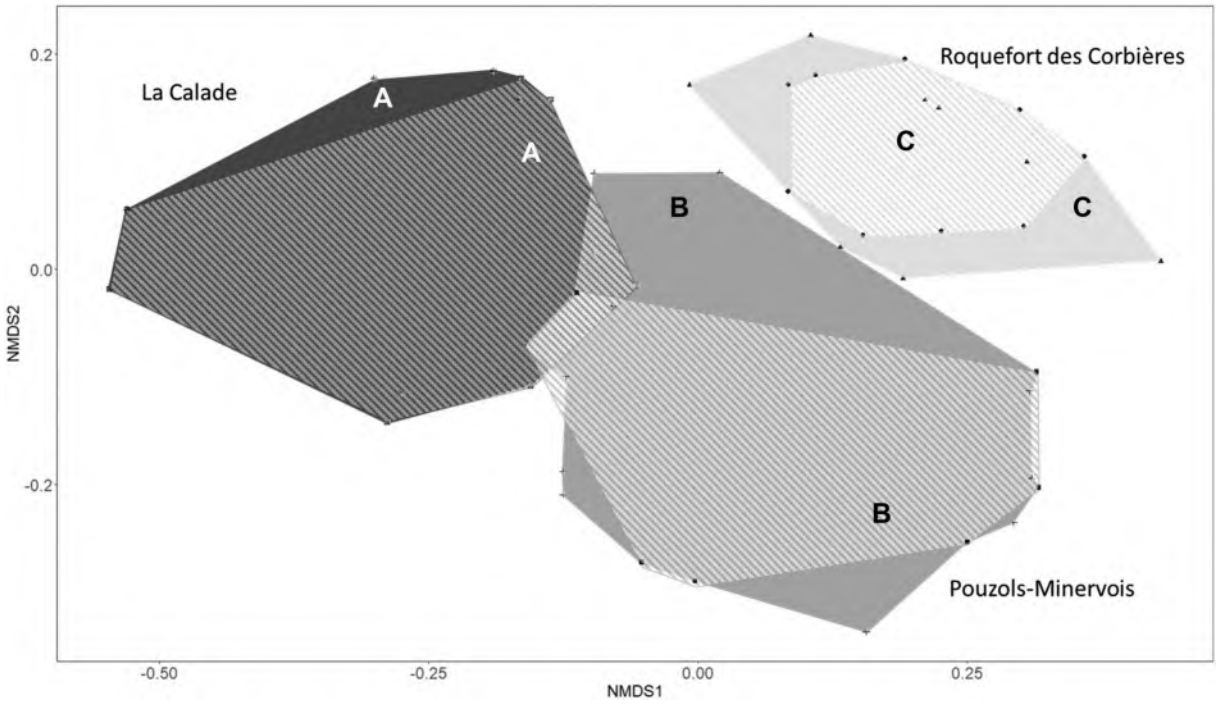


FIGURE 4 Nonmetric multidimensional scaling (NMDS) plot with polygons indicating the plant species composition of the three solar parks under (hatched polygon) and outside (solid polygon) solar panels, NMDS stress: 0.084. Different letters indicate significant differences after pairwise post hoc test ($p < 0.05$)

construction may have increased surface runoff and soil erosion (Rabaia et al., 2021).

In contrast to our expectations, the SP construction did neither increase soil bulk density nor decrease porosity compared to the abandoned vineyards (Table 2). In our study, soil bulk density was found to be lower in abandoned vineyards than in semi-natural land cover types. The past land management of vineyards may have degraded these properties before SP construction limiting effects of construction work. It is well known that the use of agricultural machinery considerably increases the soil bulk density (Dunjó et al., 2003). Under similar Mediterranean climate and land use history in Spain, the bulk density was 30% higher in vineyards than in pinewood (Dunjó et al., 2003). Such changes in soil physical properties can reduce the infiltration and storage of water. To improve the process of water infiltration and the capacity of water storage, a decompaction of the soil surface may be useful in particular if soils were already compacted by previous land management. Such decompaction also facilitates the germination and establishment of plant species (Bassett et al., 2005). The resulting improved revegetation may limit erosion and protect functions supported by soil physical quality (Beatty et al., 2017).

Soil chemical properties, such as total and organic carbon and TN are directly linked to soil fertility and plant growth (Liu et al., 2014). In our study, these properties showed lower values in anthropogenic soils than in semi-natural land cover types (Table 2). Joimel et al. (2016) obtained similar results along a gradient from natural to anthropogenic habitats in which total carbon and nitrogen decreased significantly from forests to vineyards. Soil disturbance such as soil tillage in vineyards or construction activities increases mineralization of organic matter reducing organic C and N (Brantley & Young, 2010). Accordingly, Choi et al. (2020) found a significantly lower C and N content in SP than in grassland soil. In our study, SP construction did not reduce neither C and N content nor soil chemical quality compared to degraded vineyard soil (Table 2). Consequently, the construction of SP did not further degrade the soil chemical properties. The low index of chemical quality (Figure 2b) is thus most likely related to the past vineyard management. Low C and N content suggest that nutrient cycling was lower in vineyards and SP soils and that several SP soil functions (carbon sequestration, soil structure, biological processes) were hampered compared to semi-natural soils. Appropriate site selection may limit such a loss of key soil functions by SP construction (Choi et al., 2020).

Soil microorganisms (i.e. bacteria and fungi) contribute actively to soil nutrient cycling (Schimel & Schaeffer, 2012). Thus, their genetic and physiologic characteristics are important indicators of ecosystem functioning such as nutrient cycling (Ranjard et al., 2011). Microbiological soil properties showed differences between land cover types for fluorescein diacetate hydrolase (FDAse) activity and basal respiration. FDAse is an appropriate proxy to evaluate soil microbial activities because the ubiquitous esterase enzymes (e.g., lipase, protease) are involved in the hydrolysis of FDA (Schnürer & Rosswall, 1982). In our study, the FDAse was two times lower in anthropogenic soils (Table 2) suggesting a reduction of microbiological activity and nutrient cycling. Soil basal respiration showed the same pattern confirming

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a degradation of soil functions compared to semi-natural soils (Sparling, 1997). Under a similar Mediterranean climate in Italy, basal respiration was three to four-times lower in vineyards than in coniferous forests, mixed forests, and shrublands (Marzaioli et al. (2010). The decrease in soil respiration may be related to the lower organic carbon and nitrogen content or the decrease in microbial biomass (Fernandes et al., 2005). Previous vineyard management, in particular, soil tillage, may have severely decreased microbial biomass resulting in low microbial activity. Five years of abandonment was probably not sufficient to entirely reestablish microbial communities (Quintana et al., 2021). Despite the reduction of microbial properties in abandoned vineyards and solar park soils, the microbiological soil quality index (mSiQ) was not significantly different between land cover types (Figure 2c). Other microbiological properties (BM and phosphatase) mainly contributing to the first PCA axis were hardly affected by land cover type and thus overruled significant response variables in mSiQ calculation.

As a consequence of lower physical and chemical sub-indicators, the general indicator of soil quality was about three times lower in SP compared to semi-natural land cover types (Figure 2d). The key processes involved in degradation of soil quality were soil tillage, partial topsoil removal increasing erosion (Quinton et al., 2010), and organic matter mineralization. Reduced organic matter content and increase of soil compaction decrease water holding capacity (Mujdeci et al., 2017) and soil stability (Simansky et al., 2013). Soil restoration by revegetation may improve soil physical and microbiological qualities of solar parks (Hernandez et al., 2019). Revegetation may increase the stability of aggregates by increasing root biomass and the production of binding agents (Erktan et al., 2016). The root exudates can also stimulate microbial biomass and activity and thus improve nutrient cycling (Eisenhauer et al., 2010; Feng et al., 2019).

4.2 | Effects of solar panels on soil microclimate, vegetation, and in-situ CO_2 effluxes

Climatic conditions influence both soil microbial activities (Shao et al., 2018) and plant communities (García-Fayos & Bochet, 2009). In our study, solar panels reduced the soil temperature in spring and in summer by about 5°C (Figure 3a). Similarly, Armstrong et al. (2016) found a soil temperature reduction of 2°C under solar panels during the summer (UK). The lower temperature under solar panels was the direct effect of shading although night temperatures may be higher (Tanner et al., 2020). Solar panels also intercept precipitation, and Tanner et al. (2020) found a significant reduction in soil humidity under solar panels in the Mojave Desert. However, we did not find any significant soil humidity difference under solar panels and outside (Figure 3b). The result may be explained by a lower evapotranspiration limiting humidity losses during drought periods as suggested by Tanner et al. (2020).

Mediterranean vegetation is dominated by heliophilous plants (Bagella & Caria, 2012). So we expected that light reduction by solar panels strongly affects plant communities. However, we did not find a significant effect of solar panels on plant community composition and structure (Figure 4). The effect of solar panels on the ratio of shadow-tolerant to heliophilous species was only marginally significant and no influence on plant species richness was detected (Table 3). Other studies showed, however, a reduction in plant cover and species richness under solar panels resulting from lower germination and higher mortality (Armstrong et al., 2016). Due to light limitation, heliophilous plants are expected to be less competitive under solar panels (Chen et al., 2004). However, protection against strong solar radiation and drought during Mediterranean summer may have compensated for reduction of light and precipitation in our study. Accordingly, Tanner et al. (2020) observed that in a desert plant richness was marginally greater under their solar panels than in the control. In our study, the absence of a solar panel effect on the vegetation (Figure 4, Table 3) may also be explained by the low age of our solar parks limiting differential effects on the vegetation. In early successional stages, the vegetation is dominated by ubiquitous annual species germinating and developing under a great variety of environmental conditions. Responses to the specific microclimate under solar panels may be slow in Mediterranean vegetation types (Coiffait-Gombault et al., 2012; Kinzig et al., 1999). Long-term monitoring is required to finally evaluate the influence of solar panels on plant communities.

A lower soil respiration is an indicator of lower litter decomposition and nutrient cycling suggesting that these ecosystem functions may be reduced under solar panels (Incerti et al., 2011). In our study, soil respiration was highly affected by solar panels (Figure 3c). Half of the CO_2 fluxes from soils are produced by heterotrophic organisms (Bond-Lamberty et al., 2004). Heterotrophic respiration, but also plant respiration, is driven by environmental factors, mainly temperature and moisture, explaining the strong influence of solar panels (Francioni et al., 2020; Moinet et al., 2019). Accordingly, Armstrong et al. (2016) found a reduction of soil CO_2 effluxes under solar panels in May and June. We already detected a reduced CO_2 efflux from March onward suggesting that the warm Mediterranean spring results in earlier temperature differences between soils under and outside solar panels compared to temperate oceanic climate. This early decrease in temperature under solar panels compared to controls outside solar panels may have reduced microbial activity and thus heterotrophic respiration. The reduction of CO_2 effluxes under solar panels may also be the result of light reduction reducing plant growth and root respiration.

5 | CONCLUSIONS

Physical, chemical, and general soil quality indexes were lower in a solar park than in semi-natural land cover types. Clearing and grading the soil surface during solar park construction resulted in a strong degradation of soil physical quality, especially of soil structure, but did neither disturb soil chemical quality nor global quality compared to abandoned vineyards. These results suggest that solar parks should be preferably constructed on anthropogenic soils or that construction must be accompanied by environmental compensation measures

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and/or ecological restoration. At our Mediterranean study sites, solar panels reduced soil temperature from spring onward. Neither light nor spring temperature reduction under solar panels altered plant communities in early stages of plant succession but reduced CO_2 effluxes. Our study demonstrated that solar park construction and solar panels changed soil quality and microclimate to a magnitude known to affect key soil functions. Long-term monitoring including different seasons is required to evaluate the final response of soil properties and vegetation to solar panels.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Lambert, Q., Bischoff, A., Cueff, S., Cluchier, A., & Gros, R. (2021). Effects of solar park construction and solar panels on soil quality, microclimate, CO_2 effluxes, and vegetation under a Mediterranean climate. *Land Degradation & Development*, *32*(18), 5190–5202. https://doi.org/10.1002/ldr.4101

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From:	Colton McCullough
Sent:	Friday, February 27, 2026 9:14 AM
To:	CLARK Christopher * ODOE
Cc:	CORNETT Todd * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe
Subject:	Re: ODOE Responses to Public Comments on Proposed Order on Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm.
Attachments:	Colton McCullough Reply to Certificate Holder and ODOE.pdf

Follow Up Flag:	Follow up
Flag Status:	Flagged

Dear Certificate Holder and ODOE,

As I have made clear from the beginning my largest concern with the project is the wildfire risk. I strongly believe the only way to reduce this risk to an acceptable level is through vegetation management both with firebreaks and maintaining the overall vegetation height within the project. I have read Sherman County Weed Districts comments recommending a vegetation height of 4-8" for better erosion control/vegetation health. While I understand where the district is coming from in an erosion control perspective, I cannot agree that 8" would be safe from a wildfire standpoint in Sherman County (even a few extra inches of growth can drastically increase fuel load and flame length). Additionally, if there is a fire, due to vegetation not being properly managed, erosion control will be extremely poor that fall/winter. After reading the weed districts comments and doing some research of my own it appears that it is important to not mow native bunch grasses shorter than 3-4" to protect the crown of the plant. While I would prefer to see the vegetation kept to a height of 1-3" for fire mitigation I can concede that a slightly taller vegetation height of 3" to 6" (during fire season June-Oct.) would be what is best when erosion control, vegetation health and fire risk are all taken into consideration together. Vegetation height needs to be as short as possible while still maintaining erosion control and vegetation health. Maintaining this standard would still allow for taller healthy plant growth prior to fire season and not cause plant damage by protecting the crown when mowing.

I have concerns that the certificate holder is still requesting a vegetation height of 10-12" year-round. The fact that certificate holder doesn't see the need to maintain a shorter vegetation height during fire season shows that the certificate holder does not fully understand the wildfire risk for the area. I get that it is being looked at from a cost perspective and maintaining the vegetation will not be cheap, but this view point is one sided. The cost of replacing hundreds of acres of solar panels will dwarf any vegetation management cost. It is in everybody's best interest from the certificate holder to the rate payer to the neighboring farmer to have the vegetation managed to an enhanced standard during fire season.

I am pleased that ODOE is suggesting additional conditions for vegetation management, but I want to make sure they become a permanent requirement for the site. I understand it will be included in the comprehensive solar revegetation and soil management plan but within that document it states that it is only the plan in the interim. The certificate holder also stated the clearances are included in the Operational and Maintenance Framework Plan, but I cannot find where it states the specific vegetation management standards within the O&M Framework Plan (this may be because I am not able to see updated revisions). Additionally, the certificate holder states it will include the vegetation standards in the site-specific Operational WMP but it hasn't been finalized yet. It is frustrating that a plan this important wasn't available for public comment and review. I am hopeful that the vegetation standards and clearances ODOE requires will be built into the site certificate in several places as the site certificate holder has stated. I look forward to seeing a finalized Site-specific Operational WMP and updated O&M Framework plan that include the vegetation management standards and clearances. Thank you for your time and I look forward to hearing your replies.

Sincerely,

Colton McCullough

On Thu, Feb 12, 2026 at 3:38 PM CLARK Christopher * ODOE <Christopher.CLARK@energy.oregon.gov> wrote:

> Hello,
>
> You are receiving this message because you provided comments on the Proposed Order on Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm. The Department's responses to all comments provided on the record are attached (Department Response). In the Department's Response, we have included an explanation of how the document is organized, and how to locate the issues identified by the Department as having been raised in

your comments. The certificate holder, Portland General Electric Company, will be providing its responses directly to commenters by February 13, 2026, as required by OAR 345-027-0367.

The Department has also created an OneDrive folder that includes all copies of all comments provided on the Proposed Order. The attached "Amendment Comment Review Process Doc Navigation Help Letter" provides more information on how to access the OneDrive, the Department's file management system, and how to navigate PDF documents. The OneDrive can be accessed via the links in this email or by accessing the Biglow Canyon Wind Farm Webpage.

Please "reply all" to this email message when providing any replies to either the Department's or certificate holder's responses to your comments. Reply and sur-reply documents from the certificate holder and participants can also be uploaded directly to the OneDrive.
Replies must be received by **5:00 pm on February 27, 2026**, to be included in the record. Participants to the public comment process may request more time to submit their replies. The Council Chair may grant a requested extension on a showing of good cause. Please note the Department will only consider replies to issues raised in your own comments in preparing the draft Final Order.

Please note, I will be out of the office from February 13 to February 23, 2026. If you have questions about the process or how to submit replies to the Department or certificate holder's responses to your comments during this timeframe, please contact Sarah Esterson at sarah.esterson@energy.oregon.gov or call (503) 559-9218.

Thank you,

Christopher M. Clark
Senior Siting Analyst
550 Capitol St. NE | Salem, OR 97301
P: 503-871-7254
P (In Oregon): 800-221-8035
Stay connected!

--
Colton McCullough
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February 27, 2026

Kenny Gunn
Cultural Resources Lead
Portland General Electric Company
121 SW Salmon Street
Portland, OR 97204

Re: Biglow Canyon RFA 4 - Issue HCA-02 – Construction Phase Tribal Coordination

Dear Mr. Gunn,

Thank you for your February 13, 2026 correspondence regarding Request for Amendment 4 for the Biglow Canyon Wind Farm Site Certificate.

The Confederated Tribes of the Warm Springs Reservation of Oregon appreciate the applicant's acknowledgment of the project's location within our ceded lands and the cultural sensitivity of the area.

After review of your response, the Tribe's primary concern relates to construction-phase implementation and ensuring appropriate Tribal presence during ground-disturbing activities.

While the applicant has described avoidance buffers, eligibility determinations, and inadvertent discovery procedures, the Tribe believes that real-time Tribal coordination during active construction is essential to ensure that cultural resource protection measures are implemented consistently with the substance of consultation discussions.

Accordingly, CTWSRO requests that a Dedicated Tribal Monitor be incorporated into the construction-phase coordination framework for the Project.

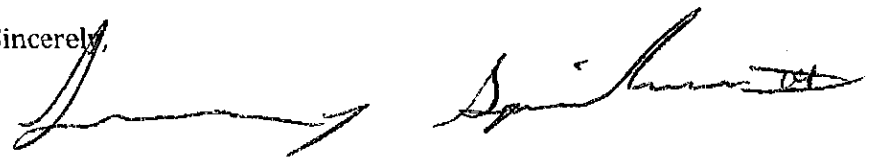
The purpose of this monitor would be to:

- Provide real-time coordination between the Tribe and the construction team;
- Observe implementation of cultural resource protection measures during ground disturbance;
- Facilitate immediate communication in the event of discoveries or unanticipated conditions;
- Maintain government-to-government engagement during construction activities occurring within culturally sensitive areas.

This request is not intended to reopen SHPO concurrence or challenge ODOE's Proposed Order. Rather, it reflects the Tribe's expectation that consultation extends meaningfully into the implementation phase of the Project.

The Tribe remains committed to collaborative engagement and appreciates your continued coordination.

Sincerely,



Lawrence Squiemphen III
Tribal Historic Preservation Officer
Confederated Tribes of the Warm Springs Reservation of Oregon

From:	lawrence squiemphen
Sent:	Friday, February 27, 2026 3:17 PM
To:	CLARK Christopher * ODOE
Cc:	CORNETT Todd * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Austin Smith
Subject:	Re: ODOE Responses to Public Comments on Proposed Order on Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm.
Attachments:	Biglow CTWS_Issue HCA-02 response .pdf

Good afternoon Christopher,
Attached is the Confederated Tribes of Warm Springs (CTWS) response to Issue HCA-02. Thanks for continued consultation with CTWS on the Biglow project that is within our ceded lands and a Culturally sensitive area to the CTWS. We appreciate you considering our comments and the tribes remain committed to collaborative engagement and continued coordination.

--
Lawrence J. Squiemphen III
Confederated Tribes of Warm Springs
Tribal Historic Preservation Officer
lawrence.squiemphen@ctwsbnr.org

Portland General Electric
121 SW Salmon Street • Portland, Ore. 97204
PortlandGeneral.com

February 27, 2026
Biglow

VIA EMAIL

Christopher Clark, Senior Siting Analyst
Oregon Department of Energy
550 Capitol St. NE 1st Floor
Salem, OR 97301

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Certificate Holder Reply to ODOE Response to Certificate Holder Comments on the Proposed Order

Dear Mr. Clark,

Portland General Electric Company (PGE; Certificate Holder) submits the following reply in response to the Oregon Department of Energy's (Department or ODOE) Response to Certificate Holder Comments, issued on February 12, 2026 ("ODOE Response Letter"), that responded to comments PGE had filed with the Department on January 14 and 30, 2026, concerning the Proposed Order on the Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF or Facility) Site Certificate.

The ODOE Response Letter indicates areas where additional information may be helpful for ODOE to resolve an issue and documents ODOE's position on certain suggested revisions, all related to the Certificate Holder's comments on the Proposed Order. This reply offers additional information on an issue-by-issue basis, conforming to the issue identification numbers presented in Table 1 of the ODOE Response Letter.

- **GS-06: Request for revision of proposed road dimension width, from 20 to 16 feet**

  The Department's evaluation requested that a site plan showing the location and width of designated emergency access roads and other internal access roads be provided. The Certificate Holder provides additional information related to the locations and widths of roads within the Biglow Solar Micrositing Area in Attachment 1 to this letter. Attachment 1 shows the locations of the 16-foot-wide internal roads (double black lines) and the 20-foot-wide emergency access roads (green lines). Existing wind turbine access roads are shown in blue. The final site plan will show all internal access and emergency access roads on-site. In addition, the water tanks shown on this attachment will be moved outside the fencelines in the 90% design and will be accessed by the emergency access roads.

- **GS-07: Request to allow Temporary Construction Areas outside fenceline, within Solar Micrositing Area**

  The Department's evaluation references representations made in BCWF RFA4 Division 27, Section 4.1.3.7 and requested that the Certificate Holder clarify the locations in the RFA where a request for temporary construction areas outside the fenceline have been

presented and evaluated.

There are inconsistencies in the BCWF RFA4 Division 27, Sections 4.1.3.7 and 4.4.3 regarding the location of temporary construction areas. Section 4.4.3 states:

> "Any temporary disturbance impacts requiring restoration and revegetation will only occur outside of the perimeter fencing for the solar areas, BESS, and collector substation and include temporary impacts from the underground collector lines, laydown areas, installation of perimeter fencing, construction of the O&M building, gen-tie line, and use of any additional temporary construction areas."

Section 4.4.3, Table 2 outlines the following temporary disturbance areas outside the perimeter fenceline:

- Solar Area: Temporary construction disturbance within a 6-foot corridor along the outside of the perimeter fenceline for fence installation.
- Solar Area Gen-Tie Line: Overhead transmission line disturbance amounts include the poles. Assumes a 150-foot temporary disturbance corridor (final corridor pending design) plus 20x20-foot pulling/tensioning areas (temporary disturbance), and 2-foot-diameter permanent disturbance from the poles (steel monopoles). Assumes approximately 700-foot spans between poles.
- Solar Area Road Crossings: Permanent disturbance for road crossings outside the solar area fenceline. Assumes a 16-foot road width, with additional 20-foot width temporary disturbance for construction.
- Temporary disturbance for the laydown area for construction; the construction area will be reclaimed following construction.

Because the layout within RFA4 represents the maximum disturbance scenario for purposes of analyzing land use and habitat impacts, all solar arrays were represented as being fenced in large blocks so that the largest permanent disturbance possible is represented. It was not intended to make a representation that during final design the primary laydown area would be located within a solar array fenceline. All areas within the micrositing area have been evaluated; therefore, regardless of whether the laydown area is within the permanent fenceline, the impacts have been evaluated.

The final site plan will show the locations of all temporary construction areas.

- **OE-05: Request to clarify frequency of inspections using thermal imaging**

The Department's evaluation requests further clarification related to Supervisory Control and Data Acquisition (SCADA) identification of anomalies and generation of work orders, and confirmation of accuracy on the proposed language.

The Certificate Holder appreciates the opportunity to further clarify the language in the Draft Operations and Maintenance (O&M) Plan. The revisions proposed to Section 3.4.2 of the Draft O&M Plan in the Proposed Order as currently framed conflates two different work streams for generating corrective work orders for anomalies detected 1) via routine module inspections and annual infrared/aerial thermal imaging, and 2) via the SCADA system.

The Certificate Holder requests replacing the original language in the Draft O&M Plan Section 3.4.2 (first and fifth bulleted item) with the following language to clarify these processes:

- **Routine module inspections and annual infrared/aerial thermal imaging:** Anomalies detected will generate corrective work orders within 48 hours, and will

be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final O&M Plan.

- **Routine SCADA monitoring and data analysis:** Anomalies detected will generate corrective work orders within 48 hours and will be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final O&M Plan.

The Certificate Holder will update this language in the Final O&M Plan submitted to ODOE prior to commencing operation of the solar facility and will provide a redlined version. The Certificate Holder confirms that the language in the Department's evaluation is accurate; the language presented above further clarifies the work streams for generating corrective work orders for detected anomalies.

- **SS-01: Request for flexibility to conduct ground disturbing activities on areas with steep slopes with engineer review**

The Department's evaluation requests additional information regarding the types of ground-disturbing activities on slopes exceeding 20 percent that are under consideration, the locations at the site where they are being considered, and any supporting evidence demonstrating how non-seismic geologic hazards in these areas will be mitigated.

The Certificate Holder addressed geologic conditions and seismic and non-seismic geologic hazards at the Biglow Solar Project site in BCWF RFA4 Exhibit H. Section 8.1 describes the non-seismic geologic hazards related to steep slopes that could affect the Biglow Solar Project, including:

- **Landslides:** There are no mapped landslides within the Solar Micrositing Area. Most of the area is mapped as low susceptibility for landslides, with areas of moderate landslide susceptibility along drainages within the Solar Micrositing Area and areas of high susceptibility for landslides along the drainages and canyons along the eastern and northwestern boundaries of the Solar Micrositing Area. If slope stability issues are identified in the final design geotechnical investigations, the structures will either be relocated during the micrositing process, or remedial measures will be implemented to improve slope stability.
- **Erosion:** Wind erosion hazard at the Project site is generally high to very high, especially on steep slopes, and is mitigated through the use of best management practices as described in the Erosion and Sediment Control Plan submitted with BCWF RFA4 Exhibit I.

Attachment 2 to this letter shows the locations of all slopes greater than 20 percent in the Project Area shaded in red. The majority of these slopes have been completely avoided through the micrositing process. The ground-disturbing activities that would take place on slopes exceeding 20 percent (i.e., the red-shaded areas located within the limits of disturbance [LOD], as shown in Attachment 2 to this letter) include excavation and cut-and-fill to grade the existing slopes above 20 percent to below 20 percent using equipment approved for these activities, industry best practices, and best management practices to prevent erosion. Following grading, the site would be developed as outlined in the designs to install solar facility equipment and structures. Grading these slopes below 20 percent will reduce non-seismic hazards associated with erosion and steep slopes at the Project site; not completing these activities would lead to greater risk of landslides and erosion at the site.

- **SP-09: Requests to Clarify Terms, Clear Brush-Free Area and Vegetation Clearance Area/Zone**

  The Department's evaluation requests specific revisions to the draft Comprehensive Solar Revegetation and Soil Management Plan and draft Construction Wildfire Mitigation Plan and requests a further explanation of how public comments discussed under Issue SP-04, WF-08, and WF-09 were considered. SP-04 and WF-09 issues are related to the height of allowed vegetation and those are addressed in the response to WF-09/WR-10 within this document. The WF-08 issue is related to 20-foot fuel breaks and the request to clarify terms does not include a request to reduce fuel breaks.

  ODOE confirmed during a meeting on January 27, 2026, with the Certificate Holder, BrightNight, and Tetra Tech that the term "clear, brush-free" can include low-growing, fire-resistant vegetation. The Certificate Holder will update the language in the Final Construction Wildfire Mitigation Plan Section 4.6.1 and the Final Comprehensive Solar Revegetation and Soil Management Plan Appendix F to clarify that the 20-foot buffer around the perimeter will be 10 feet on either side of the fenceline

  The Department's evaluation determined that the common term that should be used for all fire buffers is "noncombustible buffer." However, the Certificate Holder requests that the term "low-growing, fire-resistant vegetation" be used in reference to the areas along the solar array fencelines, access roads, and perimeter fenceline in order to:

  1) ensure clarity and consistency regarding vegetation management within these fire buffers, as "noncombustible buffer" refers primarily to gravel or bare dirt, and

  2) address existing erosion concerns while providing wildfire mitigation at the Project site. Low-growing, fire-resistant vegetation protects against soil erosion and prevents the spread of fire following ignition. Maintaining areas completely free of vegetation would contribute to soil erosion.

  The Certificate Holder requests that this language be updated in the following sections of the draft Final Order:

  - III.N.1 Findings of Fact – Wildfire Mitigation Plans – Facility Design
  - III.N.1 Findings of Fact – Wildfire Mitigation Plans – Construction WMP, Wildfire Risk Minimization Preventative Actions, Programs, and Procedures
  - III.N.1 Findings of Fact – Wildfire Mitigation Plans – Operational WMP, Wildfire Risk Minimization Preventative Actions, Programs, and Procedures

  The Certificate Holder will provide redlined versions of the associated plans by the close of the sur-reply period outlining the requested changes.

- **LU-01: Request for reduction in requirements for Site Plan Review**

  Requiring the Certificate Holder to demonstrate compliance with all applicable local ordinances and Site Certificate conditions when applying for a conditional use permit under ORS 469.401(3) is contrary to the plain language and the intent of the statute. Such an obligation requires the County to exercise discretion in making its determination. Issuance of a conditional use permit under ORS 469.401(3) is an administrative procedural step only to give the County dual enforcement authority over the facility; it is not supposed to involve discretion. The condition properly requires the certificate holder to provide the proper forms under the Sherman County Zoning Ordinance (SCZO) 5.4(1) and (3), which are both procedural requirements. SCZO 5.4(1) simply requires a site plan "drawn to scale, and showing the dimensions, arrangement, and intended use of the proposed development." Certificate Holder respectfully requests ODOE reconsider its

interpretation of the SCZO when drafting LU Condition 3(b).

- **LU-02: Objection to Evaluation of Compliance with SCZO 5.2(5)**

  Certificate Holder respectfully disagrees with ODOE's interpretation and conclusion that the Department of Land Conservation and Development (DLCD) Goal 3 exception acreage thresholds are "land standards" within the meaning of the SCZO. The DLCD Goal 3 exception acreage thresholds in OAR 660-033-0130(38) are triggers requiring application of additional criteria. Under ODOE's rationale, because the Certificate Holder demonstrates that a Goal 3 exception is warranted, ODOE should then find that the DLCD land standard in question has been met and Certificate Holder complies with SCZO 5.2(5). The Certificate Holder respectfully requests the Department reconsider its recommended findings under SCZO 5.2(5).

- **LU-04: Objection to Evaluation of Compliance with SCZO Section 5.8(20)(1)**

  SCZO 5.8(20) provides the special conditional use criteria for non-farm uses in the Exclusive Farm Use (EFU) zone. There are six criteria that must be met, three of which explicitly impose geographic extents for evaluating impacts: SZCO 5.8(20)(2) requires consideration of impacts on "adjacent lands"; SCZO 5.8(20)(3) requires consideration of the overall land use pattern of the "area"; and SCZO 5.8(20)(4) requires consideration of the location and size of the "tract" itself. SCZO 5.8(20)(1) has no language describing the geographic extent of the required analysis. Instead, the subpart refers only to farm uses described in ORS 215.203(2). ORS 215.203(2), in turn, refers to the current employment of land for the primary purpose of obtaining profit. Certificate Holder respectfully contends that subpart (1) is intended to require a general analysis, not a specific analysis limited to the subject tract as ODOE contends. If the County had intended to limit the analysis to a geographic area, like the subject tract, it would have specified as it did in subparts (2), (3), and (4). If anything, using ODOE's rationale under LU-05, when a criterion is silent as to the geographic extent of the analysis, it may be proper to apply the EFSC Land Use Analysis Area.

  The relevant sections are provided below:

  - SCZO 5.8(20)(2): Does not interfere seriously with accepted farming practices on adjacent lands devoted to farm use;
  - SCZO 5.8(20)(3): Does not materially alter the overall land use pattern of the area;
  - SCZO 5.8(20)(4): Is situated upon generally unsuitable land for the production of farm crops and livestock, considering the terrain, adverse soil or land conditions, drainage and flooding, vegetation, location and size of the tract, and the availability of necessary support resources for agriculture.

- **LU-05: Objection to Evaluation of Compliance with SCZO 5.8(20)(3)**

  The Department's Evaluation requests that the Certificate Holder provide an analysis of SCZO 5.8(20)(3) based on the established Land Use Analysis Area to support review of our comment. However, the Certificate Holder disagrees with the Department's interpretation that the Land Use Analysis Area is appropriate for this analysis, as explained below.

  SZCO 5.8(20)(3) is one of six special conditional use criteria applicable to non-farm uses in the EFU zone. As described above, three of the six special conditional use criteria impose a geographic extent for consideration. Here, subpart (3) asks the applicant to look at the "overall land use pattern of the area." This is in contrast to other subparts that ask the applicant to look at "adjacent lands" or the "tract" itself. The EFSC Land Use Analysis Area is for evaluating a facility's compliance with the EFSC Land Use Standard, which includes

demonstrating compliance with the applicable substantive criteria from the SCZO. The EFSC Land Use Analysis Area, however, is not determinative of the geographic extent for applying the SCZO criteria. The criteria themselves impose the geographic extent. Certificate Holder respectfully maintains that the geographic extent in SCZO 5.8(20)(3) requires a look beyond the EFSC Land Use Analysis Area at the "overall land use pattern of the area." This is the broadest geographic extent language in SCZO 5.8(20), expanding beyond the adjacent lands or the tract. The EFSC Land Use Analysis Area is frequently used to describe the adjacent or surrounding lands to the project site. When considering changes to overall patterns, that means land use patterns within swaths of the County like North Sherman County, not the surrounding lands within the EFSC Land Use Analysis Area.

- **LU-17: Land Use/Goal Exception – Project Furthers Oregon's Clean Energy Directives and Goals**

  Goal 3 Exception Reason "Directly Furthers Oregon's Clean Energy Directives and Goals"
  ODOE acknowledges that EFSC has discretion to decide when to grant an exception to a statewide planning goal. ODOE also acknowledges that EFSC must balance Oregon's goals and directives to combat climate change and renewable energy development against the State's Goal 3 to protect agricultural lands. Yet ODOE recommends that EFSC disregard any weight for the State's clean energy goals and the Governor's explicit directives when ODOE recommends that EFSC exercise its discretion and balance in favor of Goal 3 agricultural lands. This gives more weight and priority to Goal 3 than the State's clean energy goals and the Governor's explicit directives, which the Certificate Holder respectfully continues to assert warrants reconsideration. The State's own energy department is recommending that EFSC choose to exercise its discretion in a manner that fails to recognize or further the State's clean energy policy and directives.

  ODOE may be misinterpreting the Certificate Holder's proposed findings when concluding that "granting an exception to a Goal 3 based solely on the fact that a proposal would result in the construction or expansion of a renewable energy facility is tantamount to ignoring Goal 3 altogether." Rather, the Certificate Holder is asserting that Biglow Solar will directly further the State's clean energy goals and directives, especially in light of Executive Order 25-29, which requires state agencies to advance the implementation of the state energy strategy and get clean energy projects built, particularly those projects that contribute to energy affordability and reliability. The Certificate Holder maintains that this reason alone is sufficient to justify a Goal 3 exception. While this is not a reason commonly relied upon to grant a Goal 3 exception, it nonetheless is justified. It also does not set precedent or lead to a "slippery slope" for future decisions. This reason is based on specific facts and circumstances that are unlikely to occur repeatedly given the Certificate Holder's unique positioning as a regulated public utility in Oregon.

  In addition, the Certificate Holder has not asked EFSC to consider this reason alone to justify the Goal 3 exception. Instead, the request is coupled with the locational dependency reason and the economic benefits to the agricultural economy reason, which includes implementation of the Community Investment Plan. ODOE is concerned about expressly ignoring Goal 3 in favor of other State policies, but as ODOE recognizes, EFSC has the discretion and the authority to balance the State's goals. We believe EFSC can do so here in a way that grants the Goal 3 exception, recognizes the importance of other reasons like the ones presented here, and reaffirms Goal 3 policies with the implementation of the Community Investment Plan, ensuring that potential impacts to

agricultural lands and related economies are offset

- **LU-18: Land Use/Goal Exception – Minimal impacts to Other Resources**

  Goal 3 Exception Reason "Minimal Impacts on other resources protected by Council standards"
  ODOE appears to be rejecting this reason because of a new rationale related to "double counting" and because the Certificate Holder had already demonstrated sufficient reasons to grant an exception to Goal 3. ODOE recommended EFSC reject the minimal impacts reason, and instead consider those minimal impacts and mitigation per the Oregon Department of Fish and Wildlife Habitat Mitigation Policy as meeting the mitigation requirement in ORS 469.502(2)(c)(B). This approach avoids "double counting" - i.e., finding the same underlying facts and evidence as meeting two separate criteria necessary for granting an exception. The Certificate Holder respectfully disagrees with this approach as Council has previously determined "minimal impacts on other resources protected by Council standards" as a reason for granting an exception under ORS 469.504(2)(c)(A) and did not consider this "double counting" or finding the same underlying facts and evidence under ORS 469.504(2)(c)(B). Furthermore, there are no rules in ORS 469.504(2)(c)(A) that restrict the Council's discretionary determination of what merits a "reason," nor does ORS 469.504 have any regulations indicating that the ODOE may not consider the same underlying facts and evidence to satisfy more than one standard under the rule. Such a policy would not make sense because underlying facts and evidence do not "change" depending on what standard or rule is being considered. ODOE's decision to forego consideration of the project's minimal impacts on other resources protected by Council standards is not grounded in any statutory or rule language or policy and is inconsistent with ODOE's past practices.

- **FW-03: Flexibility on ground clearing activities in Category 2 Habitat**

  The Department's evaluation requests that the Certificate Holder provide reasons why, for the isolated areas of Category 2 habitat, site preparation activities would not be able to be planned and completed at a time that would avoid the critical period for ground-nesting birds.

  The Certificate Holder will make every effort to avoid vegetation removal or ground disturbance in Category 2 habitat from April 15 to September 1. Facility construction is scheduled to begin in June 2026. If vegetation or ground disturbance is restricted in Category 2 habitat during the breeding season, then construction will not be able to begin in Category 2 habitat until after September 1. If avoidance during the specified window is not feasible without impacting the schedule or sequencing of project construction, the Certificate Holder requests the option to complete nest clearance surveys prior to disturbance to avoid impacts to ground-nesting birds. Nest clearance surveys would allow some work to begin in Category 2 habitat in sync with the construction schedule for the rest of the Facility.

- **WF-04: Request for flexibility in road design standards for roads not needed for fire access**

  The Department's evaluation requested the Certificate Holder provide the site plan showing the designated emergency access roads and documentation of any additional correspondence with the North Sherman Rural Fire Protection District other than what was included in RFA4 Attachment U-1.

  Attachment 1 shows the designated emergency access roads. PGE and BN have

conducted extensive outreach in the community and with local emergency responders. On August 12, 2025, BN presented at a North Sherman County Rural Fire Protection District Board meeting, where proposed project details were shared alongside an overview of planned fire prevention and wildfire mitigation measures (the meeting presentation is provided as Attachment 3 to this comment letter which was not previously provided on the record). In addition to this presentation, the project team has been coordinating closely with Sherman County Emergency Services and the North Sherman County Rural Fire Protection District, and has met multiple times, both in person and over the phone, with Fire Chief Burbank to review site-specific fire mitigation measures. Feedback provided by Chief Burbank on the draft Construction Wildfire Mitigation Plan and Biglow Solar site plan indicate the measures are sufficient to address and mitigate wildfire risk during construction and operation of the Biglow Solar facility. BrightNight also plans to invest in the local community and help the North Sherman Fire District build capacity to address wildfire risks within the Fire District boundaries by donating $200,000. To memorialize their intent to donate to the Fire District, BrightNight has shared a draft MOU with Chief Burbank to share with the District for their review and comment.

- **WF-09: Support for recommended vegetation maintenance standards for wildfire season/ WF-10: Objection to Vegetation Maintenance Standards for Wildfire Season**

  The Certificate Holder appreciates ODOE's consideration of vegetation height requirements during the dry season and the input provided by the Sherman County Weed District and other commenters.

  As previously discussed, maintaining vegetation at a height of 1 to 3 inches during the June–October dry season presents practical and ecological challenges. Repeated mowing to that height would likely damage perennial bunchgrasses included in the approved seed mix, reduce long-term stand viability, increase susceptibility to invasive annual grasses, and potentially elevate fine fuel risk over time. In addition, mowing at extremely low heights may increase ignition risk due to equipment contact with rocks or soil surface.

  At the same time, the Certificate Holder acknowledges neighboring non-participating landowner concerns regarding wildfire risk and understands the desire for lower vegetation height during the peak fire season. Based on consultation with vegetation management specialists from Sherman County Weed District and Tetra Tech, and consideration of local Conservation Reserve Program management practices, the Certificate Holder is committed to maintaining vegetation at a target height of approximately 8 inches during the dry season, where practicable to ensure vegetation health. The Certificate Holder further commits that vegetation will be maintained below 10 to 12 inches, consistent with the draft Comprehensive Solar Revegetation and Soil Management Plan.

  An 8-inch target height represents a reasonable middle ground that:

  - Reduces standing fine fuels compared to unmanaged conditions;
  - Maintains bunchgrass crown integrity and long-term vegetation health;
  - Aligns more closely with local vegetation management practices; and
  - Avoids creating conditions that would favor invasive annual grasses.

  The Certificate Holder recognizes that mowing height may vary slightly depending on equipment capabilities, species composition, and site conditions, and commits to implementing vegetation management in coordination with local experts and in accordance with the final approved Comprehensive Solar Revegetation and Soil

Management Plan and Construction Wildfire Mitigation Plan.

This approach reflects the Certificate Holder's willingness to collaborate with ODOE and local stakeholders while ensuring that vegetation management practices remain ecologically sustainable and supportive of long-term wildfire risk reduction objectives.

- **TL-01: Request for additional flexibility in transmission line siting**

  The Department's evaluation requests that the Certificate Holder must present the alternate gen-tie transmission line corridors so that they can be evaluated for compliance with applicable laws, rules and standards.

  The Certificate Holder appreciates the opportunity to update the location of the project substation and 230-kV gen-tie transmission line for the record. As described in RFA 4 and the Proposed Order, the gen-tie transmission line was originally identified as approximately 600 feet in length within a 150-foot corridor and supported by four 80-foot-tall steel monopole structures.

  As design has progressed, refinement of the project substation location has resulted in a corresponding adjustment to the gen-tie transmission line, with an updated alignment of a 230-kV transmission line approximately 1,900 feet in length, supported by three 80-foot-tall steel monopole structures. Attachment 4 shows the new location of the project substation and gen-tie transmission line, all still located within the Solar Micrositing Area.

  The refinement resulted from continued engineering evaluation of site conditions and infrastructure layout. During design reviews, it was identified that the originally planned substation area may present constraints relative to the existing infrastructure. Accordingly, the substation location and corresponding gen-tie alignment were adjusted to avoid low elevation areas, better align with existing infrastructure, and improve constructability, long-term operability, and overall infrastructure resilience. This refinement reflects prudent final engineering and results in improved consistency, new and existing infrastructure, rather than a change in project scope.

  Although the revised alignment extends beyond the originally anticipated 150-foot corridor by approximately 500 feet, the alignment remains entirely within the Solar Micrositing Area and within areas previously identified in the RFA 4 application as being subject to permanent impacts. The shift represents a minor refinement in siting based on final engineering and does not introduce permanent impacts outside of those areas already analyzed and disclosed in the application materials.

  Accordingly, the Certificate Holder respectfully requests flexibility in the Final Order to accommodate this refined alignment, while clarifying that the updated configuration remains within the previously anticipated permanent impact area and does not expand the overall footprint of analyzed impacts.

PGE respectfully submits these comment replies for consideration by ODOE and the Energy Facility Siting Council in advance of Council action on the Proposed Order for Request for Amendment 4.

Sincerely,

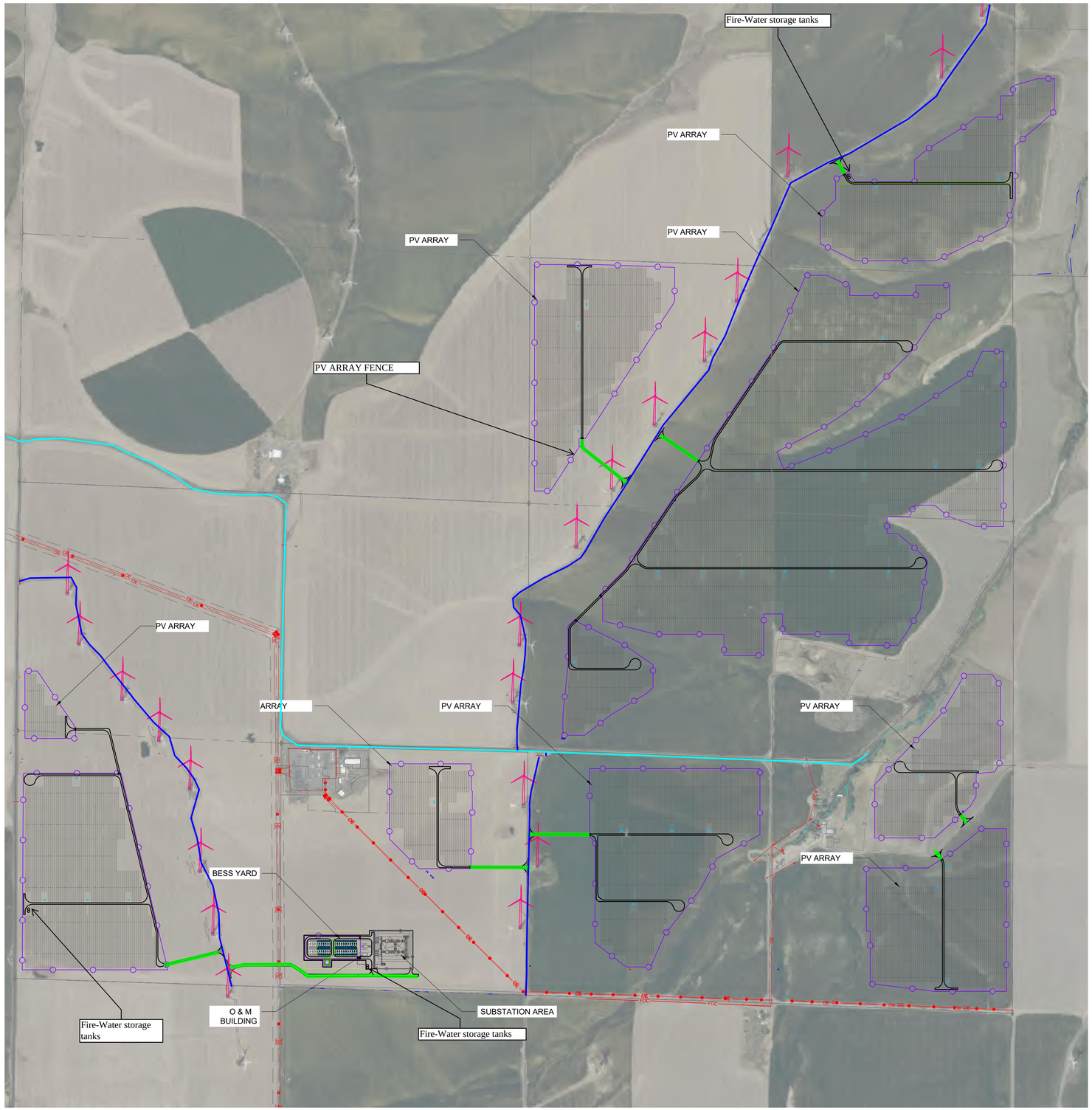
Lenna Cope

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech
Kathleen Campanella, BrightNight

Attachment 1: 60% Site Plan Road Widths
Attachment 2: Biglow Slope Exhibit
Attachment 3: North Sherman County Rural Fire Protection District Board Presentation
Attachment 4: Substation and Transmission Line Locations

Attachment 1: 60% Site Plan Road Widths



NORTH

0 300' 600' 1,200'

1" = 600' (FULL SIZE 22"×34")

LEGEND

- PROJECT BOUNDARY
- INVERTER BLOCK BOUNDARY
- FENCE
- INTERIOR ROADS 16FT
- WIND MV
- UTILITY OVERHEAD POWER LINE
- MV FEEDER 1A
- MV FEEDER 1B
- MV FEEDER 2A
- MV FEEDER 7B
- MV FEEDER 8A
- MV FEEDER 8B
- BORE
- 2-WAY MV JUNCTION BOX (JB#)
- 3-WAY MV JUNCTION BOX (JB#)
- PROPOSE NEW 20FT EMERGENCY ACCESS ROADS
- COUNTY ROAD
- EXISTING WTG ACCESS ROADS

WARNING

0 ½ 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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REV	DATE	DESCRIPTION	BY	CHK	ENG	ENG	MGR
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A	10-10-25	ISSUED FOR REVIEW 30%	RA	GC	RM	GC	GC

REVISIONS

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DRAWN BY:	R.AGUILAR	DESIGN ENGR.: R.MACIEL	ENGR. MGR.: G.CABANILLA
SCALE:	1:600	CAD FILE NAME: BIGL-E-100-01 OVERALL SITE PLAN	

PORTLAND GENERAL ELECTRIC CO.
121 SW SALMON ST. PORTLAND, OR 97204

PLANT DESCRIPTION / PROJECT NAME

OVERALL SITE PLAN

DRAWING NO.:	SHEET NO.:	REV. NO.:
BIGL-E-100-01		B

PAGE SETUP: _NONE | ANSI A (8.50 X 11.00 INCHES)

BIGL-E-100-01 OVERALL SITE PLAN.DWG | 1/31/2026 12:05:46 pm | ROBELINEAGUILAR

Attachment 2: Biglow Slope Exhibit



LINES

- PROJECT BOUNDARY
- PROPOSED ACCESS ROAD
- 1700 EXISTING MAJOR CONTOUR
- 1705 EXISTING MINOR CONTOUR
- PROPOSED FENCE
- LOD PROPOSED LIMITS OF DISTURBANCE
- EXISTING FIRE BREAK

HATCHES

- SLOPES GREATER THAN 20%

SYMBOLS

- ELECTRICAL BORE
- INVERTER & WORKING PAD
- LOAD BREAK DISCONNECT
- GATE
- TRACKER MOTOR
- BLOCK ## POWER BLOCK NUMBER

NOTE:
EXISTING/PROPOSED CONTOURS SHOWN AT A 5' INTERVAL.

REV	DATE	DESCRIPTION	BY	CHK	ENG	ENG	MGR

REVISIONS

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DRAWN BY:	DESIGN ENGR.:	ENGR. MGR.:
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PORTLAND GENERAL ELECTRIC CO.
121 SW SALMON ST. PORTLAND, OR 97204

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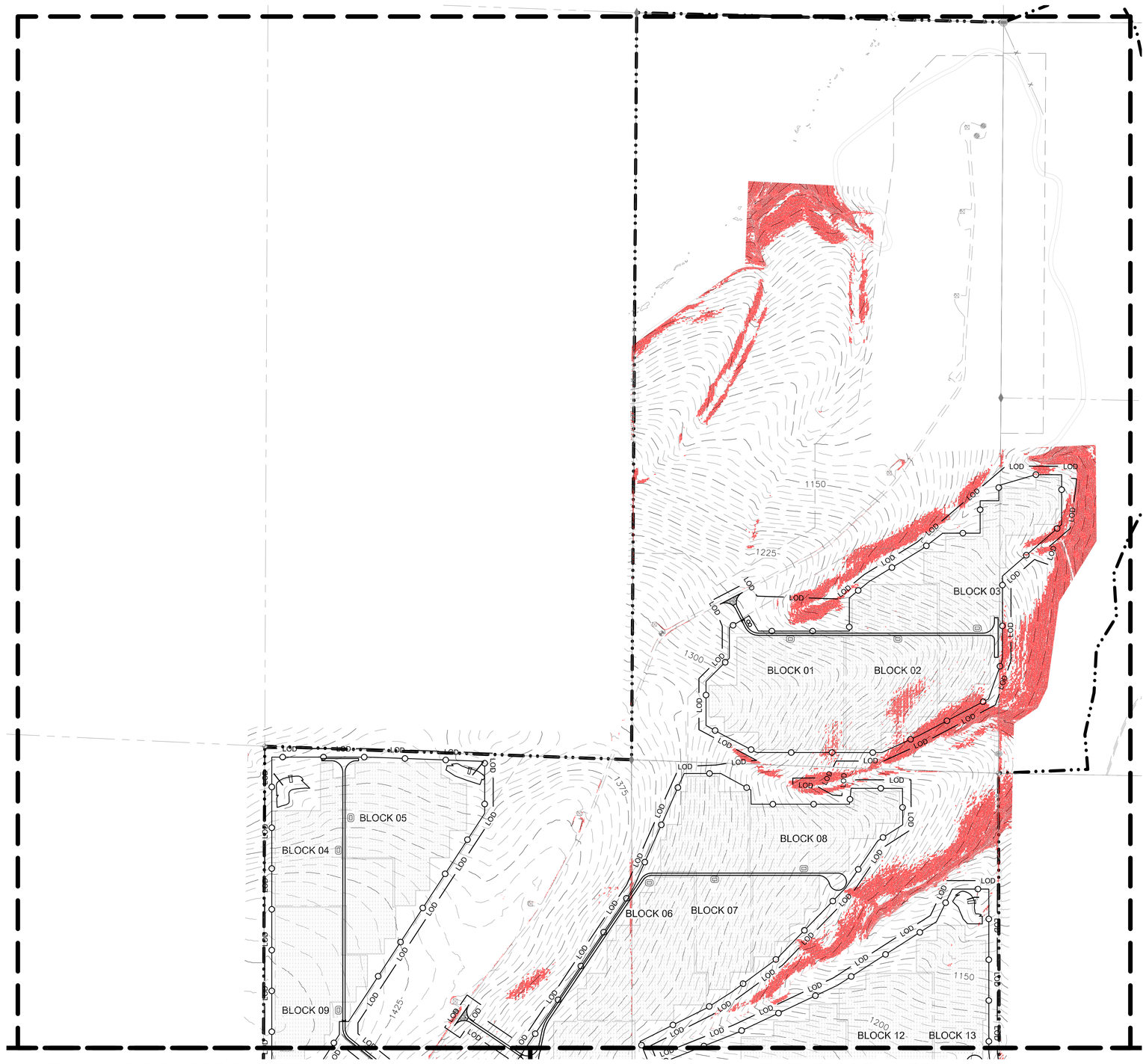
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MATCHLINE: SEE SHEET BIGL-SLPEXH-4

LINES

- PROJECT BOUNDARY
- PROPOSED ACCESS ROAD
- 1700 EXISTING MAJOR CONTOUR
- 1705 EXISTING MINOR CONTOUR
- PROPOSED FENCE
- LOD PROPOSED LIMITS OF DISTURBANCE
- EXISTING FIRE BREAK

HATCHES

- SLOPES GREATER THAN 20%

SYMBOLS

- ELECTRICAL BORE
- INVERTER & WORKING PAD
- LOAD BREAK DISCONNECT
- GATE
- TRACKER MOTOR
- BLOCK ## POWER BLOCK NUMBER

NOTE:
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INDEX OF SHEETS
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REVISIONS

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PORTLAND GENERAL ELECTRIC CO.
121 SW SALMON ST. PORTLAND, OR 97204

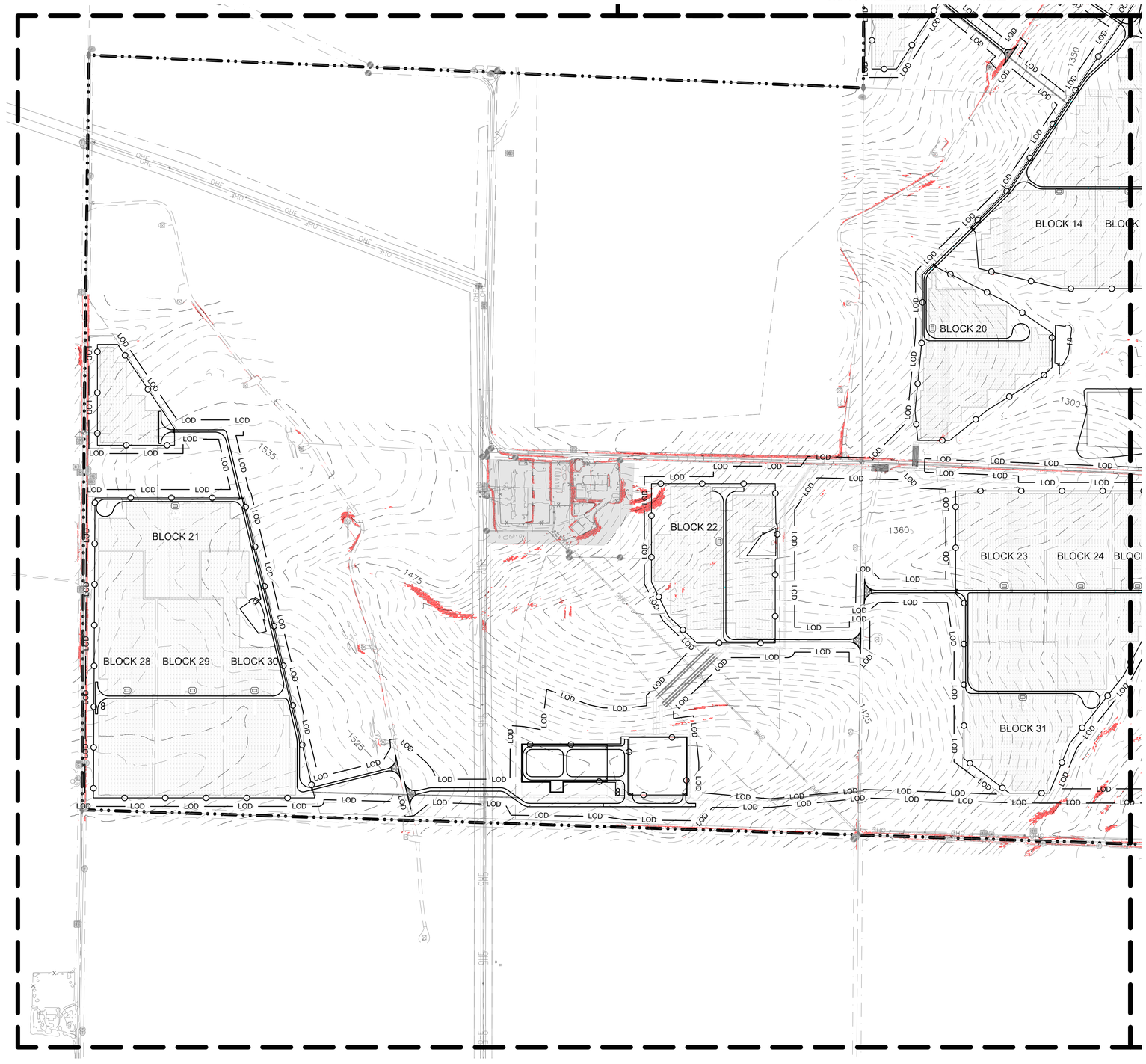
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- 1705 EXISTING MINOR CONTOUR
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- EXISTING FIRE BREAK

HATCHES

- SLOPES GREATER THAN 20%

SYMBOLS

- ELECTRICAL BORE
- INVERTER & WORKING PAD
- LOAD BREAK DISCONNECT
- GATE
- TRACKER MOTOR
- BLOCK ## POWER BLOCK NUMBER

NOTE:
EXISTING/PROPOSED CONTOURS SHOWN AT A 5' INTERVAL.

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REVISIONS

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121 SW SALMON ST. PORTLAND, OR 97204

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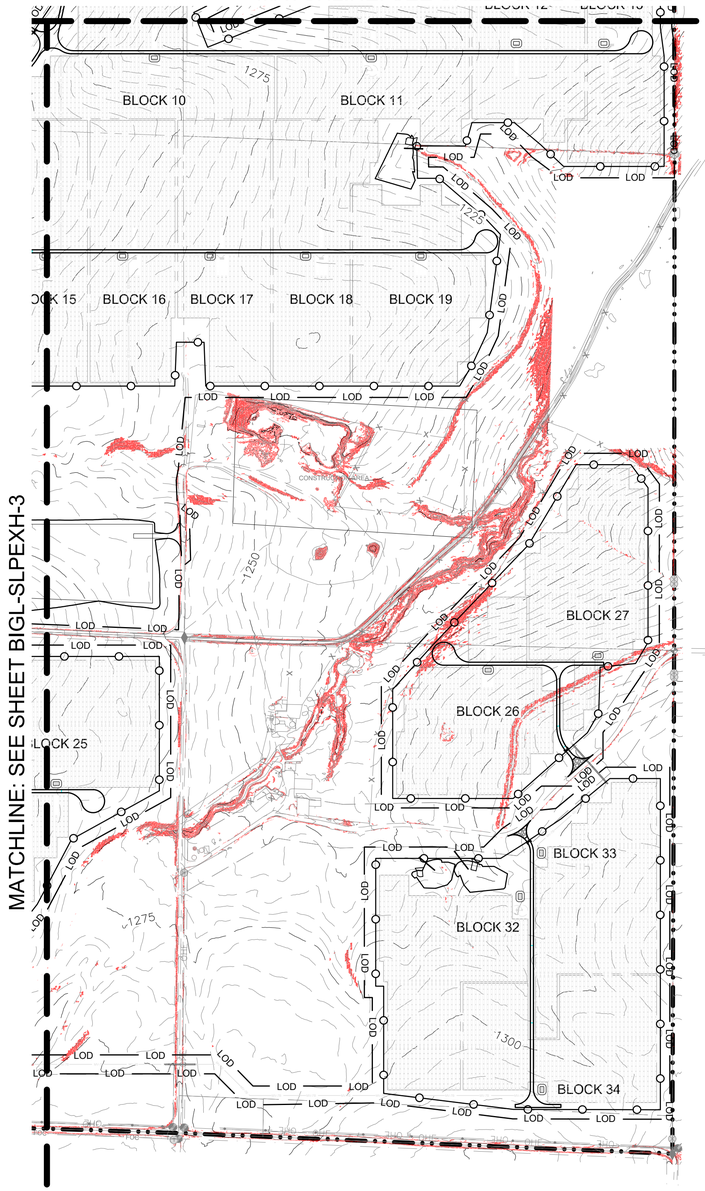
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MATCHLINE: SEE SHEET BIGL-SLPEXH-3

LINES

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- 1700 EXISTING MAJOR CONTOUR
- 1705 EXISTING MINOR CONTOUR
- PROPOSED FENCE
- LOD PROPOSED LIMITS OF DISTURBANCE
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HATCHES

- SLOPES GREATER THAN 20%

SYMBOLS

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PORTLAND GENERAL ELECTRIC CO.
121 SW SALMON ST. PORTLAND, OR 97204

PLANT DESCRIPTION / PROJECT NAME

HIGH SLOPE EXHIBIT

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Attachment 3: North Sherman County Rural Fire Protection District Board Presentation



BRIGHTNIGHT
Power when you need it

North Sherman County Fire Board

MEETING

AUGUST 2025

TODAY'S GOAL

- **Progress Update:** Share overview of the project and update you on our progress
- **Safety:** Discuss the safety measures planned for construction, design, and operation
- **Experience:** Review how BrightNight has worked with first responders in other project communities
- **Feedback:** Learn what else we can do to align our work with Sherman County's emergency safety preferences. Wrap up with a list of discussion topics.

WHO'S HERE?

BrightNight

- Kathleen – Lead developer
- Tamara – Development support
- Michael – Project Delivery
- Ranjith – BESS Engineering
- Arturo – Solar Engineering

Coffman Engineers

- Mark Gouveia

AGENDA/PURPOSE

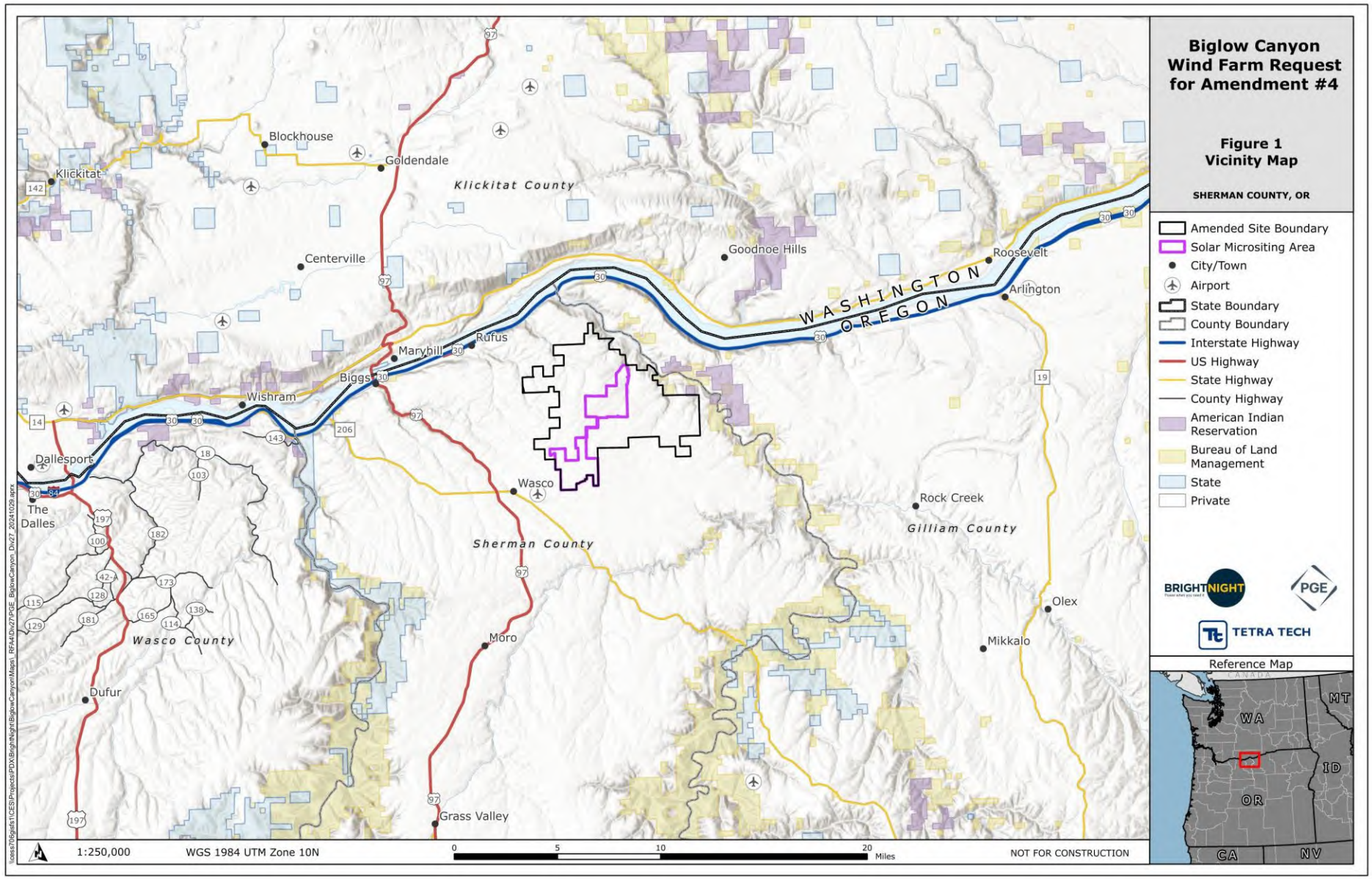
- Project Description
- Site Layout Review
- Schedule Overview
- Emergency Response Plan Overview
- Share Wildfire Mitigation Plan (WMP) measures for construction
- Ensure coordination with Sherman County responders

01

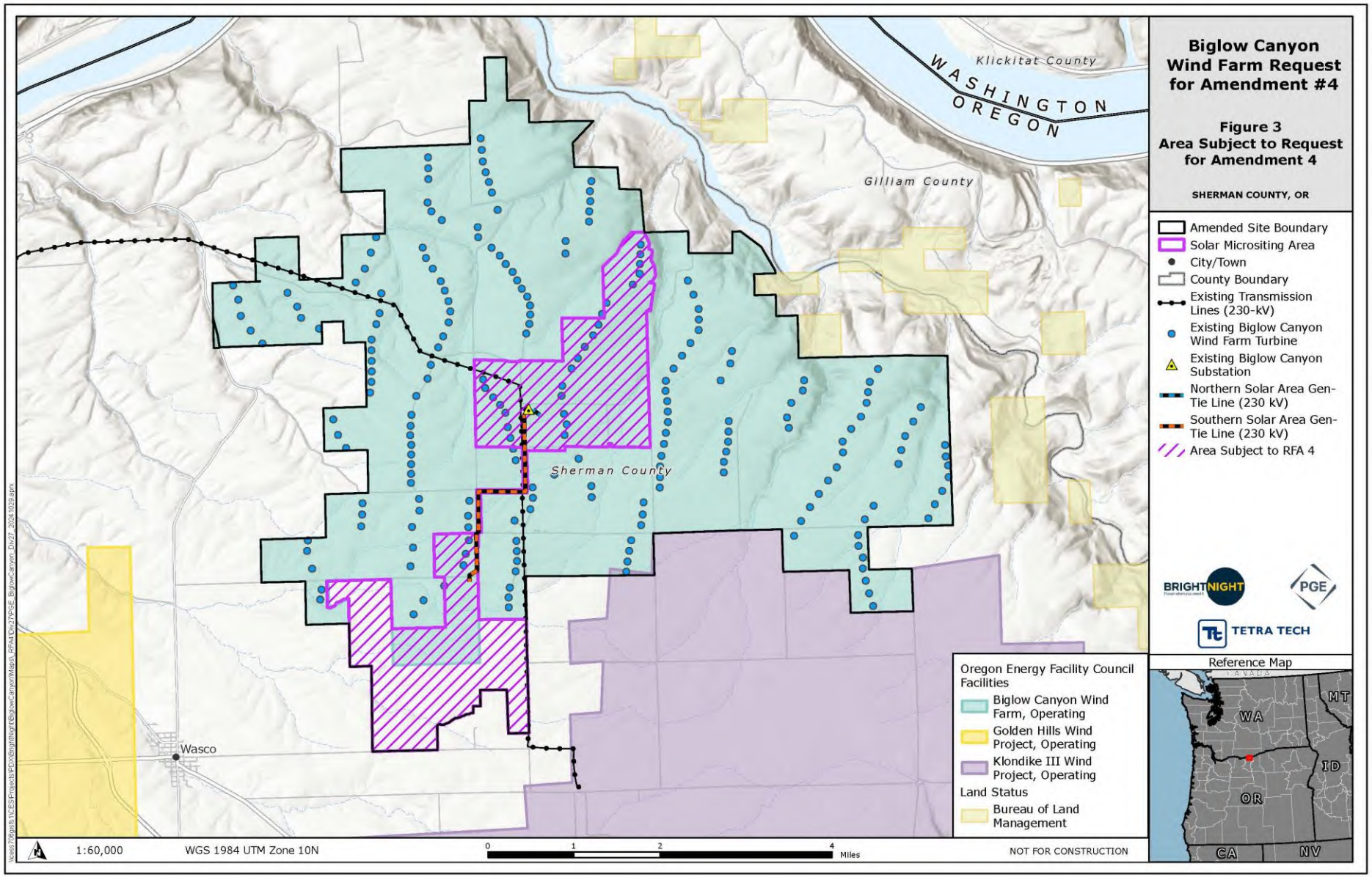
DEVELOPMENT UPDATE

Kathleen

Project Description



Project Description



Biglow Solar + Storage Project Overview

OVERVIEW
PGE and BrightNight have partnered to bring a solar and storage project to the existing Biglow Canyon Windfarm in Sherman County, Oregon.

CAPACITY
385-Megawatts in two phases. Today, we're discussing phase 1 (125 MW PV and 125 MW BESS).

FOOTPRINT
Study area is 3,980 acres. Actual project footprint is ~676 acres.

INTERCONNECTION
Utilizing the existing Biglow Canyon Substation. Ideal optimization of existing infrastructure to reduce project impact.

PERMITTING
Currently moving through the Oregon EFSC process.

Tax Revenue
At least $40,000,000 in tax revenue generated over the life of the project.

