# Exhibit B

# Project Description

**Bakeoven Solar Project**
**November 2019**

**Prepared for**

**Bakeoven Solar, LLC**

**Prepared by**

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# Acronyms and Abbreviations

| | |
|---|---|
| Applicant | Bakeoven Solar, LLC |
| ASC | Application for Site Certificate |
| BPA | Bonneville Power Administration |
| CFR | Code of Federal Regulations |
| Council or EFSC | Oregon Energy Facility Siting Council |
| Facility | Bakeoven Solar Project |
| Fire Plan | Fire Protection and Prevention Plan |
| HV | high-voltage |
| kV | kilovolt |
| Li-ion | lithium-ion |
| Maupin Substation | BPA Maupin Interconnection Substation |
| MW | megawatt |
| OAR | Oregon Administrative Rule |
| ODFW | Oregon Department of Fish and Wildlife |
| ODOE | Oregon Department of Energy |
| O&M | operations and maintenance |
| ORS | Oregon Revised Statute |
| PPA | power purchase agreement |
| PV | photovoltaic |
| RPS | Renewable Portfolio Standard |
| SCADA | supervisory control and data acquisition |
| SPCC Plan | Spill Prevention, Control, and Countermeasures Plan |

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# 1.0 Introduction

Bakeoven Solar, LLC (Applicant) proposes to construct and operate a solar energy generation facility and related or supporting facilities in Wasco County, Oregon. This Exhibit B was prepared to meet the submittal requirements in Oregon Administrative Rule (OAR) 345-021-0010(1)(b).

# 2.0 Description of the Proposed Facility

*OAR 345-021-0010(1)(b) Exhibit B. Information about the proposed facility, construction schedule and temporary disturbances of the site, including:*

*(A) A description of the proposed energy facility, including as applicable:*

*(i) The nominal electric generating capacity and the average electrical generating capacity, as defined in ORS 469.300.*

The Bakeoven Solar Project (Facility) will be a photovoltaic (PV) solar energy facility with a nominal and average generating capacity of 303 megawatts (MW), as defined in Oregon Revised Statute (ORS) 469.300(4)(c). The Facility will interconnect to the existing 230-kilovolt (kV) Bonneville Power Administration (BPA) Big Eddy to Redmond transmission line at the existing BPA Maupin Interconnection Substation (Maupin Substation). Exhibit C, Figure C-2 provides an overview of the proposed Facility. This Facility will generate clean, renewable energy for local and regional energy markets and further Oregon's response to climate change and transition to a clean energy future. As articulated in Governor Brown's recent Climate Change Agenda, "climate change impacts every Oregonian, but our rural communities, our low-income communities, communities of color, and Tribes are especially vulnerable. Climate change also poses serious risks for many of Oregon's natural resource-based industries. Meeting the challenge of climate change and growing our economy are not mutually exclusive goals: we must do both" (State of Oregon 2018). The Facility can meet this challenge by reducing carbon emissions in the utility sector and by simulating local economic growth through temporary construction jobs and long-term tax payment to Wasco County.

Oregon has outlined ambitious plans for the utility sector and for refocusing energy generation to renewable sources. In 2016, the Oregon Clean Electricity and Coal Transition Plan increased Oregon's Renewable Portfolio Standard (RPS) for large utilities to 50 percent by 2040 (ORS 469A.052(1)(h)). The proposed Facility would be eligible for RPS certification if contracted to a large utility and could contribute to achievement of Oregon's RPS goal.

The Applicant understands the obligation of the Oregon Energy Facility Siting Council (EFSC or Council) to review and approve energy facilities, and as stated in the most recent Oregon Department of Energy (ODOE) Biennial Energy report, "…there are many areas in Oregon that are good locations to site a solar project – areas with minimal or no effect on native habitat or farmland, and areas with access to transmission" (ODOE 2018). The Applicant believes the proposed Facility is a good location because it is near existing transmission lines, and the Facility will occupy a combination of unproductive farmlands and rangelands that lack their native habitat characteristics.

The Applicant has conducted early outreach to affected communities for an inclusive consideration of Facility impacts. Prior to filing this application, the Applicant held in-person meetings with City of Maupin, City of Shaniko, Confederated Tribes of Warm Springs, Bakeoven-Shaniko Rangeland Fire Protection Association, Friends of Grand Ronde, Oregon Natural Desert Association, Wasco County, Oregon Department of Fish and Wildlife, Oregon Department of Land Conservation, Oregon Department of Mineral Industries, ODOE, and U.S. Fish and Wildlife Service. Input and suggestions from these stakeholders have informed the Facility layout and the analysis presented in this application. The Applicant also demonstrated its willingness to seek community input by sending the Facility's Notice of Intent (NOI) to all landowners within 1 mile of the site boundary, above and beyond the notification area of 500 feet required by ODOE. Overall, the Facility can be designed, constructed, and operated in a manner that is consistent with the Council's siting standards and respective of local communities.

The Applicant's NOI was filed on November 2, 2018. Ten reviewing agency comment letters were received during the NOI comment period. Responses to comments presented in these letters are incorporated in the Applicant's analysis presented in this application. Table B-1 provides the exhibit locations where agency comment topics are addressed.

**Table B-1. Agency NOI Comments and Application for Site Certificate Response Location**

| Agency | Comment Topics | Response Location |
|---|---|---|
| DLCD (Department of Land Conservation and Development) | Compatibility with state land use statues and rules. | Exhibit K (Land Use) |
| ODEQ (Oregon Department of Environmental Quality) | Air quality, nuisance dust, asbestos soils, open burning, and water quality permitting. | Exhibit E (Permits), Exhibit I (Soil Conditions), Exhibit V (Generation of Solid Waste and Wastewater) |
| DOGAMI (Department of Geology and Mineral Industries) | Geotechnical investigation guidance, applicable design standards and codes, and distance resilience. | Exhibit H (Geologic and Soil Stability) |
| ODSL (Oregon Department of State Lands) | Wetland delineation. | Exhibit J (Wetlands) |
| ODA (Oregon Department of Aviation) | Confirmed no public airports within 25 miles of the project. | Not applicable – no comments to address or conditions of approval from ODA |
| ODFW (Oregon Department of Fish and Wildlife) | Big game overlay, construction timing, revegetation, raptor nest surveys, weed control, operational monitoring, and mitigation. | Exhibit P (Fish and Wildlife), Exhibit Q (Threatened and Endangered Species) |
| OPUC (Oregon Public Utilities Commission) | Ability to finance project, technical expertise, and decommissioning bonding. | Exhibit D (Organizational Expertise), Exhibit M (Financial Capability) |

| Agency | Comment Topics | Response Location |
|---|---|---|
| Wasco County | Goal 3 exception, construction impacts, traffic on Bakeoven Road, weed control, emergency services, water use. | Exhibit C (Project Location), Exhibit K (Land Use), Exhibit O (Water Requirements), Exhibit P (Fish and Wildlife), Exhibit U (Public Services) |
| CTWSRO (Confederated Tribes of the Warm Springs Reservation of Oregon) | Federal nexus, consultation for cultural survey, review by CTWSRO Cultural & Heritage Committee. | Exhibit S (Historic, Cultural, and Archaeological Resources) |

## 2.1 Site Boundary Definition

The proposed site boundary consists of approximately 10,640 acres of private land under lease by the Applicant (Exhibit C, Figure C-2). A portion of the proposed site boundary is designated as the proposed micrositing corridor, where solar arrays and other related and supporting facilities may be located. The micrositing corridor is approximately 4,160 acres (Exhibit C, Figure C-2). The proposed micrositing corridor's location was slightly shifted and total area increased, by approximately 143 acres, from what was described in the Applicant's NOI. This change was made to address landowner requests, to realign a portion of the proposed 230-kV transmission line onto private land under lease by the Applicant, and to avoid impacts to sensitive resources identified during resource analyses.

## 2.2 Facility Phasing

The Applicant anticipates that Facility construction may begin as early as June 2020 and proposes to construct the Facility in phases. The size and construction schedule for each phase will depend on market demand. The entire Facility, including all phases, will be completed by 2025 unless the Applicant seeks an amendment to extend the construction deadline (see Section 6.0 of this exhibit). The Applicant proposes findings and conditions throughout this Application for Site Certificate (ASC) to allow phasing during Facility design and construction. Phasing Facility design and construction allows the Applicant the ability to tailor delivery of power for a particular customer, depending on market demands. The Applicant may own and operate all phases of the Facility or the Applicant may seek to transfer a phase of the Facility to a new owner/operator, as discussed further below.

## 2.3 Transferring and Amending the Site Certificate

A power purchase agreement (PPA) customer is a contractual customer, and may be a public utility or private company. A PPA customer type will not trigger a transfer or amendment of the site certificate under OAR Chapter 345, Division 27 because the PPA customer does not own or control the Facility. Comparatively, a customer that wants direct project ownership will require a transfer of a portion of the Facility site certificate because this type of customer will own or control a portion of the Facility. In order to accommodate either customer type, the Applicant seeks the flexibility to divide and transfer the site certificate subsequent to its issuance.

The process would likely involve the following steps:

- Certificate holder files notice of transfer with ODOE;
- Certificate holder files an amendment requesting to transfer portion of the Facility site certificate to customer; and
- Customer files an amendment requesting the Council's approval to hold the transferred site certificate.

Each phase will consist of solar modules and other related or supporting facilities within a defined site boundary. However, each phase may also share related or supporting facilities with another phase, which will result in overlapping site boundaries. Once the transfer and amendment process is complete, each phase will be a stand-alone Facility. A shared facilities agreement will govern how the certificate holders share related or supporting facilities and operate the overlapping site boundaries under their site certificates.

