

Renewable Electricity

Procurement of renewable electricity from sources like wind and solar offers an immediate and significant opportunity to reduce greenhouse gas (GHG) emissions from ODOT's retail electricity purchases. Like renewable diesel, renewable electricity is a "drop-in" energy source, meaning it does not require any capital or operational upgrades to access the benefits. There are various options in the marketplace to procure renewable electricity supply, including:

- Development of on-site renewable generation (e.g. photovoltaic (PV) solar)
- Participation in a community solar program
- Participation in local utility green power programs
- Power purchase agreements directly with the power generators (direct access)
- Contract with an independent broker to purchase unbundled renewable energy certificates/credits (RECs)

ODOT led the nation in innovative on-site renewable generation through Oregon's Solar Highway Program, which utilizes highway right-of-way space for installation of solar PV arrays. Installation of owned-renewable electricity generation requires an appropriate area – either roof space or open land area – and the economics favor installing as large a system as possible. On-site solar installments can carry large upfront costs and require additional maintenance costs, which can be a barrier for many. Rooftop and additional right-of-way solar installations also offer future opportunities for ODOT. While these installations generate GHG-free electricity for ODOT, significant developments would be needed to match ODOT's electricity consumption.¹ If considered, project locations should focus on Portland General Electric (PGE) and Pacific Power territories since these investor-owned utilities continue to offer net metering agreements that are limited in consumer-owned utility districts.

Several ODOT maintenance districts are pursuing community solar, which offers customers of PGE, Pacific Power and Idaho Power the option to subscribe to an off-site solar energy project and receive clean energy credits on their utility bill. A monthly subscription fee is required. ODOT is a unique customer in that there are various subscription rates assigned to different meters - not all rates can subscribe to a community solar project. Program fees vary based on the project and program. Initial inquiries indicate a cost-neutral or even reduced costs for ODOT to participate in community solar.

Participation in Oregon utility green power programs (e.g., Pacific Power's BlueSky program) offer a relatively simple way to procure large quantities of renewable electricity without the cost and labor burden of owning and maintaining onsite generation. These programs also enhance and financially support Oregon utilities as they make the transition to 100% renewable electricity by 2040 – per the requirements of Oregon HB2021.² Depending on total annual load and related plans for renewable purchases, the additional cost for renewable power may be discounted for bulk purchases. See the following sections for more details on costs and program administration.

¹ ODOT's existing onsite solar arrays only represent an estimated 5% of the agency's annual electricity use.

² <https://olis.oregonlegislature.gov/liz/2021R1/Downloads/MeasureDocument/HB2021/Enrolled>

RECs may also be purchased “unbundled” from a variety of brokers operating in the Northwest (e.g. 3Degrees or Native Energy). Purchase of these products transfer ownership of the environmental benefit to the buyer but may not originate from a local project and therefore may not support Oregon’s transition to renewable electricity as directly as participation in a utility sponsored program. The benefit of this approach is potentially lower costs for

SUPER ACTION

Supporting the rapid development of renewable electricity generation is a foundational action to reach global climate goals and is a necessary precursor to maximize climate benefits from future equipment upgrades – such as electric vehicles and electrification of building systems.

the renewable environmental attribute. If this approach is taken, it is highly recommended that unbundled REC purchases be required to originate from Oregon-based projects and carry the Center for Resource Solutions' Green-e Energy certification. Unbundled RECs may be purchased from brokers that originate from other regions in the U.S. These RECs may be lower cost, but do not support Oregon’s goals as directly as local development of renewable generation capacity.

Utility customers may also contract with developers for a power purchase agreements to supply dedicated renewable power transmitted and distributed via local utilities. This approach can be challenging to develop and administer, particularly for a geographically distributed organization like ODOT. These agreements are common between generators and industrial or commercial facilities with large, consistent electricity loads in a common geography. The benefit of

these types of agreements is access to large supplies of renewable power potentially at below commercial or meter rates.

It’s important to note that Governor Kate Brown recently signed HB2021 into law, which requires Oregon electric utilities to reduce GHG emissions by 80 percent below baseline emissions levels by 2030, 90 percent below baseline emissions levels by 2035 and 100 percent below baseline emissions levels by 2040.³

Real World Examples

The EPA’s Green Power Partnership is a program that helps organizations, businesses, and governments purchase lower-carbon power. The program lends credibility to green power purchases, provides resources for communicating the benefits of green power to stakeholders, and publicly recognizes organizations for participation. The program also grows the green energy market in the US, ensuring a steady supply of power and continuous investment in lower carbon energy.