Schedule Overview

2024

April-Sept

Survey Complete (cultural resources, habitat, raptor, wetlands, botanical)

Meetings with community leaders

Initial tribal outreach

2025

April

Application for Amendment for existing EFSC Site Certificated deemed published and complete by ODOE

July

Preliminary layout

Technology selection

Agricultural mitigation meetings

August

Sponsorship of the Sherman County Fair

Open house, Aug. 19

September

Anticipate completing EFSC application submission

November

EFSC issues "draft proposed order," tentative hearing date set

2026

January

Council review and determination

Q2

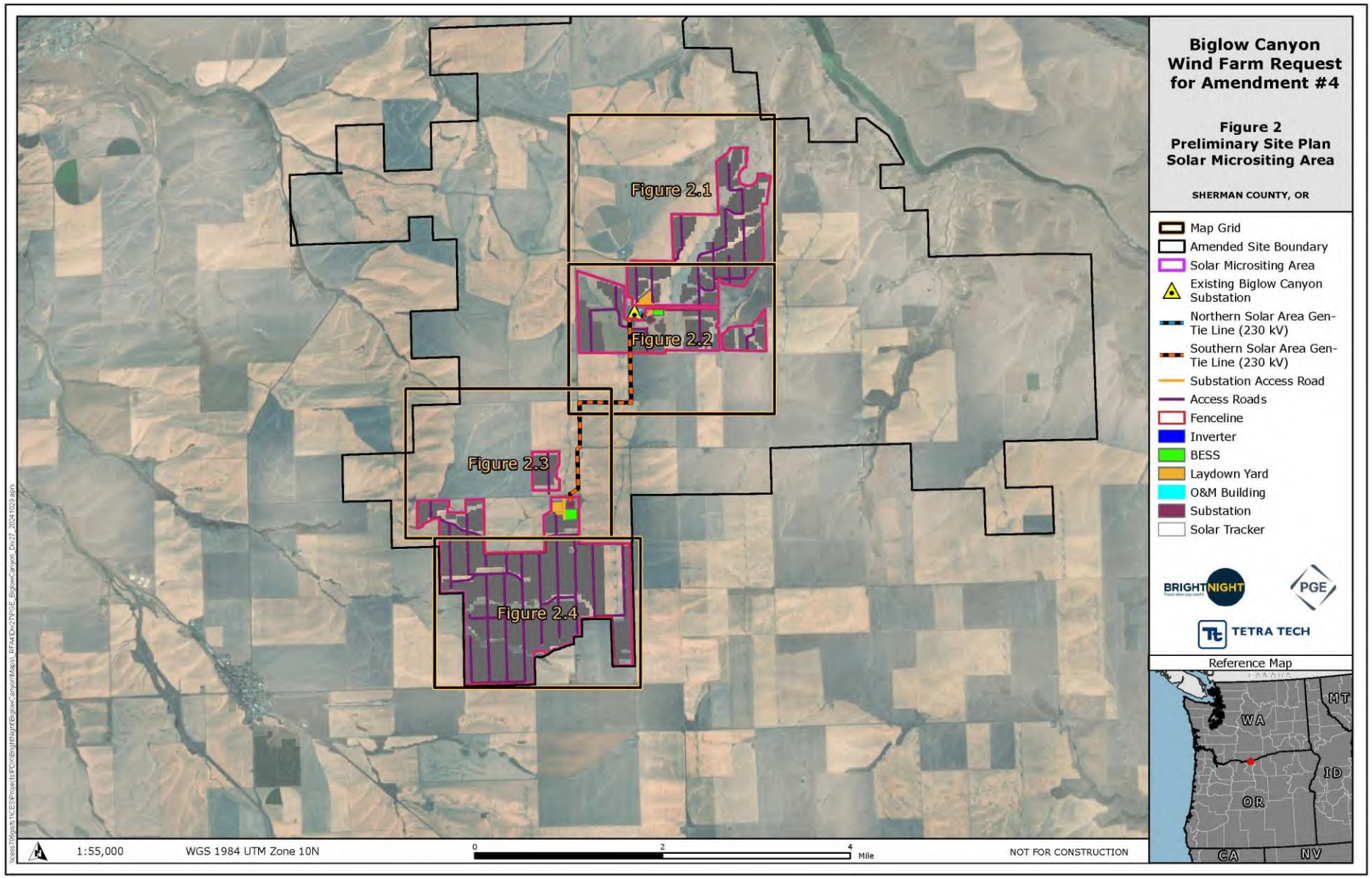
Construction of phase 1

2027

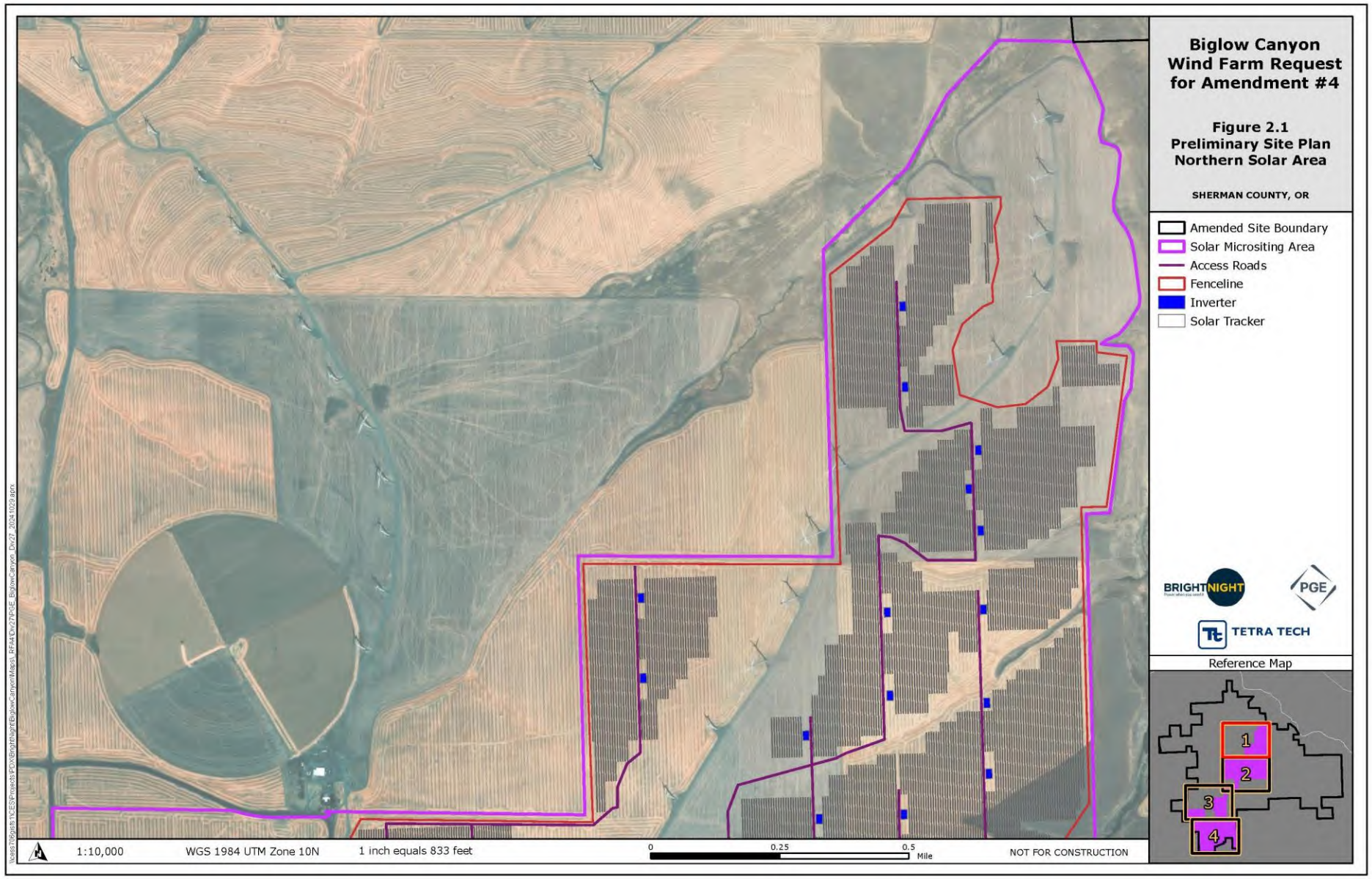
Q4

Anticipated construction of phase 2

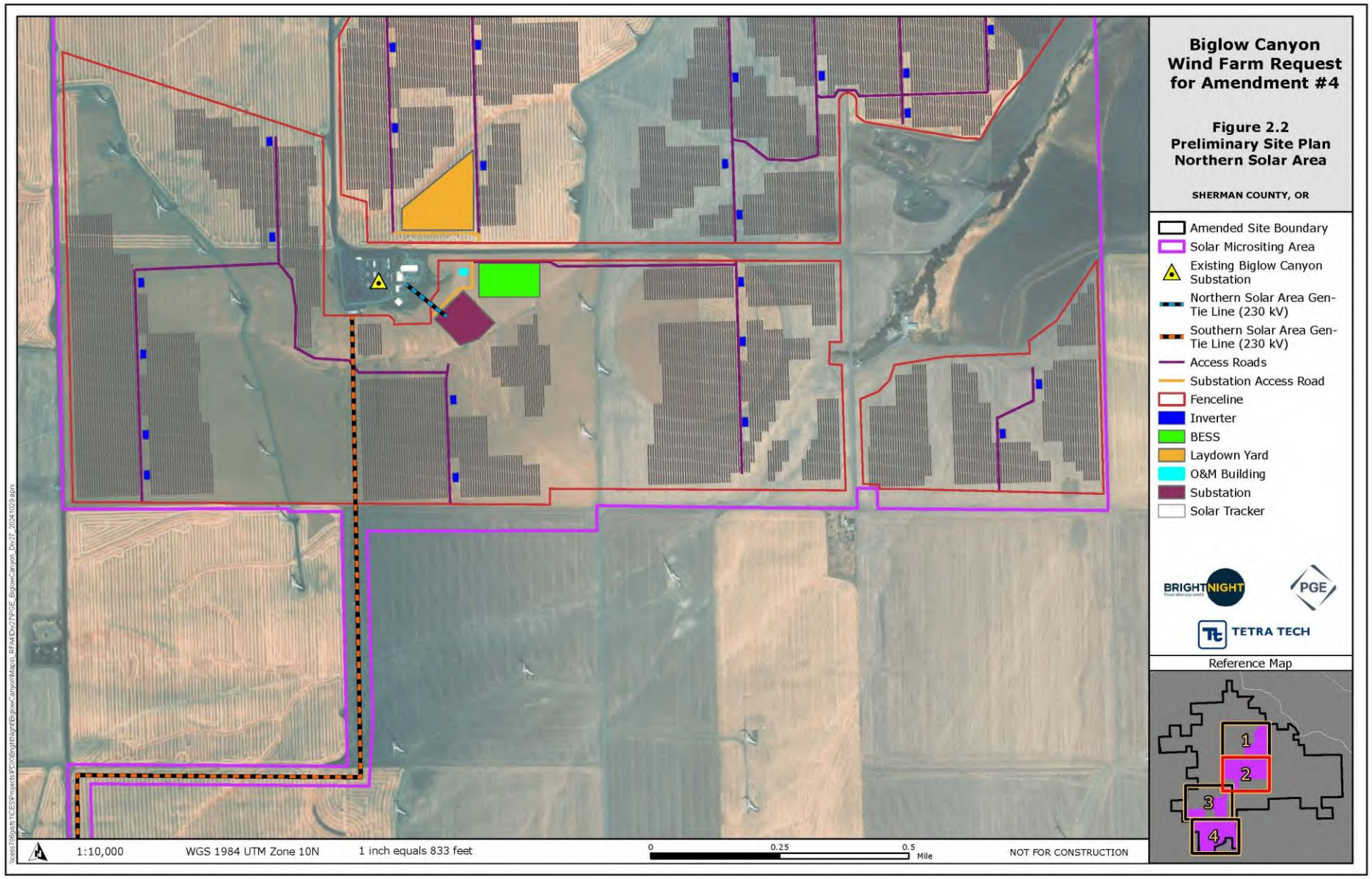
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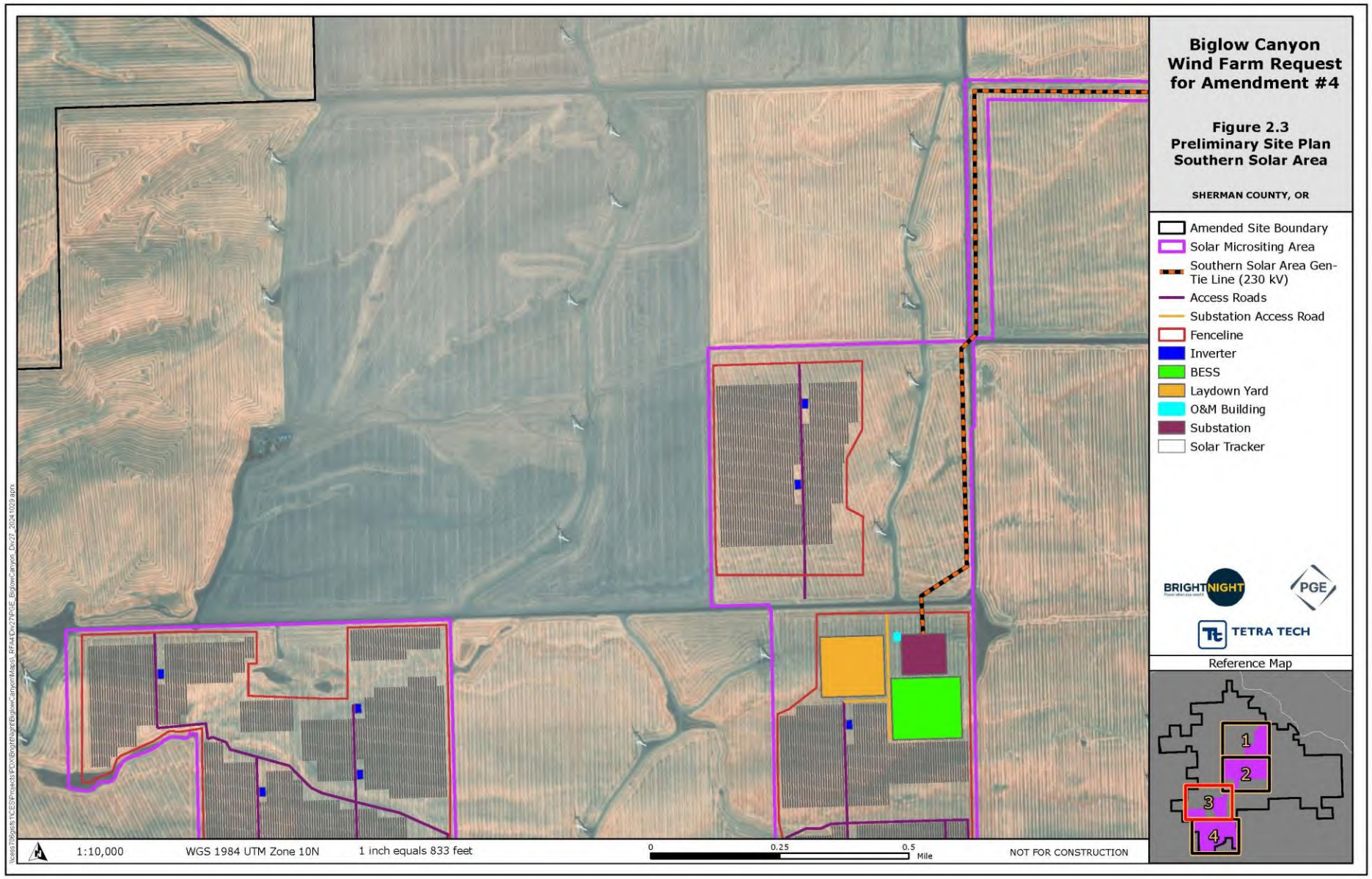
Project Description



Project Description



Project Description



Project Description



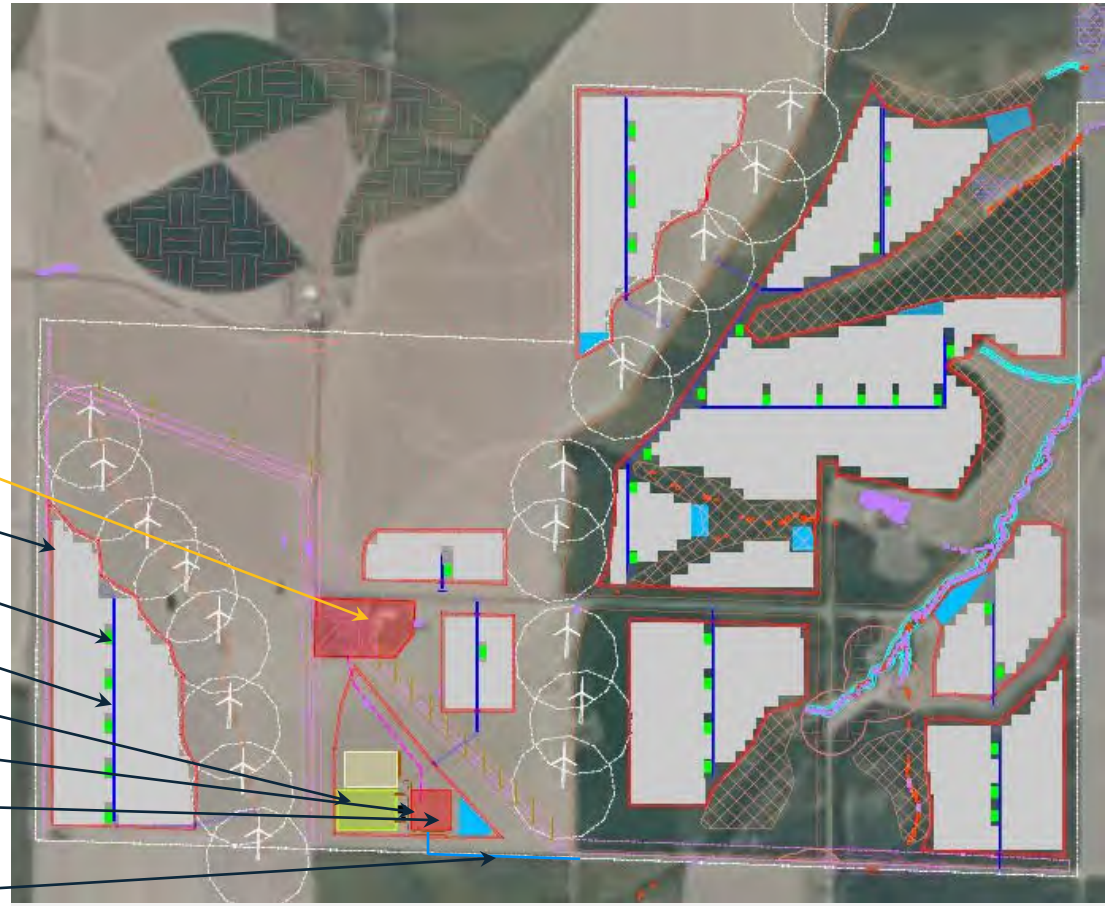
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ENGINEERING

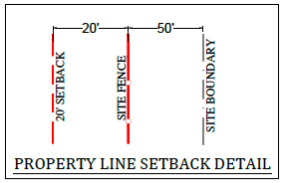
Ranjith (BESS)
Arturo (PV)

Overall Site Layout

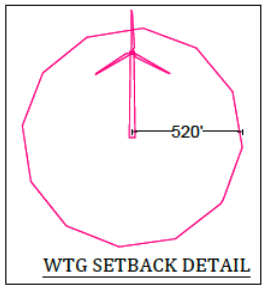
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- Fence line
- Inverters
- Improved roads 16ft
- BESS
- O&M Building
- Project substation
- Substation Access road 24ft, with 20 ft internal roads



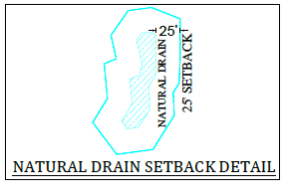
16’ interior access roads and 20’ perimeter setback for access



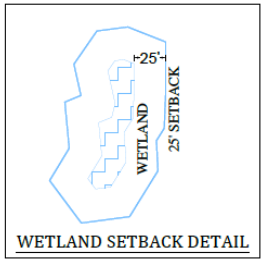
PROPERTY LINE SETBACK DETAIL



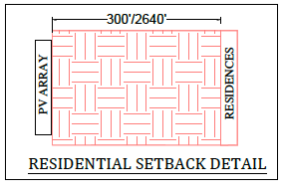
WTG SETBACK DETAIL



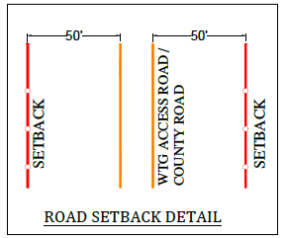
NATURAL DRAIN SETBACK DETAIL



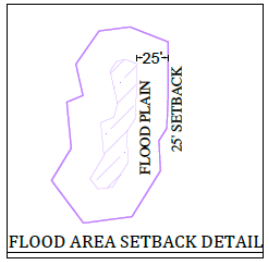
WETLAND SETBACK DETAIL



RESIDENTIAL SETBACK DETAIL



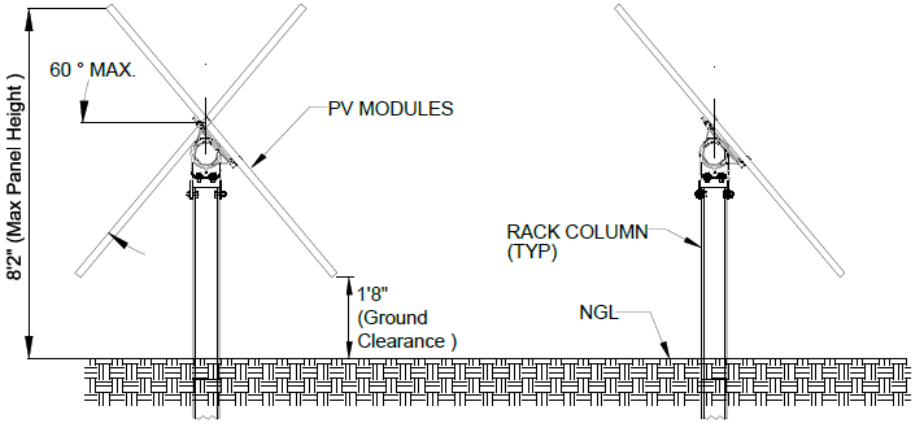
ROAD SETBACK DETAIL



FLOOD AREA SETBACK DETAIL

Solar PV Arrays





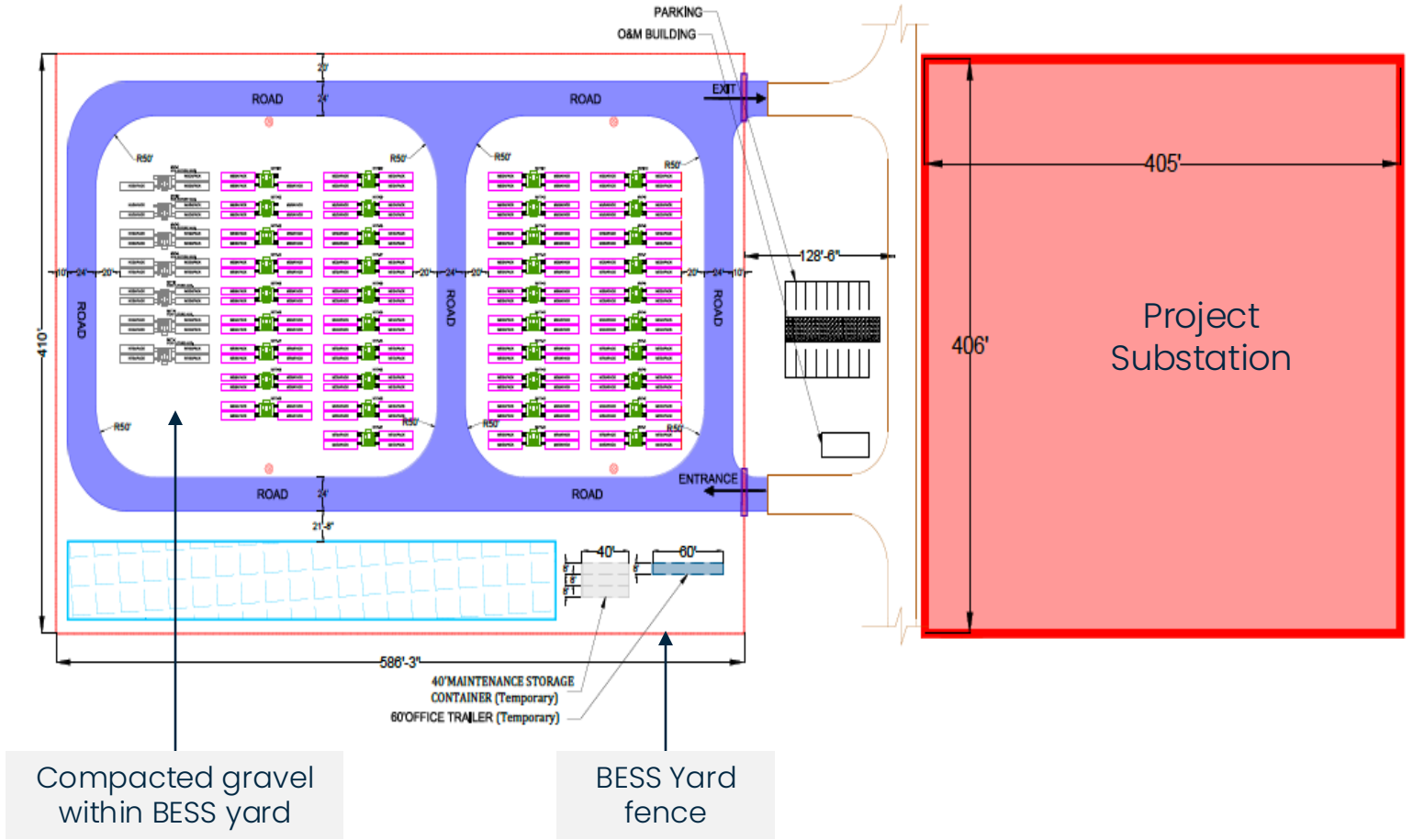
TYPICAL RACK NORTH/SOUTH END ELEVATION





BESS Site Layout and General Arrangement

BESS YARD



Project Specifications - 125MW / 500 MWh BESS coupled to 125MW PV

Equipment Clearances:

- Minimum 8' clearance between front faces of battery enclosures for O&M access and UL 9540A fire propagation prevention guidelines
- Minimum 10' clearance between side faces of battery enclosures

Access Roads

- 24' interior access roads and perimeter road for firetruck access
- 50' internal turning radius

Minimum 10' setback from fence to BESS yard perimeter road

BESS Equipment Details

Subtitle goes here



Manufacturer and Model – Tesla Megapack 2XL

Fully integrated AC battery enclosure with battery modules, string inverters, thermal management system and fire safety systems

Proprietary fire detection and suppression system

Over 14 GWh in operation

Proposed Equipment Quantities

- Initial Install – 154 Megapacks and 39 Medium Voltage Transformers
- Future Augmentation – 29 Megapacks and 7 Medium Voltage Transformers
- Medium Voltage Transformers – 39
- Note that equipment quantities could change as design progresses

Equipment Specifications:

Mechanical

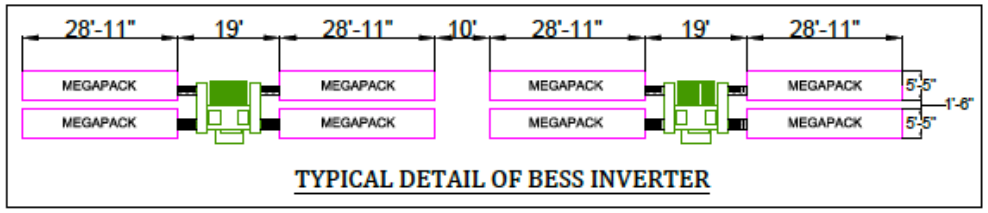
- IP66/ NEMA 3R
- L x D x H - 8.8m x 1.6m x 2.7m
- 84,000 lbs
- Operating Temperature Range: -30C to 50C

Electrical

- Output voltage: 480V AC 3 phase
- Power Rating: 979 kW
- Energy Rating: 3916 kWh

Codes and Certifications

- System – UL 9540, UL 9540A, UL 1973, UL 1741, IEC 62619, IEEE1547
- Battery Cells – UL 1642



BRIGHTNIGHT
Power when you need it

03

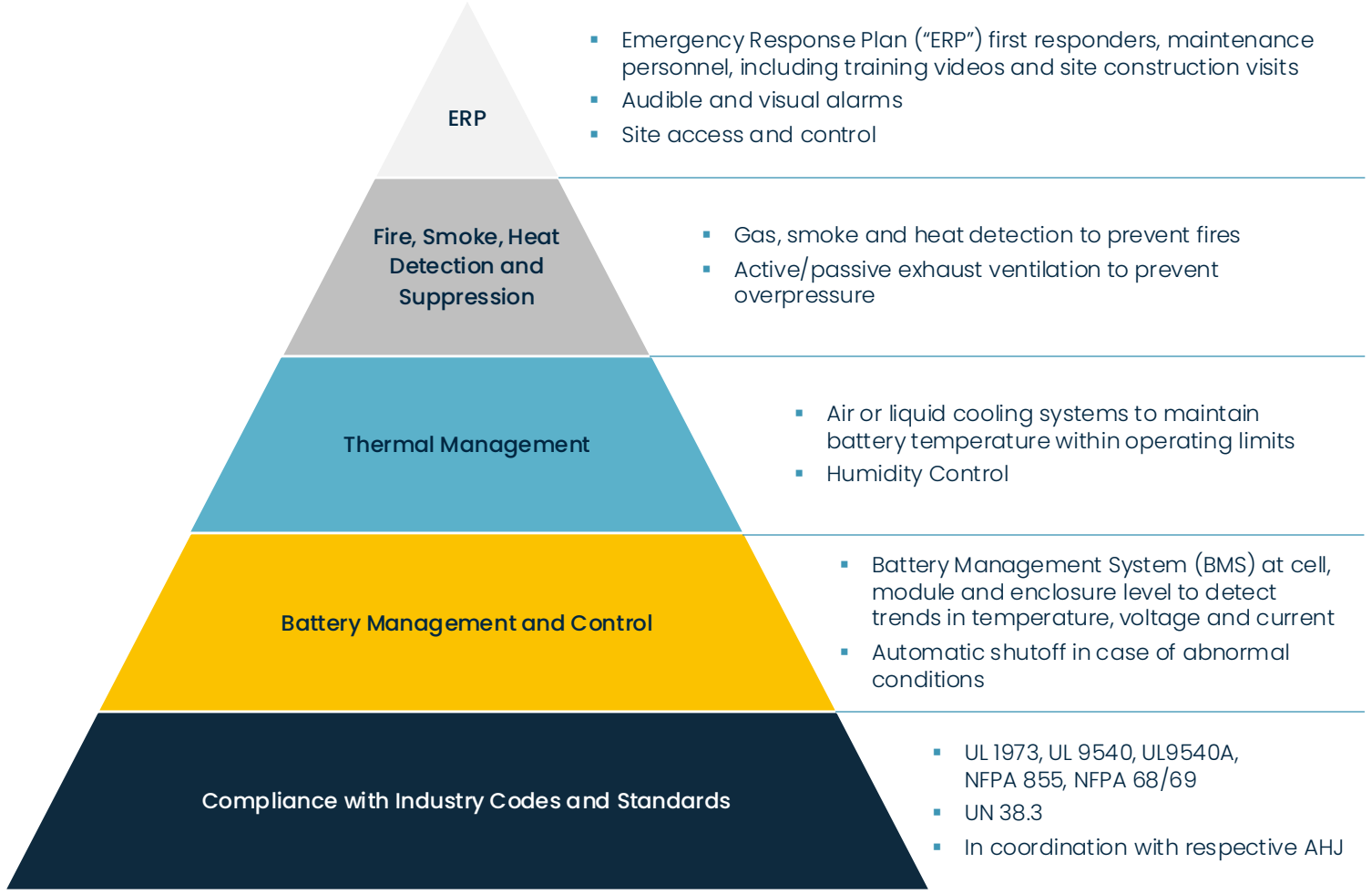
SAFETY & EMERGENCY RESPONSE

Kathleen
Coffman Engineers

BrightNight ensures safety at every level of design and operation

Foundations of BrightNight's Safety Program

- Work closely with customer design and operations teams to exceed customer's safety expectations
- Community engagement
- Rigid procurement and contracting standards with Suppliers, EPCs and Integrators
- In-depth safety review at every phase of project design
- Robust project execution process that considers safety from Cradle to Grave (design, engineering, testing, installation, commissioning, operation, service and disposal)
- 24/7 visibility to personnel, equipment and environment safety, planned PMs and Service during project operation
- Continuous learning through education, training, communication and continuous improvement process



Coffman Energy Storage Experience

Supporting developers, EPCs, utilities, and OEMs

At all stages of the project life cycle

- CUP application, permitting, utility interface
- Configurational design, Third Party Review
- 30-60-90-IFC Construction Documentation
- Fab Shop Inspections / SAT / Commissioning

Experience with all types of energy storage

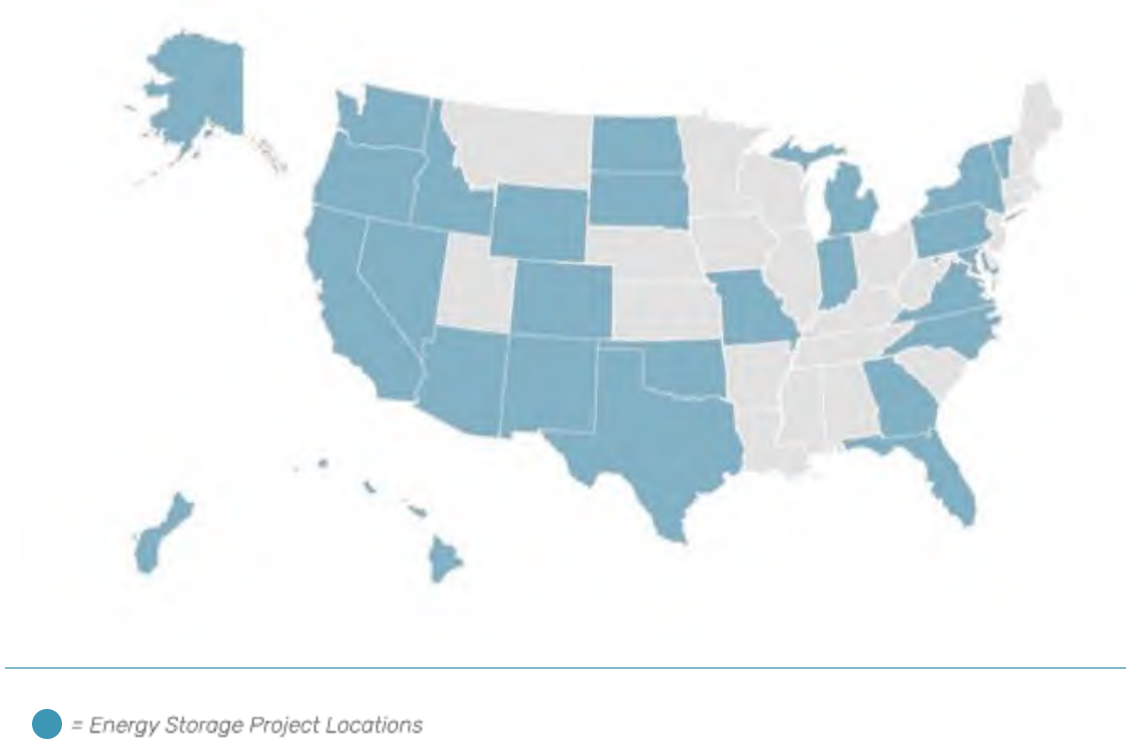
- Lithium-ion Battery Storage
- Flow Batteries / Metal-air / Non-Lithium
- Gravity Systems, Flywheel
- Compressed Air (CAES)
- Thermal Energy Storage (TES)

Services: Engineer of Record, OE, Third Party Review

Containers, Buildings, Custom Enclosures

150+ currently active projects

350+	9.5 GWh	32+
total projects	operating plants	states & territories



= Energy Storage Project Locations

Fire Prevention

BrightNight plans to use the "Tesla Megapack" battery system at the Biglow Solar and Storage Project. This industry-leading equipment features exceptional safety and prevention technology:

Noise

The Megapack is self-contained and operational noise levels are designed to minimize noise pollution. The Greenwater project will abide by all local noise ordinances.

Emissions

In the unlikely event of a fire, emissions are extremely limited. Any emissions would originate from the plastic enclosures, not the batteries. Concentrations are so small there would would be no negative impact to air quality in the surrounding area

Proactive Fire Control

Megapack is designed to prevent battery fires and be resilient if they occur. Fires are extremely rare. Testing has shown that if one occurs, Megapack safety systems can control and contain a fire within the unit.

Containment

Each Megapack unit is self-contained. This important safety feature helps prevent potential soil or water contamination and prevents the spread of an unlikely fire event.

Water Runoff

Megapacks are designed to make it difficult for water to come in contact with the enclosed battery cells.



Lithium Batteries





Tesla Megapack Fire Protection Systems

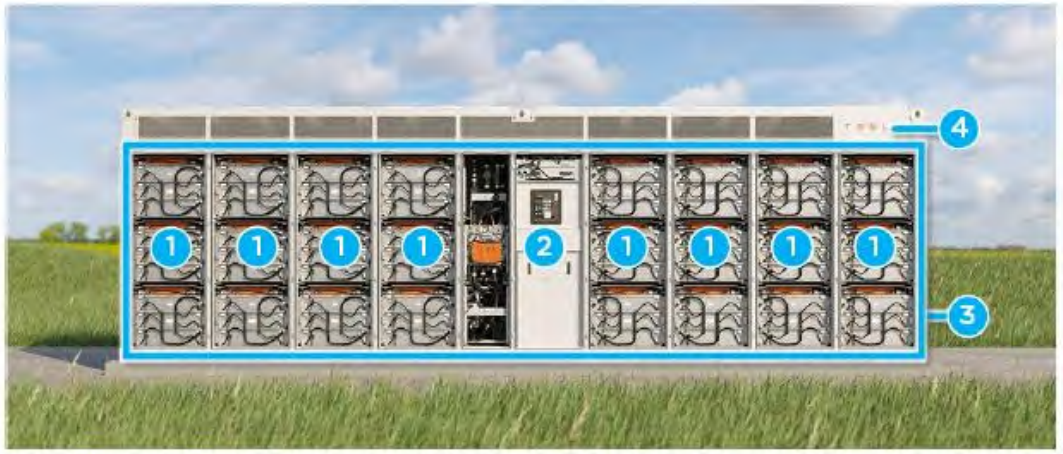
BESS projects are safe for the environment. Self contained systems with no emissions during normal operation.

24/7 Monitoring. Megapack installations are remotely monitored by Tesla 24/7, allowing for early detection, diagnosis and troubleshooting of system errors while providing live support to first responders when needed.

Proactive Fire Control. Megapack is designed to prevent battery fires and be resilient if they occur. Fires are extremely rare. Testing shows that if one occurs, Megapack safety systems can control and contain a fire within the unit. Typically contained to a single module with no visible flames on the exterior.

Recyclable at End of Life. At the end of the system's lifetime BrighNight will safely remove the battery enclosures and recycle the majority of components.





1. Battery modules with active and passive fuses – externally serviceable
2. Touch-safe Customer Interface Bay
3. Non-walk-in IP66 enclosure and deflagration mitigation
4. Thermal roof with overpressure vents

UL Listed Equipment. Equipment is fully test and listed by the UL testing company for the products in your house.

Fire Event Gas Byproducts. Gases resulting from a Megapack fire are similar to those of a typical structure fire: hydrogen, carbon dioxide, carbon monoxide and methane. Expected fire size is less than a house or vehicle fire.

Fire Event Water Runoff. Megapack units are designed to make it difficult for water to come in contact with the enclosed battery cells. Fire water runoff testing has shown no harmful levels of contaminants. (Note: Tesla's Emergency Response Guide recommends no direct water application to a Megapack fire.)

Discussion

Emergency Response Plan

Construction Wildfire Mitigation Plan

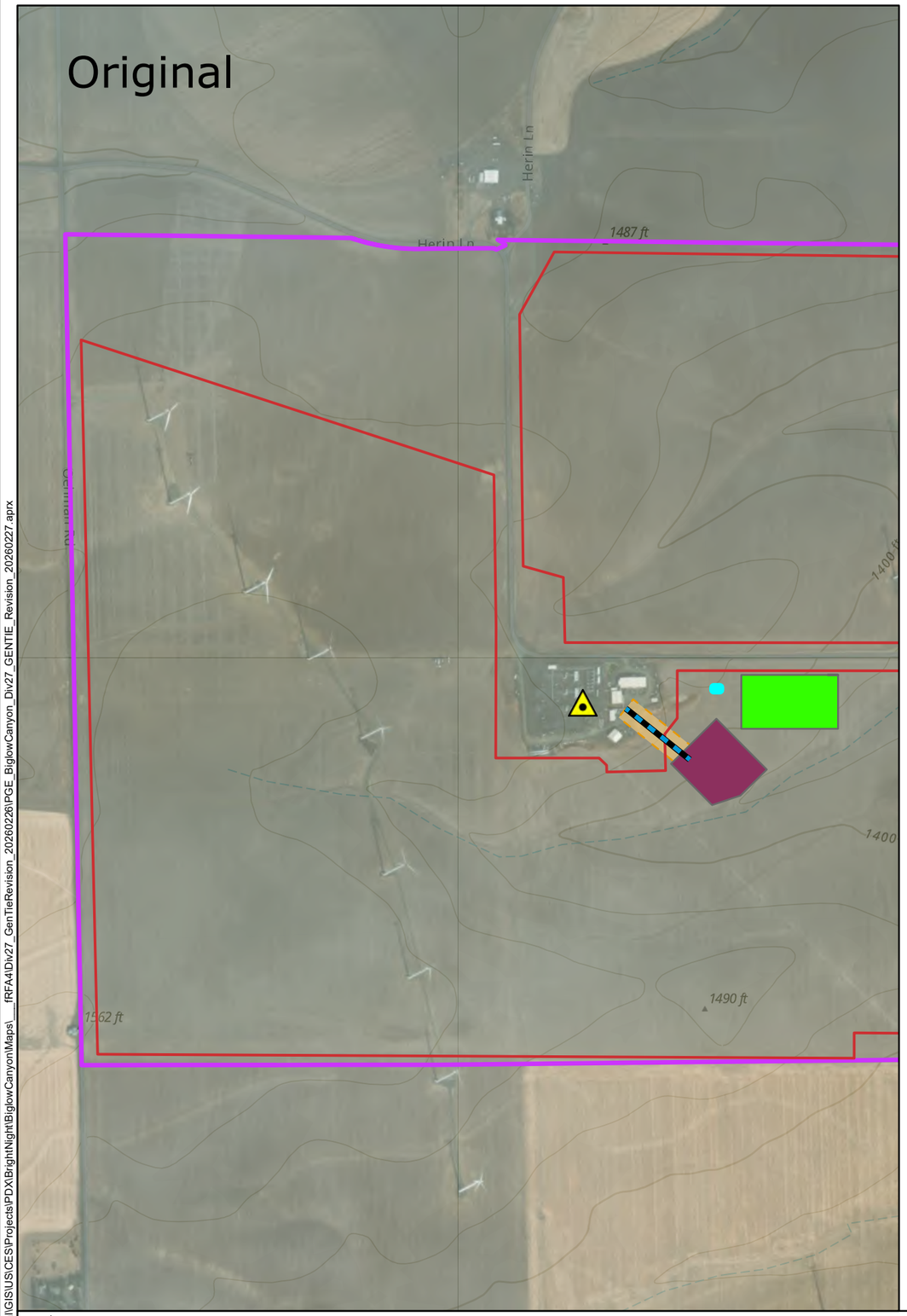
Operations Wildfire Mitigation Plan

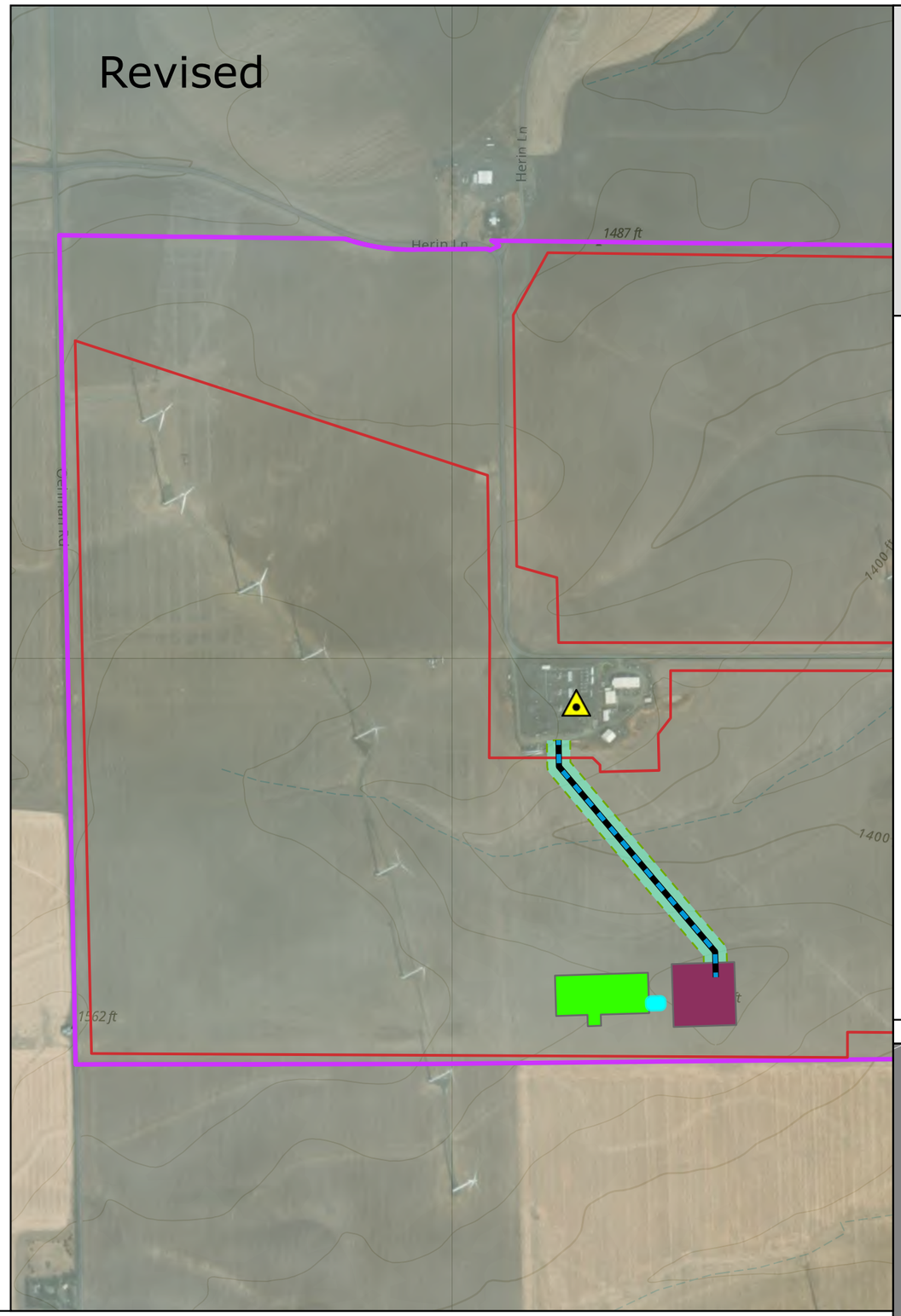

THANK YOU

Attachment 4: Substation and Transmission Line Locations

Original

Revised





Biglow Canyon Wind Farm Request for Amendment #4

Preliminary Site Plan

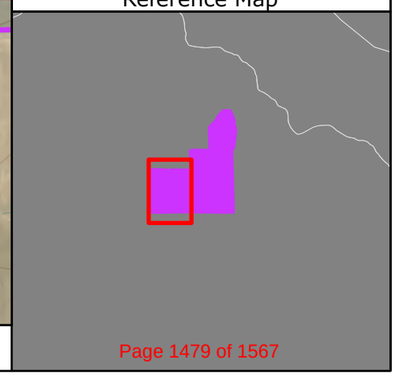
SHERMAN COUNTY, OR

- Solar Micrositing Area
- Existing Biglow Canyon Substation
- Gen-Tie Line (230 kV)
- Fenceline (Assumed Permanent Impact)
- BESS
- O&M Building
- Substation
- RFA4 Submittal Gen-Tie Route plus 75-foot Buffer
- Revised Gen-Tie Route plus 75-foot Buffer

TETRA TECH

PGE

Reference Map



1:10,000 | WGS 1984 UTM Zone 10N | 1 inch equals 833 feet | 0 0.25 0.5 Mile | NOT FOR CONSTRUCTION

\\tt.local\GIS\US\CES\Projects\PDX\BrightNight\BiglowCanyonMaps___fRFA4\Div27_GenTieRevision_20260226\PGE_BiglowCanyon_Div27_GENTIE_Revision_20260227.aprx

Portland General Electric
121 SW Salmon Street
Portland, Ore. 97204
PortlandGeneral.com

13123 E Emerald Coast Pkwy
Ste B #158
Inlet Beach, FL 32461
info@brightnightpower.com

March 6, 2026

VIA EMAIL (lawrence.squiemphen@ctwsbnr.org)

Lawrence Squiemphen III, Tribal Historic Preservation Officer
Confederated Tribes of Warm Springs Reservation of Oregon
Branch of Natural Resources
P.O. Box C
Warm Springs, OR 97761

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Sur-reply Response to Comments on Proposed Order (BCWAMD4Doc24-09)

Dear Lawrence,

Portland General Electric (PGE) and project developer BrightNight (BN) appreciate receipt of your February 27, 2026, letter on behalf of the Confederated Tribes of Warm Springs Reservation of Oregon (CTWSRO), regarding PGE's letter addressing your comments on the Oregon Department of Energy's (ODOE) Proposed Order on Request for Amendment 4 (RFA 4) to the Biglow Canyon Wind Farm Site Certificate.

PGE and BN acknowledge that the proposed solar components under RFA 4 are located within the ceded lands of CTWSRO and in an area of ongoing cultural, historical, and archaeological importance. We appreciate CTWSRO's continued participation in government-to-government consultation with the State of Oregon.

PGE remains committed to cultural resource protection in a manner consistent with the Amended Site Certificate and the Energy Facility Siting Council's (Council) Historic, Cultural, and Archaeological Resources standard (Oregon Administrative Rule [OAR] 345-022-0090). Archaeological monitoring, inadvertent discovery procedures, and continued Tribal consultation are being integrated to ensure appropriate protection of cultural resources during ground-disturbing activities.

PGE acknowledges and appreciates CTWSRO's request regarding construction-phase Tribal coordination and monitoring. We value the Tribe's continued engagement and view this request as an important continuation of coordination efforts as the project advances toward implementation.

As reflected in the record, the project design was refined based on the results of the GeoVisions report to avoid all archaeological sites determined eligible for, or likely eligible for, listing in the National Register of Historic Places (NRHP), as well as unevaluated sites, by a minimum 20-meter buffer. The Oregon State Historic Preservation Office (SHPO) concurred with the eligibility determinations and the avoidance-based approach. It is PGE's continued understanding that the approved design avoids direct impacts to identified cultural resources.

The construction-phase framework described below is intended to support careful implementation of that avoidance-based design and to ensure continued coordination and responsiveness during ground-disturbing activities. PGE is committed to ensuring that cultural

resource protection measures are implemented consistently and effectively during construction.

To that end, we agree to develop a project-specific Inadvertent Discovery Plan (IDP) and a construction-phase Cultural Resources Coordination and Monitoring Plan (CRCMP) in consultation with CTWSRO and other consulting Tribes. These plans will:

- Confirm avoidance of all known cultural resource sites, including clearly defined buffers;
- Establish notification procedures and timelines in the event of scope modifications or immediate communication protocols in the event of inadvertent discoveries or unanticipated conditions;
- Outline monitoring protocols for areas requiring additional oversight if unanticipated conditions are encountered; and
- Provide for regular coordination and communication throughout construction, including schedule updates, milestone notifications, and opportunities for ongoing engagement (e.g., periodic project update meetings).

PGE agrees to incorporate a Tribal Monitor into the project's construction-phase framework, should the Tribe wish to provide one. We will work collaboratively with CTWSRO to define the role, scope, communication protocols, and scheduling parameters for a Tribal Monitor to support real-time coordination and timely response to discoveries or unanticipated conditions in culturally sensitive areas. This framework will clarify expectations regarding site access, communication pathways, and field coordination with contractors.

To further reduce the potential for inadvertent impacts, PGE commits to clearly flagging or fencing avoidance areas prior to and during construction and ensuring that construction personnel are trained on cultural resource protection measures and appropriate communication protocols.

While PGE welcomes and supports Tribal monitoring participation, construction activities will proceed in accordance with the schedule and scope shared during ongoing coordination and communication throughout the life of the project, regardless of whether a Tribal Monitor is present on-site on a given day. The standing invitation for Tribal monitoring will remain in place throughout ground-disturbing construction activities in accordance with the approved CRCMP.

PGE believes that the avoidance measures incorporated into the refined design, together with SHPO concurrence, the IDP, and compliance with Oregon Revised Statutes (ORS) 358.910–358.920, provide a protective and legally sufficient framework. At the same time, we remain open to continued dialogue to ensure that construction-phase coordination measures are clearly defined, appropriately tailored, and supported by the record.

To ensure that the commitments and coordination framework described above are clearly reflected in the project record, PGE requests that these clarifications be incorporated into the Final Order through revisions to applicable site certificate conditions, consistent with the Proposed Order. The proposed revisions are intended to further clarify avoidance requirements, construction-phase cultural resource coordination and monitoring, and implementation of inadvertent discovery procedures. For the Department's and Council's consideration, PGE provides the following redline revisions to the conditions identified below.

***GEN-HC-02**: The certificate holder must design, construct, and operate the solar facility to avoid archaeological sites (35SH00188, BSP-1-S02, BSP-1-S10, and BSP-1-S12) and archaeological isolate (BSP-1-I04) with a minimum 20-meter avoidance buffer.*

Prior to ground-disturbing activities, avoidance areas must be clearly identified in construction plans and physically flagged or fenced in the field prior to ground-disturbing activities. The Certificate Holder must ensure that the construction personnel are informed of avoidance areas and trained on cultural resource protection requirements prior to initiating ground disturbance.
[Final Order on RFA4, Historic, Cultural, and Archaeological Condition 1]

***GEN-HC-03**: Prior to construction activities ~~that occur within the 20-meter avoidance buffer for archaeological sites (35SH00188, BSP-1-S02, BSP-1-S10, and BSP-1-S12) and archaeological isolate (BSP-1-I04);~~ the certificate holder must submit to the Department for approval, in consultation with SHPO, a Cultural Resources Coordination and Monitoring Plan (CRCMP) and a Project-Specific Inadvertent Discovery Plan (IDP) ~~demonstrating that an Oregon Qualified Archaeologist or Tribal Cultural Resource Monitor will be onsite during ground disturbing activities associated with the resources listed in this condition.~~*
The CRCMP must include at a minimum:

1. *Procedures to ensure avoidance of archaeological sites (35SH00188, BSP-1-S02, BSP-1-S10, BSP-1-S12) and archaeological isolate (BSP-1-I04), including maintenance of the required 20-meter avoidance buffers;*
2. *Procedures for flagging or fencing avoidance areas prior to construction;*
3. *Communication and coordination protocols with consulting Tribes, including construction schedule updates and notification of key construction milestones;*
4. *Procedures for training construction personnel regarding cultural resource protection measures and communication protocols;*
5. *Monitoring procedures to be implemented if ground-disturbing activities occur within avoidance buffers or if unanticipated cultural resources are encountered during construction; and*
6. *A framework allowing interested Tribes the opportunity to provide a Tribal Monitor during ground-disturbing activities.*

The Certificate Holder must implement the Department-approved CRCMP and IDP during construction and shall maintain communication with consulting Tribes regarding cultural resource protection throughout construction activities.
~~The certificate holder shall adhere to the measures approved in the Cultural Resources Monitoring Plan.~~

***OPR-HC-01**: During operations, the certificate holder shall require all onsite employees and contractors to implement and adhere to the requirements of the Inadvertent Discovery Plan, as provided in Condition PRE-HC-01. The IDP shall be reviewed and updated*

annually for current contact information, including current contact information for consulting Tribes. [Final Order on AMD4; Historic, Cultural and Archeological Condition 5]

We appreciate the Tribe's continued partnership and look forward to maintaining respectful, transparent, and collaborative engagement throughout the life of the project. Please do not hesitate to contact us if further discussion would be helpful.

Sincerely,



Kenny Gunn
Cultural Resources Lead
Portland General Electric Company

Cc: Chris Bozzini, PGE
Lenna Cope, PGE
Kiana Ziola, Tetra Tech
Kathleen Campanella, BrightNight

Portland General Electric
121 SW Salmon Street
Portland, Ore. 97204
PortlandGeneral.com

13123 E Emerald Coast Pkwy
Ste B #158
Inlet Beach, FL 32461
info@brightnightpower.com

March 6, 2026

VIA EMAIL (captainkathymccullough@gmail.com**)**

Kevin and Kathy McCullough
Wasco, OR

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Sur-Reply Response to Comments on Proposed Order

Dear Mr. and Mrs. McCullough,

Portland General Electric (PGE) and project developer BrightNight (BN) appreciate your February 24, 2026, responses to our February 13, 2026, reply regarding the Oregon Department of Energy's (ODOE's) Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF) Site Certificate.

PGE and BN carefully reviewed your most recent comment response letters and provide the following responses, based on our interpretation of the concerns raised in your correspondence, which are intended to directly and comprehensively address each issue.

This reply provides additional information on an issue-by-issue basis, consistent with ODOE's issue identification framework and categories identified in Table 1 of the ODOE Response letter dated February 12, 2026.

1. **Facility Maintenance/Organizational Expertise (Issue OE-1)**
   In your letter, you reiterate concerns regarding past maintenance challenges at the existing wind facility and express lack of confidence that the Certificate Holder will safely and reliably operate the proposed Solar Components. The Certificate Holder has addressed your facility maintenance concerns in Section 1of our February 13, 2026, comment response letter. As reflected in ODOE's evaluation of Issue OE-01, ODOE and the Certificate Holder acknowledged past maintenance and operational challenges at the existing wind facility and determined that while those issues warrant enhanced oversight, they do not demonstrate the inability to construct or operate the proposed solar components in compliance with the site certificate conditions.

   ODOE has recommended additional conditions to ensure the operational expertise of the Certificate Holder. These conditions require finalization and implementation of the draft Operations and Maintenance Plan Framework to strengthen oversight, vendor accountability, performance monitoring, and reporting expectations. To provide additional clarity regarding how these enhanced oversight measures will be implemented, the Certificate Holder has included a redlined version of the Draft Operations and Maintenance Plan as Attachment A to this letter. The revisions incorporate ODOE's proposed conditions as well as refinements offered during the public comment process. PGE and BN are committed to adhering to the applicable conditions to ensure improved transparency and operational controls moving forward.

2. **Vegetation Height and Fire Buffers/Setbacks (Issues WF-09, SP-04)**

One of the central themes of your letter is the adequacy of vegetation management and perimeter fire buffers, particularly considering the dry windy conditions characteristic of North Sherman County.

The Certificate Holder acknowledges the concerns that commenters have expressed regarding vegetation height at the proposed Biglow Solar facility and provided the following comment on vegetation height to ODOE in a letter dated February 27, 2026. You may have already seen our comment on the ODOE OneDrive set up for the Project, but we wanted to provide it here in case you have not previously seen it:

> *"The Certificate Holder appreciates ODOE's consideration of vegetation height requirements during the dry season and the input provided by the Sherman County Weed District and other commenters.*
>
> *As previously discussed, maintaining vegetation at a height of 1 to 3 inches during the June–October dry season presents practical and ecological challenges. Repeated mowing to that height would likely damage perennial bunchgrasses included in the approved seed mix, reduce long-term stand viability, increase susceptibility to invasive annual grasses, and potentially elevate fine fuel risk over time. In addition, mowing at extremely low heights may increase ignition risk due to equipment contact with rocks or soil surface.*
>
> *At the same time, the Certificate Holder acknowledges neighboring non-participating landowner concerns regarding wildfire risk and understands the desire for lower vegetation height during the peak fire season. Based on consultation with vegetation management specialists from Sherman County Weed District and Tetra Tech, and consideration of local Conservation Reserve Program management practices, the Certificate Holder is committed to maintaining vegetation at a target height of approximately 8 inches during the dry season, where practicable to ensure vegetation health. The Certificate Holder further commits that vegetation will be maintained below 10 to 12 inches, consistent with the draft Comprehensive Solar Revegetation and Soil Management Plan.*
>
> *An 8-inch target height represents a reasonable middle ground that:*
>
> - *Reduces standing fine fuels compared to unmanaged conditions;*
> - *Maintains bunchgrass crown integrity and long-term vegetation health;*
> - *Aligns more closely with local vegetation management practices; and*
> - *Avoids creating conditions that would favor invasive annual grasses.*
>
> *The Certificate Holder recognizes that mowing height may vary slightly depending on equipment capabilities, species composition, and site conditions, and commits to implementing vegetation management in coordination with local experts and in accordance with the final approved Comprehensive Solar Revegetation and Soil Management Plan and Construction Wildfire Mitigation Plan.*
>
> *This approach reflects the Certificate Holder's willingness to collaborate with ODOE and local stakeholders while ensuring that vegetation management practices remain ecologically sustainable and supportive of long-term wildfire risk reduction objectives."*

In addition, the Certificate Holder provided the following comment regarding vegetation management within wildfire buffers to ODOE in a letter dated February 27, 2026:

"ODOE confirmed during a meeting on January 27, 2026, with the Certificate Holder, BrightNight, and Tetra Tech that the term 'clear, brush-free' can include low-growing, fire-resistant vegetation. The Certificate Holder will update the language in the Final Construction Wildfire Mitigation Plan Section 4.6.1 and the Final Comprehensive Solar Revegetation and Soil Management Plan Appendix F to clarify that the 20-foot buffer around the perimeter will be 10 feet on either side of the fenceline.

The Department's evaluation determined that the common term that should be used for all fire buffers is 'noncombustible buffer.' However, the Certificate Holder requests that the term 'low-growing, fire-resistant vegetation' be used in reference to the areas along the solar array fencelines, access roads, and perimeter fenceline in order to:

1) ensure clarity and consistency regarding vegetation management within these fire buffers, as 'noncombustible buffer' refers primarily to gravel or bare dirt, and

2) address existing erosion concerns while providing wildfire mitigation at the Project site. Low-growing, fire-resistant vegetation protects against soil erosion and prevents the spread of fire following ignition. Maintaining areas completely free of vegetation would contribute to soil erosion.

The Certificate Holder requests that this language be updated in the following sections of the draft Final Order:

- *III.N.1 Findings of Fact – Wildfire Mitigation Plans – Facility Design*
- *III.N.1 Findings of Fact – Wildfire Mitigation Plans – Construction WMP, Wildfire Risk Minimization Preventative Actions, Programs, and Procedures*
- *III.N.1 Findings of Fact – Wildfire Mitigation Plans – Operational WMP, Wildfire Risk Minimization Preventative Actions, Programs, and Procedures*

The Certificate Holder will provide redlined versions of the associated plans by the close of the sur-reply period outlining the requested changes."

We believe these comments and forthcoming redlines thoroughly address the issues raised.

3. Soil Health and Erosion (Issue SP-01)

In your response, you question whether the conversion of agricultural land to solar use will realistically improve conditions in a dryland farming environment such as Sherman County,

The Certificate Holder has addressed your concerns related to soil health and erosion in Section 5 of our February 13, 2026, comment response letter, which included some examples of research regarding the effects of solar energy facilities on vegetation and soil health. The memorandum provided by the Certificate Holder summarizing the effects of Solar Energy Facilities on Vegetation and Soils was originally prepared to support discussions with the Sherman County Soil and Water Conservation District (SWCD) regarding soil health and vegetation management considerations. The research cited describes localized microclimate effects that can occur at ground level beneath photovoltaic (PV) panels, such as moderated soil temperatures, reduced wind exposure at the surface, and reduced evapotranspiration due to shading. These are site-scale soil and vegetation dynamics that have been observed in other regions and may or may not

translate to Sherman County conditions. It was intended to provide context from peer-reviewed research conducted in agricultural and semi-arid environments that may inform broader conversations about land management at Biglow, not to suggest that solar panels increase precipitation or alter regional rainfall patterns.

This information was shared with you to address the statements in your January 29, 2026, letter questioning solar facility contributions to soil quality improvement and to provide research findings that show potential benefits to arid grasslands and shrublands are possible from solar facility operations in other locations that may have some similar ecological characteristics to north-central Oregon. Including this research in the record was meant to provide transparency and to acknowledge that similar agricultural landscapes elsewhere have studied these interactions.

As noted in item 5 below, agrivoltaics research is a pre-screened project in the draft Biglow Solar Community Investment Plan (CIP). If carried out, such a project could provide meaningful insight into the impacts of solar facilities on vegetation and soil health in Sherman County, Oregon.

4. **Right to Farm (Issue LU-07)**
   With respect to liability, you reiterate concerns that local farmers could face wildfire exposure risks and that existing Right to Farm protections may be insufficient in this context.

   As noted by ODOE in their letter to you on February 12, 2026, regarding Issue LU-07 (Right to Farm), "Matters of liability are generally not within the Council's jurisdiction."

5. **Community Investment Plan – Agrivoltaics Research (Issue LU-07)**
   In discussing the CIP, you express skepticism about the agrivoltaics research concept, particularly given the local water constraints and your concern regarding the structure of the project selection process.

   The pre-screened agrivoltaics concept referenced in Section 5.1 of the CIP (BCWF RFA4 Proposed Order Attachment E) is an optional research opportunity; it does not presume irrigation or additional water use, and it would only proceed if supported locally and selected through the Community Investment process. The proposed budget for the pre-screened agrivoltaics research project would be a one-time investment of $100,000 to $300,000 to fund a full-time research assistant and necessary equipment. Annual expenses for the proposed project would be paid from the account established with that one-time investment.

   All pre-screened CIP projects would need to be approved by the Sherman County Court before being selected to receive mitigation funding. Regardless of whether such research is pursued, vegetation management and soil protection at the Biglow Solar facility will ultimately be governed by the final approved Comprehensive Solar Revegetation and Soil Management Plan and applicable site certificate conditions.

   Regarding your concerns on the selection committee that would review applications for the mitigation funding and make recommendations to the Sherman County Court: The make-up of the selection committee is based on other similar boards formed for agricultural mitigation programs in Morrow County but updated to be reflective of Sherman County's agricultural community needs and to consider input from ODOE, the

County, and other stakeholders. However, the Certificate Holder is open to suggestions for committee membership and has added a representative from the Oregon Wheat Growers League in response to public comment on the Draft Proposed Order.

A redlined version of the CIP is included as Attachment B. The revisions reflect refinements made during the Proposed Order process and additional commitments offered during public comment to enhance transparency in project selection, eligibility criteria, and reporting to Sherman County. The draft Memorandum of Understanding between PGE and the Mid-Columbia Economic Development District, has been added as an attachment to the CIP, which outlines the terms for implementation of the CIP, including membership on the selection committee and the process for selecting projects for funding.

6. **Wildfire Risk Analysis (Issue WF-02)**
   Your most recent comment reiterates your concern with the datasets and assumptions used in the wildfire risk analysis, including reliance on climate normals, burn probability modeling, and fuel classifications.

   The Certificate Holder has addressed your previous concerns related to the climate data used in the BCWF RFA4 wildfire risk analysis in Section 2.d. of our letter to you on February 13, 2026; your comment in your February 24, 2026, reply letter does not include enough information for us to provide an additional response.

7. **Wildfire Mitigation (Issue WF-12)**
   Throughout your letter, wildfire prevention remains your primary concern, and you urge development of a robust, project-specific Operations Wildfire Mitigation Plan (WMP). In response, the Certificate Holder is submitting an Operations WMP Outline as Attachment C to this letter.

   The Proposed Order (PO) and ODOE's draft proposed conditions require that a final Operations WMP be completed and approved prior to operation of the solar facility, phase, or component, as applicable (PRO-WF-01). The Certificate Holder acknowledges this requirement and remains committed to timely development and submittal of the final Operations WMP consistent with the PO and the Energy Facility Siting Council (EFSC)'s final site certificate conditions.

   In advance of that requirement, and in recognition of public and agency interest in this topic, PGE is providing an Operations WMP Outline in Attachment C to this letter that lists anticipated commitments and establishes a clear framework for development of the final Operations WMP. This outline is intended to demonstrate continued progress and provide EFSC and members of the public with transparency regarding how wildfire risk will be addressed during facility construction and operations.

   In both the Draft Construction WMP and Operations WMP Outline, the Certificate Holder has committed to the following measures to support wildfire prevention and response during construction and operation of the Biglow Solar facility:

   - Facility operator emergency response training (Draft Construction WMP Section 3.1)
   - Maintaining multiple on-site water sources with a minimum of 500 gallons of water each and operator training on how to use water hoses, pumps, and related

equipment (Draft Construction WMP Sections 3.1 and 4.2); and

- Providing pre-screened financial support in the Biglow Solar CIP for Sherman County firefighting equipment, staffing, and training, as well as community wildfire mitigation projects, as described in item 8 below.

A redlined version of the Draft Construction WMP is also included as Attachment D. The revisions incorporate refinements made during the Proposed Order process and provide additional specificity regarding fire prevention protocols, equipment standards, on-site water availability, and coordination with local fire districts.

We agree that wildfire mitigation planning for a facility of this scale and location must be robust and carefully developed. As a public utility, PGE is subject to additional operational, safety, and reliability obligations that extend beyond those applicable to many standalone private facilities. Accordingly, the Operations WMP is being developed to align not only with EFSC site certificate requirements, but also with PGE's broader wildfire risk mitigation framework, utility safety standards, and public safety responsibilities.

For this reason, development of the final Operations WMP requires careful coordination across engineering, operations, emergency response, and utility compliance teams. While a draft or final Operations WMP is not required at this stage of the amendment review, PGE is committed to ensuring that the completed plan reflects a comprehensive, utility-level approach to wildfire risk prevention, preparedness, and response. The Operations WMP Outline provides for the record the elements that must be accounted for in the final Operations WMP and our commitment to develop a robust final Operations WMP.

8. **Firefighter Training and Fire Department Capacity (Issues PS-01 and PS-02)**
You raise important questions about the capacity and preparedness of local volunteer fire responders and whether facility personnel will be equipped to respond effectively to a fire event.

   The Certificate Holder has identified a pre-screened project in Sherman County to build firefighting capacity (including upgrading, maintaining, or adding firefighting equipment and facilities; additional training for volunteers; additional funding for staff; and funding for projects to develop fuel breaks, reduce wildfire hazards, and provide firefighting water) in Section 5.2 of the CIP (BCWF RFA4 Proposed Order Attachment E). In addition, the Certificate Holder has committed to ensuring all facility personnel are fully trained in emergency response (Draft Operations and Maintenance Framework Plan, Section 3.6), including the use and maintenance of fire protection equipment (Draft Construction WMP Section 3.1).

9. **Lithium Battery Fire Safety**
Although not directly addressed in your comment letter, we reviewed the article you submitted with your comment response letter that discusses a recent lithium-ion battery fire at the Moss Landing Vistra Power Plant, a natural gas-powered energy generation plant and battery energy storage facility located outside of San Francisco.

   We acknowledge your ongoing concerns regarding fire risks associated with lithium-ion batteries used to store electricity at facilities like the one planned for the Biglow Solar facility. As reflected in our prior correspondence and materials submitted to the record,

PGE and BrightNight have addressed the design, engineering, and operational measures proposed to minimize fire risk at the facility. This has included providing opportunities for direct discussion with Coffman Engineers, Inc., as well as sharing presentations and supporting documentation describing applicable codes and standards, fire detection and suppression systems, emergency response coordination, and operational safeguards.

The letter included as Attachment E to this letter summarizes our prior communications and outreach efforts related to battery fire safety and outlines our efforts to communicate with you regarding battery storage fire risk and the steps we are taking to prevent fires at the proposed Biglow Solar facility.

Regarding the comparison to the Moss Landing 2023 incident: Below is some additional context regarding the key distinctions between indoor battery buildings and state-of-the-art containerized battery energy storage facilities, including current building codes that were not in existence or adopted at the time of construction for facilities involved in some of these more significant battery building fires (IFC, NFPA 855 and UL9540/9540A). This information is being provided so that the EFSC record contains a complete understanding of the inherent differences in fire and life-safety risks associated with different types of lithium-ion battery systems, particularly BESS facilities inside buildings vs. those in non-occupiable, outdoor facilities constructed to 2026 industry standards and best practices.

Over the past 5 years, the BESS industry has moved almost exclusively towards outdoor, non-occupiable containers (enclosures) for lithium-ion battery deployment. While some limited indoor battery facilities continue to be developed, they are typically for very specific, niche, or smaller applications.

The Moss Landing 2023 incident involved a thermal runaway and fire event at an indoor battery building, which is considerably different in configuration, risk profile and fire performance relative to the type of outdoor lithium-ion battery facility being proposed at Biglow. The Moss Landing battery building began construction (and retrofit to BESS facility) in December 2019, using NMC (Nickel Manganese Cobalt) lithium-ion battery chemistry first developed, tested, and produced in 2017/2018. The most current fire code including specific BESS information was not included at the Moss Landing facility until 2019. NFPA 855 was not published until August 2019.

Containerized BESS facilities utilize modular, typically pre-assembled enclosures and have the following specific differences from indoor installations:

1. **Separation** – Containerized BESS typically have 8 to 10 feet of aisles, which in all but the most extreme scenarios limits potential fire size to a single enclosure. Note that the more probable fire event would only involve a few cells and no flaming would be expected on the exterior of the cabinet.
2. **Occupiable Spaces** – Containerized BESS have no occupiable spaces inside. As such the risk to maintenance personnel is significantly reduced.
3. **Physical Size** – The standard for Energy Storage Systems (NFPA 855) limits the size of outdoor enclosures/cabinets to 53 ft in length x 8.5 ft in width x 9.5 ft in height. This naturally limits the fuel load of the containerized BESS.
4. **Unit Level Factory Testing / Certification** – Containerized BESS are tested and listed as a complete unit. No additional safety systems are required to be added

in-field and the performance of the factory designed/constructed safety systems is known. In addition to other rigorous testing and listing requirements, this equipment is UL tested and listed according to UL9540 at the cell, module, unit, and installation level (Large Scale Fire Test, LSFT). These tests evaluate multiple factors of the equipment during an incident, including heat flux, temperature, toxic and flammable gas release, and potential to propagate to other cells, modules, or units.

For the reasons stated above, past incidents at indoor battery buildings are not comparable to the planned Biglow Solar facility.

We are committed to continuing to work with you and your family constructively. Given the accommodations implemented and the enhanced regulatory requirements included in the Proposed Order, we believe the record demonstrates that substantial and meaningful efforts have been made to address the concerns raised.

Please reach out if you have questions or would like to discuss further. We are committed to continuous engagement of the community and neighbors as this project moves forward.

Sincerely,

Dan Wilson

Daniel Wilson
Director, Renewable Operations
Portland General Electric Company

Kathleen Campanella

Kathleen Campanella
Senior Director, Development
BrightNight

Cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

Attachments:

- Attachment A: Redlined Draft Operations and Maintenance Plan Framework
- Attachment B: Redlined Community Investment Plan
- Attachment C: Operations Wildfire Mitigation Plan Outline
- Attachment D: Redlined Draft Construction Wildfire Mitigation Plan
- Attachment E: Certificate Holder Communications and Outreach Related to Battery Fire Safety

Attachment A: Redlined Draft Operations and Maintenance Plan Framework

Operations and Maintenance Plan Framework for Solar Components

Biglow Canyon Wind Farm
Request for Amendment 4
~~**November 2025**~~March 2026

Prepared for

Portland General Electric Company

Prepared by

TETRA TECH

Modifications proposed by the Department presented in "track-changes",

November 2025

Additional revisions provided by Certificate Holder (Department Changes accepted unless otherwise noted) March 2026

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Table 1: Department Recommended Requirements v

Acronyms and Abbreviations

BCWF	Biglow Canyon Wind Farm
BESS	battery energy storage system
BIGL	BIGL bn, LLC or other BrightNight subsidiaries
BMS	battery management system
Certificate Holder, or PGE	Portland General Electric Company
EFSC	Energy Facility Siting Council
EOP	Emergency Operations Response Plan
EPCRA	Emergency Planning and Community Right-to-Know Act
MV	medium voltage
O&M	operations and maintenance
ODOE	Oregon Department of Energy
PV	photovoltaic
QA/QC	quality assurance/quality control
RFA 4	Request for Amendment 4
SCADA	supervisory control and data acquisition
WMP	Wildfire Mitigation Plan

Table 1: Department Recommended Requirements

Summary	Timing	Requirement
Prior to Operations - Plan Finalization		
Action Based Plan	This plan shall be finalized based on actions that can be monitored, tracked, and recorded. Detailed narrative or explanation that is not a specific action must be removed. Filter for clarity and remove unnecessary high-level narrative.	
Qualifications and Contact Information	In the Plan: Include the contact information for: 1. The individuals that will manage and oversee vendors and contractors. 2. The individuals that will perform design-phase safety reviews. Evidence to Support Plan Review: Certificate must provide to the Department the names, contact information and qualifications of the individuals that will manage and oversee vendors and contractors; and of the individuals that will perform design-phase safety reviews. The Department may request additional information or justification for any individuals where the experience or qualifications is inadequate.	
Incorporation of requirements/citations from applicable site certificate conditions, protocols and technical plans	In the Plan: Identify all technical and site management plans applicable to operations and compliance for the solar components; incorporate relevant action items into the plan. At a minimum, the plan must reference and incorporate the Emergency Operations Responses Plan, Operational Spill Prevention Control and Countermeasure Plan, Operational Wildlife Mitigation Plan, and Comprehensive Revegetation, Noxious Weed and Soil Reclamation Plan.	
Inspection and maintenance	In the Plan: Identify all inspections and maintenance activities, schedule, protocol and inspection documentation format. Evidence to Support Plan Review: Provide documentation to be used to track maintenance and inspection activities. If information will be tracked via software, explain, demonstrate and provide available data.	
Vendor Performance Scoring System	In the Plan: The final plan shall include details about the Certificate Holder's vendor performance scoring system. The scoring system must, at a minimum, evaluate vendor response time, corrective maintenance scoring rates and inspection completion.	

Summary	Timing	Requirement
Operations and Maintenance Budget Tracking and Forecasting	In the Plan: The final plan shall include a section for Operations and Maintenance Budget Tracking, including but not limited to, a summary of the basis for the amount estimated in the initial maintenance reserve, and an explanation of the 5-year life cycle cost modeling. The plan shall include information about the estimated and available budget. Future plan updates must include 5-year life cycle cost modeling results.	
Third-Party O&M Budget Audit	In the Plan: The final plan shall include information about annual third-party condition assessments, and ensure that the scope of the assessment includes annual review of vendor/contractor performance against warranty and reliability benchmarks.	
Build Transfer Agreement	Evidence to Support Plan Review: Provide a copy of the executed Build Transfer Agreement	
Community Outreach	In the Plan: The final plan shall include names and addresses of participating landowners, and shall detail the schedule, agenda and outreach efforts for annual coordination meetings, to be conducted by the Certificate Holder. The final plan shall require that the Certificate Holder invite Sherman County emergency responders and ODOE to each annual meeting. The plan shall require minutes from each meeting. Any issues will be tracked and evaluated to determine the appropriate response.	
Reporting	In the Plan: Require reporting to the Department of the following: 1. Within 72-hours of a change in contractors, vendors or contract terms, report the change, the reasons for the change, and the identification, contact information and qualifications to the Department. 2. Monthly, report to the Department a summary of performance monitoring results (Vendor Performance Scoring System), including identification of any significant performance issues and corrective actions taken by or for the participating entity, contractor(s) and vendor(s). Certificate holder shall identify corrective actions, including stop work or removal from site, required of the vendor(s) for any performance scores less than 95% percent on-time inspection and repair completion rate. 3. Annually, provide to the Department a written report from a third-party contractor evaluating whether the established or forecasted operations and maintenance budget is adequate for site operations. 4. Annually, provide the agenda, attendees list and meeting minutes from the community outreach meetings. Certificate holder shall report any issues identified at the meeting and shall provide their response and/or resolution of the identified issue.	

1.0 Introduction

This draft outline of the Operations and Maintenance (O&M) Plan for the amended Biglow Canyon Wind Farm (BCWF) integrates the Solar Components as identified in the BCWF Request for Amendment 4 (RFA 4) into the existing wind facility. It has been jointly developed by Portland General Electric Company (PGE; the Certificate Holder) and BIGL bn, LLC (BIGL), a subsidiary of BrightNight, LLC, to establish the preliminary framework for how the Solar Components of the Amended BCWF will be operated, maintained, and managed in compliance with the Site Certificate and applicable regulatory standards.

This O&M Plan applies exclusively to the Solar Components and associated infrastructure introduced through the BCWF RFA 4. It does not govern the O&M of the existing wind energy infrastructure, which continues to be managed under the previously coordinated PGE Operational Safety Monitoring Program. The O&M Plan reflects lessons learned from legacy wind operations at BCWF and current best practices for utility-scale solar and storage projects.

The O&M Plan framework described in Section 3.0 outlines the structure of operational responsibilities, long-term maintenance protocols, quality assurance processes, environmental compliance measures, and integration with emergency response and monitoring systems. The Certificate Holder will provide an O&M Plan that will use this framework to further detail the specific actions required to operate and maintain the Solar Components. The final O&M plan will be submitted to the Oregon Department of Energy (ODOE) prior to the start of operation of the Solar Components.

The final O&M Plan will reference and incorporate several other technical and site management plans relevant to operations and compliance for the Solar Components at the amended BCWF. These include, but are not limited to, the following plans developed for the BCWF RFA 4:

- The standalone Emergency Operations Response Plan (EOP) specific to solar and battery energy storage system (BESS) components;
- The Construction-phase Wildfire Mitigation Plan (WMP) and the Operations-phase WMP, which outline prevention and response protocols for wildfire risk during all project phases;
- The Comprehensive Solar Revegetation and Soil Management Plan, which details vegetation establishment, monitoring, and long-term maintenance;
- The Dust Abatement Plan, which governs dust control measures during both construction and operations; and
- Other resource-specific plans (e.g., the Decommissioning Plan, Spill Prevention and Control protocols) as required by the Site Certificate.

These documents will be cross-referenced with the final O&M Plan to ensure consistent implementation and clarity of responsibilities. The final O&M Plan will remain a living document, subject to regular review and revision in response to design changes, regulatory updates, and lessons learned during implementation.

2.0 Facility Partnership: Roles and Responsibilities

The Amended BCWF reflects a project delivery model that combines PGE's regulatory responsibility and long-term ownership with development and technical execution support from BIGL. This structure is designed to ensure compliance with Site Certificate conditions while leveraging external technical expertise to deliver the proposed Solar Components efficiently and to current industry standards.

PGE, as the Certificate Holder, retains ultimate oversight and responsibility for the Amended BCWF, including the Solar Components as outlined in RFA 4. BIGL has been engaged to support the initial development and construction of these components under a Build Transfer Agreement and will also provide O&M services for a minimum of the first 5 years of project operation. This approach allows for continuity between construction and early stage operation, while ensuring that all long-term operational accountability remains with PGE.