## 2.4 Major Components, Structures, and Systems

> *(ii) Major components, structures and systems, including a description of the size, type and configuration of equipment used to generate electricity and useful thermal energy.*

The major components of the proposed solar energy generation Facility are solar modules, tracker systems, posts, and related electrical equipment. These components are combined to form a solar array. The layout of the solar array can vary depending on project size, technology, topography, and other constraints. Therefore, the Applicant seeks to permit a range of technology to preserve design flexibility. The solar modules and associated equipment, and precise layout of the solar array, have not yet been finalized. Because technology is changing rapidly, this ASC analyzes impacts associated with the largest anticipated Facility footprint, or about 2,717 acres within a 4,160-acre micrositing corridor (see Exhibit C). During final design, the Applicant will consider all micrositing factors and solar technology available at that time to design the most efficient and effective solar array layout. However, the actual solar array equipment and layout selected will not exceed the impacts analyzed. Therefore, the following description of major components is based on the best available design information at this time and largest anticipated footprint but may not reflect the final design.

As noted above, the Applicant proposes to construct the Facility in phases over several years. The impact analysis presented in this ASC represents the fully built-out scenario of 303 MW.

### *2.4.1 Solar Modules*

Solar modules use mono- or poly-crystalline cells to generate electricity by converting sunlight into direct current electrical energy. The electrical generation from a single module varies by module size and the number of cells per module. The crystalline cells are contained within antireflective glass panels and a metal frame, and linked together with factory-installed wire connectors. The modules will be connected in series to form long rows. The rows of modules are then connected via combiners, cables, and switchboards. The configuration of multiple rows (also referred to as an "array") can vary depending on the equipment type and topography.

Exhibit C, Figure C-2 depicts a typical sample solar layout developed for purposes of analyzing impacts, using 951,900 modules (each 320 watts) in strings of 19 modules per string for 50,100 strings. Figure B-1 depicts an example solar module design, represented by Canadian Solar's BiKu New Generation BiFacial Module. The actual number of modules will vary depending on the module technology, energy output, spacing, mounting equipment, phase of the Facility, and other design criteria, which are subject to change during final design. Impact assumptions are based on this use of 951,900 modules for the 303-MW solar array and that all areas within the solar array fenced area will be permanently impacted by construction of the Facility. See Exhibit C for temporary and permanent impact calculations.

### *2.4.2 Tracker Systems*

Strings of solar modules will be mounted on single-axis tracker systems that optimize electricity production by rotating the solar modules to follow the path of the sun throughout the day. The length of each tracker row may vary by topography and the number of modules that the tracker can hold. For example, Figure B-2 shows a typical tracker system supporting 80 modules. Figure B-3 is a photographic illustration of an installed solar string on a tracker system. The actual number of tracker systems and modules will depend on the system selected. The depicted layout in Figure C-2 assumes 38 modules per rack. The drive unit for the tracking system can control a single row or multiple rows of modules through a series of mechanical linkages and gearboxes. As the solar modules tilt throughout the day, the height of their top edges will shift accordingly (i.e., up to 12 feet high). The tracker system, and associated posts, will be specifically designed to withstand wind, snow, and seismic loads anticipated at the site.

### *2.4.3 Posts*

Each tracker will be supported by multiple steel posts, which could be round hollow posts, or pile-type posts (i.e., H-pile, C-pile, S-pile). Post depth may vary depending on soil conditions, but the posts are typically installed 4 to 8 feet below the surface and protrude approximately 4 to 5.5 feet above grade. Posts at the end of tracker rows are usually installed to greater depth to withstand wind uplift. In some soil conditions, concrete backfill is required for each post. For the purposes of this ASC, the Applicant assumes that 150,300 posts will be installed and that all posts will use concrete foundations. The actual number of posts and foundation method may vary depending on the final tracker system, topography, height of the solar modules, and site–specific geological conditions. Post locations will be determined by the final layout of the tracker system and geotechnical investigations of the micrositing corridor.

### *2.4.4 Cabling*

The electrical current produced by solar modules is in the form of direct current. Cables collect and aggregate the direct current before it is converted to alternating current and sent to the project substation. Low-voltage cabling will connect the solar modules of each tracker string in series and combine two strings to a single combiner box. Cabling from multiple combiner boxes will connect to a single inverter, which will convert the direct current to alternating current and connect to the buried collection system. For example, the cabling system for the site plan shown on Exhibit C, Figure C-2 connects 19 modules in series per string, 38 modules (two strings) per tracker rack, with a single pad-mounted combiner box per rack for a total of 25,050 combiner boxes. Cabling can be mounted to the tracker system, placed in cable trays, or buried. The buried cable associated with the solar array will be located within the micrositing corridor and included in the estimated total impact associated with the solar array (i.e., no separate temporary impacts are calculated for buried cable inside the micrositing corridor).

### *2.4.5 Inverters*

The direct current collected from the solar modules via combiner boxes must be converted into alternating current before connecting to the collector substation. Inverters serve the function of converting direct current power supply to an alternating current power supply in accordance with electrical regulatory requirements. For example, Figure C-2 depicts a solar site plan with 153 inverter/transformer stations to convert the direct current from the modules to produce 303 MW of alternating current. Figure B-4 provides a photo illustration of an installed inverter/transformer station. The final number of inverters will vary depending on the actual generation output of the solar array. While Figure C-2 depicts inverters co-located with transformers on the same concrete slab, string inverters may also be used. The inverter specification will comply with the applicable requirements of the National Electric Code and Institute of Electrical and Electronics Engineers standards.

### *2.4.6 Transformers*

The alternating current from the inverters will be routed to transformers that will increase the output voltage from the inverter (1,500 volts) to the desired substation feed voltage (34.5 kV). The transformers could be co-located with the inverters associated with each array, or centrally located. For the purposes of analysis, the site plan on Figure C-2 shows 153 inverters/transformer stations. Transformers at these locations will step up the voltage from the inverters.

### *2.4.7 Collection System*

The collection system will link transformers throughout the solar array to the proposed collector substation. The collector system will mostly be buried adjacent to access roads within the solar arrays, but also may be used to connect separated fenced solar arrays together. In some areas, the collector system will be installed overhead due to environmental site constraints or for long runs when an overhead 34.5 kV line is more efficient. For example, Figure C-2 depicts transformers connecting the generation output of the solar array to approximately 23 miles of underground 34.5-kV collector lines, which will be installed at a depth of approximately 3 feet. In this maximum footprint layout for analysis, approximately 4.2 miles of 34.5-kV collector line will be installed overhead from the north end of the Facility south along Bakeoven Road to the collector substation (see Exhibit C, Figure C-2). Single- or double-circuit, monopole support structures up to 75 feet tall may be used.

## 2.5 Site Plan and General Arrangement

*(iii) A site plan and general arrangement of buildings, equipment and structures.*

The Facility layout with the general arrangement of buildings, equipment, and structures is shown in Exhibit C, Figure C-2. Preliminary site plans for the Facility are also provided as part of Figure C-2. Larger-scale plans for the operations and maintenance (O&M) building as well as collector substation and battery storage areas, are provided on Figures B-5 and B-6. As noted above, these site plans are provided for the purposes of the ASC analysis; although the final Facility design may differ from the preliminary site plan provided, the actual solar array equipment and layout selected will not exceed the impacts analyzed.

## 2.6 Fuel and Chemical Storage

*(iv) Fuel and chemical storage facilities, including structures and systems for spill containment.*

The Facility does not require fuel or chemicals for the generation of electricity. The primary chemical storage will be transformers that use oil for cooling. Transformers for the solar array and battery storage system will be ground-mounted units constructed on concrete pads with secondary spill containment traps designed to minimize the possibility of accidental leakage. Transformers oil is typically use mineral oil or seed oil that are considered nontoxic. Transformer coolant does not contain polychlorinated biphenyls or compounds listed as extremely hazardous by the U.S. Environmental Protection Agency. The small quantity and nontoxic nature of the oils combined with the fact that the transformers will be included in secondary containment on concrete pads will minimize risk effects of potential spills on soils. In the unlikely event of a spill, the Applicant will follow response measures outlined in its operations Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) as required under 40 Code of Federal Regulations [CFR] 112.

Small quantities of lubricants, degreasers, herbicides, or other chemicals may be stored in the O&M building. Storage of these chemicals will follow label instructions. No underground storage tanks will be installed at the O&M building. No extremely hazardous materials (as defined by 40 CFR 355) are anticipated to be produced, used, stored, transported, or disposed of at this Facility during operation.

During construction, on-site fuel storage may be placed in designated areas within the temporary staging areas. Secondary containment and refueling procedures for on-site fuel storage will follow the contractor's SPCC Plan.

## 2.7 Fire Prevention and Control

*(v) Equipment and systems for fire prevention and control.*

The solar array will have shielded electrical cabling, as required by applicable code, to prevent electrical fires. In addition, the collector system and substation will have redundant surge arrestors to deactivate the Facility during events of unusual operational events that could start fires. The collector substation will have also sufficient spacing between equipment to prevent the spread of fire. All electrical equipment will meet National Electrical Code and Institute of Electrical and Electronics Engineers standards and will not pose a significant fire risk. Vegetation within the fence line, and along the transmission line corridor, will be managed as needed to reduce fuels for fire.

Facility roads will be sufficiently sized for emergency vehicle access in accordance with 2014 Oregon Fire Code requirements, including Section 503 and Appendix D - Fire Apparatus Access Roads. Specifically, roads will be 16 to 20 feet wide with an internal turning radius of 28 feet and less than 10 percent grade to provide access to emergency vehicles. The fenced areas around the O&M building, collector substation, and battery storage system will be graveled, with no vegetation present.

Smoke/fire detectors will be placed around the site that will be tied to the supervisory control and data acquisition (SCADA) system (see Section 3.4) and will contact local firefighting services. The O&M building will have basic firefighting equipment for use on site during maintenance activities, such as shovels, beaters, portable water for hand sprayers, fire extinguishers, and other equipment. The construction contractor will be trained in fire prevention awareness and have onsite fire extinguishers to respond to small fires. In the event of a large fire, emergency responders will be dispatched.

