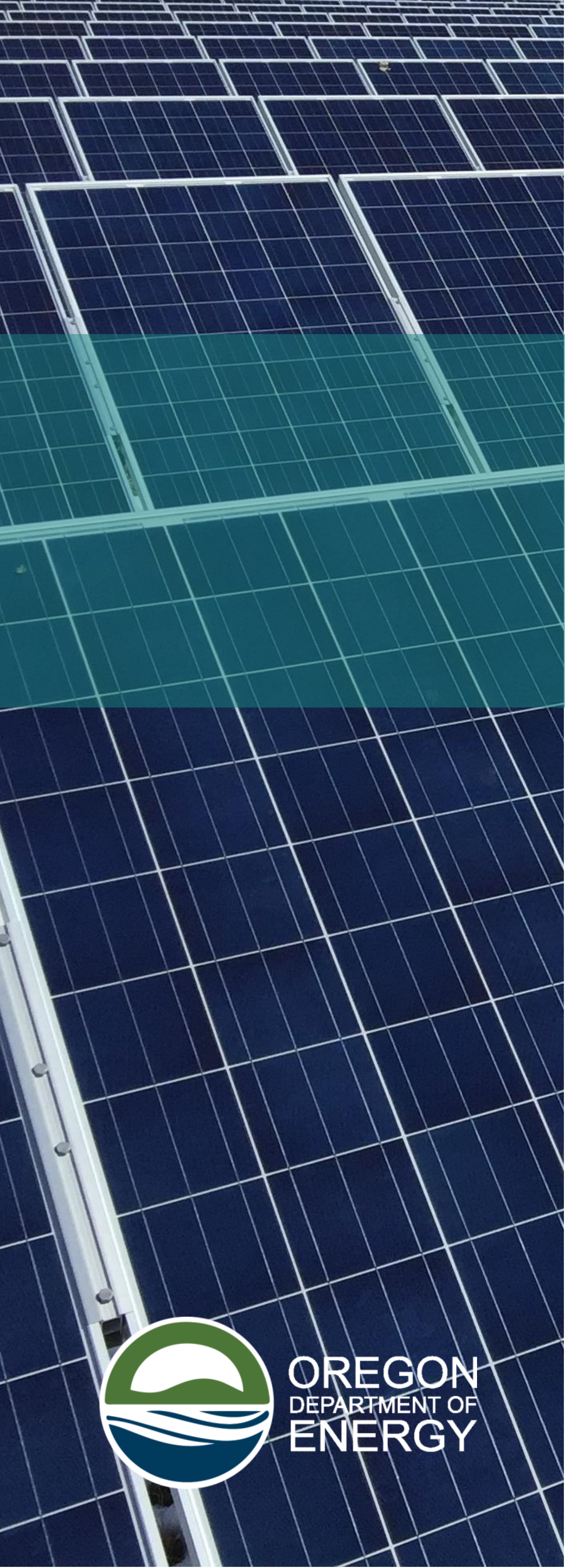
For meeting of: March 21, 2023
Agenda Item No.: 6.1



STUDY ON SMALL-SCALE AND COMMUNITY-BASED RENEWABLE ENERGY PROJECTS

Submitted to the

OREGON LEGISLATURE

by the

OREGON DEPARTMENT OF ENERGY

September 2022

2022 SMALL-SCALE AND COMMUNITY-BASED RENEWABLE ENERGY PROJECTS STUDY

Lead Author: Stephanie Boles

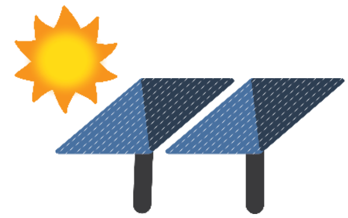
Contributing Authors: John Cornwell, Rob Del Mar, Jessica Reichers, and Adam Schultz

Outreach and Engagement Support: Stacey Heuberger**,** Linda Ross, Ruchi Sadhir, and Christy Splitt

Design and Publication: Jennifer Kalez and Erica Hertzsch

Special thank you to the support team at the Oregon Department of Energy for making this work possible.

EXECUTIVE SUMMARY



The Small-Scale and Community-Based Renewable Energy Projects Study provides foundational information to understand the landscape of small-scale and community-based renewable energy projects. Section 18 of HB 2021 directed the Oregon Department of Energy to convene a diverse workgroup of stakeholders to examine opportunities to encourage development of and address barriers to small-scale and community-based renewable energy projects. The workgroup found that these projects often have unique characteristics and outcomes that are dependent on the availability of project development expertise, access to financing and funding, and expectations of consumers. The information provided in this study is a collaboration of background information provided by ODOE and the workgroup's broad assessment of how small-scale and community-based renewable energy projects can contribute to economic development, provide local energy resilience, and support Oregon's clean energy goals.

To support study development, ODOE convened four workshops to discuss: (1) ownership and access; (2) opportunities and barriers; (3) benefits, costs, and rate impacts; and (4) recommendations for small-scale and community-based renewable energy projects in Oregon. ODOE conducted a literature review on the topics to be discussed to prepare for the workshops and meet the study's legislative directive. This largely consisted of research on reports, studies, and analyses from U.S. Department of Energy laboratories, other data, and market research. For each of the four workshops, ODOE invited guest speakers with direct experience and perspectives on the topics being discussed. This informed stakeholder discussion for each workshop by providing first-hand knowledge and provided workshop members an opportunity to ask questions to better understand the opportunities and barriers to small-scale or community renewable energy project development.

Overall, the workgroup members determined that small-scale projects can help Oregon achieve important goals, such as improving equitable access to clean energy, making more efficient use of state land resources, supporting community energy resilience, and increasing local economic performance.

What is Resilience?

Resilience is the ability of power systems to **withstand and rapidly restore power delivery** to customers following non-routine disruptions of severe impact or duration. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring events such as earthquakes or catastrophic wildfires.

When considering the resilience of the power sector, utilities necessarily focus on the resilience of the power grid itself to withstand the effects of, or recover from, severe events that might disrupt service. Many other stakeholders, however, focus on the concept of community energy resilience – the ability of the community to provide power during an outage, particularly to support essential services. This latter concept, community energy resilience, was the primary focus of the workgroup when considering unique benefits and opportunities.

While large-scale projects will meet the bulk of Oregon's future energy needs, small-scale and community-based renewable energy projects also have a role in achieving Oregon's clean energy goals. These projects can deliver additional unique benefits in some circumstances, including the potential to create local socio-economic value, improve community energy resilience, and provide broader firsthand experience with renewable energy projects. Small-scale projects can also have a smaller land-use impact on natural resources, working lands, and habitats.

Small-scale and community-based projects may offer opportunities to address energy inequities. Historically, communities of color, indigenous communities, rural, and low-income communities have not been able to access small-scale and community-based renewable energy projects.[1] While large-scale renewable energy projects produce clean power at economies of scale that greatly reduce greenhouse gas emissions and mitigate the effects of climate change for all, small-scale projects may have additional benefits of improving local energy resilience, local control over energy choices, and local job and infrastructure investments, among others. These unique benefits of small-scale and community-based projects accrue to the project owners. Today, uptake of customer-sited clean energy technologies accrues disproportionately to middle- and high-income households in the U.S.

Beyond project ownership, local communities can benefit from local energy generation resources. Small-scale projects can create opportunities for local energy skills, jobs, and awareness and will involve community members in decision-making about energy choices and management. Capturing opportunities to develop local energy resources—through energy efficiency or using renewable energy— is more likely if there are businesses, organizations, government agencies, or individuals that have the knowledge and experience to lead, manage, and implement projects and programs. Although these energy opportunities are available in every community, many lack the local resources to plan for, develop, and maintain these facilities, so local involvement in these projects is essential to build this knowledge. Enabling the sharing of this information with other communities is critical to expanding and accelerating community energy efforts. Financing can also be a major barrier to the development of small-scale or community-based projects, because existing financing instruments and institutions may not have experience with projects that involve multiple ownership parties or atypical organizations.

Informed by the literature review and multiple discussions, workgroup members discussed ideas that could bolster small-scale and community-based renewable energy project benefits for Oregonians. While not every idea was supported by all workgroup members, some garnered wider agreement. For example, many workgroup members supported grant-based subsidies to assist communities, small businesses, Tribes, and nonprofit organizations to plan, develop, and build renewable energy projects.

Additionally, many workgroup members supported simplifying permitting and siting for smaller projects, as well as developing model codes for counties and municipalities. Many also suggested clarifying the state's long-term goals regarding renewable energy, including specifically the goals related to small-scale and community-based projects. This would enable utilities, municipalities, Tribes, and other interested parties to better plan for these types of projects. Many workgroup members also suggested more transparency surrounding the location of existing excess transmission and interconnection capacity, existing and proposed projects, project costs, and project attributes to assist developers with planning.

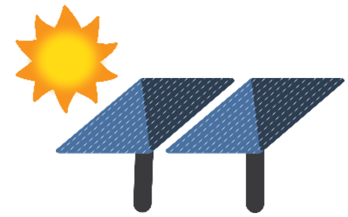
The complete Small-Scale and Community Renewable Energy Projects Study is available online: https://www.oregon.gov/energy/Data-and-Reports/Pages/SSREP-Study.aspx

TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... **i**
SECTION I: OREGON DEPARTMENT OF ENERGY **1**
STUDY DEVELOPMENT 1
Workgroup Structure and Members 2
Timeline 3
CLEAN ENERGY BACKGROUND 3
Definitions 5
SMALL-SCALE AND COMMUNITY-BASED RENEWABLE ENERGY PROJECTS IN OREGON 6
EXISTING POLICY 8
FOUNDATIONAL OVERVIEW 13
Ownership 14
Accessibility 15
Opportunities and Barriers 17
BENEFITS, COSTS, AND RATE IMPACTS 18
Benefits 18
Costs 23
Rate Impacts 27
SECTION II. CONTRIBUTIONS OF WORKGROUP MEMBERS **29**
KEY TAKEAWAYS FROM WORKGROUP MEMBERS 29
WORKGROUP MEMBER RECOMMENDATIONS 33
DISCUSSION OF WORKGROUP MEMBERS 34
SECTION III. CONCLUSION **43**
REFERENCES **44**

SECTION I: OREGON DEPARTMENT OF ENERGY

HB 2021 (2021) directed the Oregon Department of Energy to convene a workgroup to examine opportunities to encourage the development of small-scale and community-based renewable energy projects, including how they can contribute to economic development and local energy resilience. As a part of the state's major clean energy bill, the Small-Scale and Community-Based Renewable Energy Projects Study supports the broader goal to achieve clean energy targets in Oregon.



STUDY DEVELOPMENT

The goal of the HB 2021 Study on Small-Scale and Community-Based Renewable Energy Projects was to examine opportunities to encourage development of **small-scale** and **community-based** renewable energy projects by convening a workgroup of decisionmakers and stakeholders. In particular, the workgroup was required to consider how these projects can contribute to economic development and local energy resilience and to better understand the role of these projects in Oregon's equitable clean energy transition. Furthermore, the purpose of the workgroup was to consider factors related to development of these projects from the perspectives of the diverse range of stakeholders in Oregon's energy landscape.

The legislature identified specific topics for the workgroup to explore:

- Opportunities and barriers to development of small-scale and community-based renewable energy projects
- Opportunities and potential models for diverse access and ownership of small-scale and community-based renewable energy projects in Oregon.
- Economic, resilience, and other benefits and costs of small-scale and community-based renewable energy projects
- Potential rate impacts of development of small-scale and community-based renewable energy projects in Oregon

Workgroup Structure and Members

Section 18 of HB 2021 directed the Oregon Department of Energy to convene a diverse workgroup of stakeholders to examine opportunities to encourage development of small-scale and community-based renewable energy projects that can contribute to economic development and local energy resilience.

The legislation specified that the workgroup include:

- One state representative appointed by the Speaker of the House
- One senator appointed by the President of the Senate
- Individuals who represent:
    - Renewable energy developers
    - Investor-owned electric utilities in this state
    - Consumer-owned utilities in this state
    - Electricity service suppliers
    - Residential, commercial, and industrial rate payers
    - Cities and counties
    - Tribal governments
    - Business Oregon
    - The Department of Land Conservation and Development
    - The renewable energy workforce
    - Environmental justice communities
    - The Public Utility Commission
    - The Public Purpose Fund Administrator described in ORS 470.555
    - The Bonneville Power Administration

Based on the above guidance the workgroup members were:

- Senator Michael Dembrow
- Representative Mark Owens
- Allie Rosenbluth, Rogue Climate
- Angela Crowley-Koch, Oregon Solar + Storage Industries Association
- Bob Jenks, Oregon Citizens' Utility Board
- Dan Orzech, Oregon Clean Power Cooperative
- Dave Moldal, Energy Trust of Oregon[1]
- Diane Henkels, Small Business Utility Advocates
- Erik Anderson, PacifiCorp
- Heidi Hawkins, Constellation
- Jaimes Valdez, Portland Bureau of Planning and Sustainability – Portland Clean Energy Fund
- Jimmy Lindsay, Portland General Electric
- Jon Jinings, Oregon Department of Land Conservation and Development
- Julie Peacock, Bonneville Power Administration
- Kacia Brockman, Oregon Public Utility Commission
- Kyle Roadman, Emerald People's Utility District
- Marc Patterson, Idaho Power
- Mark Nystrom, Lane County Public Works
- Mike McArthur, Community Renewable Energy Association
- Natalie Rogers, City of Milwaukie
- Nikita Daryanani, Coalition of Communities of Color

[1] Member did not make policy recommendations.

- Oriana Magnera, Verde
- Ranfis Giannettino-Villatoro, BlueGreen Alliance
- Ryan Davies, Central Electric Coop
- Steve Uffelman, City of Prineville
- Tom McBartlett, City of Ashland Electric Utility
- Will Van Vactor, Crook County
- Maggie Tallmadge, Navajo Power

Based on the workgroup's findings, ODOE produced this report describing the status and trends for small-scale renewable energy development and providing suggestions identified by workgroup members.