BrightNight and its subsidiary BIGL will implement a long-term O&M strategy grounded in industry best practices, internal experience, and a robust safety-first culture. While specific vendors have not yet been selected, BrightNight's team draws on a strong national track record in solar and battery storage project delivery and management. The Solar Components of the Amended BCWF will be supported by comprehensive O&M protocols that include scheduled preventive maintenance, real-time monitoring, remote diagnostics, and rapid response to equipment issues. BrightNight's O&M program, which emphasizes cradle-to-grave execution, 24/7 visibility into system performance, and continuous learning, will guide all operational phases. Quality assurance will be embedded through stringent contracting standards, rigorous design-phase safety reviews, and direct oversight by experienced internal personnel. Over the first 5 years of the project, BIGL will manage a third-party ~~party~~ experienced O&M provider, who will serve as the primary entity responsible for day-to-day maintenance and performance monitoring, while PGE's role will be defined in coordination with project milestones, interconnection requirements, NERC compliance, and long-term asset management planning.

BrightNight is committed to working in partnership with qualified local vendors whenever possible, fostering regional economic benefits and ensuring on-the-ground responsiveness throughout the project's operational life. All third-party vendors, whether local or national, will be selected through a rigorous procurement process that evaluates technical qualifications, safety performance, environmental compliance, and proven experience with utility-scale solar and storage facilities. Selected vendors will be required to adhere to industry best practices, such as:

- Implementing detailed preventive maintenance schedules,
- Providing trained and certified personnel,
- Using real-time monitoring and fault detection systems,
- Following all original equipment manufacturers' maintenance and service guidelines,
- Maintaining transparent documentation and reporting protocols,
- Using digital maintenance management systems,
- Conducting regular quality assurance/quality control (QA/QC) inspections,

- Establishing clear escalation procedures for unplanned outages, and
- Participating in site-specific safety trainings and continuous improvement processes.

BrightNight is also acutely aware of the community concerns stemming from historical O&M challenges at the BCWF. Based on conversations with local stakeholders, a key feature of the O&M strategy, though not highly technical, demonstrates the commitment to maintaining consistent communication with community members over the life of the BCWF Solar Components. The Project Developer and Certificate Holder will provide direct contact information and conduct regular check-ins to ensure residents feel empowered to raise questions or concerns. Any issues brought forward will be relayed promptly to the appropriate O&M teams for timely response and resolution. While BrightNight and PGE do not anticipate concerns of this nature, we believe creating a clear, accessible escalation path is an important part of building lasting community trust.

This structured approach ensures that any vendor engaged in the Amended BCWF will operate with the same high standards of safety, reliability, and performance that define BrightNight's operational philosophy.

This partnership structure does not alter the Certificate Holder's regulatory obligations or diminish its responsibility for compliance with the Energy Facility Siting Council (EFSC) and other applicable state and federal requirements. Rather, it provides a defined and managed pathway for project delivery that integrates third-party expertise into a framework that remains under PGE's control. Any third-party permits associated with construction activities will be secured through BIGL or its contractors but will be limited to standard, project-level requirements (e.g., encroachment, transport, building permits) and do not change the scope or structure of the existing site certificate.

Overall, the division of responsibilities between PGE and BIGL maintains clear regulatory accountability while enabling technically competent execution of the amended facility. This model is consistent with industry practices for utility-owned renewable infrastructure and is expected to support a timely and orderly expansion of the BCWF site in accordance with certificate conditions.

3.0 Integrated Operations and Maintenance Plan Framework

The Certificate Holder will submit a final version of the O&M Plan to ODOE prior to the commencement of operations. This Plan is intended to meet regulatory obligations, and to serve as the foundational framework guiding day-to-day operations of the Solar Components at the Amended BCWF.

To ensure consistency between compliance documentation and real-world implementation, the Plan will be updated as needed to fully incorporate the procedures, protocols, and tools adopted by the selected long-term O&M service provider. This integrated approach is designed to maintain a single, authoritative document that governs both regulatory compliance and operational execution, which eliminates the risk of conflicting or duplicative guidance.

3.1 Purpose and Applicability

The framework described in this section outlines the intended procedures for managing and maintaining the Solar Components of the Amended BCWF. It incorporates requirements from the Site Certificate, applicable codes, and protocols from the EOP, Decommissioning Plan, and supporting exhibits. This Plan applies to the Certificate Holder, BIGL, its contractors, and subcontractors. The final O&M Plan will be a living document. It shall be reviewed annually and revised in coordination with design changes, operational updates, or regulatory amendments.

3.2 Facility Description and Roles

The Amended BCWF includes legacy wind infrastructure and new solar photovoltaic (PV) and BESS systems. These additions are constructed under a Build Transfer Agreement by BIGL, with PGE retaining long-term ownership and regulatory oversight as the Certificate Holder.

- The facility will have ~~3~~three FTE onsite employees, ~~2~~two techs, and a ~~BN Services~~BIGL O&M Manager ~~is typically unmanned~~; operations also rely on remote supervisory control and data acquisition (SCADA) systems.
- Initial O&M management services for solar and BESS components will be performed by BIGL for 5 years.

3.3 Design and Equipment Selection

The Certificate Holder and BIGL are going through the design and equipment selection process. During final design, PGE will consider all solar technologies available to ensure the most efficient and productive solar array layout and BESS equipment. The final O&M plan will incorporate O&M activities specific to the equipment selected, based on the manufacturers' instructions.

3.4 Preventative Maintenance and Asset Monitoring

BIGL or the Certificate Holder will identify preventative maintenance measures and supporting equipment monitoring efforts to ensure safe and reliable operation of the facility.

3.4.1 Substation

- Thermal imaging for termination and buswork
- Visual inspection of structure foundation and conduit
- Lubrication of moving parts (breakers, switches, etc.)
- Cooling system checks
- Control room inspections visual and tests
- Label and nameplate check
- Vegetation management

3.4.2 PV System

- ~~Routine module inspections and annual infrared/aerial thermal imaging with anomalies detected via SCADA generating corrective work orders as soon as reasonably possiblewithin 48 hours~~

- Routine module inspections and annual infrared/aerial thermal imaging: Anomalies detected will generate corrective work orders within 48 hours, and will be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final O&M Plan.
- Routine SCADA monitoring and data analysis: Anomalies detected will generate corrective work orders within 48 hours and will be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final O&M Plan.
- Torque checks per manufacturers' recommendations
- Panel washing with water use logs (per Exhibit O limits)
- ~~The more frequent of either OEM recommendations, annual, and/or semiannual v~~Visual inspection of inverters, combiner boxes or load break disconnects, trackers, and all major equipment according to manufacturers' recommendations
- ~~SCADA tests and inspections~~
- Vegetation management

3.4.3 BESS

- ~~Quarterly I~~infrared inspections of power conversion system units per OEM recommendations~~,~~
- Inspections of heating, ventilation, and air conditioning, battery management system (BMS), and fire suppression systems per OEM recommendations.
- SCADA/BMS remote monitoring for anomalies
- Response procedures tied to EOP protocols for thermal runaway (EOP Section 3.2.1)
- Vegetation management

3.5 Compliance, Controls, and Reporting

The Certificate Holder will implement O&M practices that support compliance with applicable regulatory requirements and Site Certificate conditions. This will include operational controls, oversight procedures, and alignment with supporting plans that address vegetation management, spill prevention, wildfire mitigation, air and water quality, and other environmental and safety considerations.

Compliance measures will be scaled to site activities and updated as operations evolve. Documentation of inspections, incidents, and maintenance activities will be maintained. Reporting will follow applicable requirements and timeframes outlined in the Site Certificate and coordinating agency permits.

This section will be updated in the final O&M Plan to reflect specific commitments based on Site Certificate conditions and reporting requirements identified by ODOE and coordinating agencies. The final version will define required reporting content, frequencies, responsible parties, and coordination procedures to demonstrate ongoing compliance.

3.6 Emergency Preparedness Integration

The Certificate Holder will take the following actions to address emergency preparedness:

- Inspect and test all safety equipment.
- Review and update the EOP regularly, and ensure all personnel are fully trained in emergency response.
- Perform all Spill Prevention, Control, and Countermeasure Plan requirements, including maintaining spill kits.
- Develop and maintain a Hazardous Materials Management Plan if required by state or federal regulations.
- If applicable, prepare and maintain an Emergency Planning and Community Right-to-Know Act (EPCRA) Tier I or II form, plus a list and quantities of chemicals that exceed reporting thresholds for EPCRA Tier 2.
- Conduct an audit that includes a review of site compliance with the facility's safety program and onsite observation for proper implementation of safety policies, including Lock Out-Tag Out, and a review of the facility's safety program and any recommended revisions.
- Perform a root cause analysis, corrective actions taken, and recommended corrective work related to injuries or illness requiring medical attention other than first aid, injuries or illness requiring restricted duty or days away from work, or a fatality.
- Notify the operator as soon as possible, not to exceed 1 hour, of any of the following events:
    1) Emergency responders contacted for an emergency or law enforcement response.
    2) Injury on site requiring medical attention more than first aid.
    3) Unplanned outage of one or more medium-voltage (MV) collection or high-voltage circuits.
    4) Onsite fire.
    5) Conditions that necessitate an evacuation of onsite personnel.
    6) Awareness of an impending weather event that has a reasonable probability of causing significant damage or any of the preceding 1) through 5) events.

3.7 Contractor and Staff Oversight

BrightNight, on behalf of PGE, will oversee and facilitate the O&M of the BCWF Solar Components with an O&M service provider experienced in operating and maintaining large-scale PV solar systems and balance-of-plant systems for a large-scale BESS. There will be a long-term service agreement with the Solar Component BESS supplier. The O&M service provider will be responsible for the operation of the Solar Components, maintenance of the PV solar system to the point of interconnection, and maintenance of equipment/circuits from the BESS inverter AC output terminals to the point of interconnection. The O&M service provider's scope will cover equipment, including the PV array, PV system inverters, low-voltage cables, MV transformers (including auxiliary transformers), MV feeders, MV switchgear, site meters, ~~substation equipment, generation tie line,~~ and the O&M building equipment. PGE will perform maintenance on the substation equipment and gen-tie line.

4.0 Long-term Maintenance and Operational Continuity

To support the proposed 40-year operational life of the Solar Components, the Certificate Holder has developed a long-term maintenance and operations framework that evolves over time and ensures continuous compliance with site certificate conditions.

Years 1–5: BIGL will lead O&M activities under the Build Transfer Agreement. ~~This includes~~The O&M service provider will have full responsibility for inspections, corrective maintenance, and warranty compliance~~.~~ BIGL's scope will also include preventive maintenance scheduling and vendor oversight.

Post-Year 5: PGE will assume full O&M responsibilities, integrating solar and BESS oversight into its internal asset management systems. This transition will be guided by a detailed handover plan including training, document transfer, and performance reviews conducted in Year 4.

Continuity of Practice: Regardless of ownership stage, O&M will be conducted in accordance with procedures established in this document, including vendor management, EOP training, and incident reporting protocols. Performance metrics and component reliability will be tracked in PGE's asset management software and reviewed annually.

4.1 Personnel and Quality Assurance Oversight

The Amended BCWF will be supported by experienced operations personnel through all phases of its operating life.

Operations Roles:

- SCADA/Performance Analyst
- Field Technician Team (PV/BESS certified)
- Asset Manager (PGE)
- QA/QC Lead (during and post-handoff)

Quality Assurance Protocols:

- Annual third-party condition assessments (PV and BESS)
- Annual SCADA data audit for performance anomalies
- Compliance inspections linked to EOP protocols
- Maintenance records retained and reviewed for trends

4.2 Budget Planning and Lifecycle Management

PGE will incorporate the solar and BESS components into its existing capital planning processes. The following measures support financial assurance and long-term reliability:

- Maintenance Budgeting:
  - O&M budgets for the first 5 years are embedded in the Build Transfer Agreement.

  - Post-transfer, expenses are forecasted annually by the Asset Management Team and tracked against site-specific performance.
- Lifecycle Planning:
  - A major maintenance reserve will be included in financial modeling to support inverter replacement, battery module refresh (anticipated at 12–15 years), and other long-term needs.
  - PGE's decommissioning cost estimates (Exhibit X) will be updated every 5 years to reflect equipment aging and market conditions.

5.0 Plan Updates and Reporting

The O&~~I~~M Plan shall be reviewed and revised annually, if applicable, by the Certificate Holder based on design changes, operational updates, or regulatory changes; and to incorporate the procedures, protocols, and tools adopted by the selected long-term O&M service provider.

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Attachment B: Redlined Community Investment Plan

Draft Community Investment Plan

Biglow Canyon Wind Farm
Request for Amendment 4
November 2025

Prepared for

Portland General Electric Company

Prepared by

TETRA TECH

With Department Revisions (December 2025)

Additional Revisions by Certificate Holder (Department changes accepted unless otherwise noted), March 2026

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Attachment 1 – Draft Memorandum of Understanding for the Community Investment Fund

Acronyms and Abbreviations

AC	alternating current
BCWF or Existing Facility	Biglow Canyon Wind Farm
BESS	battery energy storage system
BIGL / Project Developer	BIGL bn, LLC
Biglow Solar Account	Biglow Community Investment Fund
CCS	County Cost Share
Certificate Holder / PGE	Portland General Electric Company
CIP	Community Investment Plan
Council / EFSC	Oregon Energy Facility Siting Council
CWPP	Community Wildfire Protection Plan
EESE	environmental, economic, social and energy
EFU	Exclusive Farm Use
gen-tie	generation tie
MCEDD	Mid-Columbia Economic Development District
MOU	Memorandum of Understanding
MW	megawatt
OAR	Oregon Administrative Rule
ORS	Oregon Revised Statutes
OSU	Oregon State University
OWEB	Oregon Watershed Enhancement Board
POI	point of interconnection
PV	photovoltaic
RFA 4	Request for Amendment 4
SCZO	Sherman County Zoning Ordinance
Solar Components	photovoltaic solar energy generation and battery storage
Solar Micrositing Area	a portion of the existing site boundary and proposed expanded site boundary
SWCD	Soil and Water Conservation District

1.0 Introduction

The Portland General Electric Company (PGE or Certificate Holder) owns and operates the Biglow Canyon Wind Farm (BCWF or Existing Facility) under Site Certificate on Amendment 3, issued October 31, 2008 (Site Certificate). PGE has filed a Request for Amendment 4 (RFA 4) to add photovoltaic (PV) solar energy generation and battery storage (Solar Components[1]) to the Existing Facility.

BCWF currently consists of 217 wind turbines, with a peak generating capacity of 450 megawatts (MW). RFA 4 adds up to 125 MW alternating current (AC) generating capacity from PV solar arrays and 125 MW in battery storage capacity (Solar Components) in approximately 1,445 acres (Solar Area) sited within the existing BCWF site boundary Solar Micrositing Area (RFA 4 Site Boundary). The Solar Micrositing Area is approximately 1,924 acres and provides a conservative estimate of the maximum acreage needed for development, micrositing, and temporary disturbances from the Solar Components during construction, rather than the anticipated disturbance footprint. The permanent disturbance[2] area impacted by the Solar Components within the Solar Micrositing Area is up to 1,455 acres (Solar Area) and the final footprint will be confirmed during pre-construction compliance.

The Solar Micrositing Area is zoned entirely Exclusive Farm Use (EFU) by Sherman County and is currently cultivated for dryland wheat. Because the permanent disturbance area from the Solar Components will exceed 12 acres and 20 acres of high-value and arable farmland, respectively, RFA 4 requires an exception to Oregon Statewide Planning Goal 3 (Agricultural Lands).

This Community Investment Plan (CIP) supports PGE's Goal 3 exception request and helps justify why a Goal 3 exception is warranted for the BCWF, as amended. The CIP is a mitigation plan that, once implemented, will ensure that any potential adverse impacts to the local agricultural economy from the removal of cultivated wheat land are offset to a level acceptable to Sherman County and the community.

PGE will own and operate the Solar Components as a part of the BCWF, which, to date, have been developed by BIGL bn, LLC (BIGL, or Project Developer). BIGL, in its capacity as the project developer, is supporting PGE in the RFA 4 and may construct and temporarily operate the Solar

[1] Solar Components will include solar arrays, inverters, and inverter step-up transformers. Related or supporting facilities include underground medium voltage collector lines, a collector substation, battery energy storage system (BESS) facilities and their subcomponents (i.e., inverters), approximately 600 feet of a new 230-kV generation tie transmission line, operations and maintenance structures, site access roads, internal roads, perimeter fencing, facility entry gates, and temporary laydown areas. The maximum generating capacity from the Solar Components will be 125 MW AC, and the infrastructure will be fenced within the Solar Micrositing Area creating a permanent impact area of up to 1,445 acres (i.e., Solar Area).
[2] Permanent disturbance includes areas and infrastructure (trackers, inverters, internal roads, buildings, stormwater basins, and parking) inside the perimeter fence for the Solar Micrositing Area.

Components on behalf of PGE under a Build-Transfer Agreement and may implement components of the CIP including providing mitigation fund payments on behalf of PGE.

1.1 Project Layout and Construction Schedule

The proposed layout for the Solar Components includes a primary area of infrastructure improvements within the Solar Micrositing Area. The Solar Area will connect to the electrical grid through the existing point of interconnection (POI) at the Biglow Canyon Substation, which is situated within the Solar Micrositing Area.

Solar Micrositing Area: The Solar Micrositing Area is a continuous area of land that covers approximately 1,924 acres, fully within the approved BCWF site boundary, within which construction of the Solar Components may occur, subject to site certificate conditions. This area includes the Existing Facility's current POI and may be expanded to add a new 230-kilovolt (kV) line terminal, all Solar Components, and the fenced area for where such components will be located (1,445 acres; Solar Area).

Solar Area: This area falls within both the approved BCWF site boundary and the Solar Micrositing Area. It will host new solar arrays using tracking systems, a new BESS, a new collector substation, a new operations and maintenance building, a temporary laydown yard for construction, new access roads, perimeter fencing, the Existing Facility's current POI, approximately 600 feet of new 230-kV generation tie line, and other associated project components.

The Solar Components located within this area will add approximately 125 MW AC generating capacity on a total of up to 1,445 acres that would be fenced within the approved BCWF site boundary. All Solar Components will be set back at least 520 feet from the existing wind turbines per PGE requirements.

Construction is expected to begin in Q2 of 2026 and continue through Q4 of 2027 for a duration of approximately 17 to 19 months from mobilization to final completion.

1.2 Goal 3 Exception and Need for Mitigation Plan

Oregon Statewide Planning Goal 3 (Agricultural Lands) (Goal 3) requires counties to identify farmland on its comprehensive plan map, and zone those lands as EFU. An EFU zone places certain restrictions on developments to minimize uses that conflict with farming (DLCD 2023). Oregon Administrative Rule (OAR) Chapter 660, Division 33 and similar provisions under Sherman County Zoning Ordinance (SCZO) Article 3 regulate EFU lands and permitted uses on these lands. The SCZO has not been amended since 2003 and does not reflect the current list of uses and standards provided by OAR 660-033-0130. As a result, PGE directly applied OAR 660-033-0130(38)(g), which states that a PV solar power generation facility shall not use, occupy, or cover more than 12 acres of high-value farmland unless certain criteria under OAR 660-033-0130(38)(h) are met or an exception is taken pursuant to Oregon Revised Statutes (ORS) 194.732. Similarly, per OAR 660-033-0130(38)(i), a PV solar power generation facility shall not use, occupy, or cover more than 20 acres of arable lands unless certain criteria under OAR 660-033-0130(38)(i) are met or an exception is taken pursuant to ORS 194.732.

As the Solar Components will occupy more than 12 acres of high-value farmland and more than 20 acres of arable land, it does not meet the acreage standards under OAR 660-033-0130(38)(g) and (i) and requires a Goal 3 exception. The Energy Facility Siting Council (Council or EFSC) may approve an exception to Goal 3 for an energy facility that meets the criteria listed under ORS 469.504(2)(c) and OAR 345-022-0030(4)(c). These criteria include the following:

- Reasons justify why the state policy embodied in the applicable goal should not apply;
- The significant environmental, economic, social and energy (EESE) consequences anticipated as a result of the proposed facility have been identified and adverse impacts will be mitigated in accordance with rules of the Council applicable to the siting of the proposed facility (EESE consequences); and
- The proposed facility is compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts.

This CIP supports the approval of PGE's Goal 3 exception request by supporting the "reasons" to justify the Goal 3 exception and ensuring that potential adverse impacts under the EESE consequences are properly mitigated. Measures to address the Amended Facility's compatibility are outlined in RFA 4 Exhibit K, Sections 6.2 and 8.3.

PGE justifies a Goal 3 exception by demonstrating that reasons justify removing up to 1,445 acres of dryland wheat from agricultural production for 40 years. One of the reasons is that the Amended Facility will result in rural local economic development benefits. This CIP ensures that the rural local economic benefits will offset potential adverse impacts the Solar Components may have on Sherman County's agricultural economy. In addition, participating landowners—many of whom represent multigenerational farm families—have emphasized that solar development provides an opportunity to diversify income and strengthen long-term financial stability. This landowner perspective reinforces the rationale for a Goal 3 exception, as the Amended Facility not only contributes to rural economic development but also supports the continuity of agricultural operations across generations.

2.0 Development of the Plan

To help inform the development of the CIP and to identify example projects that could be funded through the mitigation fund (see Section 4.0), PGE and the Project Developer spent considerable time and effort coordinating with the local agricultural community to understand what potential projects/investments would be most beneficial to support the local agricultural economy. Meetings were held with local wheat farmers, the Oregon Watershed Enhancement Board (OWEB), Oregon State University (OSU) including its extension service in Sherman County and the College of Agricultural Sciences, the Oregon Wheat Commission, the Sherman County Fire District, Sherman County Emergency Services, the Rural Sherman County Fire Board, the Weed Master, the Road Master, the County Planning office, and County Judge

Engagement also included targeted discussions with project landowners and surrounding landowners, who underscored the importance of financial resilience in maintaining viable farm operations. Coordination with the Sherman County Soil and Water Conservation District (SWCD) has not yet occurred in person because the SWCD indicated they did not wish to engage unless the project was approved; the Project Developer remains committed to continued outreach with the SWCD once the project is approved.~~While coordination with the Sherman County Soil and Water Conservation District (SWCD) has not yet occurred in person, the Project Developer remains committed to continued outreach.~~

Fire safety emerged consistently as the most pressing community concern—not only in relation to the Solar Components, but as a broader and growing threat to Sherman County's agricultural economy. In response, the Project Developer has prioritized coordination with local fire districts, including a presentation to the North Sherman Fire Board on August 12, 2025, and a follow-up meeting with Chief Burbank of the North Sherman County Fire District on September 9. These meetings provided an opportunity to review site layout and engineering plans, incorporate feedback, and identify opportunities to strengthen local fire response capacity.

Several key themes for possible agricultural mitigation investments emerged from this coordination:

1. Investments in minimizing wildland fire risk to agricultural crops, properties, and infrastructure and minimizing risk of liability to farmers from farm activities igniting fires and impacting non-farm uses in the agricultural district;
2. Research into agrivoltaics techniques in the context of dryland farming in central and eastern Oregon;
3. Research into long-term effects to soils that have been removed from cultivation and placed in long-term vegetation management programs within solar array areas;
4. Maintaining and/or improving weed control county-wide on agricultural lands and minimizing costs for weed control;
5. Technical assistance training for heavy equipment operation and repairs for farmers and laborers in the County to provide uplift in firefighting support, construction, and farming;
6. Providing funding for 4H, National Future Farmers of America Organization, or other youth programs; and
7. Providing additional funds to supplement Natural Resources Conservation Service and SWCD cost share programs for technical assistance programs such as improving haul routes, weed control, establishing fire breaks, etc.

As described further in Section 4.0, the final decision on what projects would be funded and/or what organizations would be awarded mitigation funds will be determined by the Sherman County Court. The mitigation projects identified in Section 5.0 and the selection criteria identified in Section 4.2.4 are unique to the Sherman County agricultural community and its specific needs. The

projects identified in this plan are in direct response to community feedback and will bring economic benefit to the County's agricultural community, which is primarily composed of dryland wheat farmland.

3.0 Overview of Project Impacts on Agricultural Economy

PGE evaluated the potential adverse impacts to Sherman County's agricultural economy from removing up to 1,445 acres of dryland wheat from production for the life of the project. For details of this evaluation, see RFA 4 Exhibit K, Attachment K-1. The removal of 1,445 acres of winter wheat would have an estimated reduction in annual output of $281,300 in the grain sector. Putting this into context, $281,300 is equivalent to 0.8 percent of the Sherman County's average value of production of winter wheat and 0.1 percent of the State's average value of production of winter wheat. This highlights the small percent of the county and state's winter wheat production value impacted by the Solar Micrositing Area.

Using a worst-case scenario impact analysis of a full build out of the Solar Components resulting in the loss of 1,445 acres of dryland wheat over 40 years, PGE estimates that the Amended Facility may result in a loss of annual indirect economic output of $100,000 over the life of the Facility, as amended. This loss of indirect economic output represents decreases in spending on wheat farming inputs like seeds, fertilizer, and fuel and contract services.

Calculated over a period of 40 years of operation, and adjusting for inflation, the estimated indirect output would be $2,315,218 or $1,600 per acre of farmland taken out of production. The final mitigation payments will be based on the actual acres identified in the final design of the Solar Components, which may be less than the full 1,445 acres identified in the Goal 3 exception request.

4.0 Mitigation Fund

PGE and the Project Developer have partnered with Sherman County and the Mid-Columbia Economic Development District (MCEDD) to establish an agricultural mitigation fund that will administer and distribute dollars for projects having a benefit to the Sherman County agricultural economy. The fund will ensure that any potential adverse impacts from the Solar Components are offset to levels acceptable to Sherman County and the community. Maintaining local control over investment decisions was identified as an essential element of trust-building during stakeholder engagement. For this reason, all mitigation fund allocations will ultimately be directed by the Sherman County Court to ensure alignment with community priorities and accountability to local stakeholders.

4.1 Establishing the Biglow Community Investment Fund

MCEDD will administer the Biglow Community Investment Fund under an Administrative Agreement among Sherman County, MCEDD, PGE, and BIGL. MCEDD, PGE, and BIGL have prepared a draft Memorandum of Understanding (MOU) describing their intended coordination and

framework for administering the Community Investment Fund. The draft MOU is included as an attachment to this Community Investment Plan. The Parties anticipate that the MOU will be executed prior to the start of construction of the Solar Components. ~~(as described in the Memorandum of Understanding among Sherman County, MCEDD, and PGE, dated [add]).~~

Prior to construction, $1,600 per acre for each acre the Solar Components removed from agricultural production will be placed into the Biglow Solar Account that will then be used to fund mitigation projects under the CIP. The total number of acres removed will be determined based on the final layout confirmed during the Oregon Department of Energy pre-construction compliance review. The mitigation payment may be provided by PGE or the Project Developer (or other entity) on behalf of PGE.

4.2 Administration of the Biglow Community Investment Fund

MCEDD will administer the Biglow Community Investment Fund, which will be funded prior to construction of each phase of the Solar Components. MCEDD will also oversee the following administrative steps.

4.2.1 Selection Committee

MCEDD will form and oversee a five-person advisory committee (Selection Committee) to review applications for funding and make recommendations to Sherman County BOC on funding projects. The Selection Committee will comprise the following individuals:

- One representative from Sherman County government;
- One representative from an academic institution engaged in agriculture research in Sherman County or an agricultural-related nonprofit entity located in Sherman County;
- One dryland farm producer in the County;
- One community member; and
- One representative with expertise in wildfire as it relates to agricultural lands.
- One representative from the Oregon Wheat Growers League.

Sherman County will have the ability to propose candidates for the Selection Committee in accordance with the aforementioned criteria, provided that the County proposes candidates within 30 calendar days of the formation of the committee. If the County elects not to propose candidates to the Selection Committee, MCEDD shall make any remaining necessary appointments.

In addition to the members above, the Selection committee shall include one non-voting member with subject matter expertise over statewide or regional agriculture issues selected by the Energy Facility Siting Council.

4.2.2 Applications for Funding

MCEDD shall issue a notice of available funding for mitigation projects as provided by the administrative agreement and contemplated in the Memorandum of Understanding. The notice will identify the selection criteria for qualifying projects and include an application form. All applications for funding would need to be filed with MCEDD at a time determined by the parties, ahead of the Start of Construction (Application Deadline).

4.2.3 Awarding Funds

The Selection Committee will review applications, rank the projects against the selection criteria, and make recommendations to the Sherman County BOC within 3 months of the Application Deadline. The BOC will aim to make a decision on funding within 60 days of receipt of the Selection Committee's recommendation. MCEDD will award funds within 30 days of the County's decision.

4.2.4 Selection Criteria

The selection criteria for a qualified mitigation project are to ensure that projects provide uplift of the Sherman County agricultural economy and are responsive to community needs as described in Section 2.0 and as may be identified by the community in the future. These selection criteria were identified after significant community engagement and listening sessions.

Except as provided in Section 4.2.5 below, the Selection Committee will apply and balance the selection criteria when recommending projects for funding. The five selection criteria are as follows:

1. Improving resiliency and efficiency of Sherman County's agricultural economy;
2. Improving agricultural wildfire protection and risk management capacity;
3. Investing in research to further agrivoltaics for dryland wheat lands;
4. Investing in agricultural education for next-generation farmers; and
5. Subsidizing the price of wheat produced in Sherman County

4.2.5 Pre-Screened Projects

A preliminary list of pre-screened projects is included in Section 5.0. These projects have been identified by Sherman County and the community as having a direct benefit to the rural agricultural economy of Sherman County and are deemed to meet, on balance, the selection criteria. A project proponent of a pre-screened project must still apply for funding through MCEDD and provide a project plan to identify the project's fiscal contribution to the rural agricultural economy and confirm that the selection criteria will be satisfied. A pre-screened project application goes directly to the BOC for consideration and bypasses review by the Selection Committee.

4.3 Reporting Obligations

Award recipients shall provide an annual report to the County, MCEDD, and PGE, as further described in the MOU.

5.0 Pre-Screened Projects

The five pre-screened projects were developed based on extensive outreach and coordination with key stakeholders from the Sherman County agricultural community, as well as state-wide agricultural-related organizations (see Section 2.0). These projects have the support of both the County and the community, who agree they will provide meaningful benefits to Sherman County's agricultural economy. In particular, they include initiatives that support essential services such as wildfire mitigation. For Sherman County, wildfire mitigation is especially critical, as it helps protect wheat farms—the primary land use in the county—and their supporting infrastructure, including roads, equipment, grain elevators and storage facilities, as well as urban areas tied to farm operations.

5.1 Project 1: Dryland Wheat Agrivoltaics Research in Sherman County

Project Sponsors: OSU Foundation, OSU Extension Office, OSU Nexus of Energy, Water, and Agriculture Lab

Project Description: This project would involve research into agrivoltaics techniques in the context of dryland farming in central and eastern Oregon. Research may include an agrivoltaics test project in Sherman County where different dryland crops, including wheat, are grown within a solar array and studied. Research may include investigation in panel layout/row dimension design to facilitate farm equipment, cropping trials, differences in crop yields based on panel shading, and effects on soils within different vegetation regiments within panel arrays. Research study will be further defined by the project ~~sponsor~~sponsor, and project sponsor will seek input from Sherman County stakeholders, including Oregon Wheat Growers League in developing the scope of the research study.

Project Benefit: Researching achievable agrivoltaics strategies in eastern Oregon would generate valuable insights to guide project siting decisions and identify potential legislative or regulatory changes that could further incentivize compatible farming practices alongside solar power generation. Based on information provided by OSU Associate Professor Chad Higgins, partial shading from solar panels has shown increase in crop production while using less water (Hassanpour Adeh et al. 2018). Research on agrivoltaics in the context of central and eastern Oregon dryland farming could create opportunities for Sherman County farmers to diversify their operations. By capturing more soil moisture, solar panel shading may allow farmers to maintain current dryland crop yields, such as winter wheat, within a smaller footprint.

Proposed Budget: To be provided by project sponsor. Project budget is anticipated to range from $100,000 to $300,000 to fund a full-time research assistant and any necessary equipment.

5.2 Project 2: Agricultural Wildfire Risk Minimization and Capacity Building

Project Sponsors: North Sherman County Rural Fire Department

Project Description: Sherman County has experienced large-scale wildfires that have burned thousands of acres and have destroyed more than 1 million bushels of wheat in a single fire resulting in more than $5 million in damage (Sherman County 2024). In response to increased community support for fire mitigation and prevention efforts, Sherman County developed and adopted a Community Wildfire Protection Plan (CWPP) in 2024 to identify and mitigate wildfire risk and to develop a strategy to reduce those risks. The CWPP is also meant to assist the county, its communities, and fire districts by making them eligible for certain grants or other funding sources. Grants and funding sources may include National Fire Plan grants, U.S. Forest Service Community Wildfire Defense Grants, and other funding sources to treat hazard fuel situations and to better prepare residents for wildfires that may occur.

The CWPP[3] identifies several projects such as:

1. Upgrading, maintaining, or adding firefighting equipment for Sherman County's Rural Fire Protection Districts.
    a. See Project #7 in CWPP Section XIII.
    b. See Project #31 in CWPP Section XIII.
2. Upgrading and developing new facilities at Rufus Fire Hall, North Sherman Rural Fire Protection District Station, and/or South Sherman Rural Fire Protection District Station
    a. See Project #6 in CWPP Section XIII.
3. Training for volunteers
    a. See Project #13 in CWPP Section XIII.
4. Funding for additional staff
    a. See Project #2 in CWPP Section XIII – develop paid seasonal county firefighting positions.
    b. Fund administrative staff to support all projects identified in CWPP Section XIII.
5. Fund projects to develop fuel breaks, reduce wildfire hazards, provide firefighting water.
    a. See Projects #14, #15, #22 through #30 in CWPP Section XIII.

The County could allocate mitigation funding to support either partial or full implementation of the projects identified in the CWPP, as well as other initiatives aimed at supporting the County's agricultural community in wildfire mitigation and response.

Project Benefit: Section V.E. of the County's CWPP identifies the probability of wildfire in Sherman County as high, with significant vulnerability to grain fields, pastures, and utility infrastructure. As noted in the CWPP, previous fires in the county have burned one million bushels of wheat and caused over $5 million in damages. Any project that reduces the risk or extent of wildfire damage to dryland wheat crops and their supporting infrastructure would provide a direct economic benefit to the County's agricultural community. Stakeholder feedback reinforced that agricultural mitigation and wildfire mitigation are deeply interconnected in Sherman County. Farmers

[3] See Section XII of the CWPP (Sherman County 2024) for a list of identified wildfire mitigation projects.

repeatedly emphasized that their livelihoods depend on the resilience of their land and crops, and that wildfire protection must be addressed alongside agricultural investments. Accordingly, the coordination on behalf of RFA4 with the North Sherman Fire District demonstrates a proactive approach to integrating agricultural and fire mitigation needs.

Proposed Budget: To be provided by project sponsor. Project budget is anticipated to range from $100,000 to $500,000.

5.3 Project 3: Funding matching for SWCD programs for wheat farmers

Project Sponsors: Sherman County SWCD

Project Description: Provide funding to supplement funding of SWCD County Cost Share (CCS) program. The Sherman County SWCD CCS program is funded from county tax dollars and includes projects such as improving farming haul roads with gravel, solar well developments, border fencing, terrace and water and sediment control basin reshaping, weed control, pasture/range planting, and creation and maintenance of fire breaks (Sherman County SWCD 2025). As funding for this program is limited, mitigation funds could be directed to SWCD to supplement this program's funding and provide additional opportunities for Sherman County farmers to participate in this program.

Project Benefit: Benefits to farmers participating in the SWCD CCS program would depend on the project but would result in offsetting costs to farmers for soil conservation, weed control, fire mitigation, etc.

Proposed Budget: To be provided by project sponsor. The current annual budget for this program is $100,000 allocated at $25,000 quarterly. For conservation projects, landowners provide 25 percent of the cost while SWCD provides 75 percent of the cost share rate with projects up to $20,000.[4] Mitigation funds allocated to this program could increase the annual budget to provide capacity to fund more projects in the county depending on demand by Sherman County farmers.

5.4 Project 4: Next-Generation Farming Innovation and Technology Training Program

Project Sponsors: To be determined. Sponsors could be individual wheat farmers seeking funding for precision agricultural technology investments, school district seeking funding for heavy equipment training programs, or other community programs such as 4H or National Future Farmers of America Organization seeking funding for youth programs focused on wheat farming.

Project Description: A variety of projects could be included, such as:

- Grant program for county wheat farmers to invest in precision agricultural technology such as weed management equipment, remote sensing technology to assist with weed mapping

[4] See CCS grant application:
https://www.shermancountyswcd.com/files/a1235c3b6/CCS_Application_2024.pdf

or soil mapping, variable rate technology to collect data on soil variability to inform application of fertilizers, and other technologies.

  - The precision agricultural technology grant program is intended to increase Sherman County wheat farmer's access to this technology through a cost-sharing agreement between farmers and MCEDD.
  - The cost-share agreement would be determined by the County BOC but is assumed to be 50 percent of the total cost of the precision tech equipment and installation. A cost-share program ensures prospective recipients of the program are fully invested in the use and maintenance of the precision agricultural technology.

- Grant program to offset tuition costs for Sherman County residents to participate in heavy equipment training and receive large equipment operator certification.

Project Benefit:

- The cost-share grant program for precision agricultural technology is assumed to increase the number of farmers who otherwise would not have access to precision management technology due to the significant upfront cost barrier. Investments in this technology could help county wheat farmers decrease costs to expensive farming inputs such as chemicals, fertilizers, and fuel resulting in economic benefits to these farmers.
- The grant program for heavy equipment operation training would directly relate to increasing local capacity to operate farm equipment, firefighting equipment, and construction equipment. This increased capacity would economically benefit farmers in the County by providing additional labor capacity.

Proposed Budget: To be provided by project sponsor. Project budget is anticipated to range from $200,000 to $1,000,000 depending on the number of grants allocated.

5.5 Project 5: Capacity Building for Wheat Growers

Project Sponsor: Sherman County, individual wheat farmers.

Project Description: This project proposes a per-bushel support mechanism to strengthen the financial resilience of Sherman County's wheat growers. For every bushel of wheat produced in the County, an additional $0.05 would be paid directly to farmers on top of the prevailing market price. This payment is intended to help offset the rising costs of inputs such as seed, fertilizer, fuel, machinery, and labor.

Project Benefits: The benefit of this project is that it directly places funds into the hands of Sherman County wheat farmers at a time when input costs are rising and market prices remain unpredictable. More specifically, the project would:

- Support farm income by providing an additional payment linked to production levels.
- Help offset rising input costs such as seed, fertilizer, and fuel.

- Provide flexibility for reinvestment in farm operations, equipment, or practices that improve efficiency.
- Contribute to the local agricultural economy by supplementing the revenue available to wheat growers.
- Offer modest support for community stability, as additional farm income can help sustain agricultural operations in the County.

Proposed Budget: To be provided by project sponsor. At a rate of $0.05 per bushel, the project could cost up to approximately $282,550 in a single harvest season, assuming an annual production of 5.65 million bushels. The actual budget would vary depending on annual yield volumes and prevailing market conditions.

6.0 References

DLCD (Department of Land Conservation and Development). 2023. Oregon's Statewide Land Use Planning Goals. Oregon Planning. https://www.oregon.gov/lcd/OP/Pages/Goals.aspx

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Sherman County SWCD (Soil and Water Conservation District). 2025. County Cost Share. [Website] Available online at: https://www.shermancountyswcd.com/county-cost-share

Attachment 1 – Draft Memorandum of Understanding for the Community Investment Fund

MEMORANDUM OF UNDERSTANDING
FOR
BIGLOW SOLAR AGRICULTURAL MITIGATION

This Memorandum of Understanding ("MOU") is entered into on _____, 2025 ("Effective Date"), among Sherman County ("County"), Mid-Columbia Economic Development District ("MCEDD"), and _____, ("Project Sponsor"), collectively the "Parties."

Recitals

A. Project Sponsor is developing solar photovoltaic and battery energy storage components on up to ~~3,234~~1,925 acres on private land zoned exclusive farm use in Sherman County, Oregon ("Solar Components").

B. The Solar Components will be subject to review by the Oregon Energy Facility Siting Council ("EFSC") as an amendment to the Portland General Electric's existing Biglow Canyon Wind Farm Site Certificate on Amendment 3, dated October 31, 2008 ("Biglow Solar RFA").

C. The Biglow Solar RFA provides reasons upon which EFSC may grant an exception to Oregon's Statewide Planning Goal 3 and authorize the removal of up to 3,234 acres from dryland wheat production for the life of the Solar Components.

D. Project Sponsor performed an agricultural economic impact analysis ("AIA") to evaluate the direct, indirect, and induced impacts from removing up to ~~3,234~~1,445 acres of land from dryland wheat production. The AIA concluded that the quantifiable agricultural impacts on Sherman County's agricultural economy from permanent footprint of the Solar Components may be approximately $1,531 per acre.

E. Project Sponsor anticipates mitigating the Project's quantifiable agricultural impacts through the implementation of the Biglow Solar Community Investment Plan ("CIP"). Project Sponsor and the County wish to support the agricultural economy in Sherman County with projects ("Mitigation Projects") that advance priorities of the local agricultural community ("Mitigation Selection Criteria"). The draft CIP is included in the Biglow Solar RFA and identifies the Mitigation Selection Criteria and potential Mitigation Projects.

F. Project Sponsor and the County wish to work with MCEDD to implement the CIP, and the Parties enter into this MOU to document their anticipated coordination efforts under the CIP and to outline a general framework by which the Parties may establish future commercial arrangements and related implementation efforts (the "Potential Arrangement").

G. The Parties hereby acknowledge and agree that further negotiation and evaluation are required and that additional material provisions and additional details are required before a final agreement might be drafted ("Definitive Agreement"). Except for Section 4, this MOU does not constitute a binding agreement between the Parties or their respective affiliates, and only such a mutually executed Definitive Agreement would be binding on them if such a Definitive Agreement can be reached. This MOU is intended solely as a statement of preliminary intent by the Parties as an aid to their further discussions and negotiations towards

PGE Internal

the Potential Arrangement and Definitive Agreement.

NOW THEREFORE, in pursuit of the Potential Arrangement, it is anticipated that the Parties will use the next several months to discuss, evaluate and negotiate the specific terms and parameters of such Potential Arrangement and Definitive Agreement. Any terms, conditions, roles and responsibilities in support of such Potential Arrangement will be mutually agreed to and approved by the Parties in a separate Definitive Agreement. The preliminary objectives and of the Parties include the following:

1. Party Contributions and Responsibilities.

a. It is anticipated that Project Sponsor is responsible for finalizing the draft CIP, managing the implementation of the CIP, and facilitating the Potential Arrangement negotiations that may give rise to the Definitive Agreement.

b. It is anticipated that MCEDD helps implement the CIP by administering the Community Investment Fund as further described below.

c. It is anticipated that the County through the Board of Commissioners is the decision-maker for selecting Mitigation Projects for funding.

2. Establishing the Community Investment Fund. It is anticipated that the Community Investment Fund would be funded as follows:

a. Project Sponsor will pay $1,531 per acre into the Community Investment Fund for each acre that the Solar Components remove from dryland wheat production ("Mitigation Payment"). The total number of acres removed from production for purposes of calculating the Mitigation Payment shall be determined prior to construction based on the final layout of the Solar Components proposed for construction ("Start of Construction"), which may be constructed in whole or in part depending on phasing.

b. There may be more than one Start of Construction and therefore more than one Mitigation Payment depending on Project phasing. The Community Investment Fund is intended to fund Mitigation Projects with the entire amount of one Mitigation Payment, meaning if there is more than one Mitigation Payment because of phasing, there would be more than one round of funding under the Community Investment Fund.

c. The Mitigation Payment needs to be paid into the Community Investment Fund prior to the Start of Construction for each respective phase.

3. Administering the Community Investment Fund. It is anticipated that MCEDD will administer the Community Investment Fund on behalf of the County and Project Sponsor, as contemplated in the CIP and ultimately, as provided in the Definitive Agreement, which the Parties contemplate may address, without limitation, the following:

a. Term. The Definitive Agreement will commence upon its execution and

PGE Internal

terminate at the earlier of (i) five years or (ii) the day by which all the funds are allocated and the reporting completed to satisfy the Project Sponsor's mitigation obligations under the CIP.

b. Selection Committee. It is anticipated that MCEDD will form and oversee a ~~five~~six-person advisory committee ("Selection Committee") to review applications for funding and make recommendations to the County on which Mitigation Projects should receive funding. It is anticipated that the Selection Committee will be comprised of: (i) one representative from Sherman County government; (ii) one representative from an academic institution engaged in agriculture research in Sherman County or an agricultural-related nonprofit entity located in Sherman County; (iii) one dryland farm producer in the County; (iv) one community member; ~~and~~ (v) one representative with expertise in wildfire as it relates to agricultural lands; and (vi) one representative from the Oregon Wheat Growers League. The Selection Committee may be formed following EFSC's approval of the Biglow Solar RFA. The County may propose candidates for appointment to the Selection Committee in accordance with the aforementioned criteria. If the County elects not to propose candidates for the Selection Committee, MCEDD shall make any remaining necessary appointments.

c. Applications for Funding. All applications for funding would need to be filed with MCEDD at a time determined by the parties, ahead of the Start of Construction ("Application Deadline"). MCEDD, in coordination with the County and Project Sponsor, will work to develop a Mitigation Project funding application. Notice of available funding and the application form would be released at least four months prior to the Application Deadline.

d. Awarding Funds. It is anticipated that the Selection Committee will recommend to the County which Mitigation Projects to fund through the Community Investment Fund by applying the Mitigation Selection Criteria and issuing a recommendation within 90 days of the Application Deadline. It is anticipated that the County would select Mitigation Projects for funding based on the Selection Committee's recommendations, subject to Section 3.e below, and award funds within 60 days of being presented with the Selection Committee's recommendations. MCEDD will award funds within 30 days of the County's decision.

e. Pre-Screened Mitigation Projects. The CIP identifies five potential Mitigation Project that were scoped based on feedback from the agricultural community and stakeholders ("Pre-Screened Mitigation Projects"). The parties intend that the Pre-Screened Mitigation Projects may bypass the Selection Committee and be deemed recommended for funding upon MCEDD receiving a complete funding application.

f. Reporting. It is anticipated that any recipient of funds from the Community Investment Fund would provide an annual report to the County, the Project

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Sponsor, and MCEDD, to be further detailed in the Definitive Agreement.

g. Administration Fee. It is anticipated that the Project Sponsor will pay MCEDD a fee for administering the Community Investment Fund. Members of the Selection Committee will be nonpaid volunteers.

4. Term. This MOU shall be effective upon execution by all the Parties ("Effective Date") and shall run for three years from the Effective Date or until (a) the mutual executive of the Definitive Agreement or (b) termination by mutual written consent of all the Parties.

[add three party signature block]

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Attachment C: Operations Wildfire Mitigation Plan Outline

PGE Biglow Canyon Wind Farm Operations Wildfire Mitigation Plan Outline

This document outlines Portland General Electric Company's (PGE) approach to a Draft Operations Wildfire Mitigation Plan (Operations WMP) for the Biglow Canyon Wind Farm Solar Components. The plan will satisfy the approval standards under OAR 345-022-0115(1)(b), will follow the template provided by the Oregon Department of Energy on January 28, 2025, and will be aligned with the structure, terminology, and risk-based mitigation framework contained in PGE's 2026–2028 Wildfire Mitigation Plan (WMP) filed with the Oregon Public Utility Commission, including any future Commission-approved updates.

Key Components of the Plan:

Wildfire Risk Assessment and Prevention

- PGE's proposed 2026-2028 Wildfire Mitigation Plan Appendix H contains PGE's Generation Wildfire Risk Assessment, including the Biglow facility with Solar Components added. Figure H-1 of PGE's 2026-2028 Wildfire Mitigation Plan shows the areas in an Outlying Fire Risk Zone (OFRZ), which are considered at a higher risk of wildfire.
- Prevention measures are expected to include inspection and correction practices, vegetation management, defensible space requirements, fire-season operational protocols, and other mitigation strategies consistent with PGE's Commission-filed 2026–2028 WMP. The Operations WMP will define specific procedures, standards, and implementation timelines during facility operations, similar to those described in Section 4.1.3 of the Draft Construction WMP.
- The Operations WMP will describe fire detection systems, thermal management controls, monitoring systems, emergency response protocols, and integration with situational awareness systems to mitigate fire risk and support safe facility operations, similar to those described in Section 4.1.4 of the Draft Construction WMP.

Fire Season Readiness

- During PGE-declared Fire Season, personnel performing operational or maintenance activities will follow wildfire mitigation procedures designed to reduce ignition risk and maintain safe working conditions. The Operations WMP will describe Fire Season readiness protocols applicable to facility operations.
- Consistent with Fire Season readiness operational protocols outlined in PGE's proposed 2026-2028 Wildfire Mitigation Plan, field personnel and suppliers will be equipped with appropriate fire suppression tools and equipment during fire season, which may include properly rated fire extinguishers, round-pointed shovels, Pulaskis, and other firefighting equipment identified in company standards. Supplemental fire suppression resources, such as mobile fire trailers equipped with water supply, hose, and pump systems, may be deployed when conditions warrant.

- The Operations WMP will also outline requirements to ensure fire suppression tools and equipment remain functional and readily accessible during operations in fire-prone areas. These requirements will be consistent with applicable fire prevention rules and other relevant jurisdictional requirements.
- Fire Season field operational restrictions will be defined in the Operations WMP and are expected to align with PGE's Fire Season Readiness operating procedures. During periods of elevated fire danger, PGE may implement additional operational controls based on wildfire risk indicators such as National Weather Service Red Flag Warnings, Industrial Fire Precaution Levels (IFPL), National Fire Danger Rating System conditions, or other jurisdiction-specific fire restrictions.
- Depending on conditions, these measures may include restrictions on spark-producing activities, time-of-day limitations on certain work activities, enhanced fire watches, pre-positioning of fire suppression tools and equipment, or temporary suspension of non-essential activities.
- If a fire occurs during operations, personnel will follow company emergency response procedures, including notification of emergency services and PGE's Control Center/s, coordination with local fire authorities, and implementation of appropriate response actions consistent with site-specific Emergency Response Plans.

Inspections and Maintenance

- Comprehensive inspection and maintenance schedules for all facility components will follow manufacturer recommendations associated with each type of facility component, will be summarized in a table within the Plan, and documentation of inspections will be submitted to ODOE for compliance evaluation.

Vegetation Management

- Maintenance of low-growing, fire-resistant vegetation within 20-foot defensible space around site perimeter (10 feet inside the fence and 10 feet outside the fence) (or as specified by ODOE in the Final Order).
- Vegetation under solar arrays maintained at 8 inches maximum height during fire season and 10 to 12 inches outside of fire season (or as specified by ODOE in the Final Order).
- Bi-annual vegetation assessments with additional monitoring as needed.

Training and Monitoring

- Start-of-operations and annual safety training will be provided for all personnel covering electrical safety and equipment use. The Operations WMP will describe the content and delivery methods of these training programs.
- Additionally, identified PGE field personnel and Suppliers (contractors and vendors) will be required to complete mandatory Fire Season Training through computer-based training or

other company-approved training methods prior to performing field activities during fire season.

- 24/7 remote monitoring via SCADA system with smoke/fire detectors throughout facility.
- Coordination with local fire departments and emergency services.

Plan Updates and Reporting

- Annual reporting per OAR 345-026-0080 to Oregon Department of Energy.
- Annual review of the Operations WMP to determine if updates are necessary, including evaluation of changes in standards, policies, future technologies or best practices.
- Provisions for Operations WMP amendments as needed.

The Operations WMP will establish a comprehensive framework for preventing wildfires, maintaining appropriate equipment and vegetation management, and responding effectively to wildfire emergencies at the expanded Biglow Canyon facility.

Attachment D: Redlined Draft Construction Wildfire Mitigation Plan

Draft Construction Wildfire Mitigation Plan

Biglow Canyon Wind Farm Request for Amendment 4

Prepared for

Portland General Electric Company

Prepared by

TETRA TECH

April 2025

Amended by ODOE November 2025

Revised by Certificate Holder (Department changes accepted unless otherwise noted) March 2026

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Attachment 1. Residence/Landowner Outreach Letter

1.0 Introduction

The Energy Facility Siting Council (EFSC) approved Portland General Electric Company's (PGE or Certificate Holder) Draft Construction Wildfire Mitigation Plan (WMP) as part of the Request for Amendment (RFA) 4 to the Site Certificate for the Biglow Canyon Wind Farm (BCWF or Existing Facility) which added photovoltaic solar energy generation and battery storage (Solar Components) to the operating BCWF in Sherman County, Oregon.

This plan is intended to satisfy the approval standards under OAR 345- 022-0115(1)(b), which requires the Plan to:

> *(A) Identify areas within the site boundary that are subject to a heightened risk of wildfire, using current data from reputable sources, and discuss data and methods used in the analysis;*
>
> *(B) Describe the procedures, standards, and time frames that the applicant will use to inspect facility components and manage vegetation in the areas identified under subsection (a) of this section;*
>
> *(C) Identify preventative actions and programs that the applicant will carry out to minimize the risk of facility components causing wildfire, including procedures that will be used to adjust operations during periods of heightened wildfire risk;*
>
> *(D) Identify procedures to minimize risks to public health and safety, the health and safety of responders, and damages to resources protected by Council standards in the event that a wildfire occurs at the facility site, regardless of ignition source; and*
>
> *(E) Describe methods the applicant will use to ensure that updates of the plan incorporate best practices and emerging technologies to minimize and mitigate wildfire risk.*

This plan is submitted in adherence to the following Site Certificate Conditions relating to RFA 4:

> Wildfire Prevention and Risk Mitigation Condition 1 (PRE): Prior to facility construction, the certificate holder shall finalize and submit a Construction Wildfire Mitigation Plan (WMP), Attachment XX to the Final Order on AMD4 to the Department for review and approval.
>
> [PRE-WF-01; Final Order on AMD4]
>
> Wildfire Prevention and Risk Mitigation Condition 2 (CON): During facility construction, the certificate holder shall require onsite contractors and employees to adhere to the Construction Wildfire Mitigation Plan (WMP) approved under PRE-WF-01.
>
> [CON-WF-01; Final Order on AMD4]

2.0 Final Wildlife Mitigation Plan Checklist (Prior to Construction)

2.1 Update Applicable Sections of Construction WMP

To finalize this Construction WMP prior to construction of the Solar Components, the following sections will be updated:

- Update Section 4.0 based on final Solar Component design including a brief description of areas within the site that are subject to high wildfire risk, fire prevention features at the site, such as road~~s~~ dimensions, setbacks, fire breaks, entry/exit locations, location of water trucks and fire protection equipment locations.
- Update Section 4.1 and include in this WMP the facility site maps described in Section 4.1.6.
- Update Section 4.3 with contact information and emergency response procedures for the fire department, Certificate Holder, and operational manager. Update Section 4.3 with analysis area residence contact information and confirm analysis area residence contact letter sent to residences within site boundary and 0.5 miles from the facility.
- Update S~~s~~ection 4.6 to describe vegetation management and areas that will be managed to be vegetation-free, noncombustible space, or gravel surface.

3.0 Prior to Construction Task List (PRE)

Prior to construction of the facility, the activities in Sections 3.1 and 3.2 will be completed.

3.1 Training

The Certificate Holder will organize and hold an on-site training with Certificate Holder, contractors and construction personnel, inviting specialty contractors, local fire departments, participating and adjacent landowners, emergency management office personnel, ODOE, and any other emergency management agency that covers:

- Description of construction phasing;
- The type, location, and proper use of fire protection equipment;
- Fire protection equipment usage and maintenance requirements;
- The locations of water sources and proper usage, storing and maintenance for the pump, hose nozzle; and water hose;
- Overview of smoking policy and locations;
- Overview of procedures and restrictions of construction maintenance activities during Fire Season and Red Flag Warnings designated in this Plan;
    - Rescue, Alarm, Contain and Extinguish RACE procedures including:
    - Rescue anyone in danger (if safe to do so);
    - Alarm – call the control room, who will then determine if 911 should be alerted;
    - Contain the fire (if safe to do so); and
    - Extinguish the incipient fire stage (if safe to do so).
- Provide information and encourage attendees to sign up for the County's emergency management notification system.

The training attendee list and training materials will be provided to ODOE to demonstrate compliance. The Certificate Holder will fill out and submit to ODOE the template residence outreach letter provided as Attachment 1 of this WMP. Once ODOE confirms the letter to be sufficient, the letter will be mailed to each residence within the 0.5-mile analysis area. The mailing will be confirmed and submitted to ODOE.

3.2 Solar Micrositing Area Site Maps Submission

The Certificate Holder will update site maps from Section 4.1.6 concurrently to local fire departments and ODOE.

4.0 Construction Wildfire Mitigation Plan (CON)

The information in Section 4.0 will be updated in the finalized WMP.

4.1 Summary of Solar Component Design Features and Fire Protection Equipment

4.1.1 Construction Phasing

The Certificate Holder and contractors will maintain vegetation within the Solar Micrositing Area and will also maintain a defensible space clearance along Facility features. Defensible space will be free of combustible vegetation or other materials. Roads and parking areas will be maintained to be free of vegetation tall enough to contact the undercarriage of the vehicle.

During construction clearing, grubbing, and grading, the contractor will establish ~~create noncombustible~~a buffer managed with low-growing, fire-resistant vegetation ~~buffer zone~~ extending a minimum of 10 feet inside the fence line and another minimum 10-foot limits of disturbance buffer outside the fence line for a total of a minimum of 20 feet of ~~noncombustible~~ buffer around the perimeter of the site.

While hot work permits are not generally anticipated for the construction of the Solar Components, such permits or formal approval will be required during fire season if any hot work is to be conducted.

Fuel storage and handling protocols include the following:

- Any equipment or vehicles carrying fuel must remain parked at a designated location along a county-right-of way.
- Vehicles leaving the right-of-way must not carry fuel containers, with the exception of a
- single five-gallon container used to operate the water truck pump.
- Smoking will be restricted to designated areas within the Facility only.

4.1.2 Wildfire Risk

The data sources used in this Plan to identify areas within the Solar Micrositing Area subject to heightened risk of wildfire include the Oregon CWPP Planning Tool (ODF and USFS 2024) and the Sherman County Multiple-Jurisdictional Natural Hazards Mitigation Plan (Sherman County 2024).

This section will be updated in the finalized WMP.

The Sherman County Multiple-Jurisdictional Natural Hazards Mitigation Plan describes a county-wide risk assessment of wildfire as “high” probability and identifies many areas in the county as “conducive for large and fast-moving wildfires” due to high winds typical for regional dry conditions and terrain. The plan identifies risk factors for starting wildfires in the county as highways, railroads, lighting, power lines, debris burning, and equipment.

4.1.3 Fire Prevention

The greatest risk of fire is during construction, when welding and metal cutting will take place, and vehicles and construction equipment may be used in areas of tall, dry grass. To prevent fires from occurring, the construction contractor will implement a number of systems and procedures. These will include requirements to conduct welding or metal cutting only in areas cleared of vegetation, and to keep firefighting equipment on-site as discussed in Section 4.4. Construction workers will keep vehicles on roads during the dry months of the year, unless offroad activities are required for emergency purposes, in which case fire precautions will be observed. Construction workers will be prohibited from parking vehicles in areas of tall, dry vegetation to prevent fires caused by contact with hot mufflers or catalytic converters. In the event of a large fire, emergency responders will be dispatched.

Fire prevention specific to solar arrays is dependent on proper installation and maintenance of electrical equipment to prevent short-circuits and consequent sparking, and reduction in fuel to reduce the chance of fire spreading. Qualified staff will be employed to install and maintain electrical equipment. The solar array will have shielded electrical cabling, as required by applicable code, to prevent electrical fires. All electrical equipment will meet National Electrical Code and Institute of Electrical and Electronics Engineers standards. With proper maintenance and safety checks, the electrical collection system and gen-tie lines are unlikely to cause a fire. The substrate on the ground inside the solar array fence line will be gravel where needed for maintenance and access roads or where gravel already exists, and vegetation where gravel isn't needed or already present. Weeds will be managed in accordance with the weed management procedures described in the ~~Amended Revegetation Plan and Biglow Solar Noxious Weed Plan (see Exhibit P, Attachments P-2 and P-4, respectively~~Comprehensive Solar Revegetation and Soil Management Plan~~)~~.

~~The new roads proposed within the Solar Micrositing Area, shall be sufficiently sized for emergency vehicle access in accordance with 2022 Oregon Fire Code requirements, including Section 503 and Appendix D - Fire Apparatus Access Roads. Specifically, the n~~New roads proposed within the solar area fence lines will be at least ~~20~~16 feet in width. The areas immediately around the O&M buildings, proposed substation, and BESS will be graveled, with no vegetation present.

Additionally, the RFA 4 solar arrays, BESS, and associated project components will be setback at least 50 feet from all property lines of non-participating landowners.

4.1.4 Battery Energy Storage System Fire Prevention

The Certificate Holder will implement the following fire prevention and control methods to minimize fire and safety risks for the Li-ion batteries proposed for the BESS:

- The batteries will be stored in completely contained, leak-proof modules.
- The Li-ion battery system will be kept in a temperature-controlled facility with individual
- battery modules isolated to prevent the spread of fire if it were to occur.

- The batteries will be based on Lithium Iron Phosphate chemistry, which has a lower risk of fire.
- The Li-ion battery system will be comprised of multiple temperature-controlled battery enclosures, each with its own fire detection, monitoring and fire protection systems. The battery enclosures will be spaced at a minimum recommended distance from each other as required by the battery supplier, AHJ requirements and applicable codes and standards. Minimum spacing isolates each battery enclosure and reduces the risk of fire propagation between battery enclosures in the unlikely event of a fire.
- Ample working space will be provided around the BESS for maintenance and safety purposes.
- Twenty-four-hour monitoring of the BESS will be implemented and will include shutdown capabilities.
- Transportation of Li-ion batteries is subject to 49 CFR 173.185 – Department of Transportation Pipeline and Hazardous Material Administration. This regulation contains requirements for prevention of a dangerous evolution of heat, prevention of short circuits, prevention of damage to the terminals, and prevention of batteries coming into contact with other batteries or conductive materials. Adherence to the requirements and regulations, personnel training, safe interim storage, and segregation from other potential waste streams will minimize any public hazard related to transport, use, or disposal of batteries.
- Design of the BESS will be in accordance with applicable Underwriters Laboratories (UL 2023; specifically 1642, 1741, 1973, 9540A), National Electric Code, and National Fire Protection Association (specifically 855) standards, which require rigorous industry testing and certification related to fire safety and/or other regulatory requirements applicable to battery storage at the time of construction.
- Additionally, the Certificate Holder will employ the following design practices, as applicable to the available technology and design at time of construction:
    - Employment of an advanced and proven battery management system;
    - Qualification testing of battery systems in accordance with UL 9540A (Revision 4) at the batter cell, module, and unit level;
    - Installation of fire sensors, smoke and hydrogen and/or carbon monoxide detectors, alarms, emergency ventilation systems, cooling systems within each battery enclosure;
    - Employment of fire control panels with 24-hour battery backup;
    - Installation of doors that lock with restricted access to authorized personnel only;
    - Implementation of locks and fencing to prevent entry of unauthorized personnel;
    - Installation of remote power disconnect switches; and

- Clear and visible signs to identify remote power disconnect switches.

4.1.5 Facility Access

The locations of specific access points and gates will depend on the final configuration of the solar areas and related infrastructure. The perimeter fencing will have lockable vehicle access gates. As currently designed, five gates are included for the ~~Northern~~ Solar Area ~~and three gates for the Southern Solar Area~~. Additional gates may be included for emergency exits or for removal of wildlife. Each solar array, with any collocated related or supporting facility components, would be enclosed by seven-foot-tall chain-link perimeter fencing with one foot of razor or barbed wire at the top. Alternatively, ~~W~~wire mesh, or similar, perimeter fencing, up to 8 feet in height may be used~~., will enclose each of the two solar areas as shown on Figure 2 of the RFA 4 Division 27 document~~.

4.1.6 Facility Site Maps

This Construction WMP includes facility site maps that identify:

- The phasing for construction of facility features and components;
- During construction clearing, grubbing, and grading, the contractor will establish a ~~low-growing vegetation~~ buffer zone managed with low-growing, fire-resistant vegetation extending a minimum of 10 feet inside the fence line and another minimum 10-foot limit~~s~~ of disturbance buffer outside the fence line for a total of a minimum of 20 feet of buffer around the perimeter of the site.
- Location and dimensions of facility roads;
- Solar arrays, BESS, and associated project components will be setback at least 50 feet from all property lines of non-participating landowners;
- Location of vegetation free, noncombustible, defensible spaces;
- Wildfire risk at the site;
- High-fire consequence areas/resources (includes existing infrastructure, residences, sensitive habitat, or cultural resources)
- The location of facility access points;
- A description and the location of emergency access procedures, including how emergency responders and/or adjacent landowners may access site for fire protection equipment or to extinguish an on-site fire when personnel will not be onsite;
- The type and location of fire protection equipment on site;
- The locations of water sources that will be on-site during construction.

Facility site maps will be included in the finalized WMP~~.~~.

The final Construction WMP will include a site map detailing specific access points, location of fire protection equipment, and location of water sources.

4.2 Specifications for Fire Protection Equipment

The following fire suppression equipment will be carried in vehicles conducting maintenance activities and stored on-site at the O&M building at all times:

- Fire Extinguisher: Dry chemical. 2A:10BC (5 pound), properly mounted or secured;
- Pulaski;
- Hand Shovel: Round point. 26 to 28 in "D" Handle, blade - 12 inches long and 10 inches wide; and
- Collapsible Pail or Backpack Pump: 5-gallon capacity~~; and~~.
- ~~Drip Can: 5-gallon capacity.~~

During fire season (designated Fire Season or June to October each year) water trucks/water source, water buffalo, or tank with minimum 500-gallon capacity must be on site. The water truck or water supply shall include the following, unless approved by ODOE:

- Pump should be maintained ready to operate and capable to provide a discharge of not less than 20 gallons per minute at 115 psi at pump level. Note: Volume pumps will not produce the necessary pressure to effectively attack a fire start. Pressure pumps are recommended.
- Provide enough hose (500 feet minimum) not less than 3/4" inside diameter to reach areas where power driven machinery has worked.
- Water supply, pump, and at least 250 feet of hose with nozzle must be maintained as a connected, operating unit ready for immediate use.

All internal combustion engines must be equipped with exhaust systems, mufflers and screens, or include an appropriate spark arrestor; and must be kept in good operating condition. All combustion engines (including but not limited to off road vehicles, chainsaws, and generators) will be equipped with a spark arrester that meets U.S. Forest Service Standard 5100-1.

All power-driven machinery will be kept free of excess flammable material which may create a risk of fire.

4.3 Solar Component Contact Information and Emergency Response Procedures

Local fire department and county emergency management contact information:

- North Sherman County Rural Fire Protection District: (541) 442-5252 or 911
- Sherman County Emergency Services: (541) 565-3100 or 911

Fire department response times to the site:

- The Project Developer and Certificate Holder will work with North Sherman County RFPD to determine response times to the site and this will be included in the final Construction WMP.

Certificate holder primary contact and contact of construction contractor managers:

Certificate Holder Primary Contact Information	
Name	Dan Wilson
Company	Portland General Electric Company
Street Address	121 SW Salmon Street, 3WTC0403
City/State/Zip	Portland, OR 97204
Phone	503-630-8138
Email	Dan.Wilson@pgn.com
Construction Contractor Manager Contact Information	
Name	Construction contractor managers contact information will be provided in the final Construction WMP.
Title	
Street Address	
City/State/Zip	
Phone	
Email	

Residence addresses within the site boundary and 0.5 miles from the site boundary:

- Attachment XX of the finalized WMP will include a list of property owners within the RFA 4 Site Boundary and a 0.5-mile radius.
- Residence/landowner outreach letter is provided as Attachment 1 of this WMP. Use this letter to provide to new or updated residences with the analysis area as designated in Section 5.0, Plan Updates and Reporting Requirements.

Contact 911 in the event of:

- A fire or emergency on-site that cannot be addressed by personnel on-site and requires the
- assistance of fire or emergency medical personnel;
- A fire ignition on-site that spreads out of the fence line;
- Any fire off-site that does not have emergency responders on site.
    - To the extent that construction personnel can safely assist and/or provide equipment to help extinguish off-site fires until emergency responders are on site, it is encouraged to do so to assist in the spread of the fire, loss of life, property and damage to the environment.

4.4 Use of Vehicles and Power Driven Machinery at Site

The following best management practices (BMPs) to minimize fire risk from vehicle travel, equipment use, and fueling activities will be implemented at the site during construction:

- The movement of vehicles will be planned and managed to minimize fire risk.
- The contractors will be responsible for identifying and marking paths for all off-road vehicle travel. All off-road vehicle travel will be required to stay on the identified paths. No off-road vehicle travel will be permitted while working alone. Travel off road or parking in vegetated areas will be restricted during fire season as designated in this Plan.
- Areas with grass that are as tall or taller than the exhaust system of a vehicle must be wetted or mowed before vehicles travel through it.
- Workers will be instructed to shut off the engine of any vehicle that gets stuck, and periodically inspect the area adjacent to the exhaust system for evidence of ignition of vegetation. Stuck vehicles will be pulled out rather than "rocked" free and the area will be inspected again after the vehicle has been moved.
- The contractors will designate a location for field fueling operations at the temporary construction yards. Any fueling of generators, pumps, etc. shall take place at this location only.
- Fuel containers, if used, shall remain in a vehicle or equipment trailer, parked at a designated location alongside a county right-of-way. No fuel containers shall be in the vehicles that exit the right-of-way except the five-gallon container that is required for the water truck pump.
- All power--driven machinery will be kept free of excess flammable material which may create a risk of fire.

4.5 Fire Weather Monitoring and Restrictions during Fire Season

4.5.1 Definitions

- **Non-Fire Season –** Approximately October - May
- **Fire Season –** Approximately June-September, formally designated by the Oregon Department of Forestry (ODF). Under ORS 478.960 (4), a Fire Chief can establish Fire Season within a Fire District when ODF, under ORS 477.505, declares Fire Season. Begins seasonal restrictions for public and industry.
- **Fire Weather Watch –** A fire weather watch is issued when there is a high potential for the development of a red flag event. A watch is issued 18 to 96 hours in advance of the expected onset of criteria. Intent of a fire weather watch is to alert forecast users at least a day in advance for the purposes of resource allocation and fire fighter safety. A watch means critical fire weather conditions are possible but not imminent or occurring.

- **Red Flag Weather Warning –** A red flag warning is used to warn of impending or occurring red flag conditions. Its issuance denotes a high degree of confidence that weather and fuel conditions consistent with local red flag event criteria will occur in 48 hours or less. Specific Red Flag criteria differ for each situation and district in Oregon. Be extremely careful with open flames and other activities that emit sparks.
- **Hot Work –** Any cutting, grinding, welding, or other activity that creates spark or open flame.

4.5.2 Fire Watch Service

Fire watch shall:

- Be physically capable and experienced to operate firefighting equipment.
- Have facilities for transportation and communications to summon assistance.
- Observe portions of the facility where equipment activity occurred during the day.

Upon discovery of a fire, fire watch personnel must: First report the fire, summon any necessary firefighting assistance, describe intended fire suppression activities; then, after determining a safety zone and an escape route that will not be cut off if the fire increases or changes direction, immediately proceed to control and extinguish the fire, consistent with firefighting training and safety.

4.5.3 Fire-Prevention Measures and Restrictions

Certificate holder shall maintain a log when construction activities are impacted by Fire Restrictions during Fire Season as designed in this Section. The log will include:

- The date;
- Fire Precaution Level;
- Description of actions taken, including if any measures were taken to reduce wildfire risk that are not identified in this Plan.

4.5.3.1 Non-Fire Season

- All hot work (must be conducted on roads or on non-combustible surfaces.
- Smoking in designated areas only.

4.5.3.2 Fire Season

- All hot work (any cutting, welding, or other activity that creates spark or open flame) must be conducted on roads or on non-combustible surfaces.
- Water source meeting specifications in this Plan will be on site during fire season.
- Following the completion of hot work, the Certificate Holder or contractors must maintain a fire watch for 60 minutes to monitor for potential ignition.

- Fire watch shall be on duty during any breaks and for one hour after all power driven machinery used by the operator has been shut down for the day.
- Smoking in designated areas only.

4.5.3.3 Fire Weather Watch

- No hot work permitted.
- Driving and parking only permitted on graveled or paved surfaces.
- Fire watch shall be on duty during any breaks and for one hour after all power driven machinery used by the operator has been shut down for the day.
- No smoking on site.

4.5.3.4 Red Flag Weather Warning

- No hot work permitted.
- On-site personnel must be aware of Red Flag Warning.
- Driving and parking only permitted on graveled or paved surfaces.
- Fire watch shall be on duty during any breaks and for one hour after all power driven machinery used by the operator has been shut down for the day.
- No smoking on site.

Table 1. Fire Prevention Measures during Fire Season

Requirement	Non-Fire Season	Fire Season	Fire Weather Watch	Red Flag Warning
Fire weather advisory	Not required	Not required	Not required	On-site personnel must be aware of Red Flag Warning.
On-site water source	N/A	As specified in Section 4.2	As specified in Sections 4.2 and 4.3.	As specified in Sections 4.2 and 4.3.
Hot work	Only permitted on roads or on non-combustible surfaces.	Only permitted on roads or on non-combustible surfaces; fire watch required for 60 minutes after completion	Not Permitted	Not Permitted
Fire Watch Service	Not required	During breaks and for 60 minutes after all power-driven machinery has been shut down for the day.	During breaks and for 60 minutes after all power-driven machinery has been shut down for the day.	During breaks and for 60 minutes after all power-driven machinery has been shut down for the day.

Requirement	Non-Fire Season	Fire Season	Fire Weather Watch	Red Flag Warning
Driving and Parking	As described in Section 4.4.	As described in Section 4.4.	Only permitted on roads or on non-combustible surfaces and Section 4.4.	Only permitted on roads or on non-combustible surfaces and Section 4.4.
Smoking	Designated areas only	Designated areas only	Not permitted	Not permitted

4.6 Vegetation Management

4.6.1 Vegetation-free, Noncombustible Space, and Vegetation Standards

Vegetation within the fence line and below the solar arrays will be maintained in accordance with the approved Revegetation and Reclamation Plan for the facility.

- Vegetation will be limited to a height of 10-12 inches during the wet season (November-May) and 8 inches during the dry season (June-October), with a minimum vertical clearance of 12 inches from electrical equipment.
- Vegetation near, at, or taller than the maximum height shall be removed or mowed. Mowing must be done in advance of fire season or in accordance to any fire restrictions.
- 20 feet of low-growing, fire-resistant vegetation buffer around the perimeter of the site (10 feet on each side of the fenceline)
- Vegetation within 10 feet of each side of all service roads will be managed ~~by mowing or other vegetation removal~~with low-growing, fire-resistant vegetation.
- At no point shall vegetation come in contact with electrical equipment.
- Any vegetation removed from the site will be disposed of and not stored onsite.
- The Certificate Holder and contractors will prevent the accumulation of combustible "burn piles" on site.

The following areas will be managed to be vegetation-free, noncombustible space, or gravel surface:

- ~~16-foot wide~~16-foot-wide ~~service roads within solar fence line – all weather compacted soil or graveled~~
- ~~20 feet of noncombustible buffer around the perimeter of the site~~ (10 feet on each side of the fenceline)
- Fenced areas around the collector substation, operations and maintenance structure, and meteorological stations will be graveled, with no vegetation present.
- All newly constructed roads will be graded and graveled to meet load requirements for all equipment.

~~Vegetation within 10 feet of eitherach side of all service roads will be managed by mowing or other vegetation removal~~

Vegetation in these areas will be managed by the following techniques:

- Mechanical Clearing: mowing, brushing, chipping, tree trimming/felling
- Manual Clearing: hand tools (chainsaws, machetes, handsaws)
- Chemical Treatment: use of approved herbicides by licensed applicators to control or suppress vegetation growth (broadcast spray, spot treatment, cut-stump/basal bark)

4.7 Construction Trainings

4.7.1 Safety Training

Once per year after construction begins, organize and hold an on-site training with Certificate Holder and construction personnel, inviting equipment manufacturers, specialty contractors, local fire departments, participating and adjacent landowners, emergency management office personnel, ODOE, and any other emergency management agency that covers:

- The location of electrical facility components and the fire safety measures associated with each component that have been constructed;
- Description of remaining construction phasing;
- The type, location, and proper use of fire protection equipment;
- Fire protection equipment usage and maintenance requirements;
- The locations of water sources and proper usage, storing and maintenance for the pump, hose nozzle; and water hose;
- Overview of smoking policy and locations;
- Overview of procedures and restrictions of construction activities during Fire Season, Fire Weather Watches, and Red Flag Warnings designated in this Plan;
- Rescue, Alarm, Contain and Extinguish (RACE) procedures including:
    - Rescue anyone in danger (if safe to do so);
    - Alarm – call the control room, who will then determine if 911 should be alerted;
    - Contain the fire (if safe to do so); and
    - Extinguish the incipient fire stage (if safe to do so).
- Provide information and encourage attendees County's emergency management notification system.

5.0 Plan Updates: Amendments and Reporting Requirements:

The following will be provided to ODOE in the semi-annual construction report required per OAR 345-026-0080:

- Sections 4.1 and 4.2, any changes in wildfire risk at the site or changes in facility components or preventative features.
- Section 4.3, any changes in local fire protection agency personnel and operational managers.
- Section 4.3, any changes in analysis area residence/landowner addresses or contact information.
- A copy of the Fire Season Restriction Log identified in Section 4.5.3.
- Changes in wildfire risk if different from the Site Plan provided prior to construction. Evaluation of wildfire risk will be consistent with the requirements of OAR 345-022--0115(1) using current data from reputable sources.

This information may be used to establish the performance of the Construction WMP. If determined by certificate holder or ODOE, adjustments or improvements must be proposed to ensure the Construction WMP provides wildfire mitigation. Any ODOE required updates shall be implemented within 14 days, unless otherwise agreed to by ODOE based on a good faith effort to address wildfire hazard.

This Plan may be amended from time to time by agreement of the certificate holder and the Oregon Energy Facility Siting Council (EFSC) or ODOE, acting within its delegated authority of EFSC. Such amendments may be made without amendment of the site certificate. EFSC authorizes ODOE to agree to amendments to this Plan. ODOE will notify EFSC of all amendments, and EFSC retains the authority to approve, reject, or modify any amendment of this Plan agreed to by ODOE.