The U.S. EPA’s Green Power Partnership’s Top 30 Local Government⁴ rankings as of April 2021 include two Oregon communities:

- City of Portland operations (81% renewable and ranked 12th in the nation)
- City of Hillsboro (93% renewable and ranked 30th)
- Outside of Oregon, examples include Port of Vancouver, Massachusetts Bay Transportation Authority, and Dallas Fort Worth International Airport.⁵

³ Ibid

⁴ <https://www.epa.gov/greenpower/green-power-partnership-top-30-local-government>

⁵ <https://www.epa.gov/greenpower/green-power-partnership-100-green-power-users>

There are a number of state governments involved in the program as well:

- Delaware (50% renewable). Delaware purchases its energy on the open market through brokers, leveraging its large demand to secure attractive rates for supplying its owned buildings with renewables.
- Pennsylvania (40% renewables for government operations).
- Connecticut (13% renewable for government operations).
- California (13% renewable for government operations). California powers its vast array of government services (from jails to administrative buildings) with purchased green power and from onsite generation.
- New Hampshire (12% for government operations).
- Wisconsin (9% for government operations).

Several federal agencies also purchase renewable energy - all purchase between 9 - 13% renewables to power their buildings:

- General Services Administration
- Drug Enforcement Administration
- Centers for Disease Control
- Department of Agriculture

Other Alternatives

- Strategic energy management is already practiced by ODOT and provides a significant precursor action to purchases of renewable electricity. Because renewable electricity may require a premium for purchase in the near-to-midterm, reducing overall electricity consumption and particularly reducing peak electricity demands will reduce energy cost and therefore reduce the premium required for renewable electricity.
- Partner with the Oregon Department of Administrative Services (ODAS) to pursue Direct Access through a price agreement.⁶ Identifying a large-scale renewable generator to supply ODOT with 100% renewable electricity and administering that program across the State of Oregon may be better suited to an agency like ODAS, which focuses on procurement across state agencies.
- Design new buildings to be fully electric and retrofit existing buildings with electric heating (air and water); converting natural gas buildings to electricity allow for 100% of renewable power. Based on interviews with Oregon Department of Energy, electric heat pumps (including water heating) for smaller commercial/public building spaces (e.g., 5,000 square feet or smaller) are viable options now. No technologies are readily available to convert ODOT's existing large commercial spaces that are using natural gas boilers. Fully electric maintenance stations are also not feasible due to operational needs (e.g., quickly melting snow or ice off equipment). Where conversion to electric is not a viable option, focus should be on equipment efficiency upgrades like advanced controls and procurement of renewable natural gas.⁷

⁶ From the Public Utility Commission website: "Under Oregon's Electric Restructuring law, all nonresidential consumers have the ability to purchase electricity from a Public Utility Commission-certified electricity service supplier (ESS) other than their current utility, which is known as Direct Access. Under a Direct Access agreement, the local service provider is responsible for distribution of services, while an electricity service supplier (ESS) would be responsible for the generation and transmission services. More info available here: <https://www.oregon.gov/puc/utilities/Pages/Direct-Access.aspx>

⁷ Barlow School Office Building in Portland switched from a natural gas steam to hydronic boiler system to zonal ductless heat pumps with a high-efficiency heat recovery ventilator. The building was one of the highest natural gas users for office spaces in ODOT's portfolio and now uses no natural gas (overall building energy use intensity is down).

Current Conditions

During fiscal years (FY) 2016 – 2019, ODOT purchased an average of 41,000 MWh of electricity annually from over 40 different electric utilities (see Figure 1). Electricity is used by ODOT to power buildings as well as highway system equipment (i.e., street lighting, ramp meters, traffic signals, radio towers, bridges). ODOT currently practices strategic energy management in its largest facilities by monitoring energy use and upgrading equipment for efficiency. One project of note is the upgrade of highway

lighting in ODOT Region 1 (greater Portland area). This project converted 9,500 lights to efficient LEDs and is estimated to reduce energy consumption by 7,000 MWh per year.⁸ ODOT also generates about 2.1 MWh annually⁹ from onsite PV solar generation from two sites located on ODOT-owned land (Baldock rest area solar array, I-205 / I-5 interchange). ODOT also has solar arrays installed on facilities throughout the state (East Salem Compound, Building Q; Transportation Building, Salem; SE Portland DMV; Lawnfield Bridge Building; Region 4 Headquarters; Pendleton Maintenance Station). Unlike the Baldock and interstate interchange sites, these solar arrays are net metered meaning the local utility reduces the agency's bill equivalent to the amount of electricity added to the grid. These solar arrays are equal to roughly 5% of ODOT's average annual electricity consumption.¹⁰

Two utilities supply almost 70% of ODOT's electricity: PGE is ODOT's largest electricity supplier (40%), followed by Pacific Power (28%). Figure 2, below, depicts two circle graphs: on the left shows the percent of ODOT's total electricity consumption, while the graph on the right shows utility-specific consumption and associated GHG emissions for the two main utilities compared to all others. ODOT's electricity consumption trended downward between FY16-19, decreasing by about 9% between those years. However, the associated GHG emissions did not decrease as much (only a 1% decrease) because of a temporary increase in emissions factors in 2019 from low-carbon electricity suppliers.