On-site employees will receive training on fire prevention and response. Employees will also be required to keep vehicles on roads and off dry grassland during the dry months of the year, unless such activities are required for emergency purposes, in which case fire precautions will be observed. In the rare event of an electrical fire in the solar module blocks or collector substation, it is likely that Facility staff will monitor and contain the fire, but not try to extinguish it.

At the beginning of Facility operations, a copy of the site plan indicating the arrangement of the Facility structures and access points will be provided to the Juniper Flat Rural Fire Protection District, which is the local fire district (see Exhibit U). The Applicant has also met with the Bakeoven-Shaniko Rangeland Fire Protection Association and will coordinate with the Oregon State Fire Marshall as needed. Exhibit U provides additional information regarding local public service providers.

**Battery Storage System:** The Facility may use either lithium-ion (Li-ion) or flow batteries to store up to 100 MW of the energy generated by the solar arrays. Section 3.7.1 provides a detailed description of the battery storage options. The following paragraphs summarize the information pertinent to fire prevention and control for the battery storage system.

The chemicals used in Li-ion batteries are generally nontoxic but do present a flammability hazard. However, Li-ion batteries are susceptible to overheating and require cooling systems, especially at the utility scale (LAZARD 2016). The gas released by an overheating Li-ion cell is mainly carbon dioxide. The electrolyte solution, usually consisting of ethylene or propylene, may also vaporize and vent if the cell overheats (Battery University 2018).

The Applicant will implement the following fire prevention and control methods to minimize fire and safety risks if Li-ion batteries are used for battery storage:

- The batteries will be stored in completely contained, leak-proof modules.
- The Fire Protection and Prevention Plan (Fire Plan) will have response procedures specific to the battery storage system in the event of an emergency, such as a fire.
- 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.
- The Applicant will employ the following design practices:
    - Use of lithium iron phosphate (LFP) battery chemistry that does not release oxygen when it decomposes due to temperature;
    - Employment of an advanced and proven battery management systems;
    - Qualification testing of battery systems in accordance with UL 9540A (UL 2018);
    - Installation of fire sensors, alarms, and aerosol fire extinguishing systems in every battery container;
    - Installation of remote power disconnect switches;
    - Clear and visible signs to identify remote power disconnect switches;
    - Training of local emergency response personnel in power disconnect and firefighting techniques.

Flow batteries do not present a flammability hazard and therefore do not require the complex cooling systems that Li-ion batteries do (LAZARD 2016).

# 3.0 Related or Supporting Facilities

*OAR 345-021-0010(1)(b)(B) A description of major components, structures and systems of each related or supporting facility.*

Related or supporting facilities consist of a 230-kV transmission line, a collector substation, one O&M building, a SCADA system, site access/service roads, perimeter fencing, gates, temporary construction areas, and battery storage. These related or supporting facilities are described in the following sections.

## 3.1 230-kV Transmission Line

The Facility will require construction of an associated transmission line that will connect to the regional grid. The associated transmission line, in and of itself, is not a transmission line within the meaning of Council jurisdiction. The associated transmission line will be approximately 11 miles of 230-kV overhead line to connect the proposed collector substation to the existing 230-kV BPA Big Eddy to Redmond transmission line at the Maupin Substation (Exhibit C, Figure C-2). The 230-kV overhead line will be supported by H-frame structures with two galvanized steel or wood poles, or single metal monopole structures. The structures will rise to a height of approximately 80 to 100 feet above grade depending on design and terrain. Figures B-7, B-8, and B-9 depict typical 230-kV support structures.

## 3.2 Collector Substation

The collector substation will combine and step up the voltage of energy generated by the Facility to the desired transmission voltage. The substation will be located on a graveled, fenced area within the micrositing corridor near the transmission line corridor (a possible location is shown on Figure C-2). Transformers will be non-polychlorinated biphenyl oil-filled types. Additional substation equipment may include circuit-breakers, power transformer(s), bus and insulators, disconnect switches, relaying, battery and charger, surge arresters, alternating current and direct current supplies, control enclosure, metering equipment, grounding, and associated control wiring. Any additional equipment will be located within the fenced substation area.

## 3.3 Operations and Maintenance Building

The O&M building will be a single-story building located near the solar array and will include an office space, storage, bathroom, and breakroom facilities. Water will be supplied via an on-site exempt groundwater well (see Exhibit O). The O&M building will also have an on-site, state-permitted septic system with a discharge capacity of up to 7,500 gallons. Electric power and telephone service will be provided via local service providers. A gravel parking and storage area will be located adjacent to the building. As the O&M building will be enclosed within the perimeter fence, no additional fencing is planned around the building and parking area.

## 3.4 Communication and SCADA System

A SCADA system will be installed to collect operating and performance data from the solar array. The SCADA system provides for remote operation of the Facility from the O&M building and the Applicant's national control center in Portland, Oregon.

Fiber optic cables for the SCADA system will be installed with the collection system (Section 2.4.7). In areas where the collection system is buried, the fiber cables will be installed in the same trench. Where the collection system is above ground, the fiber cables will be mounted on overhead poles along with conductors.

## 3.5 Site Access, Service Roads, Perimeter Fencing, and Gates

The Facility will be accessed from Bakeoven Road east of Maupin, Oregon. The locations of access points will depend on the final configuration of the solar array, and any section of Bakeoven Road within the micrositing corridor could be improved to provide access to the Facility. Within the site boundary, approximately 24 miles of service roads will be constructed for access and maintenance purposes. New service roads within the site boundary will be up to 20 feet wide with an internal turning radius sufficiently sized for emergency vehicle access. Chain-link perimeter fencing, up to 8 feet in height, will enclose the solar array. The perimeter fencing will have vehicle and pedestrian access gates, including two 16-foot-wide gates and one 4-foot-wide gate. Exhibit C, Figure C-2 depicts the Facility layout.

## 3.6 Temporary Staging Areas

During construction, temporary staging areas will be used to support construction, as well as store supplies and equipment. One or more temporary concrete batch plants may be installed within the temporary staging areas as an accessory use to construction of the Facility. For the purposes of ASC analysis, three staging areas are depicted on the Facility layout: one within the perimeter fence line, and two outside the fence line but within the micrositing corridor (Exhibit C, Figure C-2). Approximate acreage of these areas is provided in Exhibit C. The staging areas will consist of a crushed gravel surface that will be removed following construction.

Temporary staging areas outside the fence will be reclaimed by removing the gravel surface, re-grading to match adjacent contours, and reseeding. Staging areas within the fence line will be considered permanent impacts, and reclaimed at the Applicant's discretion.

## 3.7 Battery Storage

The Applicant proposes the option to construct a battery storage system adjacent to the collector substation (Figures B-6 and B-10, and Exhibit C, Figure C-2). The battery storage system will be capable of storing and later deploying 100 MW of energy generated by the Facility or other sources connected to Maupin Substation. Two battery options may be used: Li-ion batteries or flow batteries (see Figure B-10 for representative drawings). Both systems use a series of self-contained containers located within a fenced area, or within a single warehouse-type enclosure of a similar scale and size. For purposes of the analysis presented in this ASC, containers are assumed because they would generally have a greater potential impact from a noise and visual perspective, and a similar disturbance area. If developed, the warehouse-type enclosure will be designed generally consistent with the character of similar buildings and painted in a low-reflectivity, neutral color to blend with the surrounding landscape. The enclosure will be constructed in compliance with State of Oregon structural and electrical code requirements, to the extent applicable, and in compliance with applicable site certificate conditions.

### *3.7.1 Battery Storage Options*

#### *3.7.1.1 Lithium-ion Batteries*

Li-ion batteries are the most common type of utility-scale battery storage system technologies. Li-ion batteries are a type of solid-state rechargeable battery where lithium ions, suspended in an 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 (Energy Storage Association 2017a). Li-ion batteries have a typical lifespan of 5 to 10 years and will experience a consistent degradation of performance over that time. Li-ion batteries are generally used in utility-scale applications when rapid, short-term (minute) deployments of power are needed. For example, Li-ion batteries can smooth the fluctuating generation from solar arrays, which can vary based on time of day and cloud cover, to deliver consistent and predictable power to the grid.

#### *3.7.1.2 Flow Batteries*

Flow batteries are a new emerging technology for utility-scale battery storage systems. Similar to how "solid-state" batteries refer to a suite of battery technologies, "flow batteries" refer to any battery where two electrolyte solutions, one with positive ions and the other with negative ions, are contained in separate tanks and the migration of electrons from one solution to the other, typically through a membrane, creates electricity. The different classes of flow batteries include reduction-oxidation (redox) flow, hybrid, and membrane-less (Energy Storage Association 2017b). Like Li-ion batteries, each class of flow battery includes a variety of chemistries with different characteristics. Flow batteries typically have a maximum life-span of 10 to 20 years, but do not degrade over time like conventional batteries. During normal operations, the electrolyte solutions are recovered and reused during the recharging process. The chemicals used are generally not highly reactive or toxic substances. Examples of electrolyte solutions range from food-grade substances used in ViZn Energy battery systems to zinc bromine in a system under development by Primus Power.

### *3.7.2 Battery Storage System Equipment*

The battery storage design will include the following elements:

- Battery storage equipment, including batteries and racks or containers, inverters, isolation transformers, and switchboards.

- Balance of plant equipment (more advanced systems required for Li-ion), which may include a warehouse-type building, medium-voltage and low-voltage electrical systems, fire suppression, heating, ventilation, and air-conditioning systems, building auxiliary electrical systems, and network/SCADA systems.
- Cooling system (more advanced systems required for Li-ion), which may include a separate chiller plant located outside the battery racks with chillers, pumps, and heat exchangers.
- High-voltage (HV) equipment, including a step-up transformer, HV circuit breaker, HV current transformers and voltage transformers, a packaged control building for the HV breaker and transformer equipment, HV towers, structures, and HV cabling.