6.0 References

CBI. 2020. Wildfire Risk Assessment Data Layer Descriptions Spreadsheet. DataLayerDescriptions_04_01_2019.Xlsx. Conservation Biology Institute. Available online at: https://databasin.org/datasets/31cc2ca6bebe4efab3b139c50dd79722/

Oregon Explorer. 2024. Oregon CWPP Planning Tool. https://tools.oregonexplorer.info/oe_htmlviewer/index.html?viewer=wildfireplanning

Sherman County. 2024. Sherman County Multiple-Jurisdictional Natural Hazards Mitigation Plan.

Attachment 1. Residence/Landowner Outreach Letter

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Attachment E: Certificate Holder Communications and Outreach Related to Battery Fire Safety

Correspondence and Engagement Log – Battery Fire Safety

Stakeholder: Ms. Kathy McCullough
Engagement Period: May – October 2025

Date	Engagement Type	Initiated By	Participants	Subject / Purpose	Outcome / Notes
September 17, 2025	Virtual Meeting (Scheduled)	Project Team	Coffman Engineers; Project Team; Ms. McCullough	BESS / fire risk discussion	Not attended[1]
September 17, 2025	Email / Phone Follow-Up	Project Team	Ms. McCullough	Follow-up regarding missed meeting; presentation shared	Meeting rescheduled
September 18-19, 2025	Email	Ms. McCullough	Coffman Engineers; Project Team	Technical follow-up questions	Addressed in subsequent meeting
September 2025	Virtual Meeting	Project Team	Coffman Engineers; Ms. McCullough	Fire safety discussion	Technical questions addressed
September 23, 2025	Virtual Meeting	Project Team	Coffman Engineers; Project Team; Ms. McCullough	Follow-up coordination meeting	Continued engagement

Footnotes

1. A meeting was scheduled with Ms. McCullough to discuss any questions she had regarding fire risk/safety. The project team and Coffman Engineers waited for Ms. McCullough at the agreed upon scheduled time, but she did not attend. Follow-up contact was attempted via phone and text. Ms. McCullough later apologized, and materials were provided in writing.

From: Daniel Wilson
Sent: Friday, March 6, 2026 4:00 PM
To: Kathryn McCullough
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Chris Bozzini; Kathleen Campanella; Ziola, Kiana
Subject: Biglow Canyon RFA4 Certificate Holder Sur-reply - Kathy and Kevin McCullough (3/6/26)
Attachments: BIGL RFA4_Comment Sur-Reply Letter to Kathy and Kevin McCullough_03062026.pdf

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March 6, 2026

Dear Kathy And Kevin,

Thank you for your responses to our February 13, 2026 reply regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate, please find attached Portland General Electric's and the project developer, BrightNight's, sur-reply.

All the best.

Dan Wilson
Director, Renewable Operations
651-380-2440 (cell)
PortlandGeneral.com • Follow us on social @PortlandGeneral

Portland General Electric
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Portland, Ore. 97204
PortlandGeneral.com

13123 E Emerald Coast Pkwy
Ste B #158
Inlet Beach, FL 32461
info@brightnightpower.com

March 6, 2026

VIA EMAIL (mcculloctloc@gmail.com)

Colton McCullough

Re: Biglow Canyon Wind Farm Request for Amendment 4 – Proposed Order Response to Comment (BCWAMD4Doc25-03-P3)

Dear Mr. McCullough,

Portland General Electric (PGE) and the project developer BrightNight (BN) appreciate your February 27, 2026, response to our reply regarding the Proposed Order on Request for Amendment 4 (RFA 4) of the Biglow Canyon Wind Farm (BCWF) Site Certificate.

PGE and BN carefully reviewed your most recent comment response letter and provide the following responses, based on our interpretation of the concerns raised in your correspondence, which are intended to directly and comprehensively address each issue.

This reply provides additional information on an issue-by-issue basis, consistent with the Oregon Department of Energy (ODOE)'s issue identification framework and categories identified in Table 1 of the ODOE Response Letter dated February 12, 2026.

1. Vegetation Height (Issues WF-09, SP-04)

PGE and BN acknowledge the concerns that you have expressed regarding vegetation height at the proposed Biglow Solar facility and share the following comment on vegetation height that we provided to ODOE in a letter dated February 27, 2026. You may have already seen our comment on the ODOE OneDrive set up for the Project, but we wanted to provide it here in case you have not previously seen it:

> *The Certificate Holder appreciates ODOE's consideration of vegetation height requirements during the dry season and the input provided by the Sherman County Weed District and other commenters.*
>
> *As previously discussed, maintaining vegetation at a height of 1 to 3 inches during the June–October dry season presents practical and ecological challenges. Repeated mowing to that height would likely damage perennial bunchgrasses included in the approved seed mix, reduce long-term stand viability, increase susceptibility to invasive annual grasses, and potentially elevate fine fuel risk over time. In addition, mowing at extremely low heights may increase ignition risk due to equipment contact with rocks or soil surface.*
>
> *At the same time, the Certificate Holder acknowledges neighboring non-participating landowner concerns regarding wildfire risk and understands the desire for lower vegetation height during the peak fire season. Based on consultation with vegetation management specialists from Sherman County Weed District and Tetra Tech, and*

consideration of local Conservation Reserve Program management practices, the Certificate Holder is committed to maintaining vegetation at a target height of approximately 8 inches during the dry season, where practicable to ensure vegetation health. The Certificate Holder further commits that vegetation will be maintained below 10 to 12 inches, consistent with the draft Comprehensive Solar Revegetation and Soil Management Plan.

An 8-inch target height represents a reasonable middle ground that:

- *Reduces standing fine fuels compared to unmanaged conditions;*
- *Maintains bunchgrass crown integrity and long-term vegetation health;*
- *Aligns more closely with local vegetation management practices; and*
- *Avoids creating conditions that would favor invasive annual grasses.*

The Certificate Holder recognizes that mowing height may vary slightly depending on equipment capabilities, species composition, and site conditions, and commits to implementing vegetation management in coordination with local experts and in accordance with the final approved Comprehensive Solar Revegetation and Soil Management Plan and Construction Wildfire Mitigation Plan.

This approach reflects the Certificate Holder's willingness to collaborate with ODOE and local stakeholders while ensuring that vegetation management practices remain ecologically sustainable and supportive of long-term wildfire risk reduction objectives.

2. Wildfire Risk Mitigation (Issue WF-12)

Your February 27, 2026, comment response letter expressed continued concern regarding the fact that an Operations Wildfire Mitigation Plan (WMP) has not yet been provided.

The Proposed Order (PO) and ODOE's draft proposed conditions require that a final Operations WMP be completed and approved prior to operation of the solar facility, phase, or component, as applicable (PRO-WF-01). The Certificate Holder acknowledges this requirement and remains committed to timely development and submittal of the final Operations WMP consistent with the PO and the Energy Facility Siting Council (EFSC)'s final site certificate conditions.

In advance of that requirement, and in recognition of public and agency interest in this topic, PGE is providing an Operations WMP Outline as Attachment A to this letter. Attachment A outlines anticipated commitments and establishes a clear framework for development of the final Operations WMP. This outline is intended to demonstrate continued progress and provide EFSC and members of the public with transparency regarding how wildfire risk will be addressed during facility construction and operations.

In both the Draft Construction WMP and Operations WMP Outline, the Certificate Holder has committed to the following measures to support wildfire prevention and response during construction and operation of the Biglow Solar facility:

- Facility operator emergency response training (Draft Construction WMP Section 3.1);
- Maintaining multiple on-site water sources with a minimum of 500 gallons of water each and operator training on how to use water hoses, pumps, and related equipment (Draft Construction WMP Sections 3.1 and 4.2); and
- Identifying a pre-screened project in Sherman County to build firefighting capacity (including upgrading, maintaining, or adding firefighting equipment and facilities;

additional training for volunteers; additional funding for staff; and funding for projects to develop fuel breaks, reduce wildfire hazards, and provide firefighting water) in Section 5.2 of the Community Investment Plan (BCWF RFA4 Proposed Order Attachment E).

We agree that wildfire mitigation planning for a facility of this scale and location must be robust and carefully developed. As a public utility, PGE is subject to additional operational, safety, and reliability obligations that extend beyond those applicable to many standalone private facilities. Accordingly, the Operations WMP is being developed to align not only with EFSC site certificate requirements, but also with PGE's broader wildfire risk mitigation framework, utility safety standards, and public safety responsibilities.

For this reason, development of the final Operations WMP requires careful coordination across engineering, operations, emergency response, and utility compliance teams. While a draft or final Operations WMP is not required at this stage of the amendment review, PGE is committed to ensuring that the completed plan reflects a comprehensive, utility-level approach to wildfire risk prevention, preparedness, and response. The Operations WMP Outline provides for the record the elements that must be accounted for in the final Operations WMP and our commitment to develop a robust final Operations WMP.

Our communities' concerns are very important to us, and we are committed to operating this facility in a way that reflects our shared interest in protecting people, property, and the landscape we all value.

Please reach out if you have questions or would like to discuss further. As previously discussed, there will be continued engagement of the community and neighbors as this project moves forward.

Sincerely,

Lenna Cope

Kathleen Campanella

Lenna Cope
Senior Environmental Specialist
Portland General Electric Company

Kathleen Campanella
Senior Director, Development
BrightNight

cc: Chris Bozzini, PGE
Kiana Ziola, Tetra Tech

Attachments:

- Attachment A: Operations Wildfire Mitigation Plan Outline

Attachment A: Operations Wildfire Mitigation Plan Outline

PGE Biglow Canyon Wind Farm Operations Wildfire Mitigation Plan Outline

This document outlines Portland General Electric Company's (PGE) approach to a Draft Operations Wildfire Mitigation Plan (Operations WMP) for the Biglow Canyon Wind Farm Solar Components. The plan will satisfy the approval standards under OAR 345-022-0115(1)(b), will follow the template provided by the Oregon Department of Energy on January 28, 2025, and will be aligned with the structure, terminology, and risk-based mitigation framework contained in PGE's 2026–2028 Wildfire Mitigation Plan (WMP) filed with the Oregon Public Utility Commission, including any future Commission-approved updates.

Key Components of the Plan:

Wildfire Risk Assessment and Prevention

- PGE's proposed 2026-2028 Wildfire Mitigation Plan Appendix H contains PGE's Generation Wildfire Risk Assessment, including the Biglow facility with Solar Components added. Figure H-1 of PGE's 2026-2028 Wildfire Mitigation Plan shows the areas in an Outlying Fire Risk Zone (OFRZ), which are considered at a higher risk of wildfire.
- Prevention measures are expected to include inspection and correction practices, vegetation management, defensible space requirements, fire-season operational protocols, and other mitigation strategies consistent with PGE's Commission-filed 2026–2028 WMP. The Operations WMP will define specific procedures, standards, and implementation timelines during facility operations, similar to those described in Section 4.1.3 of the Draft Construction WMP.
- The Operations WMP will describe fire detection systems, thermal management controls, monitoring systems, emergency response protocols, and integration with situational awareness systems to mitigate fire risk and support safe facility operations, similar to those described in Section 4.1.4 of the Draft Construction WMP.

Fire Season Readiness

- During PGE-declared Fire Season, personnel performing operational or maintenance activities will follow wildfire mitigation procedures designed to reduce ignition risk and maintain safe working conditions. The Operations WMP will describe Fire Season readiness protocols applicable to facility operations.
- Consistent with Fire Season readiness operational protocols outlined in PGE's proposed 2026-2028 Wildfire Mitigation Plan, field personnel and suppliers will be equipped with appropriate fire suppression tools and equipment during fire season, which may include properly rated fire extinguishers, round-pointed shovels, Pulaskis, and other firefighting equipment identified in company standards. Supplemental fire suppression resources, such as mobile fire trailers equipped with water supply, hose, and pump systems, may be deployed when conditions warrant.

- The Operations WMP will also outline requirements to ensure fire suppression tools and equipment remain functional and readily accessible during operations in fire-prone areas. These requirements will be consistent with applicable fire prevention rules and other relevant jurisdictional requirements.
- Fire Season field operational restrictions will be defined in the Operations WMP and are expected to align with PGE's Fire Season Readiness operating procedures. During periods of elevated fire danger, PGE may implement additional operational controls based on wildfire risk indicators such as National Weather Service Red Flag Warnings, Industrial Fire Precaution Levels (IFPL), National Fire Danger Rating System conditions, or other jurisdiction-specific fire restrictions.
- Depending on conditions, these measures may include restrictions on spark-producing activities, time-of-day limitations on certain work activities, enhanced fire watches, pre-positioning of fire suppression tools and equipment, or temporary suspension of non-essential activities.
- If a fire occurs during operations, personnel will follow company emergency response procedures, including notification of emergency services and PGE's Control Center/s, coordination with local fire authorities, and implementation of appropriate response actions consistent with site-specific Emergency Response Plans.

Inspections and Maintenance

- Comprehensive inspection and maintenance schedules for all facility components will follow manufacturer recommendations associated with each type of facility component, will be summarized in a table within the Plan, and documentation of inspections will be submitted to ODOE for compliance evaluation.

Vegetation Management

- Maintenance of low-growing, fire-resistant vegetation within 20-foot defensible space around site perimeter (10 feet inside the fence and 10 feet outside the fence) (or as specified by ODOE in the Final Order).
- Vegetation under solar arrays maintained at 8 inches maximum height during fire season and 10 to 12 inches outside of fire season (or as specified by ODOE in the Final Order).
- Bi-annual vegetation assessments with additional monitoring as needed.

Training and Monitoring

- Start-of-operations and annual safety training will be provided for all personnel covering electrical safety and equipment use. The Operations WMP will describe the content and delivery methods of these training programs.
- Additionally, identified PGE field personnel and Suppliers (contractors and vendors) will be required to complete mandatory Fire Season Training through computer-based training or

other company-approved training methods prior to performing field activities during fire season.

- 24/7 remote monitoring via SCADA system with smoke/fire detectors throughout facility.
- Coordination with local fire departments and emergency services.

Plan Updates and Reporting

- Annual reporting per OAR 345-026-0080 to Oregon Department of Energy.
- Annual review of the Operations WMP to determine if updates are necessary, including evaluation of changes in standards, policies, future technologies or best practices.
- Provisions for Operations WMP amendments as needed.

The Operations WMP will establish a comprehensive framework for preventing wildfires, maintaining appropriate equipment and vegetation management, and responding effectively to wildfire emergencies at the expanded Biglow Canyon facility.

From: Lenna Cope
Sent: Friday, March 6, 2026 3:45 PM
To: Colton McCullough
Cc: CLARK Christopher * ODOE; ESTERSON Sarah * ODOE; Patrick G Rowe; Chris Bozzini; Kathleen Campanella; Ziola, Kiana
Subject: Biglow Canyon RFA4 Certificate Holder Sur-reply - Colton McCullough
Attachments: BIGL RFA4_Comment Sur-Reply Letter to Colton McCullough_03.06.2026.pdf

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Dear Mr. McCullough,

Thank you for your responses to our February 13, 2026 reply regarding the Proposed Order on Request for Amendment 4 of the Biglow Canyon Wind Farm Site Certificate, please find attached Portland General Electric's and the project developer, BrightNight's, sur-reply.

Thank you.

Lenna Cope, P.E.
Pronouns: she/her
Senior Environmental Specialist | 503-464-2634 | 503-313-5022
portlandgeneral.com | Follow us on social @PortlandGeneral
An Oregon kind of energy.

Attachment B-3: Department Evaluation of Public Comments

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
General Standard of Review (OAR 345-022-0000)			
Issue GS-01	Concern about single hearing for a complex amendment	Kathryn McCullough	No
Issue GS-02	Request for correction to Existing Facility Site Location	Certificate Holder	Yes, minor changes to findings or conditions
Issue GS-03	Request for correction to Turbine Dimensions in Existing Energy Facility Description	Certificate Holder	Yes, minor changes to findings or conditions
Issue GS-04	Request for correction to Existing Related or Supporting Facilities Description	Certificate Holder	Yes, minor changes to findings or conditions
Issue GS-05	Request for correction to Existing O&M Building Description	Certificate Holder	Yes, minor changes to findings or conditions
Issue GS-06	Request for revision of proposed road dimension width, from 20 to 16 feet	Certificate Holder	Yes, changes to Facility Description and draft Construction Wildfire Mitigation Plan
Issue GS-07	Request to allow Temporary Construction Areas outside fenceline, within Solar Micrositing Area	Certificate Holder	Yes, minor changes to findings or conditions
Issue GS-08	Request for flexibility in perimeter fencing design	Certificate Holder	Yes, minor changes to findings or conditions
Issue GS-09	Request for correction of description of Solar Micrositing Area	Certificate Holder	Yes, minor changes to findings or conditions
Issue GS-10	Property owner does not consent to project being developed on his private property, as currently proposed.	Jered Reid/Donald Hilderbrand	No
Organizational Expertise (OAR 345-022-0060)			
Issue OE-01	Maintenance issues at existing wind facility	Kathryn and Kevn McCullough	No

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
Issue OE-02	Request to amend recommended Amended Condition 3 (CON-OE-01), removing reference to fax number as contact method for construction managers.	Certificate Holder	Yes, minor changes to findings or conditions
Issue OE-03	Request to revise requirement to provide executed Build Transfer Agreement in draft Operations and Maintenance Plan Framework, allowing for submission of redacted copy	Certificate Holder	Yes, minor changes to findings or conditions
Issue OE-04	Request to amend frequency of performance monitoring reports	Certificate Holder	Yes, minor changes to findings or conditions
Issue OE-05	Request to clarify frequency of inspections using thermal imaging	Certificate Holder	Yes, minor changes to findings or conditions
Structural Standard (OAR 345-022-0020)			
Issue SS-01	Request for flexibility to conduct ground disturbing activities on areas with steep slopes with engineer review	Certificate Holder	Yes, changes to Condition 68
Soil Protection (OAR 345-022-0022)			
Issue SP-01	Questions the type and height of weeds required to be controlled	Kathryn McCullough	No
Issue SP-02	Requests to clarify statement referring to the use of Sherman County for weed control.	Certificate Holder	Yes, minor changes to findings or conditions
Issue SP-03	Requests Revisions to Mapped Soil Units in Analysis Area	Certificate Holder	Yes, minor changes to findings or conditions
Issue SP-04	Concerns related to 1-3" veg height under WMP and ability of that height to provide erosion control	Sherman County Weed District	Yes, changes made to Section IV.D Soil Protection, IV.N Wildfire Prevention and Risk Mitigation, Appendix F of the draft Comprehensive Revegetation and Soil Management Plan and

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
			draft Construction Wildfire Mitigation Plan.
Issue SP-05	Long-term soil health	Kathryn McCullough	No
Issue SP-06	Requests to develop a strong working relationship with certificate holder/BrightNight to ensure soil protection measures are in place.	Sherman County Soil and Water Conservation District, A. Whitman	No
Issue SP-07	Potential soil contamination from fire-damaged photovoltaic modules or battery components.	Sherman County Soil and Water Conservation District, A. Whitman	No
Issue SP-08	Enforcement of requirements for natural resource protection.	Sherman County Soil and Water Conservation District, A. Whitman	No
Issue SP-09	Requests to Clarify Terms, Clear Brush Free and Vegetation Clearance Area/Zone	Certificate Holder	Yes, changes made to Section IV.D Soil Protection, IV.N Wildfire Prevention and Risk Mitigation, Appendix F of the draft Comprehensive Revegetation and Soil Management Plan and draft Construction Wildfire Mitigation Plan.
Issue SP-10	Recommended edits to Draft Comprehensive Revegetation and Solar Management Plan	Certificate Holder	Yes, changes made to Appendix F of the draft Comprehensive Revegetation and Soil Management Plan

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
Issue SP-11	Erosion Issues	Sherman County Soil and Water Conservation District, A. Whitman	No
Issue SP-12	Weed Control	Sherman County Soil and Water Conservation District, A. Whitman	No
Land Use (OAR 345-022-0030)			
Issue LU-01	Request for reduction in requirements for Site Plan Review	Certificate Holder	Yes, minor changes to findings or conditions
Issue LU-02	Objection to Evaluation of Compliance with SCZO 5.2(5)	Certificate Holder	No
Issue LU-03	Objection to Evaluation of Compliance with SCZO 5.2(6)	Certificate Holder	Yes, minor changes to findings or conditions
Issue LU-04	Objection to Evaluation of Compliance with SCZO 5.8	Certificate Holder	No
Issue LU-05	Objection to Evaluation of Compliance with SCZO 5.8(20)(3)	Certificate Holder	No
Issue LU-06	Concern with cumulative impacts of solar development in Sherman County	Alan von Borstel	No
Issue LU-07	Recommendation that “Right to Farm” protections are needed to protect farmers from wildfire liability	Kathryn McCullough, Kevin McCullough, Irene Gilbert	No
Issue LU-08	Objection to Evaluation of OAR 660-033-0130(38)(G)	Certificate Holder	No
Issue LU-09	Recommendation to include impact of lost assessments in economic impact analysis	Oregon Wheat Growers League	No
Issue LU-10	Objection to claim that Community Investment Plan will offset impacts to agricultural economy	Oregon Wheat Growers League	No
Issue LU-11	Recommendation to include Oregon Wheat Growers League in Community Investment Selection Committee	Oregon Wheat Growers League	Yes, change to Section III.E Goal 3 Exception and draft

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
			Community Investment Plan
Issue LU-12	Need for engagement with Market Development Organizations in developing Community Investment Plan	Oregon Wheat Growers League	No
Issue LU-13	Concern with inclusion of agrivoltaics research as pre-screened project in Community Investment Plan	Oregon Wheat Growers League	Yes, change to Section III.E Goal 3 Exception and draft Community Investment Plan
Issue LU-14	Concern with including weed management projects as pre-screened project in Community Investment Plan	Oregon Wheat Growers League	No
Issue LU-15	Concern with including fire mitigation projects as pre-screened project in Community Investment Plan	Oregon Wheat Growers League	No
Issue LU-16	Objection to statement that lease payments will compensate for lost agricultural revenue	Oregon Wheat Growers League	No
Issue LU-17	Goal Exception - Consistency with State Climate Goals and Policies Reasons	Certificate Holder	No
Issue LU-18	Goal Exception - Minimal Impacts to Other Resources Reason	Certificate Holder	No
Fish and Wildlife Habitat (OAR 345-022-0060)			
Issue FW-01	Adequacy of Exhibit P and Evaluation of Impacts to Wildlife	Kathryn McCullough	No
Issue FW-02	Srivener's Error	Certificate Holder	Yes, minor changes to findings or conditions
Issue FW-03	Flexibility on ground clearing activities in Category 2 Habitat	Certificate Holder	No
Issue FW-04	Recommended edits to Draft Habitat Mitigation Plan	Certificate Holder	Yes, minor changes to findings or conditions
Historic, Cultural and Archaeological Resources (OAR 345-022-0090)			
Issues HCA-01	Supplement Record with Tribal Consultation Details	Certificate Holder	Yes, minor changes to findings or conditions

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
Issues HCA-02	Adequacy of archaeological monitoring and protective measures	Confederated Tribes of Warm Springs	Yes, changes to Section III.K Historic, Cultural and Archaeological Resources, and Condition GEN-HC-03.
Public Services (OAR 345-022-0110)			
Issue PS-01	Concerns about capacity of local fire responders to fight fire at energy facility	Kathryn McCullough	No
Issue PS-02	Concern that local fire responders do not have adequate training to respond to fire at energy facility or BESS	Kathryn McCullough	No
Wildfire Prevention and Risk Mitigation (OAR 345-022-0115)			
Issue WF-01	Concerns about burn probability data used in fire risk analysis	Kathryn McCullough	No
Issue WF-02	Concerns about use of climate normal for fire risk analysis In Exhibit V	Kathryn McCullough	No
Issue WF-03	Concerns about fuel models used for fire risk analysis	Kathryn McCullough	No
Issue WF-04	Request for flexibility in road design standards for roads not needed for fire access	Certificate Holder	Yes, changes to draft Construction Wildfire Mitigation Plan, draft Amended Site Certificate and dFO Section I.D.3, description of roads.
Issue WF-05	Recommendations for BESS design criteria to minimize fire risk	Kathryn McCullough	No
Issue WF-06	Request for clarification of setback requirement	Certificate Holder	Yes, minor changes to findings or conditions
Issue WF-07	Concerns about adequacy of 50-foot fire setbacks	Kathryn McCullough; Kevin McCullough	No
Issue WF-08	Concern about adequacy of 20-foot fuel breaks	Sherman County Soil and Water Conservation District; Irene Gilbert	No

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
Issue WF-09	Support for recommended vegetation maintenance standards for wildfire season	Colton McCullough	Yes, changes made to Section IV.D Soil Protection, IV.N Wildfire Prevention and Risk Mitigation, Appendix F of the draft Comprehensive Revegetation and Soil Management Plan and draft Construction Wildfire Mitigation Plan.
Issue WF-10	Objection to recommended vegetation maintenance standards for wildfire season	Certificate Holder	
Issue WF-11	Request to remove requirement to include drip can with fire suppression equipment.	Certificate Holder	
Issue WF-12	Concern about lack of availability of Operational Wildfire Mitigation Plan.	Kathryn McCullough, Irene Gilbert	No
Siting Standards for Transmission Lines (OAR 345-024-0090)			
Issue TL-01	Request for additional flexibility in transmission line siting	Certificate Holder	Yes, changes made to draft Amended Site Certificate and dFO Section I.D.3, description of 230 kV transmission line.
Noise Control Regulation (OAR 340-035-0035)			
Issue NC-01	Requests Proposed Order Table 26 be revised to add NSR13 and reference to RFA Exhibit Y Table Y-7.	Certificate Holder	Yes, minor changes to findings or conditions
Issue NC-02	Requests revisions to recommended Noise Control Condition 2 (PRE-NC-02) allowing for general waiver versus solar specific	Certificate Holder	Yes, changes made to Condition PRE-NC-02.
Water Rights			
Issue WR-01	Requests revisions to recommended Amended Water Rights Condition 1 (PRE-WR-01) to Clarify Well Log Submission Timing	Certificate Holder	Yes, changes made to Condition PRE-WR-01 (now CON-WR-01)

Table 1: List of Issues, Commenters and Comment Evaluation Process Summary

Issue ID	Issue Summary	Commenter	Change Incorporated into Draft Final Order
Issue WR-02	Requests revisions to recommended Amended Condition 75 (OPR-WR-01) on Applicability of Groundwater Usage Monitoring and 5,000 gallon/day limit	Certificate Holder	Yes, changes made to Condition OPR-WR-01.
Issue WR-03	Requests revisions to recommended Amended Condition 75 (OPR-WR-01) on Applicability of 5,000 gallon/day limit	Certificate Holder	Yes, changes made to Condition OPR-WR-01.

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I. Introduction

Portland General Electric Company (certificate holder) filed Request for Amendment 4 of the Site Certificate for the Biglow Canyon Wind Farm (RFA4) to the Energy Facility Siting Council (EFSC or Council) seeking authorization to expand the existing 450-megawatt (MW) wind power generation facility to allow construction and operation of a 125-MW solar power generation facility and related or supporting facilities within a 1,924-acre solar micrositing area.

On December 16, 2025, the Oregon Department of Energy (Department or ODOE) issued its Proposed Order on RFA4. On the same date, in accordance with OAR 345-027-0367(4), the Department issued a Public Notice, initiating a 45-day comment period, to conclude on January 30, 2026. The Notice also established deadlines for the subsequent comment evaluation process, including:

- February 13, 2026, for the Department and certificate holder responses to comments;
- February 27, 2026, for commenters to reply to Department/certificate holder responses; and,
- March 6, 2026, for the Department/certificate to file sur-replies.

II. Public Comment Process Overview

The Council adopted changes to the Site Certificate Amendment comment process (OAR 345-027-0367) in September 2025, effective October 2025. This is the first amendment request under the new rules.

The purpose of the rule changes was to make the site certificate amendment review process more efficient and effective, improve the public comment process and increase the public's understanding of how to participate in the process. As presented above, the new process includes a step for the certificate holder and the Department to respond to comments; allows for those commenters to then reply; and then concludes with an opportunity for the Department and certificate holder to offer sur-reply.

The rules require that the certificate holder respond to all comments received during the comment period; the Department does not have the same obligation but may choose to respond. As presented in the document below, the Department has provided responses to commenters in a manner that provides organization for the public, the Department and the Council.

The intent of this new comment process is for each commenter to receive feedback from the Department and the certificate holder on the nature of their comments – specifically, whether they were raised with sufficient specificity so that the commenters can then reply with additional information or clarification. Where comments were raised with sufficient specificity,

the process is intended to provide each commenter with feedback on whether those issues warrant remedy or change to a recommended finding of fact or recommended new or amended condition, and provide an opportunity for commenters to further explain and provide factual reasoning to support the Department and Council's evaluation of whether the certificate holder has met their burden of proof that they either can or have satisfied the requirements of applicable Council standards and other laws.

III. Evaluation of Issues by Standard

III.A. General Standard of Review (OAR 345-022-0000)

Issue GS-01 (McCullough, Kathryn): Concern about single hearing for a complex amendment
Comment ID: BCWAMD4Doc24-06 Proposed Order Public Comment McCulloughK-6 2026-01-09
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Commenter raises concern about single hearing for complex amendment.

Department Evaluation
On December 16, 2025, the Department issued public notice of the complete RFA4 and the Proposed Order on RFA4 which included notice of a 45-day comment period closing on January 30, 2026. The public notice included information for the in-person and remote public hearing held in Grass Valley on January 15, 2026.

The Department followed procedural rules and no requests were made to Council with a good-cause justification for time extensions or additional hearings, therefore, the Department recommends no further action is needed on this issue.

Issue GS-02 (Certificate Holder): Request for correction to Existing Facility Site Location
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests correction to description of facility site location. The Proposed Order Cover Letter identifies the Facility Site Location being 4.8 miles northeast of the City of Wasco. The proposed Solar Micrositing Area is 4.8 miles northeast of the City of Wasco, but the Facility Site Location is 2.5 miles northeast of the City of Wasco.

Department Evaluation
The Department's draft Final Order will not include the Cover Letter with the referenced discrepancy. However, the Department agrees that the corrections should be incorporated into

the Proposed Order Section I.C., Approved Site Description and in Section I.D.4., Proposed Solar Micrositing Area; and, in Section 3.3. of the draft Amended Site Certificate, as presented below.

> Proposed Order Section I.C. The site is located approximately 2.5 miles northeast of the City of Wasco in Townships 1 and 2 North, Ranges 17 and 18 East, Willamette Meridian.
>
> Proposed Order Section I.D.4. The facility components proposed in RFA4 would be located within a proposed 1,924-acre Solar Micrositing Area. The Solar Micrositing Area is located approximately 4.8 miles northeast of the City of Wasco.
>
> Draft Amended Site Certificate Section 3.3. The facility is located about 2.5 miles northeast of the City of Wasco in Townships 1 and 2 North, Ranges 17 and 18 East, Willamette Meridian, Sherman County, Oregon. The Solar Micrositing Area is located approximately 4.8 miles northeast of the City of Wasco.

Issue GS-03 (Certificate Holder): Request for correction to Turbine Dimensions in Existing Energy Facility Description
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
The Certificate Holder requests the following corrections be made to the description of turbine dimensions in the Proposed Order, Section I.B.1, to reflect the facility as built:

> ~~The wind turbines are located on private land that the certificate holder has leased from the affected landowners.~~ The Siemens 2.3 MW turbines are mounted on tubular steel towers with a ~~hub~~ height of ~~280~~ 262 feet at the hub and ~~maximum blade tip~~ an overall height of ~~445~~ 413 feet including the turbine blades. The wind turbines are located on private land that the certificate holder has leased from the participating landowners.

Department Evaluation
The certificate holder seeks to clarify the description in the Proposed Order and draft Amended Site Certificate of the dimensions of existing, operational wind turbines based on actual dimensions. Because the certificate holder has the best information about actual turbine dimensions at the facility, the Department agrees to amend Section I.B.1. of the Proposed Order and Section 3.1 of the draft Amended Site Certificate accordingly.

Issue GS-04 (Certificate Holder): Request for correction to Existing Related or Supporting Facilities Description
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
The certificate holder requests the following revisions to Table 1 of the Proposed Order be made to reflect existing facility components as built:

- Collector line length, underground: ~~106~~75 miles
- Collector line length, overhead: ~~3.9~~5 miles
- O&M Building Quantity: ~~2~~3 each

Department Evaluation
The certificate holder seeks to clarify the description in the Proposed Order Table 1 and draft Amended Site Certificate Section 3.1, Subsection 2.a of existing facility components, consistent with final design. Because the certificate holder has the best information about existing facility components/final design, the Department agrees to amend the Proposed Order Table 1 and draft Amended Site Certificate Section 3.1, Subsection 2.a, based on the changes presented above.

Issue GS-05 (Certificate Holder): Request for correction to Existing O&M Building Description
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
The certificate holder requests that the total square footage of the as built O&M buildings total identified in Section 3.1, Subsection 2.d of the site certificate be changed from 17,500 square feet to 19,500 square feet due to the building evaluated through ODOE's Change Request process.

Department Evaluation
Based on review of the record, the Department confirms that on January 12, 2017, it issued a determination under previous rules referring to a Change Request process, confirming that construction of an additional warehouse at the O&M site could occur without being reviewed through the site certificate process. The square footage of the additional warehouse was 3,600 feet (the amount reflected in the certificate holder's revision).

It is the Department's intent to incorporate changes reviewed through Change Requests, Facility Modifications and Amendment Determination Requests into a Site Certificate when the Site Certificate is open through the amendment process. Therefore, the Department agrees to incorporate changes in the O&M square footage reference, consistent with the dimensions reviewed through the Change Request process, into the draft Amended Site Certificate Section 3.1, Subsection 2.d.

Issue GS-06 (Certificate Holder): Request for revision of proposed road dimension width, from 20 to 16 feet
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
The certificate holder requests that the Proposed Order Section I.D.3 be amended to clarify that all new facility access roads will be 16, rather than 20, feet in width.

Department Evaluation
In RFA4, Section 4.1.3.6, the certificate holder represented that "all newly constructed roads within the Solar Micrositing Area will be graveled to meet load requirements for all equipment. These internal access roads are expected to be approximately 20 feet in width." In RFA4, Exhibit V, Attachment V-1, the Draft Construction Wildfire Mitigation Plan states that "new roads proposed within the Solar Micrositing Area shall be sufficiently sized for emergency vehicle access in accordance with 2022 Oregon Fire Code requirements, including Section 503 and Appendix D - Fire Apparatus Access Roads. Specifically, the new roads proposed within the solar area fence lines will be 20 feet in width." In a subsequent comment, the certificate holder stated that this representation was only intended to apply to certain external access roads and other roads needed for emergency access (See Issue WF-04.)

In its response to this issue, the Department requested that the certificate holder provide a site plan showing the location and width of designated emergency access roads and other internal access roads to support the evaluation.

In reply to the Department's response to comments, the certificate holder provided a map showing that new roads connecting the existing facility access roads to the proposed substation, O&M building and solar array access gates would be designed to allow fire access (e.g. 20-foot roads) but all roads within solar array fencelines would be 16 feet.

Compliance with 2022 Oregon Fire Code Requirements is not required for all roads, only those that are intended to provide emergency vehicles access to structures and buildings in the event of a fire-related emergency. In addition, during a brief call on March 4, 2026, the Department discussed the road width changes with Chief Burbank of the North Sherman County Rural Fire Protection District (RFPD). Chief Burbank confirmed that fire response within the proposed solar array perimeter fencelines would be limited, and that the RFPD would primarily seek to contain any fire that started within or spread into a solar array from outside of the perimeter fences and that response vehicles have off-road capabilities. Because there would be limited need to ensure access by full-size emergency vehicles to portions of the facility within the perimeter fencelines, the Department recommends the Council grant the additional flexibility requested; however, under the Construction Wildfire Mitigation Plan attached to the draft Final

Order, the final site plan must be reviewed and approved by the Department in consultation with local fire and emergency management officials.

Issue GS-07 (Certificate Holder): Request to allow Temporary Construction Areas outside fenceline, within Solar Micrositing Area
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder requests clarification in the Proposed Order Section I.D.3 that temporary construction areas may be placed anywhere within the proposed Solar Micrositing Area, not only within perimeter fencelines. The certificate holder indicates that this clarification is consistent with the RFA and ensures construction logistics are not inadvertently limited.

Department Evaluation
In RFA4, Section 4.1.3.7., the certificate holder represented that temporary construction yards would be located within the fenceline (permanent disturbance footprint) of the proposed facility:

> "During construction, one 8.7-acre temporary construction area (laydown area) within the perimeter fencing will be used to support construction, store supplies and equipment, and facilitate the delivery and assembly of materials and equipment…Additional temporary construction areas may be used as determined by the construction contractor, but these would be within the solar areas considered permanent disturbance; therefore, maximum impact is evaluated in RFA4"

Certificate holder indicates that the proposed clarification is consistent with the RFA. In its reply to the Department's initial response, the certificate holder explains that **t**here are inconsistencies in the BCWF RFA4 Division 27, Sections 4.1.3.7 and 4.4.3 regarding the location of temporary construction areas. Section 4.4.3 states:

> "Any temporary disturbance impacts requiring restoration and revegetation will only occur outside of the perimeter fencing for the solar areas, BESS, and collector substation and include temporary impacts from the underground collector lines, laydown areas, installation of perimeter fencing, construction of the O&M building, gen-tie line, and use of any additional temporary construction areas."

Section 4.4.3, Table 2 explains that temporary disturbance areas outside the perimeter fenceline include, among other things "…Temporary disturbance for the laydown area for construction" and states that "…the construction area will be reclaimed following construction."

The certificate holder further explains that because the layout within RFA4 represented the maximum disturbance scenario, solar arrays were represented as being fenced in large blocks so that the largest permanent disturbance possible was represented, but this was not intended to represent that the primary laydown area would be located within a solar array fenceline. All areas within the micrositing area have been evaluated; therefore, regardless of whether the laydown area is within the permanent fenceline, the impacts have been evaluated.

The Department appreciates the certificate holder's clarification and agrees to make the following changes in Section I.D.3 of the Draft Final Order. Similar changes are presented in Section 3.2 of the Draft Amended Site Certificate:

An approximately 8.7 acre, temporary construction area would be ~~established within the perimeter fenceline,~~ used to store supplies and equipment and facilitate the delivery and assembly of materials and equipment during construction. Additional temporary construction areas may be utilized within the ~~permanent footprint of the proposed solar arrays~~ Solar Micrositing Area. The areas would consist of a crushed gravel surface that will be removed following construction and revegetated, crushed gravel surface that will remain following construction because that was the pre-existing surface condition, or vegetation that is left in place for which the need to revegetate would be evaluated following construction.

Issue GS-08 (Certificate Holder): Request for flexibility in perimeter fencing design
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests additional flexibility in perimeter fencing materials, including use of wire mesh or similar perimeter fencing up to 8 feet in height.

Department Evaluation
The description of perimeter fencing in the draft Site Certificate is consistent with information provided in RFA4, Section 4.1.3.6; however, the Department agrees that flexibility in the final design and type of fencing is allowable as long as the fencing is constructed and grounded in accordance with NESC Rule 110, would maintain public health and safety by preventing unauthorized entrance to the site, and would not create an unnecessary hazard for wildlife. The Department will incorporate changes in the draft Final Order Section I.D.3, draft Amended Site Certificate Section 3.2, and Section 4.1.5 of the Construction Wildfire Mitigation Plan, to allow the additional flexibility requested.

Issue GS-09 (Certificate Holder): Request for correction of description of Solar Micrositing Area
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests changes to a footnote in Facility Component Table to clarify Solar Micrositing Area is larger than permanent disturbance footprint, as presented below:

> ~~The Solar Micrositing Area would occupy approximately 1,445 acres within fenced areas and transmission line corridor. The entire solar facility footprint is considered a permanent disturbance area for the purposes of evaluating and mitigating impacts to resources such as Fish and Wildlife Habitat; however, soil reclamation and weed management is applicable to the solar facility footprint as discussed in applicable section in this order.~~
>
> The approved BCWF site boundary encompasses approximately 25,000 acres and includes all existing and approved BCWF components. The Certificate Holder proposes to modify the use of approximately 1,924 acres within the approved BCWF site boundary (Figure 3) to accommodate the Solar Components. These 1,924 acres comprise the Solar Micrositing Area (also referred to as the RFA 4 Site Boundary), within which construction of the Solar Components may occur.

Department Evaluation
The Department agrees with the certificate holder that the description of the Solar Micrositing Area and maximum permanent disturbance of the Solar Facility, as provided in the Proposed Order Section I.D, Table 2 footnote 1, should be clear and consistent with the table itself, (e.g. 1,924 acre Solar Micrositing Area and 1,445 acre maximum permanent disturbance.)

The footnote is intended to clarify the term "permanent footprint" from an impact assessment perspective. For example, impacts within the perimeter fence of a solar facility are a permanent impact under the Fish and Wildlife Habitat standard. But that does not mean impacts to soils and vegetation within the fenceline are permanent. In fact, impacts to soils and vegetation within the fenceline are not permanent and these impacts need to be minimized and mitigated under other standards, such as Soil Protection and Land Use.

The certificate holder's proposed revisions are providing a different intent – of clarifying that the existing site boundary is being used to accommodate solar, which has nothing to do with the impact assessment under Fish and Wildlife, Soil Protection or Land Use for this amendment. The Department disagrees with the incorporating the certificate holder's proposed language, but agrees to make the following change:

> Solar facility components would permanently occupy up to 1,445 acres within the 1,924 acre ~~The~~ Solar Micrositing Area~~would occupy approximately 1,445 acres within fenced areas and transmission line corridor~~. Areas within the perimeter fenceline of the solar facility ~~The entire solar facility footprint is~~ are considered a permanent ~~disturbance area~~

~~for the purposes of evaluating and mitigating impacts to resources such as~~ impact under the Fish and Wildlife Habitat standard; however, impacts within the perimeter fenceline to soils, vegetation and noxious weeds are not considered permanent under the Soil Protection and Land Use standards and must be minimized and mitigated, ~~soil reclamation and weed management is applicable to the solar facility footprint~~ as discussed in applicable sections in this order.

Issue GS-10 (Jered Reid/Donald Hilderbrand): Property owner does not consent to project being developed on his private property, as currently proposed.
Comment ID: BCWAMD4Doc24-16 Proposed Order Public Comments HilderbrandD via Law Office of Jered Reid 2026-01-29
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-04 Proposed Order Public Comment CH Response to Donald Hilderbrand 2026-02-13
Comment Summary
Mr. Hilderbrand, a person with an ownership interest in real property included in the proposed site, commented that he does not consent to his property being included in the project.

Department Evaluation
Matters related to property rights, including land access, purchasing, and leasing are generally outside of EFSC jurisdiction, meaning that EFSC cannot resolve disputes associated with these issues between landowners and the certificate holder, or between individual owners of a property.

In its responses to this issue, the Certificate Holder further clarified that no portion of the proposed facilities described in RFA4, or associated infrastructure, is planned on property owned by Mr. Hilderbrand, nor does the request contemplate the inclusion of non-participating landowners' property.

Because the commenter has not raised an issue related to a matter within the Council's jurisdiction, the Department does not intend to make any changes to the draft of the Final Order based on this comment.

III.B. Organizational Expertise (OAR 345-022-0060)

Issue OE-01 (McCullough, Kathryn; McCullough, Kevin); Maintenance issues at existing wind facility
Comment ID: BCWAMD4Doc24-01 Proposed Order Public Comment McCulloughK-1 2025-12-23
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13.
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24
Sur-reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06

Comment Summary
Commenters object to approval of RFA4 until maintenance issues at the existing wind facility are addressed, stating that the certificate holder "should not be allowed to build solar until the Vestas towers are fixed." Commenter provides documentation of ongoing maintenance issues at existing wind facility, including blade throw, leaks of hydraulic oil from nacelles and turbine towers, transformer failures, multiple fallen bolts, hatch doors, nose cones, and other objects from turbines.

Department Evaluation
In its responses to this issue, the certificate holder also acknowledges the operational incidents documented at the BCWF and explains that it has implemented targeted improvements specific to the BCWF, including changes to internal management structure and personnel; a change in the turbine operations and maintenance provider with a newly negotiated contract to mitigate future technical challenges and better align with site-specific performance goals; and improved monitoring of contractor performance. Improved preventative maintenance, robust monitoring, and corrective action planning will be the result of these changes, which are still ongoing. The certificate holder represents that "lessons learned from past challenges have resulted in more robust preventative maintenance and corrective action protocols, stronger vendor performance accountability, clearer performance standards tied to equipment health, and improved quality assurance and quality control oversight" and that the lessons "have informed the design, operational planning, and compliance framework for the proposed solar and battery energy storage systems under RFA4…" The certificate holder further maintains that recommended new and amended conditions in the Proposed Order and the implementing plans and conditions address the commenters concerns through mandatory reporting, defined timelines, corrective action tracking and inspection authority.

In replies, the commenter expressed their continuing concern with this issue.

As discussed on page 40 of the Proposed Order, the Department acknowledges that the existing wind facility has experienced substantial equipment and maintenance issues over the past several years.

While the Department does not agree that the maintenance issues demonstrate that the certificate holder, in partnership with BIGL, LLC, cannot operate or maintain a solar facility in compliance with site certificate conditions, the issues do demonstrate a deficiency in the adequacy of the existing site certificate conditions in ensuring systematic oversight of vendor performance, preventive maintenance, and safe, reliable construction and operation.

The Department has recommended the Council adopt additional conditions of approval to improve oversight and ensure the safe operation of the proposed solar components, including recommended Organizational Expertise Conditions 1 and 2 which require the finalization of the Draft O&M Framework Plan included as Attachment C to the Proposed Order. Based on comments and information provided on the record, the Department does not recommend any changes to the draft Final Order.

Issue OE-02 (Certificate Holder): Request to amend recommended Amended Condition 3 (CON-OE-01), removing reference to fax number as contact method for construction managers.
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests changes to recommended Amended Condition 3 (CON-OE-01) to remove requirement to provide fax numbers for construction managers.

Department Evaluation
The Department agrees that requiring a fax number is unnecessary given the other communication methods included in the recommended amended condition, including phone number and email address. The Department agrees to remove reference to "fax number" in recommended Amended Condition 3 (CON-OE-01) in the draft Final Order.

Issue OE-03 (Certificate Holder): Request to revise requirement to provide executed Build Transfer Agreement in draft Operations and Maintenance Plan Framework, allowing for submission of redacted copy
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests changes to recommended Organizational Expertise Condition 1 and Proposed Order Table 5, which requires submittal of an executed Build Transfer Agreement (BTA) as part of finalization of the O&M Framework Plan. Specifically, certificate holder requests that they be authorized to submit a redacted copy, redacting confidential terms and conditions.

Department Evaluation
The Department agrees that there are likely confidential terms and conditions of the BTA which do not have a nexus with the Organizational Expertise standard and therefore do not need to be included in the version submitted to the Department. Receipt by the Department of an executed BTA is a recommended requirement because it is the mechanism that will establish the certificate holder's role and responsibility for oversight and control over a third-party; and, the third-party's role and responsibility in selecting and managing construction contractors, construction and operation of the proposed solar components. The Department proposes to incorporate the following language in Proposed Order Table 5 and Table 1 of the draft O&M Framework Plan.

Confidential terms and conditions, unrelated to the roles, responsibilities, oversight and control of the certificate holder, third-parties, site certificate and facility, may be redacted from the executed BTA provided to the Department.

Issue OE-04 (Certificate Holder): Request to amend frequency of performance monitoring reports
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests changes to recommended Organizational Expertise Condition 1 (PRO-OE-01) through Table 1 of the O&M Framework Plan (Proposed Order Attachment C) and Proposed Order Table 5, to reduce the frequency of reporting results of vendor performance from monthly to quarterly. Certificate holder states that monthly reporting may over-emphasize short-term variability that does not reflect underlying performance trends, while quarterly reporting allows for more meaningful evaluation of system performance and provides sufficient time for the certificate holder and O&M contractors to address identified issues.

Department Evaluation
As presented in Table 1 of the O&M Framework Plan (Proposed Order Attachment C) and Proposed Order Table 5, under the heading "Reporting," the proposed monthly reporting requirement applies to identification of any significant performance issues and corrective actions taken by or for the participating entity, contractor(s) and vendor(s). Further, monthly reporting shall identify corrective actions, including stop work or removal from site, required of the vendor(s) for any performance scores less than 95% percent on-time inspection and repair completion rate.

The Department understands the certificate holder's concerns but disagrees that a lessor frequency be established prior to establishing a cadence or implementation and evaluation of the plan. The Department's experience with the existing operating facility demonstrates that more frequency is necessary to track and understand operational and maintenance issues and status and/or plan for repairs.

The draft O&M Framework Plan allows for annual review and update of the plan (see Proposed Order Attachment C, Section 5, Conclusions. The Department maintains that changes in monitoring and reporting frequency be evaluated once the plan is implemented, based on revisions necessary to support effective review and understanding of vendor performance.

The Department recommends an additional change to Section 5.0 of the draft O&M Framework Plan, stating that:

All changes are subject to review and approval by the Department.

Issue OE-05 (Certificate Holder): Request to clarify frequency of inspections using thermal imaging
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder requests to modify Proposed Order Attachment C, draft O&M Framework Plan, Section 3.4.2 as presented below:

> Routine module inspections and annual infrared/aerial thermal imaging with anomalies detected via SCADA generating corrective work orders ~~within 48 hours~~ according to the final Operations and Maintenance Plan.

Certificate holder requests this change stating that it is unlikely that SCADA will detect module-level anomalies for work order creation.

Department Evaluation
The Department accepts the certificate holder's clarification on the frequency of thermal imaging because it is the certificate holder's proposal, but requests further clarification related to SCADA's identification of anomalies and generation of work orders.

In its responses, the Department requested clarification of the intent of the change. In its replies, the certificate holder explained that the current language in Section 3.4.2 of the Draft O&M Plan conflates two different work streams for generating corrective work orders for anomalies detected 1) via routine module inspections and annual infrared/aerial thermal imaging, and 2) via the SCADA system. The certificate holder provided revised language replacing the original language in the Draft O&M Plan Section 3.4.2 (first and fifth bulleted item) with the following language to clarify these processes:

> o **Routine module inspections and annual infrared/aerial thermal imaging:** Anomalies detected will generate corrective work orders within 48 hours, and will be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final O&M Plan.
>
> o **Routine SCADA monitoring and data analysis:** Anomalies detected will generate corrective work orders within 48 hours and will be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final O&M Plan.

Because the proposed language merely clarifies that inspections and SCADA monitoring are two different pathways for identifying anomalies and potential issues occurring within the PV system, the Department agrees to make the proposed changes.

III.C. Structural Standard (OAR 345-022-0022)

Issue SS-01 (Certificate Holder): Request for flexibility to conduct ground disturbing activities on areas with steep slopes with engineer review
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests that recommended Amended Condition 68 be changed to allow ground disturbing activities in areas with slopes exceeding 20 percent when reviewed and approved by the Geotechnical Engineer of Record and designed to adequately address non-seismic hazard risks, as presented below.

> **Proposed Clarified Condition 68 (CON-SS-03):**
> The Certificate Holder shall design, engineer, and construct the solar facility to avoid dangers to human safety presented by non-seismic hazards, including but not limited to settlement, landslides, flooding, erosion, and collapsible soils. Ground-disturbing activities shall be avoided in areas with slopes exceeding 20 percent unless such activities are reviewed and approved by the Geotechnical Engineer of Record and designed to adequately address non-seismic hazard risks.

Department Evaluation
Recommended Amended Condition 66 requires that the certificate holder complete and submit a final Geotechnical Investigation prepared, which must be prepared for Geotechnical Engineer of Record and would evaluate seismic and non-seismic hazards at the site, based on final design. The language proposed by the certificate holder therefore is duplicative. Any changes to recommended Amended Condition 68 must be reviewed in tandem with recommended Amended Condition 66.

To assist in the evaluation of relaxing the prohibition of ground disturbing works on slopes exceeding 20%, the Department requests additional information regarding the types of ground disturbing activities on slopes exceeding 20 percent that are under consideration, the locations at the site where they are being considered, and any supporting evidence demonstrating how non-seismic geologic hazards in these areas will be mitigated. Please note that the recommended Condition 68 was intended to ensure compliance with the requirements of Sherman County's Natural Hazards (NH) Combining Zone and SCZO Section 3.7. If work on steep slopes within the NH Combining Zone is proposed, all information required under SCZO 3.7(5) must be included in RFA4.

In its reply, the certificate holder provided an additional map showing locations where cut and-fill on existing slopes above 20 percent would occur.

Based on this additional information, the Department acknowledges that there are some areas within the proposed Solar Micrositing Area outside of Sherman County's Natural Hazard Combining Zone where cut and fill to grade existing slopes to below 20 percent would not present a significant hazard, but the Department continues to have concerns about the certificate holder's proposal to locate facility components on or near the steep edges of Biglow Canyon and other areas within the County's Natural Hazard Combining Zone (see RFA4 Land Use Exhibit, Figure K-2).

To ensure these areas are avoided, while providing additional flexibility on the remainder of the site, the Department suggests Recommended Amended Condition 68 be further revised. Changes to the condition as presented in the Proposed Order are shown in underline, strikethrough, black font; additional changes recommended as a result of the comment evaluation process are shown un underline, strikethrough, red font.

> **Recommended Amended Condition 68:** The certificate holder shall design, engineer and construct the solar facility to avoid dangers to human safety presented by non-seismic hazards~~. As used in this condition, "non-seismic hazards",~~ include~~e~~ing but not limited to ~~settlement~~, landslides, flooding~~, and~~ erosion, and collapsible soils. Ground disturbing activities are not permitted in areas within Sherman County's Natural Hazard Combining Zone~~, nNo ground disturbing activity may occur in areas~~ where slopes exceed~~ing~~ 20 percent.

III.C. Soil Protection (OAR 345-022-0022)

Issue SP-01 (McCullough, Kathryn); Questions the type and height of weeds required to be controlled
Comment ID: BCWAMD4Doc24-06 Proposed Order Public Comment McCulloughK-6 2026-01-09
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13

Comment Summary
Commenter questions whether weeds are allowed to be a foot in height and whether noxious weeds, or all weeds, are required to be controlled/mitigated.

Department Evaluation
Noxious weeds will not be allowed to be 1-foot in height. The vegetation height limit of 1-foot established in the draft Construction Wildfire Mitigation Plan (WMP) Section 4.6.1. applies to beneficial vegetation, not noxious weeds.

Noxious weeds and invasive annual grass are required to be treated, controlled and monitored during construction and operation (see recommended Soil Protection Conditions 1 to 3).

In its responses to this issue, the certificate holder also commented that it believes the concerns are already addressed by the Proposed Order and its recommended plans and conditions.

The Department considers this issue resolved.

Issue SP-02 (Certificate Holder); Requests to clarify statement referring to the use of Sherman County for weed control.
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate Holder requests to clarify that while there is intent to contract the Sherman County Weed Control District to implement measures of the Weed Control Plan, the District may not have sufficient capacity to manage implementation, in which case other qualified vendors may be contracted to implement the measures of the Weed Control Plan.

Department Evaluation
RFA4 Exhibit K Land Use, Section 8.1.3.1 states, "The Certificate Holder currently contracts with the Sherman County Weed Control District to inspect and treat weeds at BCFW and will continue to use their staff's services to treat the Solar Micrositing Area." This representation was incorporated into the Proposed Order Section D.1. Soil Protection; however, it was not expressly incorporated into a condition or weed-related mitigation requirement.

Recommended Soil Protection Conditions 1 to 3 require finalization and implementation of the draft Comprehensive Solar Vegetation and Soil Management Plan (Proposed Order Attachment D). Weed control requirements applicable prior to and during construction and operation are included in this plan. The plan does not require that the certificate holder contract with Sherman County Weed Control District to implement and monitor the requirements of the plan but rather requires that it be implemented by a qualified Weed Control Contractor.

The Department agrees that the recommended findings of fact can be updated based on the certificate holder's revised representation. Rather than revising the facts to refer to the potential of contracting with Sherman County Weed District or qualified vendors for weed control, the Department recommends that the findings of fact be revised to refer to the requirements of the draft Comprehensive Solar Revegetation and Soil Management Plan, as presented below:

~~The certificate holder has indicated that the District will be contracted to implement the measures of the Weed Control Plan.~~[1] Prior to and during construction and operation of the facility components proposed in RFA4, the certificate holder will be required to hire a Weed Control Contractor responsible for performing weed control in accordance with the Comprehensive Solar Revegetation and Soil Management Plan under recommended Soil Protection Conditions 1 through 3.[2]

The Department considers this issue resolved.

Issue SP-03 (Certificate Holder); Requests Revisions to Mapped Soil Units in Analysis Area
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests revision of percentage of Solar Micrositing Area in Soil Unit 16D in Proposed Order Table 7. Commenter recommends amount should be 0.1%, not 0.2%.

Department Evaluation
Based on review of AMD4 Exhibit I, the Department agrees to correct Table 7 in the draft Final Order, as requested.

The Department considers this issue resolved.

Issue SP-04 (Sherman County Weed District) Concerns related to 1-3" veg height under WMP and ability of that height to provide erosion control
Comment ID: BCWAMD4Doc24-15 Proposed Order Public Comment Sherman County Weed District 2026-01-28
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-02 Proposed Order Public Comment CH Response to Colton McCullough 2026-02-13; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13; BCWAMD4Doc27-13 Proposed Order Public Comment CH Response to Sherman Co Weed District 2026-02-13;

Comment Summary
Sherman County Weed District (SCWD) recommends vegetation be maintained at 4-8 inch height during dry season to support erosion control. SCWD suggests that a vegetative height of

[2] BCWAMD4DocXX. Proposed Order on AMD4 Attachment D, Table A-2, pg. A-3. The draft Comprehensive Solar Revegetation and Soil Management Plan includes additional experience requirements for the Weed Control Contractor.

1-3 inches will not support erosion control. SCWD also expresses concerns with the viability of bunchgrass species if maintained at the 1-3 inch height.

Department Evaluation
The Department is evaluating several comments related to the recommendation that vegetation within the solar facility and other vegetation clearance areas be maintained at 1 to 3 inches during fire season to mitigate fire risk. Mr. McCullough recommends the recommendation be implemented throughout the life of the facility (Issue WF-09). SCWD recommends that the vegetation height standard be increased to 4 to 8 inches to support erosion control and enhance viability of bunchgrass species.

In its comments, the certificate holder requested that the height standard be increased to 10 to 12 inches year-round but in reply to the Sherman County Weed District, requested that ODOE take the District's professional recommendation into consideration and revise the Proposed Order and implementing plans accordingly to require management of grass height at 4 to 8 inches during dry season. Mr. McCullough commented that he did not agree that 8" vegetation would be safe from a wildfire standpoint, but acknowledged the importance of not mowing native bunch grasses shorter than 3-4" to protect the crown of the plant. He conceded that a slightly taller vegetation height (3" to 6" during fire season June-Oct) would be acceptable considering erosion control, vegetation health, and fire risk together.

The Department maintains that vegetation management is a critical tool for minimizing wildfire risk associated with the proposed facility but defers to the professional recommendation of the County Weed Control District as to the appropriate standard to best balance wildfire risk mitigation and soil protection. Consistent with the District's recommendation, the Department revised Section III.N.I Wildfire Prevention and Risk Mitigation of the draft Final Order, Attachment G draft Construction Wildfire Mitigation Plan, and Appendix F of the draft Comprehensive Revegetation and Soil Management Plan to include reference to vegetation requirements below:

a. **Vegetation Height and Clearance**

Vegetation within and adjacent to the Solar Components will be maintained as follows:

- During the dry season (June to October), vegetation height will be limited to 4 to 8 inches. Vegetation will be mowed to a height of 4 inches prior to June of each year.
- Outside of the dry season (November to May), vegetation will be maintained at a maximum height of less than 12 inches~~,~~.
- ~~with a~~ A minimum vertical clearance of 12 inches from all electrical and mechanical equipment will be maintained at all times.
- Vegetation exceeding ~~this~~ the heights listed above will be mowed or removed ~~prior to local~~ in accordance with any ODF- or County-issued fire restrictions.

…

Issue SP-05 (McCullough, Kathryn); Long-term soil health
Comment ID: BCWAMD4Doc24-17 Proposed Order Public Comment McCulloughK-10 2026-01-29
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Ms. McCullough raises concerns about lack of evidence supporting claims related to long-term soil improvement following use of the site for solar after 50 years.

Department Evaluation
Ms. McCullough does not identify a specific recommended finding, condition, or conclusion for which she objects Vegetation management and erosion control is required under the Draft Comprehensive Revegetation and Soil Management Plan established under recommended Soil Protection Conditions 1 to 3, however commenter has not explained how plan is deficient or could be improved.

In its responses on this issue, the certificate holder provides a memo summarizing some recent published literature outlining some of the ecosystem service benefits that can result from native vegetation management practices at solar photovoltaic facilities, such as the creation of microhabitats around solar panels with lower air temperatures and evapotranspiration rates, higher soil water content, and additional surface roughness that slows wind speeds and protects against erosion. The certificate holder also highlighted conditions of approval related to soil protection and the provisions of the draft Comprehensive Revegetation and Soil Management Plan for vegetation management and erosion control at the site.

The Department does not recommend revisions to the draft Final Order based on this comment because the commenter did not identify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object.

Issue SP-06 (Sherman County Soil and Water Conservation District, A. Whitman); Requests to develop a strong working relationship with certificate holder/BrightNight to ensure soil protection measures are in place.
Comment ID: BCWAMD4Doc24-21 Proposed Order Public Comment Sherman SWCD 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-14 Proposed Order Public Comment CH Response to SWCD 2026-02-13

Comment Summary
Ms. Whitman of Sherman County Soil and Water Conservation District (SCSWCD) requests to develop a strong working relationship with certificate holder/BrightNight to ensure soil protection measures are in place.

Department Evaluation
In its responses to the Sherman County SWCD on this issue, the certificate holder emphasized previous attempts to engage with Ms. Whitman and highlighted the conditions related to soil protection included in the Proposed Order.

In the Department's responses, the Department requested that Ms. Whitman identify specific recommended findings, conditions, or conclusions of law to which she objects and explain the regulatory nexus for requiring consultation, and adherence to recommendations provided during consultation.

Ms. Whitman did not reply to either the certificate holder or Department. Because the commenter did not identify the specific recommended findings, conditions, or conclusions of law to which she objects, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. Accordingly, the Department does not recommend any changes to the draft Final Order in response to this issue.

Issue SP-07 (Sherman County Soil and Water Conservation District, A. Whitman); Potential soil contamination from fire-damaged photovoltaic modules or battery components.
Comment ID: BCWAMD4Doc24-21 Proposed Order Public Comment Sherman SWCD 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-14 Proposed Order Public Comment CH Response to SWCD 2026-02-13

Comment Summary
Ms. Whitman of SCSWCD raises concerns about potential for panels or batteries damaged by fire or other cause to release toxins into soils and waterways.

Department Evaluation
In its responses to the Sherman County SWCD on this issue, the certificate holder emphasized previous attempts to engage with Ms. Whitman and highlighted the conditions related to soil protection included in the Proposed Order.

In its responses, the Department notes that Ms. Whitman does not identify a specific recommended finding, condition, or conclusion for which she objects. Control of noxious weeds and annual grasses is required under the Draft Comprehensive Revegetation and Soil Management Plan established under recommended Soil Protection Conditions 1 to 3, however Ms. Whitman has not explained how the plan is deficient or could be improved. Wildfire minimization and mitigation are required under Wildfire Prevention and Risk Mitigation Conditions 1 to 3, however commenter has not explained how plan is deficient or could be improved.

Because the issue was not raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond, the Department does not recommend any changes to the draft Final Order in response to this issue.

Issue SP-08 (Sherman County Soil and Water Conservation District, A. Whitman); Enforcement of requirements for natural resource protection.
Comment ID: BCWAMD4Doc24-21 Proposed Order Public Comment Sherman SWCD 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-14 Proposed Order Public Comment CH Response to SWCD 2026-02-13

Comment Summary
Ms. Whitman of SCSWCD raises concerns about enforcement of measures to protect environment and natural resources. She suggests that the State hold the certificate holder accountable for controlling weeds, preventing soil erosion, promoting fire prevention, and any other practices that ensure the health of the surrounding community and watersheds.

Department Evaluation
In its responses to this issue, the certificate holder highlights conditions of approval related to soil protection in the Proposed Order and provisions related to weed control, erosion control, and fire prevention in the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D of the Proposed Order.

In its responses, the Department noted that Ms. Whitman did not identify a specific recommended finding, condition, or conclusion of law to which she objects, and that Ms. Whitman had not explained how the draft Comprehensive Solar Revegetation and Soil Management Plan is deficient or could be improved.

Because the issue was not raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond, the Department does not recommend any changes to the draft Final Order in response to this issue..

Issue SP-09 (Certificate Holder); Requests to Clarify Terms, Clear Brush Free and Vegetation Clearance Area/Zone
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder provides the following clarification to ensure consistent interpretation of buffer area requirements along roads and perimeter fencelines within the Solar Micrositing Area. The terms “clear, brush-free area” and “vegetation-clearance area/zone” are used in

multiple locations in the Proposed Order and Attachments D and G without consistent definition. To improve the clarity and avoid misinterpretation, the certificate holder requests that these terms be replaced with "low-growing, fire-resistant vegetation," or that the documents otherwise clarify that these buffer areas are intended to be maintained with low-growing, fire-resistant vegetation rather than fully devoid of vegetation.

In addition, the certificate holder notes an inconsistency regarding whether the required buffer along the perimeter fenceline is intended to be 10 feet on each side or 20 feet measured along the exterior or interior and requests clarification from ODOE to ensure consistent understanding and implementation of the buffer requirement.

Department Evaluation
In the Proposed Order Attachment G Section 4.1.6 (draft Construction WMP), the Department recommended the following:

> During construction clearing, grubbing, and grading, the contractor will establish a noncombustible buffer zone extending a minimum of 10 feet inside the fenceline and another minimum 10-foot limits of disturbance buffer outside the fenceline for a total of a minimum of 20 feet of noncombustible buffer around the perimeter of the site.

Also as presented in the draft Amended Site Certificate Table 1 attached to the Proposed Order, the vegetation management buffer for the perimeter fenceline is established at 20 feet. These requirements were based on the draft Construction Wildfire Mitigation Plan and draft Comprehensive Revegetation and Soil Management Plan provided by the certificate holder.

In its responses, the Department agreed that the varying terms used in Section III.D.1 and draft Amended Site Certificate should be replaced with a consistent term, "noncombustible buffer" and be further clarified that for the perimeter fenceline, the buffer extends 10-feet on either side.

In replies, the certificate holder provided additional information to support its request to replace all references to a "noncombustible buffer" with the term ""low-growing, fire-resistant vegetation." The certificate holder requests that this change be applied to areas along the solar array fencelines, access roads, and perimeter fenceline. While the certificate holder does not request to reduce the size of the 20-foot fuel breaks around the perimeter of the site the certificate holder does request to change the standards for vegetation management in this zone. The certificate holder argues that these changes are necessary to address existing erosion concerns while providing wildfire mitigation at the Project site.

In sur-replies to Kevin and Kathryn McCullough, the certificate holder provided a redlined of the draft Construction Wildfire Mitigation Plan which removes the perimeter buffer from the list of areas the certificate holder previously represented would be "managed to be vegetation-free, noncombustible space, or gravel surface" and instead represents that "20 feet of low-growing, fire-resistant vegetation buffer [would be maintained] around the perimeter of the site (10 feet

on each side of the fenceline)." The revised draft Construction Wildfire Mitigation Plan further represents that "Vegetation within 10 feet of each side of all service roads will be managed with low-growing, fire-resistant vegetation" rather than a vegetation free, noncombustible, zone.

Section 1205.5.1 of the Oregon Fire Code provides:

> *"A clear brush free area of 10 feet shall be required around the perimeter of the ground-mounted photovoltaic arrays or as determined by the fire code official. A maintained vegetative surface or noncombustible base, approved by the fire code official, shall be installed and maintained under the photovoltaic arrays and associated electrical equipment installations."*

The Department acknowledges the need to balance wildfire protection with erosion control, particularly given the presence of highly erodible soils at the site. Given this need, as well as the inconsistencies in the record, the Department will defer to the requirements of the Oregon Fire Code and will insert the term "clear, brush free area." The Department acknowledges that this term may include either a noncombustible, non-vegetated area or an area of low-growing, fire resistant vegetation, and requests that the certificate holder consult with local fire officials on specific management criteria and provide documentation of the local fire officials determination of what standard is appropriate as part of the pre-construction compliance review process.

The following changes are incorporated into Section III.D.1 Soil Protection, draft Construction Wildfire Mitigation Plan and Appendix F of the draft Comprehensive Solar Revegetation and Soil Management Plan attached to the draft Final Order:

> •A minimum 20-foot ~~non-combustible buffer~~ clear, brush free area will be maintained around the ~~interior or exterior~~ perimeter of fenced solar array areas (10-feet inside the fence and 10-feet outside the fence); activities necessary to maintain the area as clear, brush free shall be based on consultation with the local fire code official.~~, and~~

Issue SP-10 (Certificate Holder); Requests revisions to Draft Comprehensive Revegetation and Solar Management Plan
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder provides additional recommended edits to the draft Comprehensive Revegetation and Solar Management Plan presented as Attachment D to the Proposed Order.

Department Evaluation

The Department reviewed the certificate holder's proposed changes to the draft Comprehensive Revegetation and Solar Management Plan and generally agrees to administrative changes and clarifications. As presented for Issue FW-03, the Department does not agree to the certificate holder's request for flexibility in ground disturbing activities during the sensitive ground nesting bird season.

The Department reviewed the certificate holder's requested changes to the seed mix presented in Appendix F Table 2 in consultation with ODFW. ODFW confirmed that the proposed seed mix is acceptable, but recommend ensuring the forbs are available, as some of those species can be difficult to find and have appropriate alternates or additions to the seed mix.

Issue SP-11 (Sherman County Soil and Water Conservation District, A. Whitman); Erosion Control

Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-14 Proposed Order Public Comment CH Response to SWCD 2026-02-13

Comment Summary

Ms. Whitman of SCSWCD raises general concerns about the spread of noxious weeds and annual grass at the site and their potential to increase wildfire risk.

Department Evaluation

In responses to this issue, the certificate holder highlights conditions of approval related to soil protection in the Proposed Order and provisions related to weed control in the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D of the Proposed Order.

In its responses, the Department notes that Ms. Whitman did not identify a specific recommended finding, condition, or conclusion of law to which she objected and that Ms. Whitman had not explained how the draft Comprehensive Solar Revegetation and Soil Management Plan is deficient or could be improved.

Because the issue was not raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond, the Department does not recommend any changes to the draft Final Order in response to this issue.

Issue SP-12 (Sherman County Soil and Water Conservation District, A. Whitman); Weed Control

Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-14 Proposed Order Public Comment CH Response to SWCD 2026-02-13

Comment Summary

Ms. Whitman of SCSWCD raises general concerns about the spread of noxious weeds and annual grass at the site and their potential to increase wildfire risk.

Department Evaluation
In its responses to this issue, the certificate holder highlights conditions of approval related to soil protection in the Proposed Order and provisions related to weed control in the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D of the Proposed Order.

In its response, the Department notes that Ms. Whitman did not identify a specific recommended finding, condition, or conclusion of law to which she objects. Ms. Whitman has not explained how the draft Comprehensive Solar Revegetation and Soil Management Plan is deficient or could be improved.

Because the issue was not raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond, the Department does not recommend any changes to the draft Final Order in response to this issue.

III.D. Land Use (OAR 345-022-0030)

Issue LU-01 (Certificate Holder); Request for reduction in requirements for Site Plan Review
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder requests the following changes be made to recommended Land Use Condition 3:

a. Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department and the Sheman County Planning Commission, an application for Conditional Use Permit ~~pursuant to ORS 469.401(3) meeting the requirements of SCZO Section 5.4(1) and (3).~~
b. ~~The Site Plan required under SCZO 5.4(1) must demonstrate compliance with all applicable local ordinances and site certificate conditions.~~
[Final Order on AMD4]

The certificate holder asserts that because it has elected to seek a Council determination of compliance with statewide land use planning goals under ORS 469.504(1)(b), Sherman County would not have discretionary approval of a CUP or Site Plan, and compliance with applicable sections of the Sherman County Zoning Code (SCZO) would be determined by Council and memorialized in the Final Order and Site Certificate.

Department Evaluation
The certificate holder is correct that under ORS 469.401(3), an affected County does not have general discretion to reject a permit addressed in an amended site certificate, the statute explicitly authorizes the County to consider whether the permit is consistent with the terms and conditions of the amended site certificate. The statute also requires the certificate holder to submit "proper applications and payment of the proper fees" for any permit addressed in the site certificate, including the Conditional Use Permit. In its responses to this issue, the Department requested additional information on why the certificate holder believed requiring a site plan would not be needed, or why, the condition, as written would be inconsistent with ORS 469.401(3).

In its reply, the certificate holder argues that requiring a demonstration of compliance with all applicable local ordinances and site certificate conditions when applying for a conditional use permit is contrary to the plain language and the intent of the statute because it would require the County to exercise discretion in making its determination. The certificate holder that issuance of a conditional use permit under ORS 469.401(3) is not supposed to involve discretion. Here, the Department disagrees. The statute provides as follows:

> "…After the site certificate or amended site certificate is issued, the only issue to be decided in an administrative or judicial review of a state agency or local government permit for which compliance with governing law was considered and determined in the site certificate or amended site certificate proceeding *shall be whether the permit is consistent with the terms of the site certificate or amended site certificate*." (emphasis added)

In addition, ORS 469.401(5) provides that

> "Nothing in ORS chapter 469 shall be construed to preempt the jurisdiction of any state agency or local government over matters that are not included in and governed by the site certificate or amended site certificate. Such matters include but are not limited to employee health and safety, building code compliance, wage and hour or other labor regulations, local government fees and charges *or other design or operational issues that do not relate to siting the facility."*

Taken together, these provisions establish a limited scope of local review to ensure that a facility is consistent with the terms and conditions of a site certificate, and with any applicable local ordinances that were not included in and governed by the site certificate. While this review is generally limited to ministerial level decisions, some level of discretion on part of the County planning staff is necessary.

The Department and the County will need a final site plan in order to verify that the facility will comply with setback, dimensional requirements, and other restrictions imposed through site certificate conditions and applicable local ordinances. While the Department believes the

condition is appropriate as written, the following clarifying edits have been made in the draft Final Order:

Recommended Land Use Condition 3

a. Prior to construction of any component or phase of the solar facility, the certificate holder shall submit, to the Department and the Sheman County Planning Commission, an application for Conditional Use Permit ~~pursuant to ORS 469.401(3)~~ meeting the requirements of SCZO Section 5.4(1) and (3).
b. The Site Plan required under SCZO 5.4(1) must demonstrate compliance with all ~~applicable local ordinances and~~ site certificate conditions and the applicable substantive criteria addressed in the Final Order on AMD4.

[Final Order on AMD4]

Issue LU-02 (Certificate Holder); Objection to Evaluation of Compliance with SCZO 5.2(5)

Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30

Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary

Certificate holder objects to the Department's recommended finding that the proposed facility would not comply with SCZO 5.2(5) and requests that the Department reconsider its recommended finding that the acreage thresholds under OAR 660-033-0130(38)(k) are a "land standard" within the meaning of the SCZO, arguing instead that they are thresholds that, if triggered, require the application of more stringent review criteria under the exceptions test. The certificate holder restated its position in its reply but did not provide new argument or evidence.

Department Evaluation

In the Proposed Order, the Department recommends the Council find:

> "…the facility components proposed in RFA4 would generally comply with applicable air, water, and solid waste standards; however, as described in the evaluation of directly applicable state rules and laws under ORS 197.646, below, the facility components proposed in RFA4 would exceed the maximum amounts of arable and high-value farmland allowed under OAR 660-033-0130(38), and for this reason cannot be approved without an exception to Statewide Planning Goal 3."

OAR 660-033-0130 establishes the minimum standards applicable to the schedule of permitted and conditional uses under OAR 660-033-0120. OAR 660-033-0130(38)(g) provides as follows: "For high-value farmland described at ORS 195.300(10), a photovoltaic solar power generation facility shall not use, occupy, or cover more than 12 acres" unless certain standards are met. A similar standard is established under OAR 660-033-0130(38)(i) which provides; "For arable

lands, a photovoltaic solar power generation facility shall not use, occupy, or cover more than 20 acres..."

Similar to all other standards set in the rule and the SCZO, if a facility would use, occupy, or cover, more land than allowed by the rule, then the facility cannot be approved as a conditional use. Instead, the project proponent must seek an exception to the standards and the Statewide Planning Goal the standards implement. Because the acreage thresholds in OAR 660-033-0130(38) are used to determine whether a facility can be approved as a Conditional Use, and because they are directly applicable to any Sherman County Land Use decision under ORS 197.646, the Department maintains that they are effectively land use standards within the meaning of SCZO 5.2.

Issue LU-03 (Certificate Holder); Objection to Evaluation of Compliance with SCZO 5.2(6)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder objects to the Department's recommended finding that the proposed facility would not comply with SCZO 5.2(6) and requests that the Department reconsider its finding that failure to comply with acreage threshold under OAR 660-033-0130(38)(k) is a "use violation" within the meaning of the SCZO.

Department Evaluation
The Department agrees with the certificate holder that the obligation to receive approval of a Goal 3 exception does not constitute a "use violation" of the SCZO and agrees to revise the analysis.

Issue LU-04 (Certificate Holder); Objection to Evaluation of Compliance with SCZO Section 5.8(20)(1)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder objects to the Department's recommended finding that the proposed facility would not comply with SCZO 5.8(20)(1) and request that the Department reconsider its finding that failure to comply with acreage threshold under OAR 660-033-0130(38) would result in the proposed facility being incompatible with farm use. The certificate holder restated its position in its reply.

Department Evaluation
The Department interprets the "compatibility with farm use" standard under SCZO 5.8(20)(1) to mean that the non-farm use is compatible with farm uses on the subject tract, which is a distinct issue from the compatibility with adjacent uses criteria found in SCZO 5.8(20)(2) and in the Council's exception criteria under ORS 469.504(2)(c)(C). The Department maintains that the minimum standards applicable to conditional uses under OAR 660-033-0130 are an appropriate measure of whether a proposed facility is compatible with farm use when the County has not adopted its own standards or criteria.