Timeline

Based on the requirements of HB 2021 outlined above, ODOE convened the following workshops to engage workgroup members on key issues:

December 2021:	Form Workgroup and Hold Kick-Off Meeting
April 28, 2022:	Advisory Committee Workshop #1: Ownership & Access
June 3, 2022:	Advisory Committee Workshop #2: Opportunities & Barriers
June 28, 2022:	Advisory Committee Workshop #3: Economic, Resilience, Rate, & Other Impacts, Benefits, and Costs
July 28, 2022:	Advisory Committee Workshop #4: Project Recap & Possible Recommendations

For each of the four workshops, ODOE invited guest speakers with direct experience and perspectives for the topics being discussed. The intent was to provide real-world information and understanding for the workshop members and provide the opportunity to ask questions and better understand the effects on small-scale or community-renewable energy project development. This information grounded workgroup members with foundational information with which to discuss the relative opportunities and challenges for the topic of each workshop.

ODOE developed this report to document its engagement with the workgroup and characterize the range of suggestions from workgroup members in a report due September 30, 2022. For more information, including extensive background materials and full recordings of the workgroup meetings, visit https://www.oregon.gov/energy/Data-and-Reports/Pages/SSREP-Study.aspx

CLEAN ENERGY BACKGROUND

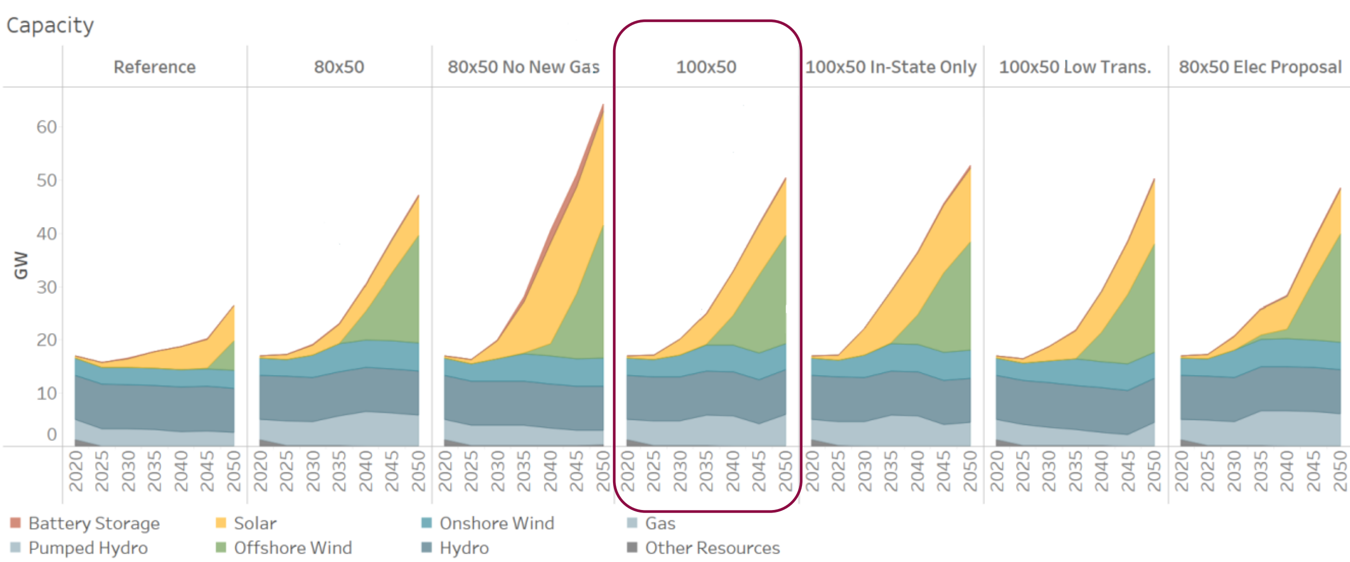
In the coming years, Oregon will set itself on a pathway to achieve its clean energy goals. Today, there is a unique opportunity to engage with stakeholders to identify a preferred pathway to 2050, including assessing and supporting an optimal desired role for small-scale and community-based renewables. These energy projects will have an important role in Oregon's energy future, along with large-scale projects that will meet the bulk of the gap in generation need, and that may help Oregon achieve other important goals – equity, efficient land use, resilience, and increased local economic performance.

States across the U.S. have adopted increasingly aggressive clean energy and climate change policies in recent years.[2] Local governments – including Bend, Eugene, Portland, and Multnomah County in Oregon – are also adopting such policies, often with even more aggressive timelines and goals than those adopted by their respective states.[3] In almost all cases, these policies are intended to achieve significant reductions in economy-wide greenhouse gas emissions by 2050 (sometimes referred to as *deep decarbonization*), including energy efficiency provisions.

While these policies vary in specifics, recent technical analyses find that achieving these targets will require an "unprecedented transition"[4] and "substantial investment"[5] to effect "a transformation of the energy system."[6] This transformation has the potential to boost Oregon's GDP in 2050 by as much as $4 billion,[7] driven by indirect economic and health benefits, but also by redirecting the billions that Oregonians currently spend on fossil fuels (that largely benefit other states) to in-state investments in clean energy.[8]

Significant decisions remain, however, for state policymakers on whether, and to what extent, to encourage or discourage specific technology pathways within this transition to a clean energy economy by mid-century. The necessary deployment of large-scale renewable energy projects – such as wind and solar power projects, or the infrastructure to support lower carbon fuels or renewable hydrogen – further contributes to this wide "turning radius" and the need to take near-term action to achieve mid-century policy goals.[9] The following visual from the *Oregon Clean Energy Pathways* study, for example, illustrates what its modeling identified for different renewable energy resource builds across various scenarios:[10]

Figure 1: *Oregon Clean Energy Pathways Study* scenario models to achieve 100 percent clean electricity and varying levels of deep decarbonization of the economy by 2050



The 100 percent clean energy by 2050 scenario (100x50 scenario in Figure 1 circled in red) identified the following renewable electricity generation resources in Oregon to achieve its policy objectives by 2050:

- **Solar:** From 500 MW in 2020 to 10,550 MW by 2050 (2,000 percent growth)
- **Onshore wind:** From 3,210 MW in 2020 to 4,970 MW in 2050 (55 percent growth)
- **Offshore wind:** From 0 MW in 2020 to 20,250 MW by 2050

In total, this scenario would require a **nearly 10x increase** in the amount of renewable generating capacity installed in Oregon in 2020 by 2050. Put another way, this would require more than 1,000 MW of new renewable energy capacity to become operational in Oregon every year, on average, between 2020 and 2050.

Definitions

Section 18 of HB 2021 directs ODOE to "*convene a workgroup to examine opportunities to encourage development of **small-scale** and **community-based** renewable energy projects in this state that contribute to economic development and local energy resiliency.*" The Legislature used the terms "small-scale" and "community-based" separately in this direction, clearly recognizing a difference between them and directing the workgroup to examine both.

Oregon law provides definitions for both terms:

ORS 469A.210 defines **Small-Scale Renewable Energy Projects** as projects "with a generating capacity of 20 megawatts or less that generate electricity utilizing a type of energy described in ORS 469A.025." PUC Order 21-464 (adopted December 14, 2021) further refines this definition for the purpose of compliance with ORS 469A.210, requiring a small-scale renewable energy project to be an Oregon Renewable Portfolio Standard-approved generator and excluding net-metered projects.

HB 2021 Section 1 defines **Community-Based Renewable Energy** as "one or more renewable energy systems that interconnect to utility distribution or transmission assets and may be combined with microgrids, storage systems or demand response measures, or energy-related infrastructure that promotes climate resiliency or other such measures, and that:

(a) Provide a direct benefit to a particular community through a community-benefits agreement or direct ownership by a local government, nonprofit community organization or federally recognized Tribe; or

(b) Result in increased resiliency or community stability, local jobs, economic development or direct energy cost savings to families and small businesses."

Community-benefits agreements are contracts between a community group(s) and a renewable energy project developer that require the developer to provide specific benefits to the local community. In exchange, the community group must agree to support the project.

Based on the statutory definitions, the Study on Small-Scale and Community-Based Renewable Energy Projects examined project types in two categories:

CATEGORY 1: **Small-Scale Renewable Energy Projects**	**CATEGORY 2:** **Community-Based Renewable Energy Projects**
Eligible projects to meet the ORS469A.210 small-scale renewable energy project capacity standard — specifically, renewable energy projects with a generating capacity of 20 megawatts or less that generate electricity utilizing a type of energy resource eligible under the Oregon Renewable Portfolio Standard and that are eligible to be certified as an RPS-approved generator. The study will not consider net metered projects under this definition.	Renewable energy projects not in Category 1 with a generating capacity of 20 megawatts or less that generate electricity utilizing a type of energy described in ORS 469A.025 that interconnect to utility distribution or transmission assets and that: (a) Provide a direct benefit to a particular community through a community-benefits agreement or direct ownership by a local government, nonprofit community organization or federally recognized Tribe; or (b) Result in increased resiliency or community stability, local jobs, or economic development. The study may consider net metered projects under this definition.
Projects considered in **both categories** may include microgrids, storage systems, or demand response measures, or other energy-related infrastructure that promotes climate resilience. The study will only examine projects located in Oregon as required in HB 2021, Section 18. Definitions are for the Study on Small-Scale and Community-Based Renewable Energy Projects only and is not a definition for any other proceedings or purposes.	

SMALL-SCALE AND COMMUNITY-BASED RENEWABLE ENERGY PROJECTS IN OREGON

Decarbonizing the state’s energy sector will require a coordinated, multi-faceted approach, including replacing carbon-emitting power resources with zero- or low-carbon power resources in addition to continued savings from energy efficiency, improved grid flexibility, deployment of energy storage technologies, and increased regionalization of energy markets. Small-scale and community-based projects will have a role to play in this transition. Beyond their role in contributing to power system decarbonization, small-scale and community-based renewable projects may also provide additional benefits, including local economic development, workforce training, and employment opportunities, improved power system flexibility, and local resilience.

As of year-end 2021, approximately 4,814 megawatts of generating capacity eligible for the state's Renewable Portfolio Standard were operating in Oregon.[11] Of this capacity, approximately 911 megawatts (18.9 percent) were from individual projects less than 20 MW in size.[ii]

Figure 2: Nameplate Capacity of Oregon Renewable Energy Projects by Size Over Time[12]

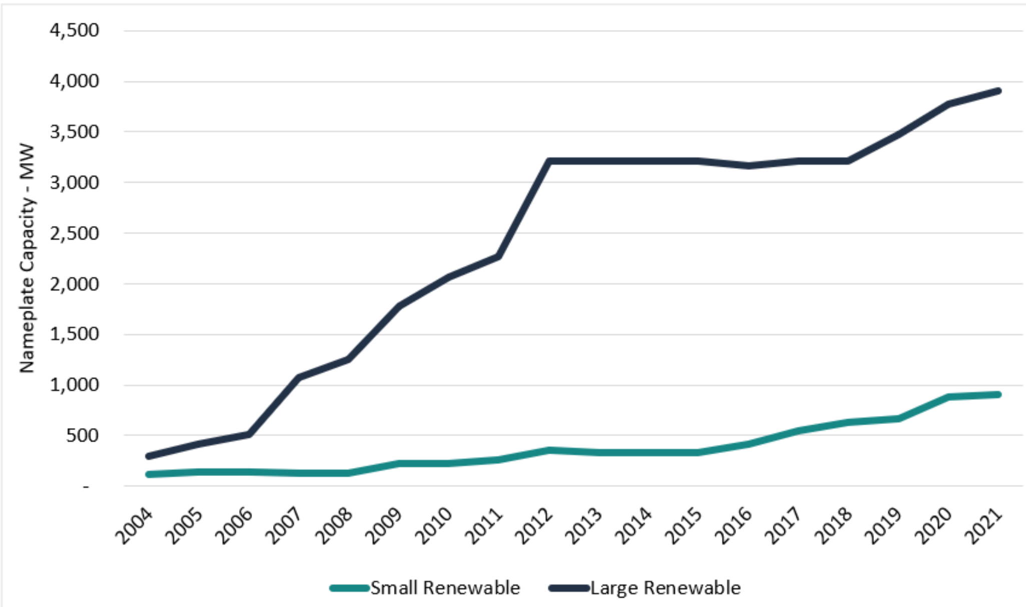
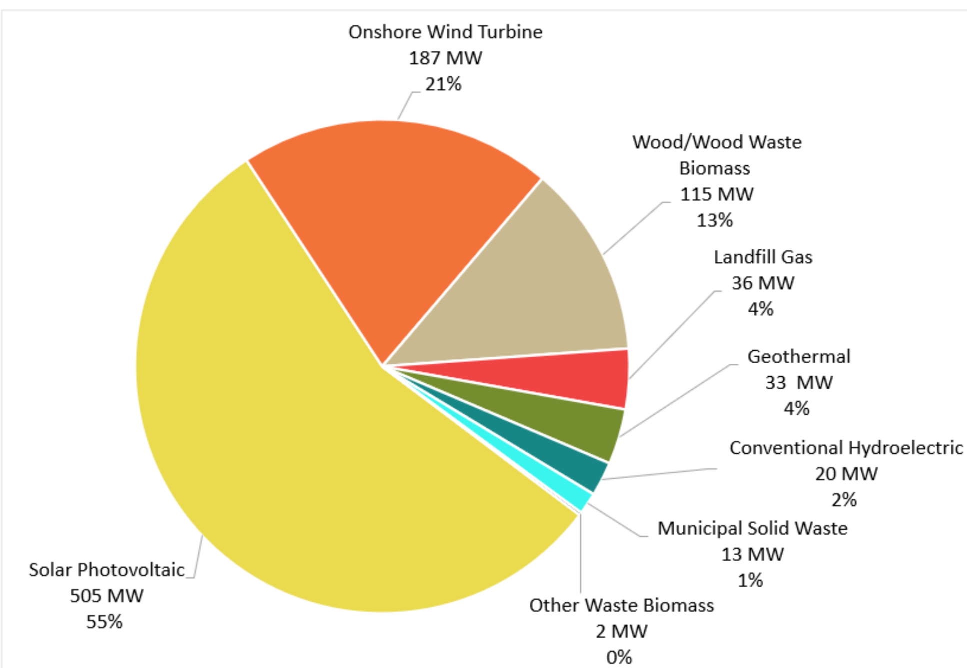


Figure 3: Total Nameplate Capacity of Oregon Renewable Energy Projects Under 20 MW by Type, 2021[13]



[ii] This 977 MW of capacity is not necessarily all eligible for the 10 percent small-scale renewables capacity standard described in ORS469A.210. Rules for the small-scale capacity standard can be found in the OPUC Docket AR-622. This data is from EIA 860.