Both the Li-ion and flow battery technologies are often placed in standard-sized shipping containers on a concrete slab, as represented on Figure B-10. Each container holds the batteries, a supervisory and power management system, cooling system (if needed), and a fire prevention system. By connecting multiple containers, the battery storage system can be scaled to the desired capacity. Containers may be stacked up to two levels with an estimated maximum height of approximately 20 feet. For additional details on dimensions used for purposes of this analysis, see Section 4.6. A typical battery storage system is depicted on Figure B-10.

### *3.7.3 Battery Storage System Operations and Maintenance*

The batteries and other materials for the battery storage system will be manufactured offsite and transported to the Facility by truck. As applicable, defective or decommissioned parts will be disposed of or recycled in compliance with 49 CFR 173.185, which regulates the transportation of Li-ion batteries.

The O&M activities will mainly consist of minimal procedures that do not require tampering with the battery cell components. Flow batteries will require replacement of the electrolyte solutions approximately every 10 to 20 years, whereas Li-ion systems require more frequent replacement of the batteries every 5 to 10 years.

Both battery storage systems will be stored in completely contained, leak-proof modules. The modules will be stored on a concrete pad to capture any leaks that may occur. O&M staff will conduct inspections of the battery storage systems according to the manufacturer's recommendations, which are assumed to be monthly inspections.

As described in Section 2.6, an SPCC Plan will be developed to manage, prevent, contain, and control potential releases, and provide provisions for quick and safe cleanup of hazardous materials. A Fire Plan will also be developed with response procedures in the event of an emergency, such as a fire (Section 2.7).

# 4.0 Dimensions of Major Structures and Features

*OAR 345-021-0010(1)(b)(C) The approximate dimensions of major facility structures and visible features.*

The most notable features of the Facility are: (1) the solar array; (2) the 230-kV overhead transmission line, (3) the substation; (4) the O&M building, (5) the 34.5-kV overhead collector line, and (6) the battery storage system. The estimated dimensions of the major facility structures, as currently available, are summarized below.

## 4.1 Solar Array Dimensions

The solar array will comprise linear rows of modules within the perimeter fence line depicted in Exhibit C, Figure C-2. The dimensions of the example modules used in the Facility layout for purposes of ASC analysis are shown on Figure B-1. The maximum height of the solar array will be 12 feet when the modules are tilted on the tracker system (Figure B-2). Chain-link perimeter fencing, up to 8 feet in height, will enclose the solar array, with two 16-foot-wide gates and one pedestrian, 4-foot-wide gate. The exact number and size of modules, layout, and associated equipment specifications will be determined during micrositing; however, as noted earlier, the actual solar array equipment and layout selected will not exceed the impacts analyzed.

## 4.2 230-kV Transmission Line Dimensions

The approximately 11-mile-long 230-kV line will be supported either by H-frame structures with two galvanized steel or wood poles or by a galvanized steel or wood monopole structure. The structures will rise to a height of approximately 80 to 100 feet above grade, depending on the terrain. Clearing for the installation of the 230-kV transmission line will require a temporary workspace of 50 feet by 50 feet per structure (see Exhibit C). The 230-kV line will generally have 700-foot-long spans between structures; however, spans may be shorter or longer depending on the terrain.

## 4.3 Substation Dimensions

The Facility collector substation will be situated within a fenced area of approximately 3 acres (see Exhibit C) with equipment approximately 10 feet in height.

## 4.4 O&M Building Dimensions

The O&M building will be a one-story structure approximately 20 feet high with an area of approximately 5,000 square feet (see Exhibit C). The building will be located on an approximately 3-acre area that includes parking, any adjacent storage, and surrounding graveled area (including an underground septic system up to 7,500 gallons).

### 4.5 34.5-kV Overhead Collector Line Dimensions

The approximately 4.2-mile 34.5-kV overhead collector line will be constructed with single- or double-circuit wood monopole structures. The structures will be 60 to 75 feet tall with 2-foot-diameter poles, located along Bakeoven Road within the site boundary. Installation of the 34.5-kV line will require a temporary workspace of 50 feet by 50 feet per structure (see Exhibit C).

### 4.6 Battery Storage Dimensions

Both the Li-ion and flow battery technologies are often placed in standard-sized shipping containers on a concrete slab. Each container holds the batteries, a supervisory and power management system, cooling system (if needed), and a fire prevention system. By connecting multiple containers, the battery storage system can be scaled to the desired capacity. Containers may be stacked up to two levels with an estimated maximum height of approximately 20 feet. For purposes of this analysis the battery storage system (either Li-ion or flow) is assumed to require 104 double-stacked containers (208 individual containers) that will occupy an area of approximately 8.4 acres. The battery storage area will be within the perimeter fence line, and the entire footprint is assumed to be permanently disturbed by placement of containers, cooling systems, transformers, and cabling (see Exhibit C). During final design, the Applicant may decide to use an unstacked battery container layout, which would be located within the same permanently disturbed area. As described earlier, the Applicant may also decide to enclose the battery storage system in a warehouse-type structure of similar scale and size. However, as containers would generally have a greater potential impact from a noise and visual perspective, and a similar disturbance area, they are assumed for the purposes of this ASC.

## 5.0 Transmission Line Corridor

> *OAR 345-021-0010(1)(b)(D) If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a transmission line or pipeline that, by itself, is an energy facility under the definition in ORS 469.300, a corridor selection assessment explaining how the applicant selected the corridor(s) for analysis in the application. […]*

As noted above, the proposed transmission line, in and of itself, is not an energy facility as defined in ORS 469.300 because it does not cross more than one city or county. The associated transmission line will be approximately 11 miles of 230-kV overhead line to connect the Facility collector substation to the existing 230-kV BPA Big Eddy to Redmond transmission line at the Maupin Substation, entirely within the unincorporated areas of Wasco County. Therefore, a corridor selection assessment is not required; however, Exhibit K describes the transmission line alternatives considered by the Applicant.

## 5.1 Length of Line

*OAR 345-021-0010(1)(b)(E) If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a transmission line or pipeline of any size:*

*(i) The length of the pipeline or transmission line.*

The 230-kV transmission line will extend approximately 11 miles from the collector substation to the existing Maupin Substation that connects to the 230-kV BPA Big Eddy to Redmond transmission line, as shown on Figure C-2.

## 5.2 Right-of-Way Width

*(ii) The proposed right-of-way width of the pipeline or transmission line, including to what extent the new right-of-way will be required or existing right-of-way will be widened.*

The proposed 230-kV transmission line traverses private land under lease by the Applicant for approximately the first 7.5 miles. After that point, the transmission line turns west adjacent to (and briefly co-located in) an existing county road right-of-way for the remaining 3.5 miles to the Maupin Substation. The site boundary corresponds to the micrositing corridor at the end of the transmission line. which ends at the fee-owned BPA property where Maupin Substation is located.

Land currently under lease is considered under the Applicant's control, such that the Facility will not require new right-of-way or widening of an existing right-of-way. Facilities on BPA property will be owned and constructed by BPA per the terms of the Facility's interconnection agreement. Alternatively, BPA may grant a right-of-way to the Applicant for the ownership of the transmission line portion that extends from the site boundary to the Maupin Substation on the BPA property. Ownership of the facilities on BPA's property will described in the Facility's interconnection agreement that will be finalized after issuance of the Site Certificate and BPA's environmental review.

The width of the transmission line corridor (which is mostly equivalent to the micrositing corridor along the transmission line) ranges from 60 feet to 520 feet, centered on the line (see Exhibit C, Figure C-2). This range is within the transmission line corridor width defined in OAR-001-0010(13).

## 5.3 Public Right-of-Way

*(iii) If the proposed transmission line or pipeline corridor follows or includes public right-of-way, a description of where the transmission line or pipeline would be located within the public right-of-way, to the extent known. If the applicant proposes to locate all or part of a transmission line or pipeline adjacent to but not within the public right-of-way, describe the reasons for locating the transmission line or pipeline outside the public right-of-way. The applicant must include a set of clear and objective criteria and a description of the type of evidence that would support locating the transmission line or pipeline outside the public right-of-way, based on those criteria.*

Starting at the collector substation, the 230-kV transmission line corridor extends northwest across private land under lease by the Applicant for approximately 7.5 miles, then turns west parallel to Bakeoven Road for approximately 3.5 miles to the Maupin Substation, for a total length of approximately 11 miles. The transmission line will be located primarily adjacent to the public right-of-way for Bakeoven Road along the last 3.5 miles of the route (see Exhibit C, Figure C-2). In July 2019, the last 2.5 miles of the proposed transmission line were realigned, 30 feet to the north, onto private land newly under lease by the Applicant. With this realignment, the transmission line centerline is approximately 15 to 20 feet north of the Bakeoven Road right-of-way for the majority of the final 3.5 miles to Maupin Substation. For approximately 300 to 350 feet, the centerline will cross into the public right-of-way to avoid an existing barn.

The majority of the route is located outside the public right-of-way primarily because an existing 65-kV Wasco Electric Cooperative transmission line along Bakeoven Road limits the ability to co-locate the proposed 230-kV line within the same right-of-way and maintain minimum separation criteria for safety. It is also not feasible to co-locate the Facility's 230-kV transmission line directly on the existing 65-kV line, as the 65-kV towers could not support the addition of a 230-kV line. This is because the existing structures do not have the necessary height or strength to support a 230-kV line, which would require a minimum of an additional 10 feet of ground clearance that the existing 65-kV structures cannot accommodate. In addition to constraints from the existing 65-kV line, the Applicant has an assigned crossing point of existing BPA 500-kV transmission lines that affects the required route location. The proposed route also allows for the connection of the county-permitted Imperial Wind project, which eliminates the need for duplicate transmission lines if both facilities are built. Exhibit K provides additional information regarding land use compliance for the transmission line route.