Issue LU-05 (Certificate Holder) Objection to Evaluation of Compliance with SCZO 5.8(20)(3)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder objects to the Department's recommended finding that that proposed facility would not comply with SCZO 5.8(20)(3) and requests that the Department reconsider its finding that conversion of approximately 1,445 acres of cultivated land, including 1,006 acres of high-value farmland, to a non-farm use has the potential to materially alter the overall land use pattern of the analysis area by reducing the number of tracts available for farmland and potentially affecting the local agricultural economy.

Department Evaluation
The Department disagrees with the scope of the analysis provided by the certificate holder, including 130 square miles. The Land Use analysis area includes the area within and extending ½-mile from the site boundary. In its response on this issue, the Department requested that the certificate holder provide an analysis of SCZO 5.8(20)(3) based on the established Land Use analysis area, to support review of this comment. In its reply, the certificate holder declined to provide the requested analysis, arguing that the geographic extent in SCZO 5.8(20)(3) requires a look beyond the EFSC Land Use Analysis Area at the "overall land use pattern of the area." This is the broadest geographic extent language in SCZO 5.8(20), expanding beyond the adjacent lands or the tract. The EFSC Land Use Analysis Area is frequently used to describe the adjacent or surrounding lands to the project site. When considering changes to overall patterns, that means land use patterns within swaths of the County like North Sherman County, not the surrounding lands within the EFSC Land Use Analysis Area.

The Department maintains that the Analysis Area is the appropriate scale on which to evaluate stability of the overall land use pattern, particularly considering the 1-mile study radius for smaller projects that is required under OAR 660-033-0130(38)(h)(G) and (i)(D). The Department does not recommend any changes to the draft Final Order based on this issue.

Issue LU-06 (von Borstel, Alan); Concern with cumulative impacts of solar development in Sherman County
Comment ID: BCWAMD4Doc24-11 Proposed Order Public Comment Von BorstelA 2026-01-20

Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-00 Proposed Order Public Comment CH Response to Alan von Borstel 2026-02-13

Comment Summary
Mr. Von Borstel raises concern that cumulative impacts of solar development in Sherman County may adversely affect wildlife, wildfire protection, cultural, historic and scenic the agricultural community, and supporting industries.

Department Evaluation
Mr. Von Borstel raises concerns about the cumulative impact of solar development in Sherman County. He did not identify a specific standard or legal requirement or a specific impact that would result from the construction and operation of the proposed facility under consideration.

As such, the Department does not believe the commenters issue was raised with sufficient specificity to afford the Council, Department, or certificate holder an opportunity to respond. If the commenter objects to one or more findings of fact, conclusions of law, or conditions of approval in the Proposed Order, the Department requests that commenter identifies these findings, conclusions, or conditions in their reply.

Issue LU-07 (Multiple Commenters); Recommendation that "Right to Farm" protections are needed to protect farmers from wildfire liability
Comment ID: BCWAMD4Doc24-02 Proposed Order Public Comment McCulloughK-2 2025-12-24; BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05; BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30; BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-05 Proposed Order Public Comment CH Response to Irene Gilbert 2026-02-13; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24Sur-Reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06
Comment Summary
Commenters raise concerns about the increased risk of liability to farmers that could arise if a fire started by farming practices damaged the solar facility. Commenters object to recommended approval of solar facility in "high fire risk area" without hold harmless clause. Commenters assert that potential liability for a wildfire started by normal farming practices could result in bankruptcy, and without protections from liability the project infringes on the commenters "right to farm" under ORS 30.930 to 30.947.

Department Evaluation
Matters of liability are generally not within the Council's jurisdiction. Providing farmers the suggested liability protections would be a matter to take up with the state legislature. There

was no new argument or evidence provided in the commenter's reply, as such, the Department does recommend any revisions in the draft of the Final Order based on this comment because the comment raises an issue that is not within the scope of Council's authority.

Issue LU-08 (Certificate Holder); Objection to Evaluation of OAR 660-033-0130(38)(G)
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder objects to Departments recommended findings under evaluation of OAR 660-033-0130(38)(h)(G).

Department Evaluation
In its evaluation of this criteria, the Department states, "No solar facilities have been constructed or have been approved within the study area identified by rule, so no further analysis is necessary; however, the rule was intended to apply to a facility less than 12 acres in size and does not accurately capture the proposed facilities' potential impacts on the stability of the overall land use pattern..."

As stated, the Department's recommended finding is that no further analysis of the criteria is needed. The additional explanation is intended to provide context for recommended findings under the evaluation of SCZO 5.8.20(3). The Department will include clarifying changes in both sections to clarify that the Department's evaluation of the proposed facilities potential impacts on the stability of the overall land use pattern of the area is informed by, but independent of, the test required under OAR 660-033-0130(38)(h)(G).

Issue LU-09 (Oregon Wheat Growers League); Recommendation to include impact of lost assessments in economic impact analysis
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary
Commenter raises a concern that the certificate holder's analysis of economic impacts of the RFA4 facility changes does not account for lost agricultural assessments that fund research, market development, and grower services. Recommends updating the impact analysis to account for lost assessment revenues.

Department Evaluation
The commenter has not objected to a Department recommended finding of fact, conclusion of law or condition of approval in the Proposed Order, but rather to the scope of the certificate holder's analysis of the indirect economic impacts of the proposed RFA4 changes.

In its responses the certificate holder explains that, while wheat assessment revenues were not evaluated as a discrete category, the indirect impacts to the local agricultural economy in Sherman County associated with changes in production were estimated and mitigated through the sector-based approach reflected in the record (Attachment K-2, Agricultural and Fiscal Impact Analysis).

The Department does not recommend any changes to the draft Final Order based on this issue because the comment does not identify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object.

Issue LU-10 (Oregon Wheat Growers League); Objection to claim that Community Investment Plan will offset impacts to agricultural economy

Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary

Commenter contends the draft Community Investment Plan (CIP) "does not deliver" on a statement by the certificate holder that the CIP will "ensure any negative economic impacts that could result from the decrease in total acres of wheat production in the county will be offset by investments in the local agricultural community."[3] Contends that mitigation cannot fully offset the loss of agricultural land into an industrial use.

Department Evaluation

The commenter has not objected to a Department recommended finding of fact, conclusion of law or condition of approval in the Proposed Order regarding the CIP, but rather to a statement the certificate holder made about the CIP. Council must consider whether the proposed CIP supports a "rural economic benefits" reason for granting an exception to statewide planning Goal 3, which seeks to preserve agricultural land. The Department has not contended the CIP will fully offset any/all negative economic impacts to the local agricultural community. Rather, the Department has recommended the Council find the proposed CIP "*reasonably addresses* the indirect impacts of converting agricultural lands in the proposed Solar Micrositing Area to nonfarm use"[4] and recommended Council find that implementation of the CIP supports a rural economic benefits reason for granting an exception to Goal 3.

In its responses on this issue, the certificate holder restated that the economic modeling supporting the CIP adequately accounted for indirect and induced impacts to the agricultural economy. And that the evidence provided in the record, and the stakeholders consulted, adequately informs the market conditions for Sherman County wheat growers.

[3] RFA4, Exhibit K, Land Use, p. 71.
[4] Proposed Order, pp. 139-140.

The Department does not recommend any revisions to the draft Final Order based on this comment because the comment does not identify a recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which the commenter objects.

Issue LU-11 (Oregon Wheat Growers League): Recommendation to include Oregon Wheat Growers League in Community Investment Selection Committee

Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary

Commenter recommends that farmer representatives should be included in decision making process. Recommends Oregon Wheat Growers League be included in structure.

Department Evaluation

The commenter expresses concern there is no guarantee a farmer representative will be "built into the decision-making process" and proposes to "update the structure to include a representative from the Oregon Wheat Growers League."

To help inform the development of the CIP and to identify potential projects that would support the local agricultural economy the certificate holder met with, among other persons and groups, local wheat farmers and the Oregon Wheat Commission. That coordination led to the certificate holder including in the CIP five "pre-screened" projects that would qualify for funding. For other proposals, a five-person advisory committee (Selection Committee) would review applications and make recommendations to the Sherman County Board of Commissioners on funding. The Selection Committee would include one representative from Sherman County government; one representative from an academic institution engaged in agriculture research in Sherman County or an agricultural-related nonprofit entity located in Sherman County; *one dryland farm producer in the County*; one community member; and one representative with expertise in wildfire as it relates to agricultural lands.[5]

In its response to this issue, the certificate holder responded that they supported revising the final CIP to include a representative from the OWGL on the Selection Committee. The certificate holder requested that ODOE acknowledge this request and recommend to EFSC that the CIP be revised in Section 4.2.1 to identify the addition of one representative from the OWGL. The Department agrees with the certificate holder's request.

Issue LU-12 (Oregon Wheat Growers League): Need for engagement with Market Development Organizations in developing Community Investment Plan

Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

[5] Proposed Order, p. 139 and Attachment E (the draft CIP), Section 4.2.1.

Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary

Commenter recommends that further consultation with market development organizations (e.g. , Oregon Wheat Commission, U.S. Wheat Associates, National Association of Wheat Growers and Northwest Grain Growers) seeking to understand the long-term markets in domestic and international capacities "is needed to clarify statements listed in the market statements."

Department Evaluation

In its response on this issue, the Department is not clear on what "market statements" the commenter is referring, nor what further consultation with the recommended organizations would achieve. As such, the Department does not recommend any changes be made to the draft Final Order based on this issue because the commenter does not identify the recommended findings of fact, conclusions of law or conditions of approval identified in the proposed order to which they object.

Issue LU-13 (Oregon Wheat Growers League): Concern with inclusion of agrivoltaics research as pre-screened project in Community Investment Plan

Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary

Commenter raises concern with inclusion of agrivoltaics research in pre-screened mitigation project list, alleging "[t]his areas is overstated" and the project "would not produce meaningful results." Recommends producer-led analysis of research proposals would allow research investments to match the growing area most effectively.

Department Evaluation

Dryland wheat agrivoltaics research is one of five pre-screened projects identified in the draft Community Investment Plan (CIP) as having a direct benefit to the rural agricultural economy of Sherman County. These five projects were developed based on outreach and coordination with key stakeholders from the Sherman County agricultural community, as well as state-wide agricultural-related organizations including local wheat farmers, the Oregon Watershed Enhancement Board (OWEB), Oregon State University (OSU) including its extension service in Sherman County and the College of Agricultural Sciences, the Oregon Wheat Commission, the Sherman County Fire District, Sherman County Emergency Services, the Rural Sherman County Fire Board, the Weed Master, the Road Master, the County Planning Office, and County Judge. Further, as noted above, the Selection Committee for CIP mitigation projects will include one representative one dryland farm producer in the County.

In its responses to OWGL's comments, the certificate holder commented that it agreed the League's input would be valuable in the development of a proposal for an agrivoltaics project and that it anticipates that the proponent of this project would seek the input from OWGL when developing the proposal to ensure that the research directly benefited the Sherman County wheat economy. The certificate holder requested that the Department acknowledge this request and recommend to the Council that the final CIP be revised at Section 5 to require the project proponent to consult OWGL when developing the project proposal to include in the CIP funding application.

Given the concerns of OWGL, and the certificate holder's acknowledgement that additional input in the development of a proposal would be beneficial, the Department recommends the Council reject the Dryland Wheat Agrivoltaics Research in Sherman County as a pre-screened project. The project sponsor would continue to be able to apply for funding through the normal selection process and investing in research to further agrivoltaics for dryland wheat lands would continue to be one of the selection criteria for review. The Department recommends that having this project go through the full selection process is the best way to incentivize successful stakeholder engagement in the project design process.

Issue LU-14 (Oregon Wheat Growers League): Concern with including weed management projects as pre-screened project in Community Investment Plan
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary
Commenter raises concern with inclusion of weed management projects in the pre-screened mitigation project funding list. Asserts the project adds burden to neighboring properties and recommends weed management be incorporated into the project requirements rather than diminishing agricultural mitigation funds.

Department Evaluation
The commenter contends "the project should ensure that a weed management plan that can be reasonably enforced is completed outside of ag mitigation efforts."

Weed control is a requirement under Proposed Order. The certificate holder has prepared the Comprehensive Solar Revegetation and Soil Management Plan (Comprehensive Plan) to serve as a primary source of commitments related to revegetation, soil management, dust control, stormwater management, and noxious weed control through the pre-construction, construction, and operations phases for the photovoltaic solar energy generation and battery storage (Solar Components) associated with RFA4. In its responses to this issue, the certificate holder also confirmed that they agree with the League that weed control is not a separate mitigation effort, but a mandatory and integral part of project construction and operation

Under the Proposed Order recommended Soil Protection Conditions 1 through 3, the certificate holder would be required to finalize the draft Comprehensive Plan (included as Attachment D), and construct and operate the solar facility in compliance with the Plan. As with all site certificate conditions, the Department and Council maintain authority to enforce these condition requirements. The commenter has not raised any issues related to the adequacy of the draft Comprehensive Plan or Recommended Soil Protection Conditions 1 through 3.

The weed control measures funded under the draft CIP would not address weeds related to the Biglow facility but rather would provide a grant program for county wheat farmers to invest in precision agricultural technology such as weed management equipment, remote sensing technology to assist with weed mapping or soil mapping.

The draft CIP Project 4 is a "[g]rant program for county wheat farmers to invest in precision agricultural technology such as weed management equipment, remote sensing technology to assist with weed mapping or soil mapping, variable rate technology to collect data on soil variability to inform application of fertilizers, and other technologies." The description further states "[t]he cost-share grant program for precision agricultural technology is assumed to increase the number of farmers who otherwise would not have access to precision management technology due to the significant upfront cost barrier."[6]

The Department does not recommend any revisions in the draft Final Order based on this comment because recommended conditions in the Proposed Order would already require the certificate holder to take weed control measures, and the weed control funding measures described under the draft CIP would not be used to control weeds related to the certificate holder's project but rather would be utilized by county wheat farmers.

Issue LU-15 (Oregon Wheat Growers League): Concern with including fire mitigation projects as pre-screened project in Community Investment Plan
Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary
Commenter raises concern with inclusion of investments in minimizing fire risk in the pre-screened mitigation project funding list. Recommends fire mitigation should be considered separately from agricultural mitigation.

Department Evaluation

[6] Proposed Order Attachment E, Draft Community Investment Plan, pp. 10-11.

Under Council's Wildfire Prevention and Risk Mitigation standard, OAR 345-022-0115, Council must find the certificate holder has adequately characterized wildfire risk within the analysis area and that the proposed facility will be designed, constructed, and operated in compliance with a Wildfire Mitigation Plan approved by the Council.

In the Proposed Order, the Department recommends the Council impose new conditions requiring the certificate holder to submit plans addressing wildfire risks associated with the construction and operation of the solar facility. Recommended Wildfire Prevention and Risk Mitigation Conditions 1 and 2 require the certificate holder to submit to the Department, for review and approval, a Construction Wildfire Mitigation Plan (WMP), (consistent with Attachment G to the Order) and to adhere to the WMP during construction of the solar facility. And Recommended Wildfire Prevention and Risk Mitigation Conditions 3 and 4 require the certificate holder to submit to the Department for review and approval an Operational Wildfire Mitigation Plan and adhere to it during operations.

In its responses, the certificate holder also confirms that fire risk minimization and mitigation is not a separate mitigation effort, but a mandatory and integral part of project construction and operation.

In 2024, separate from the Council process related to the proposed Biglow solar facility, Sherman County developed and adopted a Community Wildfire Protection Plan (CWPP) to identify and mitigate wildfire risk in the county and to develop a strategy to reduce those risks. The CWPP identifies several projects that would assist the County in mitigating wildfire risk (e.g., upgrading, maintaining, or adding firefighting equipment for Sherman County's Rural Fire Protection Districts and training for volunteers).

In the certificate holder's draft CIP, "Agricultural Wildfire Risk Minimization and Capacity Building" is one of the five pre-screened projects identified as having a direct benefit to the rural agricultural economy of Sherman County. Under the draft CIP Project 2, the County could allocate mitigation funding to support either partial or full implementation of the projects identified in its CWPP, as well as other initiatives aimed at supporting the County's agricultural community in wildfire mitigation and response.

The Department does not recommend any revisions in the draft Final Order based on this comment because recommended conditions in the Proposed Order already require the certificate holder to take measures to comply with the Council's Wildfire Prevention and Risk Mitigation standard. Separately, the wildfire risk minimization measures described under the draft CIP would not be used to address wildfire risks related to the certificate holder's project but rather would benefit the County overall.

Issue LU-16 (Oregon Wheat Growers League): Objection to statement that lease payments will compensate for lost agricultural revenue

Comment ID: BCWAMD4Doc24-20 Proposed Order Public Comment OWGL 2026-01-30

Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-10 Proposed Order Public Comment CH Response to Oregon Wheat Growers 2026-02-13

Comment Summary
Commenter objects to a statement by the certificate holder that lease payments will compensate for any lost agricultural revenue incurred by a landowner/farmer due to conversion of farmland to energy use[7]; the commenter contends that the farm operator may not own the subject parcel and may not benefit from lease payments and suggests clarification is needed to determine if the persons who provided statements are only landowners or if they are also farm operators.

Department Evaluation
In its responses on this issue, the certificate holder notes that the agricultural economic analysis presented in BCWF RFA 4 Attachment K-2 of Exhibit K and referenced the Proposed Order evaluates direct, indirect, and induced impacts from removing land from agricultural production. Impacts to the agricultural economy are assessed in terms of employment, labor income, and economic output using the IMPLAN economic modeling package The Community Investment Plan (CIP) then ensures that the local rural economic benefits will offset potential adverse impacts the development of BCWF RFA 4 may have on Sherman County's agricultural economy. Mitigation under the Energy Facility Siting Council (EFSC) Land Use Standard and the CIP address local agricultural community and economic impacts at a county and community level, rather than compensating individual producers for lost production. That type of impact is handled by private agreement, as mentioned above.

In its responses, the Department noted that the commenter had not objected to a Department recommended finding of fact, conclusion of law or condition of approval in the Proposed Order, but rather to a statement the certificate holder made that lease payments will offset the direct loss of agricultural production resulting from its proposed solar facility.

As discussed in the Proposed Order, because the proposed solar facility would use, occupy, or cover more farmland than allowed under state laws and regulations, for Council to approve the facility, it would have to provide an exception to Statewide Planning Goal 3, which seeks to preserve and maintain agricultural lands for farm use.

The certificate holder argues that one reason Council should provide an exception to Goal 3 is because its proposed solar facility will promote rural economic development in several ways including through lease payments to affected landowners. The Department analyzed this argument in the Proposed Order and, while it agreed that some aspects of the proposal support Council granting an exception to Goal 3 because of the rural economic development that will result (e.g., through the proposed Community Investment Plan), the Department

[7] RFA4, Exhibit K, Land Use, p. 18.

recommended Council find that the certificate holder has not provided sufficient evidence to demonstrate that lease payments will benefit agricultural operations because the participating landowner or individuals farming the land have not demonstrated, or even indicated, they intend to use the lease payments from the proposed solar facility to make or allow for new farm investment.[8]

Therefore, it is not necessary to seek clarification regarding the landowner statements, and the Department does not intend to make any revisions in the draft of the Final Order based on this comment because the Department has recommended Council reject the certificate holder's position that the lease payments support Council granting an exception to Goal 3.

Issue LU-17 (Certificate Holder); Land Use/Goal Exception – Project Furthers Oregon's Clean Energy Directives and Goals

Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15; BCWAMD4Doc24-23 Proposed Order Public Comment Certificate Holder-3 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary

Certificate holder objects to the Department recommending Council reject their argument that an exception to Goal 3 is justified because authorizing the facility components proposed in RFA4 is consistent with State policies and goals addressing climate change and encouraging the acceleration of Oregon's clean energy transition.

In their comments on the Proposed Order, the certificate holder provides additional evidence and argument in support of its position. The certificate holder discusses state legislation (SB 1547, ORS 469A.005-469A.210) mandating that large investor-owned utilities, including PGE, meet Renewable Portfolio Standard targets. The certificate holder also addresses two recent Executive Orders issued by Governor Kotek, Executive Order 25-25, *Accelerating Wind and Solar Energy Development in Advance of Elimination of Federal Clean Energy Tax Credits* (EO 25-25), and Executive Order 25-29 *Reducing Greenhouse Gas Emissions and Advancing Oregon's Clean Energy Future* (EO 25-29). The certificate holder contends "a Goal 3 exception is justified because the facility, as amended, directly furthers Oregon's clean energy directives and goals."

Department Evaluation

The Department does recommend any revisions to the draft of the Final Order based on this comment.

The State of Oregon has taken several measures to combat climate change and encourage the development of renewable energy, including those discussed by the certificate holder. At the same time, Oregon has a rigorous land use system that seeks, among other goals, to preserve

[8] Proposed Order on RFA4, pp. 141-142.

the state's agricultural lands, via Goal 3. None of the statutes or Executive Orders the certificate holder cites require EFSC to grant an exception to Goal 3 for a renewable energy facility. Indeed, per statute, EFSC "*may* find goal compliance for a facility that does not otherwise comply with one or more statewide planning goals by taking an exception to the applicable goal" (ORS 459.504(2), emphasis added). Therefore, as the certificate holder has noted, EFSC has the discretion to decide when to grant an exception to a statewide planning goal.

In recent years, most projects reviewed by EFSC have sought an exception to Goal 3. That is because large renewable energy facilities, in particular solar photovoltaic power generation facilities, require significant amounts of land and that land is often zoned for Exclusive Farm Use. Therefore, it is up to EFSC to balance Oregon's goals and directives to combat climate change/encourage renewable energy against the state's Goal 3, seeking to preserve agricultural land. This is a responsibility the Department and EFSC take seriously. The Department believes that granting an exception to Goal 3 based solely on the fact that a proposal would result in the construction or expansion of a renewable energy facility, without specific evidence demonstrating that a site or facility is particularly well suited to meeting those goals or policies, is tantamount to ignoring Goal 3 altogether.

Indeed, EFSC has consistently rejected arguments that a proposed facility's potential contributions toward meeting Oregon's climate change and renewable energy policies is a reason justifying taking an exception to Goal 3. Rather, the Department and Council have sought to identify the specific impacts a proposed facility would have on agricultural lands and the agricultural economy. This is a location-specific and project-specific analysis. Council has regularly approved exceptions to Goal 3 where the project proponent can demonstrate the facility is located near existing energy or transportation infrastructure (and thus would displace less agricultural land than a facility farther from such infrastructure), will have minimal impacts to agriculture and/or provide a benefit to the rural/agricultural economy.
In the Proposed Order the Department recommends Council find that the certificate holder has provided sufficient evidence to justify an exception to Goal 3 based on the RFA4 facility components being locationally dependent on nearby major transmission infrastructure and transportation corridors and because the proposed Community Investment Plan funds are likely to be used in a manner that benefits the local agricultural economy and provide rural economic development benefits. Therefore, should Council agree with the Department's recommendation, it would grant an exception to Goal 3 for the proposed additions to the facility, not based solely on the fact that those additions will further Oregon's clean energy directives and goals, but because it makes sense to site an energy facility at that location, given the presence of nearby energy and transportation infrastructure and because the certificate holder will implement measures that will benefit the rural/agricultural economy.

The Department maintains its recommendation that Council not base a goal exception on the proposed facility components furthering Oregon's clean energy directives and goals because the certificate holder has failed to provide any specific or unique reasons that demonstrate that the proposed solar facility or the Biglow site is particularly well suited to meeting the states goals or the certificate holders' legal obligations other than the locational dependence on the

availability of excess interconnection capacity resulting from the underperforming wind facility. Were Council to acknowledge that the existence of state energy policies and priorities alone are an adequate reason to override state policies protecting farmland, proponents of future renewable energy projects may cite such a decision as a basis for Council to grant an exception to Goal 3 even if their projects, unlike this one, are not locationally dependent, would not provide a benefit to the rural/agricultural economy and/or would have greater impact on agricultural lands and productivity.

Issue LU-18 (Certificate Holder); Land Use/Goal Exception – Minimal impacts to Other Resources
BCWAMD4Doc24-23 Proposed Order Public Comment Certificate Holder-3 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder objects to recommended rejection of Minimal Impacts to Other Resources Reason to support an exception to Statewide Planning Goal 3. Provides comparison of potential impacts compared to other recent orders.

Department Evaluation
The Department does recommend any changes to the draft Final Order based on this comment and recommends Council not make changes in its Final Order based on this comment.

The certificate holder maintains that an exception to Goal 3 is justified because their proposed Solar Micrositing Area would have minimal impacts on other resources protected by Council standards since it would avoid sensitive environmental features, including Washington ground squirrel occupied habitat, FEMA 100-year floodplains, U.S. Fish and Wildlife Service-designated critical habitat, and ODFW-designated big game winter ranges, and wetlands and waters. They contend their proposal would impact less Category 2 through 4 habitats than three other facilities to which Council granted a Goal 3 exception and that the permanent habitat loss that would occur will be mitigated according to ODFW Habitat Mitigation Policy goal. While the overall acreages may be greater, the Department notes that the construction and operation of the proposed facility would result in permanent impacts to up to 21 acres of Category 2 Sagebrush Shrub-Steppe habitat that is in or adjacent to a Priority Wildlife Connectivity Area. Two of the three facilities which the certificate holder used for comparison in its comments affected no Category 2 habitat, while the remaining facility affected 0.1 acres. The Department maintains that this level of impact on essential, limited, habitat is, in itself, more than a "minimal impact."

Per ORS 469.504(2)(c) the Council may take an exception to a statewide planning goal if it finds the following standards are met:

(A) Reasons justify why the state policy embodied in the applicable goal should not apply;
(B) The significant environmental, economic, social and energy consequences anticipated as a result of the proposed facility have been identified and adverse impacts will be mitigated in accordance with rules of the council applicable to the siting of the proposed facility; and
(C) The proposed facility is compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts.

Thus, for Council to grant an exception to Goal 3, in addition to finding there are sufficient reasons to justify taking an exception, ORS 469.504(2)(c)(B) requires Council to also find that the significant environmental, economic, social and energy consequences anticipated as a result of the facility components proposed in RFA4 have been identified and adverse impacts will be mitigated in accordance with rules of the Council. Here, because the Department believes the certificate holder had already demonstrated sufficient reasons to grant an exception to Goal 3, it recommended Council reject minimal impacts as a reason for granting an exception under ORS 469.504(2)(c)(A) and instead consider those minimal impacts and mitigation per the ODFW Habitat Mitigation Policy as meeting the mitigation requirement in ORS 469.502(2)(c)(B).[9] This approach avoids "double counting" - *i.e.*, finding the same underlying facts and evidence as meeting two separate criteria necessary for granting an exception. Accordingly, the Department recommends Council not make any changes to the Draft Final Order in response to the certificate holder's comments.

III.E. Fish and Wildlife Habitat (OAR 345-022-0060)

Issue FW-01 (McCullough, Kathryn); Adequacy of Exhibit P and Evaluation of Impacts to Wildlife
Comment ID: BCWAMD4Doc24-03 Proposed Order Public Comment McCulloughK-3 2026-01-01
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13

Comment Summary
Ms. McCullough raises concerns regarding the adequacy of RFA4 Exhibit P and the evaluation of impacts to wildlife. She states that the Exhibit P (to the preliminary RFA4) is incomplete and appears to apply only to birds and bats, arguing that other mammals should be addressed. She provides photographic documentation of other animals in the vicinity of the site.

[9] See Proposed Order, p. 146: ". . . the construction and operation of the facility components proposed in RFA4 could have significant adverse impacts on soils, fish and wildlife habitat, cultural resources, and waters of the State, but the Department recommends the Council find that existing and recommended conditions of approval are adequate to avoid, minimize, or mitigate these impacts."

Department Evaluation
The Department believes RFA4 Exhibit P, and associated findings in the Proposed Order, adequately address potential impacts to fish and wildlife species, including the species identified by Ms. McCullough. Because impacts to all wildlife and wildlife habitat, not just bird and bat species, were considered in the evaluation of the RFA4, the Department does not recommend any additional changes to the Proposed Order are warranted at this time.

Under OAR 345-022-0060(3)(d) [formerly OAR 345-021-0010(1)(p)(D)], Exhibit P must identify all *state sensitive species* that might be present in the analysis area, based on consultation with ODFW and appropriate field study and literature review. Information about state sensitive species is required to be included in the Fish and Wildlife Exhibit, in part, to inform habitat categorization based and determine appropriate measures to avoid and minimize impacts in accordance with ODFW's Habitat Mitigation Policy, but the importance and use of habitat to wildlife more generally is also considered when making these determinations.

In Exhibit P, Section 6.1, of the final RFA4, the certificate holder identifies that 16 *state sensitive species* that have the potential to occur in the analysis area. This list is not intended to be a list of all species that are potentially present at the site, only those species identified by ODFW as State Sensitive, or Sensitive-Critical, which for the proposed Solar Micrositing Corridor, includes primarily bird and bat species and two reptile species.

As referenced by the commenter, the biologists conducting field surveys of the site also recorded non-listed species encountered during surveys in the Biological Survey Reports included in Attachment P-1, including some of the species identified in the comments and associated photographs. Impacts to non-listed species were further addressed in Exhibit P, and the Proposed Order, through the consideration of mapped Big Game Winter Range (for Elk and Mule Deer) and Priority Wildlife Connectivity Areas (based on connectivity needs for 54 surrogate species) in the categorization of habitat, which resulted in additional areas shrubland-steppe and grassland habitat being considered Category 2 "essential and limited" habitat. ODFW also recommended additional measures to protect wildlife and habitat which were incorporated into the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to the Proposed Order.

The Department does not recommend any changes in the draft Final Order based on this comment, for the reasons described above.

Issue FW-02 (Certificate Holder); Srivener's Error
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests correction of a Scrivener's error in Condition GEN-FW-02. Notes that GEN-FW-02 references Condition 63 (should now be GEN-FW-03)

Department Evaluation
The Department agrees to make the recommended change, applicable language where the change would be presented is shown below, in red underline, strikethrough font:

Condition GEN-FW-02:…

a. …
b. ….
c. … If the construction would result in additional permanent impacts, the certificate holder shall increase the area of mitigation for permanent loss of Category 3 and Category 4 habitat as described in the Habitat Mitigation Plan incorporated herein by ~~Condition 63~~ GEN-FW-03.

Issue FW-03 (Certificate Holder) Flexibility on ground clearing activities in Category 2 Habitat
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
The certificate holder comments that the proposed restrictions on vegetation removal in Category 2 habitat during the critical period for ground nesting birds (Apr 15 to Sept 1) would preclude almost all work in those areas and would incentivize grading instead of mowing or drive and crush. The certificate holder requests that the Department make the following changes to Section 5.0, Table 4 of the draft Comprehensive Solar Revegetation and Soil Management Plan included as Attachment D to the Proposed Order:

~~On or before April 15 of any year in which construction occurs within Category 2 habitat, all mowing, vegetation removal and/or ground disturbance associated with site preparation must be completed. No mowing, vegetation removal and/or ground disturbance associated with site preparation may occur within Category 2 habitat between April 15 through September 1.~~

To the extent practical, mowing or other vegetation removal activities in Category 2 habitat will be scheduled to occur outside the critical period for ground nesting birds (April 15 – September 1), to avoid disturbing active nests. If mowing or other vegetation removal activities in Category 2 habitat are necessary between April 15 to September 1, the Certificate Holder shall hire a qualified biologist to conduct a clearance survey for nesting birds prior to vegetation removal. The Certificate Holder shall ensure that active nest sites identified during the clearance survey are flagged and marked as sensitive areas for avoidance on construction maps.

Department Evaluation

As explained on page 181 of the Proposed Order, the language in the draft Comprehensive Solar Revegetation and Soil Management Plan was intended to require the certificate holder to complete all initial mowing, vegetation removal and ground disturbance *associated with site preparation* in Category 2 habitat before April 15 or after September 1, and not to prohibit any subsequent vegetation management activities such as mowing. The location and extent of Category 2 habitat is isolated, within a distinct location expanding 20 acres. In response to this comment, the Department agreed to evaluate the proposed change, but requested that the certificate holder provide reasons why, for the isolated area of Category 2 habitat, site preparation activities would not be able to planned and completed at time that would avoid the critical period for ground nesting birds.

In its reply, the certificate holder noted that Facility construction is scheduled to begin in June and that if vegetation or ground disturbance is restricted in Category 2 habitat during the breeding season, then construction will not be able to begin in Category 2 habitat until after September 1. It remains unclear why the certificate holder would not be able to mobilize vegetation management crews for the limited area of Category 2 habitat prior to construction, or if waiting until September to work in the habitat area would. In addition, the Department consulted with ODFW on the proposed change. ODFW commented that clearance surveys are ineffective for accurate identification and requested that vegetation removal activities occur prior to the beginning of nesting season (April 15).

Based on ODFW's recommendation and the information on the record, the Department does not recommend any changes in the draft Final Order based on this issue.

Issue FW-04 (Certificate Holder); Recommended edits to Draft Habitat Mitigation Plan
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder provides additional recommended edits to the Draft Habitat Mitigation Plan presented as Attachment F to the Proposed Order.

Department Evaluation
The Department reviewed the certificate holder's proposed changes to the draft Habitat Mitigation Plan and considers the changes not to modify the substantive intent of the plan but rather clarify to ensure appropriate approach for evaluating success for noxious weed control and shrub planting. The Department is reviewing the proposed changes with ODFW and will provide any agreed upon changes in the draft Final Order.

III.F. Historic, Cultural and Archaeological Resources (OAR 345-022-0090)

Issue HCA-01 (Certificate Holder): Supplement Record with Tribal Consultation Details
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Comment Summary
Certificate holder requests additional details about its outreach to Tribes be incorporated into the Proposed Order.

Department Evaluation
The Department appreciates the certificate holder's efforts to engage with Tribes regarding this project; however, we do not agree with the proposed additions for the draft Final Order. The Tribes themselves have had the opportunity to provide input on the record, and as described under Issue HCA-02, the Confederated Tribes of the Warm Springs Reservation of Oregon have expressed concerns with recommended conditions of approval. The Department has included clarifying changes to Section III.K.1 of the draft Final Order explaining that additional information regarding the certificate holder's and Department's outreach efforts is provided in Exhibit S and comments on the Proposed Order.

Issue HCA-02 (Confederated Tribes of Warm Springs) Adequacy of archaeological monitoring and protective measures
Comment ID: BCWAMD4Doc24-09 Proposed Order Public Comment CTWS 2026-01-15
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
CTWS express concerns that the certificate holder characterized archaeological monitoring as limited in scope and duration, focused on a single location, rather than implementing monitoring for all ground-disturbing activities, as recommended in the Cultural Resources Survey Report. CTWS requests that the full suite of cultural resource protection measures identified through survey and consultation be implemented."

Department Evaluation
There are two proposed conditions that require avoidance and monitoring.

- Recommended Historic, Cultural, and Archaeological Condition 1 (GEN-HC-02) requires the certificate holder to avoid ground disturbing activities within 20-meters of all sites and isolates identified as eligible for, or likely eligible for, listing on the National Register of Historic Places during construction and operation of the proposed solar facility.
- Recommended Historic, Cultural, and Archaeological Condition 2 (GEN-HC-03) requires the certificate holder to submit a Cultural Resources Monitoring Plan demonstrating that an Oregon Qualified Archaeologist or Tribal Cultural Resource Monitor will be onsite during ground disturbing activities that would occur within the 20-meter buffer.

The Cultural Resources Survey Report provided as Attachment S-1 to RFA4 Exhibit S, includes several recommendations for monitoring, including the following:

> "GeoVisions recommends a monitoring plan and Inadvertent Discovery Plan be in place prior to Project construction, that an archaeological monitor who meets the standards of "qualified archaeologist" as defined by the existing site certificate be present during and observe all ground disturbing activities, as well as construction activities in and around recorded archaeological sites and isolates, as well as the probable location of the Oregon Trail, and that a tribal monitor is present for all construction activities within 20 meters of sites and isolates with precontact or culturally important material to ensure that no identified or unidentified archaeological sites are "excavat[ed], injur[ed], destroy[ed] or alter[ed]," (ORS 358.920(1)(a) to identify and to ensure that any subsurface archaeological objects, sites, and/or historic properties be properly identified and preserved over the course of Project construction activities and uphold the intent of the State of Oregon (ORS 358.910(2))." RFA4, Att S-1, pg. 102.

In its responses to this issue, the Department acknowledged that the monitoring requirements of these conditions are more limited than what was recommended by GeoVisions, which recommends that a Qualified Archaeologist be on site during all ground disturbing activities and that a Tribal Cultural Resource Monitor be present when ground disturbing activities occur within a 20-meter avoidance buffer. The Department requested that the certificate holder provide a draft Cultural Resources Monitoring Plan that is consistent with the recommendations included in the GeoVisions Report.

In the certificate holder's responses, they restated their commitment to cultural resource protection but disagreed with the recommendation for additional monitoring. The certificate holder emphasized that archaeological monitoring, if required, would not be focused on a single location; it would be focused for all ground-disturbing actions within 20- meters of eligible and unevaluated sites, as defined by the GeoVisions report and the State Historic Preservation Office's (SHPO) concurrence. The certificate holder noted that the project has been designed to avoid all such sites with a 20-meter buffer; thus, monitoring of the 20-meter buffers is not expected to be necessary. If project design changes, or in the event of inadvertent discoveries during construction, then monitoring would be implemented and impacts would be evaluated. The certificate holder further asserts that while GeoVisions' recommendations for avoidance of NRHP-ineligible resources and for archaeological monitoring during all ground-disturbing activities, including within 20 meters of those resources, may be in line with conditions imposed for the existing wind facility, those conditions are inconsistent with the SHPO concurrence. The certificate holder commented that it did not have record of a request from CTWSRO, through informal coordination or at our November 2025 meeting at CTWSRO's offices or formal government-to-government consultations, for protective measures beyond those reflected in the Proposed Order and draft Amended Site Certificate and noted that if the Tribal Historic Preservation Officer (THPO) believed that certain resources should be managed differently or that additional protection measures should be required, the certificate holder would support continued government-to-government consultation between CTWSRO THPO

and ODOE, as determinations regarding applicable standards, conditions, and mitigation requirements fall within the Council's and ODOE's purview.

In reply to the certificate holder, the CTWS THPO reiterated the importance of ensuring appropriate Tribal presence during ground-disturbing activities and requested that a Dedicated Tribal Monitor be incorporated into the construction-phase coordination framework for the Project to:

- Provide real-time coordination between the Tribe and the construction team;
- Observe implementation of cultural resource protection measures during ground disturbance;
- Facilitate immediate communication in the event of discoveries or unanticipated conditions;
- Maintain government-to-government engagement during construction activities occurring within culturally sensitive areas.

The CTWSRO noted that its request was not intended to reopen SHPO concurrence or challenge ODOE's Proposed Order but rather to reflect the Tribe's expectation that consultation extends meaningfully into the implementation phase of the Project.

The Department notes that, while the certificate holder may have preferred this issue to have been raised by the Tribes at an earlier point in time, the CTWS THPO did raise this issue on the record with sufficient specificity for the issue to be evaluated. The Department appreciates the Tribes' engagement in the review process. The Department further notes that the recommendation for a Qualified Archaeologist to be present during all ground-disturbing activities included in the GeoVisions' report is consistent with SHPO's July 10, 2025 concurrence letter, which was based on the certificate holder's own representations in the preliminary Request for Amendment that it would comply with existing Site Certificate Condition 71 during construction of the solar components.

The Department believes the request to have a Dedicated Tribal Monitor present during all ground disturbing activities goes beyond the recommendations in the GeoVisions Report, and beyond what was requested in the initial comment; however, the Department believes the Tribes' request to have a qualified archaeologist on site during ground disturbing activities is reasonable given the history of the area and potential for additional unidentified pre-contact sites or isolates to be present at the site documented in the cultural resources survey report. The Department further recommends that the requirements are consistent with the recommendations made in SHPO's concurrence letter.

> Accordingly, in the draft Final Order the Department will include the following changes to Recommended Historic, Cultural, and Archaeological Condition 2 (GEN-HC-03):
>
> Prior to construction~~ activities that occur within the 20-meter avoidance buffer for archaeological sites (35SH00188, BSP-1-S02BSP-1-S10, and BSP-1-S12) and~~

~~archaeological isolate (BSP-1-I04)~~, the certificate holder must submit to the Department for approval, in consultation with SHPO, a Cultural Resources Monitoring Plan demonstrating that an Oregon Qualified Archaeologist or Tribal Cultural Resource Monitor will be onsite during ground disturbing activities ~~associated with the resources listed in this condition~~ at the site. The plan may provide for exceptions to monitoring scope and frequency, subject to approval by the Department, in consultation with the Confederated Tribes of Warm Springs. The certificate holder shall adhere to the measures approved in the Cultural Resources Monitoring Plan.

III.G. Public Services (OAR 345-022-0110)

Issue PS-01 (McCullough, Kathryn); Concerns about capacity of local fire responders to fight fire at energy facility
Comment ID: BCWAMD4Doc24-05 Proposed Order Public Comment McCulloughK-5 2026-01-06
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24
Sur-Reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06

Comment Summary
Commenter raises concerns about the adequacy of fire protection services at the site and potential risks to volunteer firefighters, particularly risks associated with fighting fire involving BESS components. Provides examples of risks, including toxic fumes, thermal runaway, and the ineffectiveness of water-based firefighting, in combination with challenging fire environment and rural setting.

Department Evaluation
In Section 4.4.7 of RFA4 Exhibit V, PGE explains that it would provide the North Sherman County Rural Fire Protection District with construction plans, schedules, and locations prior to the start of construction and that the Construction and Operations Wildfire Management Plans required under Wildfire Prevention and Risk Mitigation Condition 1 to 4 would address structural, BESS, and wildfire scenarios, and would include provider training on facility-specific hazards, established communication channels, site access, and firefighting resources.

In responses to this comment, the certificate further explained that on August 12, 2025, BrightNight presented details about the project and wildfire mitigation measures to the North Sherman County Rural Fire Protection District Boar and represents that it has been coordinating closely with Sherman County Emergency Services, the North Sherman County Rural Fire Protection District (RFPD), and Fire Chief Burbank of the North Sherman RFPD.

The certificate holder also indicates that BrightNight also plans to donate $200,000 to the RFPD to help build capacity to address wildfire risks but no additional details on when this donation would occur or how it would be spent were provided on the record of RFA4.

On March 4, 2026, the Department had a brief call with Chief Burbank and confirmed that he was familiar with the facility and Wildfire Mitigation Plan. Chief Burbank concerned that he did not have any concerns, but was clear that volunteer firefighters would not be expected to respond to fires at the BESS and that fire response within the proposed solar array perimeter fencelines would be limited, and that the RFPD would primarily seek to contain any fire that started within or spread into a solar array from outside of the perimeter fences.

The certificate holder's responses also identifies that the proposed BESS would utilize Tesla Megapack battery systems, which are equipped with an internal fire suppression system. The BESS is also designed in compliance with spacing standards intended to limit the propagation of fire between units and other features to prevent spread beyond the BESS yard.

Because the role of local firefighters in responding to a BESS would be limited to actions to prevent the propagation and spread of a fire outside of the BESS yard, the Department does not recommend any revisions to the draft Final Order be made in response to this issue.

Issue PS-02 (McCullough, Kathryn); Concern that local fire responders do not have adequate training to respond to fire at energy facility or BESS
Comment ID: BCWAMD4Doc24-05 Proposed Order Public Comment McCulloughK-5 2026-01-06
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24
Sur-Reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06

Comment Summary
Ms. McCullough provides specific recommendations for improving training and recruitment of volunteer firefighters:

- Provide specialized (NFPA-855 compliant) training to local firefighters for BESS response.
- Fund and/or create a dedicated BESS response unit within existing RFPDs.
- Conduct annual drills at BESS site, simulating windy conditions.
- Conduct outreach to improve volunteer recruitment/retention.
- Conduct community outreach to increase awareness/transparency around BESS Safety Issues.
- Require facility staff to have BESS-fire response capability until firefighters arrive.
- Provide insurance coverage and financial incentives to volunteer firefighters that respond to BESS fires.

- Supply RFPDs with SCBA, foam kits, and hazmat suits
- Create a community fund to cover:
    - Emergency payouts for injured/killed volunteers' families.
    - Training and equipment upgrades.
    - Community wildfire prevention (e.g., vegetation control).

Department Evaluation
As described in the Proposed Order Section III.M, the certificate holder provided a record of correspondence documenting coordination with the North Sherman Rural Fire Protection District (NSRFPD) Fire Board and Chief Jacob Burbank indicating that NSRFPD raised several concerns about access considerations, training, and equipment needed to address fire risk associated with the facility components proposed in RFA4. In response the certificate holder indicated that they intend to provide annual training that would cover response procedures, the risks associated with PV and BESS systems, and protocols for both fire and non-fire emergencies. Training would be provided by Coffman Engineers.

Some of the mitigation proposed by Ms. McCullough, such as providing insurance coverage, financial incentives, and emergency payouts to volunteer firefighters that respond to BESS fires, may be outside of the scope of the Council's authority, but others, including providing training and equipment needed to respond to fires at the site would be established under the Wildfire Mitigation Plans required under recommended Wildfire Prevention and Risk Mitigation Conditions 1 to 4.

In responses to this comment, the certificate further explained that on August 12, 2025, BrightNight presented details about the project and wildfire mitigation measures to the North Sherman County Rural Fire Protection District Boar and represents that it has been coordinating closely with Sherman County Emergency Services, the North Sherman County Rural Fire Protection District (RFPD), and Fire Chief Burbank of the North Sherman RFPD.

On March 4, 2026, the Department had a brief call with Chief Burbank and confirmed that he was familiar with the facility and Wildfire Mitigation Plan. Chief Burbank concerned that he did not have any concerns, but was clear that volunteer firefighters would not be expected to respond to fires at the BESS and that fire response within the proposed solar array perimeter fencelines would be limited, and that the RFPD would primarily seek to contain any fire that started within or spread into a solar array from outside of the perimeter fences.

The certificate holder's responses also identifies that the proposed BESS would utilize Tesla Megapack battery systems, which are equipped with an internal fire suppression system. The BESS is also designed in compliance with spacing standards intended to limit the propagation of fire between units and other features to prevent spread beyond the BESS yard.

Because the role of local firefighters in responding to a BESS would be limited to actions to prevent the propagation and spread of a fire outside of the BESS yard, the Department does not recommend any revisions to the draft Final Order be made in response to this issue.

III.H. Wildfire Prevention and Risk Mitigation (OAR 345-022-0115)

Issue WF-01 (McCullough, Kathryn); Concerns about burn probability data in fire risk analysis
Comment ID: BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24
Sur-Reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06

Comment Summary
Ms. McCullough raises concerns about the adequacy of the wildfire risk analysis provided in RFA4, Exhibit V. Specifically, she takes issue with the estimate of burn probability in Section 2.1.5. of Exhibit V.

Department Evaluation
Commenter takes issue with the description of burn probability in RFA4 Exhibit V, stating "high burn probability is much higher than 66%, but 66% is very high, especially in an area that already has 6-10 fires in a normal year…"

Ms. McCullough did not identify a recommended finding of fact, conclusion of law or condition of approval identified in the Proposed Order to which she objects but instead takes issue with evidence in the record provided to support the evaluation of wildfire risk at the site. In preliminary RFA4 Exhibit V, the certificate holder noted that 66 percent of the Solar Micrositing Area was rated with "a High to Very High (1-in-100 to 1-in-50) burn probability." In the complete RFA4, this estimate was revised to 98 percent of the wildfire analysis area based on the refined Solar Micrositing Area. In its responses to the comment, the certificate holder also explains that the fuel models used to describe the site likely overestimate the fuel load on site due to current fallow practices and the resulting estimate of burn probability may therefore be greater than actual conditions.

The certificate holder and Department notes that the revised estimate is derived from the 2023 Pacific Northwest Quantitative Wildfire Risk Assessment (McEvoy, Andy; Dunn, Christopher; Rickert, Ian), and not the certificate holder's own data or methods.

The Department generally considers the Pacific Northwest Quantitative Wildfire Risk Assessment to be a reputable source of data for wildfire risk, and as noted above, the revised estimate that resulted from its use includes a larger portion of analysis area than the initial estimate. As a result, the Department does not recommend any changes to the draft Final Order based on this issue.

Issue WF-02 (McCullough, Kathryn); Concerns about use of climate normal for fire risk analysis
Comment ID: BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24
Sur-Reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06

Comment Summary
Ms. McCullough objects to use of "climate normal" to reflect temperature data of site in RFA4 Exhibit V Section 2.1.4 and Table V-4. Ms. McCullough asserts that use of the climate normals "effectively lower the high temperatures" experienced in the area. As an example, the she provides data showing high temperatures of 101 – 103° F measured at the Arlington Weather Station in July 2018, compared to the 1991-2020 Average (normal) maximum temperature for July of 88.9° F at the Arlington Station.

Department Evaluation
The Department believes that climate normals, published by the National Oceanic and Atmospheric Administration in accordance with global climate data reporting standards, are a reputable source of climate data. As an average, the data does not reflect extreme temperatures that may occur in a given year, but they still provide valuable data on seasonal conditions at the site that can be used to inform the overall risk analysis. The Department also notes that the draft Construction Wildfire Mitigation Plan also accounts for extreme weather events by imposing work restrictions and additional requirements during fire weather watches and red flag warning events.

As such, no substantive changes are recommended in the draft Final Order, but the Department has including clarifying changes in section explaining the limitations on the climate normal data.

Issue WF-03 (McCullough, Kathryn); Concerns about fuel models used for fire risk analysis
Comment ID: BCWAMD4Doc24-04 Proposed Order Public Comment McCulloughK-4 2026-01-05
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24
Sur-Reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06

Comment Summary

Ms. McCullough objects to fuel models used in RFA4 Exhibit V Section 2.1.2. She notes that Fuel Models 102 and 93 used for agricultural lands in the site do not reflect fallow conditions at the site.

Department Evaluation
In the complete RFA4, the certificate holder notes that 93 percent of the proposed solar Micrositing Area is described by Fuel Model 102 or 242, which reflect low load, dry climate grasses and burnable wheat fields, respectively. These fuel models are derived from data from the Community Wildfire Protection Plan (CWPP) Planning Tool (Oregon Explorer 2025), which in turn, is based on the 2023 Pacific Northwest Quantitative Wildfire Risk Assessment (McEvoy, Andy; Dunn, Christopher; Rickert, Ian).

The Department generally considers the Pacific Northwest Quantitative Wildfire Risk Assessment to be a reputable source of data for wildfire risk. Accordingly, the Department does not recommend any changes in the draft Final Order based on this issue.

Issue WF-04 (Certificate Holder); Request for flexibility in road design standards for roads not needed for fire access
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests clarification of design standards for internal access roads. States that exterior roads and other roads designated for emergency access will be designed in accordance with 2022 Oregon Fire Code Section 503. Certificate holder requests that other interior roads not intended for fire access not be required to comply with Oregon Fire Code Standards.

Department Evaluation
The Department appreciates the clarification of conflicting statements in RFA4. To assist in the evaluation of this issue, the Department requests the certificate holder provide the site plan showing the designated emergency access roads and documentation of any additional correspondence with the North Sherman Rural Fire Protection District other than what was included in RFA4 Attachment U-1.

In its response to this issue, the Department requested that the certificate holder provide a site plan showing the location and width of designated emergency access roads and other internal access roads to support the evaluation.

In reply to the Department's response to comments, the certificate holder provided a map showing that new roads connecting the existing facility access roads to the proposed substation, O&M building and solar array access gates would be designed to allow fire access (e.g. 20-foot roads) but all roads within solar array fencelines would be 16 feet.

Compliance with 2022 Oregon Fire Code Requirements is not required for all roads, only those that are intended to provide emergency vehicles access to structures and buildings in the event of a fire-related emergency. In addition, during a brief call on March 4, 2026, the Department discussed the road width changes with Chief Burbank of the North Sherman County Rural Fire Protection District (RFPD). Chief Burbank confirmed that fire response within the proposed solar array perimeter fencelines would be limited, and that the RFPD would primarily seek to contain any fire that started within or spread into a solar array from outside of the perimeter fences and that response vehicles have off-road capabilities. Because there would be limited need to ensure access by full-size emergency vehicles to portions of the facility within the perimeter fencelines, the Department recommends the Council grant the additional flexibility requested; however, under the Construction Wildfire Management Plan attached to the draft Final Order, the final site plan must be reviewed and approved by the Department in consultation with local fire and emergency management officials.

Issue WF-05 (McCullough, Kathryn); Recommendations for BESS design criteria to minimize fire risk

Comment ID: BCWAMD4Doc24-05 Proposed Order Public Comment McCulloughK-5 2026-01-06
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13
Reply ID: BCWAMD4Doc28-01 Proposed Order Public Comment McCulloughK Reply 2026-02-24
Sur-Reply ID: BCWAMD4Doc29-02 Proposed Order Public Comment CH Sur-Reply to Kathy and Kevin McCullough 2026-03-06

Comment Summary

Ms. McCullough recommends specific design criteria that could be incorporated into the design of the BESS to minimize fire risk. Specifically, the commenter recommends:

- That BESS enclosures be made of metal or fiberglass with steel reinforcements to resist turbine debris impacts
- That windbreaks (e.g., berms, fences) be installed around BESS components to reduce debris and ember spread
- That multiple generators/solar-powered cooling units be installed to prevent overheating.

Department Evaluation

In its responses to this issue, the certificate holder asserted that Ms. McCullough's concerns are addressed by the Proposed Order and its recommended plans and conditions. Specifically, the certificate holder provided the following information:

- BESS enclosures are manufactured to meet applicable building, electrical, and fire code standards, including resistance to environmental stressors. The centralized BESS yard

layout further reduces exposure to potential turbine debris compared to dispersed configurations and site design maintains appropriate setbacks from turbines (520 feet).

- Each BESS unit includes thermal sensors, continuous monitoring, alarm systems, and automatic shutdown capabilities. These systems are designed to detect overheating or abnormal operating conditions early and initiate protective measures. The system is UL 9540A tested, meaning it has undergone rigorous fire propagation testing under nationally recognized safety standards.
- BESS will be housed in enclosed, containerized units located within a centralized BESS yard. Each unit includes internal separation and dedicated monitoring systems designed to detect abnormal conditions and isolate potential thermal events before propagation. The containerized configuration localizes any potential incident within an individual unit.

The certificate holder's responses also identifies that the proposed BESS would utilize Tesla Megapack battery systems, which are equipped with an internal fire suppression system. The BESS is also designed in compliance with spacing standards intended to limit the propagation of fire between units and other features to prevent spread beyond the BESS yard.

The Department believes that while concerns about fire safety are valid, a preponderance of the evidence on the record shows that the proposed BESS can be designed to minimize risks to public health and safety and that there is not adequate justification to impose the additional requirements raised in this comment. As such, the Department does not recommend any changes to the draft proposed order as a result of this issue.

Issue WF-06 (Certificate Holder); Request for clarification of setback requirement
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests clarification that perimeter fencing must be set back 50 feet from property line of *non-participating* landowner.

Department Evaluation
The Department agrees to make the requested change in Section III.N.1 of the draft Final Order and Section 4.1.3 of the draft Construction Wildfire Mitigation Plan.

Issue WF-07 (Multiple Commenters); Concerns about adequacy of 50-foot fire setbacks
(Commenters include: Kathryn McCullough; Kevin McCullough; Colton McCullough; Sherman County Soil and Water Conservation District, Whitman, A.; Irene Gilbert)
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13

Comment Summary
Commenters raise concerns with the adequacy of 50-foot setbacks imposed in recommended Land Use Condition 1. Suggests that larger setbacks may be needed.

Department Evaluation
In its response to this issue the Department noted that the commenters have identified an issue related to a condition of approval but have not provided sufficient evidence to 1) support the claim that the 50-foot setback does not provide adequate protection from wildfire or access to emergency responders; or 2) support the imposition of a greater setback.

The certificate holder restated requirements in the Proposed Order and Draft Site Certificate in its responses but did not provide additional information. No additional evidence supporting larger setbacks was provided in replies.

Because there is not adequate evidence on the record, the Department does not recommend any changes to the draft Final Order based on this issue.

Issue WF-08 (Multiple Commenters); Concern about adequacy of 20-foot fuel breaks
(Sherman County Soil and Water Conservation District, Irene Gilbert)
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13

Comment Summary
Commenters raise concern about adequacy of 20-foot fire break around the perimeter of the facility to stop fire from spreading from the facility. Recommends additional research is needed. Sherman County Soil and Water Conservation District suggests that 30-foot is minimum recommended by NRCS. Ms. Gilbert recommends that 30-feet may not be adequate, and that additional research is needed.

Department Evaluation
In its responses to this issue the Department noted that the commenters have identified an issue related to a condition of approval but have not provided sufficient evidence to 1) support the claim that the 20-foot fuel break does not provide adequate protection from wildfire; or 2) support the imposition of a greater setback. The Department also requested clarification on what NRCS standard was referenced or how it is applied to utility facilities.

The certificate holder restated requirements in the Proposed Order and Draft Site Certificate in its responses but did not provide additional information. No additional evidence supporting larger setbacks was provided in replies.

Because there is not adequate evidence on the record, the Department does not recommend any changes to the draft Final Order based on this issue.

Issue WF-09 (McCullough, Colton); Support for recommended vegetation maintenance standards for wildfire season
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Mr. McCullough supports recommendation that vegetation be maintained at 1 to 3 inches during fire season to mitigate fire risk. The recommended finding in the Proposed Order, pg. 233, for a 1 to 3 inch vegetation height is not reflected in the draft Comprehensive Solar Revegetation and Soil Management Plan. He requests that the requirement be binding through construction and operation.

Department Evaluation
The Department is evaluating several comments related to the recommendation that vegetation within the solar facility and other vegetation clearance areas be maintained at 1 to 3 inches during fire season to mitigate fire risk. Mr. McCullough recommends the recommendation be implemented throughout the life of the facility. The Sherman County Weed Control District recommends that the vegetation height standard be increased to 4 to 8 inches to support erosion control and enhance viability of bunchgrass species.

In its comments, the certificate holder requested that the height standard be increased to 10 to 12 inches year-round but in reply to the Sherman County Weed District, requested that ODOE take the District's professional recommendation into consideration and revise the Proposed Order and implementing plans accordingly to require management of grass height at 4 to 8 inches during dry season. Mr. McCullough commented that he did not agree that 8" vegetation would be safe from a wildfire standpoint but acknowledged the importance of not mowing native bunch grasses shorter than 3-4" to protect the crown of the plant. He conceded that a slightly taller vegetation height (3" to 6" during fire season June-Oct) would be acceptable considering erosion control, vegetation health, and fire risk together.

The Department maintains that vegetation management is a critical tool for minimizing wildfire risk associated with the proposed facility but defers to the professional recommendation of the County Weed Control District as to the appropriate standard to best balance wildfire risk mitigation and soil protection. Consistent with the District's recommendation, the Department revised Section III.N.I Wildfire Prevention and Risk Mitigation of the draft Final Order, Attachment G draft Construction Wildfire Mitigation Plan, and Appendix F of the draft Comprehensive Revegetation and Soil Management Plan to include reference to vegetation requirements below:

a. **Vegetation Height and Clearance**

- Vegetation within and adjacent to the Solar Components will be maintained as follows:
- During the dry season (June to October), vegetation height will be limited to 4 to 8 inches. Vegetation will be mowed to a height of 4 inches prior to June of each year.
- Outside of the dry season (November to May), vegetation will be maintained at a maximum height of less than 12 inches~~,~~.
- ~~with a~~ A minimum vertical clearance of 12 inches from all electrical and mechanical equipment will be maintained at all times.
- Vegetation exceeding ~~this~~ the heights listed above will be mowed or removed ~~prior to local~~ in accordance with any ODF- or County-issued fire restrictions.

Issue WF-10 (Certificate Holder); Objection to Vegetation Maintenance Standards for Wildfire Season
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder objects to the Department's recommendation that vegetation be maintained at 1 to 3 inches during fire season to mitigate fire risk. Requests that the vegetation height requirements be set to limit a height of 10 to 12 inches year-round.

Department Evaluation
The Department is evaluating several comments related to the recommendation that vegetation within the solar facility and other vegetation clearance areas be maintained at 1 to 3 inches during fire season to mitigate fire risk. Mr. McCullough recommends the recommendation be implemented throughout the life of the facility. The Sherman County Weed Control District recommends that the vegetation height standard be increased to 4 to 8 inches to support erosion control and enhance viability of bunchgrass species.

In its comments, the certificate holder requested that the height standard be increased to 10 to 12 inches year-round but in reply to the Sherman County Weed District, requested that ODOE take the District's professional recommendation into consideration and revise the Proposed Order and implementing plans accordingly to require management of grass height at 4 to 8 inches during dry season. Mr. McCullough commented that he did not agree that 8" vegetation would be safe from a wildfire standpoint, but acknowledged the importance of not mowing native bunch grasses shorter than 3-4" to protect the crown of the plant. He conceded that a slightly taller vegetation height (3" to 6" during fire season June-Oct) would be acceptable considering erosion control, vegetation health, and fire risk together.

The Department maintains that vegetation management is a critical tool for minimizing wildfire risk associated with the proposed facility but defers to the professional recommendation of the

County Weed Control District as to the appropriate standard to best balance wildfire risk mitigation and soil protection. Consistent with the District's recommendation, the Department revised Section III.N.I Wildfire Prevention and Risk Mitigation of the draft Final Order, Attachment G draft Construction Wildfire Mitigation Plan, and Appendix F of the draft Comprehensive Revegetation and Soil Management Plan to include reference to vegetation requirements below:

a. **Vegetation Height and Clearance**

- Vegetation within and adjacent to the Solar Components will be maintained as follows:
- During the dry season (June to October), vegetation height will be limited to 4 to 8 inches. Vegetation will be mowed to a height of 4 inches prior to June of each year.
- Outside of the dry season (November to May), vegetation will be maintained at a maximum height of less than 12 inches~~,~~.
- ~~with a~~ A minimum vertical clearance of 12 inches from all electrical and mechanical equipment will be maintained at all times.
- Vegetation exceeding ~~this~~ the height~~s~~ listed above will be mowed or removed ~~prior to local~~ in accordance with any ODF- or County-issued fire restrictions.

…

Issue WF-11 (Certificate Holder); Request to remove requirement for drip can with fire suppression equipment.
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests that the Department remove a requirement in the Construction WMP that a 5-gallon Drip Can be carried in maintenance vehicles and stored on-site at the O&M building. Certificate holder clarifies that the project would not conduct activities requiring use of drip cans, and that workers would not have adequate experience to use drip cans.

Department Evaluation
Inclusion of drip cans in the draft Construction WMP was a representation made by the certificate holder, versus a recommended requirement. Given that the certificate holder seeks to clarify equipment that would not be needed or appropriate for the site, the Department agrees to remove the requirement as requested.

Issue WF-12 (McCullough, Kathryn; Gilbert, Irene); Concern about lack of availability of Operational Wildfire Mitigation Plan.
Comment ID: BCWAMD4Doc25-03 Proposed Order Public Hearing Transcript 2026-01-15; BCWAMD4Doc24-06 Proposed Order Public Comment McCulloughK-6 2026-01-09
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12; BCWAMD4Doc27-09 Proposed Order Public Comment CH Response to Kathy and Kevin McCullough 2026-02-13

Comment Summary
Commenters raise concern about lack of availability of Operational Wildfire Mitigation Plan for review as part of Proposed Order.

Department Evaluation
Under OAR 345-022-0115(1)(b), the Council must find that a proposed facility will be designed, constructed, and operated in compliance with a Wildfire Mitigation Plan approved by the Council. The rule sets forth the requirements that must be met in the plan. While it is preferred that draft plans for both the construction and operations phases of a facility be included in an application or request for amendment, it is not required by the standard. The Department has described the requirements that must be satisfied in Section III.N of the Proposed Order.

In its responses to this issue, the certificate holder explained that it is developing a site-specific Operational WMP, which will provide any site-specific information outlined in ODOE's Operational WMP template that is not already addressed in PGE's 2026-2028 Corporate WMP which was filed with the Oregon Public Utility Commission on December 31, 2025. The Operational WMP will include the same components as described for the Construction WMP with construction specific actions will be replaced with site-specific operations and maintenance actions. The certificate holder also provided an outline of the Operational WMP with generic examples of information that would be included.
The Department does not recommend any revisions to the draft Final Order based on this comment because the comment has not Identified a specific legal deficiency.
III.I. Siting Standards for Transmission Lines (OAR 340-035-0090)

Issue TL-01 (Certificate Holder); Request for additional flexibility in transmission line siting
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12
Reply ID: BCWAMD4Doc28-04 Proposed Order Public Comment CH Reply to ODOE 2026-02-28

Comment Summary
Certificate holder requests changes to recommended Amended Condition 119 to provide additional flexibility in transmission line siting, as presented in red underline, strikeout font below:

~~(119) OAR 345-027-0023(5): If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a pipeline or transmission line, the Council shall specify an approved corridor in the site certificate and shall allow t~~ The certificate holder ~~to~~ shall construct the ~~pipeline or~~ 230-kV transmission line connecting the Biglow Canyon Substation to the Solar Substation ~~anywhere~~ within a 150-foot corridor, as identified in the final site design ~~presented in Figure 2 of the Amended Site Certificate identified in the final site design the corridor, subject to the conditions of the site certificate. If the applicant has analyzed more than one corridor in its application for a site certificate, the Council may, subject to the Council's standards, approve more than one corridor.~~

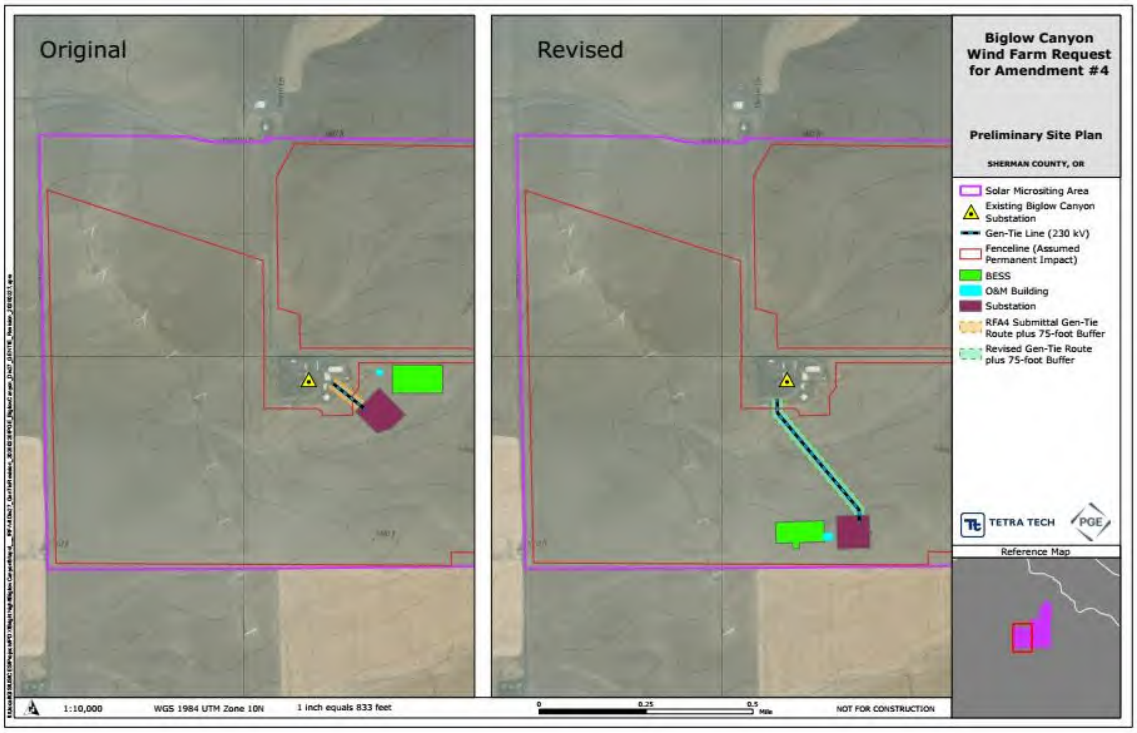
Department Evaluation

Under OAR 345-025-0010(5), the Council must specify an approved corridor for any transmission line approved in a site certificate. The Department disagrees with the certificate holder's proposed changes. The certificate holder only included one proposed corridor for the 600-foot segment of 230 kV transmission line in the Request for Amendment, which was presented in RFA4 Figure 2.2.

In its response to this issue the Department notes that if the certificate holder wishes to change the alignment of the transmission line it must present the alternate corridors so that they can be evaluated for compliance with applicable laws, rules and standards.

In its reply, the certificate holder explained that continued engineering evaluation of site conditions and infrastructure layout identified that the original substation site presented constraints relative to the existing infrastructure. Accordingly, a new location for the proposed substation and battery energy storage system (BESS) was identified to avoid low elevation areas, better align with existing infrastructure, and improve constructability, long-term operability, and overall infrastructure resilience. The certificate holder asserts that this refinement reflects prudent final engineering and results in improved consistency, new and existing infrastructure, rather than a change in project scope. Moving the collector substation location results in a corresponding adjustment to the transmission line corridor, with an updated alignment of a 230-kV transmission line approximately 1,900 feet in length, supported by three 80-foot tall steel monopole structures. The figure below shows the new location of the project substation and gen-tie transmission line, all still located within the Solar Micrositing Area.

Figure 1. Original and Revised Collector Substation Location and Transmission Corridor



The newly proposed substation location is within the proposed Solar Micrositing Area and has been fully surveyed and evaluated for all applicable resources and impacts. In addition, there do not appear to be any residences or linear structures that could be inadvertently energized within the refined corridor. Accordingly, the Department recommends the Proposed Order and draft Amended Site Certificate be amended with the revised substation location. Site certificate conditions will require an updated site plan, acoustic modeling, retirement estimate, and other resource studies to be provided prior to construction. **III.J. Noise Control Regulation (OAR 340-035-0035)**

Issue NC-01 (Certificate Holder) Requests Proposed Order Table 26 be revised to add NSR13 and reference to RFA Exhibit Y Table Y-7.
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests for Table 26, *Modeled Operational Noise of the Facility, As Amended*, to be revised to include NSR 13, and requests for Table 26 to include Table Y-7 as a source included in the noise modeling.

Department Evaluation
RFA4 Exhibit Y includes Tables Y-6 and Y-7. Both tables include 6 NSRs, including NSR 13. The data from Tables Y-6 and Y-7 are represented in the Proposed Order Table 26, but NSR is omitted and reference to RFA4 Exhibit Y Table Y-7 is also omitted, as indicated by the certificate holder.

Changes to Proposed Order Table 26 will be incorporated into the draft Final Order to be consistent with RFA4 Exhibit Y, as requested by certificate holder.

Issue NC-02 (Certificate Holder) Requests revisions to recommended Noise Control Condition 2 (PRE-NC-02) allowing for general waiver versus solar specific
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests that Noise Control Condition 2 (PRE-NC-02) be amended to allow any waivers needed to demonstrate compliance be general, rather than specifically reference the solar facility, consistent with the fact that the noise analysis is based on the facility as a whole.

Department Evaluation
As presented in Section IV.A Noise Control Regulation, the existing, operational wind facility relies on noise waivers to comply with the antiambient degradation standard. The addition of the facility components proposed in RFA4 would not change or increase the predicted exceedances of the existing, operational wind facility; however, the facility, as amended, must demonstrate compliance with the regulation (i.e., obligation to have an executed waiver where exceedances occur).

To ensure that the facility maintains compliance but is not obligated to update waivers solely to refer to a wind and solar facility, the Department agrees to modify recommended Noise Control Condition 2, as provided below in red, underline/strikeout, to be able to accept noise waivers that are applicable to the "facility." The intent of the condition is to receive waivers that align with the NSR ID's and property owners with exceedances identified in RFA4 for compliance verification.

> **Recommended Noise Control Condition 2 (PRE-NC-02)**: Prior to construction of the solar facility, the certificate holder must submit to the Department copies of executed legally effective easement(s) or real covenant(s) for all Noise Sensitive Properties impacted by the ~~solar~~ facility with noise exceedance. ~~The easement or covenant must authorize the solar energy facility to increase the ambient statistical noise levels, L10 or L50, on the sensitive property by more than 10 dBA at the appropriate measurement point.~~

[PRE-NC-01; OAR 340-035-0035(1)(b)(B)(iii)~~(III)~~; Final Order on AMD4]

III.K. Water Rights (OAR Ch. 690)

Issue WR-01 (Certificate Holder); Requests Revisions to recommended Amended Water Rights Condition 1 (PRE-WR-01) to Clarify Well Log Submission Timing
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests to modify the language of recommended Water Rights Condition 1 (PRE-WR-01) to clarify that the obligation to submit a well leg to Oregon Water Resources Department (OWRD) applies within 30-days of well construction rather than prior to well construction. Certificate holder describes that the requested changes are consistent with ORS 537.765.

Department Evaluation
The Department agrees with the certificate holder as ORS 537.765(2) states:

> *(2) The business or activity of constructing new wells or altering, abandoning or converting existing wells is declared to be a business or activity affecting the public welfare, health and safety. In order to enable the state to protect the welfare, health and safety of its residents, any licensed or permitted person shall keep a log of each well constructed, altered, abandoned or converted and shall electronically file a certified copy of the log with the Water Resources Department within 30 days after the completion of the construction, alteration, abandonment or conversion.*

Based on the above statutory language, in the draft Final Order the Department will include the condition language changes, as presented in red, underline/strikeout font below, as requested.

> **Recommended Water Rights Condition 1 (~~PRE~~CON-WR-01)**
> No later than 30 days after completing construction ~~prior to construction~~ of any new well, the certificate holder shall provide the Department a copy of the map, well log and all other information it provided to OWRD pursuant to ORS 537.545 and ORS 537.765 to qualify for an exempt ground water use for any onsite exempt wells.
> [Final Order on AMD4]

Issue WR-02 (Certificate Holder); Requests Revisions to recommended Amended Condition 75 (OPR-WR-01) on Applicability of Groundwater Usage Monitoring
Comment ID: BCWAMD4Doc24-08 Proposed Order Public Comment Certificate Holder 2026-01-14

Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder requests for recommended Amended Condition 75 (OPR-WR-01) to be amended to clarify that onsite well usage monitoring will not be required until a new well is installed, at which point meters would be installed.

Department Evaluation
Recommended Amended Condition 75 (OPR-WR-01) is intended to limit onsite well groundwater usage to 5,000 gallons per day and establishes a requirement for daily monitoring and usage recordkeeping. The recommended amended condition requiring use of flow meters to monitor combined water usage is intended to apply if new well(s) are constructed to support construction and operation of the facility components proposed in RFA4. Therefore, the Department agrees with the certificate holder and recommends that the applicability of the monitoring requirements be clarified. In the draft Final Order, the Department will include the condition language changes, as presented in red, underlined font below.

Recommended Amended Condition 75 (OPR-WR-01)

a. For any onsite exempt wells, ~~Before beginning operation of the facility, the certificate holder shall have in operation a well suitable for delivering water,~~ combined water usage shall not exceed~~ing~~ 5,000 gallons per day~~,~~ for domestic use at the facility's O&M buildings and~~, provided the rate of extraction would not exceed 5,000 gallons per day,~~ solar panel and blade-washing activities.
b. If new exempt well(s) are constructed for the solar facility, certificate holder shall install flow meters on the existing and new well(s); monitor the volume of groundwater used from all onsite wells on a daily basis; maintain a record of such use; and, make the monitoring records available to the Department upon request. ~~The certificate holder shall not change the source of water for the facility's domestic use without prior Council approval.~~

[Final Order on AMD4]

Issue WR-03 (Certificate Holder); Requests Revisions to recommended Amended Condition 75 (OPR-WR-01) on Applicability of 5,000 gallon/day limit
Comment ID: BCWAMD4Doc24-22 Proposed Order Public Comment Certificate Holder-2 2026-01-30
Response ID: BCWAMD4Doc26-01 Proposed Order Public Comment ODOE Responses 2026-02-12

Comment Summary
Certificate holder seeks clarification that the 5,000 gallon per day limitation on groundwater usage only applies to onsite exempt wells.

Department Evaluation

The Department confirms that recommended Amended Condition 74 (OPR-WR-01) is only applicable to exempt wells. In the draft Final Order, the Department will add reference to "exempt wells" to the condition, as presented in the Department Evaluation of Issue WR-02.