EXISTING POLICY

Several policies in Oregon affect renewable energy projects. While each of these may not specifically target small-scale and community-based renewable energy projects, many allow for these projects to utilize the policies.

Clean Energy for All Act (HB 2021)

Adopted in July 2021, HB 2021 mandates that 100 percent of the retail electricity supplied by Oregon's large investor-owned utilities and electricity service suppliers will be emissions free by 2040. Along with these targets, the legislature intended HB 2021 "to set a clear course toward local renewable energy development that can provide jobs and boost community economic vitality"[14] and recognized that small-scale and community-based renewable energy projects can serve as critical components of Oregon's economic recovery and resilience efforts in response to the COVID-19 pandemic, wildfires, winter storms, and drought. To this end, HB 2021:

HB 2021 mandates that 100 percent of the retail electricity supplied by Oregon's large investor-owned utilities and electricity service suppliers will be emissions free by 2040

1. Establishes a clean energy planning process requiring investor-owned utilities and electricity service suppliers to examine costs and opportunities of offsetting energy generated from fossil fuels with community-based renewable energy projects.
2. Creates the $50 million community renewable energy projects grant fund for a program at ODOE that supports planning and development of community renewable energy and resilience projects that are 20 MW or smaller in size.
3. Instructs ODOE to conduct the Study of Small-Scale and Community-Based Renewable Energy Projects "to examine opportunities to encourage development of small scale and community-based renewable energy projects in this state that contribute to economic development and local energy resiliency."
4. Sets higher small-scale renewable energy targets by amending ORS 469A.210, requiring Oregon's investor-owned utilities to acquire a larger portion of their aggregate electricity capacity from small-scale renewable energy projects, from 8 percent to 10 percent.
5. Establishes Community-wide Green Tariffs, allowing local governments flexibility in creating their own suite of clean energy resources to serve their communities in coordination with local electric utilities.

Inflation Reduction Act of 2022

In August 2022, Congress passed the Inflation Reduction Act of 2022. It is a $400 billion package containing significant tax and other incentives for renewable energy projects that may provide financial support for the planning and development of small-scale or community-based renewable energy projects.

Financial Assistance for Low-Income and Disadvantaged Communities

Section 60103 in (a)(1) created a $7 billion fund for the EPA "to make grants, on a competitive basis and beginning not later than 180 calendar days after the date of enactment of this section, to States, municipalities, Tribal governments, and eligible recipients for the purposes of providing grants, loans, or other forms of financial assistance, to enable low-income and disadvantaged communities to deploy or benefit from zero-emission technologies, including distributed technologies on residential rooftops, and to carry out other greenhouse gas emissions reduction activities, as determined appropriate by the Administrator in accordance with this section."

Loans and Grants for Transmission

Section 50151 provides an additional $2 billion for the costs of direct loans to non-federal borrowers for "national interest" electric transmission facilities, capped at 80 percent of the project cost. Section 50152 provides $760 million in grants to facilitate the siting of interstate electric transmission lines.

Loans for Rural Utilities

Section 22001 provides an additional $1 billion to the Rural Utility Service for loans to develop renewable energy projects. The Rural Energy for America Program will receive an additional $1 billion, plus $176 million for "underutilized renewable energy technologies." Section 22004 provides the U.S. Department of Agriculture $9.7 billion through the Rural Utility Service for rural electric cooperatives to reduce emissions and purchase renewable energy, zero-emission systems, and make energy efficiency improvements through loans and grants. Section 40001 provides the National Oceanic & Atmospheric Administration with $2.6 billion to help coastal states and Tribes enhance habitat preservation and preparation for extreme storms.

Grants for Greenhouse Gas Reduction Activities

Section 60114 (adding Section 137 to the Clean Air Act) provides planning grants for greenhouse gas air pollution reduction ($250 million) and for implementation of those plans ($4.75 billion). The grants will be distributed to at least one "Eligible Entity" in each state for planning (Section 137(b)), and the implementation grants will be awarded on a competitive basis to "Eligible Entities" defined as: "(A) a State; (B) an air pollution control agency; (C) a municipality; (D) an Indian tribe; and (E) a group of one or more entities listed in subparagraph (A) through (D)"(Section 137(d)(1)).

Block Grants for Environmental and Climate Justice Groups

Section 60201 (adding Section 138 to the Clean Air Act) would provide $2.8 billion through EPA for environmental and climate justice block grants for tribes, local governments, institutions of higher learning and community groups (Environmental Justice Block Grants). EPA would also receive $200 million for technical assistance.

Tax Credits

The 25D investment tax credit for direct ownership of solar property for homeowners is extended and raised to 30 percent, with a step-down to 26 percent in 2033. The White House asserted that the average family would save $9,000 on their electricity bills ($300/year) over the life of the solar systems. Stand-alone storage is now eligible for batteries with a capacity of at least 3 kWh. The credit before IRA for 2022 is 26 percent and it was slated to go down to 22 percent in 2023 and be eliminated starting in 2024.

The business investment tax credit (utility-scale, commercial, industrial, nonprofit, government, and third-party owned residential) is extended and expanded to 30 percent for construction that begins before the end of 2024. For projects beginning after 2024, the ITC is replaced by the new Clean Electricity Investment Credit. The CEITC provides a 30 percent tax credit equal to the eligible costs of qualified projects and energy storage. Under the IRA statute, projects will be able to choose between the ITC or PTC and the provisions are generally for 10 years. Energy storage now qualifies for a credit, where it had not previously qualified (Section 13302(b) and (d)).

The new "direct pay" election (like the Section 1603 under the American Recovery and Reinvestment Act) allows cash rather than a tax credit for non-profits, such as states, local governments, municipal utilities, TVA, Tribes, Alaska Natives, and cooperatively owned utilities. This means that the federal government will make direct payments to these entities. This provision generally applies to most of the credits included under this Act, such as 45 (a) (renewable energy production property), 45Q (CO2 sequestration credit), 45U (zero-emission nuclear power production credit, which is new), 45V (clean hydrogen), 45W (commercial vehicles), 45X (advanced manufacturing production), 45Y (clean electricity production credit) and 45Z (clean fuel production credit). It also includes storage.

Oregon Renewable Portfolio Standard

Oregon's Renewable Portfolio Standard sets a requirement for the amount of renewable resources that will serve Oregon electricity load, establishing specific targets for renewable energy procurement for Oregon's utilities, shown in Table 1.

Table 1. RPS Statutory Minimum Percent of Renewable Energy, Established by SB 1547

	2020	2025	2030	2035	2040
Investor-Owned Utilities and Energy Service Suppliers	20%	27%	35%	45%	50%
Large Consumer-Owned Utilities (COUs) (3% or more of total retail electricity sales)	-	25%	25%	25%	25%
Medium COUs (1.5% to 3% of total retail electricity sales)	-	10%	10%	10%	10%
Small COUs (Less than 1.5% of total retail electricity sales)	-	5%	5%	5%	5%

Small-scale and community-based renewable energy projects may count toward RPS targets. Eligible resources for the Oregon RPS include solar, wind, marine hydrokinetic, geothermal, certain biomass sources, some hydropower, and hydrogen gas. The Oregon RPS restricts hydropower facility eligibility in most cases to facilities built after January 1, 1995 to encourage development of *new* renewable resources. Importantly, this provision results in the region's large-scale legacy hydropower projects being ineligible for compliance with the RPS.

Public Utility Regulatory Policies Act

PURPA is a federal law that provides an avenue for renewable energy development by requiring utilities to purchase output from projects up to 80 MW in size at an avoided cost rate. Established in 1978, the law was enacted to encourage development of non-utility-owned renewable power and cogeneration facilities provided they meet certain requirements. PURPA gives these Qualifying Facilities, or QFs, the right to interconnect to the utility-controlled grid and requires utilities to purchase energy from the projects at an avoided cost rate.[3] The avoided cost rate is intended to reflect the price that the utility would have otherwise had to pay to purchase the energy output from another source. The law delegated significant discretion to individual utilities, and their state regulators, to establish avoided costs rates. In Oregon, certain facilities can qualify for standard contracts, specifically solar facilities smaller than 3 MW and other renewable facilities smaller than 10 MW. Utilities are still required to purchase and interconnect all renewable QFs up to 80 MW in size, albeit via negotiated terms rather than a standard offer contract.

Net Metering

Net metering is a practice where customers who have electricity generation on site will be billed for their net energy consumption – the amount consumed from the grid less the amount generated on site. Since 1999, Oregon law has required electric utilities to offer net metering to Oregon customers for renewable energy systems up to 25 kilowatts in size. There are currently two big differences between net metering policies between investor-owned utilities and consumer-owned utilities.

Ashland Food Co-op installed virtual net metered solar in 2021.

- Generator size: Oregon COUs are only required to offer net metering for systems up to 25 kW, while under OPUC rules, the IOUs allow non-residential system sizes up to 2 MW.
- Treatment of excess generation: Under OPUC rules, the IOUs are required to offer "annualized" net metering while COUs may offer monthly or annualized net metering. Annualized net metering allows a customer to carry a monthly surplus of generation forward to future months. Over the course of a year, excess summer generation may be used to offset consumption in the winter. Monthly net metering requires excess generation to be carried forward to future billing periods and surplus generation is credited to the customer's account based on the utility's avoided cost for energy. Monthly net metering provides less value to the customer because it doesn't allow a customer to carry a summer surplus to winter months. Compensating customers at full retail rates may have upward pressure on rates for nonparticipants.

Oregon statute only requires utilities to offer net metering until the aggregate capacity of all net metered systems in the service territory reaches 0.5 percent of the historic single-hour peak load. Several Oregon utilities have reached this threshold and at least one has discontinued its net metering program.

Community Solar Program

SB 1547[15] (2016) directed the OPUC to establish Oregon's Community Solar program to enable owners and subscribers of a community solar project to share in the costs and benefits of the project. The U.S.

Department of Energy defines community solar as "any solar project or purchasing program, within a geographic area, in which the benefits of a solar project flow to multiple customers such as individuals, businesses, nonprofits, and other groups. In most cases, customers are benefiting from energy generated by solar panels at an off-site array."[16] Community solar offers an opportunity for residential and commercial customers to benefit from small-scale solar energy projects even when they do not have the ability to install it on their property. The program is available to customers of Portland General Electric, Pacific Power, and Idaho Power, and enables subscribers to realize electric bill savings associated with their share of the electricity generated by a community solar facility. SB 1547 requires that at least 10 percent of allocated capacity be made available to low-income customers. While not required by the bill, some of the state's COUs also offer community solar programs.

Direct Access

Enabled by SB 1149 (1999), Direct Access enables certain large commercial and industrial electricity customers to purchase directly from an electricity service supplier rather than from their incumbent electric utility. Electricity service suppliers must be certified by the Oregon Public Utility Commission. Within direct access contracts, the electricity service supplier is responsible for generation and transmission of electricity, but the electric utility retains responsibility for delivery of the power to the retail customer over its distribution network.

Oregon Voluntary Green Energy Programs

The State of Oregon requires private electric utilities to offer voluntary renewable energy rate options to residential and small commercial customers; Pacific Power and Portland General Electric introduced a broad portfolio of renewable resource options to customers in 2002. Pacific Power offers Blue Sky,[17] and Portland General Electric offers Clean Wind, Green Source, and Green Future Solar.[18] These programs purchase renewable energy certificates, often referred to as RECs, and contribute to the costs of various renewable projects in communities around Oregon that might not be developed without the added revenues from the program.

> Portland General Electric's and Pacific Power's Green Energy Programs routinely land **among the top 10 programs** in the nation – for sales, participation, and more – according to the National Renewable Energy Laboratory.

Executive Order 20-04

While EO 20-04 established requirements on several state agencies, one of the most consequential outcomes has been the establishment of the Climate Protection Program by the Department on Environmental Quality. The CPP is a regulatory program launched in January 2022 designed to dramatically reduce economy-wide greenhouse gas emissions by 2050. The program adopts a cap on emissions from fossil fuels (e.g., natural gas, gasoline, diesel, and propane) used throughout the state, with an interim target of a 50 percent reduction by 2035 and a 90 percent reduction by 2050. While this order does not set a requirement for small-scale and community-based renewable energy projects, these projects will count toward the goals of the order.

FOUNDATIONAL OVERVIEW

As part of its work to prepare for the workshops, ODOE conducted a literature review on the topics to be discussed. This largely consisted of research on reports, studies, and analyses from U.S. Department of Energy laboratories, data, and market research. This review was intended to not only provide context for the development of the workshops but also to meet reporting requirements in the study legislative directive. The following is a distillation of ODOE's research and is provided as context for the workgroup findings and workgroup member recommendations.

This Keizer-area solar array's capacity is just under 1 MW.

As Oregon and the nation accelerate the transition to clean energy, there is growing interest in the role small-scale and community-based renewable energy projects could play. This interest is driven in part by a recognition that renewable energy technologies (wind, solar, hydroelectric, geothermal and biomass among others) can provide many environmental, economic, and social benefits. In addition, the scalability for some renewable technologies, innovation in smart technologies and controls, and reduction in costs all contribute to the ability to deploy renewables at smaller scales to potentially unlock some values that larger scale facilities cannot access.[19]

Historically, communities of color, indigenous communities, and rural and low-income communities have not been able to access small-scale and community-based renewable energy projects due to a multitude of factors that also threaten to *continue* historic inequities.[20] The growing disparity is reflected in a disproportionate uptake of customer-sited clean energy technologies by middle- and high-income households in the U.S. The benefits of renewable energy projects (notably, the value of replacing fossil fuels with emissions-free energy) for society are great, regardless of the size and ownership structure of the project. In some circumstances, small-scale and community-based renewable projects can deliver additional unique benefits – including the potential to create local socio-economic value, improve community energy resilience, and provide broader firsthand experience with renewable energy projects.