Figure 1 - ODOT Electricity Use

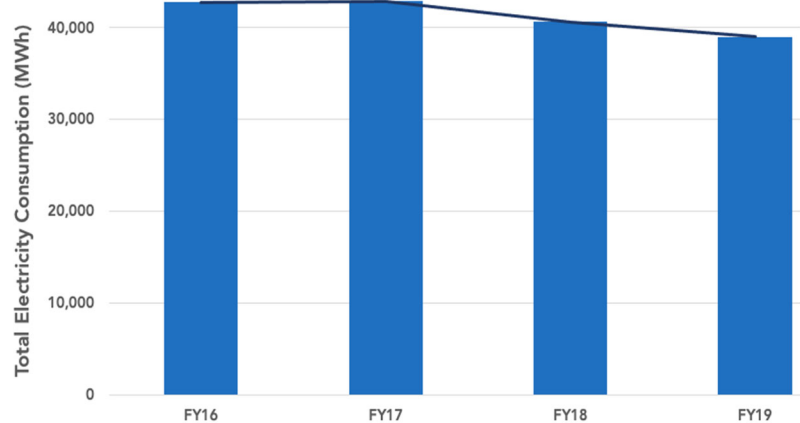
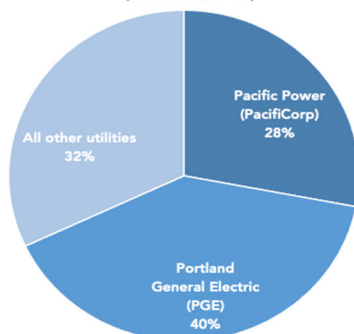
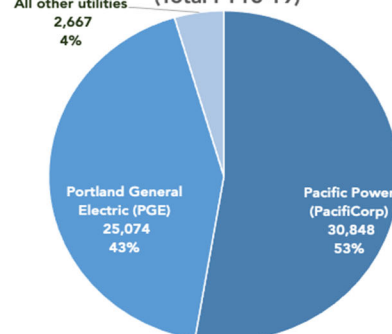


Figure 2 - Electricity Use & Emissions by Utility

Electricity Consumption by Utility, % of total kWh
(Total FY16-19)



Electricity Emissions by Utility, MT CO₂e
(Total FY16-19)



⁸ Email exchange with Ameresco staff 3/2021

⁹ 120,000 kwh from the 105 exchange (number from US Federal Highway Administration <https://www.fhwa.dot.gov/publications/publicroads/12novdec/04.cfm>) and 1.97 million kwh from the Baldock Solar Station (from ODOT's webpage <https://www.oregon.gov/odot/Programs/Pages/Solar-Baldock.aspx>)

¹⁰ From G3C, average annual usage = 141024 MMBTU ≈ 41.3 Million kwh. 2.03/41.3 ≈ 4.9%

PGE and Pacific Power are investor-owned utilities and have significantly higher market-based emissions factors (GHGs/kWh) than other Oregon electric utilities.¹¹ While ODOT purchases about 70% of its total electricity from these two utilities, they make up 95% of ODOT's "owned" GHG emissions from electricity. Both utilities offer 100% renewable purchase options that could quickly reduce this significant source of operational emissions.

Market Study

Availability and Access

Participation in existing utility green power programs offers a near-term option to purchase a renewable electricity supply. These programs are available to commercial customers like ODOT. The following section focuses on costs for participation in PGE and Pacific Power's existing renewable electricity programs since their power generation represents the largest source of ODOT electricity GHG emissions.

Portland General Electric

PGE offers two options for renewable power:

- **Green Future Enterprise** – This option is supported by RECs generated in the Northwest and other wind power sources from the U.S. This option offers flexibility in the scale and duration of participation. The program is typically available for enrollment at any time, but is currently suspended through November 2021 due to lack of REC supply, high demand, and volatile prices in the marketplace.
- **Green Future Impact** – This option is a green tariff that directly funds development of new Pacific Northwest wind and solar facilities. This option requires a long-term power purchase agreement between 10 – 20 years. Longer terms can reduce costs. This program has specific enrollment periods and has sold out quickly in the past.