Attachment C: Draft Operations and Maintenance Framework Plan

Operations and Maintenance Plan Framework for Solar Components

Biglow Canyon Wind Farm
Request for Amendment 4
March 2026

Prepared for

Portland General Electric Company

Prepared by

TETRA TECH

[Contains revisions approved by Energy Facility Siting Council in Final Order on AMD4]

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Acronyms and Abbreviations

BCWF	Biglow Canyon Wind Farm
BESS	battery energy storage system
BIGL	BIGL bn, LLC
BMS	battery management system
Certificate Holder, or PGE	Portland General Electric Company
EFSC	Energy Facility Siting Council
EOP	Emergency Operations Response Plan
EPCRA	Emergency Planning and Community Right-to-Know Act
MV	medium voltage
O&M	operations and maintenance
ODOE	Oregon Department of Energy
PV	photovoltaic
QA/QC	quality assurance/quality control
RFA 4	Request for Amendment 4
SCADA	supervisory control and data acquisition
WMP	Wildfire Mitigation Plan

Table 1: Council Imposed Requirements

Summary	Timing	Requirement
Prior to Operations - Plan Finalization		
Action Based Plan	This plan shall be finalized based on actions that can be monitored, tracked, and recorded. Detailed narrative or explanation that is not a specific action must be removed. Filter for clarity and remove unnecessary high-level narrative.	
Qualifications and Contact Information	In the Plan: Include the contact information for: 1. The individuals that will manage and oversee vendors and contractors. 2. The individuals that will perform design-phase safety reviews. Evidence to Support Plan Review: Certificate must provide to the Department the names, contact information and qualifications of the individuals that will manage and oversee vendors and contractors; and of the individuals that will perform design-phase safety reviews. The Department may request additional information or justification for any individuals where the experience or qualifications is inadequate.	
Incorporation of requirements/citations from applicable site certificate conditions, protocols and technical plans	In the Plan: Identify all technical and site management plans applicable to operations and compliance for the solar components; incorporate relevant action items into the plan. At a minimum, the plan must reference and incorporate the Emergency Operations Responses Plan, Operational Spill Prevention Control and Countermeasure Plan, Operational Wildlife Mitigation Plan, and Comprehensive Revegetation, Noxious Weed and Soil Reclamation Plan.	
Inspection and maintenance	In the Plan: Identify all inspections and maintenance activities, schedule, protocol and inspection documentation format. Evidence to Support Plan Review: Provide documentation to be used to track maintenance and inspection activities. If information will be tracked via software, explain, demonstrate and provide available data.	
Vendor Performance Scoring System	In the Plan: The final plan shall include details about the certificate holder's vendor performance scoring system. The scoring system must, at a minimum, evaluate vendor response time, corrective maintenance scoring rates and inspection completion.	
Operations and Maintenance Budget	In the Plan: The final plan shall include a section for Operations and Maintenance Budget Tracking, including but not limited to, a summary of the basis for the amount estimated in the initial maintenance reserve, and an	

Tracking and Forecasting	explanation of the 5-year life cycle cost modeling. The plan shall include information about the estimated and available budget. Future plan updates must include 5-year life cycle cost modeling results.
Third-Party O&M Budget Audit	In the Plan: The final plan shall include information about annual third-party condition assessments, and ensure that the scope of the assessment includes annual review of vendor/contractor performance against warranty and reliability benchmarks.
Build Transfer Agreement	Evidence to Support Plan Review: Provide a copy of the executed Build Transfer Agreement (BTA). Confidential terms and conditions, unrelated to the roles, responsibilities, oversight and control of the certificate holder, third-parties, site certificate and facility, may be redacted from the executed BTA provided to the Department.
Community Outreach	In the Plan: The final plan shall include names and addresses of participating landowners, and shall detail the schedule, agenda and outreach efforts for annual coordination meetings, to be conducted by the certificate holder. The final plan shall require that the certificate holder invite Sherman County emergency responders and ODOE to each annual meeting. The plan shall require minutes from each meeting. Any issues will be tracked and evaluated to determine the appropriate response.
Reporting	In the Plan: Require reporting to the Department of the following: 1. Within 72-hours of a change in contractors, vendors or contract terms, report the change, the reasons for the change, and the identification, contact information and qualifications to the Department. 2. Monthly, report to the Department a summary of performance monitoring results (Vendor Performance Scoring System), including identification of any significant performance issues and corrective actions taken by or for the participating entity, contractor(s) and vendor(s). Certificate holder shall identify corrective actions, including stop work or removal from site, required of the vendor(s) for any performance scores less than 95% percent on-time inspection and repair completion rate. 3. Annually, provide to the Department a written report from a third-party contractor evaluating whether the established or forecasted operations and maintenance budget is adequate for site operations. 4. Annually, provide the agenda, attendees list and meeting minutes from the community outreach meetings. Certificate holder shall report any issues identified at the meeting and shall provide their response and/or resolution of the identified issue.

1.0 Introduction

This draft outline of the Operations and Maintenance (O&M) Plan for the amended Biglow Canyon Wind Farm (BCWF) integrates the Solar Components as identified in the BCWF Request for Amendment 4 (RFA 4) into the existing wind facility. It has been jointly developed by Portland General Electric Company (PGE; the Certificate Holder) and BIGL bn, LLC (BIGL), a subsidiary of BrightNight, LLC, to establish the preliminary framework for how the Solar Components of the Amended BCWF will be operated, maintained, and managed in compliance with the Site Certificate and applicable regulatory standards.

This O&M Plan applies exclusively to the Solar Components and associated infrastructure introduced through the BCWF RFA 4. It does not govern the O&M of the existing wind energy infrastructure, which continues to be managed under the previously coordinated PGE Operational Safety Monitoring Program. The O&M Plan reflects lessons learned from legacy wind operations at BCWF and current best practices for utility-scale solar and storage projects.

The O&M Plan framework described in Section 3.0 outlines the structure of operational responsibilities, long-term maintenance protocols, quality assurance processes, environmental compliance measures, and integration with emergency response and monitoring systems. The Certificate Holder will provide an O&M Plan that will use this framework to further detail the specific actions required to operate and maintain the Solar Components. The final O&M plan will be submitted to the Oregon Department of Energy (ODOE) prior to the start of operation of the Solar Components.

The final O&M Plan will reference and incorporate several other technical and site management plans relevant to operations and compliance for the Solar Components at the amended BCWF. These include, but are not limited to, the following plans developed for the BCWF RFA 4:

- The standalone Emergency Operations Response Plan (EOP) specific to solar and battery energy storage system (BESS) components;
- The Construction-phase Wildfire Mitigation Plan (WMP) and the Operations-phase WMP, which outline prevention and response protocols for wildfire risk during all project phases;
- The Comprehensive Solar Revegetation and Soil Management Plan, which details vegetation establishment, monitoring, and long-term maintenance;
- The Dust Abatement Plan, which governs dust control measures during both construction and operations; and
- Other resource-specific plans (e.g., the Decommissioning Plan, Spill Prevention and Control protocols) as required by the Site Certificate.

These documents will be cross-referenced with the final O&M Plan to ensure consistent implementation and clarity of responsibilities. The final O&M Plan will remain a living document, subject to regular review and revision in response to design changes, regulatory updates, and lessons learned during implementation.

2.0 Facility Partnership: Roles and Responsibilities

The Amended BCWF reflects a project delivery model that combines PGE's regulatory responsibility and long-term ownership with development and technical execution support from BIGL. This structure is designed to ensure compliance with Site Certificate conditions while leveraging external technical expertise to deliver the proposed Solar Components efficiently and to current industry standards.

PGE, as the Certificate Holder, retains ultimate oversight and responsibility for the Amended BCWF, including the Solar Components as outlined in RFA 4. BIGL has been engaged to support the initial development and construction of these components under a Build Transfer Agreement and will also provide O&M services for a minimum of the first 5 years of project operation. This approach allows for continuity between construction and early stage operation, while ensuring that all long-term operational accountability remains with PGE.

BrightNight and its subsidiary BIGL will implement a long-term O&M strategy grounded in industry best practices, internal experience, and a robust safety-first culture. While specific vendors have not yet been selected, BrightNight's team draws on a strong national track record in solar and battery storage project delivery and management. The Solar Components of the Amended BCWF will be supported by comprehensive O&M protocols that include scheduled preventive maintenance, real-time monitoring, remote diagnostics, and rapid response to equipment issues. BrightNight's O&M program, which emphasizes cradle-to-grave execution, 24/7 visibility into system performance, and continuous learning, will guide all operational phases. Quality assurance will be embedded through stringent contracting standards, rigorous design-phase safety reviews, and direct oversight by experienced internal personnel. Over the first 5 years of the project, BIGL will manage an experienced third-party O&M provided who will serve as the primary entity responsible for day-to-day maintenance and performance monitoring, while PGE's role will be defined in coordination with project milestones, interconnection requirements, NERC compliance, and long-term asset management planning.

BrightNight is committed to working in partnership with qualified local vendors whenever possible, fostering regional economic benefits and ensuring on-the-ground responsiveness throughout the project's operational life. All third-party vendors, whether local or national, will be selected through a rigorous procurement process that evaluates technical qualifications, safety performance, environmental compliance, and proven experience with utility-scale solar and storage facilities. Selected vendors will be required to adhere to industry best practices, such as:

- Implementing detailed preventive maintenance schedules,
- Providing trained and certified personnel,
- Using real-time monitoring and fault detection systems,
- Following all original equipment manufacturers' maintenance and service guidelines,
- Maintaining transparent documentation and reporting protocols,
- Using digital maintenance management systems,
- Conducting regular quality assurance/quality control (QA/QC) inspections,

- Establishing clear escalation procedures for unplanned outages, and
- Participating in site-specific safety trainings and continuous improvement processes.

BrightNight is also acutely aware of the community concerns stemming from historical O&M challenges at the BCWF. Based on conversations with local stakeholders, a key feature of the O&M strategy, though not highly technical, demonstrates the commitment to maintaining consistent communication with community members over the life of the BCWF Solar Components. The Project Developer and Certificate Holder will provide direct contact information and conduct regular check-ins to ensure residents feel empowered to raise questions or concerns. Any issues brought forward will be relayed promptly to the appropriate O&M teams for timely response and resolution. While BrightNight and PGE do not anticipate concerns of this nature, we believe creating a clear, accessible escalation path is an important part of building lasting community trust.

This structured approach ensures that any vendor engaged in the Amended BCWF will operate with the same high standards of safety, reliability, and performance that define BrightNight's operational philosophy.

This partnership structure does not alter the Certificate Holder's regulatory obligations or diminish its responsibility for compliance with the Energy Facility Siting Council (EFSC) and other applicable state and federal requirements. Rather, it provides a defined and managed pathway for project delivery that integrates third-party expertise into a framework that remains under PGE's control. Any third-party permits associated with construction activities will be secured through BIGL or its contractors but will be limited to standard, project-level requirements (e.g., encroachment, transport, building permits) and do not change the scope or structure of the existing site certificate.

Overall, the division of responsibilities between PGE and BIGL maintains clear regulatory accountability while enabling technically competent execution of the amended facility. This model is consistent with industry practices for utility-owned renewable infrastructure and is expected to support a timely and orderly expansion of the BCWF site in accordance with certificate conditions.

3.0 Integrated Operations and Maintenance Plan Framework

The Certificate Holder will submit a final version of the O&M Plan to ODOE prior to the commencement of operations. This Plan is intended to meet regulatory obligations, and to serve as the foundational framework guiding day-to-day operations of the Solar Components at the Amended BCWF.

To ensure consistency between compliance documentation and real-world implementation, the Plan will be updated as needed to fully incorporate the procedures, protocols, and tools adopted by the selected long-term O&M service provider. This integrated approach is designed to maintain a single, authoritative document that governs both regulatory compliance and operational execution, which eliminates the risk of conflicting or duplicative guidance.

3.1 Purpose and Applicability

The framework described in this section outlines the intended procedures for managing and maintaining the Solar Components of the Amended BCWF. It incorporates requirements from the Site Certificate, applicable codes, and protocols from the EOP, Decommissioning Plan, and supporting exhibits. This Plan applies to the Certificate Holder, BIGL, its contractors, and subcontractors. The final O&M Plan will be a living document. It shall be reviewed annually and revised in coordination with design changes, operational updates, or regulatory amendments.

3.2 Facility Description and Roles

The Amended BCWF includes legacy wind infrastructure and new solar photovoltaic (PV) and BESS systems. These additions are constructed under a Build Transfer Agreement by BIGL, with PGE retaining long-term ownership and regulatory oversight as the Certificate Holder.

- The facility will have three FTE onsite employees, two techs and a BIGL O&M Managemer; operations also rely on remote supervisory control and data acquisition (SCADA) systems.
- Initial O&M management services for solar and BESS components will be performed by BIGL for 5 years.

3.3 Design and Equipment Selection

The Certificate Holder and BIGL are going through the design and equipment selection process. During final design, PGE will consider all solar technologies available to ensure the most efficient and productive solar array layout and BESS equipment. The final O&M plan will incorporate O&M activities specific to the equipment selected, based on the manufacturers' instructions.

3.4 Preventative Maintenance and Asset Monitoring

BIGL or the Certificate Holder will identify preventative maintenance measures and supporting equipment monitoring efforts to ensure safe and reliable operation of the facility.

3.4.1 Substation

- Thermal imaging for termination and buswork
- Visual inspection of structure foundation and conduit
- Lubrication of moving parts (breakers, switches, etc.)
- Cooling system checks
- Control room inspections visual and tests
- Label and nameplate check
- Vegetation management

3.4.2 PV System

- Routine module inspections and annual infrared/aerial thermal imaging: Anomalies detected will generate corrective work orders within 48 hours and will be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final Operations and Maintenance Plan

- Routine SCADA monitoring and data analysis: Anomalies detected will generate corrective work orders within 48 hours and will be addressed according to level of severity; otherwise, as soon as reasonably possible and according to the final O&M Plan.
- Torque checks per manufacturers recommendations
- Panel washing with water use logs (per Exhibit O limits)
- Visual inspection of inverters, combiner boxes or load break disconnects, trackers, and all major equipment according to manufacturer's recommendation
- Vegetation management

3.4.3 BESS

- Quarterly infrared inspections of power conversion system units,
- Inspections of heating, ventilation, and air conditioning, battery management system (BMS), and fire suppression systems
- SCADA/BMS remote monitoring for anomalies
- Response procedures tied to EOP protocols for thermal runaway (EOP Section 3.2.1)
- Vegetation management

3.5 Compliance, Controls, and Reporting

The Certificate Holder will implement O&M practices that support compliance with applicable regulatory requirements and Site Certificate conditions. This will include operational controls, oversight procedures, and alignment with supporting plans that address vegetation management, spill prevention, wildfire mitigation, air and water quality, and other environmental and safety considerations.

Compliance measures will be scaled to site activities and updated as operations evolve. Documentation of inspections, incidents, and maintenance activities will be maintained. Reporting will follow applicable requirements and timeframes outlined in the Site Certificate and coordinating agency permits.

This section will be updated in the final O&M Plan to reflect specific commitments based on Site Certificate conditions and reporting requirements identified by ODOE and coordinating agencies. The final version will define required reporting content, frequencies, responsible parties, and coordination procedures to demonstrate ongoing compliance.

3.6 Emergency Preparedness Integration

The Certificate Holder will take the following actions to address emergency preparedness:

- Inspect and test all safety equipment.
- Review and update the EOP regularly, and ensure all personnel are fully trained in emergency response.
- Perform all Spill Prevention, Control, and Countermeasure Plan requirements, including maintaining spill kits.

- Develop and maintain a Hazardous Materials Management Plan if required by state or federal regulations.
- If applicable, prepare and maintain an Emergency Planning and Community Right-to-Know Act (EPCRA) Tier I or II form, plus a list and quantities of chemicals that exceed reporting thresholds for EPCRA Tier 2.
- Conduct an audit that includes a review of site compliance with the facility's safety program and onsite observation for proper implementation of safety policies, including Lock Out-Tag Out, and a review of the facility's safety program and any recommended revisions.
- Perform a root cause analysis, corrective actions taken, and recommended corrective work related to injuries or illness requiring medical attention other than first aid, injuries or illness requiring restricted duty or days away from work, or a fatality.
- Notify the operator as soon as possible, not to exceed 1 hour, of any of the following events:
    1) Emergency responders contacted for an emergency or law enforcement response.
    2) Injury on site requiring medical attention more than first aid.
    3) Unplanned outage of one or more medium-voltage (MV) collection or high-voltage circuits.
    4) Onsite fire.
    5) Conditions that necessitate an evacuation of onsite personnel.
    6) Awareness of an impending weather event that has a reasonable probability of causing significant damage or any of the preceding 1) through 5) events.

3.7 Contractor and Staff Oversight

BrightNight, on behalf of PGE, will oversee and facilitate the O&M of the BCWF Solar Components with an O&M service provider experienced in operating and maintaining large-scale PV solar systems and balance-of-plant systems for a large-scale BESS. There will be a long-term service agreement with the Solar Component BESS supplier. The O&M service provider will be responsible for the operation of the Solar Components, maintenance of the PV solar system to the point of interconnection, and maintenance of equipment/circuits from the BESS inverter AC output terminals to the point of interconnection. The O&M service provider's scope will cover equipment, including the PV array, PV system inverters, low-voltage cables, MV transformers (including auxiliary transformers), MV feeders, MV switchgear, site meters, and the O&M building equipment. PGE will perform maintenance on the substation
equipment and gen-tie line.

4.0 Long-term Maintenance and Operational Continuity

To support the proposed 40-year operational life of the Solar Components, the Certificate Holder has developed a long-term maintenance and operations framework that evolves over time and ensures continuous compliance with site certificate conditions.

Years 1–5: BIGL will lead O&M activities under the Build Transfer Agreement. The O&M service provider will have full responsibility for inspections, corrective maintenance, and

warranty compliance. BIGL's scope will also include preventive maintenance scheduling and vendor oversight.

Post-Year 5: PGE will assume full O&M responsibilities, integrating solar and BESS oversight into its internal asset management systems. This transition will be guided by a detailed handover plan including training, document transfer, and performance reviews conducted in Year 4.

Continuity of Practice: Regardless of ownership stage, O&M will be conducted in accordance with procedures established in this document, including vendor management, EOP training, and incident reporting protocols. Performance metrics and component reliability will be tracked in PGE's asset management software and reviewed annually.

4.1 Personnel and Quality Assurance Oversight

The Amended BCWF will be supported by experienced operations personnel through all phases of its operating life.

Operations Roles:

- SCADA/Performance Analyst
- Field Technician Team (PV/BESS certified)
- Asset Manager (PGE)
- QA/QC Lead (during and post-handoff)

Quality Assurance Protocols:

- Annual third-party condition assessments (PV and BESS)
- Annual SCADA data audit for performance anomalies
- Compliance inspections linked to EOP protocols
- Maintenance records retained and reviewed for trends

4.2 Budget Planning and Lifecycle Management

PGE will incorporate the solar and BESS components into its existing capital planning processes. The following measures support financial assurance and long-term reliability:

- Maintenance Budgeting:
  - O&M budgets for the first 5 years are embedded in the Build Transfer Agreement.
  - Post-transfer, expenses are forecasted annually by the Asset Management Team and tracked against site-specific performance.
- Lifecycle Planning:
  - A major maintenance reserve will be included in financial modeling to support inverter replacement, battery module refresh (anticipated at 12–15 years), and other long-term needs.
  - PGE's decommissioning cost estimates (Exhibit X) will be updated every 5 years to reflect equipment aging and market conditions.

5.0 Plan Updates and Reporting

The O&M Plan shall be reviewed and revised annually, if applicable, by the certificate holder based on design changes, operational updates, or regulatory changes; and to incorporate the procedures, protocols, and tools adopted by the selected long-term O&M service provider. All changes are subject to review and approval by the Department.

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Attachment D: Draft Comprehensive Solar Revegetation and Soil Management Plan

Comprehensive Solar Revegetation and Soil Management Plan

Biglow Canyon Wind Farm
Request for Amendment 4
March 2026

Prepared for

Portland General Electric Company

Prepared by

Tetra Tech, Inc.

[Contains revisions approved by Energy Facility Siting Council in Final Order on AMD4]

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Appendix D. Fugitive Dust Control Plan

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Appendix G: Weed Control Plan

Acronyms and Abbreviations

BCWF or Facility	Biglow Canyon Wind Farm
BIGL	BIGL bn, LLC
Comprehensive Plan	Comprehensive Solar Revegetation and Soil Management Plan
County	Sherman County
EFSC	Energy Facility Siting Council
EMC	Environmental Monitoring Contractor
EPC	Engineering, Procurement, and Construction Contractor
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
ODOE	Oregon Department of Energy
PGE or Certificate Holder	Portland General Electric Company
RC	Revegetation Contractor
RFA	Request for Amendment
WC	Weed Control Contractor

1.0 Introduction

This Comprehensive Solar Revegetation and Soil Management Plan (Comprehensive Plan) has been prepared by Portland General Electric Company (PGE or Certificate Holder) to serve as a primary source of commitments related to revegetation, soil management, dust control, stormwater management, and noxious weed control through the pre-construction, construction, and operations phases for the photovoltaic solar energy generation and battery storage (Solar Components) associated with Request for Amendment (RFA) 4 of the Site Certificate for the Biglow Canyon Wind Farm (BCWF or Facility). PGE will own and operate the Solar Components as a part of the BCWF (together, Amended Facility or Facility), which, to date, have been developed by BIGL bn, LLC (BIGL or Project Developer). BIGL, in its capacity as the project developer, supports PGE in this RFA 4 and may construct and temporarily operate the Solar Components on behalf of PGE under a Build-Transfer Agreement.

For ease of implementation and compliance tracking, this document is structured to identify actionable items by phase and typical sequencing within each phase, with additional details provided as appendices and/or incorporated by reference.

This Comprehensive Plan will be updated, as necessary, in coordination with the Oregon Department of Energy (ODOE) and applicable agencies as specified below prior to construction to reflect the final layout of the Solar Components and additional details only available once an Engineering, Procurement, and Construction Contractor (EPC) has been identified.

1.1 Plan Finalization

Table 1 identifies information that must be incorporated into the Comprehensive Plan before beginning any phase of construction.

Table 1. Action Items for Plan Finalization

Action	Timeframe	Implemented By	Review/ Verification
Notify Department of identity of EMC, EPC, RC, and WC. Provide evidence that each contractor meets the minimum qualifications described in Appendix A.	Plan Finalization	Certificate Holder	ODOE
Update Appendix A, Table A-1 with name and contact information for each contractor.	Plan Finalization	Certificate Holder	ODOE
Update Section 6.0, Table 5 with operations long-term vegetation management details from Public Utility Commission (PUC)-approved vegetation management plan, including monitoring for Wildfire Management Plan vegetation criteria.	Prior to Operations	EMC	ODOE
Update Appendix B, Table B-1 with temporary and permanent disturbance acres by habitat subtype.	Plan Finalization	EMC	ODOE

Action	Timeframe	Implemented By	Review/ Verification
Update Appendix B with a Construction Plan and maps based on final design, expected disturbance levels, and sequencing of construction.	Plan Finalization	EMC	ODOE, ODA, ODFW, County
Update Appendix C with approved National Pollutant Discharge Elimination System (NODES) 1200-C permit and Erosion and Sediment Control Plan (ESCP). Incorporate all stormwater control and treatment best management practices (BMPs) required by the 1200-C permit, and any supplemental BMPs required by this Comprehensive Plan, into ESCP.	Plan Finalization	EPC	ODOE
Update Appendix D with construction dust control measures. Include contact information and procedures for Dust Control Hotline	Plan Finalization	EPC	ODOE
Update Appendix E with proposed baseline soil compaction sample locations.	Plan Finalization	Certificate Holder	ODOE
Update Appendix F with Final Revegetation methods, as needed, for both temporary and permanent disturbance areas in consultation with ODOE	Plan Finalization	EMC	ODOE
Update Appendix G with timing and treatment methods for each identified weed species of concern after consulting with the Sherman County Weed District.	Plan Finalization	WC & EMC	ODOE and County
Update Appendix G with final noxious weed and vegetation monitoring methods.	Plan Finalization	EMC	ODOE
Notes: EMC = Environmental Monitoring Contractor; EPC = Engineering, Procurement, and Construction Contractor; ODOE = Oregon Department of Energy; WC = Weed Control Contractor; County = Sherman County			

2.0 Definitions

Definitions applicable to this Comprehensive Plan are provided in Table 2, below.

Table 2. Definitions for the Biglow Canyon Wind Farm

Term	Definition
BCWF; Facility	Biglow Canyon Wind Farm
Habitat Areas	Any undeveloped, non-agricultural areas, including but not limited to areas mapped as grassland, sagebrush shrub-steppe, or riparian habitat, prior to construction of the Solar Components.
Permanent Disturbance Area	Any area permanently occupied by the Solar Components, including all areas within the fence line of a solar array or substation.
Sensitive Soils	Soils that are highly susceptible to erosion from water, fugitive dust propagation, compaction, or other impacts as described in Appendix E.

Term	Definition
Solar Components	Photovoltaic solar energy generation, battery storage, and other components authorized in RFA 4.
Solar Micrositing Area/ RFA 4 Site Boundary	Maximum area where Solar Components may be built or cause temporary disturbance.
Temporary Disturbance Area	Any area that is disturbed during construction of the Solar Components but will not be permanently occupied during operations.
Weed Management Area	Disturbance area associated with the Solar Components and a 10-foot buffer.

3.0 Plan Goals and Management Objectives

This Comprehensive Plan was developed to demonstrate compliance with the terms and conditions of the Site Certificate and other applicable state and local laws and regulations. Specifically, the actions described in this Comprehensive Plan are intended to increase the probability of revegetation success, reduce erosion and dust pollution, protect topsoil for future agricultural use on agricultural land, prevent and address the establishment and spread of noxious weeds, minimize fire risk, and maintain beneficial vegetation at the site.

The BCWF is located on privately owned agricultural land used primarily for dryland wheat production and, to a lesser extent, cattle grazing. The grazed land is grassland, shrub-steppe rangeland, and/or fallow wheat stubble fields. The Solar Micrositing Area also contains important wildlife habitat and movement corridors, particularly along the John Day River and its tributaries. Sensitive soils are present throughout the Solar Micrositing Area, and erosion hazards from wind and water are severe in areas with steep slopes, including canyons and drainages in the northeast portion. To ensure that the area can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the Solar Components, Permanent Disturbance Areas in wildlife habitat will be revegetated for the purposes of soil stabilization to reduce erosion, dust pollution, topsoil depletion, and the potential for invasion by noxious weeds and other invasive plants. Cropland in the Solar Micrositing Area will be returned to landowner control and will not be revegetated by the Certificate Holder.

To minimize impacts to agricultural uses and habitat in Temporary Disturbance Areas, soil disturbance and vegetation removal will be minimized and reasonable efforts will be made to restore vegetation and soils in agricultural and habitat areas to their pre-disturbance condition. Best Management Practices (BMPs) will be implemented to minimize erosion and prevent the introduction or spread of noxious weeds and other invasive plants in both habitat areas and temporarily disturbed developed areas (i.e., existing roads, rock quarries).

4.0 Pre-construction Compliance

Table 3 outlines actions related to revegetation, soil management, dust control, stormwater management, and noxious weed control that must be completed before beginning construction.

Table 3. Pre-construction Compliance Checklist

Action	Timeframe	Implemented By	Review/ Verification
Provide Final Comprehensive Plan to all participating parties.	At least 30 days prior to construction	Certificate Holder	ODOE
Hold a kick-off meeting with the EMC, EPC, County, and ODOE.	At least 14 days prior to construction.	Certificate Holder	ODOE
Collect baseline soil compaction measurements within all anticipated Level 3 and 4 Disturbance Areas described in Appendix B using the protocol described in Appendix E. Submit baseline soil compaction measurement results to ODOE.	Prior to construction	EMC	ODOE
Complete installation of stormwater, erosion, and sediment controls as required by the 1200-C permit. See Appendix C.	Prior to construction	EPC	ODOE
Coordinate the construction schedule and sequence with landowners to maintain land in current production and weed control until the last growing season prior to construction.	Prior to construction	Certificate Holder	ODOE
Conduct on-site Environmental Training with contractors, construction personnel, and environmental inspector(s), inviting specialty contractors, Oregon Department of Agriculture (ODA), Oregon Department of Fish and Wildlife (ODFW), the County, and ODOE. The training must cover all aspects of this Comprehensive Plan and other requirements applicable to construction, including but not limited to: • Roles and responsibilities • Implementation of avoidance buffers for sensitive resources (e.g., flagging) • Methods for identifying and preventing the spread of noxious and invasive weeds • BMPs for soil protection and erosion control under the 1200-C Permit. • Fire prevention practices during construction	Prior to construction	Certificate Holder	ODOE
Provide records demonstrating that all contractor personnel have attended on-site Environmental Training described above.	Prior to construction	Certificate Holder	ODOE
Conduct additional pre-construction noxious weed surveys to identify noxious weeds present within the Solar Components at the time of construction to inform management.	Prior to construction	EMC	ODOE
Provide the Appendix G Weed Control Plan to the Sherman County Weed District for review and concurrence with treatment guidelines.	Prior to construction	Certificate Holder	ODOE
Treat noxious weeds within the Weed Management Area in accordance with methods in Appendix G.	Prior to construction	WC	ODOE

Action	Timeframe	Implemented By	Review/ Verification
Provide evidence that existing noxious weeds have been identified and treated in accordance with methods in Appendix G.	Prior to construction	Certificate Holder	ODOE
Notes: County = Sherman County; EMC = Environmental Monitoring Contractor; EPC = Engineering, Procurement, and Construction Contractor; ODOE = Oregon Department of Energy; RC = Revegetation Contractor; WC = Weed Control Contractor			

5.0 Construction Compliance

Table 4 outlines actions needed for compliance during construction related to revegetation, soil management, dust control, stormwater management, and noxious weed control.

This list includes actions applicable throughout construction as well as actions required as construction nears completion and revegetation commences in preparation for entering the operations phase.

Table 4. Construction Compliance Checklist

Action	Timeframe	Responsible Party	Review/ Verification
During Construction Mobilization			
Provide information about target noxious weed species at the operations and maintenance buildings.	During construction	EPC	EMC & ODOE
Ensure a copy of this Comprehensive Plan and a description of any additional fugitive dust control requirements are available on site.	During construction	EPC	EMC & ODOE
Prominently display Dust Control Hotline signs, providing direct access to the Certificate Holder Site Manager.	During construction	EPC	EMC & ODOE
Flag sensitive environmental resources (e.g., historic, cultural and archaeological resources; active raptor nests; delineated wetlands and waterways) and noxious weed infestations to alert construction personnel of avoidance areas or management requirements.	During construction	EMC	ODOE
During Ground-Disturbing Activities			
On or before April 15 of any year in which construction occurs within Category 2 habitat, all mowing, vegetation removal and/or ground disturbance associated with site preparation must be completed. No mowing, vegetation removal and/or ground disturbance associated with site preparation may occur within Category 2 habitat between April 15 through September 1.	During construction within Category 2 habitat	EPC, Certificate Holder	EMC & ODOE
In Disturbance Level 3, 4, and 5 areas (described in Appendix B), stockpile excavated soils by soil horizon to replace in the same order and prevent mixing of topsoil and subsoils. Put conserved topsoil back in place prior to revegetation activities.	During construction	EPC	EMC & ODOE
Do not move topsoil and other soils from areas with noxious weeds to areas without noxious weeds; instead, return these soils to their previous location during reclamation activities to reduce the transport of weed seeds, roots, or rhizomes.	During construction	EPC	EMC & ODOE
Use appropriate erosion and sediment control practices, as required by the NPDES 1200-C permit (Appendix C).	During construction	EPC	EMC & ODOE
Limit vehicle access to designated routes, whether existing roads or newly constructed roads, and the outer limits of construction disturbances per the final design for the Solar Components; limit vehicle traffic in areas with noxious weeds.	During construction	EPC	EMC & ODOE
Require construction vehicles to pass through a wheel wash station at vehicle ingress/egress points each time they enter or exit the Solar Components.	During construction	EPC	EMC & ODOE

Action	Timeframe	Responsible Party	Review/ Verification
Clean vehicles and equipment associated with ground disturbance and movement of topsoil utilizing a mobile wash station after performing work in areas with noxious weeds and prior to performing work in areas without noxious weeds.	During construction	EPC	EMC & ODOE
Implement appropriate BMPs to control any dust generated by construction activities, such as applying water or stabilizers to roads and disturbed soil areas.	During construction	EPC	EMC & ODOE
Maintain records of U.S. Environmental Protection Agency (EPA) Method 22 (ODEQ 2019) monitoring.	During construction	EPC	EMC & ODOE
After grading is complete but prior to installation of Solar Components, apply temporary or permanent soil stabilization, as described in Appendix F.	During construction	RC	EMC & ODOE
Monitor the Weed Management Area for noxious weeds during and after construction and implement control measures as described in Appendix G.	During and following construction	EMC & Certificate Holder	ODOE
Conduct compliance monitoring to ensure that contractors are complying with noxious weed prevention measures in this Comprehensive Plan. Facilitate coordination meetings with ODOE and Sherman County Weed District, train all personnel to maintain tracking sheets, conduct routine check-in calls with the construction team, and document communication with landowners prior to chemical application. Maintain records and provide ODOE with copies of these records annually during construction. If the Certificate Holder contracts with the Sherman County Weed District to perform weed control at the Solar Components, then monitoring records will include a statement that the county agency performed the work.	During construction	EMC	ODOE
If construction extends into the growing season prior to the commercial date of operations and formal post-construction weed monitoring, conduct informal but comprehensive weed surveys to inform adaptive management. Weed monitoring may be conducted as part of routine environmental monitoring to be completed at least monthly from April to October.	During construction	EMC	ODOE
Soil Stabilization and Reclamation			
Coordinate with the landowner or farm operator to identify the preferred approach for soil stabilization on agricultural land until routine seeding and tillage resumes. Soil stabilization may include applying unseeded hydromulch or crimping in weed-free straw until seeding can occur. Landowner may choose to assume responsibility for soil stabilization. Agricultural lands will be restored to landowner satisfaction.	During and following construction	Certificate Holder	EMC & ODOE

Action	Timeframe	Responsible Party	Review/ Verification
Meet with ODOE in coordination with ODFW and Sherman County Weed District to review the actual extent and conditions of disturbed areas and confirm the revegetation methods to be implemented.	After each phase of construction is complete and before revegetation	Certificate Holder	ODOE
In areas with noxious weeds where soil was removed, return soils to their previous location during reclamation activities to reduce transport of weed seeds, roots, or rhizomes.	During reclamation	EPC	EMC & ODOE
Treat noxious weeds in the Weed Management Area using methods described in Appendix G and in consultation with the Sherman County Weed District as necessary. No weed treatment will occur in agricultural lands without landowner permission.	Before reclamation and revegetation	WC	EMC & ODOE
Decompact soil by mechanical scarification (tilling or ripping the soil) to an appropriate depth as described in Appendix F. Soil amendment, such as addition of organic matter (compost), may also be necessary to alleviate compaction.	Prior to revegetation	EPC	EMC & ODOE
Complete post-construction soil compaction testing in spring or late fall in accordance with Appendix E. Submit results to ODOE for review and approval.	After reclamation and before revegetation	EMC & Certificate Holder	ODOE
Perform soil preparation prior to seeding using methods described in Appendix F.	Before revegetation	EPC	EMC & ODOE
Prevent conditions favorable for noxious weed germination by revegetating as soon as practicable.	After reclamation	RC	ODOE
Revegetation of Permanent Disturbance Areas			
Following completion of construction phases, seed undeveloped permanent disturbance areas in accordance with methods described in Appendix F.	During revegetation	RC	EMC & ODOE
Revegetation of Agricultural Temporary Disturbance Areas			
Coordinate with the landowner or farm operator to identify the preferred approach for revegetating agricultural land. Landowner may choose to assume responsibility for revegetation. Agricultural lands will be restored to landowner satisfaction.	During revegetation, following each construction phase	Certificate Holder, EPC	EMC & ODOE
Report to ODOE on the success of agricultural land restoration efforts; provide evidence that landowner or farm operator is satisfied with restoration.	During & following construction	Certificate Holder	EMC & ODOE
Revegetation of Non-Agricultural Temporary Disturbance Areas			

Action	Timeframe	Responsible Party	Review/ Verification
Reseed areas of temporary disturbance outside of agricultural lands, as described in Appendix F.	During revegetation, following each construction phase	RC	EMC & ODOE
If straw is needed and certified weed-free straw is unavailable, identify a local source of straw and obtain approval for its use by ODOE in consultation with the Sherman County Weed District.	Before revegetation	RC or EPC	ODOE
Consult with ODOE, ODFW, ODA, Sherman County Weed District, and/or the seed supplier to determine the optimal timing for seed application based on climatic conditions of the particular year when construction and revegetation efforts are implemented. Seeding from September to March is typically recommended.	Before revegetation	RC & EMC	ODOE
Stabilize seeded areas to facilitate establishment by applying seedless, certified weed-free hydromulch containing a tackifier or crimped weed-free straw.	During revegetation	RC or EPC	EMC & ODOE
Maintain records of revegetation efforts in all temporary and permanent disturbance areas and update ODOE monthly as revegetation work occurs.	Monthly during revegetation	EMC	ODOE
Notes: EMC = Environmental Monitoring Contractor; EPC = Engineering, Procurement, and Construction Contractor; ODOE = Oregon Department of Energy; RC = Revegetation Contractor; WC = Weed Control Contractor			

6.0 Operations Compliance

Table 5 summarizes actions needed for compliance during operations related to revegetation, stormwater management, and noxious weed control. This list includes actions applicable throughout operations as well as actions required only initially following construction, for example through the Notice of Termination (NOT) for Coverage under a NPDES Permit. Soil management and dust control measures are not included in Table 5 because they are addressed during prior phases.

Table 5. Operations Compliance Checklist

Action	Timeframe	Responsible Party	Review/ Verification
YEAR 1			
Conduct seasonal monitoring of Permanent Disturbance Areas to visually assess the following: a. Establishment of seeded species; b. Inspection of areas of bare soil for erosion; and c. Presence of noxious weeds.	Initiate within 60 days of the completion of revegetation and conduct once per season in the first year following construction	EMC	ODOE
Inspect and maintain stormwater measures as required in the 1200-C permit.	During operations, prior to achieving NOT for the NPDES	Certificate Holder & EMC	ODOE
Inspect and maintain any permanent stormwater management infrastructure. Inspect project facilities (e.g., roads) for erosion issues.	During operations, after achieving NOT for the NPDES	Certificate Holder	ODOE
YEARS 2 to 6			
Conduct annual monitoring of Permanent Disturbance Areas to assess whether vegetation meets success criteria (Appendices B and D).	Annually for 5 years in May or June, beginning the first year after revegetation	EMC	ODOE
Monitor revegetated Temporarily Disturbance Areas, unless the landowner converted the area to land uses that preclude meeting revegetation success criteria. To determine if revegetated temporarily disturbed areas are meeting success criteria, compare vegetation for monitoring and reference transects in each of the non-agricultural habitat subtypes that had more than 0.2 acre of temporary disturbance (Appendix B).	Annually for 5 years in May or June, beginning the first year after revegetation	EMC	ODOE
Determine and report on whether success criteria have been met or are trending towards being met (see Appendix F for report content and success criteria) for Temporary and Permanent Disturbance Areas. Final determination of whether the Certificate Holder is in compliance with revegetation obligations will be made by ODOE. Remedial actions and/or additional monitoring for areas may be required in areas that have been determined by ODOE not to have met the success criteria.	Annually for 5 years in May or June, beginning the first year after revegetation and for the life of the Solar Components on a schedule to be determined in consultation with ODOE	EMC	ODOE
If a revegetated area is damaged by wildfire, develop a plan, subject to ODOE approval, to address the damaged area. Continue to monitor and report on revegetation progress during the remainder of the 5-year period. Report to ODOE within 72 hours of discovery.	During the first 5 years following revegetation if wildfire occurs.	EMC	ODOE

Action	Timeframe	Responsible Party	Review/ Verification
Summarize noxious weed monitoring results in annual reports that describe noxious weeds identified, treatments implemented, treatment efficacy, and recommendations for additional treatments. Submit reports to ODOE, ODA, ODFW, and the County annually. If the Certificate Holder contracts with the Sherman County Weed District to perform weed control at the Solar Components, then no monitoring report needs to be provided except for a statement that the County agency performed the work.	During first 5 years of operations	Certificate Holder & EMC	ODOE
Implement the measures outlined in Appendix F to address vegetation management to reduce wildfire risk	During operation	EMC	ODOE
Consult with ODOE, ODA, and the Sherman County Weed District to design a long-term weed control plan as needed based on the success of control efforts.	After 5th year of annual monitoring	Certificate Holder	ODOE, ODA, County
Provide records demonstrating that all Facility personnel have been trained on noxious weed control.	Annually during operations	Certificate Holder	ODOE
Monitor as outlined in Appendix G within the Weed Management Area for the life of the Solar Components to assess weed growth and inform noxious weed control measures. Assess the success of noxious weed treatments and document any new noxious weed infestations observed.	During operations	Certificate Holder & EMC	ODOE
Control noxious weeds as described in the long-term weed control plan. Maintain ongoing communication with landowners and the Sherman County Weed District regarding noxious weeds at the Solar Components. Control noxious weeds reported by landowners on a case-by-case basis and prepare a summary of measures taken for that landowner.	During operations	Certificate Holder	ODOE
Consult with the Sherman County Weed District on timing, method, and application rates for each identified weed species of concern, to allow for adaptive weed management given changes in weed control effectiveness from noxious weed species tolerance to herbicide treatment over time. Report the results of the consultation to ODOE within 30 days. Any alternative control methods can be proposed by the Certificate Holder or its contractors, subject to approval by the Sherman County Weed District.	Every fall season during operations	Certificate Holder	ODOE

Notes: EMC = Environmental Monitoring Contractor; NOT = Notice of Termination; NPDES = National Pollutant Discharge Elimination System; ODOE = Oregon Department of Energy; ODFW = Oregon Department of Fish and Wildlife

7.0 Plan Amendment

This Comprehensive Plan may be amended from time to time by agreement of the Certificate Holder and the Oregon Energy Facility Siting Council (EFSC). Such amendments may be made without amendment of the site certificate. EFSC authorizes ODOE to agree to amendments to this Comprehensive Plan. ODOE shall notify EFSC of all Comprehensive Plan amendments, and EFSC retains the authority to approve, reject, or modify any amendment agreed to by ODOE.

8.0 References

ODEQ (Oregon Department of Environmental Quality). 2019. OAR 340-208-0210 EPA Method 22. https://secure.sos.state.or.us/oard/viewAttachment.action?ruleVrsnRsn=256141

Appendix A. Roles and Qualifications

Roles and Responsibilities

The Certificate Holder is the overall responsible party for construction and operation of the Solar Components and implementation of this Comprehensive Plan. However, the Certificate Holder may use contractors to complete tasks associated with this Comprehensive Plan. Responsible parties and their roles are described in Table A-1. Minimum qualifications for contractors are provided in Table A-2.

Table A-1. Roles and Responsibilities

Responsible Party	Name and Contact Information	Role
Certificate Holder	Portland General Electric Company	Responsible for compliance with all site condition requirements, hiring contractors that meet the minimum qualifications described in Appendix A, and ensuring that all contractors perform work in accordance with the requirements of this Comprehensive Plan.
Engineering, Procurement, and Construction Contractor (EPC)	Name: Contact Person: Address: Phone Email	Responsible for implementing best management practices (BMPs) and other measures specified in the National Pollutant Discharge Elimination System (NPDES) 1200-C permit and this Comprehensive Plan to minimize impacts during construction, as well as for performing restoration and revegetation actions, as identified in this Comprehensive Plan.
Revegetation Contractor (RC)	Name: Contact Person: Address: Phone Email	Responsible for performing revegetation actions during and immediately after construction, as described in this Comprehensive Plan.
Weed Control Contractor (WC)	Name: Contact Person: Address: Phone Email	Responsible for performing weed control actions in the Weed Management Area, as described in this Comprehensive Plan.
Environmental Monitoring Contractor (EMC)	Name: Contact Person: Address: Phone Email	Responsible for conducting environmental monitoring and documenting compliance with aspects of this Comprehensive Plan during and following construction, including conducting revegetation, dust, soil, stormwater, and noxious weed monitoring.

Responsible Party	Name and Contact Information	Role
Oregon Department of Energy (ODOE)	Oregon Department of Energy Compliance Specialist 550 Capitol St. NE Salem, OR 97301 Phone Email	Responsible for providing technical input on proposed BMPs and other measures to minimize impacts and for validating all compliance deliverables described in this Comprehensive Plan. ODOE may utilize contractors to meet its responsibilities under this Comprehensive Plan during some or all phases.
Sherman County (County)	Sherman County Weed Department Nick Weis, Weed District Supervisor 66143 Lone Rock Road Moro, OR 97039 (541) 565-3655 nickw@shermancountyor.gov	Responsible for providing input on weed control and other actions described in this Comprehensive Plan and its implementation as needed. The County will also attend calls with ODOE and other agencies as needed.

Contractor Minimum Qualifications

Table A-2. Contractor Minimum Qualifications

Contractor	Role	Minimum Qualification
Engineering, Procurement, and Construction Contractor (EPC)	Responsible for implementing BMPs and other measures specified in the NPDES 1200-C permit and this Comprehensive Plan to minimize impacts during construction, as well as for performing restoration and revegetation actions.	Minimum qualifications for the EPC include: • Experience implementing measures in the NPDES 1200-C permit; • Demonstration of sufficient resources and staffing for anticipated BMP installations and maintenance; and • Experience in coordination with agencies and private landowners.
Revegetation Contractor (RC)	Responsible for performing revegetation actions during and immediately after construction.	The Certificate Holder will ensure that the RC has the following minimum qualifications: • Demonstrated experience in the Columbia Plateau; • Experience in native plant, non-native and invasive plants, and noxious weed identification and management; • Experience in revegetating natural areas; • Experience with site preparation and applicable seeding methods; • Experience in documenting revegetation actions and providing progress reports; • Experience in coordination with agencies and private landowners; and • No recent (within one year) violations on the contractor's record.
Weed Control Contractor (WC)	Responsible for performing weed control prior to, during, and after construction within the disturbance area and a 10-foot buffer (Weed Management Area).	The Certificate Holder will ensure that noxious weed management actions will be conducted by specialists with the following qualifications: • Experience in native plant, non-native and invasive plants, and noxious weed identification in the Columbia Plateau Ecoregion; • Experience in noxious weed mapping; • If chemical control is used, specialists must possess a Commercial or Public Pesticide Applicator License from the Oregon Department of Agriculture or possess an Immediately Supervised Pesticide Trainee License and be supervised by a licensed applicator;

Contractor	Role	Minimum Qualification
		• Training in noxious weed management or Integrated Pest Management with an emphasis in noxious weeds; • Experience in coordination with agencies and private landowners; and • No recent (within one year) violations on the contractor's record.
Environmental Monitoring Contractor (EMC)	Responsible for conducting environmental monitoring and documenting compliance with aspects of this Comprehensive Plan during and following construction, including conducting revegetation, dust, soil, stormwater, and noxious weed monitoring as described below.	Minimum qualifications for the EMC include: • Have an active certification recognized in the 1200-C permit (e.g., Certified Erosion and Sediment Control); • Experience implementing and monitoring measures in the NPDES 1200-C permit; • Experience and knowledge of U.S. Environmental Protection Agency Method 22 (ODEQ 2019) with respect to the general procedures for determining the presence of visible emissions; • Experience in native plant, non-native and invasive plants, and noxious weed identification and management; • Experience in noxious weed mapping; • Training in noxious weed management or Integrated Pest Management with an emphasis in noxious weeds; and • Experience in coordination with agency and private landowners. The EMC will include a qualified botanist or revegetation specialist who will be responsible for monitoring and reporting on revegetation success.

Appendix B. Construction Plan

Disturbance Acreage

Acres of temporary and permanent disturbance to habitat subtypes associated with Solar Component construction and operation are provided in Table B-1.

Table B-1. Acres of Temporary and Permanent Disturbance

ODFW Habitat Category	Habitat Type	Habitat Subtype	Temporary Disturbance (acres)	Permanent Disturbance (acres)
1	N/A	N/A	-	-
2	Riparian	Riparian Trees	0.0	0.0
	Shrub-steppe	Sagebrush Shrub-Steppe	0.3	20.7
	Category 2 Subtotal		**0.3**	**20.7**
3	N/A	N/A	-	-
4	Grassland-steppe	Grasslands	0.1	3.0
	Surface Water	Ephemeral Streams	0.0	0.0
	Category 4 Subtotal		**0.1**	**3.0**
5	N/A	N/A	-	-
6	Agriculture	Irrigated Cropland	0.1	52.0
	Agriculture	Non-Irrigated Cropland	9.4	1,365.0
	Developed	Developed	1.0	3.9
	Category 6 Subtotal		**10.5**	**1,420.9**
		Total	**10.9**	**1,444.6**

1. There are no disturbances in surface water habitat types. Refer to Exhibit J of RFA 4 for detailed analysis of disturbances to wetlands and waters.

N/A = not applicable; ODFW = Oregon Department of Fish and Wildlife

Disturbance Levels

Revegetation and soil stabilization needs will be determined by a combination of topography, soil type, disturbance level, and existing vegetative cover.

Disturbance levels will primarily be determined by conditions such as slope, gradient, and existing vegetation. As much as is feasible, use of heavy machinery and soil disturbance should be conducted on dry soil. Disturbance of saturated soil has a much greater risk of compaction and requires more effort to revegetate and control weedy species. Disturbance levels are defined as follows and depicted in Figure B-1:

- *Level 1 – Mowing:* Mowing is used to conserve vegetative resources within a facility. Vegetation will be limited to a height of 12 inches and mowed to no less than 6 inches during construction. Mowing to no less than 6 inches protects perennial grass crowns and allows grasses to regenerate. Depending on facility objectives, vegetation can be allowed to reach a normal height

or kept trimmed to a height between 6 inches and the plant's full height potential. Crushing of vegetation will be minimal and this disturbance level is designed to have a minimal impact on existing vegetation. This method is least likely to result in invasions of undesirable plant species.

- *Level 2 – Overland Drive and Crush:* Disturbance caused by accessing a facility without significantly modifying the landscape. Vegetation is crushed to the ground but no surface soil is removed so root structures are left intact. Even though vegetation may be damaged or destroyed, the surface soil and seed bank remain in place. Some crushed vegetation will likely sprout after disturbance ceases. These activities would result in minimal to moderate disturbance. This type of disturbance will result in a faster recovery time for vegetation compared to Levels 3 and 4. Soil seed banks remain largely in place, perennial vegetation can grow back, and minimal external efforts are necessary. This method is less likely to result in invasions of undesirable plant species compared to Levels 3 and 4.
- *Level 3 – Clear and Cut:* Disturbance caused by accessing the facility including having to remove all vegetation to improve or provide suitable access for equipment. All vegetation is removed, soils are compacted, and the root zone or soil A-horizon may be disturbed, but no subsurface soil is removed. Clear and cut activities would result in moderate disturbance. This type of disturbance will result in moderate recovery times for vegetation. This method has a moderate risk for invasion of undesirable plant species. An example is imprinting to crush vegetation down into the soil or incidental grading and smoothing of surface soils.
- *Level 4 – Clear and Cut with Soil Removal*: Disturbance is caused by removing all vegetation in the impact zone, soils are compacted, and surface soil and subsoil are displaced. These activities result in heavy disturbance. This type of disturbance results in an extensive recovery time for vegetation and is most likely to lead to invasions of undesirable plant species, which can result in lengthy and expensive control efforts. Includes disc-and-roll construction and other traditional construction methods where soils are disturbed and no vegetation is left intact. This category includes all work requiring the segregation and replacement of topsoil.
- *Level 5 – Development Footprint*: Disturbance is caused by removing all vegetation and covering the area surface with gravel, concrete, or other vegetation-free surfaces, or where the intended function of a specific area necessitates it remain unvegetated. This disturbance level includes roads, graveled lots, fire breaks, utility pole pads, and the areas underlying any component installed on a foundation. This level does not include vegetated areas under solar arrays. This type of disturbance will result in a complete loss of vegetation and will be required to be monitored and kept free of noxious weeds and other vegetation for the life of the facility.

Maps showing the expected disturbance levels in Temporary and Permanent Disturbance Areas in relation to existing vegetation type, habitat type, and areas with sensitive soils are provided in Figure B-1 below.

<<INSERT DISTURBANCE LEVEL MAPS HERE>>

Figure B-1. Disturbance Levels in Temporary and Permanent Disturbance Areas in Relation to Existing Vegetation Type, Habitat Type, and Areas with Sensitive Soils

Appendix C. 1200-C Permit and Erosion and Sediment Control Plan

Appendix D. Fugitive Dust Control Plan

To manage fugitive dust from construction, the Certificate Holder and its contractors will generally follow the Dust Control Plan Flow Chart (Figure D-1).

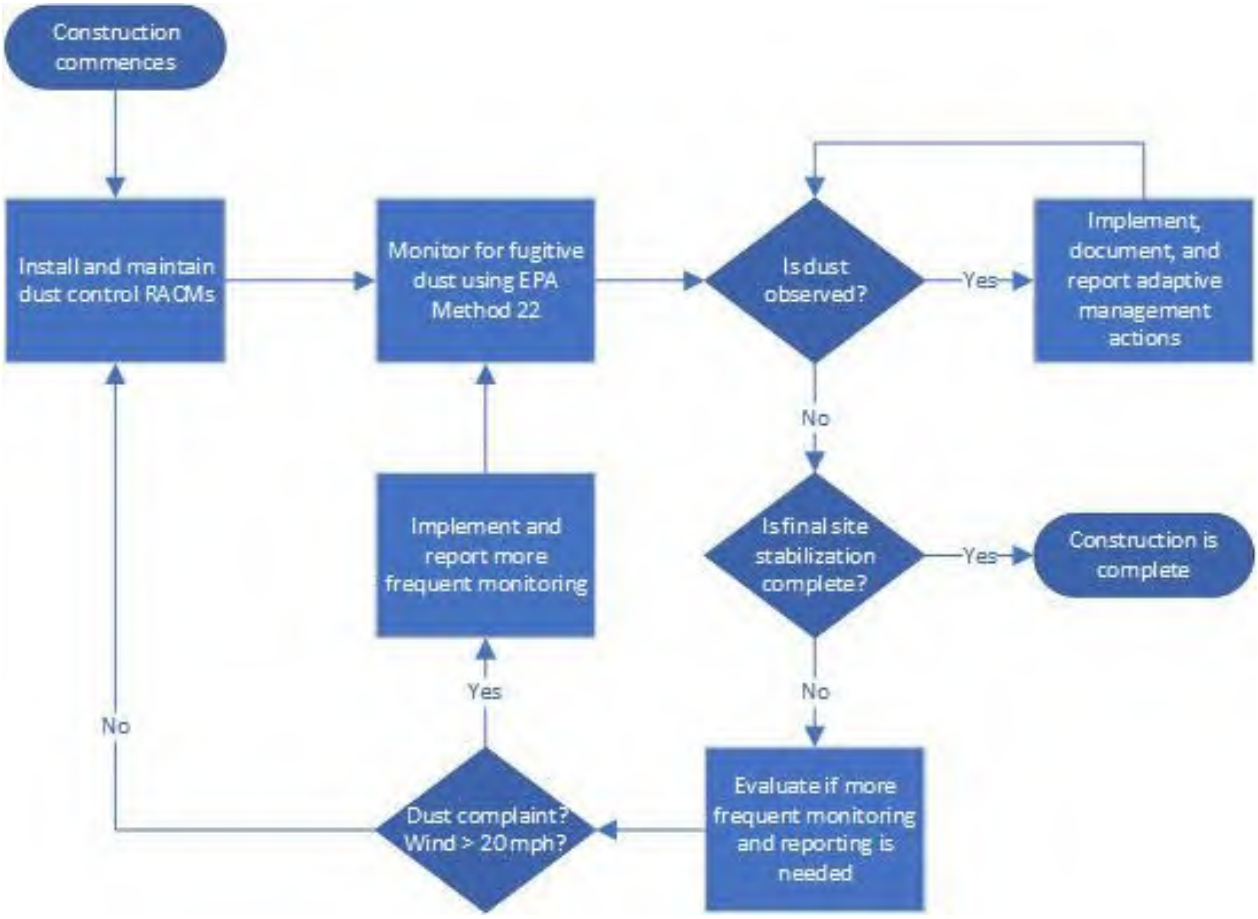


Figure D-1. Dust Control Plan Flow Chart

Fugitive Dust Monitoring and Reasonable Available Control Measures (RACMs)

The visual monitoring required by the 1200-C permit must occur at least once every 14 calendar days. However, because Oregon Administrative Rule (OAR) 340-208-0210 restricts visible fugitive emissions on a continuous standard to a maximum of **18 seconds in any 6-minute period**, and because fugitive dust emissions may provide an immediate public safety concern, this plan requires that fugitive dust be monitored and controlled on an ongoing basis (Table D-1).

Monitoring for fugitive dust emissions shall include:

- Use of U.S. Environmental Protection Agency (EPA) Method 22 (ODEQ 2019), as specified in OAR 340-208-0210, **at least once per day during the dry season, during peak construction activities.**

- The observation shall be performed during times of peak construction activity at the downwind facility boundary.
- Recording of observations in a fugitive dust inspection log that is kept on site and shall be kept digitally, described below.

Triggers for additional, more frequent monitoring will include:

- Observation of visible fugitive dust emissions by the Environmental Inspector, contractor(s), agency, or Certificate Holder staff,
- Wind speeds or gusts greater than 20 miles per hour, or
- Receipt of complaints or concerns through the Project Dust Control Hotline or other means.

Table D-1. Fugitive Dust Sources and Reasonable Available Control Measures (RACMs)

Construction Phase	RACM(s)	Supplemental RACM(s)
All Phases of Construction	Daily fugitive dust monitoring and record keeping.	Increase frequency of monitoring.
	Prominent display of Dust Control Hotline signs, providing direct access to the Environmental Inspector.	If established, proactive engagement with Community Action Council.
	Worker Environmental Awareness Program training for all construction employees.	Additional trainings and refreshers for employees.
	Maintain stockpile of best management practices (BMPs) on site, including sufficient palliatives for a single treatment of all access roads and sufficient palliatives, mulch, and/or hydromulch for a minimum of 25 percent of the total disturbed area, and machinery for application.	Increase stockpile of palliatives, mulch, and/or hydromulch and add additional BMPs.
	Documentation and reporting of adaptive management actions.	Development and submittal of revised Fugitive Dust Control Plan.
Facility Access	Install and maintain stabilized construction entrances at ingress/egress locations and restrict traffic to these locations.	Add additional construction entrance BMPs (e.g., wheel wash).
	Daily sweeping up of sediment from paved surfaces utilizing vacuum sweeper with high efficiency particulate air (HEPA) filtration.	Increase sweeper frequency.
	Access roads shall be graveled.	Road maintenance and reapplication of gravel.
	Access roads will be stabilized with water or palliative sufficient to eliminate visible and sustained dust from vehicular travel and wind erosion. Reapply stabilization as necessary to maintain dust-free condition.	If water is unavailable or ineffective, or if water use is limited by any agency or regulation, access roads will be stabilized with longer-lasting palliatives.
	Restrict construction traffic to established and stabilized access routes.	Install fencing or barricades to prevent traffic outside of established routes.

Construction Phase	RACM(s)	Supplemental RACM(s)
	Limit traffic speeds to 15 miles per hour on stabilized unpaved roads within the facility as long as such speeds do not create significant visible dust emissions. Traffic speed signs shall be displayed prominently at all entrances and exits.	Limit traffic speeds within the facility to 5 or 10 miles per hour.
	Minimize disturbance areas and soil exposure to the maximum extent feasible.	Limit work to a portion of the disturbed area until all disturbed areas receive temporary or final stabilization.
	When wind speeds or gusts exceed 15 miles per hour, minimize new disturbances to the extent possible and/or mobilize additional water trucks or palliatives to minimize fugitive dust from exposed surfaces.	Stop all ground disturbing activities and apply additional dust control measures until measures are effective or wind speeds slow and fugitive emissions stop.
	Separate and cover or otherwise stabilize topsoil to preserve it until it is replaced during revegetation.	Increase maintenance frequency for topsoil cover/stabilization. Combine methods, such as mulch plus tackifier.
	Stabilize exposed soils within the timeframes established in the 1200-C permit. Stabilize exposed soils in stages based on soil conditions and weather.	Stabilize exposed soils more frequently, even if additional work is anticipated within the timeframe established in the 1200-C permit. Reapply stabilization measures following any additional disturbances.
	Temporarily stabilize exposed surfaces to prohibit significant and sustained visible fugitive dust from wind erosion. Utilize BMPs such as mulch, hydromulch with or without seeds, tackifier, spreading stone or gravel, and trackwalking.	Combine stabilization methods, such as mulch plus tackifier, or trackwalking plus hydromulch. Increase frequency of maintenance of stabilization.
	Seed exposed surfaces during the appropriate season with approved temporary or permanent seed mixes.	Reapply seed to newly disturbed areas or areas with poor germination. Use temporary seeding even if additional work is anticipated before final stabilization. Use irrigation to enhance seeding success.
Removing and Hauling Sand, Soil, or Other Loose Materials	Gate seals should be tight on dump trucks. Soil load shall be kept below 6 inches of the freeboard of the truck. Drop heights shall be minimized when loaders dump soil into trucks. Gate seals will be checked and tight on dump trucks. All trucks on highways must be fully covered and secured.	Cover haul trucks with a tarp or other suitable cover.

Fugitive Dust Reporting

A dust inspection log shall be completed after each dust inspection. Log records shall be kept digitally and included in construction monitoring reports as described in Appendix E of this Comprehensive Plan. This log shall include all information required in EPA Method 22. Photos and/or video taken during the observation period to document conditions shall be available

digitally to the Oregon Department of Energy upon request. Any documented exceedance events shall include a detailed explanation of RACMs implemented for corrective action and the results of subsequent monitoring demonstrating fugitive dust has returned to below exceedance thresholds.

Appendix E. Environmental Monitoring Methods

The Environmental Monitoring Contractor (EMC) will be present during construction activities that involve ground disturbance, grading, weed treatments, vegetation removal, and high traffic volumes and is responsible for monitoring and recording construction activity to ensure compliance with this Comprehensive Plan.

In addition, the EMC will:

- Assist contractor(s) for the direction of water trucks, civil activities, and road maintenance to reduce fugitive dust and erosion issues.
- Identify when reasonably available and best available control measures are not adequate, as designated in Appendix D.
- Maintain dust inspection and noxious weed logs and reporting designated in this Comprehensive Plan.

Specific protocols and requirements for testing and monitoring to be performed prior to and during construction and revegetation efforts are described in the sections that follow.

Soil Compaction Testing

Monitoring Protocol

The EMC will conduct pre- and post-construction soil compaction testing in all anticipated Level 3 and 4 Disturbance Areas, and any areas consisting of soils with low soil compaction resistance (e.g., Lickskillet very stony loam (16D) and Lickskillet-Rock outcrop complex [18E] soils). If disturbance level maps are not available at the time of pre-construction sampling, the Certificate Holder may choose to base sample locations on the overall anticipated disturbance area (i.e., regardless of level of disturbance). Soil compaction sample locations will be evenly distributed across the disturbance area at a rate of 1 sample per 50 acres. Sample locations were stratified by soil type to ensure a minimum of three sample locations in each soil type and a representative density of sample locations in major soil types. Additionally, sample locations were selected to avoid infrastructure such as inverters and roads where revegetation will not occur. Sample locations are identified in Figure E-1, below.

Soil compaction measurements will be collected at all sample locations prior to ground disturbing activities and again at the same locations post reclamation but prior to revegetation.

[to be inserted at plan finalization]

Figure E-1. Soil Compaction Sample Locations

Test Methods

Soil Compaction Testing will be conducted using the following standard methods (NRCS 2020; Duiker 2025):

- The surveyor will measure soil resistance using a penetrometer.
- Resistance will be measured at 3-inch intervals to 12 inches or until the meter goes above 300 pounds per square inch (3, 6, 9, and 12 inches if soils allow).
- Measurements will be conducted in conditions favorable to soil testing (e.g., non-saturated or frozen soils).

Results

Testing results will be provided to the Oregon Department of Energy (ODOE) prior to construction and after reclamation but before revegetation.

Baseline Vegetation Conditions

Prior to construction of the Solar Components, the EMC will conduct pre-construction habitat surveys for all temporary disturbance areas. Data collected will include:

- Vascular plant species present;
- Native/non-native species present;
- Percent cover of dominant species; and
- Percent cover of state and county listed noxious weeds.

Revegetation Monitoring

The Certificate Holder will monitor revegetated areas as described below, unless the landowner converted an area to a use that precludes meeting revegetation success criteria such as cropland. The Certificate Holder should coordinate grazing timing and intensity with the landowner so that it does not preclude revegetation success. Revegetated areas will be monitored by a qualified investigator in May or June annually for 5 years, beginning the first year after seeding.

Temporary Disturbance Areas

Reference and Revegetation Transects

Establish 50-meter reference and revegetation transects for each temporarily disturbed wildlife habitat subtype and category with more than 0.5 acres of temporary disturbance as described below. Establish one reference transect for every temporarily disturbed wildlife habitat subtype and category. Reference transects are intended to be representative of baseline conditions for the revegetation effort.

Establish revegetation transects randomly in every wildlife habitat subtype and category that will be temporarily disturbed by construction using existing habitat mapping. Transect locations and/or lengths may need to be adjusted to account for linear features whose disturbance footprint may be too narrow or too short to meaningfully place a transect. Determine the number of transects as follows:

- Less than 0.5 acres of temporary disturbance = 0 transects
- 0.3 to 5 acres of temporary disturbance = 1 transect
- 6 to 10 acres of temporary disturbance = 2 transects
- For each additional 10 acres of disturbance, one additional transect will be added (e.g., 11-20 acres of disturbance = 3 transects, 21-30 acres = 4 transects, etc.)

Temporary Disturbance Area Monitoring Methods

Vegetation will be measured quantitatively using the line-point intercept (LPI) method combined with a belt transect to document species richness and sagebrush density, where necessary (Elzinga et al. 1998; MacKinnon et al. 2011). The LPI method is described in detail in the *Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Volume I* (Herrick et al. 2021). The surveyor will drop a narrow pin perpendicular to the ground at 1-meter intervals along a 50-meter transect and record up to four plant species that intercept the pin in order of interception as well as the soil surface type (bare ground, litter, rock, moss, or biotic crust) where the pin touches the ground. Once all 50 points have been collected, the surveyor will walk back along the transect and record any species within 1 meter on either side of the transect that were not documented at a point. The surveyor will take a photo from the transect start point, looking down the length of the transect. For transects in sagebrush shrub-steppe habitat, the surveyor will record the number of sagebrush individuals by size class (i.e., less than 1 foot tall, between 1 and 2 feet tall, greater than 2 feet tall) occurring within 1 meter on either side of the 50-meter transect.

Following field surveys, foliar cover will be determined by multiplying the number of top hits for each species by two. Cover of bare ground will be determined by counting every point in which bare ground was recorded as a surface type and no plants were intercepted and multiply this number by two. Species richness will be determined by counting all the unique species that were recorded at a point or along the belt transect.

Permanent Disturbance Areas

Following implementation of revegetation efforts, the Certificate Holder will monitor revegetated permanent disturbance areas as described below. Revegetated areas will be monitored by a qualified investigator annually for 5 years, beginning the first year after seeding. If success criteria are met in the first 5 years, then long-term vegetation monitoring to document and manage vegetation to reduce wildfire risk will be determined in consultation with ODOE.

The Certificate Holder will monitor Permanent Disturbance Areas to assess the following:

- Dominant species composition;
- Relative cover of desirable and undesirable forbs and grasses;
- Percent cover of bare soil;
- Degree of erosion;
- Presence of noxious weeds; and

- Qualitative assessment of overall vigor of vegetation within revegetated areas.

The EMC will monitor revegetated Permanent Disturbance Areas with a meander survey beginning within 60 days of the completion of initial revegetation. During the meander survey, the EMC will walk in revegetated Permanent Disturbance Areas and document the assessment items listed above using photos and spatial data collection. Areas of erosion and significant patches of bare soil will be mapped and photographed. The EMC will record dominant species, overall percent cover of forbs and grasses, and general notes about plant vigor.

Monitoring will be conducted at least once per season during the first year following construction. After the first complete year of monitoring, the Certificate Holder will consult with ODOE to determine if the monitoring cycle can be reduced based on revegetation progress. After five years of monitoring, the Certificate Holder will design a long-term monitoring plan in consultation with ODOE.

Revegetation Monitoring Reports

Revegetation monitoring reports will be prepared and submitted to ODOE annually for five years following revegetation. The first monitoring report will include a detailed description and timeline of revegetation methods that were implemented including species, amounts, and locations of seed applications and dates revegetation work was performed. Annual monitoring reports will include:

a. Geographic information system (GIS) maps of revegetated areas and disturbance levels;
b. Monitoring methods;
c. Local climatic data (i.e., precipitation, temperature) for the monitoring month and year and percent deviation from the historical average;
d. Results of monitoring efforts;
e. Photos of transects and representative overview photos of revegetated areas;
f. Assessment of whether revegetated areas are trending toward meeting success criteria;
g. Assessment of factors impacting the ability of revegetated areas to trend towards meeting the success criteria; and
h. Recommendations for remedial actions, if any. If applicable, provide recommendations for reseeding, weed control, or other remedial measures for areas (either permanently or temporarily disturbed) that are not showing progress toward meeting success criteria. Include adaptive management measures taken in the next monitoring report.

References

Duiker, S. 2025. Diagnosing Soil Compaction Using a Penetrometer (Soil Compaction Tester). Adapted from: Lloyd Murdock, Tim Gray, Freddie Higgins, and Ken Wells, 1995. Soil Compaction in Kentucky. Cooperative Extension Service, University of Kentucky, AGR-161. https://extension.psu.edu/diagnosing-soil-compaction-using-a-penetrometer-soil-compaction-tester

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Appendix F. Revegetation and Soil Stabilization Methods

Soil Stabilization

- The Engineering, Procurement, and Construction Contractor (EPC) will use appropriate erosion and sediment control practices (i.e., seeded or unseeded hydromulch, tackifier, weed-free erosion control blankets, weed-free or locally sourced straw mulch) to maintain topsoil during construction in Temporary and Permanent Disturbance Areas.
- After grading is complete but prior to installation of Solar Components, apply temporary or permanent soil stabilization.
- If seeding is used for temporary soil stabilization, seed areas with less than 70 percent vegetative cover with a non-invasive, non-persistent cover crop such as winter wheat or sterile triticale.
- Select cover crop based on the time of year; for example, winter wheat or sterile triticale can be seeded from fall to early spring while peas should be seeded in spring. Tillage radish and sunflowers can be seeded in spring to reduce compaction but are not suitable options for soil stability.

Soil Reclamation

In areas where soil is removed during construction, the following measures will be taken where appropriate:

- During construction, excavated topsoil will be stockpiled separately from subsoil and replaced in proper order with topsoil on the surface to maintain soil productivity. Stockpiled soil will be put back in place prior to revegetation activities.
- Topsoil and other soils from noxious weed infested areas will not be moved outside infested areas and will be returned to their previous location during reclamation activities to eliminate the transport of weed seeds, roots, or rhizomes. Noxious weed occurrences will be flagged and monitored for compliance.

Site Preparation

- Ensure that soils from weed infested areas are treated with a pre- or post-emergent herbicide as needed prior to initiation of revegetation efforts, depending on site-specific conditions.
- Prior to final regrade and revegetation efforts, any weeds that have grown during periods of construction dormancy should be treated as described in Appendix G.
- Perform site preparation using methods described below. Consider site-specific factors including slope, soil type, size of area, and erosion potential when determining methods.
    - Soil Roughening: Also known as imprinting, tracking, or track walking, soil roughening is a temporary erosion control practice and seedbed preparation technique implemented when grading a slope (EPA 2021). This technique involves creating grooved soil surface with depressions running parallel to the hill contour to promote seed germination and provide moderate erosion control while vegetation is established.

Tracking with heavy equipment may compact the soil and inhibit root penetration; this can be mitigated by using lighter-weight equipment and not tracking saturated soil. Soil roughening should be done prior to applying hydromulch, straw mulch, or installing erosion BMPs. Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth (ODOT 2023).

- Deep Tilling: Reduce soil compaction by fracturing restrictive soil layers in areas where compaction levels inhibit plant growth (NRCS 2022). Deep tillage s only suitable in areas outside of solar arrays and where solar infrastructure is not present (i.e., temporary roads) and should be conducted after construction and prior to revegetation when soil moisture is at 30-50 percent of field capacity.
- Decompaction: Where soil compaction testing demonstrates that soils are compacted greater than 300 pounds per square inch (psi), then remediation activities may be completed in those areas prior to the construction contractor moving to a new location or offsite as described in Table F-1. Areas with intact vegetation (typically in areas with Level 1 or 2 disturbance) will not be decompacted to avoid additional soil disturbance and erosion risk. Locations where baseline monitoring indicated that soils were compacted more than 300 psi prior to construction will only be decompacted as needed based on field assessment of likely vegetation success (see Table F-1). Remediation activities may include mechanical scarification (e.g., tilling or ripping the soil) to an appropriate depth to reduce the potential effects of compaction, to maintain soil productivity, and reduce the potential for erosion on compacted soils. Dry soils should be decompacted using an agricultural disc, soil ripper, or similar equipment

- Prepare salvaged topsoil into a firm, fine-textured seedbed before seeding or planting (ODOT 2023). Loosen the top 1 to 2 inches of the soil surface by shallow tilling with a disc, followed by harrow or drag if necessary and where feasible with construction equipment. If soil is assessed as too soft by the Revegetation Contractor or the Environmental Monitoring Contractor (EMC), firm with a roller or cultipacker.

Table F-1. Decompaction Action by Disturbance Lavel

Disturbance Lavel	Baseline Soil Compaction under 300 psi	Baseline Soil Compaction over 300 psi
1 – Mowing	If intact, living vegetation present, then no action; confirm vegetation success in next growing season.	If intact, living vegetation present, then no action; confirm vegetation success in next growing season.
	If bare soil, revegetate as described in the following section	If bare soil, decompact prior to revegetation

2 – Overland Drive and Crush	If intact, living vegetation present, then no action; confirm vegetation success in next growing season.	If intact, living vegetation present, then no action; confirm vegetation success in next growing season.
	If bare soil, revegetate as described in the following section	If bare soil, decompact prior to revegetation
3 – Clear and Cut	Revegetate as described in the following section.	Decompact prior to revegetation
4 – Clear and Cut with Soil Removal	Revegetate as described in the following section.	Decompact prior to revegetation

Revegetation Methods

- The Certificate Holder will restore temporarily disturbed areas by re-establishing slope, surface stability, and drainage features, as needed, followed by soil preparation and seeding as described below.
- Revegetation will begin as soon as feasible after completion of each construction phase. Seeding and planting will be done in a timely manner and in the appropriate season to facilitate germination and establishment of seeded species.
- Following seeding, stabilize seeded areas to facilitate establishment by applying seedless, certified weed-free hydromulch containing a tackifier or crimped weed-free straw.
- Cropland outside the Solar Components fenceline will be returned to landowner control and will not be revegetated by the Certificate Holder.
- Revegetation methods for each disturbance level were developed to tailor revegetation to specific conditions (Table F-2).

Table F-2. Revegetation Methods by Disturbance Level

Disturbance Level	Soil Reclamation	Site Preparation	Seeding
1 – Mowing	No soil disturbance. Retain existing vegetation to prevent erosion.	Weed control.	Seed if necessary to achieve success criteria.
2 – Overland Drive andCrush	No soil disturbance. Retain existing vegetation and	Weed control.	Seed if necessary to achieve success criteria.

	implement erosion control practices.		
3 – Clear and Cut	Track or decompact soil as necessary. Implement erosion control practices.	Weed control. Seed cover crop if necessary to stabilize soil. Prepare firm, fine-textured seedbed prior to seeding.	Required
4 – Clear and Cut with SoilRemoval	Stockpile topsoil separately from subsoil and stabilize during construction. Regrade and replace subsoil then topsoil prior to seeding. Track or decompact soil as necessary. Implement erosion control practices.	Weed control. Regrade and add soil amendments if necessary. Seed cover crop if necessary to stabilize soil. Prepare firm, finetextured seedbed prior to seeding.	Required

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Seed Mix and Shrub Planting

A low-growing seed mix was developed for revegetation of Temporary Disturbance Areas and Permanent Disturbance Areas within the Solar Micrositing Area (Table F-3).

Table F-3. Seed Mix for Revegetation of Disturbed Areas

Growth Habit	Common Name	Scientific Name	Pounds of pure live seed/acre[1]
Grasses			
	Squirreltail	*Elymus elymoides*	3.5
	Thurber's needlegrass	*Eriocoma thurberiana*	4.4
	Idaho fescue	*Festuca idahoensis*	2.1
	Sandberg bluegrass	*Poa secunda* ssp. *secunda*	2.1
Forbs (choose 3 or 4 depending on seed availability)			
	Common yarrow	*Achillea millefolium*	0.1
	Oregon sunshine	*Eriophyllum lanatum*	0.1
	Fleabane	*Erigeron filifolius* or *E. pumilus*	0.1
	Wooly plantain	*Plantago patagonica*	0.2
	Clover	*Trifolium macrocephalum*	0.1
Total			**12**

Note: The species and seeding rates included in this table are a recommendation. Substitutions can be made through consultation with ODOE.

1. Pounds of pure live seed per acre listed for drill seeding and imprint seeding. Double drill seeding rate for broadcast seeding and multiply by 2.5 for hydroseeding.

Seeding Methods

Four common seed application methods that may be used for revegetation include broadcast seeding, drill seeding, imprint seeding, and hydroseeding; each of these are discussed further below. Other seeding methods may be proposed for review and approval prior to revegetation efforts.

Broadcast Seeding

Broadcast seeding is the application of seed directly to the ground surface. This method may be chosen for areas with shallow and rocky soils, and the type of broadcast spreader would depend on the size of the area to be seeded and the terrain.

In this method, the seed mix would be broadcast at 24 pounds of pure live seed per acre, or twice the recommended rate for drill seeding. When feasible, due to the seasonality of when planting can occur, the entire area will be seeded after grading is complete but before placement of solar components, providing more flexibility in seed application. In those instances where seeding occurs prior to installation of components, follow-up seeding will occur in areas temporarily disturbed by installation and any areas that are deficient in vegetation from the first round of seeding. Immediately following seed application, hydromulch or certified weed-free straw would be applied. Broadcast seeding will not be employed if winds exceed 5 miles per hour. If certified weed-free straw is unavailable, the Certificate Holder or EPC will identify a local source of straw. The local

source of the straw will be approved by the Sherman County Weed District and the Oregon Department of Fish and Wildlife (ODFW) prior to purchase. This straw will either be crimped into the ground or applied with a tackifier.

Drill Seeding

Drill seeding can be used for large areas with deep soils and moderate to gentle terrain to accommodate mechanical equipment. This method provides the advantage of planting the seed at a uniform depth and may provide better soil to seed contact. Using a range seed drill, seeds will be sown at 12 pounds pure live seed per acre or according to application rates recommended by the seed supplier. Drill seeding will be difficult after solar components have been installed, so it will primarily be used if seeding occurs after grading is complete but before components are installed, or in areas that were temporarily disturbed during construction that do not have any permanent infrastructure (e.g., temporary access roads, laydown areas).

Imprint Seeding

Imprint seeding is a no-till drill seeding method used to restore grasslands in areas with low annual precipitation. Seeds will be sown at 12 pounds pure live seed per acre or according to application rates recommended by the seed supplier. The seeder consists of a heavy metal drum roller with V-shaped, angled teeth and a seed agitator box. The teeth create V-shaped troughs with a depth of 4-7 inches to collect rainwater. The rolling drum presses the seed into the soil, insuring good seed-to-soil contact. The troughs collect rainwater for seed germination and seedling growth. Imprint seeders can be used on steep slopes and do not require seed bed preparation before seeding. Seeding can occur on soils with light to moderate vegetative cover, with the vegetation acting as a mulch, preventing soil erosion until seedlings are established. Imprint seeders do not work well in areas with shrubs or heavy vegetation cover. Heavily compacted soils may need to be ripped or de-compacted before seeding. The seeding rate for this method should be the same as for broadcast seeding.