## 5.4 Voltage, Capacity, Current, and Structures

*(v) For transmission lines, the rated voltage, load carrying capacity, and type of current and a description of transmission line structures and their dimensions.*

The transmission line will have a rated voltage of 230-kV and be able to carry the full output of the Facility. The type of current is alternating current. The 230-kV overhead line will be supported either by H-frame structures with two galvanized steel or wood poles, or by galvanized steel or wood monopole structures. The structures will rise to a height of approximately 80 to 100 feet above grade depending on design and terrain. The 230-kV line will generally have 700-foot-long spans between structures; however, spans may be shorter or longer depending on the terrain. Typical 230-kV support structures are illustrated on Figures B-7, B-8, and B-9.

# 6.0 Construction Schedule

*OAR 345-021-0010(1)(b)(F) A construction schedule including the date by which the applicant proposes to begin construction and the date by which the applicant proposes to complete construction. Construction is defined in OAR 345-001-0010. The applicant shall describe in this*

> *exhibit all work on the site that the applicant intends to begin before the Council issues a site certificate. The applicant shall include an estimate of the cost of that work. For the purpose of this exhibit, "work on the site" means any work within a site or corridor, other than surveying, exploration or other activities to define or characterize the site or corridor, that the applicant anticipates or has performed as of the time of submitting the application.*

The Applicant proposes to begin construction on or after June 2020 and to construct the Facility in phases. The size and construction schedule for each phase will be based on market demand, but the entire Facility, including all phases, will be completed by 2025, unless the Applicant seeks an amendment to extend the construction deadline. An example phased construction schedule is outlined in Table B-2.

**Table B-2. Example Construction Schedule**

| Year | Activity |
|---|---|
| 2019 | Issuance of Bakeoven Solar Project site certificate |
| 2020 | Final engineering and begin construction |
| 2021 | Phase 1 construction and operation |
| 2022 | Phase 2 construction and operation |
| 2023/2024 | Phase 3 construction and operation |
| 2025 | Construction completion deadline for all phases |

Furthermore; the Applicant requests:

- a deadline for the start of construction 5 years from issuance of the site certificate; and
- a deadline for construction completion of 1 year later than the deadline for beginning construction, or 6 years from issuance of the site certificate.

The contractor will be required to schedule work time during daylight hours and follow any timing restrictions set by the site certificate. At this time, no work has been scheduled before the Council issues a site certificate; however, preliminary work such as aerial and ground surveys, geotechnical boring, geological surveys, and site planning activities may be required before a certificate is issued. The work associated with site characterization will be conducted using standard trucks and the boring will typically require a three-axle truck to perform the bores.

The following activities have been completed, or may be completed, before EFSC issues a site certificate:

- land lease,
- interconnection studies,
- American Land Title Association survey,
- geotechnical survey,
- preliminary design,

- solar monitoring station installation, and
- resource surveys.

The Applicant may elect to perform weed control activities a year before construction to reduce the weed seed bank in areas where ground disturbance may occur. This work is valued at less than $100,000.

# 7.0 Submittal Requirements and Approval Standards

## 7.1 Submittal Requirements

**Table B-3. Submittal Requirements Matrix**

| Requirement | Location |
|---|---|
| OAR 345-021-0010(1)(b) Exhibit B. Information about the proposed facility, construction schedule and temporary disturbances of the site, including: | Section 2.0 |
| (A) A description of the proposed energy facility, including as applicable: | Section 2.0 |
| (i) The nominal electric generating capacity and the average electrical generating capacity, as defined in ORS 469.300. | Section 2.0 |
| (ii) Major components, structures and systems, including a description of the size, type and configuration of equipment used to generate electricity and useful thermal energy. | Section 2.4 |
| (iii) A site plan and general arrangement of buildings, equipment and structures; | Section 2.5 |
| (iv) Fuel and chemical storage faculties, including structures and systems for spill containment | Section 2.6 |
| (v) Equipment and systems for fire prevention and control. | Section 2.7 |
| (vi) For thermal power plants (I) A discussion of the source, quantity and availability of all fuels proposed to be used in the facility to generate electricity or useful thermal energy; (II) Process flow, including power cycle and steam cycle diagrams to describe the energy flows within the system; (III) Equipment and systems for disposal of waste heat; (IV) The fuel chargeable to power heat rate; | N/A |
| (vii) For surface facilities related to underground gas storage, estimated daily injection and withdrawal rates, horsepower compression required to operate at design injection or withdrawal rates, operating pressure range and fuel type of compressors. | N/A |
| (viii) For facilities to store liquefied natural gas, the volume, maximum pressure, liquefaction and gasification capacity in thousand cubic feet per hour. | N/A |
| (B) A description of major components, structures and systems of each related or supporting facility. | Section 3.0 |
| (C) The approximate dimensions of major facility structures and visible features. | Section 4.0 |

| Requirement | Location |
| --- | --- |
| (D) If the proposed energy facility is a pipeline or a transmission line or has, as a related or supporting facility, a transmission line or pipeline that, by itself, is an energy facility under the definition in ORS 469.300, a corridor selection assessment explaining how the applicant selected the corridor(s) for analysis in the application. In the assessment, the applicant shall evaluate the corridor adjustments the Department has described in the project order, if any. The applicant may select any corridor for analysis in the application and may select more than one corridor. However, if the applicant selects a new corridor, then the applicant must explain why the applicant did not present the new corridor for comment at an information meeting under OAR 345-015-0130. In the assessment, the applicant shall discuss the reasons for selecting the corridor(s), based upon evaluation of the following factors: | Section 5.0 |
| (i) Least disturbance to streams, rivers and wetland during construction. | N/A |
| (ii) Least percentage of the total length of the pipeline or transmission line that would be located within areas of Habitat Category 1, as described by the Oregon Department of Fish and Wildlife. | N/A |
| (iii) Greatest percentage of the total length of the pipeline or transmission line that would be located within or adjacent to public roads, and existing pipeline or transmission line rights-of-way. | N/A |
| (iv) Least percentage of the total length of the pipeline or transmission line that would be located within lands that require zone changes, variances or exceptions. | N/A |
| (v) Least percentage of the total length of the pipeline or transmission line that would be located in a protected area as described in OAR 345-022-0040. | N/A |
| (vi) Least disturbance to areas where historical, cultural or archaeological resources are likely to exist. | N/A |
| (vii) Greatest percentage of the total length of the pipeline or transmission line that would be located to avoid seismic, geological and soils hazards. | N/A |
| (viii) Least percentage of the total length of the pipeline or transmission line that would be located within lands zoned for exclusive farm use. | N/A |
| (E) If the proposed energy facility is a pipeline or transmission line, or has, as a related or supporting facility, a transmission line or pipeline of any size: | Section 5.0 |
| (i) The length of the pipeline or transmission line. | Section 5.1 |
| (ii) The proposed right-of-way width of the pipeline or transmission line, including to what extent new right-of-way will be required or existing will be widened. | Section 5.2 |
| (iii) If the proposed transmission line or pipeline corridor follows or includes public right-of-way, a description of where the transmission line or pipeline would be located within the public right-of-way, to the extent known. If the applicant proposes to locate all or part of a transmission line or pipeline adjacent to but not within the public right-of-way, describe the reasons for locating the transmission line or pipeline outside the public right-of-way. The applicant must include a set of clear and objective criteria and a description of the type of evidence that would support locating the transmission line or pipeline outside the public right-of-way, based on those criteria. | Section 5.3 |
| (iv) For pipelines, the operating pressure and delivery capacity in thousand cubic feet per day and the diameter and location, above or below ground, of each pipeline. | N/A |

| Requirement | Location |
|---|---|
| (v) For transmission lines, the rated voltage, load carrying capacity, and type of current and a description of transmission line structures and their dimensions. | Section 5.4 |
| (F) A construction schedule including the date by which the applicant proposes to begin construction and the date by which the applicant proposes to complete construction. Construction is defined in OAR 345-001-0010. The applicant shall describe in this exhibit all work on the site that the applicant intends to begin before the Council issues a site certificate. The applicant shall include an estimate of the cost of that work. For the purpose of this exhibit, "work on the site" means any work within a site or corridor, other than surveying, exploration or other activities to define or characterize the site or corridor that the applicant anticipates or has performed as of the time of submitting the application. | Section 6.0 |

## 7.2 Approval Standards

OAR 345 Division 22 does not provide an approval standard specific to Exhibit B.

# 8.0 References


Battery University. 2018. BU-304a: Safety Concerns with Li-ion. Last Updated October 2018. http://batteryuniversity.com/learn/article/safety_concerns_with_li_ion. Accessed December 2018.

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# Figures

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NEW

CanadianSolar

# BiKu MODULE

**NEW GENERATION BIFACIAL MODULE**

**FRONT POWER RANGE: 360W ~ 375W**

**ADDITIONAL BACK POWER OUTPUT UP TO 30%**

**CS3U-360|365|370|375MB-FG**

FRONT

BACK

5BB cell

MBB cell

* Both 5BB and MBB modules will be supplied.