Many communities and households are unable to directly access small-scale and community-based renewable technologies for a variety of reasons, including high up-front costs, lack of access to credit, split incentives between landlords and tenants, lack of outreach and awareness, historical inequities, and other barriers. These trends have raised concerns of a growing "electrical divide" where certain communities are not able to access the unique benefits that small-scale and community-based renewable energy projects can deliver — and could further disadvantage historically underserved communities.

Advancement in renewable energy technologies and policy priorities have changed the energy landscape, introducing new technical, economic, and social benefits. Many stakeholders contend that it is critical to ensure the equitable distribution of Oregon's clean energy transition, and to improve the ability of communities to access small-scale and community-based projects that can create local socio-economic value, improve community energy resilience, and provide broader firsthand experience with renewable energy projects.

Ownership

There are a wide variety of options to unlock the benefits of renewable energy through different ownership models. These options are dependent on various factors including energy regulations, how projects are structured, and how projects can access financial incentives. For example, solar energy facilities are currently eligible for a federal tax credit equal to 30 percent of the capital cost of the project. Because it is a tax credit, this incentive favors owners, or ownership models, with federal tax liability. However, the Inflation Reduction Act added provisions to allow for some incentives to be "direct pay," thus eliminating the need for federal tax liability in certain cases. Some examples of ownership models include:

> *Community Shared Renewables*: Community shared programs typically enable participants to buy a subscription for output from a centrally located system owned or operated by a third party. The subscription represents a portion of the generation from the community solar project and often translates to savings on the participant's electric bill.
>
> *On-Site, Behind-the-Meter:* An electricity customer installs and owns a renewable project on the customer side of the meter to supply on-site power and thereby displace power purchased from the utility.
>
> *Cooperative Local Ownership:* Local landowners and investors pool their resources into an LLC to own and operate the project while selling output to the local utility to incorporate into its grid mix to serve all customers.
>
> *Flip Structure:* Local investors without tax liability bring in a tax-motivated corporate equity partner to own most of the project for the first ten years (i.e., the period of tax credits), and then "flip" project ownership to the local investor thereafter. It is not yet clear what effect the provisions of the recently adopted Inflation Reduction Act of 2022 will have on interest in using this model for developing renewable projects in the years ahead.
>
> *Municipal-Owned:* A municipality develops and owns an in-front-of-the-meter project, potentially financed with tax-exempt municipal bonds, and sells the power to the utility to incorporate into its grid mix to serve all customers.

These models are more common with small-scale projects than with larger-scale projects. In the case of large-scale renewable projects, the more common model is where a utility directly builds and owns a project or purchases the output from a project owned by a third-party developer (also known as an independent power producer) through a long-term power purchase agreement, or PPA. With these ownership models, all customers of the utility receive the clean energy and carbon benefits from the projects and the cost of acquiring these benefits can be spread accordingly among all utility ratepayers. In contrast, depending on the particular type of small-scale ownership model, these benefits can sometimes accrue only to the subset of utility customers with an ownership stake in the project. While specific customers do not own the resource in these scenarios, they benefit from low-cost resource that is the result of the economies of scale.

Accessibility

Ownership is not the only method of improving access to the benefits of renewable energy projects. Access also includes improving local capacity to develop projects and involving community members in decision-making about energy projects. As detailed in HB 2021, these types of activities could include:

- Early involvement of community-based organizations and public entities during project development.
- Outreach and education to community members to improve understanding of potential projects and opportunities.
- Technical assistance for communities to identify, plan, and construct projects.
- Learning sessions in communities to educate them on benefits and pathways to successful project completion with staffing support and a chance for developers to learn about community needs.
- Funding opportunities for communities to invest in projects.

The policies and models described above help to increase access and ownership opportunities for small-scale renewables, but challenges remain, including:

- *Local Capability and Technical Assistance:* Opportunities to develop local energy resources—through energy efficiency or using renewable energy—are present in every community. Capturing opportunities to develop local energy resources is more likely if there are businesses, organizations, government agencies, or individuals that have the knowledge and experience to lead, manage, and implement projects and programs. Many communities lack such local capability, and building this capacity is critical to expanding and accelerating community energy efforts.
- *Financing:* Many projects, including projects that could provide unique local benefits, may not move forward due to lack of financing. Community energy projects can face additional financial hurdles because existing financing instruments and institutions may not have experience with projects that involve multiple ownership parties or atypical organizations that are frequently encountered in small-scale or community-based projects. These projects typically have more difficulty securing financing and therefore often pay higher costs than larger projects.

In recent years, Oregon has created new programs to help expand opportunities for diverse access and ownership of Small-Scale and Community-Based Renewable Energy Projects, including:

Community Renewable Energy Grant Program: The Oregon Legislature established the Community Renewable Energy Grant Program in 2021 as part of HB 2021. The program provides grants for planning and building community renewable energy and energy resilience projects up to 20 MW in size. Priority for grant funding is given to projects that serve underrepresented communities and that improve community energy resilience. The Community Renewable Energy Grant Program, administered by the Oregon Department of Energy, has two features that specifically support diverse ownership of small-scale and community-based renewable energy projects:

In recent years, Oregon has created new programs to help expand opportunities for diverse access and ownership of Small-Scale and Community-Based Renewable Energy Projects.

1. Grants are only available to public entities such as a federally recognized Oregon Tribe; a city, county, or special district; or a consumer-owned electric utility. Private developers and other non-public entities may partner in a project, but the applicant must be one of these public entities. This provision supports community partnerships and public ownership of projects.
2. Incentives may cover up to 100 percent of project costs, including planning and development. This provision enables projects to be financed without the need for private tax equity partners to leverage the federal investment tax credit.

ODOE launched the Community Renewable Energy Grant program in March 2022. More than 60 applications, representing communities across Oregon, were submitted in the first round of fund that closed on July 10. Additional rounds of funding will follow in the fall of 2022 and in 2023.

Oregon Community Solar Program: As part of Senate Bill 1547 (2016), the Oregon Legislature directed the PUC to establish the Oregon Community Solar Program. Community solar projects enable individuals to share in the costs and benefits of centrally located solar energy projects up to 3 MW in size. Projects must be in an investor-owned utility service territory of Portland General Electric, Pacific Power, or Idaho Power. The Oregon Community Solar Program supports diverse ownership and access to renewables in several ways:

This nearly 3-MW solar array outside Willamina launched Portland General Electric's Green Future Solar Program in 2016. PGE customers could "buy" 1-kW blocks of solar.

1. Solar projects may be cooperatively owned with the owners receiving the clean energy benefits, or have a single owner that sells subscriptions to individual utility customers that receive the clean energy benefits.
2. Virtual net metering enables energy output from a centralized project to be distributed as electric utility bill credits to multiple individual owners or subscribers.
3. The bill credits are valued comparably to residential retail electricity rates. These rates are considerably higher than the avoided cost rates paid to PURPA-qualifying facilities and thus include a ratepayer-funded incentive that the OPUC determined is necessary to make small-scale Community Solar Program projects viable.

Community-wide Green Tariff: Established by HB 2021, Section 22, Community-wide Green Tariffs allow local governments to create their own suite of clean energy resources to serve their communities in coordination with local electric utilities.

Opportunities and Barriers

Renewable energy development is one of many potential uses for Oregon's lands and natural resources. The state has a number of energy, environmental, land use, and economic development policies, statutes, and goals, which interact in complex ways and are sometimes in conflict. Oregon's goals and values are reflected in numerous ways within statute. When it comes to energy facility siting, Oregon's energy goals must be considered alongside a broad set of 19 statewide land use goals,[21] which cover a host of issues, from air and water quality to protection of natural resources and open spaces. The land use goals include specific mandates related to citizen involvement, economic development, transportation, recreation, and energy conservation.

These goals are designed to help implement the mission of the statewide land use planning program, which is to conserve farm land, forest land, coastal resources, and other important natural resources; encourage efficient development; coordinate the planning activities of local governments and state and federal agencies; enhance the state's economy; and reduce the public costs that result from poorly planned development.[22] All city and county land use and development ordinances and comprehensive plan provisions that are used to evaluate local jurisdictional energy projects must align with these state level land use goals.

Small-scale renewable energy projects are approved at the county level. Oregon's Energy Facility Siting Council is responsible for overseeing the siting of most large-scale energy facilities and infrastructure in Oregon.[23] State-level oversight of energy facilities helps ensure a comprehensive, coordinated review that results in projects that are sited, constructed, and operated consistent with the protection of public health and safety, and that are in compliance with energy policy and environmental protection policies of the state.[24] This work includes close collaboration with other state agencies and local and Tribal governments. (More information on EFSC can be found on ODOE's website.[25])

State-jurisdiction energy facilities must meet 14 general standards to receive approval for construction, which includes Oregon's land use goals. There are specific standards for non-generating facilities and for wind. The general standards also cover a range of issues, such as fish and wildlife habitat, historic and cultural resources, recreation, and scenic resources.

Both Oregon's land use laws and the siting process, established in the early 1970s, ensure that important natural, historic, or cultural resources are not negatively affected; and that impacts are minimized if they cannot be avoided. However, at times these programs come into conflict with the state's efforts to increase renewable energy development. For example, it can take significant time and resources for project developers to demonstrate that their projects are consistent with the state's goals and standards, and this can have a dampening effect on development. In designing and implementing land use and energy policy, state policymakers and regulators must balance competing demands of environmental protection and energy development.

All energy generating resources come with trade-offs. It is important to acknowledge the trade-offs and to understand how they may adversely affect communities and the environment. For example, ODOE data shows that photovoltaic facilities in Oregon occupy approximately 6 acres per 1 MW of capacity. Figure 4 uses

Small-scale community renewable projects are approved at the county level.

landmarks in Portland to show the approximate amount of space required for different sized solar projects.

Figure 4: Oregon Small-Scale Ground-Mounted Solar Sizes Compared to Portland Metro Area Geography

Oregon has no comprehensive strategy that identifies an optimal path for developing the renewable energy resources necessary to achieve the state's decarbonization policy objectives. Preliminary technical analyses suggest that the state may need to develop tens of gigawatts (in other words, many thousands of megawatts) of new renewable generating capacity by 2050. This scale of buildout will require significant capital investment, with the potential to put pressure on energy costs for Oregonians. A comprehensive strategy for the state would need to consider how to develop the scale of renewables necessary while balancing other important policy objectives, such as maintaining energy affordability, particularly for low-income communities. Such a strategy, if developed, could also identify the optimal contribution of small-scale and community-based renewables that also recognizes the unique attributes of those projects (e.g., community energy resilience, avoided transmission), while also considering the most cost-effective pathway to achieve the state's economy-wide decarbonization policy objectives.

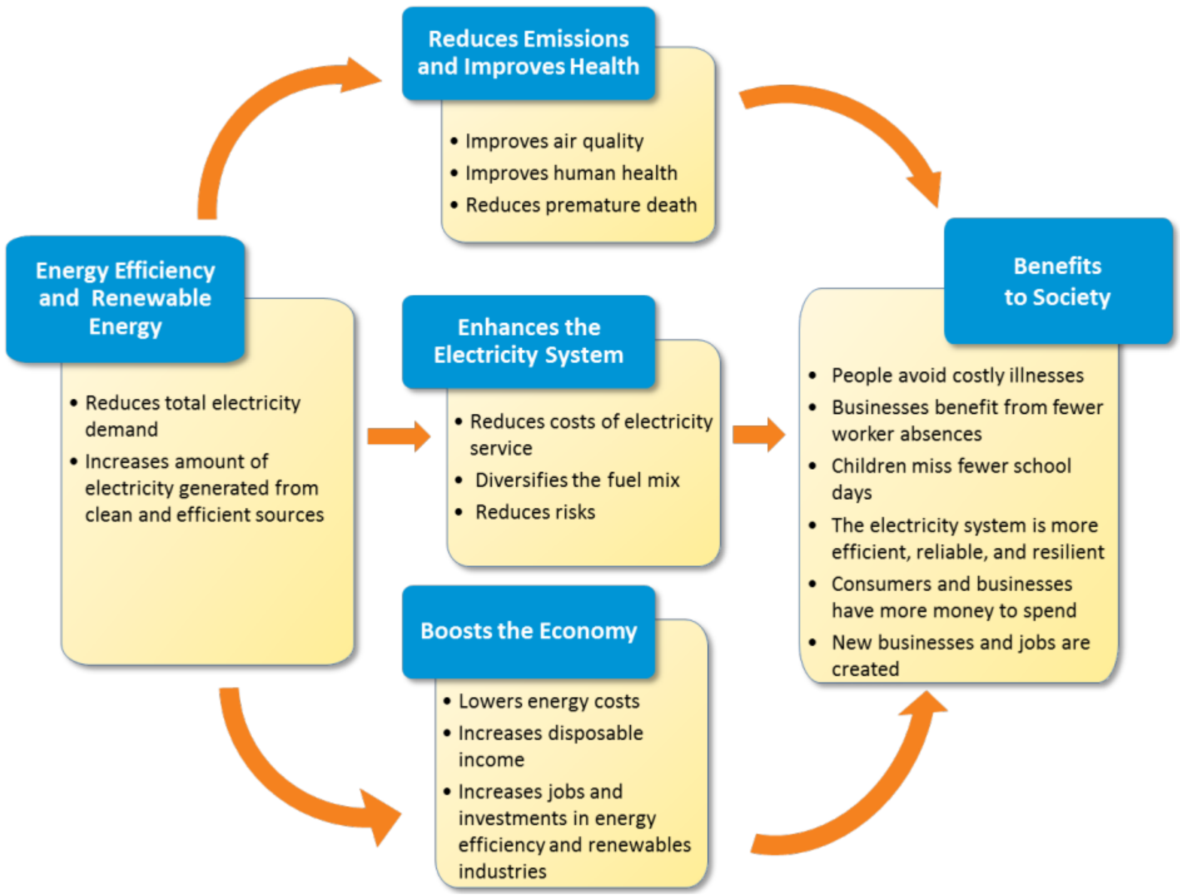
BENEFITS, COSTS, AND RATE IMPACTS

Benefits

Advancement in renewable energy technology and policy priorities have changed the energy landscape, introducing new technical, economic, and social benefits. Important questions include: how we identify and quantify these benefits, how we identify which of these benefits are universal to all clean energy projects (irrespective of size and ownership structure), how we identify which benefits are unique to small-scale and community-based projects, and who receives the benefits.