Pacific Power

BlueSky Renewable Energy – The BlueSky program is also supported by RECs. The program can be aligned with 100% of electricity usage or purchased in 200 kWh blocks. The usage program uses a 50:50 mix of wind and solar, while the block program is 92:5:2:1 of wind, solar, biomass, and geothermal. Pacific Power does not offer a green tariff program like PGE.

Oregon Community Solar Program¹²

Customers of Pacific Power, PGE, and Idaho Power can participate in community solar programs within Oregon. These programs generate solar energy from a central location and share electricity credits amongst multiple owners or subscribers, which offers customers the benefits of solar without actually installing panels themselves. Generally, the program works in the following ways:

1. Identify suitable project(s)
2. Estimate subscription size / eligible meters
3. Sign contract
4. Start receiving credits on monthly bill as soon as project is connected to the grid

¹¹ See Oregon Dept. of Environmental Quality, 2010-2019 – Greenhouse Gas Emissions from Electricity Use. Utility-specific factors found online at <https://www.oregon.gov/deq/aq/programs/Pages/GHG-Emissions.aspx>.

¹² More information about the Oregon Community Solar Project can be found here: <https://www.oregoncsp.org/about/>

Cost

The following section focuses on costs for the aforementioned renewable electricity programs.

Portland General Electric

- **Green Future Enterprise/Choice** - PGE staff report customer interest in RECs has significantly increased recently, which is creating unprecedented price and supply volatility in the REC market. As a result, prices being paid in the market are regularly exceeding the standard prices for commercial customers (\$0.003 per kWh). Given the circumstances of PGE paying more than what customers are being charged, PGE requested regulators temporarily suspend their program for 90 days (as of September 1, 2021). This means PGE will not be enrolling any new customers in its Green Futures Enterprise program until the suspension is lifted. At the time of writing this report, PGE was unable to provide specific costs for ODOT's participation in the program. However, high-level estimates range from \$75,000 - \$120,000 per year to offset roughly 1.5 MW across 10,000 eligible ODOT meters.¹³
- **Green Future Impact** - Participation in the Green Future Impact program requires a long-term contract and ensures the purchased renewable energy is from a regional solar or wind project in Oregon. The initial offering of this program sold out quickly and is not currently available. PGE anticipates opening this program again in the near future (mid-2022) and foresees sign-up opportunities to go quickly. Costs to participate in the initial offering was \$0.001 / kWh for a 15-year contract, in addition to standard rates. There is a 10-year minimum contract period, and up to a 20-year contract to get the best rates. PGE did not share estimates for the anticipated next round of the program.

Pacific Power

- **BlueSky Renewable Energy** – Pacific Power's program is open and available for enrollment. Prices range between \$0.0071 – 0.0075 per kWh. The lower end of the range is the bulk price, if ODOT were to purchase 100% renewables. The higher-end of the range is for a purchase equal to 25% of annual use.

Oregon Community Solar Program

- Community solar is unique in that it actually does not cost extra to subscribe. The program is partially funded through rate-payers of the aforementioned utilities, which reduces costs for subscribers. At the time of writing, ODOT was quoted a bill savings of approximately 8%. While the savings is not guaranteed, an increase in costs is not possible due to simply subscribing to the program. There are cancellation fees (\$40 per account), which may be waived if advanced notice is given (more than 30 days).

Making the Transition (Lessons Learned)

Participating in one of the renewable electricity programs described above:

- Offers a relatively simple climate action to transition to a low-to-zero carbon energy source without the need to upgrade existing equipment.
- Allows the user to procure up to 100% renewable electricity without large-scale onsite development of renewable electricity generation equipment and capacity.

¹³ Not all subscription rates are eligible to participate in a REC program like Green Futures Enterprise/Choice.

Staff time is required:

- To prepare and understand current usage and renewable electricity goals prior to negotiating a price with local electric utilities.
- To administer and maintain the program. That said, electric utilities sometimes provide technical support for program design and annual accounting support and summaries.

Recommendations to better position ODOT for future opportunities:

- Prepare for PGE's next Green Future Impact offering. The last round sold out within one day. Best to understand the application requirements and have the application prepared well ahead of time to maximize the chance of success.
- Work with the utilities to have specific utility staff assigned to ODOT's account to support future data collection and organization toward climate action.

GHG Benefit & Cost Impacts

Life Cycle Considerations

Greenhouse gas pollution from tailpipes is often the focus when considering emissions from vehicles. But there are also GHG emissions associated with the production of fuels used to generate electricity (e.g. natural gas, coal, etc.). As power supplies move toward renewables like wind and solar, upstream production emissions are also significantly reduced.