**MORE POWER**

UP TO 30% — Up to 30% more energy yield due to back side power generation

41°C — Low NMOT: 41 ± 3 °C
Low temperature coefficient (Pmax): -0.37 % / °C

Innovative module design, Better shading tolerance

**MORE RELIABLE**

Lower internal current, lower hot spot temperature

Minimizes micro-cracks and prevents snail trails

Fire Class A and Type 3 / Type 13

Heavy snow load up to 5400 Pa, wind load up to 2400 Pa

30 years — **power output warranty**

10 years — **product warranty on materials and workmanship**

**MANAGEMENT SYSTEM CERTIFICATES***

ISO 9001:2008 / Quality management system
ISO 14001:2004 / Standards for environmental management system
OHSAS 18001:2007 / International standards for occupational health & safety

**PRODUCT CERTIFICATES***

IEC 61215 / IEC 61730: VDE / CE
UL 1703: CSA

**MECHANICAL DATA**

| Specification | Data |
|---|---|
| Cell Type | Mono-crystalline |
| Cell Arrangement | 144 [2 x (12 x 6) ] |
| Dimensions | 2012 × 992 × 5.8 mm (79.2 × 39.1 × 0.23 in) without J-Box and corner protector |
| (Incl. corner protector) | 2015 × 995 × 8.5 mm (79.3 × 39.2 × 0.33 in) without J-Box |

| | |
|---|---|
| **Bakeoven Solar Project**<br><br>**Figure B-1**<br>**Example Solar Module** | AVANGRID RENEWABLES |

# Example Tracker Components
# (Represented by Array Technologies DuraTrack HZ v3)

ARRAY TECHNOLOGIES

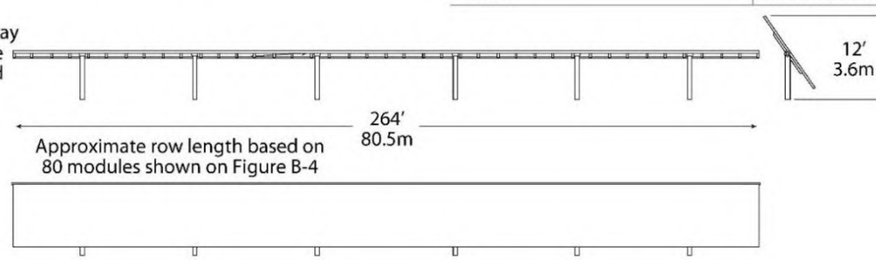
Source: Array Technologies Inc., 3901 Midway Place NE, Albuquerque, NM 87109 USA, www.arraytechinc.com.

## GENERAL

| | |
|---|---|
| Annual Power Consumption (kWh per 1 MW) | 400 kWh per MW per year, estimated |
| Land Area Required per 1 MW | Approx. 5 to 5.75 acres per MW @ 33% GCR (site and design specific) |

## TYPICAL STRUCTURAL AND MECHANICAL FEATURES

| | |
|---|---|
| Tracking Type | Horizontal single axis |
| Tilt Angle | 0° |
| kW per Drive Motor | ~ 650–800 kW DC |
| String Voltage | Up to 1,500V DC |
| Maximum Linked Rows | 28 |
| Maximum Row Size | 80 modules (crystalline, 1,000V DC) & 90 modules (crystalline, 1,500V DC) |
| Drive Type | Rotating gear drive |
| Motor Type | 2 HP, 3 PH, 480V AC |
| Motors per 1 MW AC | Less than 2 |
| East-West / North-South Dimensions | Site / module specific |
| Array Height | 54" standard, adjustable (46" min height above grade) |
| Ground Coverage Ratio (GCR) | Flexible, 28–45% typical |
| Modules Supported | Most commercially available, including frameless crystalline and thin film |
| Tracking Range of Motion | ± 52° |
| Operating Temperature Range | -30°F to 140°F (-34°C to 60°C) |
| Module Configuration | Single-in-portrait standard. Dual-in-landscape (crystalline), four-in-landscape (thin film) also available. |
| Module Attachment | Single fastener, high-speed mounting clamps with integrated grounding. Traditional rails for crystalline in landscape, custom racking for thin film and frameless crystalline per manufacturer specs. |
| Materials | HDG steel and aluminum structural members |




**Bakeoven Solar Project**

**Figure B-2**
**Example Tracker Components**

AVANGRID RENEWABLES

**Bakeoven Solar Project**

**Figure B-3**
**Illustration of Installed Solar String**

AVANGRID RENEWABLES

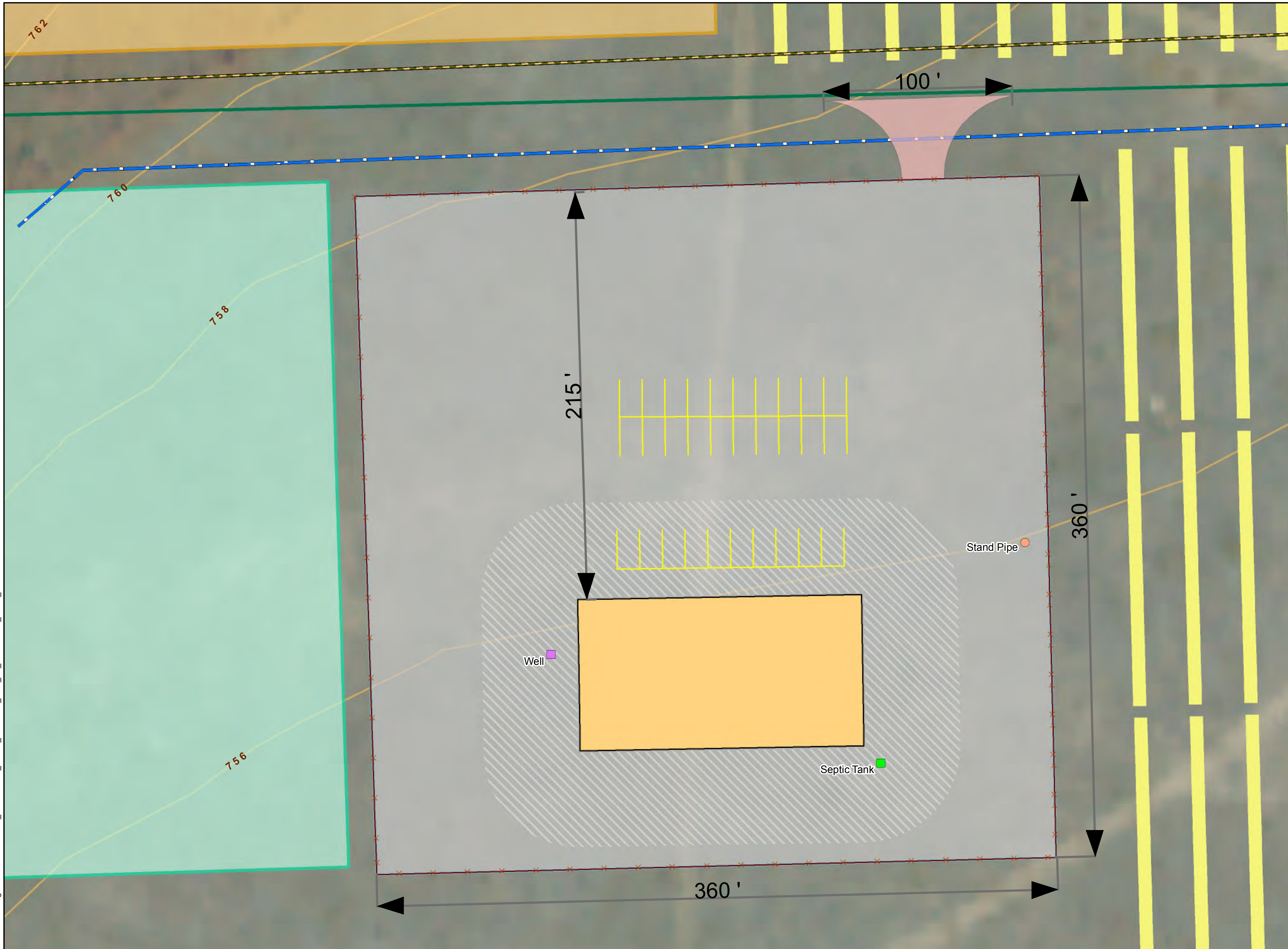

**Bakeoven Solar Project**

**Figure B-4**
**Illustration of Inverter/Transformer Station**

# Bakeoven Solar Project

**Figure B-5**
**O&M Facility Site Plan**

WASCO COUNTY, OREGON




Contour (meter)

**O&M Facility Layout**

- Septic Tank
- Stand Pipe
- Well
- Parking Space
- 50' Fire Break
- O&M Building
- O&M Facility
- Driveway
- Proposed Fence

**Proposed Facility Layout**

- Permanent New Road
- Overhead Collector Line
- Underground Collector Line
- Fence Line
- Solar Array Area
- Battery Storage System
- Collector Substation

TETRA TECH
AVANGRID RENEWABLES

Data Sources

Avangrid-Project Infrastructure;
USDA-Aerial Imagery;