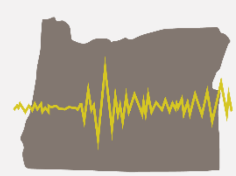
Some benefits of renewable energy projects are obvious: improving clean air and clean water, reducing greenhouse gas emissions, decreasing dependence on foreign energy sources, enhancing local economic development, increasing tax revenue for communities, and providing high-paying jobs in the state.

Figure 5: The Multiple Benefits of Energy Efficiency and Renewable Energy[26]



The key question for this study is: "Which benefits are specifically unique to small-scale and community-based renewable energy projects?" The key unique benefit for small-scale or community-based projects is local resilience. Other benefits include an easier and potentially faster siting process, the opportunity to develop a skilled workforce with knowledge about developing and operating renewable energy projects, as well as a potential for local revenue.

What is Resilience?



Resilience and **reliability** are often used interchangeably, though they have different definitions.   Power system resilience is a concept separate and distinct from power system reliability. Resilience is the ability of power systems to withstand and rapidly restore power delivery to customers following non-routine disruptions of severe impact or duration. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring events such as earthquakes or catastrophic wildfires.

Meanwhile, reliability standards are focused on having an adequate power supply under a reasonably expected range of conditions, including forecasted demand growth, equipment failures, and weather impacts on energy demand, resource availability, and transmission capacity.

When considering the resilience of the power sector, utilities necessarily focus on the resilience of the power grid itself to withstand the effects of, or recover from, severe events that might disrupt service. Many other stakeholders, however, focus on the concept of community energy resilience – the ability of the community to provide power during an outage, particularly to support essential services. This latter concept, community energy resilience, was the primary focus of the workgroup when considering unique benefits and opportunities.

Oregon has many potential events that could lead to loss of power for extended periods of time. Improving community (and grid) resilience can mitigate the consequences of outage events – avoiding or reducing shocks to customers (e.g., decreasing outage times), managing disruptions and providing backup power for critical services, and improving the ability to respond to and recover from events. The Pacific Northwest is subject to several hazards that can affect the electric grid, including a very high risk of a devastating earthquake, as well as climate-induced risks, such as increased frequency of wildfires and damaging storms.

Cascadia Subduction Zone Earthquake

In recent decades, geologists have learned more about the risk to the Pacific Northwest from the Cascadia Subduction Zone—an active seismic fault that parallels the coast about 100 miles offshore.[27] By investigating the geologic record, scientists have found that a rupture of the CSZ occurs approximately every 300 to 400 years, with the last rupture occurring on January 26, 1700 — or 322 years ago as of the publication of this report. The chance of a significant rupture of the CSZ occurring within the next 50 years is expected to be between 15 and 20 percent.[28] The CSZ is capable of producing a megathrust earthquake registering a magnitude of 9.0+ on the Richter Scale with a devastating tsunami to follow. This type of an event has the potential to be similar to the Tohoku earthquake and resulting tsunami that devastated the Sendai region, including the Fukushima nuclear plant, off coastal Japan in March 2011.

The Oregon Resilience Plan, published in 2013, evaluated the expected impacts to the energy sector. The plan identified significant vulnerabilities to the state's Critical Energy Infrastructure (CEI) Hub, a six-mile stretch of the lower Willamette River northwest of downtown Portland where key liquid fuel and natural gas storage and transmission facilities are located, along with a significant concentration of electric transmission facilities, on soils prone to liquefaction. Given the severe impacts expected to the CEI Hub, there will likely be severe disruptions to liquid fuel deliveries across the state. The plan also found that it could take one to three months to restore electric service in the Willamette Valley, and upwards of six months in coastal areas of the state.

Climate-Induced Risks

Climate change poses another unique threat to Oregon's energy systems because it has implications for both resilience and reliability. Climate change will affect the frequency and intensity of short-term extreme events like wildfires, floods, and storm surges in certain parts of the state. It will also affect average weather and hydrologic conditions over longer time horizons that has implications for the region's energy systems.[29]

Reliability – and to some degree resilience – efforts are built around expectations of "routine" disturbances to energy systems that fall within a range of expected conditions based on historical data and experience.[30] Climate change is projected to alter future conditions to an extent where historical trends are no longer reliable, and a "new normal" for what constitutes expected average and extreme conditions will need to be integrated into decision-making.[31] For example, Oregon is projected to experience higher average temperatures and more frequent and longer-lasting extreme heat events in summer, which could affect reliability if utilities are unprepared for higher electricity loads and reduced transmission capacity of power lines. The metrics and standards that measure reliability may need to evolve accordingly to account for these changes.[32]

Smoke from the 2020 Labor Day wildfires. Photo: Oregon Department of Transportation

Reliability and resilience are concepts that exist on a continuum. If once uncommon events begin occurring with sufficient frequency, they might become reliability issues. Climate scientists also expect that climate change is likely to increase wildfire frequency and the amount of area burned in Oregon, which could adversely affect the operation of the electric transmission system. This will heighten the need for enhanced resilience of our energy systems to withstand these non-routine, though increasingly common, events. This is especially the case in coastal and remote regions of Oregon. Regardless, small-scale or community-based renewable projects may play a role in addressing grid reliability and resilience needs.

Adaptive capacity and ability to respond to climate change and disasters are affected by factors including socioeconomic status, certain demographic characteristics, human and social capital (the skills, knowledge, experience, and social cohesion of a community), the condition and accessibility of critical infrastructure, and the availability of institutional resources like emergency response and disaster recovery funding. Some communities and populations will be less able to respond to and recover from a major disruption than others. For example, people with limited economic resources living in areas with deteriorating infrastructure are more likely to experience disproportionate impacts from extreme events such as a severe storm or flood.[33] Community energy resilience and climate adaptation solutions, including small-scale and community-renewable energy projects, should be evaluated to determine if and how their benefits flow to vulnerable communities and specific populations with greater vulnerability, and how project designs could be modified to increase social and environmental equity.

Equity considerations should be evaluated when designing public policies to encourage, or incentivize, investments in community energy resilience. In the electric sector, the reliability of the services provided is expected to be uniform to all customers. Investments that improve community energy resilience, however, will enable certain customers or communities to benefit from more resilient energy supply following a major disruption. This will likely create a scenario where some customers and communities have more resilient energy systems than others.

How can small-scale and community-based renewable energy projects help with resilience?

Distributed Energy Resources that can operate independently from the rest of the grid can improve community energy resilience in the event of a wider disruption to the state's larger energy systems. Several Oregon utilities are deploying distributed energy resources as part of projects that will enhance energy resilience at the local level.

Distributed Energy Resource is an umbrella term used to refer to any resource interconnected to the distribution system of a local utility. While definitions vary on the range of resources included, the Oregon Department of Energy considers DERs to be inclusive of the following:

- Generation sources (e.g., rooftop solar or diesel generators)
- Technologies that modify demand on the distribution system (e.g., energy efficiency and demand response)
- Electric vehicles and associated charging infrastructure; energy storage technologies (e.g., distributed batteries)
- Hardware or software control systems utilized to communicate with the grid and/or to optimize the usage of other DERs

A microgrid is "a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. The key distinguishing characteristic of a microgrid is its ability to connect and disconnect from that larger grid so that it can operate either as a grid-connected resource or in island-mode to deliver power only to local loads."[34]

- *Energy Efficiency:* The first step in designing a microgrid is to evaluate ways to reduce energy demand by improving energy efficiency, and thereby reducing the size and cost of the microgrid.
- *Size and Location:* A microgrid can range in size from a single home or building to an entire campus or even a city. The larger the size, the more complicated and expensive it is to design, build, and control.
- *Isolate Critical Loads:* All system loads should be evaluated to identify and isolate only those that are critical. For example, providing power from a microgrid to a building's heating system may be considered critical, while powering the cooling system may not be.
- *Control Equipment:* The key distinguishing characteristic of any microgrid is its ability to disconnect or "island" itself from the larger electric grid. Advanced control equipment can automatically island a system from the grid and optimize the use of DERs within the microgrid.

- *Technology Selection:* A microgrid can include virtually any type of DER. Additional efficiencies can be achieved through combining technologies. This might include, for example, supplementing an existing diesel generator with a solar plus storage system that can enable the microgrid to supplement its on-site liquid fuel supplies. This will allow the site to operate during some daylight hours without the diesel generator at all and increasing the overall time that the site can function off the grid.

For more information on resilience, see Chapter 5 of the *2018 Biennial Energy Report*.[35]

Solar plus storage microgrid systems can provide significant community resilience benefits by supplying ongoing local power to critical community lifeline services during long-duration grid outages caused by high-impact, low-frequency events such as major seismic events, catastrophic wildfires, or cyberattacks.[36] Microgrids in Oregon are employed in a wide range of situations today and most often rely on diesel or propane generators to provide emergency back-up power in case of a grid outage. These types of systems are especially common with certain types of commercial and industrial customers that are uniquely sensitive to any potential disruption of power supply from the grid. Hospitals are one of the more common examples, where a routine two-hour grid outage caused by a severe storm could have significant adverse consequences for high-risk patients or sensitive medical equipment. Meanwhile, many advanced industrial processes (e.g., semiconductor manufacturing) are also susceptible to substantial adverse consequences resulting from even a minor grid outage and use diesel generators to ensure power reliability.[37] Microgrids offer supplemental power or even a potential alternative to traditional diesel backup power enabling communities to meet policy objectives around local renewable energy targets, carbon reductions, or green jobs. [38]

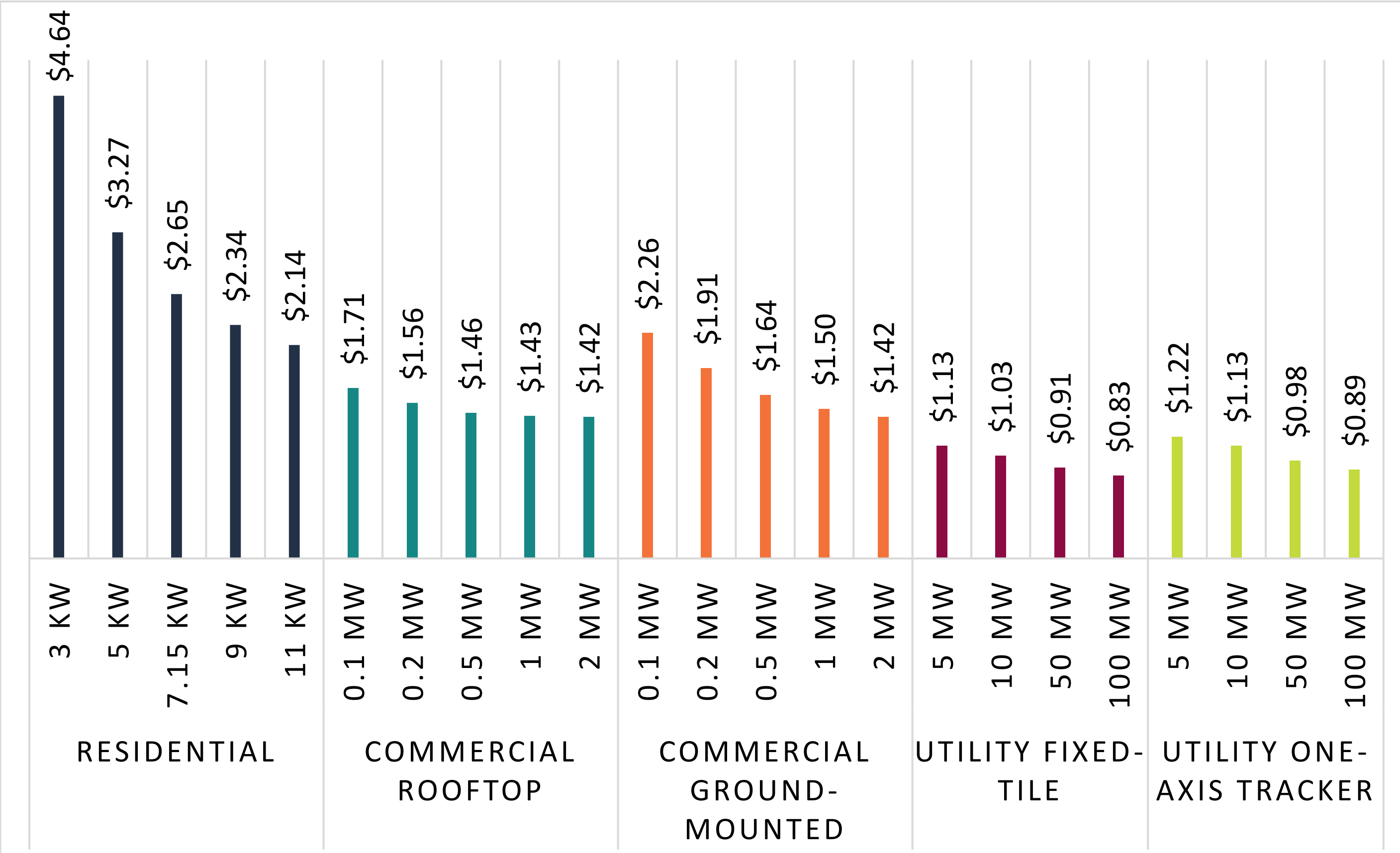
Rapid declines in the cost for solar and battery storage systems have led to an emerging interest in the deployment of microgrid systems based on these technologies, particularly at facilities that provide critical lifeline services to communities. Notable recent deployments in the state include EWEB's project at Howard Elementary School in Eugene[39] that provides power to pump clean water for the community, and PGE's project at the Beaverton Public Safety Center that provides back-up power for this local critical facility.[40] These types of microgrid projects can provide carbon-free power to support the continued delivery of critical lifeline services while avoiding the need to rely on imported liquid fuels or emit carbon.

The Beaverton Public Safety Center has a backup power system that includes a generator, solar energy, and a battery energy storage system.

Costs

Small-scale projects do not benefit from the economies of scale of larger utility-scale projects. Costs of renewable energy projects, in general, decrease as the project gets larger. This is known as an economy of scale, which allows the fixed costs of a project to be spread over more kilowatts, providing a volume discount. To see the scale of this, Figure 6 shows the price per watt for solar projects by size and by type.