Hydroseeding

Hydroseeding is most applicable for areas where drill or broadcast seeding machinery cannot access; this usually includes steep slopes or narrow terrain but can be used in all terrains. Soil bed preparation is also crucial for growth success and frequently includes tracking perpendicular to the slope to create micro conditions for seed. Flat grading and compaction are not recommended. Seeding rates increase by 30 to 50 percent of broadcast seeding rates (i.e., 30 pounds pure live seed per acre) per consultation with the seed supplier and ODFW. Prior to hydroseeding, the tackifier will be reviewed and approved in consultation with the Oregon Department of Energy (ODOE). Fertilizer should not be used when hydroseeding wildlife habitat.

Revegetation Records

The EMC will maintain records of revegetation efforts in all temporary and permanent disturbance areas and update ODOE monthly as revegetation work occurs. Revegetation records will include:

a. Date construction phase was completed;

b. Acreage of each disturbance level;

c. Description and photos of the affected area;

d. Date revegetation was initiated;

e. Description of the revegetation effort, including methods and timing;

f. Supporting figures representing the location, acres affected, and pre-disturbance condition of the revegetation area; and

g. Confirmation from the landowner that temporary disturbances in cropland have been satisfactorily restored.

Success Criteria for Temporary Disturbance Areas

Reclamation of Temporary Disturbance Areas on agricultural lands will be considered complete after the land is returned to farm operations and landowners provide written confirmation that they are satisfied that any impacts to soil productivity have been addressed. The Certificate Holder will provide evidence that landowners are satisfied after one crop cycle.

In non-agricultural areas, the Certificate Holder will make reasonable efforts to restore vegetation and soils in habitat areas to their pre-disturbance condition.

a. **Native Shrubs**: Average density of sagebrush on revegetation transects in areas planted with sagebrush should be at least 50 percent of the reference transect within 5 years.

b. **Native and Desirable Forbs**: Cover of native and desirable (i.e., non-native species included in the seed mix) forbs, averaged across revegetation transects by habitat subtype and category, will be at least 75 percent of reference transects for the corresponding habitat subtype within 5 years.

c. **Native and Desirable Grasses**: Cover and richness of native and desirable (i.e., non-native species included in the seed mix) grass species, averaged across revegetation transects by habitat subtype and category, will be at least 85 percent of reference transects for the corresponding habitat subtype within 5 years.

d. **Noxious Weeds**: Presence and cover of noxious weeds on revegetation transects is 75 percent or less than that of the reference transect for the corresponding habitat subtype.

Vegetation Management for Permanent Disturbance Areas

During operation of the Solar Components, vegetation under the solar panels will be managed to minimize fire risk and erosion by maintaining low growing vegetation.

Prohibition on Use of Domestic Sheep and Goats for Vegetation Management

The certificate holder may not keep or use domestic sheep, goats, or other livestock at the solar facility for vegetation control or other purposes without written approval from the Department. Any request to use domestic sheep, goats, or other livestock at the solar facility must be accompanied by a description of practices and controls that will be implemented to prevent

zoonotic disease transmission to wild sheep populations. The Department may impose additional requirements to prevent zoonotic disease transmission based on consultation with ODFW.

Success Criteria for Permanent Disturbance Areas

The Certificate Holder will establish uniform (i.e., evenly distributed, without large bare areas) perennial, non-invasive vegetation that provides 70 percent or more cover on all exposed areas in compliance with the soil protection standard (Oregon Administrative Rule 345-022-0022); National Pollutant Discharge Elimination System 1200-C permit requirements; and Sherman County requirements.

Integrated Vegetation Management

To support reclamation success and reduce wildfire risk throughout all phases (i.e., both construction and operations) of the Solar Components, vegetation management will be implemented consistent with the draft Construction Wildfire Mitigation Plan and anticipated Operations Wildfire Management Plan. In the interim, while those plans are being finalized, this section establishes the minimum vegetation management and fire prevention requirements that will apply during construction and operation of the Solar Components. Vegetation will be managed in accordance with the applicable provisions of the 2025 Oregon Fire Code:

Oregon Fire Code, Section 1205.5.1 Provides:

> *"A clear brush free area of 10 feet shall be required around the perimeter of the ground-mounted photovoltaic arrays or as determined by the fire code official. A maintained vegetative surface or noncombustible base, approved by the fire code official, shall be installed and maintained under the photovoltaic arrays and associated electrical equipment installations.".*

These measures are intended to minimize ignition potential, maintain defensible space, support consistent vegetation control, and outline inspection practices that will contribute to long-term fire resiliency. At a minimum, the following criteria will be met:

a. **Vegetation Height and Clearance**

- Vegetation within and adjacent to the Solar Components will be maintained as follows:
    - During the dry season (June to October), vegetation height will be limited to 4 to 8 inches. Vegetation will be mowed to a height of 4 inches prior to June of each year.
    - Outside of the dry season (November to May), vegetation will be maintained at a maximum height of less than 12 inches,
    - A minimum vertical clearance of 12 inches from all electrical and mechanical equipment will be maintained at all times.
- Vegetation exceeding the heights listed above will be mowed or removed in accordance with any Oregon Department of Forestry or County-issued fire restrictions.
- At no time shall vegetation come into contact with electrical infrastructure, inverters, or cable runs.

- A minimum 20-foot, clear, brush free area will be maintained around perimeter of fenced solar array areas (10-feet inside the fence and 10-feet outside the fence). Activities necessary to maintain the area as clear, brush free shall be based on consultation with the local fire code official; and
- Gravel or compacted soil surfaces will be maintained beneath and around all inverter skids, the collector substation, O&M building, and meteorological towers.

b. **Fuel and Debris Management**

- Vegetation and debris removed from the Facility will be disposed of off-site and will not be stored or burned on-site.
- The Certificate Holder and contractors will prevent accumulation of combustible materials or "burn piles."
- Inspections will ensure that fence lines, service roads, and work areas remain clear of dry vegetation, woody debris, or stored materials that could create fuel continuity during fire season.
- All newly constructed or maintained service roads within the Solar Micrositing Area will maintain a minimum 16-foot width of graveled, all-weather surface to facilitate emergency response access.

c. **Designated Noncombustible Areas**

- All-weather service roads will be compacted soil or gravel and maintained in good condition.
- A 20-foot non-vegetated perimeter buffer will be maintained around substations and Operations and Maintenance buildings.
- Parking and laydown areas will consist of compacted soil, gravel, or other non-combustible material to reduce ignition potential from vehicles and equipment.
- Areas immediately surrounding electrical equipment, transformers, and battery energy storage system (BESS) enclosures will remain vegetation-free and will be maintained as graveled or earthen surfaces.

d. **Standards and Continuous Improvement:** Vegetation management and fire prevention measures will be reviewed annually to ensure continued compliance with applicable codes and evolving best practices, including:

- North American Electric Reliability Corporation (NERC) FAC-003-0 – Vegetation Management Standard for Transmission Lines
- Oregon Fire Code and National Fire Protection Association (NFPA) Standards relevant to energy facilities
- OAR Chapter 477 and 629-043 – ODF Fire Prevention Standards
- OAR 860-024 – Public Utility Commission (PUC) Electrical Safety Standards
- American Clean Power (ACP) and Avian Power Line Interaction Committee (APLIC) industry best practices

The Certificate Holder will evaluate new technologies, standards, and operational lessons learned each year to incorporate applicable improvements into this Comprehensive Plan or the future Operations Wildfire Management Plan.

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Appendix G. Weed Control Plan

Regulatory Framework

The Oregon Department of Agriculture (ODA) and Sherman County Weed District maintain lists and classifications of noxious weeds. Although not all listed noxious weeds occur in the vicinity of the Solar Micrositing Area, the Certificate Holder and its contractors should be aware of the entire list while monitoring and controlling weeds.

State of Oregon

In Oregon, a noxious weed is defined under Oregon Revised Statutes (ORS) 569.175 as "a terrestrial, aquatic, or marine plant designated by the State Weed Board under ORS 569.615 as among those representing the greatest public menace and as a top priority for action by weed control programs." Noxious weeds have been declared by ORS 569.350 as a menace to public welfare, and control of these plants is the responsibility of private landowners and operators, as well as county, state, and federal governments.

The Oregon State Weed Board (OSWB) was created by ODA under ORS 569.600. OSWB provides recommendations for noxious weed control at the state level and is responsible for updating the State Noxious Weed List. The OSWB and the ODA classify noxious weeds in Oregon in accordance with the ODA Noxious Weed Classification System; there are three designations under the State's system:

- **A-Listed Weed:** A weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states makes future occurrence in Oregon seem imminent.
    - **Recommended Action:** Focus on prevention of new infestations through vector control, certification programs, education, outreach and surveys. New and existing infestations are prioritized for eradication or intensive control when and where found. Regionally focused, species-specific Statewide Management Strategies for A-listed weeds may be developed as necessary.
- **B-Listed Weed:** A weed of economic importance that is regionally abundant but may have limited distribution in some counties.
    - **Recommended Action:** Limited to intensive control at the state, county, or regional level as determined on a site-specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.
- **T-Designated Weed:** A designated group of weed species selected from the B list as a focus for prevention and control by the Noxious Weed Control Program. T-designated noxious weeds are determined by the Oregon State Weed Board and management actions are prioritized and informed by species-specific T-List Statewide Management Strategies created and maintained by the ODA. Action against these weeds will receive priority in accordance with the recommendations of the Statewide Management Strategy.

Sherman County

The Sherman County noxious weed list and protocol were developed by the Sherman County Weed District. Sherman County defines weeds of significance with six classes:

- **A Class:** High priority. Any noxious weed which greatly endangers the overall economic well-being of the County and has a small enough distribution where eradication is possible.
- **B Class:** Moderate priority. A noxious weed which is well established in the County and has known negative impacts, but due to its distribution, eradication is not feasible.
- **C Class:** Low priority. A noxious weed which is widespread throughout the County and has known economic impacts.
- **Q Class**: Questionable list. A newly detected weed which may have some importance, but more information is needed to determine its impact on agriculture. There is only one Q Class weed currently: hairy willow herb (*Epilobium hirsutum*).
- **T Class:** Targeted list. A noxious weed from any Class that the Sherman County Weed Control Board wishes to focus efforts and resources on. This list is reviewed annually.
- **W Class:** Watch list. Any noxious weed that may occur in neighboring counties, the State or similar environments as the County, and could potentially endanger the overall economic well-being of the County. Once detected, these weeds shall be moved to the appropriate list.

Noxious Weeds Identified at the Solar Components

Noxious weeds identified within the Solar Micrositing Area on July 9 and 10, 2024, are listed in Table G-1. Twelve listed noxious weeds were documented, including 8 ODA-listed noxious weeds and 12 Sherman County listed noxious weeds. Eight of the noxious weeds observed were state and/or County "B" listed weeds. One species, rush skeletonweed (*Chondrilla juncea*), is an "A" Class Weed in Sherman County and a state "T"-designated weed, meaning that ODA targeted this species for prevention and control.

In addition to noxious weeds, cheatgrass (*Bromus tectorum*), an invasive annual grass, was identified in grassland habitats within the Solar Micrositing Area. While cheatgrass is not a listed noxious weed, it and other invasive annual grasses can adversely impact habitat and increase fire risk.

Table G-1. Noxious Weeds Observed During Surveys in 2024

Scientific Name	Common Name	ODA Status[1]	Sherman County Status[1]	Frequency[2]
Aegilops cylindrica	jointed goatgrass	B	C	Infrequently observed.
Centaurea diffusa	diffuse knapweed	B*	B	Several small to medium-sized populations observed.
Chondrilla juncea	rush skeletonweed	B (T)*	A (T)	Frequently observed in non-cultivated areas.

Scientific Name	Common Name	ODA Status[1]	Sherman County Status[1]	Frequency[2]
Cirsium arvense	Canada thistle	B*	B (T)	One observation made.
Cirsium vulgare	bull thistle	B*	C	Observed in two locations.
Convolvulus arvensis	field bindweed	B	B	Many small to large populations observed.
Conyza canadensis	horseweed	Not listed	C	Commonly observed.
Lactuca serriola	prickly lettuce	Not listed	C	Frequently observed.
Onopordum acanthium	Scotch thistle	B	B (T)	Several observations made.
Rhaponticum (Acroptilon) repens	Russian knapweed	B*	B	One observation made.
Salsola tragus	Russian thistle	Not listed	C	Frequently observed.
Secale cereale	cereal rye	Not listed	C	Frequently observed.

1. Species marked with a (*) are targeted for biocontrol.
2. Patch/observation sizes are as follows: small = less than 0.1 acre, medium = 0.1 to 1.0 acre, large = greater than 1 acre.

Management Objectives

Management objectives shall be based on the classification status of a species and frequency of observations (Tables G-1 and G-2). Classification status will be determined based on the higher-status identified by the State or County Weed List unless recommended otherwise by the County. Management objectives for unlisted species will be determined on a case-by-case basis based on need for control (e.g., fire control, etc.)

Table G-2. Management Objectives

Weed Classifications	Years		
	0	1-6	6+
A, A(T) or B(T)	Begin control prior to construction; continue throughout consttruction	Intensive control with goal of eradication within first 5 years of operations. Prevent new infestations	Intensive control and eradication for life of facility. Prevent new infestations
B	Begin control prior to construction and continue throughout construction.	Intensive control with the goal to eradicate within first 5 years of operations. Prevent new infestations.	Monitor and manage to prevent new populations/spread of existing populations.
C	Monitor and manage to prevent new populations/spread of existing populations.	Monitor and manage to prevent new populations/spread of existing populations.	Monitor and manage to prevent new populations/ spread of existing populations.
Invasive Annual Grasses	Monitor and manage to minimize wildfire risk.	Monitor and manage to minimize wildfire risk.	Monitor and manage to minimize wildfire risk.

Weed Control Methods

Noxious weed control methods for the Weed Management Area (i.e., the disturbance area associated with the Solar Components plus a 10-foot buffer) described in this Comprehensive Plan were developed utilizing information from the ODA Noxious Weed Control Program and the Sherman County Weed District. Management of noxious weeds will be considered throughout all stages of construction and operation of the Solar Components and will include:

- **Prevention:** Implementing measures to prevent the spread of noxious weeds during construction, operation, and maintenance activities.
- **Treatment:** Treating noxious weed populations with their appropriate control methods, at appropriate time intervals.
- **Monitoring:** Assessing noxious weed changes within the Weed Management Area over time and ensuring that legacy as well as new weed populations are not increasing their distribution.

Portland General Electric Company's (the Certificate Holder) objective is to prevent the introduction of new noxious weed populations and spread of existing noxious weed populations. The methods described above in this Comprehensive Plan and supplemented below will be implemented to minimize the spread of noxious weeds during construction activities. New noxious weeds detected within the Weed Management Area during post-construction revegetation will be considered a result of construction activities and will be controlled accordingly.

Biological Control

Biological control involves the use of prescribed insects, fungi, and livestock to control noxious weeds to achieve management objectives. Biological control methods are typically targeted to a specific species or plant to control its persistence. They are also used for maintenance in targeted areas for vegetation management control in height and density that includes mitigating fire risk and erosion. Biological control is environmentally friendly and should be the first consideration when applicable.

Mechanical Treatment

Mechanical treatment will be the preferred method of treatment for existing noxious weed populations where appropriate within the Weed Management Area. Mechanical control methods rely on removal of plants, seed heads, and/or cutting roots with a shovel or other hand tools or equipment that can be used to remove, mow, or disc noxious weed populations. Hand removal of plants is also included under this treatment method. Mechanical methods are useful for smaller, isolated populations of noxious weeds in areas of sensitive habitats. Additionally, hand removal of small infestations can minimize soil disturbance, allowing desirable species to remain and limiting conditions favorable for noxious weeds.

Some rhizomatous plants can spread by discing or tillage. For example, rush skeletonweed, which has been identified within the Solar Micrositing Area (Appendix E), can reproduce vegetatively from small segments of root, and discing or tilling can facilitate the spread of this species. As such,

implementation of discing will be species-specific and avoided in areas where it will be counter-productive.

If discing is employed in areas that will be revegetated following construction, subsequent seeding will be conducted to re-establish desirable vegetative cover that will stabilize the soils and slow the potential re-invasion of noxious weeds. Discing, tilling, or other mechanical treatments that disturb the soil surface within native habitats will also be avoided in favor of herbicide application, which is an effective means of reducing the size of noxious weed populations as well as preventing the establishment of new infestations.

Chemical Treatment

Chemical control can effectively remove noxious weeds through use of selective herbicides. The specific herbicide used, and the timing of application will be chosen based on the specific noxious weed being treated, as appropriate herbicides differ between species and types of plants (i.e., dicots such as rush skeletonweed versus monocots such as jointed goatgrass).

Herbicides will be applied to identified, treatable, noxious weed infestations. The Certificate Holder or their contractors will coordinate with the Sherman County Weed District to determine which populations are treatable and will notify landowners of proposed herbicide use on their lands prior to application. If a noxious weed population is deemed to be untreatable (e.g., too widespread and established in an area to successfully control), the Certificate Holder will implement the applicable prevention measures discussed in this Comprehensive Plan, subject to approval by the Oregon Department of Energy (ODOE) and the Sherman County Weed District.

Apply only herbicides approved by the U.S. Environmental Protection Agency (EPA) and ODA; annually check the status of herbicide approval (e.g., confirming herbicides are approved for use by the EPA and ODA).

Herbicide application will be performed within the appropriate season to achieve desired results, as approved by ODOE and the Sherman County Weed District. No weed treatment will occur in agricultural lands without landowner permission.

Herbicide Application and Handling

Hand application methods (e.g., backpack spraying) may be used in roadless areas or in rough terrain. Vehicle-mounted sprayers (e.g., handgun, boom, and injector) will be used mainly in open areas that are readily accessible by vehicle. Calibration checks of equipment will be conducted prior to spraying activities, as well as periodically throughout use, to ensure that appropriate application rates are achieved.

Herbicides will be transported with the following stipulations:

- Only the quantity needed for that day's work will be transported.
- Concentrate will be transported in approved containers only, and in a manner that will prevent spilling, stored separately from food, clothing, and safety equipment.

- Mixing will be done at a distance greater than 200 feet from open or flowing water, wetlands, or other sensitive species' habitat. No herbicides will be applied at these areas unless authorized by the appropriate regulatory agencies.
- All herbicide equipment and containers will be inspected daily for leaks.
- Herbicide use will be in accordance with all manufacturers' label recommendations and warnings.
- Apply herbicide under appropriate conditions (i.e., not when wind velocity exceeds 15 miles per hour for granular application or exceeds 10 miles per hour for liquid applications; snow or ice covers the foliage of target species; or adverse weather conditions are forecasted within the next few days).

Herbicide Spills and Cleanups

All appropriate precautions will be taken to avoid herbicide spills. In the event of a spill, cleanup will be immediate. Contractors will keep spill kits in their vehicles to allow for quick and effective response to spills. Items included in the spill kit will be:

- Protective clothing and gloves;
- Adsorptive clay, "kitty litter," or other commercial adsorbent;
- Plastic bags and a bucket;
- A shovel;
- A fiber brush and screw-in handle;
- A dustpan;
- Caution tape;
- Highway flares (use on existing hard-top roads only); and
- Detergent.

Response to an herbicide spill will vary with the size and location of the spill, but general procedures include:

- Stopping the leak;
- Containing the spilled material;
- Traffic control;
- Dressing the clean-up team in protective clothing;
- Cleaning up and removing the spilled herbicide, as well as the contaminated adsorptive material and soil; and
- Transporting spilled herbicide and contaminated material to an authorized disposal site.

Herbicide Spill Reporting

All herbicide contractors will have readily available copies of the appropriate material safety data sheets for the herbicides used at their disposal and will keep copies of the safety data sheets in the application vehicle. If an herbicide spill of any size occurs, the appropriate agency and spill coordinators will be notified promptly. In case of a spill into wetlands and waterbodies, the appropriate federal, state, and county agencies will be notified immediately. All herbicide spills equal to or greater than 200 pounds or 25 gallons of pesticide residue will be reported to the Oregon Emergency Response System in accordance with applicable laws and requirements (Oregon Administrative Rules 340-142-0050). The Certificate Holder, BIGL bn, LLC (BIGL or Project Developer), or the Environmental Monitoring Contractor (EMC) will report all herbicide spills to ODOE by phone or email within 72 hours with follow-up reporting as appropriate.

Special Considerations

Special consideration will be provided to perennial, intermittent, and ephemeral streams/draws during treatment activities. No herbicide will be sprayed where the drift can enter standing water or saturated soil. It will be the herbicide applicators' responsibility to ensure that no herbicide or drift enters standing water, regardless of the season when the herbicide is applied. Similar considerations will be made when in proximity to agricultural fields.

Weed Monitoring and Reporting

Weed inspections will occur within the Weed Management Area through visual inspection of the site while driving or walking. During the construction phase, the EMC will conduct periodic monitoring of noxious weeds. Noxious weeds observed during construction will be treated with mechanical or chemical treatments or other best management practices, as applicable. If construction extends into the growing season prior to the commercial date of operations and formal post-construction weed monitoring, the EMC will conduct informal but comprehensive weed surveys to inform adaptive management. In addition, weed monitoring may be conducted by the EMC as part of routine construction environmental monitoring monthly from April to October.

The EMC will conduct annual post-construction noxious weed monitoring within the Weed Management Area starting the first growing season after construction to map the extent of all noxious weed occurrences and identify areas for treatment. Results will be summarized in annual monitoring reports that describe treatments performed, treatment efficacy, recommendations to improve efficacy (if necessary), and any new noxious weed occurrences. Reports will be submitted to ODOE, ODFW, and the County annually. The Certificate Holder will be responsible for treating all noxious weeds observed within the Weed Management Area.

Based on the success of control efforts after the second year of monitoring, the Certificate Holder will consult with ODOE and the Sherman County Weed District to determine if the monitoring cycle can be reduced for Year 3 through Year 5. After 5 years of monitoring, the Certificate Holder will design a long-term weed control plan in consultation with ODOE and the Sherman County Weed District . The Certificate Holder will maintain ongoing communication with individual landowners, the Sherman County Weed District, and ODOE regarding noxious weeds within the Weed

Management Area. Landowners may also contact the Certificate Holder directly to report the presence of noxious weeds related to Solar Component activity. The Certificate Holder will control reported noxious weeds on a case-by-case basis and prepare a summary of measures taken for that landowner. During the operational period of the Solar Components, the Certificate Holder will control noxious weeds as described in the long-term weed control plan. The Certificate Holder will report the investigator's findings and recommendations regarding weed control in the Solar Component's annual report required by Oregon Administrative Rule 345-026-0080.

Treatment Plan

Table G-3, below, provides a treatment plan for noxious and invasive weeds (listed by ODA and Sherman County) in the Weed Management Area, including management objectives and treatment guidelines. This table will be updated in each year's annual monitoring report. Specific herbicide application rates will be determined in consultation with the Sherman County Weed District and the Weed Control Contractor.

Table G-3. Treatment Plan for Noxious and Invasive Weeds

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
Aegilops cylindrica	jointed goatgrass	B/C	Infrequently observed.	Monitor and manage to prevent new populations/spread of existing populations	Mechanical: Timing is critical, mow after flowering but before seeds reach soft boot stage. Early mowing will result in new tiller growth. Requires multiple mowings throughout the growing season over several years. **Chemical:** Apply to actively growing plants in late winter or spring before flowering or pre-emergent herbicide in fall. Biocontrol: None
Centaurea diffusa	diffuse knapweed	B/B	Several small to medium-sized populations observed.	Monitor and manage to prevent new populations/spread of existing populations	Mechanical: Manually remove entire plant, including taproot, prior to flowering. Chemical: Apply to actively growing plants in fall or spring from rosette to bolting stage. **Biocontrol:** Agents include several seed feeding flies and weevils and a root-boring beetle.
Chondrilla juncea	rush skeletonweed	B (T)/A(T)	Frequently observed in non-cultivated areas.	Intensive control, eradication within first 5 years of operations. Prevent new populations.	Mechanical: Regenerates from root fragments. Manually remove entire plant, including taproot, prior to flowering. Will require multiple efforts during the growing season for more than one year. **Chemical:** Apply to rosettes in the spring immediately before or during bolting. Biocontrol: Agents include a gall midge, gall mite, rust fungus, and root-mining moth
Cirsium arvense	Canada thistle	B/B(T)	One observation made.	Eradication of observation prior to construction. Monitor and manage to prevent new populations.	Mechanical: Not recommended, rhizomatous. **Chemical:** Apply from rosette to bud stage to actively growing thistle in spring or in fall with select chemicals only. Biocontrol: Four approved agents; stem weevil, seed head weevil, crown weevil, and stem gall fly.

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
Cirsium vulgare	bull thistle	B/C	Observed in two locations.	Begin control prior to construction. Eradication within 5 years of operations of. Prevent new populations.	**Mechanical:** Till or pull prior to flowering. Cut off root below soil surface. Chemical: Treat rosettes in fall or spring. Biocontrol: Seed head gall fly, not effective for individuals but can reduce overall population.
Convolvulus arvensis	field bindweed	B/B	Many small to large populations observed.	Monitor and manage to prevent new populations/spread of existing populations.	Mechanical: Not recommended, bindweed has extensive root systems and can spread by seed and root fragments. **Chemical**: Apply to rapidly growing plants in spring or summer, prior to flowering. Plants should not be under drought stress at time of application. Biocontrol: Two approved agents; a moth and mite.
Conyza canadensis	horseweed	Not listed/C	Commonly observed.	Monitor and manage to prevent new populations/spread of existing populations.	**Mechanical**: Mow or pull prior to flowering. Chemical: Apply to rapidly growing plants prior to flowering. Biocontrol: Unknown
Lactuca serriola	prickly lettuce	Not listed/C	Frequently observed.	Monitor and manage to prevent new populations/spread of existing populations.	Mechanical: Graze, till, or pull prior to flowering. Mowing not considered effective due to robust regrowth. **Chemical:** Apply to rapidly growing plants in spring prior to flowering. Biocontrol: None
Onopordum acanthium	Scotch thistle	B/B(T)	Several observations made.	Intensive control, eradication within first 5 years of operations	**Mechanical:** Pull prior to flowering, cut off root below soil surface. Tilling will control emerged plants but stimulate germination. Follow up tilling with herbicide application to treat seedlings. Sheep and goats will eat young plants and flower heads. Chemical: Treat from rosette to bolting stage in fall or spring. Most effective on small rosettes. Biocontrol: None

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
Rhaponticum (Acroptilon) repens	Russian knapweed	B/B	One observation made.	Eradication of observation prior to construction. Monitor and manage to prevent spread/new populations.	**Mechanical:** Manually remove entire plant, including taproot, prior to flowering. Chemical: Apply to actively growing plants in fall or in spring from rosette to bolting stage. Biocontrol: Gall nematode available.
Salsola tragus	Russian thistle	Not listed/C	Frequently observed.	Monitor and manage to prevent new populations/spread of existing populations.	Mechanical: Hand pulling effective for small populations. Mow just before flower maturation or repeatedly mow younger plants. **Chemical:** Treat young, rapidly growing plants from seedling to mid-rosette stage in spring or fall. Most effective on smaller plants. Preemergence also effective. Many populations are herbicide resistant in the inland northwest, consult with local herbicide applicator or county weed manager. Biocontrol: Leaf mining and stem boring moths have provided poor control.
Secale cereale	cereal rye	Not listed/C	Frequently observed.	Monitor and manage to prevent new populations/spread of existing populations.	**Mechanical**: Repeated mowing in spring prior to seed set or tillage combined with herbicide application in fallow fields. Hand pull prior to seed set. Chemical: Treat prior to seed set. Herbicide more effective if applied one year after mowing to reduce thatch buildup. Biocontrol: None
Bromus tectorum (and others)	Cheatgrass; other annual invasive grasses	Not Listed	Common in grassland habitat	Monitor and manage to minimize wildfire risk.	**Mechanical:** Repeated mowing (every 3 weeks) to 2 inches in spring can eliminate seed production in areas where herbicide application is unacceptable. Chemical: Apply pre-emergent herbicide prior to germination. Post emergent in fall or early spring/summer to rapidly growing plants prior to seed set.

Scientific Name	Common Name	State/County Status	Frequency	Management Objective	Treatment Guidelines[1]
					Biocontrol: None

Sources: Becerra-Alvarez 2025, DiTomaso et al. 2013, ODA 2025.

1. Preferred treatment method in bold.

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Attachment E: Draft Community Investment Plan

Draft Community Investment Plan

Biglow Canyon Wind Farm
Request for Amendment 4
March 2026

Prepared for

Portland General Electric Company

Prepared by

TETRA TECH

[Contains revisions approved by Energy Facility Siting Council in Final Order on AMD4]

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Acronyms and Abbreviations

AC	alternating current
BCWF or Existing Facility	Biglow Canyon Wind Farm
BESS	battery energy storage system
BIGL / Project Developer	BIGL bn, LLC
Biglow Solar Account	Biglow Community Investment Fund
CCS	County Cost Share
Certificate Holder / PGE	Portland General Electric Company
CIP	Community Investment Plan
Council / EFSC	Oregon Energy Facility Siting Council
CWPP	Community Wildfire Protection Plan
EESE	environmental, economic, social and energy
EFU	Exclusive Farm Use
gen-tie	generation tie
MCEDD	Mid-Columbia Economic Development District
MW	megawatt
OAR	Oregon Administrative Rule
ORS	Oregon Revised Statutes
OSU	Oregon State University
OWEB	Oregon Watershed Enhancement Board
POI	point of interconnection
PV	photovoltaic
RFA 4	Request for Amendment 4
SCZO	Sherman County Zoning Ordinance
Solar Components	photovoltaic solar energy generation and battery storage
Solar Micrositing Area	a portion of the existing site boundary and proposed expanded site boundary
SWCD	Soil and Water Conservation District

1.0 Introduction

The Portland General Electric Company (PGE or Certificate Holder) owns and operates the Biglow Canyon Wind Farm (BCWF or Existing Facility) under Site Certificate on Amendment 3, issued October 31, 2008 (Site Certificate). PGE has filed a Request for Amendment 4 (RFA 4) to add photovoltaic (PV) solar energy generation and battery storage (Solar Components[1]) to the Existing Facility.

BCWF currently consists of 217 wind turbines, with a peak generating capacity of 450 megawatts (MW). RFA 4 adds up to 125 MW alternating current (AC) generating capacity from PV solar arrays and 125 MW in battery storage capacity (Solar Components) in approximately 1,445 acres (Solar Area) sited within the existing BCWF site boundary Solar Micrositing Area (RFA 4 Site Boundary). The Solar Micrositing Area is approximately 1,924 acres and provides a conservative estimate of the maximum acreage needed for development, micrositing, and temporary disturbances from the Solar Components during construction, rather than the anticipated disturbance footprint. The permanent disturbance[2] area impacted by the Solar Components within the Solar Micrositing Area is up to 1,455 acres (Solar Area) and the final footprint will be confirmed during pre-construction compliance.

The Solar Micrositing Area is zoned entirely Exclusive Farm Use (EFU) by Sherman County and is currently cultivated for dryland wheat. Because the permanent disturbance area from the Solar Components will exceed 12 acres and 20 acres of high-value and arable farmland, respectively, RFA 4 requires an exception to Oregon Statewide Planning Goal 3 (Agricultural Lands).

This Community Investment Plan (CIP) supports PGE's Goal 3 exception request and helps justify why a Goal 3 exception is warranted for the BCWF, as amended. The CIP is a mitigation plan that, once implemented, will ensure that any potential adverse impacts to the local agricultural economy from the removal of cultivated wheat land are offset to a level acceptable to Sherman County and the community.

PGE will own and operate the Solar Components as a part of the BCWF, which, to date, have been developed by BIGL bn, LLC (BIGL, or Project Developer). BIGL, in its capacity as the project developer, is supporting PGE in the RFA 4 and may construct and temporarily operate the Solar

[1] Solar Components will include solar arrays, inverters, and inverter step-up transformers. Related or supporting facilities include underground medium voltage collector lines, a collector substation, battery energy storage system (BESS) facilities and their subcomponents (i.e., inverters), approximately 600 feet of a new 230-kV generation tie transmission line, operations and maintenance structures, site access roads, internal roads, perimeter fencing, facility entry gates, and temporary laydown areas. The maximum generating capacity from the Solar Components will be 125 MW AC, and the infrastructure will be fenced within the Solar Micrositing Area creating a permanent impact area of up to 1,445 acres (i.e., Solar Area).
[2] Permanent disturbance includes areas and infrastructure (trackers, inverters, internal roads, buildings, stormwater basins, and parking) inside the perimeter fence for the Solar Micrositing Area.

Components on behalf of PGE under a Build-Transfer Agreement and may implement components of the CIP including providing mitigation fund payments on behalf of PGE.

1.1 Project Layout and Construction Schedule

The proposed layout for the Solar Components includes a primary area of infrastructure improvements within the Solar Micrositing Area. The Solar Area will connect to the electrical grid through the existing point of interconnection (POI) at the Biglow Canyon Substation, which is situated within the Solar Micrositing Area.

Solar Micrositing Area: The Solar Micrositing Area is a continuous area of land that covers approximately 1,924 acres, fully within the approved BCWF site boundary, within which construction of the Solar Components may occur, subject to site certificate conditions. This area includes the Existing Facility's current POI and may be expanded to add a new 230-kilovolt (kV) line terminal, all Solar Components, and the fenced area for where such components will be located (1,445 acres; Solar Area).

Solar Area: This area falls within both the approved BCWF site boundary and the Solar Micrositing Area. It will host new solar arrays using tracking systems, a new BESS, a new collector substation, a new operations and maintenance building, a temporary laydown yard for construction, new access roads, perimeter fencing, the Existing Facility's current POI, approximately 600 feet of new 230-kV generation tie line, and other associated project components.

The Solar Components located within this area will add approximately 125 MW AC generating capacity on a total of up to 1,445 acres that would be fenced within the approved BCWF site boundary. All Solar Components will be set back at least 520 feet from the existing wind turbines per PGE requirements.

Construction is expected to begin in Q2 of 2026 and continue through Q4 of 2027 for a duration of approximately 17 to 19 months from mobilization to final completion.

1.2 Goal 3 Exception and Need for Mitigation Plan

Oregon Statewide Planning Goal 3 (Agricultural Lands) (Goal 3) requires counties to identify farmland on its comprehensive plan map, and zone those lands as EFU. An EFU zone places certain restrictions on developments to minimize uses that conflict with farming (DLCD 2023). Oregon Administrative Rule (OAR) Chapter 660, Division 33 and similar provisions under Sherman County Zoning Ordinance (SCZO) Article 3 regulate EFU lands and permitted uses on these lands. The SCZO has not been amended since 2003 and does not reflect the current list of uses and standards provided by OAR 660-033-0130. As a result, PGE directly applied OAR 660-033-0130(38)(g), which states that a PV solar power generation facility shall not use, occupy, or cover more than 12 acres of high-value farmland unless certain criteria under OAR 660-033-0130(38)(h) are met or an exception is taken pursuant to Oregon Revised Statutes (ORS) 194.732. Similarly, per OAR 660-033-0130(38)(i), a PV solar power generation facility shall not use, occupy, or cover more than 20 acres of arable lands unless certain criteria under OAR 660-033-0130(38)(i) are met or an exception is taken pursuant to ORS 194.732.

As the Solar Components will occupy more than 12 acres of high-value farmland and more than 20 acres of arable land, it does not meet the acreage standards under OAR 660-033-0130(38)(g) and (i) and requires a Goal 3 exception. The Energy Facility Siting Council (Council or EFSC) may approve an exception to Goal 3 for an energy facility that meets the criteria listed under ORS 469.504(2)(c) and OAR 345-022-0030(4)(c). These criteria include the following:

- Reasons justify why the state policy embodied in the applicable goal should not apply;
- The significant environmental, economic, social and energy (EESE) consequences anticipated as a result of the proposed facility have been identified and adverse impacts will be mitigated in accordance with rules of the Council applicable to the siting of the proposed facility (EESE consequences); and
- The proposed facility is compatible with other adjacent uses or will be made compatible through measures designed to reduce adverse impacts.

This CIP supports the approval of PGE's Goal 3 exception request by supporting the "reasons" to justify the Goal 3 exception and ensuring that potential adverse impacts under the EESE consequences are properly mitigated. Measures to address the Amended Facility's compatibility are outlined in RFA 4 Exhibit K, Sections 6.2 and 8.3.

PGE justifies a Goal 3 exception by demonstrating that reasons justify removing up to 1,445 acres of dryland wheat from agricultural production for 40 years. One of the reasons is that the Amended Facility will result in rural local economic development benefits. This CIP ensures that the rural local economic benefits will offset potential adverse impacts the Solar Components may have on Sherman County's agricultural economy. In addition, participating landowners—many of whom represent multigenerational farm families—have emphasized that solar development provides an opportunity to diversify income and strengthen long-term financial stability. This landowner perspective reinforces the rationale for a Goal 3 exception, as the Amended Facility not only contributes to rural economic development but also supports the continuity of agricultural operations across generations.

2.0 Development of the Plan

To help inform the development of the CIP and to identify example projects that could be funded through the mitigation fund (see Section 4.0), PGE and the Project Developer spent considerable time and effort coordinating with the local agricultural community to understand what potential projects/investments would be most beneficial to support the local agricultural economy. Meetings were held with local wheat farmers, the Oregon Watershed Enhancement Board (OWEB), Oregon State University (OSU) including its extension service in Sherman County and the College of Agricultural Sciences, the Oregon Wheat Commission, the Sherman County Fire District, Sherman County Emergency Services, the Rural Sherman County Fire Board, the Weed Master, the Road Master, the County Planning office, and County Judge

Engagement also included targeted discussions with project landowners and surrounding landowners, who underscored the importance of financial resilience in maintaining viable farm operations. While coordination with the Sherman County Soil and Water Conservation District (SWCD) has not yet occurred in person, the Project Developer remains committed to continued outreach.

Fire safety emerged consistently as the most pressing community concern—not only in relation to the Solar Components, but as a broader and growing threat to Sherman County's agricultural economy. In response, the Project Developer has prioritized coordination with local fire districts, including a presentation to the North Sherman Fire Board on August 12, 2025, and a follow-up meeting with Chief Burbank of the North Sherman County Fire District on September 9. These meetings provided an opportunity to review site layout and engineering plans, incorporate feedback, and identify opportunities to strengthen local fire response capacity.

Several key themes for possible agricultural mitigation investments emerged from this coordination:

1. Investments in minimizing wildland fire risk to agricultural crops, properties, and infrastructure and minimizing risk of liability to farmers from farm activities igniting fires and impacting non-farm uses in the agricultural district;
2. Research into agrivoltaics techniques in the context of dryland farming in central and eastern Oregon;
3. Research into long-term effects to soils that have been removed from cultivation and placed in long-term vegetation management programs within solar array areas;
4. Maintaining and/or improving weed control county-wide on agricultural lands and minimizing costs for weed control;
5. Technical assistance training for heavy equipment operation and repairs for farmers and laborers in the County to provide uplift in firefighting support, construction, and farming;
6. Providing funding for 4H, National Future Farmers of America Organization, or other youth programs; and
7. Providing additional funds to supplement Natural Resources Conservation Service and SWCD cost share programs for technical assistance programs such as improving haul routes, weed control, establishing fire breaks, etc.

As described further in Section 4.0, the final decision on what projects would be funded and/or what organizations would be awarded mitigation funds will be determined by the Sherman County Court. The mitigation projects identified in Section 5.0 and the selection criteria identified in Section 4.2.4 are unique to the Sherman County agricultural community and its specific needs. The projects identified in this plan are in direct response to community feedback and will bring economic benefit to the County's agricultural community, which is primarily composed of dryland wheat farmland.

3.0 Overview of Project Impacts on Agricultural Economy

PGE evaluated the potential adverse impacts to Sherman County's agricultural economy from removing up to 1,445 acres of dryland wheat from production for the life of the project. For details of this evaluation, see RFA 4 Exhibit K, Attachment K-1. The removal of 1,445 acres of winter wheat would have an estimated reduction in annual output of $281,300 in the grain sector. Putting this into context, $281,300 is equivalent to 0.8 percent of the Sherman County's average value of production of winter wheat and 0.1 percent of the State's average value of production of winter wheat. This highlights the small percent of the county and state's winter wheat production value impacted by the Solar Micrositing Area.

Using a worst-case scenario impact analysis of a full build out of the Solar Components resulting in the loss of 1,445 acres of dryland wheat over 40 years, PGE estimates that the Amended Facility may result in a loss of annual indirect economic output of $100,000 over the life of the Facility, as amended. This loss of indirect economic output represents decreases in spending on wheat farming inputs like seeds, fertilizer, and fuel and contract services.

Calculated over a period of 40 years of operation, and adjusting for inflation, the estimated indirect output would be $2,315,218 or $1,600 per acre of farmland taken out of production. The final mitigation payments will be based on the actual acres identified in the final design of the Solar Components, which may be less than the full 1,445 acres identified in the Goal 3 exception request.

4.0 Mitigation Fund

PGE and the Project Developer have partnered with Sherman County and the Mid-Columbia Economic Development District (MCEDD) to establish an agricultural mitigation fund that will administer and distribute dollars for projects having a benefit to the Sherman County agricultural economy. The fund will ensure that any potential adverse impacts from the Solar Components are offset to levels acceptable to Sherman County and the community. Maintaining local control over investment decisions was identified as an essential element of trust-building during stakeholder engagement. For this reason, all mitigation fund allocations will ultimately be directed by the Sherman County Court to ensure alignment with community priorities and accountability to local stakeholders.

4.1 Establishing the Biglow Community Investment Fund

MCEDD will administer the Biglow Community Investment Fund under an Administrative Agreement (as described in the Memorandum of Understanding among Sherman County, MCEDD, and PGE, dated [add]). Prior to construction, $1,600 per acre for each acre the Solar Components remove from agricultural production will be placed into the Biglow Solar Account that will then be used to fund mitigation projects under the CIP. The total number of acres removed will be determined based on the final layout confirmed during the Oregon Department of Energy pre-

construction compliance review. The mitigation payment may be provided by PGE or the Project Developer (or other entity) on behalf of PGE.

4.2 Administration of the Biglow Community Investment Fund

MCEDD will administer the Biglow Community Investment Fund, which will be funded prior to construction of each phase of the Solar Components. MCEDD will also oversee the following administrative steps.

4.2.1 Selection Committee

MCEDD will form and oversee a six-person advisory committee (Selection Committee) to review applications for funding and make recommendations to Sherman County BOC on funding projects. The Selection Committee will comprise the following individuals:

- One representative from Sherman County government;
- One representative from an academic institution engaged in agriculture research in Sherman County or an agricultural-related nonprofit entity located in Sherman County;
- One dryland farm producer in the County;
- One representative selected by the Oregon Wheat Grower's League;
- One community member; and
- One representative with expertise in wildfire as it relates to agricultural lands.

Sherman County will have the ability to propose candidates for the Selection Committee in accordance with the aforementioned criteria, provided that the County proposes candidates within 30 calendar days of the formation of the committee. If the County elects not to propose candidates to the Selection Committee, MCEDD shall make any remaining necessary appointments.

In addition to the members above, the Selection committee shall include one non-voting member with subject matter expertise over statewide or regional agriculture issues selected by the Energy Facility Siting Council.

4.2.2 Applications for Funding

MCEDD shall issue a notice of available funding for mitigation projects as provided by the administrative agreement and contemplated in the Memorandum of Understanding. The notice will identify the selection criteria for qualifying projects and include an application form. All applications for funding would need to be filed with MCEDD at a time determined by the parties, ahead of the Start of Construction (Application Deadline).

4.2.3 Awarding Funds

The Selection Committee will review applications, rank the projects against the selection criteria, and make recommendations to the Sherman County BOC within 3 months of the Application Deadline. The BOC will aim to make a decision on funding within 60 days of receipt of the Selection Committee's recommendation. MCEDD will award funds within 30 days of the County's decision.

4.2.4 Selection Criteria

The selection criteria for a qualified mitigation project are to ensure that projects provide uplift of the Sherman County agricultural economy and are responsive to community needs as described in Section 2.0 and as may be identified by the community in the future. These selection criteria were identified after significant community engagement and listening sessions.

Except as provided in Section 4.2.5 below, the Selection Committee will apply and balance the selection criteria when recommending projects for funding. The five selection criteria are as follows:

1. Improving resiliency and efficiency of Sherman County's agricultural economy;
2. Improving agricultural wildfire protection and risk management capacity;
3. Investing in research to further agrivoltaics for dryland wheat lands;
4. Investing in agricultural education for next-generation farmers; and
5. Subsidizing the price of wheat produced in Sherman County

4.2.5 Pre-Screened Projects

A preliminary list of pre-screened projects is included in Section 5.0. These projects have been identified by Sherman County and the community as having a direct benefit to the rural agricultural economy of Sherman County and are deemed to meet, on balance, the selection criteria. A project proponent of a pre-screened project must still apply for funding through MCEDD and provide a project plan to identify the project's fiscal contribution to the rural agricultural economy and confirm that the selection criteria will be satisfied. A pre-screened project application goes directly to the BOC for consideration and bypasses review by the Selection Committee.

4.3 Reporting Obligations

Award recipients shall provide an annual report to the County, MCEDD, and PGE, as further described in the MOU.

5.0 Pre-Screened Projects

The five pre-screened projects were developed based on extensive outreach and coordination with key stakeholders from the Sherman County agricultural community, as well as state-wide

agricultural-related organizations (see Section 2.0). These projects have the support of both the County and the community, who agree they will provide meaningful benefits to Sherman County's agricultural economy. In particular, they include initiatives that support essential services such as wildfire mitigation. For Sherman County, wildfire mitigation is especially critical, as it helps protect wheat farms—the primary land use in the county—and their supporting infrastructure, including roads, equipment, grain elevators and storage facilities, as well as urban areas tied to farm operations.

5.1 Project 1: Agricultural Wildfire Risk Minimization and Capacity Building

Project Sponsors: North Sherman County Rural Fire Department

Project Description: Sherman County has experienced large-scale wildfires that have burned thousands of acres and have destroyed more than 1 million bushels of wheat in a single fire resulting in more than $5 million in damage (Sherman County 2024). In response to increased community support for fire mitigation and prevention efforts, Sherman County developed and adopted a Community Wildfire Protection Plan (CWPP) in 2024 to identify and mitigate wildfire risk and to develop a strategy to reduce those risks. The CWPP is also meant to assist the county, its communities, and fire districts by making them eligible for certain grants or other funding sources. Grants and funding sources may include National Fire Plan grants, U.S. Forest Service Community Wildfire Defense Grants, and other funding sources to treat hazard fuel situations and to better prepare residents for wildfires that may occur.

The CWPP[3] identifies several projects such as:

1. Upgrading, maintaining, or adding firefighting equipment for Sherman County's Rural Fire Protection Districts.
    a. See Project #7 in CWPP Section XIII.
    b. See Project #31 in CWPP Section XIII.
2. Upgrading and developing new facilities at Rufus Fire Hall, North Sherman Rural Fire Protection District Station, and/or South Sherman Rural Fire Protection District Station
    a. See Project #6 in CWPP Section XIII.
3. Training for volunteers
    a. See Project #13 in CWPP Section XIII.
4. Funding for additional staff
    a. See Project #2 in CWPP Section XIII – develop paid seasonal county firefighting positions.
    b. Fund administrative staff to support all projects identified in CWPP Section XIII.
5. Fund projects to develop fuel breaks, reduce wildfire hazards, provide firefighting water.
    a. See Projects #14, #15, #22 through #30 in CWPP Section XIII.

[3] See Section XII of the CWPP (Sherman County 2024) for a list of identified wildfire mitigation projects.

The County could allocate mitigation funding to support either partial or full implementation of the projects identified in the CWPP, as well as other initiatives aimed at supporting the County's agricultural community in wildfire mitigation and response.

Project Benefit: Section V.E. of the County's CWPP identifies the probability of wildfire in Sherman County as high, with significant vulnerability to grain fields, pastures, and utility infrastructure. As noted in the CWPP, previous fires in the county have burned one million bushels of wheat and caused over $5 million in damages. Any project that reduces the risk or extent of wildfire damage to dryland wheat crops and their supporting infrastructure would provide a direct economic benefit to the County's agricultural community. Stakeholder feedback reinforced that agricultural mitigation and wildfire mitigation are deeply interconnected in Sherman County. Farmers repeatedly emphasized that their livelihoods depend on the resilience of their land and crops, and that wildfire protection must be addressed alongside agricultural investments. Accordingly, the coordination on behalf of RFA4 with the North Sherman Fire District demonstrates a proactive approach to integrating agricultural and fire mitigation needs.

Proposed Budget: To be provided by project sponsor. Project budget is anticipated to range from $100,000 to $500,000.

5.2 Project 2: Funding matching for SWCD programs for wheat farmers

Project Sponsors: Sherman County SWCD

Project Description: Provide funding to supplement funding of SWCD County Cost Share (CCS) program. The Sherman County SWCD CCS program is funded from county tax dollars and includes projects such as improving farming haul roads with gravel, solar well developments, border fencing, terrace and water and sediment control basin reshaping, weed control, pasture/range planting, and creation and maintenance of fire breaks (Sherman County SWCD 2025). As funding for this program is limited, mitigation funds could be directed to SWCD to supplement this program's funding and provide additional opportunities for Sherman County farmers to participate in this program.

Project Benefit: Benefits to farmers participating in the SWCD CCS program would depend on the project but would result in offsetting costs to farmers for soil conservation, weed control, fire mitigation, etc.

Proposed Budget: To be provided by project sponsor. The current annual budget for this program is $100,000 allocated at $25,000 quarterly. For conservation projects, landowners provide 25 percent of the cost while SWCD provides 75 percent of the cost share rate with projects up to $20,000.[4] Mitigation funds allocated to this program could increase the annual budget to provide capacity to fund more projects in the county depending on demand by Sherman County farmers.

[4] See CCS grant application:
https://www.shermancountyswcd.com/files/a1235c3b6/CCS_Application_2024.pdf

5.3 Project 3: Next-Generation Farming Innovation and Technology Training Program

Project Sponsors: To be determined. Sponsors could be individual wheat farmers seeking funding for precision agricultural technology investments, school district seeking funding for heavy equipment training programs, or other community programs such as 4H or National Future Farmers of America Organization seeking funding for youth programs focused on wheat farming.

Project Description: A variety of projects could be included, such as:

- Grant program for county wheat farmers to invest in precision agricultural technology such as weed management equipment, remote sensing technology to assist with weed mapping or soil mapping, variable rate technology to collect data on soil variability to inform application of fertilizers, and other technologies.
    - The precision agricultural technology grant program is intended to increase Sherman County wheat farmer's access to this technology through a cost-sharing agreement between farmers and MCEDD.
    - The cost-share agreement would be determined by the County BOC but is assumed to be 50 percent of the total cost of the precision tech equipment and installation. A cost-share program ensures prospective recipients of the program are fully invested in the use and maintenance of the precision agricultural technology.
- Grant program to offset tuition costs for Sherman County residents to participate in heavy equipment training and receive large equipment operator certification.

Project Benefit:

- The cost-share grant program for precision agricultural technology is assumed to increase the number of farmers who otherwise would not have access to precision management technology due to the significant upfront cost barrier. Investments in this technology could help county wheat farmers decrease costs to expensive farming inputs such as chemicals, fertilizers, and fuel resulting in economic benefits to these farmers.
- The grant program for heavy equipment operation training would directly relate to increasing local capacity to operate farm equipment, firefighting equipment, and construction equipment. This increased capacity would economically benefit farmers in the County by providing additional labor capacity.

Proposed Budget: To be provided by project sponsor. Project budget is anticipated to range from $200,000 to $1,000,000 depending on the number of grants allocated.

5.4 Project 4: Capacity Building for Wheat Growers

Project Sponsor: Sherman County, individual wheat farmers.

Project Description: This project proposes a per-bushel support mechanism to strengthen the financial resilience of Sherman County's wheat growers. For every bushel of wheat produced in the

County, an additional $0.05 would be paid directly to farmers on top of the prevailing market price. This payment is intended to help offset the rising costs of inputs such as seed, fertilizer, fuel, machinery, and labor.

Project Benefits: The benefit of this project is that it directly places funds into the hands of Sherman County wheat farmers at a time when input costs are rising and market prices remain unpredictable. More specifically, the project would:

- Support farm income by providing an additional payment linked to production levels.
- Help offset rising input costs such as seed, fertilizer, and fuel.
- Provide flexibility for reinvestment in farm operations, equipment, or practices that improve efficiency.
- Contribute to the local agricultural economy by supplementing the revenue available to wheat growers.
- Offer modest support for community stability, as additional farm income can help sustain agricultural operations in the County.

Proposed Budget: To be provided by project sponsor. At a rate of $0.05 per bushel, the project could cost up to approximately $282,550 in a single harvest season, assuming an annual production of 5.65 million bushels. The actual budget would vary depending on annual yield volumes and prevailing market conditions.

6.0 References

DLCD (Department of Land Conservation and Development). 2023. Oregon's Statewide Land Use Planning Goals. Oregon Planning. https://www.oregon.gov/lcd/OP/Pages/Goals.aspx

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Sherman County. 2024. Sherman County Community Wildlife Protection Plan. Prepared by the Sherman County Community Wildfire Protection Plan Steering Committee and Fair Winds Consulting, LLC. September. Available online at: https://www.co.sherman.or.us/documents/sherman-county-cwpp-2024-pdf/

Sherman County SWCD (Soil and Water Conservation District). 2025. County Cost Share. [Website] Available online at: https://www.shermancountyswcd.com/county-cost-share

Attachment F: Draft Amended Habitat Mitigation Plan

Biglow Solar Project

Draft Habitat Mitigation Plan

Biglow Canyon Wind Farm
Request for Amendment 4
March 2026

Prepared for

Portland General Electric Company

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[Contains revisions approved by Energy Facility Siting Council in Final Order on AMD4]

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Figure 1. Habitat Mitigation Area

1.0 Introduction

This draft Habitat Mitigation Plan (HMP) was submitted by the Portland General Electric Company (PGE or Certificate Holder) for the photovoltaic solar energy generation and battery storage (Solar Components) at the Biglow Canyon Wind Farm (BCWF or Existing Facility). Located approximately 4.5 miles northeast of Wasco in Sherman County, Oregon, BCWF currently consists of 217 wind turbines, with a peak generating capacity of 450 megawatts (MW).

The Solar Micrositing Area identified as part of Request for Amendment 4 of the Site Certificate (RFA 4) is approximately 1,924 acres and provides an estimate of the maximum area needed for development, micrositing, and temporary disturbances from the Solar Components during construction, rather than the anticipated disturbance footprint. The permanent disturbance area impacted by the Solar Components is approximately 1,445 acres.

PGE will own and operate the Solar Components as a part of the BCWF (together, Facility), which, to date, have been developed by BIGL bn, LLC (BIGL). BIGL, in its capacity as the project developer, supports PGE in this RFA 4 and may construct and temporarily operate the Solar Components on behalf of PGE under a Build-Transfer Agreement.

The Certificate Holder's goal is to preserve and maintain in-kind habitat in the Columbia Plateau Ecoregion to achieve a net benefit to Category 2 habitat, and no net loss of Category 4 habitat through the measures described in this HMP.

2.0 Finalization of the HMP (PRE-FW-01)

Fish and Wildlife Habitat Condition 1 requires finalization of the draft HMP, stating the following:

> *Prior to construction of a phase or component of the solar facility, as applicable, the certificate holder shall submit a final Habitat Mitigation Plan substantially similar to Final Order on RFA4 Attachment F, base don the finalization requirements included in Section 2.0 of the plan. The final plan must be submitted for review and approval by the Department, in consultation with ODFW.*

The HMP must be finalized prior to construction, based on the estimated permanent habitat impacts associated with the facility, component or phase, as applicable. Final review and approval of the HMP has been delegated by the Council under ORS 469.402 to the Department. The Department, in consultation with the Oregon Department of Fish and Wildlife (ODFW), will review the final HMP based on the following scope:

1. **Final habitat and impact assessment.** Based on final design/layout, update tabular summaries of temporary and permanent disturbance estimates (acres).
    a. Table 2. Temporary and Permanent Impacts by Habitat Category and Habitat Subtype,
    b. Table 3. Calculating Mitigation for Permanent Impacts, and

   c. Table 4. Calculating Mitigation for Temporary Impacts
2. **Execute legal instrument.** Obtain and submit to ODOE a copy of the conservation easement or legal instrument securing the Habitat Mitigation Area (HMA) for conservation purposes as outlined in this HMP:
   a. The term of the conservation easement or legal instrument will be for the life of the Solar Components;
   b. The terms of the conservation easement or legal instrument will be binding upon the landowner, heirs, or successors and would run with the land if property is sold;
   c. The conservation easement or legal instrument will identify restricted uses that have the potential to diminish wildlife habitat functions and value, including but not limited to grazing; grading, mowing, blading or expansion of impervious surfaces or access road networks; division of the Property.
3. **Identify/map baseline condition/monitoring sites and enhancement action areas.** Map baseline habitat conditions of the HMA. Propose number and location of monitoring sites for noxious weeds and shrub-planting. Submit habitat mapping and monitoring site locations to ODOE and ODFW for review and approval.
   a. Provide baseline habitat maps, photographs and maps/GIS data for proposed monitoring:reference sites at the HMA with a description of the weed and vegetative cover.
      i. Baseline monitoring plot photo points within the HMA, include 1) a minimum of five permanent photo points distributed to show general vegetation status throughout the HMA, and 2) additional photo points as needed to monitor success of noxious weed control and shrub-planting;
4. **Finalize enhancement actions and success criteria in Section 6.2.1, 6.2.2 and 6.2.3.** Based on the baseline assessment completed under Sub(3) above:
   a. Provide maps/GIS data of weed treatment and shrub-planting areas.
   b. Determine sagebrush planting density.
   c. Finalize the success criteria for weed treatment and shrub planting.
      i. Success criteria for weed treatment must represent a percent increase in native vegetation cover and percent decrease in invasive cover at monitoring sites compared to baseline.
      ii. Shrub planting will be considered successful when sagebrush density in enhancement areas is 50 percent of planting density at 5 years.
   d. Propose restoration methods in the event of fire which at a minimum include post-burn seeding and noxious weed control.
   e. The ODOE and ODFW must evaluate whether the combined enhancement actions satisfy the Category 2 mitigation goal of a net benefit in habitat quality. If the HMA has minimal need or opportunity for the enhancement actions as currently proposed, additional actions may be identified/required.
5. **Finalize Implementation Schedule.** Provide an implementation schedule for habitat enhancement actions and monitoring.

6. **Finalize Monitoring Protocols and Survey Methods.** Submit final proposed monitoring protocol and survey methods to monitor and evaluate the success of enhancement actions.

Approval of the final HMP will be based on review by the ODOE, in consultation with ODFW, based on the adequacy of the information provided to address the steps/requirements listed above.

3.0 Habitat Categories and Habitat Types

A habitat survey was conducted as part of RFA4 to verify habitat subtypes and habitat categories of all areas to be affected by the Facility. The ODFW Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0025) provides a framework to categorize habitats based on type, quality, availability, and usefulness/importance to wildlife, and establishes mitigation goals and implementation standards for each. Table 1 defines each of the six habitat category types as presented in the ODFW Habitat Mitigation Policy.

Table 1. Habitat Categorization Types

Category Type	Definition[1]	Mitigation Goal
1	Irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on either a physiographic province or site-specific basis, depending on the individual species, population or unique assemblage.	The mitigation goal for Category 1 habitat is no loss of either habitat quantity or quality.
2	Essential habitat for a fish or wildlife species, population, or unique assemblage of species and is limited either on a physiographic province or site-specific basis depending on the individual species, population or unique assemblage.	The mitigation goal if impacts are unavoidable is no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality.
3	Essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited either on a physiographic province or site-specific basis, depending on the individual species or population.	The mitigation goal is no net loss of either habitat quantity or quality.
4	Important habitat for fish and wildlife species.	The mitigation goal is no net loss of either habitat quantity or quality.
5	Habitat for fish and wildlife having high potential to become either essential or important habitat.	The mitigation goal, if impacts are unavoidable, is to provide a net benefit in habitat quantity or quality.
6	Habitat that has low potential to become essential or important habitat for fish and wildlife.	The mitigation goal is to minimize impacts.
1. Source: OAR 635-415-0025.		

4.0 Temporary and Permanent Impacts

Impacts may be permanent or temporary. Permanent impacts are defined as those impacts that will exist for the life of the Solar Components. Temporary impacts are those impacts that will last for a time less than the life of the Solar Components. The duration of temporary impacts to habitat will vary by habitat subtype. For example, the recovery period for agricultural areas that were temporarily disturbed could be as short as 1 to 3 years, grasslands generally recover within 3 to 7 years, and shrublands may require 10 to 50 years to recover (with the longer recovery periods associated with disturbances in mature sagebrush [*Artemisia* sp.] habitats). The Certificate Holder will restore temporary impacts consistent with the Comprehensive Solar Revegetation and Soil Management Plan (Final Order on RFA4, Attachment D).

As described in Exhibit P, there are no impacts to Category 1 habitat within the Solar Micrositing Area. Category 2 habitat occurs in the Solar Micrositing Area and will be impacted by the Solar Components (Table 2). Category 2 habitat within the Solar Micrositing Area is associated with Shrub-steppe; Sagebrush Shrub-steppe habitat along Biglow Canyon and to a lesser extent, Riparian: Riparian Tree habitat. Category 4 and 6 habitat will also be impacted by the Solar Components, while Category 3 and 5 habitat were not identified in the affected area.

Table 2 shows the acres of permanent and temporary impacts in each habitat category by habitat subtype for the Solar Components.

Table 2. Temporary and Permanent Impacts by Habitat Category and Habitat Subtype

Habitat Category	Habitat Subtype	Impact (acres)	
		Temporary	Permanent
2	Riparian Trees	<0.1	<0.1
	Sagebrush Shrub-Steppe	0.3	20.7
Category 2 Subtotal		**0.3**	**20.7**
4	Grassland-steppe	0.1	3.0
	Ephemeral Streams	<0.1	<0.1
Category 4 Subtotal		**0.1**	**3.0**
6	Irrigated Cropland	0.1	52.0
	Non-Irrigated Cropland	9.4	1,365.0
	Developed	1.0	3.9
Category 6 Subtotal		**10.5**	**1,420.9**
Grand Total		**10.9**	**1,444.6**

Note: Totals in this table may not sum correctly due to rounding; "--" = no impact; <0.1 = greater than zero but less than 0.05 acre.

5.0 Methods for Calculating Mitigation

Solar Component impacts, as determined based on the Solar Micrositing Area, would result in a mitigation need of 45 acres, including 44.4 acres of mitigation for permanent impacts (41.4 acres of Category 2 and 3.0 acres of Category 4 habitat) and 0.6 acres of mitigation for temporary impacts (0.6 acres of Category 2 and <0.1 acres of Category 4; Table 3 and Table 4).[1] The actual acres of temporary and permanent impacts and the associated mitigation requirements will be confirmed following construction. The Certificate Holder is not proposing compensatory mitigation under the ODFW Fish and Wildlife Habitat Mitigation Policy for impacts to Category 6 habitat.

Table 3. Calculating Mitigation for Permanent Impacts

Habitat Category	Impact Acres	Mitigation Ratio[1]	Mitigation Need	Mitigation Description
Category 2	20.7	2:1	41.4	The mitigation goal for Category 2 habitat is "no net loss" and "net benefit." Accordingly, mitigation for permanent impacts on Category 2 habitat needs to demonstrate a net benefit in quality or quantity.
Category 4	3.0	1:1	3.0	The mitigation goal for Category 4 habitat is "no net loss" in quantity or quality. During a site visit on January 10, 2025, ODFW recommended that impacts on Upland Tree habitat types should be mitigated within grassland or shrubland habitat types.
Category 6	1,420.9	0:1	--	The mitigation goal for impacts on Category 6 habitat is minimization; no compensatory mitigation proposed.
Grand Total	**1,444.6**	**--**	**44.4**	--

1. Acres mitigation per acres impacted.

Note: Totals in this table may not sum correctly due to rounding.

Table 4. Calculating Mitigation for Temporary Impacts

Habitat Category	Habitat Subtype	Impact Acres	Mitigation Ratio[1]	Mitigation Need	Mitigation Description
Category 2	Riparian Trees	<0.1	2:1	<0.1	The mitigation goal for Category 2 habitat is "no net loss" and "net benefit." Accordingly, mitigation for permanent impacts on Category 2 habitat needs to demonstrate a net benefit in quality or quantity.
	Sagebrush Shrub-steppe	0.3	2:1	0.6	

[1] Temporary impacts result in temporal loss of habitat function and values from the time an impact occurs to the time when the restored habitat provides a pre-impact level of habitat function. Sagebrush steppe and riparian tree habitat subtypes are reasonably expected to require a longer restoration timeframe (5+ years) and therefore would be expected to result in temporal loss requiring compensatory mitigation beyond the Certificate Holder's revegetation obligation.

Habitat Category	Habitat Subtype	Impact Acres	Mitigation Ratio[1]	Mitigation Need	Mitigation Description
Category 4	Grassland-steppe	0.1	0:1	--	The mitigation goal for Category 4 habitat is "no net loss" in quantity or quality. The proposed mitigation ratio would result in a lesser amount of acreage of mitigation than what is impacted by the Solar Components. Combined with restoration of temporary disturbances, the proposed mitigation ratio is intended to account for the temporary loss of habitat functionality and meet the "no net loss" goal. Temporary disturbances to Category 4 Grassland-steppe are not mitigated beyond restoration.
	Ephemeral Streams	<0.1	1:1	<0.1	
Category 6	Agriculture, Developed	10.5	0:1	--	The mitigation goal for impacts on Category 6 habitat is minimization; no compensatory mitigation proposed.
Grand Total		**10.9**	**--**	**0.6**	--

1. Acres mitigation per acres impacted.

Note: Totals in this table may not sum correctly due to rounding. "--" = no impact; <0.1 = greater than zero but less than 0.05 acres.

6.0 Biglow Canyon Wind Farm Habitat Mitigation Area

The HMA is the area where the Certificate Holder is proposing to perform enhancement and preservation actions that are in addition to the revegetation of areas of temporary disturbance associated with the Biglow Solar Project. The HMA must be large enough and have the characteristics to meet the standards set in OAR 635-415-0025.

According to ODFW standards, areas appropriate for mitigation of Category 2 habitat impacts must provide "in-kind" mitigation that creates similar structure and function to that being disturbed, be "in-proximity" to the Solar Components, and have potential for habitat enhancement. The Certificate Holder identified 78 acres for the HMA located within 880 acres of land owned by the Certificate Holder adjacent to the Carty Generating Facility in Morrow County (Figure 1). The Certificate Holder identified an area larger than its mitigation need to allow for flexibility in management of the HMA. The Certificate Holder discussed the location of the HMA with ODFW and received assurance that the mitigation goals of "in-kind" and "in-proximity" can be met.

6.1 Habitat Assessment and Mitigation Accounting

The Certificate Holder identified 78 acres of suitable in-kind and in-proximity habitat within an 880-acre parcel. The HMA is adjacent to the existing PGE-owned Conservation Area and a conservation area maintained by The Nature Conservancy (South Farm Conservation Area; Figure 1). The habitat mapped within the HMA includes rabbitbrush shrubland and broom

snakeweed shrubland (Figure 1). The HMA is dominated by Sandberg's bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and intermittent areas of needle-and-thread grass (*Hesperostipa comata*), as well as cheatgrass (*Bromus tectorum*). There are also occasional occurrences of green rabbitbrush (*Chrysothamnus viscidiflorus*), gray rabbitbrush (*Ericameria nauseosa*), big sagebrush (*Artemisia tridentata*), fiddleneck (*Amsinckia menziesii*), and yarrow (*Achillea millefolium*).

The HMA is within a PWCA connector (ODFW 2023).[2] The HMA also contains Category 1 and Category 2 habitat associated with Washington ground squirrel (*Urocitellus washingtoni*) colonies that are immediately adjacent to the HMA.

The Certificate Holder plans to mitigate for the habitats impacted by placing a conservation easement on the appropriate acreage and by providing habitat uplift through the habitat enhancement and monitoring activities described below.

6.2 Habitat Enhancement Actions

Based on the acres of impact and mitigation need identified in Tables 2, 3, and 4, the Certificate Holder identified 78 acres available to fulfill the mitigation need for Solar Component impacts, subject to confirmation of impacts following construction. The objectives of habitat enhancement and restoration are to protect habitat within the mitigation area from degradation and improve the habitat quality of the mitigation area. The Certificate Holder shall initiate the habitat enhancement actions for the Facility before beginning operation of the Solar Components. The Certificate Holder shall restrict uses of the mitigation area that are inconsistent with the goal of no net loss and net benefit of Category 2 habitat and no net loss of Category 4 habitat as designated in the conservation easement. The Certificate Holder shall implement habitat enhancement actions as described in this HMP and as specified in the Site Certificate Enhancement actions and monitoring procedures are detailed below and will be finalized in this HMP prior to construction. Besides legal protection to ensure no development, enhancement actions for the HMA include those detailed in the following subsections.

6.2.1 Restoration and Enhancement Actions in the Event of Fire

The final HMP must include a description of enhancement actions to be implemented at the HMA if the site is damaged from fire or fire suppression efforts (e.g., vehicular disturbance or chemical

[2] The Oregon Conservation Strategy (ODFW 2025) defines PWCA "regions" as the combined top one percent of connectivity priorities across all 54 Oregon Connectivity Assessment and Mapping Project (OCAMP) species' connectivity models. Regions are large, contiguous areas and represent the highest-value habitat for facilitating species movement throughout the state. PWCA "connectors" are then described as pathways that provide the best available habitat for facilitating movement between regions. Connectors may pass through high-quality habitat in intact, relatively undisturbed parts of the landscape, as well as the best remaining marginal habitat in developed or degraded areas. The Solar Components impact a PWCA region along Biglow Canyon.

application). At a minimum, the enhancement actions must include a plan for seeding and noxious weed treatment, and coordination of the final measures to be implemented after the fire or fire suppression activities.

6.2.2 Noxious Weed Prevention, Inventory, and Control

Weeds will be controlled as needed to maintain and enhance habitat quality within the mitigation area, with the goal of working toward eradication of targeted noxious weeds or, if eradication is not practical, decreasing their abundance to minimize impacts on native plant communities. Weeds known to occur within the HMA include rush skeletonweed (*Chondrilla juncea*), knapweed (*Centaurea* spp.), and yellow starthistle (*Centaurea solstitialis*).

The final HMP will identify the weed management practices including schedule and treatment, consistent with an integrated weed management approach, using an appropriate combination of inventory, prevention (such as best management practices to prevent weed establishment), and control methods (such as hand pulling, mowing, biological control, and/or herbicides). The Certificate Holder shall obtain ODFW's approval prior to the use of pesticides. Controlling weeds in the HMA should promote growth of native vegetation.

6.2.3 Access Control

The Certificate Holder will monitor and control access to the HMA and will post informative signs depicting the area(s) as "protected" and including natural resources information as appropriate for the life of the Facility. Primary access to the PGE property is controlled by a gate off Tower Road north of the Carty Generating Station (currently used by PGE and The Nature Conservancy), the gated entrance to the Boardman Plant, and a gated road from Ione to the south. The Nature Conservancy and Three Mile Canyon Farms may occasionally use the two-track access crossing PGE's property to access the Farm's conservation area. Approved access to the site is currently limited to such occasional approved use of access roads and PGE's general operational needs. No livestock grazing is currently occurring on the site, and grazing would be a restricted use identified in the conservation easement, as established in Section 2.0 of this HMP. Periodic monitoring will be conducted to evaluate the effectiveness of access control measures and signage maintenance needs.

6.2.4 Sagebrush Plantings

To mitigate for temporal and permanent impacts to Category 2 sagebrush habitat, the Certificate Holder will plant sagebrush in the HMA, focusing on enhancing and expanding remnant stands of shrubs that were impacted by past wildfires. Planting density will be determined in this HMP prior to construction.

6.3 HMA Enhancement Monitoring

The Certificate Holder will use a qualified investigator (botanist, wildlife biologist, or revegetation specialist) to conduct monitoring at the HMA. The purpose of this monitoring is to evaluate on an ongoing basis the protection of habitat quality and the results of enhancement actions.

The investigator will visit the HMA each growing season for the first five years post planting/weed treatment. If success is achieved at year five, monitoring may be reduced to every fifth year thereafter (in years divisible by five, unless otherwise specified for specific measures) for the life of the Facility.

Monitoring methods and frequency will be established in the final HMP, as established in Section 2.0 of this Plan. Monitoring activity shall include an assessment of the following:

1. General quality of vegetation cover (dominant species, structural age, etc.), as determined by ocular estimates, measurements, and photo points;
2. Success of weed control efforts:
    a. Weed control efforts at the HMA will be considered successful when native plant cover within monitoring sites is greater than baseline, and invasive cover within monitoring sites is less than baseline. The final success criteria should be a percent increase and percent decrease value, following evaluation of baseline conditions at the monitoring sites.
    b. Annual inventories will be conducted on the HMA to identify new weed infestations, the status of existing infestations, and the progress of weed control efforts in eradicating or reducing infestations.
    c. Weed inventories will be conducted on foot. Detailed information on weed infestations will be collected, including, but not limited to, data on species, location, growth form, infestation size, and weed cover class (an ocular estimate of the percentage of the ground covered or concealed by weeds in a specific infestation area). In addition, the surveyor will identify potential weed control strategies for each infestation, as well as constraints that could limit the effectiveness of weed control efforts.
    d. Results from the surveys will be incorporated into a GIS database and provided to the Department with the Monitoring Report. Weed infestations will also be photographed over time to document progress of weed control efforts.
3. Sagebrush planting will be considered successful when sagebrush density in enhancement areas is 50 percent of planting density at 5 years of planting. Density (plant counts) will be measured within macroplots, quadrats, and/or belt transects randomly located within the enhancement area.
4. Success of remedial actions to restore habitat quality in damaged areas (such as managed weed infestations, fire damage, and any necessary seeding/planting areas), as determined by vegetation cover (ocular estimate) and photo points (see below);

5. Photos taken from established monitoring positions (photo points) within the HMA, including 1) a minimum of five permanent photo points distributed to show general vegetation status throughout the HMA, and 2) additional photo points as needed to monitor success of significant enhancement activities, such as managed weed infestations and/or any necessary seeding/planting areas;
6. Incidental wildlife occurring within the HMA (counts concurrent with all other monitoring work);
7. Environmental factors found on site during monitoring activities and annual summary records (such as precipitation); and
8. Surveys of resident special status wildlife species (Washington ground squirrel) that have been documented during previous monitoring or survey efforts within the HMA, using existing protocols approved by ODFW.

7.0 Data Reporting

The Certificate Holder will submit a report including wildlife and habitat monitoring data and analysis to ODOE and ODFW during each monitoring year according to the schedule in Table 5. The Certificate Holder will notify the U.S. Fish and Wildlife Service and ODFW within one business day if any federal or state endangered or threatened species are killed or injured on the facility site or within the HMA. The Certificate Holder may include the reporting of wildlife monitoring data and analysis in the report required under OAR 345-026-0080 or submit this information as a separate document concurrently with the submittal of the report. In addition, the Certificate Holder will provide ODOE with any data or record generated by the investigators in carrying out this Plan upon request by ODOE.

Table 5. Schedule of Monitoring

Task	Schedule
General HMA Monitoring	During the first, third, and fifth years after Solar Component construction, and otherwise every fifth year thereafter for the life of the Facility.
Washington Ground Squirrel Monitoring	
General Weed Inventory, Control and Monitoring Activity for HMA	Every year for the first 5 years following implementation of initial enhancement; long-term monitoring frequency to be determined after year 5.
HMA Sagebrush Habitat Monitoring	Every year for the first 5 years following implementation of initial enhancement; long-term monitoring frequency to be determined after year 5.

8.0 Amendment of the HMP

This HMP may be amended from time to time by agreement of the Certificate Holder and the Energy Facility Siting Council (EFSC), or ODOE, acting within its delegated authority of EFSC under ORS 469.402. Such amendments may be made without amendment of the site certificate. EFSC authorizes ODOE to agree to amendments to this HMP. ODOE shall notify EFSC of all amendments, and EFSC retains the authority to approve, reject, or modify any amendment of this plan agreed to by ODOE.

9.0 References

ODFW (Oregon Department of Fish and Wildlife). 2023. Priority Wildlife Connectivity Areas Web Map. Oregon Department of Fish and Wildlife. Salem, Oregon. https://experience.arcgis.com/experience/6979b6598f904951bd0af1821e1595f1/

ODFW. 2025. Priority Wildlife Connectivity Areas. https://oregonconservationstrategy.org/success-story/priority-wildlife-connectivity-areas-pwcas/ (Accessed August 8, 2025).

Figure

Biglow Canyon Wind Farm RFA4

Figure 1
Habitat Mitigation Area

MORROW COUNTY, OR

CP-C39
CP-C37
Tower Rd
CP-R22
CP-C47
CP-C48
CP-R28
CP-C52

- Habitat Mitigation Area
- County Boundary
- City/Town
- Carty 1 HMA boundary
- PGE Conservation Area
- South Farm Conservation Area

Oregon PWCA Type
- Connector
- Region

WAGS Habitat Buffer
- Habitat Category 1 WAGS Buffer
- Habitat Category 2 WAGS Buffer

Habitat
- Broom Snakeweed Shrubland
- Rabbitbrush Shrubland

TETRA TECH

PGE

Reference Map



1:25,000

WGS 1984 UTM Zone 10N

0 1,250 2,500 5,000 US Feet

NOT FOR CONSTRUCTION

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Attachment G: Draft Construction Wildfire Mitigation Plan

Draft Construction Wildfire Mitigation Plan

Biglow Canyon Wind Farm

Request for Amendment 4

March 2026

Prepared for
Portland General Electric Company

Prepared by



[Contains revisions approved by Energy Facility Siting Council in Final Order on AMD4]

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Attachment 1. Residence/Landowner Outreach Letter

1.0 Introduction

The Energy Facility Siting Council (EFSC) approved Portland General Electric Company's (PGE or Certificate Holder) Draft Construction Wildfire Mitigation Plan (WMP) as part of the Request for Amendment (RFA) 4 to the Site Certificate for the Biglow Canyon Wind Farm (BCWF or Existing Facility) which added photovoltaic solar energy generation and battery storage (Solar Components) to the operating BCWF in Sherman County, Oregon.