Reference Map

1:600 WGS 1984 UTM Zone 10N

0 50 100 200 Feet

NOT FOR CONSTRUCTION

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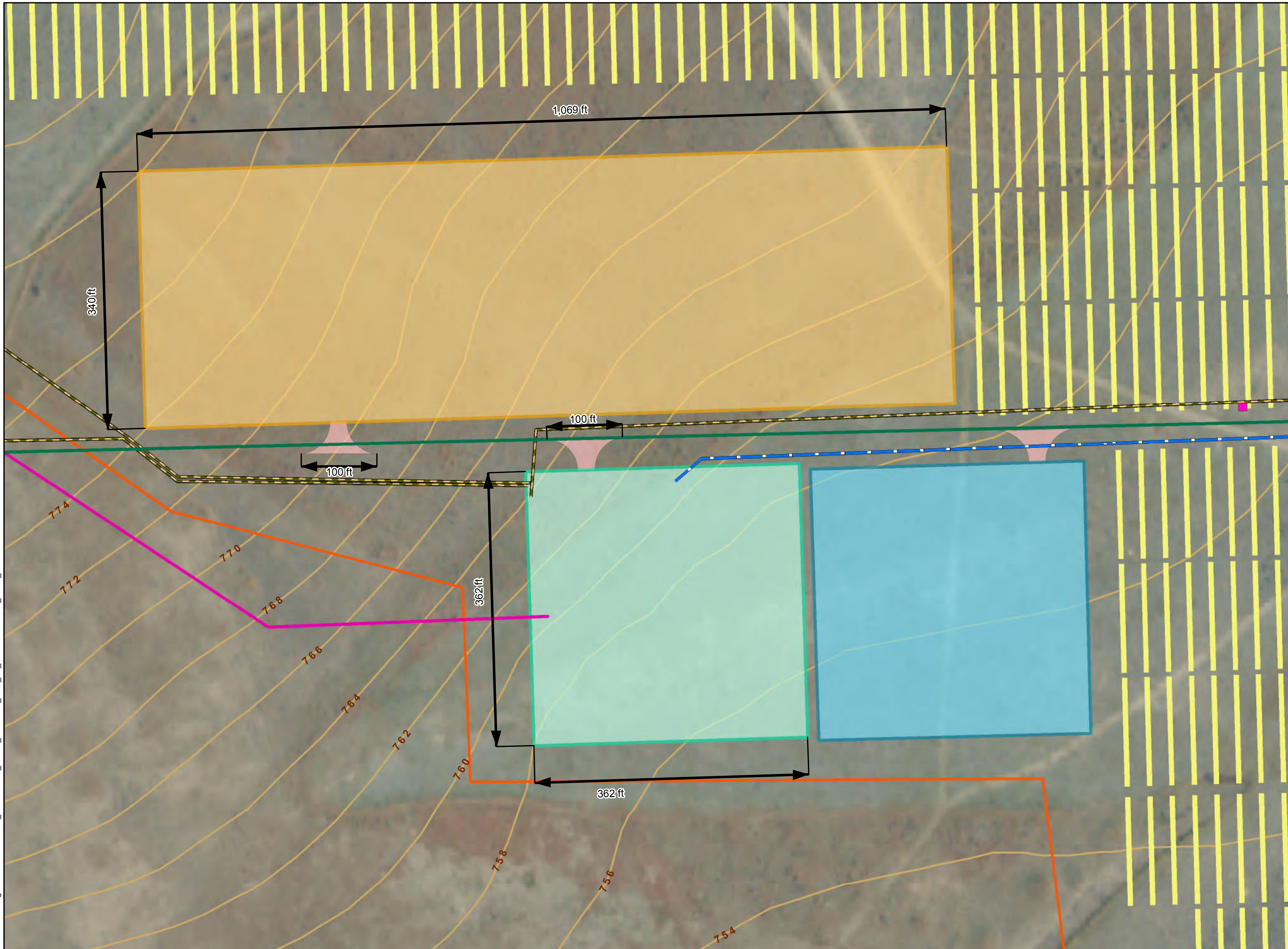
# Bakeoven Solar Project

## Figure B-6
## Collector Substation and Battery Storage System Site Plan

WASCO COUNTY, OREGON




Contour (meter)

**Proposed Facility Layout**

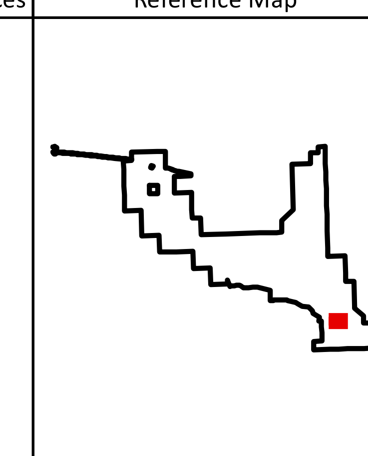
- Inverter
- Permanent New Road
- Transmission Line (230 kV)
- Overhead Collector Line
- Underground Collector Line
- Fence Line
- Solar Array Area
- Battery Storage System
- O&M Building
- Collector Substation
- Driveway

TETRA TECH

AVANGRID RENEWABLES

Data Sources: Avangrid-Project Infrastructure; USDA-Aerial Imagery;

Reference Map



1:1,500 WGS 1984 UTM Zone 10N

0 50 100 200 Feet

NOT FOR CONSTRUCTION

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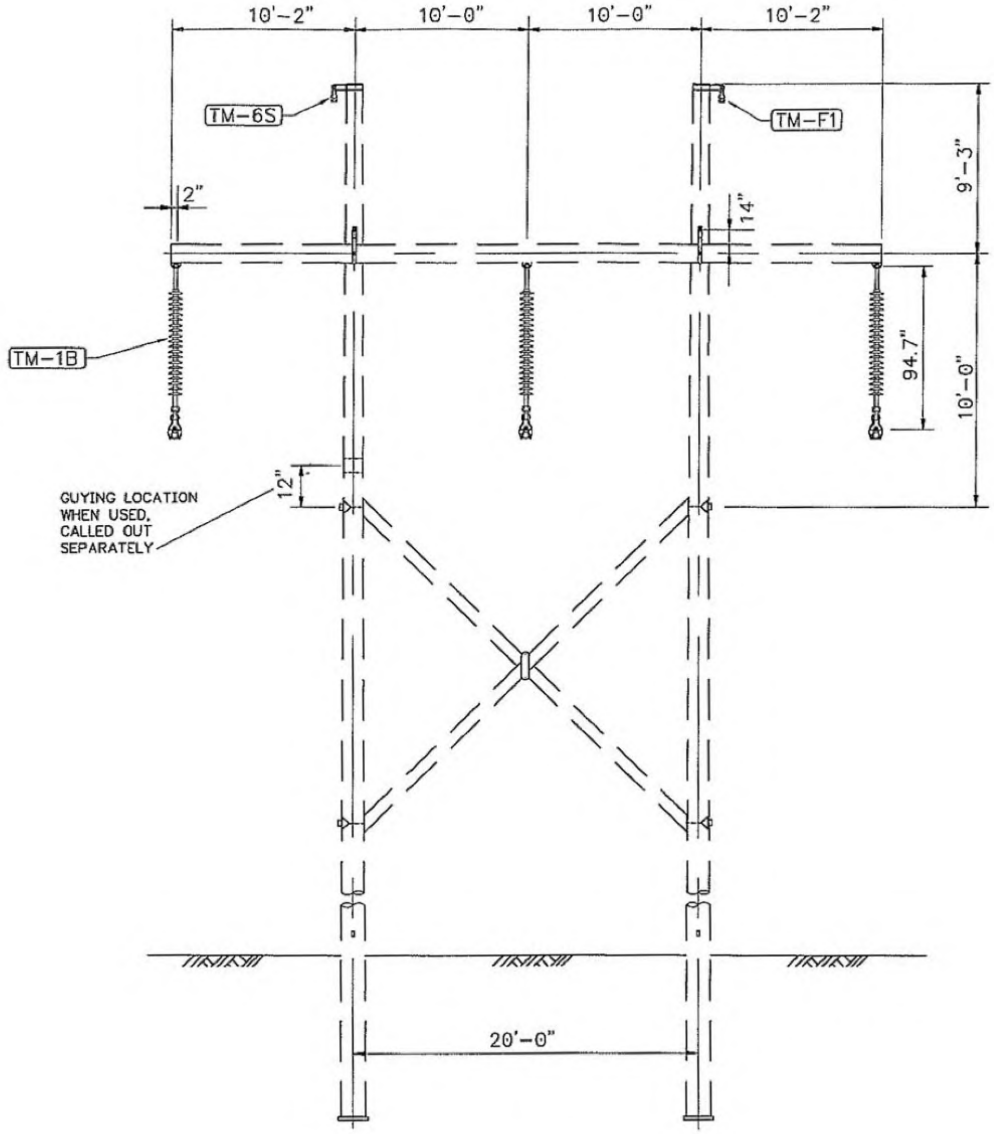
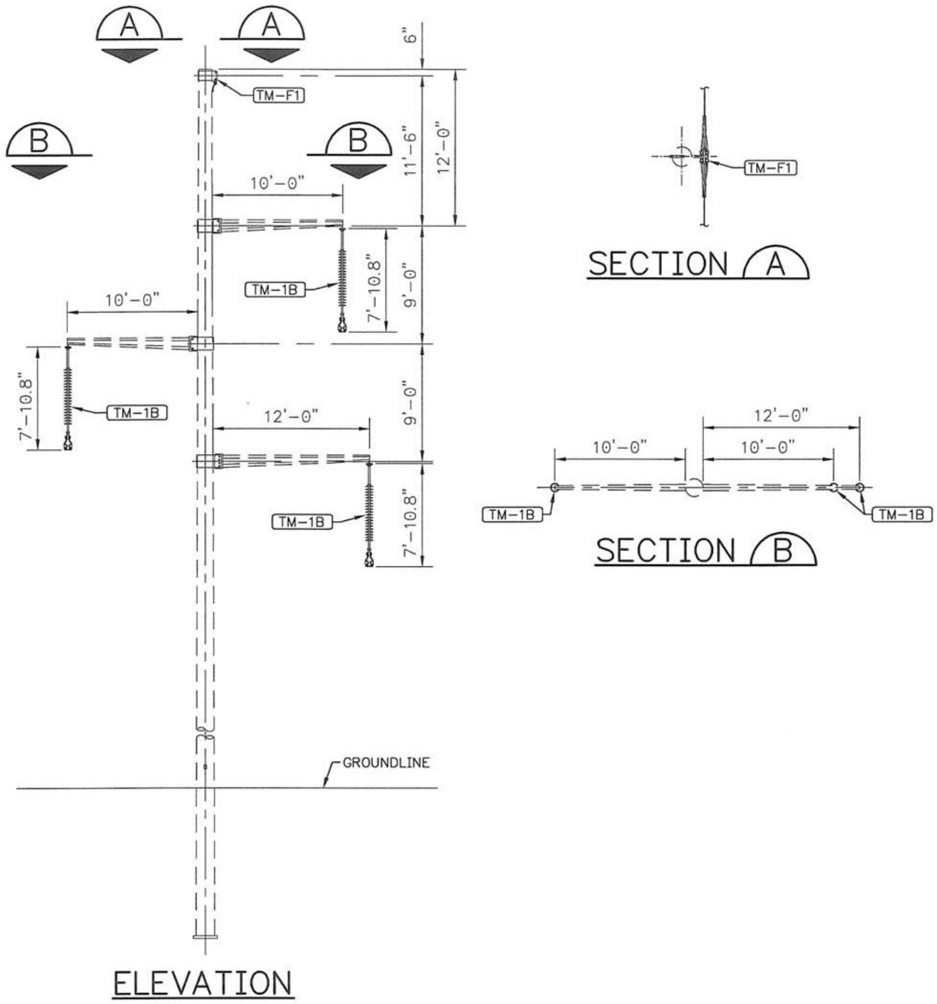



| ITEM | QTY | DESCRIPTION |
|---|---|---|
| TM-6S | 1 | SHIELD WIRE SUPPORT ASSEMBLY |
| TM-F1 | 1 | FIBEROPTIC SUPPORT ASSEMBLY |
| TM-1B | 3 | 230-KV SUSPENSION INSULATOR WITH ARMOR ROD |