Figure 6: Cost Per Watt DC of Solar Installations by Sector and Project Size (Derived from the NREL U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks: Q1 2021)[41]



Additionally, Lawrence Berkeley National Laboratory shows the median price, along with 20th and 80th percentiles of different sized solar projects by size for 2021 in Figure 7 and 8.

Figure 7: Non-Residential Systems Installed in 2021[42]

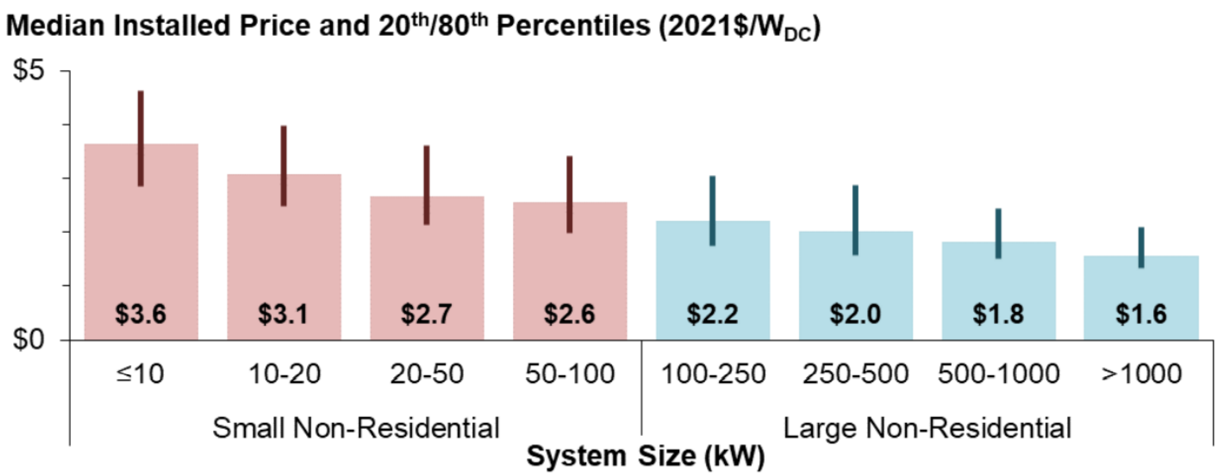
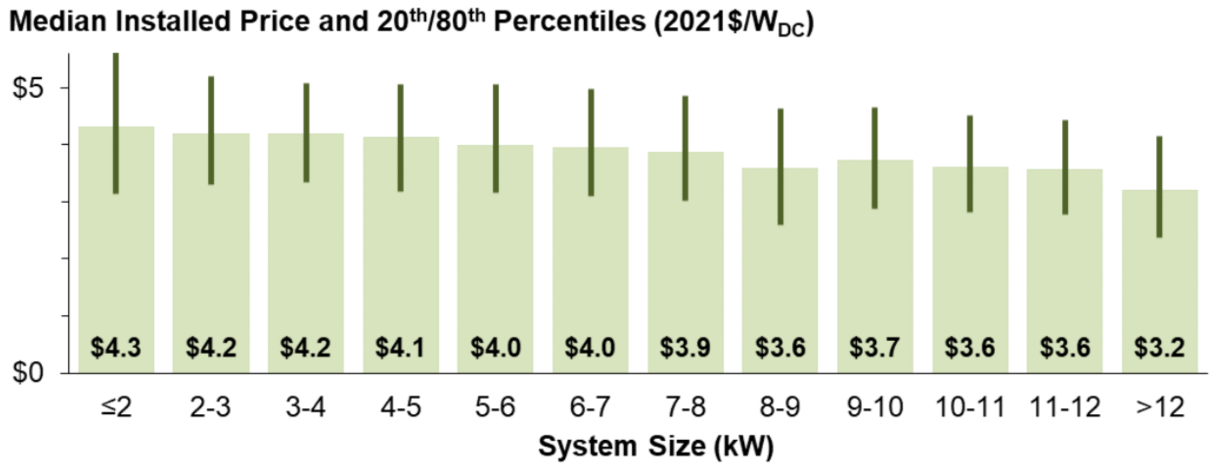


Figure 8: Residential Systems Installed in 2021[43]



There are also costs associate with the steep learning curve for developing renewable energy projects. Communities and municipalities attempting to develop their first project do not necessarily possess the capacity or capability to navigate the planning, financing, and development hurdles that larger developers have available to them. They may require outside consultants to assist in the development of their project that will further increase costs. An assessment of these costs has not been conducted and would require data from utilities and developers to conduct a robust cost analysis.

Oregon Data Gap: Renewable Project Costs
The Oregon Department of Energy lacks robust, current data on the costs of deploying renewable energy projects of various sizes in Oregon. This data, if collected, would allow the Department to develop a more thorough cost-benefit analysis of renewable projects in the state.

Integration

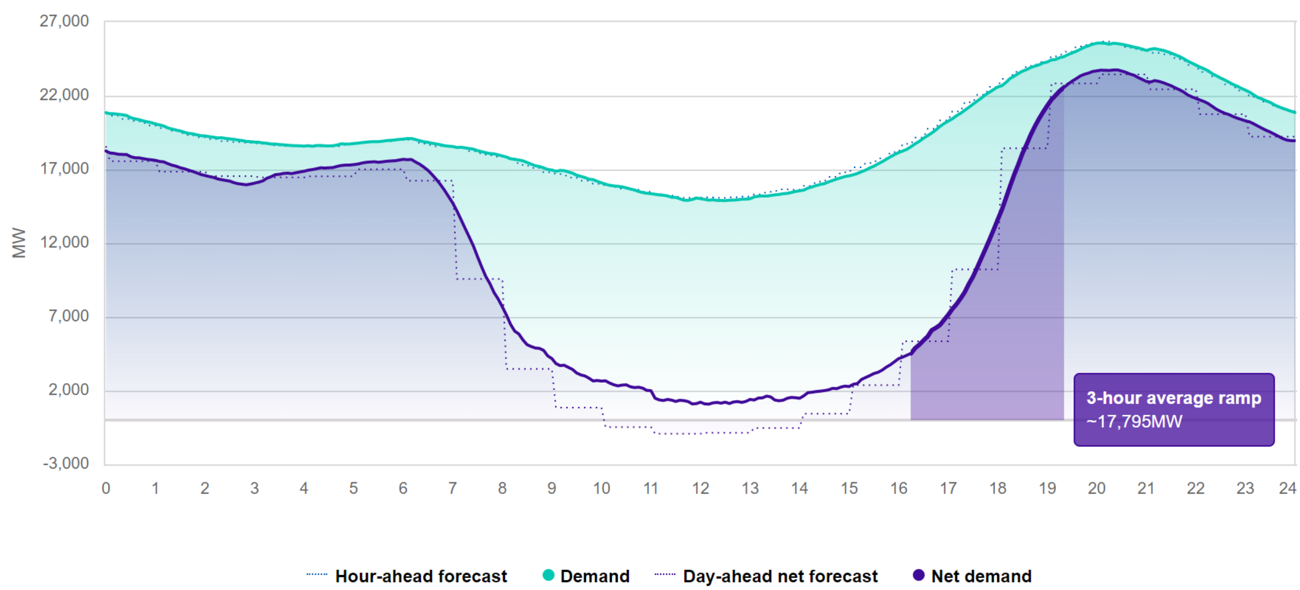
Integrating small-scale and community-based renewable projects into the electric grid can be a barrier to development of these projects. Most small-scale projects are based on solar generation, which is available only when the sun is shining and is not always available when the grid demand is at its highest, which reduces the overall value of these projects to utilities.

Historically, utilities have designed and built the electric system to accommodate variability in customer demand by building transmission and distribution systems capable of carrying enough electricity from generators to customers to meet the highest level of demand expected, even if that level of demand only occurs a few hours of the year. This also included building out complementary resources, such as natural gas peaking facilities, that could deliver enough supply to meet variability in customer demand throughout the day and during different seasons of the year.

Solar PV facilities are variable generators that only produce energy during daylight hours and does not always align with grid load needs. Solar generation ramps up quickly in the morning, provides peak generation during the middle of the day, and ramps down quickly in the evening, which is challenging for grid operators to integrate with system loads. As solar output is declining in the early evening, customer demand on the grid tends to be increasing. Net load or net demand is a term used to describe system demand, less the demand that is met by solar output on the grid. In areas with high solar development, the resulting net demand curve can drop steeply in the morning as solar output increases rapidly, and then climb steeply in the evening as solar output declines. When plotted over the hours of the day, the net demand curve resembles the profile of a duck and so has been colloquially named "the duck curve" as shown in Figure 9.

Net load, or **net demand**, is a term used to describe system demand, less the demand that is met by solar output on the grid.

Figure 9: Typical Electricity Load Profile Compared with Solar Energy Supply – Duck Curve



To date, the duck curve has occurred in markets with large amounts of solar, especially California and Hawaii, during springtime months when mild weather results in low mid-day net loads but will occur in other states as more solar energy is brought online. The graphic above shows California Independent System Operator net electricity demand on April 24, 2022 – a typical spring day in California. The "belly" of the duck represents low net power demand on the grid due to peak solar output on the grid. The "neck" of the duck represents the steep ramp up of net power demand as people come home from work and turn on lights and appliances at the same time the sun is going down and solar output declines. This neck of the duck requires a large amount of non-solar capacity to be dispatched on the grid over a relatively short timeframe. This phenomenon occurs when two factors are present: (1) significant solar output, and (2) comparatively low net load during mid-day hours.

Challenges to integrating solar energy resources is not unique to small-scale or community-based facilities. Oregon electric utilities will be integrating significantly larger solar facilities into their systems to meet the state's 100 percent clean electricity goals. While the deployment of renewables presents new challenges, they are not dissimilar from the types of challenges faced by the industry in the past. Technology advancements are making it increasingly possible to harness the variability of customer demand and better align that demand with the availability of renewable output. In addition, energy storage technologies are becoming more cost-effective and can provide flexibility of either supply or demand, as required, to complement the availability of renewable output. Energy markets can also provide utilities with more flexibility to manage variable renewable energy resources. Participation in larger electricity markets (such as the Western Energy Imbalance Market or EIM) provides access to more opportunities to buy and sell electricity that can complement the variable output of renewables. These technologies and market options can be used to integrate both small-scale and utility-scale solar generation output.

Rate Impacts

To achieve the clean energy targets established in HB 2021, Oregon investor-owned utilities and electricity service suppliers will need to acquire new renewable energy generation to displace existing fossil fuel generation. The impact on utility customers' rates of acquiring this new renewable energy will depend on the price the utility pays for the generation. There are three primary ways that a utility acquires new renewable energy generation.

First, a utility may conduct a competitive solicitation for large-scale renewable resources to meet the resource needs identified in the utility's Integrated Resource Plan. This is most often the lowest-cost way for a utility to acquire new renewable energy, based on economies of scale of large projects and an energy price established by competitive bid, and therefore typically has the least impact on customer rates.

Second, small-scale renewable energy projects considered in this report may, as Qualifying Facilities under PURPA, sell their generation to a utility at prices based on the utility's "avoided cost." Avoided cost is the amount the utility would pay if the utility were procuring comparable power by building its own resource to generate the power, by entering a long-term contract for power in the competitive market, or by buying the power in wholesale markets. Avoided cost rates are therefore intended to be cost-neutral to ratepayers. As Oregon utilities integrate more and more variable renewable energy generation into the grid over the coming years, there will be increasing need for flexible resources such as storage, as described above, to help dampen the steep ramps in demand seen in the "duck curve." Accordingly, the OPUC has opened an investigation to review the methodology for setting avoided cost rates to ensure that Qualifying Facilities are fairly compensated for the energy and capacity value their generation brings to the utility system, and that the utility's procurement under PURPA is cost-neutral to ratepayers.[44]

Third, a utility customer may install a behind-the-meter renewable energy generator to offset their energy consumption through net metering. Net metering compensates customers for their generation at retail energy rates, which are generally higher than the utility's avoided cost. This incremental cost is borne by the utility's ratepayers.[45]

The workgroup agreed that future policy decisions should be based on a principle of equitable distribution of costs and benefits, recognizing the difference between economic and other societal and local benefits versus utility system benefits.[46] Oregon is experiencing upward pressure on electricity rates as a result of several important state policies that address climate change and social equity, as well as other factors like adapting to climate change through wildfire mitigation, global natural gas price increases, and inflation in the cost of labor and materials. Recent policies potentially affecting rates include Oregon's greenhouse gas emissions reduction targets,[47] differential rates that reduce energy burden for disadvantaged customers,[48] and residential customer financial relief during the COVID-19 pandemic.[49] The workgroup acknowledged this increasing rate pressure on utility customers when discussing whether ratepayers or taxpayers should bear the cost of incentivizing development of small-scale renewable energy projects.

The workgroup agreed that future policy decisions should be based on a principle of equitable distribution of costs and benefits.

SECTION II. CONTRIBUTIONS OF WORKGROUP MEMBERS

KEY TAKEAWAYS FROM WORKGROUP MEMBERS

The Oregon Department of Energy facilitated four workshops over the first half of 2022. During these, workgroup members heard from a range of experts, from small-scale developers and project owners, electric utilities, regulators, and others. The presentations provided real-world context to facilitate group discussions and provide a framework to the focus of each workshop. The following provides takeaways identified by workgroup members during the workshops, and an overview of the information presented by workgroup members and their invited guest speakers.

Opportunities

Small-scale and community-based renewable energy projects can potentially present multiple **opportunities in Oregon's clean energy transition**. Opportunities discussed by the workgroup members in the workshops include:

- Providing local economic development and employment
- Leveraging underdeveloped resources like small hydroelectric, geothermal, or biomass
- Using renewable energy and storage or other technologies to provide backup power to critical infrastructure for community energy resilience
- Making use of previously disturbed land and combining renewable power with other land uses
- Deferring or avoiding capital expenditures in transmission and distribution systems
- Reducing the potential for local opposition in permitting with local/smaller projects, in certain circumstances
- Protection of natural and cultural resources because of community involvement
- Providing on-site training opportunities for students of trades

Barriers

Small-scale and community-based renewable energy projects may also, however, face **barriers to development** not encountered by large-scale projects. Barriers discussed by the workgroup members, include:

- Local land-use related permitting restrictions
- Securing project financing and access to capital
- Securing insurance for projects without a guaranteed income stream
- Higher per-megawatt cost relative to larger scale projects (economies of scale)
- Local opposition to energy production facilities near residential areas or because of concerns about cultural and natural resources
- Limited local staff capacity and expertise on renewable energy projects development and financing

- Lack of technical assistance for project development and management
- Lack of local skilled labor to operate and maintain projects over time
- Wheeling charges associated with moving power over the transmission network from one utility service territory to another
- Lack of available interconnection capacity on transmission and distribution lines

Some workgroup members pointed out that these barriers mentioned above may be exacerbated in Tribal communities and for Oregonians with lower incomes.