This plan is intended to satisfy the approval standards under OAR 345- 022-0115(1)(b), which requires the Plan to:

(A) Identify areas within the site boundary that are subject to a heightened risk of wildfire, using current data from reputable sources, and discuss data and methods used in the analysis;

(B) Describe the procedures, standards, and time frames that the applicant will use to inspect facility components and manage vegetation in the areas identified under subsection (a) of this section;

(C) Identify preventative actions and programs that the applicant will carry out to minimize the risk of facility components causing wildfire, including procedures that will be used to adjust operations during periods of heightened wildfire risk;

(D) Identify procedures to minimize risks to public health and safety, the health and safety of responders, and damages to resources protected by Council standards in the event that a wildfire occurs at the facility site, regardless of ignition source; and

(E) Describe methods the applicant will use to ensure that updates of the plan incorporate best practices and emerging technologies to minimize and mitigate wildfire risk.

This plan is submitted in adherence to the following Site Certificate Conditions relating to RFA 4:

Wildfire Prevention and Risk Mitigation Condition 1 (PRE-WF-01)
Prior to construction of any component or phase of the solar facility, the certificate holder shall finalize and submit to the Department, for review and approval, a Construction Wildfire Mitigation Plan (WMP), consistent with Attachment G to the Final Order on AMD4.

Wildfire Prevention and Risk Mitigation Condition 2 (CON-WF-01)
During construction of the solar facility, the certificate holder shall require onsite contractors and employees to adhere to the Construction Wildfire Mitigation Plan (WMP) approved under Condition PRE-WF-01.

2.0 Final Wildlife Mitigation Plan Checklist (Prior to Construction)

2.1 Update Applicable Sections of Construction WMP

To finalize this Construction WMP prior to construction of the Solar Components, the following sections will be updated:

- Update Section 4.0 based on final Solar Component design including a brief description of areas within the site that are subject to high wildfire risk, fire prevention features at the site, such as road dimensions, setbacks, fire breaks, entry/exit locations, location of water trucks and fire protection equipment locations.
- Update Section 4.1 and include in this WMP the facility site maps described in Section 4.1.6.
- Update Section 4.3 with contact information and emergency response procedures for the fire department, Certificate Holder, and operational manager. Update Section 4.3 with analysis area residence contact information and confirm analysis area residence contact letter sent to residences within site boundary and 0.5 miles from the facility.
- Update Section 4.6 to describe vegetation management and areas that will be managed to be vegetation-free, noncombustible space, or gravel surface.

3.0 Prior to Construction Task List (PRE)

Prior to construction of the facility, the activities in Sections 3.1 and 3.2 will be completed.

3.1 Training

The Certificate Holder will organize and hold an on-site training with Certificate Holder, contractors and construction personnel, inviting specialty contractors, local fire departments, participating and adjacent landowners, emergency management office personnel, ODOE, and any other emergency management agency that covers:

- Description of construction phasing;
- The type, location, and proper use of fire protection equipment;
- Fire protection equipment usage and maintenance requirements;
- The locations of water sources and proper usage, storing and maintenance for the pump, hose nozzle; and water hose;
- Overview of smoking policy and locations;
- Overview of procedures and restrictions of construction maintenance activities during Fire Season and Red Flag Warnings designated in this Plan;
    - Rescue, Alarm, Contain and Extinguish RACE procedures including:

  - Rescue anyone in danger (if safe to do so);
  - Alarm – call the control room, who will then determine if 911 should be alerted;
  - Contain the fire (if safe to do so); and
  - Extinguish the incipient fire stage (if safe to do so).
- Provide information and encourage attendees to sign up for the County's emergency management notification system.

The training attendee list and training materials will be provided to ODOE to demonstrate compliance. The Certificate Holder will fill out and submit to ODOE the template residence outreach letter provided as Attachment 1 of this WMP. Once ODOE confirms the letter to be sufficient, the letter will be mailed to each residence within the 0.5-mile analysis area. The mailing will be confirmed and submitted to ODOE.

3.2 Solar Micrositing Area Site Maps Submission

The Certificate Holder will update site maps from Section 4.1.6 concurrently to local fire departments and ODOE.

4.0 Construction Wildfire Mitigation Plan (CON)

The information in Section 4.0 will be updated in the finalized WMP.

4.1 Summary of Solar Component Design Features and Fire Protection Equipment

4.1.1 Construction Phasing

The Certificate Holder and contractors will maintain vegetation within the Solar Micrositing Area and will also maintain a defensible space clearance along Facility features. Defensible space will be free of combustible vegetation or other materials. Roads and parking areas will be maintained to be free of vegetation tall enough to contact the undercarriage of the vehicle.

During construction clearing, grubbing, and grading, the contractor will establish create a clear, brush free area extending a minimum of 10 feet inside the fence line and another minimum 10-foot limits of disturbance buffer outside the fence line. Vegetation within the area will be managed in accordance with the recommendations of the local fire official.

While hot work permits are not generally anticipated for the construction of the Solar Components, such permits or formal approval will be required during fire season if any hot work is to be conducted.

Fuel storage and handling protocols include the following:

- Any equipment or vehicles carrying fuel must remain parked at a designated location along a county-right-of way.
- Vehicles leaving the right-of-way must not carry fuel containers, with the exception of a single five-gallon container used to operate the water truck pump.

- Smoking will be restricted to designated areas within the Facility only.

4.1.2 Wildfire Risk

The data sources used in this Plan to identify areas within the Solar Micrositing Area subject to heightened risk of wildfire include the Oregon CWPP Planning Tool (ODF and USFS 2024) and the Sherman County Multiple-Jurisdictional Natural Hazards Mitigation Plan (Sherman County 2024).

This Section will be updated in the finalized WMP.

The Sherman County Multiple-Jurisdictional Natural Hazards Mitigation Plan describes a county-wide risk assessment of wildfire as "high" probability and identifies many areas in the county as "conducive for large and fast-moving wildfires" due to high winds typical for regional dry conditions and terrain. The plan identifies risk factors for starting wildfires in the county as highways, railroads, lighting, power lines, debris burning, and equipment.

4.1.3 Fire Prevention

The greatest risk of fire is during construction, when welding and metal cutting will take place, and vehicles and construction equipment may be used in areas of tall, dry grass. To prevent fires from occurring, the construction contractor will implement a number of systems and procedures. These will include requirements to conduct welding or metal cutting only in areas cleared of vegetation, and to keep firefighting equipment on-site as discussed in Section 4.4. Construction workers will keep vehicles on roads during the dry months of the year, unless offroad activities are required for emergency purposes, in which case fire precautions will be observed. Construction workers will be prohibited from parking vehicles in areas of tall, dry vegetation to prevent fires caused by contact with hot mufflers or catalytic converters. In the event of a large fire, emergency responders will be dispatched.

Fire prevention specific to solar arrays is dependent on proper installation and maintenance of electrical equipment to prevent short-circuits and consequent sparking, and reduction in fuel to reduce the chance of fire spreading. Qualified staff will be employed to install and maintain electrical equipment. The solar array will have shielded electrical cabling, as required by applicable code, to prevent electrical fires. All electrical equipment will meet National Electrical Code and Institute of Electrical and Electronics Engineers standards. With proper maintenance and safety checks, the electrical collection system and gen-tie lines are unlikely to cause a fire. The substrate on the ground inside the solar array fence line will be gravel where needed for maintenance and access roads or where gravel already exists, and vegetation where gravel isn't needed or already present. Weeds will be managed in accordance with the weed management procedures described in the Comprehensive Solar Revegetation and Soil Management Plan.

New needed for emergency access shall be sufficiently sized and designed for emergency vehicles in accordance with 2022 Oregon Fire Code requirements, including Section 503 and Appendix D - Fire Apparatus Access Roads. The areas immediately around the O&M buildings, proposed substation, and BESS will be graveled, with no vegetation present.

Additionally, the RFA 4 solar arrays, BESS, and associated project components will be setback at

least 50 feet from all property lines of non-participating landowners.

4.1.4 Battery Energy Storage System Fire Prevention

The Certificate Holder will implement the following fire prevention and control methods to minimize fire and safety risks for the Li-ion batteries proposed for the BESS:

- The batteries will be stored in completely contained, leak-proof modules.
- The Li-ion battery system will be kept in a temperature-controlled facility with individual battery modules isolated to prevent the spread of fire if it were to occur.
- The batteries will be based on Lithium Iron Phosphate chemistry, which has a lower risk of fire.
- The Li-ion battery system will be comprised of multiple temperature-controlled battery enclosures, each with its own fire detection, monitoring and fire protection systems. The battery enclosures will be spaced at a minimum recommended distance from each other as required by the battery supplier, AHJ requirements and applicable codes and standards. Minimum spacing isolates each battery enclosure and reduces the risk of fire propagation between battery enclosures in the unlikely event of a fire.
- Ample working space will be provided around the BESS for maintenance and safety purposes.
- Twenty-four-hour monitoring of the BESS will be implemented and will include shutdown capabilities.
- Transportation of Li-ion batteries is subject to 49 CFR 173.185 – Department of Transportation Pipeline and Hazardous Material Administration. This regulation contains requirements for prevention of a dangerous evolution of heat, prevention of short circuits, prevention of damage to the terminals, and prevention of batteries coming into contact with other batteries or conductive materials. Adherence to the requirements and regulations, personnel training, safe interim storage, and segregation from other potential waste streams will minimize any public hazard related to transport, use, or disposal of batteries.
- Design of the BESS will be in accordance with applicable Underwriters Laboratories (UL 2023; specifically 1642, 1741, 1973, 9540A), National Electric Code, and National Fire Protection Association (specifically 855) standards, which require rigorous industry testing and certification related to fire safety and/or other regulatory requirements applicable to battery storage at the time of construction.
- Additionally, the Certificate Holder will employ the following design practices, as applicable to the available technology and design at time of construction:
    - Employment of an advanced and proven battery management system;
    - Qualification testing of battery systems in accordance with UL 9540A (Revision 4) at the batter cell, module, and unit level;

- Installation of fire sensors, smoke and hydrogen and/or carbon monoxide detectors, alarms, emergency ventilation systems, cooling systems within each battery enclosure;
- Employment of fire control panels with 24-hour battery backup;
- Installation of doors that lock with restricted access to authorized personnel only;
- Implementation of locks and fencing to prevent entry of unauthorized personnel;
- Installation of remote power disconnect switches; and
- Clear and visible signs to identify remote power disconnect switches.

4.1.5 Facility Access

The locations of specific access points and gates will depend on the final configuration of the solar areas and related infrastructure. The perimeter fencing will have lockable vehicle access gates. As currently designed, five gates are. Additional gates may be included for emergency exits or for removal of wildlife. Each solar array would be enclosed by wire mesh, chain link, or similar perimeter fencing, up to 7-8 feet in height.

4.1.6 Facility Site Maps

This Construction WMP includes facility site maps that identify:

- The phasing for construction of facility features and components:
- During construction clearing, grubbing, and grading, the contractor will establish a clear, brush free area extending a minimum of 10 feet inside the fence line and another minimum 10-foot limits of disturbance buffer outside the fence line for a total of a minimum of 20 feet of clear, brush free area around the perimeter of the site.;
- Location and dimensions of facility roads;
- Solar arrays, BESS, and associated project components will be setback at least 50 feet from all property lines of non-participating landowners;
- Location of vegetation free, noncombustible, defensible spaces;
- Wildfire risk at the site;
- High-fire consequence areas/resources (includes existing infrastructure, residences, sensitive habitat, or cultural resources)
- The location of facility access points;
- A description and the location of emergency access procedures, including how emergency responders and/or adjacent landowners may access site for fire protection equipment or to extinguish an on-site fire when personnel will not be onsite;
- The type and location of fire protection equipment on site;
- The locations of water sources that will be on-site during construction.

Facility site maps will be included in the final WMP..

The final Construction WMP will include a site map detailing specific access points, location of fire protection equipment, and location of water sources.

4.2 Specifications for Fire Protection Equipment

The following fire suppression equipment will be carried in vehicles conducting maintenance activities and stored on-site at the O&M building at all times:

- Fire Extinguisher: Dry chemical. 2A:10BC (5 pound), properly mounted or secured;
- Pulaski;
- Hand Shovel: Round point. 26 to 28 in "D" Handle, blade - 12 inches long and 10 inches wide; and
- Collapsible Pail or Backpack Pump: 5-gallon capacity.

During fire season (designated Fire Season or June to October each year) water trucks/water source, water buffalo, or tank with minimum 500-gallon capacity must be on site. The water truck or water supply shall include the following, unless approved by ODOE:

- Pump should be maintained ready to operate and capable to provide a discharge of not less than 20 gallons per minute at 115 psi at pump level. Note: Volume pumps will not produce the necessary pressure to effectively attack a fire start. Pressure pumps are recommended.
- Provide enough hose (500 feet minimum) not less than 3/4" inside diameter to reach areas where power driven machinery has worked.
- Water supply, pump, and at least 250 feet of hose with nozzle must be maintained as a connected, operating unit ready for immediate use.

All internal combustion engines must be equipped with exhaust systems, mufflers and screens, or include an appropriate spark arrestor; and must be kept in good operating condition. All combustion engines (including but not limited to off road vehicles, chainsaws, and generators) will be equipped with a spark arrester that meets U.S. Forest Service Standard 5100-1.

All power-driven machinery will be kept free of excess flammable material which may create a risk of fire.

4.3 Solar Component Contact Information and Emergency Response Procedures

Local fire department and county emergency management contact information:

- North Sherman County Rural Fire Protection District: (541) 442-5252 or 911
- Sherman County Emergency Services: (541) 565-3100 or 911

Fire department response times to the site:

- The Project Developer and Certificate Holder will work with North Sherman County RFPD to determine response times and procedures for the site and these will be included in the final

Construction
WMP.

Certificate holder primary contact and contact of construction contractor managers:

Certificate Holder Primary Contact Information	
Name	Dan Wilson
Company	Portland General Electric Company
Street Address	121 SW Salmon Street, 3WTC0403
City/State/Zip	Portland, OR 97204
Phone	503-630-8138
Email	Dan.Wilson@pgn.com
Construction Contractor Manager Contact Information	
Name	Construction contractor managers contact information will be provided in the final Construction WMP.
Title	
Street Address	
City/State/Zip	
Phone	
Email	

Residence addresses within the site boundary and 0.5 miles from the site boundary:

- Attachment 2 of the finalized WMP will include a list of property owners within the RFA 4 Site Boundary and a 0.5-mile radius.
- Residence/landowner outreach letter is provided as Attachment 1 of this WMP. Use this letter to provide to new or updated residences with the analysis area as designated in Section 5.0, Plan Updates and Reporting Requirements.

Contact 911 in the event of:

- A fire or emergency on-site that cannot be addressed by personnel on-site and requires the assistance of fire or emergency medical personnel;
- A fire ignition on-site that spreads out of the fence line;
- Any fire off-site that does not have emergency responders on site.
    - To the extent that construction personnel can safely assist and/or provide equipment to help extinguish off-site fires until emergency responders are on site, it is encouraged to do so to assist in the spread of the fire, loss of life, property and damage to the environment.

4.4 Use of Vehicles and Power Driven Machinery at Site

The following best management practices (BMPs) to minimize fire risk from vehicle travel, equipment use, and fueling activities will be implemented at the site during construction:

- The movement of vehicles will be planned and managed to minimize fire risk.
- The contractors will be responsible for identifying and marking paths for all off-road vehicle travel. All off-road vehicle travel will be required to stay on the identified paths. No off-road vehicle travel will be permitted while working alone. Travel off road or parking in vegetated areas will be restricted during fire season as designated in this Plan.
- Areas with grass that are as tall or taller than the exhaust system of a vehicle must be wetted or mowed before vehicles travel through it.
- Workers will be instructed to shut off the engine of any vehicle that gets stuck, and periodically inspect the area adjacent to the exhaust system for evidence of ignition of vegetation. Stuck vehicles will be pulled out rather than "rocked" free and the area will be inspected again after the vehicle has been moved.
- The contractors will designate a location for field fueling operations at the temporary construction yards. Any fueling of generators, pumps, etc. shall take place at this location only.
- Fuel containers, if used, shall remain in a vehicle or equipment trailer, parked at a designated location alongside a county right-of-way. No fuel containers shall be in the vehicles that exit the right-of-way except the five-gallon container that is required for the water truck pump.
- All power-driven machinery will be kept free of excess flammable material which may create a risk of fire.

4.5 Fire Weather Monitoring and Restrictions during Fire Season

4.5.1 Definitions

- **Non-Fire Season –** Approximately October - May
- **Fire Season –** Approximately June-September, formally designated by the Oregon Department of Forestry (ODF). Under ORS 478.960 (4), a Fire Chief can establish Fire Season within a Fire District when ODF, under ORS 477.505, declares Fire Season. Begins seasonal restrictions for public and industry.
- **Fire Weather Watch –** A fire weather watch is issued when there is a high potential for the development of a red flag event. A watch is issued 18 to 96 hours in advance of the expected onset of criteria. Intent of a fire weather watch is to alert forecast users at least a day in advance for the purposes of resource allocation and fire fighter safety. A watch means critical fire weather conditions are possible but not imminent or occurring.
- **Red Flag Weather Warning –** A red flag warning is used to warn of impending or occurring

red flag conditions. Its issuance denotes a high degree of confidence that weather and fuel conditions consistent with local red flag event criteria will occur in 48 hours or less. Specific Red Flag criteria differ for each situation and district in Oregon. Be extremely careful with open flames and other activities that emit sparks.

- **Hot Work –** Any cutting, grinding, welding, or other activity that creates spark or open flame

4.5.2 Fire Watch Service

Fire watch shall:

- Be physically capable and experienced to operate firefighting equipment.
- Have facilities for transportation and communications to summon assistance.
- Observe portions of the facility where equipment activity occurred during the day.

Upon discovery of a fire, fire watch personnel must: First report the fire, summon any necessary firefighting assistance, describe intended fire suppression activities; then, after determining a safety zone and an escape route that will not be cut off if the fire increases or changes direction, immediately proceed to control and extinguish the fire, consistent with firefighting training and safety.

4.5.3 Fire-Prevention Measures and Restrictions

Certificate holder shall maintain a log when construction activities are impacted by Fire Restrictions during Fire Season as designed in this Section. The log will include:

- The date;
- Fire Precaution Level;
- Description of actions taken, including if any measures were taken to reduce wildfire risk that are not identified in this Plan.

4.5.3.1 Non-Fire Season

- All hot work (must be conducted on roads or on non-combustible surfaces.
- Smoking in designated areas only.

4.5.3.2 Fire Season

- All hot work (any cutting, welding, or other activity that creates spark or open flame) must be conducted on roads or on non-combustible surfaces.
- Water source meeting specifications in this Plan will be on site during fire season.
- Following the completion of hot work, the Certificate Holder or contractors must maintain a fire watch for 60 minutes to monitor for potential ignition.

- Fire watch shall be on duty during any breaks and for one hour after all power driven machinery used by the operator has been shut down for the day.
- Smoking in designated areas only.

4.5.3.3 Fire Weather Watch

- No hot work permitted.
- Driving and parking only permitted on graveled or paved surfaces.
- Fire watch shall be on duty during any breaks and for one hour after all power driven machinery used by the operator has been shut down for the day.
- No smoking on site.

4.5.3.4 Red Flag Weather Warning

- No hot work permitted.
- On-site personnel must be aware of Red Flag Warning.
- Driving and parking only permitted on graveled or paved surfaces.
- Fire watch shall be on duty during any breaks and for one hour after all power driven machinery used by the operator has been shut down for the day.
- No smoking on site.

Table 1. Fire Prevention Measures during Fire Season

Requirement	Non-Fire Season	Fire Season	Fire Weather Watch	Red Flag Warning
Fire weather advisory	Not required	Not required	Not required	On-site personnel must be aware of Red Flag Warning.
On-site water source	N/A	As specified in Section 4.2	As specified in Section 4.2 and 4.3.	As specified in Section 4.2 and 4.3.
Hot work	Only permitted on roads or on non-combustible surfaces.	Only permitted on roads or on non-combustible surfaces; fire watch required for 60 minutes after completion	Not Permitted	Not Permitted
Fire Watch Service	Not required	During breaks and for 60 minutes after all power-driven machinery has been shut down for the day.	During breaks and for 60 minutes after all power-driven machinery has been shut down for the day.	During breaks and for 60 minutes after all power-driven machinery has been shut down for the day.

Requirement	Non-Fire Season	Fire Season	Fire Weather Watch	Red Flag Warning
Driving and Parking	As described in Section 4.4.	As described in Section 4.4.	Only permitted on roads or on non-combustible surfaces and Section 4.4.	Only permitted on roads or on non-combustible surfaces and Section 4.4.
Smoking	Designated areas only	Designated areas only	Not permitted	Not permitted

4.6 Vegetation Management

4.6.1 Vegetation-free, Noncombustible Space, and Vegetation Standards

Vegetation within the fence line and below the solar arrays will be maintained in accordance with the approved Comprehensive Solar Revegetation and Soil Management Plan for the facility.

- Vegetation within and adjacent to the Solar Components will be maintained as follows:
    - During the dry season (June to October), vegetation height will be limited to 4 to 8 inches. Vegetation will be mowed to a height of 4 inches prior to June of each year.
    - Outside of the dry season (November to May), vegetation will be maintained at a maximum height of less than 12 inches,
- A minimum vertical clearance of 12 inches from electrical and mechanical equipment will be maintained at all times.
- Vegetation exceeding the heights listed above shall be removed or mowed. Mowing must be done in advance of fire season or in accordance to any fire restrictions.
- A minimum 20-foot clear, brush free area will be maintained around the perimeter of fenced solar array areas (10-feet inside the fence and 10-feet outside the fence). Activities necessary to maintain the area as clear, brush free shall be based on consultation with the local fire code official;
- Vegetation along service roads will be managed by mowing or other vegetation removal
- At no point shall vegetation come in contact with electrical equipment.
- Any vegetation removed from the site will be disposed of and not stored onsite.
- The Certificate Holder and contractors will prevent the accumulation of combustible "burn piles" on site.

The following areas will be managed to be vegetation-free, noncombustible space, or gravel surface:

- Fenced areas around the collector substation, operations and maintenance structure, and meteorological stations will be graveled, with no vegetation present
- All newly constructed roads will be graded and graveled to meet load requirements for all equipment

- Vegetation in these areas will be managed by the following techniques:
- Mechanical Clearing: mowing, brushing, chipping, tree trimming/felling
- Manual Clearing: hand tools (chainsaws, machetes, handsaws)
- Chemical Treatment: use of approved herbicides by licensed applicators to control or suppress vegetation growth (broadcast spray, spot treatment, cut-stump/basal bark)

4.7 Construction Trainings

4.7.1 Safety Training

Once per year after construction begins, organize and hold an on-site training with Certificate Holder and construction personnel, inviting equipment manufacturers, specialty contractors, local fire departments, participating and adjacent landowners, emergency management office personnel, ODOE, and any other emergency management agency that covers:

- The location of electrical facility components and the fire safety measures associated with each component that have been constructed;
- Description of remaining construction phasing;
- The type, location, and proper use of fire protection equipment;
- Fire protection equipment usage and maintenance requirements;
- The locations of water sources and proper usage, storing and maintenance for the pump, hose nozzle; and water hose;
- Overview of smoking policy and locations;
- Overview of procedures and restrictions of construction activities during Fire Season, Fire Weather Watches, and Red Flag Warnings designated in this Plan;
- Rescue, Alarm, Contain and Extinguish (RACE) procedures including:
    - Rescue anyone in danger (if safe to do so);
    - Alarm – call the control room, who will then determine if 911 should be alerted;
    - Contain the fire (if safe to do so); and
    - Extinguish the incipient fire stage (if safe to do so).
- Provide information and encourage attendees County's emergency management notification system.

5.0 Plan Updates: Amendments and Reporting Requirements:

The following will be provided to ODOE in the semi-annual construction report required per OAR 345-026-0080:

- Sections 4.1 and 4.2, any changes in wildfire risk at the site or changes in facility components or preventative features.
- Section 4.3, any changes in local fire protection agency personnel and operational managers.
- Section 4.3, any changes in analysis area residence/landowner addresses or contact information.
- A copy of the Fire Season Restriction Log identified in Section 4.5.3.
- Changes in wildfire risk if different from the Site Plan provided prior to construction. Evaluation of wildfire risk will be consistent with the requirements of OAR 345-022--0115(1) using current data from reputable sources.

This information may be used to establish the performance of the Construction WMP. If determined by certificate holder or ODOE, adjustments or improvements must be proposed to ensure the Construction WMP provides wildfire mitigation. Any ODOE required updates shall be implemented within 14 days, unless otherwise agreed to by ODOE based on a good faith effort to address wildfire hazard.

This Plan may be amended from time to time by agreement of the certificate holder and the Oregon Energy Facility Siting Council (EFSC) or ODOE, acting within its delegated authority of EFSC. Such amendments may be made without amendment of the site certificate. EFSC authorizes ODOE to agree to amendments to this Plan. ODOE will notify EFSC of all amendments, and EFSC retains the authority to approve, reject, or modify any amendment of this Plan agreed to by ODOE.

6.0 References

CBI. 2020. Wildfire Risk Assessment Data Layer Descriptions Spreadsheet. DataLayerDescriptions_04_01_2019.Xlsx. Conservation Biology Institute. Available online at: https://databasin.org/datasets/31cc2ca6bebe4efab3b139c50dd79722/

Oregon Explorer. 2024. Oregon CWPP Planning Tool. https://tools.oregonexplorer.info/oe_htmlviewer/index.html?viewer=wildfireplanning

Sherman County. 2024. Sherman County Multiple-Jurisdictional Natural Hazards Mitigation Plan.

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Attachment 1. Residence/Landowner Outreach Letter

Portland General Electric
121 SW Salmon Street • Portland, Ore. 97204
PortlandGeneral.com

DATE
Big low

Re: Community Outreach Letter for Big low Canyon Wind Energy Facility

My name is XXX and I'm the XXX for XX LLC. We are the certificate holder of the Big low Canyon Wind Farm Energy Facility, approved by the Oregon Energy Facility Siting Council (EFSC). Construction of the facility will start/was completed in XX. The facility is a XX megawatt solar facility located XX. You are receiving this letter because your address is within 0.5 miles from the facility site boundary and we want to make sure you are aware of the following information:

- Safety at the facility is our highest priority. We have emergency procedures in place in the event of an emergency on site or off site that may impact the facility and adjacent areas. This includes an EFSC Wildfire Mitigation Plan (WMP) that addresses vegetation management, facility inspections, and maintenance protocols to ensure that the facility minimizes fire risk. The WMP also requires fire protection equipment to be on site and allows for emergency access for fire departments in the event of a fire on site or off site.

- In the event of an emergency on site or off site that cannot be addressed by facility personnel, local emergency and law enforcement will be contacted and procedures designated by the Sherman County's Office of emergency management will be followed, if necessary.

- If you have not already done so, we recommend you sign up for Sherman County emergency notification system. You may sign up via the County's webpage or directly via this link: Link: https://www.co.sherman.or.us/question/get-notified-county-emergency-alerts/#/city/answers/public-information/get-notified-county-emergency-alerts

Please contact me if you have any questions about the facility, XX company, or any other concerns regarding construction and operation of the facility. Further, the Oregon Department of Energy (ODOE) is staff to EFSC and can be contacted if you have questions. Follow the link below for contact information:

https://www.oregon.gov/energy/facilities-safety/facilities/Pages/Compliance-Program.aspx

Thank you,

NAME

TITLE

CONTACT INFORMATION

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Attachment H: Draft Inadvertent Discovery Plan

1. Purpose

This procedure provides a protection and mitigation protocol for an inadvertent **cultural resource's** discovery, until the discovery has reached an appropriate resolution. Most inadvertently discovered **cultural resources** occur during ground-disturbing activities associated with facilities development, maintenance, or improvement.

Cultural resources consist of the physical remains of the activities of people in the past. This Inadvertent Discovery Procedure (IDP) should be followed should any archaeological sites, objects, or human remains are found. These are protected under Federal and State laws and their disturbance can result in criminal penalties.

1.1. Scope

1.1.1. The scope of this procedure is to minimize impacts to **cultural resources**.

1.1.2. This procedure is applicable to all PGE Personnel and PGE contractors.

1.1.3. The procedure outlines appropriate steps for PGE Personnel and Contractors when **cultural resources** are inadvertently or unanticipatedly discovered during work.

1.1.4. **Inadvertent discoveries** are categorized as either "definitely human remains" or "not definitely human remains" and the steps after each type of discovery are distinct.

1.1.5. **Cultural resources** can be found during any ground-disturbing activity. If encountered all excavation and work in the area MUST STOP. Archaeological objects vary and can include evidence or remnants of historic-era and precontact activities by humans. Archaeological objects can include but are not limited to:

A. Stone flakes, arrowheads, stone tools, bone or wooden tools, baskets, beads

B. Historic building materials such as nails, glass, metal such as cans, barrel rings, farm implements, ceramics, bottles, marbles

C. Layers of discolored earth resulting from hearth fire

D. Structural remains such as foundations

E. Shell Middens

F. Culturally Modified Trees

G. Human skeletal remains and/or bone fragments which may be whole or fragmented

1.1.6. If there is an **inadvertent discovery** of any **cultural resources**, follow this procedure. If in doubt, call it in.

1.2. Precautions

1.2.1. Determine that the area of the **inadvertent find** is safe to work in before implementing protection measures.

1.2.2. The **inadvertent find** should not be photographed, handled or removed until a professional archaeologist is contacted or on site.

1.2.3. Any communication with media should be routed through PGE's Corporate Communication department and must be avoided until adequate assessment of the discovery is made.

1.2.4. If the **inadvertent find** is clearly human, it must be treated with respect and not further disturbed.

1.2.5. PGE shall make its best efforts, in accordance with federal and state law to ensure that its personnel and contractors keep any discovery confidential. PGE will not contact the media, or any third-party member or members of the public regarding a discovery. Prior to any release of information by PGE, PGE shall concur with the responsible agencies and Tribes on the amount of information, if any, to be released to the public.

1.2.6. If applicable, review the sites HPMP (Historical Properties Management Plan) which is included in the FERC license.

1.2.7. For known environmentally sensitive areas, notify EHS prior to any ground disturbance.

1.3. Limitations

1.3.1. This procedure is limited to the treatment of unanticipated identification of **cultural resources** in the course of a PGE action/operation.

2. Responsibilities

2.1. PGE Personnel and Contractors

2.1.1. Stops work when an **inadvertent discovery** of a cultural resource is made.

2.1.2. Contacts appropriate personnel and protects the area, per the procedure.

2.2. PGE Security

2.2.1. Acts as point of contact for calls about **inadvertent discoveries**.

2.2.2. Notifies law enforcement when probable human remains are involved.

2.3. Cultural Resources Specialist

2.3.1. Conducts preliminary in-field assessment of the discovery.

2.3.2. Coordinates with PGE security as required.

2.3.3. Notifies appropriate agencies and/or appropriate Tribes within 24 hours of the discovery.

2.3.4. Provides direction and support services to affected personnel.

2.3.5. Engages an external consultant if required.

2.4. PGE Management

2.4.1. Ensures all site/facility Personnel have received the **cultural resources** sensitivity training.

2.4.2. Contacts PGE's Cultural Resources Specialist to discuss adequate protection for the discovery until a professional in-field assessment of the discovery is made.

2.4.3. Follows any additional management plan guidance specific to PGE project facilities.

3. Procedure

3.1. Prerequisite Actions

3.1.1. Field personnel and supervisors must complete the required Environmental Compliance Training provided by Environmental and Licensing Services that includes cultural awareness training.

3.2. Procedure

3.2.1. Initial Response

A. If an **inadvertent discovery** of a cultural resource is made, all work within the area of discovery shall cease immediately.

1. If the **inadvertent discovery** is believed to be human remains stop ALL work immediately and follow these steps.
    a. Contact PGE Security and Environmental Health & Safety (EHS) immediately within two hours or as soon as reasonably practical.
    b. Cover the remains in a manner that will avoid directly touching them and will protect them from damage, exposure, and obscure their view. Restrict access to the area and leave the cover in place until directed otherwise. Do not take photographs. Do not speak to the media.
    c. PGE Security: Contact Oregon State Police (OSP) to determine whether the find is forensic, i.e., a recent death requiring a criminal investigation.
    d. Contact the PGE's Cultural Resources Specialist (EHS): See the "Cultural Resources Discovery Contact List" (A01).
2. If the discovery is not definitively human remains, PGE's personnel who uncovered the find or their supervisor will contact PGE's Cultural Resources Specialist (EHS) within two hours of discovery or as soon as practical.
    a. PGE's Security does not need to be contacted.

B. PGE Personnel will flag off a buffered area about 200 feet around the discovery if possible.
    1. The area of work stoppage must be large enough to provide for the security, protection, and integrity of the discovery.

C. PGE Personnel must promptly protect the discovery from continued exposure to the weather and from public view.
    1. This may be accomplished using a clean tarp or other fabric.

3.2.2. Assessment

A. After being contacted by PGE Security, OSP, in consultation with the State Medical Examiner and the State Physical Anthropologist, will conduct an assessment to determine if it is a crime scene.

B. If the site is determined not to be a crime scene by OSP, or that the find is definitely not modern, do not move anything! The remains will continue to be secured in place along with any associated funerary objects, and protected from weather, water runoff, and shielded from view. PGE's Cultural Resources Specialist will conduct an on-site assessment of the **inadvertent discovery**.

1. PGE's Cultural Resources Specialist will ensure that all work has halted near the find, that the protection buffer has been created and is adequate, and that the **inadvertent discovery** continues to be treated with respect and secured from harm.

2. If the discovery has been determined non-modern human remains by law enforcement, PGE's Cultural Resources Specialist will contact the State Historic Preservation Office (SHPO), the State Physical Anthropologist, and the Legislative Commission on Indian Services (LCIS) for further guidance as soon as possible, along with the notifying the appropriate Tribes as designated by LCIS.

3. If the discovery is not human remains but a cultural resource, PGE's Cultural Resources Specialist will contact the State Historic Preservation Officer and appropriate Tribes as designated by LCIS within 24 hours of the discovery.

4. PGE's Cultural Resources Specialist will inform PGE Management or Project Manager of a reasonable time frame within which construction or maintenance activity can resume at the location of discovery.

5. PGE's Cultural Resources Specialist will inform appropriate PGE management of the **inadvertent discovery** within 24 hours of the find.

C. Do not resume any work in the buffered area until a plan is developed and carried out between the State Police, SHPO, LCIS, and appropriate Native American Tribes and you are directed that work may proceed.

3.3. Acceptance Criteria

3.3.1. None.

3.4. Post-Performance Activity

3.4.1. PGE's Cultural Resources Specialist will coordinate further archaeological fieldwork and reporting required to complete documentation of the **inadvertent find**.

3.4.2. If Tribes require repatriation of any **cultural resources**, PGE's Cultural Resources Specialist will coordinate the effort with stakeholders jointly identified by the SHPO, Tribes designated by LCIS, and PGE within a reasonable time frame.

3.4.3. PGE will follow appropriate laws and management procedures to assure the proper treatment and care of the discovery.

3.4.4. PGE's Cultural Resources Specialist will confirm with PGE Management when the area is cleared for work to resume.

4. References

4.1. Industry Standards or Codes

4.1.1. Code Federal Regulations (CFR): Native American Graves Protection and Repatriation Act (NAGPRA): 43 CFR 10

4.1.2. Oregon Revised Statute:

A. ORS 97.740-994 and 358.905-961: Protection under Oregon State law

B. ORS 146.090 & .095: Deaths requiring investigation in OR

4.1.3. Revised Code of Washington: RCW 68.50.645, 27.44.055, and 68.60.055: Inadvertent Discoveries in WA

4.2. PGE

4.2.1. Cultural Resources & Inadvertent Discoveries (SharePoint

5. Definitions and Acronyms

5.1. Definitions

5.1.1. **Cultural Resources:** Physical evidence of past human activity (site, object, structure, natural feature or landscape) considered significant by a group of people traditionally associated with it. **Cultural resources** are defined as being fifty years or older. These resources may include artifacts (lithic or stone tools or fragments of tools, ceramic vessels, animal remains, can scatters, farm

equipment), or features (remnants of walls, petroglyphs, cooking hearths or trash middens). **Cultural resources** may be the location of a significant event, prehistoric or historic occupation or activity, whether standing, ruined, or vanished, and possessing historical, cultural, or archaeological value.

5.1.2. **Inadvertent Discoveries/Finds: Cultural resources** found unexpectedly during construction or maintenance activities.

5.2. Acronyms

5.2.1. EHS: Environmental Health and Safety

5.2.2. HPMP: Historical Properties Management Plan

5.2.3. IDP: Inadvertent Discovery Procedure

5.2.4. LCIS: Legislative Commission on Indian Services

5.2.5. NAGPRA: Native American Graves Protection and Repatriation Act

5.2.6. SHPO: State Historic Preservation Office

6. Forms and Appendices

6.1. Forms

6.1.1. None.

6.2. Appendices

6.2.1. A01: IDP Contact List (see Cultural Resources SharePoint for updated contact list)

7. Revision Table

Review this document no later than three (3) years of the effective date, as required by the Document Governance.

Rev. No.	Revision Date	Reason for Revision	Affected Pages
0	3/9/2016	Issued for implementation by the Generation Procedure Advisory Committee	ALL
1	2/19/2018	New template; correcting typos in A01.	A01
2	09/14/2021	Purpose statement and Scope section edited; Revised Procedure Steps and Process; Added Confidentiality statement; new template. Scope applicable to all of PGE: numbering changed.	ALL
3	08/06/2024	Minor clarifications to Procedure Section and Acronyms based on feedback from LCIS and Oregon SHPO. Updated Contact Sheet to list current staff, contact info and availability.	ALL

Name	Affiliation	Office Phone	Mobile Phone	Email/Other	Availability
On Duty	PGE Security	503-464-8196	–		24/7
Kenny Gunn	PGE Cultural Resources Specialist (EHS)	**503-464-BONE (503-464-2663)**	503-550-5822	kenny.gunn@pgn.com	24/7
Oregon State Police – Sgt. Ryan Tague	Oregon Law Enforcement	Dial *OSP or *677	541-576-4393 503-731-3030 (Dispatch)	ask.osp@osp.oregon.gov or rtague@osp.oregon.gov	Dispatch 24/7
Dr. Veronica Vance	Oregon State Forensic Anthropologist	503-932-8130	Same		Dispatch 24/7
John Pouley	State Archaeologist/ Oregon SHPO	503-480-9164	Same	john.pouley@oregon.gov	Mon–Fri 7:30a–3:30p
Jamie French (Secondary Contact)	Asst. State Archaeologist/Oregon SHPO	503-979-7580	Same	jamie.french@oprd.oregon.gov	Mon–Fri 7:30a–3:30p
Dr. Elissa Bullion	Oregon State Physical Anthropologist/ Commission on Indian Services	503-986-1067 (Secondary)	971-707-1372 (Primary)	Elissa.Bullion@oregonlegislature.gov	Mon-Fri 7:30a-8p Sat-Sun intermittent Dispatch 24/7
Washington State Patrol	Washington Law Enforcement (Vancouver District)	360-449-7999	–		Dispatch 24/7

Name	Affiliation	Office Phone	Mobile Phone	Email/Other	Availability
Dr. Guy Tasa	Washington State Physical Anthropologist	360-790-1633	Same	Guy.tasa@dahp.wa.gov	Mon–Fri 8a–4p

Attachment I: Decommissioning Cost Estimate Summary Table

Biglow Canyon Wind Farm Proposed Facility Decommissioning Tasks and Cost Estimate

Task or Component	Quantity	Unit	Unit Cost ($)	Estimate ($)
1.1 Mobilization / Demobilization				
1.1.1 Equipment Mob	1	Lump Sum	61,200.00	61,200.00
1.1.2 Site Facilities	1	Lump Sum	2,200.00	2,200.00
1.1.3 Crew - Mob & Site Setup	3	Day	13,548.63	40,645.89
1.1.4 Crew - Demob & Site Cleanup	2	Day	13,548.63	27,097.26
			Subtotal	***131,143.15***
1.2 Project Site Support				
1.2.1 Site Facilities	6	Month	1,605.00	9,630.00
1.2.2 Field Management	6	Month	54,496.60	326,979.60
			Subtotal	***336,609.60***
1.3. Substation Retirement				
1.3.1 Fence Removal	1	Day	1,305.08	1,305.08
1.3.2 Transformer Removal	1	Each	94,140.68	94,140.68
1.3.3 Control Building Removal	1	Each	5,249.48	5,249.48
1.3.4 UG Utility & Ground Removal	2	Day	1,305.08	2,610.16
1.3.5 Remove Foundations	500	Cubic Yard	41.54	20,770.00
1.3.6 Misc. Material Disposal	1	Each	2,200.00	2,200.00
1.3.7 Restore Yard	1	Each	65,761.49	65,761.49
			Subtotal	***192,036.89***
1.4 230 kV Transmission Line Retirement				
1.4.1 Remove Structures	4	Each	4,684.35	18,737.40
1.4.2 Remove Foundations to Subgrade	4	Each	1,493.48	5,973.92
			Subtotal	***24,711.32***
1.5 O&M Structures Removal				
1.5.1 Loadout Containers	3	Each	165.31	495.93
1.5.2 Demo Structures	3	Each	2,249.48	6,748.44
1.5.3 Excavate / Remove Piles	5	Each	224.95	1,124.75
1.5.4 Structure Recyclingl Cost	40	Ton	70.00	2,800.00
1.5.5 Trucking - Per Load	5	Truck Loads	1,500.00	7,500.00
			Subtotal	***18,669.12***
1.6 BESS Removal				
1.6.1 BESS Unit Removal	153	Each	6,491.06	993,132.18
1.6.2 Inverter (153) / Transformer Removal (39)	192	Each	1,070.23	205,484.16
1.6.3 UG Cable Removal	3	Day	1,969.92	5,909.76
1.6.4 Support Pile Removal	318	Each	404.19	128,532.42
1.6.2 Structure & Components Removal	183	Each	987.03	180,626.49
			Subtotal	***1,513,685.01***
1.7 Inverter/Transformer Removal				
1.7.1 Disconnect Electrical	33	Each	111.39	3,675.87
1.7.2 Loadout Inverter & Transformer	33	Each	208.83	6,891.39
1.7.3 Trucking - Per Load	17	Truck Loads	1,500.00	24,750.00
			Subtotal	***35,317.26***
1.8 Inverter / Transformer Support Pile Removal				
1.8.1 Excavate / Remove Piles	33	Each	224.95	7,423.35

1.8.2 Trucking - Per Load	4	Truck Loads	1,500.00	5,820.00
			Subtotal	***13,243.35***
1.9 Solar Array Retirement				
1.9.1 Fence Removal	75,504	Linear Feet	1.27	95,890.08
1.9.2 Solar Panel Removal & Disposal	264,836	Each	8.10	2,145,171.60
1.9.3 Solar Rack (Tracker Strings) & Post Removal	10,186	Each	313.83	3,196,672.38
			Subtotal	***5,464,220.76***
1.10 UG Cable Removal				
1.10.1 Excavate & Remove Cable	20	Day	4,214.15	84,283.00
1.10.2 Trucking - Per Load	2	Truck Loads	1,500.00	3,000.00
			Subtotal	***87,283.00***
1.11 Site Restoration				
1.11.1 Strip & Decompact Roads	29,040	Linear Feet	1.43	41,527.20
1.11.2 Spot Grade Disturbed Areas	217	Acre	281.33	61,048.61
1.11.3 Re-Seed With Native Vegetation - Roads & Areas Disturbed By Construction	217	Acre	1,000.00	217,000.00
			Subtotal	***319,575.81***
Total Decommissioning Cost				***8,136,495.27***
Contractor Markups				
Home Office, Project Management			0.05	406,824.76
Contractor OH & Fee			0.15	1,281,498.01
			Subtotal	***1,688,322.77***
Total Decommissioning Cost				***9,824,818.04***
Performance Bond			0.01	98,248.18
			Gross Cost	***9,923,066.22***
	Basis (% of Cost)	**Basis ($)**	**Contingency**	**Estimate ($)**
Administration and Project Management	100%	9,923,066.22	0.10	992,306.62
Future Development (Exclude Battery)	81%	8,077,013.82	0.10	807,701.38
Future Development (Battery Only)	19%	1,846,052.40	0.20	369,210.48
			Subtotal	***2,169,218.48***
TOTAL ESTIMATED COST ($Q42024)				**12,092,284.70**
ROUNDED				12,092,000.00

Notes:

1.Unit costs in Q4 2024.

2.See RFA4 Exhibit X Attachment X-1 for detailed breakdown of tasks, actions and unit costs for the sum total costs presented in this table.

3.Tasks associated with a Lump Sum unit cost may be calculated using a fraction (in decimal form) of the actual quantities constructed or by using the more detailed breakdown of unit costs associated with the Lump Sum task identified in the cost estimating worksheet in RFA4 Exhibit X, Attachment X-1.

Estimate Summary
TETRA TECH, INC.
Job Code: Bright Night Biglow Phase 1
Description: Decommissioning Estimate

CBS Position Code	Quantity	UM	Cost Item Description	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
1	1.00	Lump Sum	BRIGHT NIGHT BIGLOW SOLAR PHASE 1 RETIREMENT	0.00	Detail	U.S. Dollar	11,560,200.97	11,560,200.97
1.1	1.00	Lump Sum	Equipment & Facilities Mob / Demob	0.20	Detail	U.S. Dollar	131,143.17	131,143.17
1.1.1	1.00	Lump Sum	Equipment Mob	0.00	Detail	U.S. Dollar	61,200.00	61,200.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
UERNTRLG	Rental Equip Transp-Large		6.00	Each	U.S. Dollar	10,000.00	60,000.00
UERNTRSM	Rental Equip Transp-Small		8.00	Each	U.S. Dollar	150.00	1,200.00

1.1.2	1.00	Lump Sum	Site Facilities	0.00	Detail	U.S. Dollar	2,200.00	2,200.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
UOCONMOB	Connex Box Mob		2.00	Each	U.S. Dollar	300.00	600.00
UOTRLTRN	Trailer Trnsp/Setup/Trdwn		2.00	Each	U.S. Dollar	800.00	1,600.00

1.1.3	3.00	Day	Crew Mob & Site Setup	1.00	Detail	U.S. Dollar	13,548.63	40,645.90

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	720.00	24.00	Each (hourly)	U.S. Dollar	43.52	31,337.50
L010101	OPERATOR	180.00	6.00	Each (hourly)	U.S. Dollar	51.71	9,308.40

1.1.4	2.00	Day	Crew Demob & Site Cleanup	1.00	Detail	U.S. Dollar	13,548.63	27,097.27

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	480.00	24.00	Each (hourly)	U.S. Dollar	43.52	20,891.66
L010101	OPERATOR	120.00	6.00	Each (hourly)	U.S. Dollar	51.71	6,205.60

1.2	6.00	Month	Project Site Support	0.05	Detail	U.S. Dollar	56,101.60	336,609.58
1.2.1	6.00	Month	Site Facilities	0.00	Detail	U.S. Dollar	1,605.00	9,630.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
URCONNEX	Connex Box		6.00	Month	U.S. Dollar	150.00	900.00
UROFFTRL	Office Trailer -12x60		6.00	Month	U.S. Dollar	500.00	3,000.00
UO1STAID	1st Aid Supplies		6.00	Month	U.S. Dollar	300.00	1,800.00
UOOFFSUP	Office Supplies($/prs/mo)		6.00	Month	U.S. Dollar	55.00	330.00
URPRTAJH	Port-a-John Unit(s) (4)		12.00	Month	U.S. Dollar	300.00	3,600.00

1.2.2	6.00	Month	Field Management	0.05	Detail	U.S. Dollar	54,496.60	326,979.58

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L90FXX02	Field - Proj Superintendent	1,320.00	1.00	Each (hourly)	U.S. Dollar	125.40	165,528.00
RPUTRK05	F-250 4X4 3/4 TON PICKUP	2,640.00	2.00	Each (hourly)	U.S. Dollar	11.88	31,363.20
L90FEL00	Field - Engr. Tech	1,320.00	1.00	Each (hourly)	U.S. Dollar	98.55	130,088.38

1.3	1.00	Each	Substation Retirement	0.04	Detail	U.S. Dollar	193,368.02	193,368.02
1.3.1	1.00	Day	Fence Removal	1.00	Detail	U.S. Dollar	1,305.08	1,305.08

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L010101	OPERATOR	10.00	1.00	Each (hourly)	U.S. Dollar	51.71	517.13
L060100	GENERAL LABORER	10.00	1.00	Each (hourly)	U.S. Dollar	43.52	435.24
RBACKH09	Deere 710J BACKHOE, 1.62CY	10.00	1.00	Each (hourly)	U.S. Dollar	35.27	352.70

1.3.2	1.00	Each	Transformer Removal	0.17	Detail	U.S. Dollar	94,140.68	94,140.68
1.3.2.1	1.00	Each	Oil Removal & Disposal	1.00	Detail	U.S. Dollar	58,245.49	58,245.49

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CBS Position Code	Quantity	UM	Description	UM/Day	Cost Source	Currency	Unit Cost	Total Cost
			Cost Item					
1.3.2.1.1	1.00	Each	Oil Removal	1.00	Detail	U.S. Dollar	870.49	870.49

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	20.00	2.00	Each (hourly)	U.S. Dollar	43.52	870.49

1.3.2.1.2	14,000.00	Gallon	Oil Disposal	0.00	Detail	U.S. Dollar	4.00	56,000.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USDISPOSAL	Disposal Fee's		56,000.00	Each	U.S. Dollar	1.00	56,000.00

1.3.2.1.3	1.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,375.00	1,375.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USTRUCKING	Trucking Sub		1,375.00	Each	U.S. Dollar	1.00	1,375.00

1.3.2.2	1.00	Each	Dismantle & Loadout Transformer	0.20	Detail	U.S. Dollar	35,895.20	35,895.20

1.3.2.2.1	1.00	Each	Dismantle, Cut & Size	0.20	Detail	U.S. Dollar	29,895.20	29,895.20

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	200.00	4.00	Each (hourly)	U.S. Dollar	43.52	8,704.86
L010101	OPERATOR	100.00	2.00	Each (hourly)	U.S. Dollar	51.71	5,171.34
*REXCAV06A	Excav 100K w/ Bucket & Grapple	50.00	1.00	Each (hourly)	U.S. Dollar	129.71	6,485.50
*REXCAV06E	Excav 100K w/ Shear	50.00	1.00	Each (hourly)	U.S. Dollar	190.67	9,533.50

1.3.2.2.2	4.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	6,000.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USTRUCKING	Trucking Sub		6,000.00	Each	U.S. Dollar	1.00	6,000.00

1.3.3	1.00	Each	Remove Control Building & Switchgear	1.00	Detail	U.S. Dollar	5,249.48	5,249.48

1.3.3.1	1.00	Each	Demo	1.00	Detail	U.S. Dollar	2,249.48	2,249.48

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	10.00	1.00	Each (hourly)	U.S. Dollar	43.52	435.24
L010101	OPERATOR	10.00	1.00	Each (hourly)	U.S. Dollar	51.71	517.13
*REXCAV06A	Excav 100K w/ Bucket & Grapple	10.00	1.00	Each (hourly)	U.S. Dollar	129.71	1,297.10

1.3.3.2	2.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	3,000.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USTRUCKING	Trucking Sub		3,000.00	Each	U.S. Dollar	1.00	3,000.00

1.3.4	2.00	Day	UG Utility & Ground Removal	1.00	Detail	U.S. Dollar	1,305.08	2,610.15

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L010101	OPERATOR	20.00	1.00	Each (hourly)	U.S. Dollar	51.71	1,034.27
L060100	GENERAL LABORER	20.00	1.00	Each (hourly)	U.S. Dollar	43.52	870.49
RBACKH09	Deere 710J BACKHOE, 1.62CY	20.00	1.00	Each (hourly)	U.S. Dollar	35.27	705.40

1.3.5	532.00	Cubic Yard	Remove Foundations To Subgrade	60.00	Detail	U.S. Dollar	41.54	22,101.14

1.3.5.1	532.00	Cubic Yard	Excavate / Remove Foundation - Various Depth	150.00	Detail	U.S. Dollar	29.52	15,704.68

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	35.47	1.00	Each (hourly)	U.S. Dollar	43.52	1,543.66
L010101	OPERATOR	70.93	2.00	Each (hourly)	U.S. Dollar	51.71	3,668.20
*REXCAV06C	Excav 100K w/ Hammer	35.47	1.00	Each (hourly)	U.S. Dollar	166.14	5,892.43

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CBS Position Code	Quantity	UM	Description	Hours	Cost Item UM/Day	Cost Source	Currency	Unit Cost	Total Cost
*REXCAV06A	Excav 100K w/ Bucket & Grapple			35.47	1.00 Each (hourly)	U.S. Dollar		129.71	4,600.38
1.3.5.2	532.00	Cubic Yard	Concrete Transport Offsite		100.00	Detail	U.S. Dollar	12.02	6,396.46
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
RDUTRK06	CAT D350D, 18CY-24CY			53.20	1.00 Each (hourly)	U.S. Dollar		76.71	4,080.97
L080940	TEAMSTER			53.20	1.00 Each (hourly)	U.S. Dollar		43.52	2,315.49
1.3.6	1.00	Lump Sum	Misc. Material Disposal		0.00	Detail	U.S. Dollar	2,200.00	2,200.00
1.3.6.1	1.00	Each	Trucking - Per Load		0.00	Detail	U.S. Dollar	1,500.00	1,500.00
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub				1,500.00 Each	U.S. Dollar		1.00	1,500.00
1.3.6.2	10.00	Ton	Disposal Cost		0.00	Detail	U.S. Dollar	70.00	700.00
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USDISPOSAL	Disposal Fee's				700.00 Each	U.S. Dollar		1.00	700.00
1.3.7	1.00	Lump Sum	Restore Yard		0.12	Detail	U.S. Dollar	65,761.49	65,761.49
1.3.7.1	4.00	Acre	Backfill / Regrade		2.00	Detail	U.S. Dollar	1,654.59	6,618.38
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER			40.00	2.00 Each (hourly)	U.S. Dollar		43.52	1,740.97
L010101	OPERATOR			40.00	2.00 Each (hourly)	U.S. Dollar		51.71	2,068.53
REXCAV06B	Gradall - Excavator			20.00	1.00 Each (hourly)	U.S. Dollar		79.62	1,592.47
*RDOZER08	CAT D6 LGP Dozer			20.00	1.00 Each (hourly)	U.S. Dollar		60.82	1,216.40
1.3.7.2	2,000.00	Cubic Yard	Vegetative Cover		300.00	Detail	U.S. Dollar	27.57	55,143.11
1.3.7.2.1	2,000.00	Cubic Yard	Topsoil, Delivered		0.00	Detail	U.S. Dollar	20.00	40,000.00
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
IMSOIL	Topsoil				2,000.00 Cubic Yard	U.S. Dollar		20.00	40,000.00
1.3.7.2.2	2,000.00	Cubic Yard	Placement		300.00	Detail	U.S. Dollar	7.57	15,143.11
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L010101	OPERATOR			133.33	2.00 Each (hourly)	U.S. Dollar		51.71	6,895.11
RDOZER08	CAT D6N XL			133.33	2.00 Each (hourly)	U.S. Dollar		61.86	8,248.00
1.3.7.3	4.00	Acre	Re-Seed With Native Vegetation		0.00	Detail	U.S. Dollar	1,000.00	4,000.00
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USLANDSCAPE	Landscape Sub				4.00 Acre	U.S. Dollar		1,000.00	4,000.00
1.4	1.00	Lump Sum	Transmission Line Retirement		0.17	Detail	U.S. Dollar	25,294.70	25,294.70
1.4.1	4.00	Each	Structure Removal		1.00	Detail	U.S. Dollar	4,684.35	18,737.39
1.4.1.1	4.00	Each	Cut / Lower Structure		2.00	Detail	U.S. Dollar	1,886.75	7,547.01
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER			80.00	4.00 Each (hourly)	U.S. Dollar		43.52	3,481.94
L010101	OPERATOR			20.00	1.00 Each (hourly)	U.S. Dollar		51.71	1,034.27
*RXMISC14	MAN LIFT GAS 125ft			20.00	1.00 Each (hourly)	U.S. Dollar		54.88	1,097.60
*RXMISC23	GROVE RT 200 TON			20.00	1.00 Each (hourly)	U.S. Dollar		96.66	1,933.20
1.4.1.2	4.00	Each	Cut / Size Structure & Loadout		2.00	Detail	U.S. Dollar	2,047.60	8,190.38
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER			120.00	6.00 Each (hourly)	U.S. Dollar		43.52	5,222.92

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CBS Position Code	Quantity	UM	Description	Cost Item UM/Day	Cost Source	Currency	Unit Cost	Total Cost
L010101	OPERATOR		20.00	1.00 Each (hourly)	U.S. Dollar		51.71	1,034.27
*RXMISC23	GROVE RT 200 TON		20.00	1.00 Each (hourly)	U.S. Dollar		96.66	1,933.20
1.4.1.3	2.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	3,000.00
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub			3,000.00 Each	U.S. Dollar		1.00	3,000.00
1.4.2	4.00	Each	Remove Foundations To Subgrade	2.22	Detail	U.S. Dollar	1,639.33	6,557.31
1.4.2.1	4.00	Each	Excavate / Remove Foundation - Various Depth	3.33	Detail	U.S. Dollar	1,458.98	5,835.90
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER		24.00	2.00 Each (hourly)	U.S. Dollar		43.52	1,044.58
L010101	OPERATOR		24.00	2.00 Each (hourly)	U.S. Dollar		51.71	1,241.12
*REXCAV06C	Excav 100K w/ Hammer		12.00	1.00 Each (hourly)	U.S. Dollar		166.14	1,993.68
*REXCAV06A	Excav 100K w/ Bucket & Grapple		12.00	1.00 Each (hourly)	U.S. Dollar		129.71	1,556.52
1.4.2.2	60.00	Cubic Yard	Concrete Transport Offsite	100.00	Detail	U.S. Dollar	12.02	721.41
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
RDUTRK06	CAT D350D, 18CY-24CY		6.00	1.00 Each (hourly)	U.S. Dollar		76.71	460.26
L080940	TEAMSTER		6.00	1.00 Each (hourly)	U.S. Dollar		43.52	261.15
1.5	1.00	Lump Sum	O&M Removal	0.36	Detail	U.S. Dollar	16,419.61	16,419.61
1.5.1	3.00	Each	Loadout Containers	10.00	Detail	U.S. Dollar	165.31	495.92
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER		3.00	1.00 Each (hourly)	U.S. Dollar		43.52	130.57
L010101	OPERATOR		3.00	1.00 Each (hourly)	U.S. Dollar		51.71	155.14
RHYDCR06	GROVE RT880 73 TON		3.00	1.00 Each (hourly)	U.S. Dollar		70.07	210.21
1.5.2	2.00	Each	Demo Structures	1.00	Detail	U.S. Dollar	2,249.48	4,498.95
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER		20.00	1.00 Each (hourly)	U.S. Dollar		43.52	870.49
L010101	OPERATOR		20.00	1.00 Each (hourly)	U.S. Dollar		51.71	1,034.27
*REXCAV06A	Excav 100K w/ Bucket & Grapple		20.00	1.00 Each (hourly)	U.S. Dollar		129.71	2,594.20
1.5.3	5.00	Each	Excavate / Remove Piles	10.00	Detail	U.S. Dollar	224.95	1,124.74
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER		5.00	1.00 Each (hourly)	U.S. Dollar		43.52	217.62
L010101	OPERATOR		5.00	1.00 Each (hourly)	U.S. Dollar		51.71	258.57
*REXCAV06A	Excav 100K w/ Bucket & Grapple		5.00	1.00 Each (hourly)	U.S. Dollar		129.71	648.55
1.5.4	40.00	Ton	Structure Recyclingl Cost	0.00	Detail	U.S. Dollar	70.00	2,800.00
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USDISPOSAL	Disposal Fee's			2,800.00 Each	U.S. Dollar		1.00	2,800.00

Notes: **********
Assumption: 264,836 modules x 72.97 lbs each
****

1.5.5	5.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	7,500.00
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub			7,500.00 Each	U.S. Dollar		1.00	7,500.00

Notes: **********
Assumption: 45,000 lbs per load
****

1.6	126.00	Each	BESS Removal	0.63	Detail	U.S. Dollar	9,188.89	1,157,800.37

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CBS Position Code	Quantity	UM	Description	Cost Item UM/Day	Cost Source	Currency	Unit Cost	Total Cost
1.6.1	126.00	Each	BESS Unit Removal	1.00	Detail	U.S. Dollar	6,491.06	817,873.94
1.6.1.1	126.00	Each	Disconnect Electrical	10.00	Detail	U.S. Dollar	99.51	12,538.72

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L010110	ELECTRCIAN	126.00	1.00	Each (hourly)	U.S. Dollar	55.99	7,054.66
L060100	GENERAL LABORER	126.00	1.00	Each (hourly)	U.S. Dollar	43.52	5,484.06

1.6.1.2	9,423.00	Gallon	Glycol Recovery & Disposal	747.86	Detail	U.S. Dollar	3.63	34,252.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USLIQUID	Liquids T&D		9,423.00	Each	U.S. Dollar	1.00	9,423.00
L060100	GENERAL LABORER	504.00	4.00	Each (hourly)	U.S. Dollar	43.52	21,936.07
RLIFTS05	JCB 508C, 8,000lbs FRKLFT	126.00	1.00	Each (hourly)	U.S. Dollar	22.96	2,892.94

1.6.1.3	126.00	Each	Battery Removal & Recycling	2.00	Detail	U.S. Dollar	2,985.29	376,146.04
1.6.1.3.1	63.00	Day	Remove Batteries, Load For Transport	1.00	Detail	U.S. Dollar	1,970.57	124,146.04

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	2,520.00	4.00	Each (hourly)	U.S. Dollar	43.52	109,681.24
RLIFTS05	JCB 508C, 8,000lbs FRKLFT	630.00	1.00	Each (hourly)	U.S. Dollar	22.96	14,464.80

1.6.1.3.2	126.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	2,000.00	252,000.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USTRUCKING	Trucking Sub		252,000.00	Each	U.S. Dollar	1.00	252,000.00

1.6.1.4	126.00	Each	Unit Removal	3.33	Detail	U.S. Dollar	3,134.42	394,937.18
1.6.1.4.1	126.00	Each	Remove Misc Waste	5.00	Detail	U.S. Dollar	394.11	49,658.41

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L060100	GENERAL LABORER	1,008.00	4.00	Each (hourly)	U.S. Dollar	43.52	43,872.49
RLIFTS05	JCB 508C, 8,000lbs FRKLFT	252.00	1.00	Each (hourly)	U.S. Dollar	22.96	5,785.92

1.6.1.4.2	126.00	Each	Loadout Unit For Transport	10.00	Detail	U.S. Dollar	165.31	20,828.76

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
RHYDCR06	GROVE RT880 73 TON	126.00	1.00	Each (hourly)	U.S. Dollar	70.07	8,828.82
L010101	OPERATOR	126.00	1.00	Each (hourly)	U.S. Dollar	51.71	6,515.88
L060100	GENERAL LABORER	126.00	1.00	Each (hourly)	U.S. Dollar	43.52	5,484.06

1.6.1.4.3	126.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,375.00	173,250.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USTRUCKING	Trucking Sub		173,250.00	Each	U.S. Dollar	1.00	173,250.00

1.6.1.4.4	1,890.00	Ton	Waste Recyling & Disposal Cost	0.00	Detail	U.S. Dollar	80.00	151,200.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USDISPOSAL	Disposal Fee's		151,200.00	Each	U.S. Dollar	1.00	151,200.00

1.6.2	192.00	Each	Inverter / Transformer Removal	5.00	Detail	U.S. Dollar	1,070.23	205,483.32
1.6.2.1	192.00	Each	Disconnect Electrical	10.00	Detail	U.S. Dollar	111.39	21,387.58

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
L010110	ELECTRCIAN	192.00	1.00	Each (hourly)	U.S. Dollar	55.99	10,749.96
L060100	GENERAL LABORER	192.00	1.00	Each (hourly)	U.S. Dollar	43.52	8,356.67

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CBS Position Code	Quantity	UM	Description		UM/Day	Cost Source	Currency	Unit Cost	Total Cost
				Cost Item					
RPUTRK05	F-250 4X4 3/4 TON PICKUP			192.00	1.00 Each (hourly)	U.S. Dollar		11.88	2,280.96
1.6.2.2	192.00	Each	Loadout Inverter & Transformer		10.00	Detail	U.S. Dollar	208.83	40,095.73
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER			384.00	2.00 Each (hourly)	U.S. Dollar		43.52	16,713.33
L010101	OPERATOR			192.00	1.00 Each (hourly)	U.S. Dollar		51.71	9,928.96
RHYDCR06	GROVE RT880 73 TON			192.00	1.00 Each (hourly)	U.S. Dollar		70.07	13,453.44
1.6.2.3	96.00	Each	Trucking - Per Load		0.00	Detail	U.S. Dollar	1,500.00	144,000.00
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub				144,000.00 Each	U.S. Dollar		1.00	144,000.00
1.6.3	3.00	Day	UG Cable Removal		1.00	Detail	U.S. Dollar	1,969.92	5,909.76
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L010101	OPERATOR			30.00	1.00 Each (hourly)	U.S. Dollar		51.71	1,551.40
L060100	GENERAL LABORER			60.00	2.00 Each (hourly)	U.S. Dollar		43.52	2,611.46
RBACKH09	Deere 710J BACKHOE, 1.62CY			30.00	1.00 Each (hourly)	U.S. Dollar		35.27	1,058.10
RLIFTS05	JCB 508C, 8,000lbs FRKLFT			30.00	1.00 Each (hourly)	U.S. Dollar		22.96	688.80
1.6.4	318.00	Each	Support Pile Removal		10.00	Detail	U.S. Dollar	404.19	128,533.35
1.6.4.1	318.00	Each	Excavate / Remove Piles		10.00	Detail	U.S. Dollar	224.95	71,533.35
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER			318.00	1.00 Each (hourly)	U.S. Dollar		43.52	13,840.73
L010101	OPERATOR			318.00	1.00 Each (hourly)	U.S. Dollar		51.71	16,444.85
*REXCAV06A	Excav 100K w/ Bucket & Grapple			318.00	1.00 Each (hourly)	U.S. Dollar		129.71	41,247.78
1.6.4.2	38.00	Each	Trucking - Per Load		0.00	Detail	U.S. Dollar	1,500.00	57,000.00
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub				57,000.00 Each	U.S. Dollar		1.00	57,000.00
1.7	33.00	Each	Inverter / Transformer Removal		5.00	Detail	U.S. Dollar	1,070.23	35,317.44
1.7.1	33.00	Each	Disconnect Electrical		10.00	Detail	U.S. Dollar	111.39	3,675.99
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L010110	ELECTRCIAN			33.00	1.00 Each (hourly)	U.S. Dollar		55.99	1,847.65
L060100	GENERAL LABORER			33.00	1.00 Each (hourly)	U.S. Dollar		43.52	1,436.30
RPUTRK05	F-250 4X4 3/4 TON PICKUP			33.00	1.00 Each (hourly)	U.S. Dollar		11.88	392.04
1.7.2	33.00	Each	Loadout Inverter & Transformer		10.00	Detail	U.S. Dollar	208.83	6,891.45
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER			66.00	2.00 Each (hourly)	U.S. Dollar		43.52	2,872.60
L010101	OPERATOR			33.00	1.00 Each (hourly)	U.S. Dollar		51.71	1,706.54
RHYDCR06	GROVE RT880 73 TON			33.00	1.00 Each (hourly)	U.S. Dollar		70.07	2,312.31
1.7.3	16.50	Each	Trucking - Per Load		0.00	Detail	U.S. Dollar	1,500.00	24,750.00
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub				24,750.00 Each	U.S. Dollar		1.00	24,750.00
1.8	33.00	Each	Inverter / Transformer Support Pile Removal		10.00	Detail	U.S. Dollar	401.42	13,246.80
1.8.1	33.00	Each	Excavate / Remove Piles		10.00	Detail	U.S. Dollar	224.95	7,423.27
Resource Code	**Description**			**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L060100	GENERAL LABORER			33.00	1.00 Each (hourly)	U.S. Dollar		43.52	1,436.30
L010101	OPERATOR			33.00	1.00 Each (hourly)	U.S. Dollar		51.71	1,706.54

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CBS Position Code	Quantity	UM	Description	Cost Item UM/Day	Cost Source	Currency	Unit Cost	Total Cost
*REXCAV06A	Excav 100K w/ Bucket & Grapple		33.00	1.00 Each (hourly)	U.S. Dollar		129.71	4,280.43
1.8.2	3.88	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	5,823.53
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub			5,823.53 Each	U.S. Dollar		1.00	5,823.53
1.9	1.00	Lump Sum	Solar Array Retirement	0.01	Detail	U.S. Dollar	5,437,684.03	5,437,684.03
1.9.1	75,504.00	Linear Feet	Fence Removal	5,124.80	Detail	U.S. Dollar	1.27	96,021.42
1.9.1.1	75,504.00	Linear Feet	Fence Removal	5,124.80	Detail	U.S. Dollar	1.02	76,920.71
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L010101	OPERATOR		441.99	3.00 Each (hourly)	U.S. Dollar		51.71	22,856.88
L060100	GENERAL LABORER		883.98	6.00 Each (hourly)	U.S. Dollar		43.52	38,474.77
RBACKH09	Deere 710J BACKHOE, 1.62CY		441.99	3.00 Each (hourly)	U.S. Dollar		35.27	15,589.05
1.9.1.2	13.89	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,375.00	19,100.71
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub			19,100.71 Each	U.S. Dollar		1.00	19,100.71
1.9.2	264,836.00	Each	Solar Panel Removal & Disposal	4,800.00	Detail	U.S. Dollar	8.10	2,145,022.47
1.9.2.1	264,836.00	Each	Solar Panel Removal	4,800.00	Detail	U.S. Dollar	3.11	823,542.47
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
RLIFTS05	JCB 508C, 8,000lbs FRKLFT		3,310.45	6.00 Each (hourly)	U.S. Dollar		22.96	76,007.93
L010101	OPERATOR		3,310.45	6.00 Each (hourly)	U.S. Dollar		51.71	171,194.46
L060100	GENERAL LABORER		13,241.80	24.00 Each (hourly)	U.S. Dollar		43.52	576,340.08

Notes: **********
Assumed production: 20 panels per laborer per hour,
Includes packaging and preparing for shipment offsite.
****

1.9.2.2	430.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	645,000.00
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USTRUCKING	Trucking Sub			645,000.00 Each	U.S. Dollar		1.00	645,000.00

Notes: **********
Assumption: 45,000 lbs per load
****

1.9.2.3	9,664.00	Ton	Recyclingl Cost	0.00	Detail	U.S. Dollar	70.00	676,480.00
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
USDISPOSAL	Disposal Fee's			676,480.00 Each	U.S. Dollar		1.00	676,480.00

Notes: **********
Assumption: 264,836 modules x 72.97 lbs each
****

1.9.3	10,186.00	Each	Solar Rack (Trackers) & Post Removal	133.33	Detail	U.S. Dollar	313.83	3,196,640.14
1.9.3.1	10,186.00	Each	Solar Rack (Trackers) & Post Removal	133.33	Detail	U.S. Dollar	280.40	2,856,140.14
Resource Code	**Description**		**Hours**	**Quantity UM**	**Currency**		**Unit Cost**	**Total Cost**
L010101	OPERATOR		12,223.20	16.00 Each (hourly)	U.S. Dollar		51.71	632,102.62
L060100	GENERAL LABORER		6,111.60	8.00 Each (hourly)	U.S. Dollar		43.52	266,003.11
*REXCAV06A	Excav 100K w/ Bucket & Grapple		6,111.60	8.00 Each (hourly)	U.S. Dollar		129.71	792,735.64
*REXCAV06E	Excav 100K w/ Shear		6,111.60	8.00 Each (hourly)	U.S. Dollar		190.67	1,165,298.77

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CBS Position Code	Quantity	UM	Description	Cost Item UM/Day	Cost Source	Currency	Unit Cost	Total Cost

Notes: **********
Crew to include
1 excavator w/shear, 1 excavator w/grapple, 2 operators and 2 laborers. Includes post removal and sizing of steel for sale as scrap, and loadout to haul trucks.
****

1.9.3.2	227.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	340,500.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USTRUCKING	Trucking Sub		340,500.00	Each	U.S. Dollar	1.00	340,500.00

Notes: **********
Assumption: 45,000 lbs per load
****

1.10	1.00	Lump Sum	UG Cable Removal	0.05	Detail	U.S. Dollar	87,283.06	87,283.06

1.10.1	20.00	Day	Excavate & Remove Cable	1.00	Detail	U.S. Dollar	4,214.15	84,283.06

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
*REXCAV06D	Excav 100K	400.00	2.00	Each (hourly)	U.S. Dollar	103.99	41,596.00
RLIFTS05	JCB 508C, 8,000lbs FRKLFT	200.00	1.00	Each (hourly)	U.S. Dollar	22.96	4,592.00
L010101	OPERATOR	400.00	2.00	Each (hourly)	U.S. Dollar	51.71	20,685.34
L060100	GENERAL LABORER	400.00	2.00	Each (hourly)	U.S. Dollar	43.52	17,409.72

1.10.2	2.00	Each	Trucking - Per Load	0.00	Detail	U.S. Dollar	1,500.00	3,000.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USTRUCKING	Trucking Sub		3,000.00	Each	U.S. Dollar	1.00	3,000.00

Notes: **********
Assumption: 45,000 lbs per load
****

1.11	1.00	Lump Sum	Site Restoration - Partial Site Seeding	0.03	Detail	U.S. Dollar	319,467.36	319,467.36

1.11.1	29,040.00	Linear Feet	Strip & Decompact Roads	2,500.00	Detail	U.S. Dollar	1.43	41,418.02

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
*RDOZER08	CAT D6 LGP Dozer	232.32	2.00	Each (hourly)	U.S. Dollar	60.82	14,129.70
L010101	OPERATOR	348.48	3.00	Each (hourly)	U.S. Dollar	51.71	18,021.07
*RFELWH08C	CAT 980 LOADER	116.16	1.00	Each (hourly)	U.S. Dollar	79.78	9,267.24

Notes: **********
Decompaction to include discing and regrading
Assume removed road base transported offsite at no charge
****

1.11.2	217.00	Acre	Spot Grade Disturbed Areas	8.00	Detail	U.S. Dollar	281.33	61,049.34

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
*RDOZER08	CAT D6 LGP Dozer	542.50	2.00	Each (hourly)	U.S. Dollar	60.82	32,994.85
L010101	OPERATOR	542.50	2.00	Each (hourly)	U.S. Dollar	51.71	28,054.49

Notes: **********
Assumtion: 620 acres total property area.
Assume that 35% of the area distrubed by construction will be regraded.
****

1.11.3	217.00	Acre	Re-Seed With Native Vegetation - Roads & Areas Disturbed By Construction	0.00	Detail	U.S. Dollar	1,000.00	217,000.00

Resource Code	Description	Hours	Quantity	UM	Currency	Unit Cost	Total Cost
USLANDSCAPE	Landscape Sub		217.00	Acre	U.S. Dollar	1,000.00	217,000.00

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CBS Position Code	Quantity UM	Description	Cost Item UM/Day	Cost Source	Currency	Unit Cost	Total Cost

Notes: **********
Assumtion: 620 acres total property area.
Assume that 35% of the area distrubed by construction will be re-seeded.
****

1.12	1.00 Lump Sum	Contractor Markups	0.00	Detail	U.S. Dollar	1,608,879.10	1,608,879.10
1.12.1	1.00 Lump Sum	Home Office, Project Management (5% Of Cost)	0.00	Detail	U.S. Dollar	387,681.70	387,681.70

Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
USMARKUP5	5% Markup		7,753,634.00 Each	U.S. Dollar	0.05	387,681.70

1.12.2	1.00 Lump Sum	Contractor OH & Fee (15% Of Cost)	0.00	Detail	U.S. Dollar	1,221,197.40	1,221,197.40

Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
USMARKUP	15% Markup		8,141,316.00 Each	U.S. Dollar	0.15	1,221,197.40

1.13	1.00 Lump Sum	ODOE Mandated Contingencies	0.00	Detail	U.S. Dollar	2,197,687.73	2,197,687.73
1.13.1	1.00 Lump Sum	20% Contingency on BESS	0.00	Detail	U.S. Dollar	231,560.00	231,560.00

Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
UODCBESS	20% ODOE Mandated Contingency		1,157,800.00 Each	U.S. Dollar	0.20	231,560.00

1.13.2	1.00 Lump Sum	1% Performance Bond	0.00	Detail	U.S. Dollar	93,625.13	93,625.13

Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
UODOE1	ODOE 1% Markup		9,362,513.00 Each	U.S. Dollar	0.01	93,625.13

1.13.3	1.00 Lump Sum	10% Administrative and Project Management	0.00	Detail	U.S. Dollar	936,251.30	936,251.30

Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
UODOE2	ODOE 10% Markup		9,362,513.00 Each	U.S. Dollar	0.10	936,251.30

1.13.4	1.00 Lump Sum	10% Future Development Contingency	0.00	Detail	U.S. Dollar	936,251.30	936,251.30

Resource Code	Description	Hours	Quantity UM	Currency	Unit Cost	Total Cost
UODOE2	ODOE 10% Markup		9,362,513.00 Each	U.S. Dollar	0.10	936,251.30

Report Total:	11,560,200.97

Category	Total
Labor	2,498,508.89
Rented Equipment	2,345,193.01
Supplies	2,130.00
Materials	40,000.00
Subcontract	4,465,058.34
Travel-Risk-Adj	9,423.00
ODCs	2,199,887.73

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