GHG Impacts

This section focuses on participation in existing utility or Oregon Community Solar programs. Other options are available, such as development of owned-solar or direct access, but these options require feasibility studies outside the scope of this work to evaluate potential benefits and costs. One-hundred percent participation in Pacific Power's Blue Sky and/or Oregon Community Solar programs would reduce ODOT's electricity emissions by 51% (7,500 MT CO₂e), which is 14% of ODOT's "owned" Scope 1 and Scope 2 emissions (55,000 MT CO₂e total). Full participation in one of PGE's programs would add another 43% reduction, for a total decrease of 26% of owned emissions.

Cost Impacts

Table 1 - Additional Cost Programs

Program	Unit Price	Average Annual Use (MWh)	Average Annual Cost (\$)	Annual GHG Reductions (MT CO2e)	Price per MT of Reduction
Portland General Electric – Green Enterprise	\$0.003 per kWh ¹⁴	16,500	\$49,500	6,270	\$7.90
Portland General Electric – Green Future Impact	\$0.001 per kWh	16,500	\$16,500	6,270	\$2.60
Pacific Power – BlueSky	\$0.0071 - \$0.0075 per kWh ¹⁵	11,600 (100% of use); 2,900 (25% of use)	\$82,360 (100%); \$21,750 (25%)	7,710 (100%); 1,930 (25%)	\$10.70 (100%); \$11.30 (25%)

Note: ODOT's electric meters are on various rate schedules and not all are eligible to participate in the programs identified above.

Table 2 - Cost-Free Programs

Program	Unit Price	Average Annual Use (MWh)	Average Annual Savings (\$)	Annual GHG Reductions (MT CO2e)	Price per MT of Reduction
Community solar	\$0.08951 per kWh (subscription rate) \$-0.0977 per kWh (bill credit) *Estimated savings of 8%	2,000 MWh (about 18% of total PAC purchase in FY2019, 10,900 MWh)	\$16,492 (annual savings from Pacific Power bill)	1,388	-\$12 (negative values indicates a financial savings in addition to GHG reduction)

Note: Due to the subscription model of community solar, participating in the program fully (matching 100% of electric load) is not an option. The rates and available amounts provided are estimates received November 2021.

¹⁴ Price information provided by PGE staff with the acknowledgement this program is currently suspended and prices may increase due to current increased market demand and related price volatility for renewable power.

¹⁵ Price information provided by Pacific Power staff. Lower end of the cost range is for purchase equal to 100% of total use and the higher cost is for 25% of use.

Direct access power purchase agreements. Oregon allows all non-residential customers to purchase electricity from a Public Utility Commission certified electricity service provider (ESS) other than their current utility. This option was researched as part of the project, but is complex beyond the project scope. Initial research found that while direct access could provide cost savings for ODOT there is also risk that costs would increase – depending on the terms of the agreement and daily flux in market prices. This option would require significant ODOT staff time to evaluate and select an ESS provider(s), come to purchase agreement terms, and manage the agreement over time. This option may be considered over the mid-term, but in the near term existing utility program and participation in Oregon’s Community Solar program are preferable in that they will require less staff time and program risk.

Co-Benefits

- Maximizes GHG benefits from related actions (e.g. electrification of vehicles and buildings).
- Does not require new equipment or retrofits.
- Creation of regional green jobs to support development of renewable generation.
- Enhanced organizational image for support of this important climate action and energy system transition.

Recommendations

- Continue implementation of cost-effective energy efficiency and conservation projects to maintain, or ideally decrease, existing load. This precursor action will reduce total energy need and costs for energy and additional premiums for renewable electricity products.
- Subscribe to community solar programs as much and as quickly as possible. Bill credits are likely to be less lucrative in the near future.
- Prepare application for PGE’s next Green Future Impacts offering. This program is only offered during defined enrollment periods (next offering likely to be mid-2022).
- Participate in Pacific Power’s BlueSky program and transition to 100% renewables. Adjust purchases over time to account for existing renewables in retail products, the benefits of Oregon’s existing Renewable Portfolio Standard (RPS) and the requirements of HB 2021 (i.e., decrease purchases over time as renewable mix on grid increases).
- Participate in PGE’s Enterprise Choice program as soon as the program opens for new enrollment (as soon as December 2021). Adjust purchases over time, as described above.
- Identify ODOT-owned facilities and land that present economically feasible opportunities for onsite solar PV development.
- Explore Direct Access, in partnership with DAS, to identify and potentially contract directly with a renewable electricity generator.