Many stakeholders identified significant barriers to developing small-scale renewable energy projects in many of Oregon's consumer-owned utility territories. Consumer-owned utilities that obtain their wholesale power from Bonneville Power Administration have reporting and metering requirements in their territories for projects larger than 200 kW. There are additional requirements for larger resources that can affect the timing and economic value of those projects, but BPA has worked with its customers to create special exceptions to allow for more flexibility. In some cases, projects developed in the service territories of these utilities may need to be exported to other utilities that are not similarly constrained by BPA's contract (such as an investor-owned utility) in order to realize their economic benefits. However, transmission wheeling charges[50] to deliver the electricity to other utilities can make some projects financially infeasible. Workgroup members and presenters indicated wheeling charges can be as much as 30 to 50 percent of the negotiated price received for the power.

This leads to a large number of untapped resources in COU territory, given the rich natural renewable resources available such as solar and wind resources that are particularly abundant in eastern Oregon. Some stakeholders indicated the need to develop solutions to better encourage development in these parts of the state. Other stakeholders felt that the already-low electricity rates in these territories (and already extremely low carbon footprint from their mostly hydro-generated purchased BPA power) would likely preclude development. The small-scale and community-based renewable energy projects being discussed in this report often are only economically feasible at rates higher than the cost of the largely carbon-free electricity that can be purchased from BPA.

Workgroup members did not reach consensus about whether small-scale and community-based renewable energy projects face unique challenges due to workforce constraints, such as the availability of full-time skilled workers. Some renewable energy developers noted that skilled labor may be harder to employ for small projects because maintenance needs may be less than full time, or because smaller projects or communities may have to compete with larger projects for that skilled labor. An invited speaker told the workgroup about his experience developing a small renewable energy facility next to an existing larger facility, which allowed him to use the skilled union labor already in the area.

Community Resilience Benefits

Workgroup members identified **important services** that investments in community energy resilience could support, including providing power to:

- Cooling/warming centers
- Critical infrastructure
- Vehicle chargers

- Cell towers and phone chargers
- Refrigerators for food and medications
- Water pumps

Climate Benefits

The **climate benefits of renewable energy projects** are common across small and large projects, and a larger impact tends to come from larger projects given their size and because greenhouse gas reduction benefits accrue globally.

Economic Benefits

Workgroup members identified the following **economic benefits** that may be associated with small-scale and community-based renewable energy projects, though most are common to all projects, regardless of size, including:

- Further reductions in solar energy costs, as increased demand brings down overall costs
- Deferred investment in grid infrastructure
- Reduced fossil fuel consumption
- Reduced customer energy costs through net metered systems
- Local economic development through
    - Local job creation
    - Increased high-skilled labor
    - Worker training
    - Diversification of local economies
    - Increased local tax revenues
- Fully maximizing existing infrastructure by
    - efficiently utilizing existing excess capacity through smaller projects that can be integrated more readily than larger projects
    - utilizing existing skilled labor in areas sited near larger projects
- Potential gross revenues from power sales

Health Benefits

Workgroup members identified replacing diesel generators with renewable resources would **reduce diesel emissions and improve local air quality**. Microgrids can also be beneficial for hospitals to ensure they are best able to serve communities as first responders in emergency events that disrupt power. Each project is unique and may have health-related benefits, such as using biodigesters to reduce animal waste that has negative effects on water quality.

Other Benefits

Workgroup members identified the following other benefits that may be associated with small-scale and community-based renewable energy projects, though some are common to all projects, regardless of size, and they include:

- Capturing odd waste streams for biomass projects
- Enabling energy developments by potentially increasing local support to permit local, smaller projects
- Ancillary benefits – such as using waste heat for industrial or district heating
- Offsetting local power demands with rooftop solar
- Energy sovereignty – communities value ownership of generating resources and independence from the larger utility system
- Enabling the availability of backup energy in emergency events where liquid fuels may be unavailable
- Supporting Oregon's reputation for clean energy leadership
- Utilizing refurbished turbines (only small developers able to do this)

Costs

Workgroup members identified the following costs that may be associated with small-scale and community-based renewable energy projects.

Many communities and organizations **lack experience** with developing renewable energy projects. This can greatly increase costs for staff time to navigate complex siting and permitting processes and gain essential knowledge on project development, financing, and operation. Staff also need to work with many different people, including developers, regulators, and governments, which is very time consuming. This can be especially challenging for smaller communities and organizations that have very limited staff and capacity.

Project development can also be more challenging for small-scale and community-based projects. There are restrictions on the size of developments to meet certain small-scale or community-based program requirements or to qualify for standard contracting. While this often provides financial incentives, it also limits the ability of developers to reduce costs through economies of scale. Also, to achieve grid resilience benefits, there are costs associated with the equipment needed to allow the resource to be islanded from the grid. Resilience benefits of microgrids, grid islanding, and energy storage is not currently recognized or accounted for in current rates. Zoning, right-of-way, and interconnection costs are also a larger portion of overall project costs.

Financing these projects can be difficult, particularly for **smaller, rural, and Tribal communities**. Tribes and other communities may not have credit ratings or their access to credit may be limited. They may also have difficulty securing insurance for small projects without guaranteed income streams. In some circumstances, Bonneville Power Administration contracts ensure access to a certain amount of low-cost power, and contain requirements that restrict COUs from buying power from other generators or from selling the power outside the COU territory that incurs wheeling charges that may make the project financially infeasible.

The **financial risk** to communities and smaller groups of developers is significantly greater than for larger entities. The costs of development failure or underperformance of the resources will fall on a small group of developers and customers, with limited options for addressing these shortfalls. Although these projects are relatively small, a failing or underperforming project could be financially disastrous for some communities and groups.

WORKGROUP MEMBER RECOMMENDATIONS

The Small-Scale and Community-Based Renewable Energy Projects Study workgroup had a diverse set of interests and perspectives and was not able to reach consensus on specific recommendations for this study. Instead, the workgroup, during the final workshop in July 2022, identified guiding principles that should be used in the development of recommendations. These principles focused on how recommendations to support small-scale and community-based renewable energy projects should:

- Assist Oregon in meeting state goals as defined in HB 2021.[51]
- Promote equitable outcomes among Oregonians, including a promotion of the state's environmental justice goals.
- Maintain affordable energy / rates for all Oregonians.
- Promote an equitable distribution of costs and benefits for all Oregonians, recognizing the difference between economic and other societal and local benefits versus utility system benefits. Workgroup members held differing perspectives on the appropriateness of using regulated utility rates to pay for benefits that do not necessarily contribute to delivery of safe and reliable service at just and reasonable rates for *all* electricity customers.
- Support project transparency.
- Consider the perspectives of other stakeholders that may differ from one's own perspective.
- Support economic development in Oregon.
- Support unique contributions of small-scale projects, including:
  - Local energy resilience
  - Nimbleness due to smaller footprint / scale
  - Community / local ownership
  - Utilization and synergy of local available resources, including hydro and bioenergy
  - Waste stream management when waste is used for bioenergy projects

DISCUSSION OF WORKGROUP MEMBERS

HB 2021 requires the reporting of "recommendations" that come from the workshop process. However, as noted previously, the workgroup members were not able to reach consensus on specific recommendations for this study other than the guiding principles. During the four workshops, the workgroup members discussed many concepts; ODOE captured these ideas and concepts and included them as part of this report. The workgroup member ideas and concepts are presented below and grouped by topic area, and they are not in any priority order. For each of these concepts there were workgroup members who supported and those who expressed concerns about them moving forward. ODOE takes no position on the concepts and ideas discussed below.

Contracting and Compensation

1. **Consider grant-based, taxpayer-funded subsidies instead of ratepayer-funded subsidies if the incentive rate is above current avoided cost rate schedules in Oregon.**

Some workgroup members are concerned about shifting costs of new projects from the beneficiaries of the project to non-beneficiaries. For example, if a small-scale incentive is funded by electricity rates that are higher than the avoided cost of the electricity produced, this could raise the overall rate for other ratepayers in the market who do not receive unique benefits from the project (e.g., local resilience). This is called a distortionary effect of the higher-than-avoided cost rate paid to the project. Some workgroup members were particularly worried about the effects of upward pressures on rates, especially for low-income and vulnerable ratepayers.

Another suggestion made that would avoid this distortionary effect was to provide taxpayer-funded incentives (like the Oregon Department of Energy's Community Renewable Energy Grant Program) to enable more small-scale renewable energy adoption opportunities for Oregon small businesses. These incentives would be in addition to the utilities purchasing the power at the contracted rate for the project. The contracted rate may be below a rate that covers the total costs of the project, and the state subsidy would help fill the gap between the two. Related, some workgroup members suggested that there may be other options that do not have to extend to all ratepayers, such as certain on-bill financing charges.

2. **Create a methodology to incorporate resilience benefits into projects. / Utilities should collaborate with communities to explore and develop metrics that value benefits, but don't add to ratepayer burden.**

Some workgroup members suggested incorporating resilience benefits into scoring and ranking processes when awarding an incentive or grant to a particular project. During the workshops, ODOE included a presentation by a California Public Utilities Commission staff member[52] on a process California is considering that ranks projects based on their resilience benefits. Numerous workgroup members liked this idea, especially if projects are being evaluated for subsidies or grants. Some workgroup members suggested the development of tools and metrics to identify communities that would most benefit from additional resilience resources, such as the mapping tool being developed under HB 4077 Section 12.

3. **Explore the development of contractual reliability and performance metrics for small-scale projects.**

Some workgroup members indicated that projects should meet some reliability and performance metrics to address potential effects of increasing numbers of small-scale projects on the overall electricity system. They suggested smaller projects should adhere to contractual performance and reliability standards consistent with other generators to ensure the electricity system continues to operate efficiently.[53] If energy is not available when needed (for example, during high-usage periods) or is available when it is problematic for the system to accept (for example, high generation during low-demand hours without storage), even a small project could lead to effects on the grid and therefore on costs.

4. Encourage OPUC to develop storage rate compensation.

Some workgroup members suggested that the Oregon Public Utility Commission establish rates that would compensate small-scale energy providers for the unique values that battery storage supply to the grid. The Oregon PUC has a range of compensation frameworks for the output of small-scale projects, but there is no rate dedicated to standalone storage or hybrid renewable-plus-storage projects. In Docket UM 2000, the OPUC is currently considering updates to its compensation methodology for Qualifying Facilities and could focus its near-term efforts on methodology changes that best recognize the values that storage resources provide to the system. Some workgroup members suggested that additional funding be given to the OPUC to fund their work on UM 2000. Both PacifiCorp and PGE are exploring customer incentives for storage.

5. Leverage Oregon's Community-wide Green Tariffs to support increased use of projects.

HB 2021 provided the opportunity for Community-wide Green Tariffs whereby local municipalities can work with utilities to define a power mix from non-emitting sources to serve the load of residential and small commercial customers within their jurisdictions. This concept of CGTs builds from an existing voluntary renewable energy tariff for non-residential customers.[54] Some workgroup members highlighted this opportunity as an existing tool to increase the use of small-scale and community-based renewable energy projects.

Some workgroup members noted that the HB 2021 clean energy targets may negate the value of the administrative effort by municipalities and utilities to implement a Community-wide Green Tariff. These same workgroup members suggest instead using the voluntary renewable energy tariff structure to allow a municipality to buy power from a single, specific generator (for example, a local irrigation modernization hydroelectric project) at higher-than-avoided-cost prices, but not commit to buying enough renewable energy to serve all residents in the jurisdiction.

6. Consider feed-in tariff for small-scale projects.

Some workgroup members suggested that feed-in tariffs for small-scale projects should be considered to authorize or require utilities to purchase power from a small-scale project at a defined rate that is typically administratively determined by state regulators. Unlike taxpayer-funded subsidies, a feed-in tariff would be ratepayer-funded. For example, California has a feed-in tariff program specifically for small-scale bioenergy generation projects.[55] This incentive program was authorized by the California Legislature in recognition that these projects could deliver additional benefits (such as a fuel threat reduction in high wildfire risk areas, or avoided methane emissions from dairy farms, etc.) beyond the traditional power system benefits for which PURPA avoided cost rates are designed to compensate. It is worth noting that the rate associated with the California program is approximately 20 cents/kWh.

Other members of the workgroup noted the high cost to ratepayers of Oregon's previous solar feed-in tariff. The "Volumetric Incentive Rate" program authorized by ORS 757.360 resulted in PGE's ratepayers paying rates approximately 10 times higher than the market price of energy.

7. Expand standard PURPA contracts and rates to larger projects in IOU territory.

Some workgroup members suggested the OPUC consider raising the capacity limit for renewable energy projects eligible to use standard PURPA contracting to 20 MW. Today in investor-owned utility service territories, standard PURPA contracts and rates are available to solar projects up to 3 MW in size and for other (non-solar) renewable energy projects up to 10 MW in size. Some workgroup members suggested that expanding the availability of standard contracts and rates to larger projects in IOU territories would eliminate the need for contract negotiation and allow rate predictability for project developers.

Some workgroup members noted that increasing the capacity limit without raising the rate would not result in more projects. Challenges with interconnection can increase with larger projects, since larger projects are often located where local load is insufficient to absorb new generation.

Further, some workgroup members pointed out that current 3 MW cap on solar projects eligible for standard contracts and rates was put in place to discourage disaggregation — when a larger project is split into multiple projects — to qualify for the higher standard contract rates rather than what could be negotiated for a larger project.