**Bakeoven Solar Project**

**Figure B-7**
**Typical 230-kV H-Frame Support Structure**

AVANGRID RENEWABLES

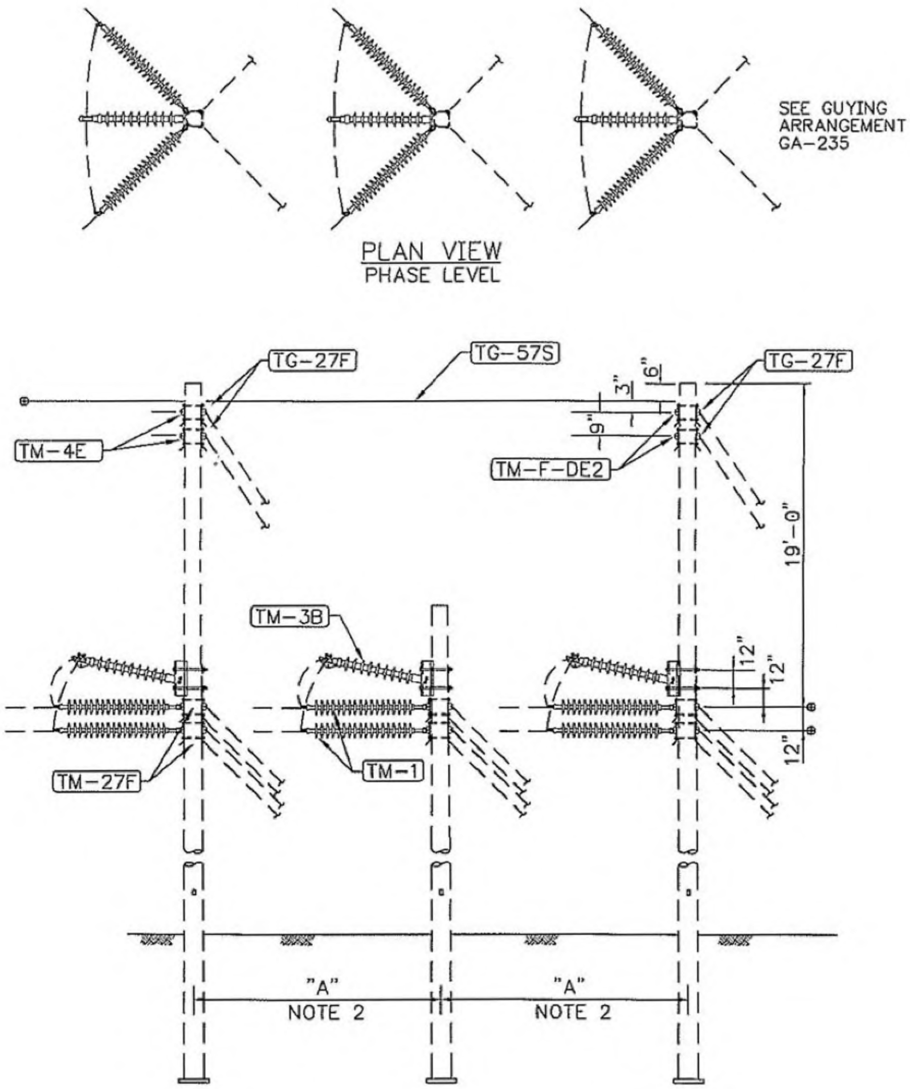



| ITEM | QTY | DESCRIPTION |
|---|---|---|
| TM-1B | 3 | 230-KV SUSPENSION INSULATOR WITH ARMOR ROD |
| TM-F1 | 1 | FIBEROPTIC TANGENT SUPPORT ASSEMBLY |

**Bakeoven Solar Project**

**Figure B-8**
**Typical 230-kV Monopole Support Structure**

AVANGRID RENEWABLES

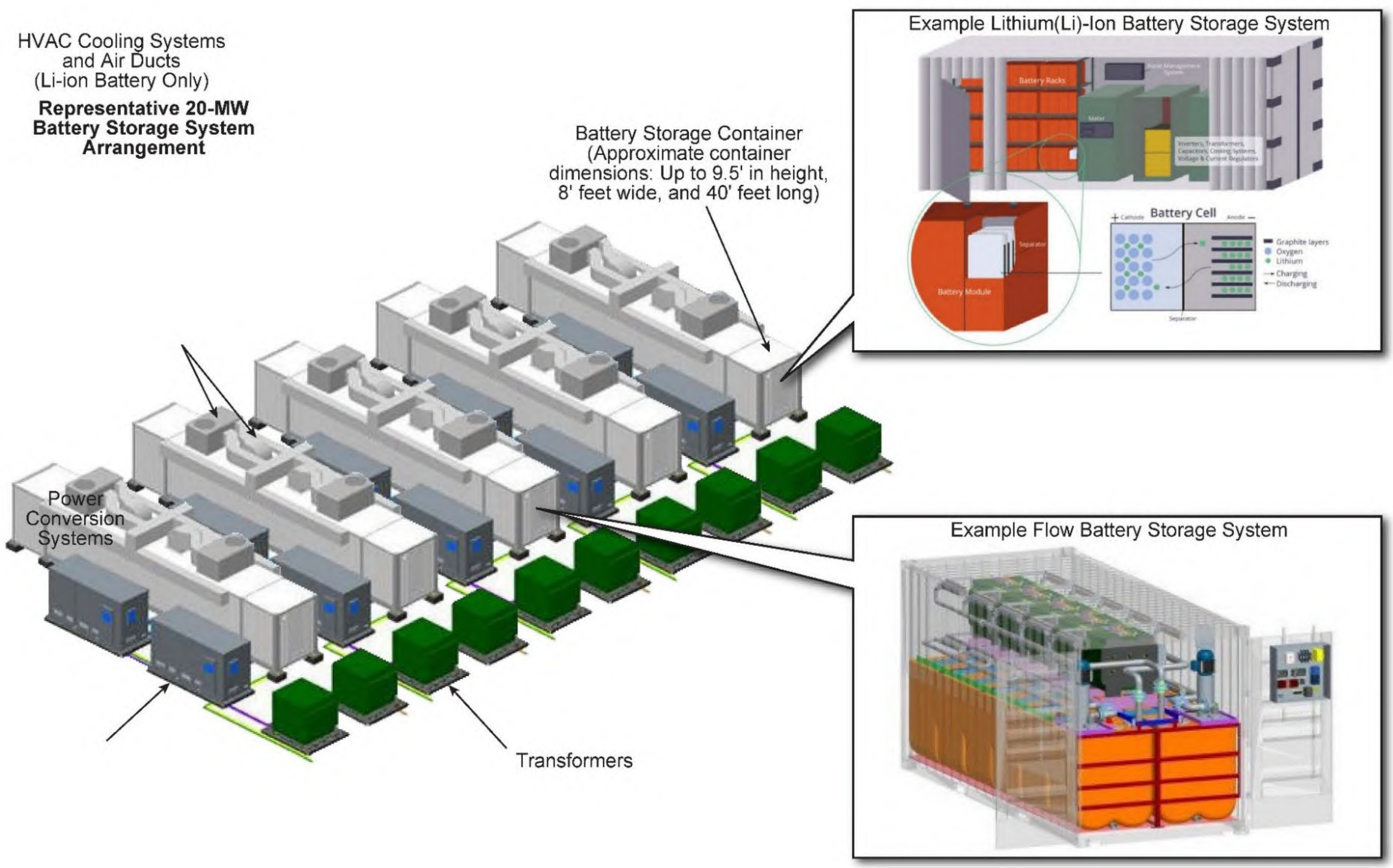



| ITEM | QTY | DESCRIPTION |
|---|---|---|
| TG-27F | 10 | TRANSMISSION DEADEND & GUYING TEE ASSEMBLY (DOUBLE) |
| TG-57S | 1 | SPAN GUY POLE TIE – DEADEND STRUCTURE |
| TM-1 | 6 | 230-KV INS. TENSION DEADEND ASSEMBLY |
| TM-3B | 3 | 230-KV HORIZONTAL JUMPER INSULATOR ASSEMBLY |
| TM-4E | 2 | SHIELD WIRE DEADEND ASSEMBLY |
| TM-F-DE2 | 1 | FIBEROPTIC DEADEND ASSEMBLY (DOUBLE) |

## Bakeoven Solar Project

**Figure B-9**
**Typical 230-kV Transition Support Structure**

AVANGRID RENEWABLES




**Bakeoven Solar Project**

**Figure B-10**
**Representative 20-MW Lithium (Li)-ion or**
**Flow Battery Storage System Arrangement**

AVANGRID RENEWABLES