Land Use

8. Simplify permitting and siting for small projects. / Develop model codes for counties.

Some workgroup members were concerned with the difficulty small projects face securing necessary permits and approvals for siting and would like the permitting and siting process simplified for small projects, while still protecting natural and cultural resources. Small wind and solar projects are predominantly sited through counties. To address these challenges, several members suggested that counties utilize ODOE's new Oregon Renewable Energy Siting Assessment mapping tool.[56] ODOE's tool also allows users to visualize the feasibility of projects in their area.

Some workgroup members suggested developing a model set of codes pertaining to renewable energy siting and development that counties could use to simplify the process for communities with less bandwidth to plan and implement on their own. Some workgroup members suggested that additional technical support and resources are needed at the county level to help expedite the permitting process.

9. Expand dual-use projects and agrivoltaics.

Some workgroup members suggested the Legislature consider directing the Department of Land Conservation and Development to update rules regarding agrivoltaics and dual-use projects. Agrivoltaics are projects that simultaneously use the land for both solar power generation and agriculture.[57] Specifically, they suggest agrivoltaic projects be allowed on all soil classes with no size capacity limitations.

Some workgroup members also suggest the definition of dual-use be broad enough to include pollinator habitats, livestock grazing, and farming, and that dual-use be considered for other types of renewables in addition to solar. Generally, these workgroup members suggest that the process for developing dual-use projects be made simpler. Some members suggested that the requirements for counties to create dual-use ordinances be removed to give counties the option to create ordinances as they see fit.

Other workgroup members suggest that Oregon land-use regulations currently do not limit the ability to pursue dual-use projects but questioned whether it was appropriate to incentivize such projects through different regulatory provisions.

10. Forge a streamlined process to develop small hydroelectric projects.

Some workgroup members suggested identifying whether there are certain environmental regulations that could be relaxed for siting and permitting small hydroelectric projects due to their overriding public benefit. This could apply to existing, non-powered dams, irrigation canals, and conduits. Some workgroup members cautioned that some of these regulations are federal rules, and that there are other stakeholders that believe the protections these rules are in place to ensure are equally (if not more) important.

11. Update Goal 13 (or streamline the process for renewables).

Some members of the workgroup suggested that current state laws be updated to define lands that are eligible for renewable energy projects, including small-scale projects. Land use decisions in Oregon are guided by a set of 19 statewide land use planning goals. The goals are intended to balance the need for economic development and the provision of other public goods with the need to protect agricultural and forest lands and other natural resources. Under current law, the type and amount of land that can be used for renewable energy development is limited by the goals, as well as the implementing rules adopted by the Land Conservation and Development Commission and local land use regulations.

In 2021, the introduced version of HB 2520[58] would have required LCDC to update Goal 13 – the statewide planning goal related to energy conservation – to identify the amount and types of lands needed to support renewable energy development in Oregon and to identify areas where it would be appropriate to prioritize the siting of renewable energy projects or allow for a local exception process. Several members of the workgroup suggested that the Legislature reconsider and fund this element of the introduced bill.

12. Provide technical assistance or easier process for siting and land-use issues.

One commonly identified hurdle for small-scale projects is the lack of technical and workforce capacity to plan, apply for, and develop projects. Some workgroup members suggest providing technical assistance for communities, municipalities, Tribes, small businesses, and other groups, as well as create an overall easier application process for siting and land-use issues. They suggest particular attention be paid to assisting Tribal communities.

Interconnection and Transmission

13. Create better transparency for interconnection feasibility with existing infrastructure.

Some workgroup members would like to see more information made available on existing transmission and distribution system infrastructure and available hosting capacity on the grid. They suggested creating a map of excess capacity/existing resources to allow for developers and communities to more easily site projects. This could be facilitated by a standardized spreadsheet submitted from each IOU and BPA to insert capacity at each existing and planned facility at regular intervals. This request was also made during the development of the Oregon Renewable Energy Siting Assessment project but was not available in a GIS format that could be implemented into the tool. Some workgroup members point out that other states require utilities to provide this type of geospatial / mapping transparency about their systems. It was noted that these types of maps are currently being developed by the IOUs, as part of the OPUC's Distribution System Planning docket [general investigation docket UM 2005; utility specific DSP filings in dockets UM 2197 (PGE), UM 2198 (PacifiCorp), and UM 2196 (Idaho Power)], but that COUs may not have the technical capabilities to develop and maintain these types of maps at this time.

Some workgroup members would also like greater transparency surrounding existing small-scale and community-based projects already connected to the grid. This would include projects within IOU and COU territory and include information on ownership structure.

Some workgroup members worry about the accountability for the accuracy of the feasibility studies for projects interconnecting to the utility distribution grid. They suggest having The Professional Engineers of Oregon approve studies to provide accountability. Alternatively, this service could be provided by an independent Regional Transmission Organization for projects interconnecting to the transmission grid.

14. Standardize wheeling charges.

Some workgroup members suggested that standardizing or formalizing wheeling charges for small-scale projects would encourage development in consumer-owned utility areas. A significant hurdle identified by some workgroup members and presenters at the workshops was the magnitude of transmission wheeling charges, sometimes FERC regulated, for small projects that must cross multiple utility service territories to deliver power. The COU portions of the state are rich in renewable energy resources; however, much of the demand for electricity is in IOU territories. Power from a small-scale project located in COU territory delivered to the customers of an IOU will need to be "wheeled" over one or more transmission systems owned by one or multiple utilities. The viability of projects is threatened in some cases due to the cost of these transmission wheeling charges, which in some cases were identified to be approximately 35 to 50 percent of the overall rate received for the electricity. Some workgroup members suggested standardization of "wheeling" charges could be accomplished through formation of a Regional Transmission Organization.

15. Support formation of a Regional Transmission Organization.

Some workgroup members supported the formation of an RTO, (see ODOE's 2021 RTO study for more details).[59] The discussion included whether an RTO could benefit small-scale projects by replacing transmission wheeling charges with a more transparent, uniform mechanism. Some workgroup members pointed out that the process and scale of RTO development and subsequent utility participation is enormous and not driven by small-scale renewables. Others indicated a concern about the ability of renewable PURPA QFs larger than 5 MW to adequately access the market in an RTO.

16. Speed up decision-making and implementation of interconnection.

Some workgroup members pointed out the delays involved in interconnection decisions and implementation can cause projects to fail. While interconnection studies can be costly and take time, the studies are still a necessary part of the process to ensure the stability of the grid. That said, there are methods to speed their completion, including the aforementioned transparency for interconnection feasibility with existing infrastructure.

The Oregon PUC has an open investigation into interconnection policies and practices, docketed as UM 2111, with a near-term focus on interconnection screening and study practices that most affect small-scale projects and modern generator configurations, such as storage and microgrids. In subsequent phases, the investigation will examine further opportunities to provide data transparency and streamline processes.

17. Allow for meter aggregation for multifamily properties to a single interconnection point.

Some workgroup members suggested allowing for meter aggregation to a single interconnection point. They suggest changing ORS 757.300 and OAR 860-039-0065 to allow multiple customers to aggregate meters on a given site. Currently, the meter aggregation rules appear to allow a single customer-generator with multiple meters on their premises or contiguous property to allocate the generation among their meters on a "cascading rank order" basis. They suggest changing allocation of generation to multiple meters from "ranked order" to a percentage basis, and to allow aggregation among multiple customers so that the generation could be split in a predetermined manner among the customers on-site. This would allow multifamily properties and manufactured home parks an opportunity to share the production from a central on-site generator among individual meters on the property, without the cost and complexity of having to install individual small-scale projects. Additionally, it would allow for on-site energy storage as well, potentially adding a resilience benefit.

Some workgroup members note that meter aggregation could increase or exacerbate the shifting of costs from participating customers to non-participating customers, including those who are low income.

18. Cost sharing for utility infrastructure upgrades.

Some workgroup members suggested small renewable energy project developers not be fully responsible for paying for upgrades needed to access a utility's grid. They argue that since these upgrades benefit the entire grid, and that the utility owns the upgraded infrastructure, the cost should be shared. Other workgroup members thought that this issue could be alleviated through an RTO.

Tribes and Communities

19. Consider implementing the suggestions made in the "National Renewable Energy Laboratory and Midwest Tribal Energy Resources Association Report: Addressing Regulatory Challenges to Tribal Solar Development."[60]

There are nine federally recognized Tribes in Oregon; these Tribal governments have been in what is now Oregon since time immemorial.[61] Village sites and traditional ways are known to date back many thousands of years. Tribal governments are separate and unique sovereign nations with powers to protect the health, safety, and welfare of their enrolled members and to govern their lands. This tribal sovereignty predates the existence of the U.S. government and the State of Oregon. Most Oregon Tribes are "confederations" of three or more Tribes and bands. Each Tribe's area of interest may extend far beyond its Tribal governmental center or reservation location. Any specific small-scale renewable energy interests or suggestions would be unique to each Tribal government and are not summarized here.

A recent NREL and MTERA report generally reviewed the challenges for Tribal communities to develop solar projects.[60] Some workgroup members highlighted the unique needs of Tribes, including unique applicability of taxes, underrepresentation in government and utility boards, disproportionate lack of access to transmission and distribution systems (historical and continued policies of bypassing tribal communities for this infrastructure, and utility coverage), disproportionate numbers of unelectrified and energy burdened households, slower response time by utilities in addressing outages, and unique requirements of Tribal Employment Rights Office.

Suggestions highlighted by some workgroup members include full property tax exemptions for Tribal energy projects, a guide to revenue share agreements with location jurisdictions, clear guidance to local jurisdictions and states prohibiting double taxation on Tribal energy infrastructure (including on sales, property, or services), guidance/incentives for expedited interconnection for Tribal energy projects, demand side aggregation, small-scale generation aggregation, and formation/management of “virtual” power plants.[62] Some of these issues (and others mentioned in the report) are similar to those of other resource-constrained communities, but other issues are very unique to tribal governments. Suggestions to overcome hurdles to the development of solar with Tribal communities include engagement with utilities during the project development stage, clarity surrounding interconnection requirements, greater engagement through the whole process, and consideration of unique grant or incentive designs for Tribal communities.

It is worth noting that the new “direct pay” election (like those in the 2022 Inflation Reduction Act) allows cash rather than a tax credit for non-profits, such as states, local governments, municipal utilities, TVA, Tribes, Alaska Natives and cooperatively owned utilities.

20. Create a forum for sharing best practices among utilities / communities / community solar projects.

During breakout sessions of the workshops, some members discussed best practices for their municipalities. This spawned an idea of creating a forum for utilities, municipalities, community solar projects, developers, etc. to share best practices. This would allow for time and money savings for these projects.

21. Increase local ownership of projects.

Some workgroup members emphasized the importance of supporting ownership models that allow communities to benefit from the revenues of small-scale projects and reinvest any revenues back into the local community. This could in turn lead to a multiplier effect of more spending in the local economy.

Ideas and considerations included cooperative ownership models and the prioritization of community-owned projects for subsidies. They also suggested finding ways to mitigate some of the risks associated with small-scale projects that could limit which communities could or would want to pursue ownership.

Others noted the challenge in identifying significant potential revenue streams, especially from small-scale renewable energy projects. The primary local economic value would likely come in the form of offset bills from net-metered projects (i.e., from being able to forgo purchasing power from another entity), or from the use of a local workforce to build and maintain the project.

22. Continue to incorporate environmental justice provisions in Oregon energy policy.

Some workgroup members conveyed the need to establish metrics and goals to ensure traditionally underserved communities in Oregon have the opportunity to participate in the benefits of small-scale renewable energy projects. Previous incentive programs, including Oregon tax credit programs, were designed to support market transformation. These programs targeted early adopters and a majority of the public funds went to higher-income individuals. Recent legislation, including HB 2021, has established equity as a fundamental component of incentive programs. These workgroup members suggest that this effort should be continued in future energy related legislation.

Existing Programs

23. Expand funding and eligibility for the Oregon Department of Energy's Community Renewable Energy Grant Program.

The workgroup broadly expressed support for the taxpayer-funded, grant-based model for the Community Renewable Energy Grant Program[63] and was impressed by initial application results from July 2022. They suggested that expanding funding and eligibility for that program or modeling a similar program on C-REP that allows non-profits and community groups to apply.

Some workgroup members suggested expanding eligibility for C-REP to the City of Portland, which is currently excluded, for types of projects not currently funded by the Portland Clean Energy Fund (e.g., microgrids for critical facilities or city buildings).

24. Fund the Small-Scale Energy Loan Program.

Some workgroup members suggested re-capitalizing the Small-Scale Energy Loan Program administered through the Oregon Department of Energy. This could be especially helpful in an environment of increasing interest rates.

25. Increase Accessibility and Participation in the Oregon Community Solar Program.

Some workgroup members expressed concerns that the Oregon Community Solar Program is too complicated and does not have a level playing field with conventional net metered projects. One workgroup member suggested extending the property tax exemption established in SB 1519 (2022) to portions of community solar projects for commercial subscribers. Current policy only provides an exemption for those portions of a project associated with residential subscribers.

Additional Suggestions

26. Change language in small-scale renewables law from *capacity* to *generation*.

Some workgroup members expressed support for revisiting an amendment that was addressed in HB 2021 (2021) that would have changed ORS 469.210:

> From: "(2) For purposes related to the findings in subsection (1) of this section, by the year 2030, at least 10 percent of the aggregate electrical ***capacity*** of all electric companies that make sales of

> electricity to 25,000 or more retail electricity consumers in this state must be composed of electricity generated by one or both of the following sources…"
>
> To: "(2) For purposes related to the findings in subsection (1) of this section, by the year 2030, at least 10 percent of the aggregate electrical ***generation*** of all electric companies that make sales of electricity to 25,000 or more retail electricity consumers in this state must be composed of electricity generated by one or both of the following sources…"

These workgroup members suggest that this change would create more demand for smaller projects.

Other workgroup members mentioned that this topic has already been decided by the Legislature and did not support revisiting it. Others still cautioned that the change would greatly increase the amount of investment required creating an increased burden on ratepayers, including vulnerable populations; that it could encourage over building of projects; and ignores the major difference in capacity factor between renewables and traditional generation.

27. Clarify long-term state goals regarding small-scale projects.

Some workgroup members identified the importance of understanding (and clearly defining, where necessary) Oregon's long-term goals for, and benefits from small-scale projects for planning purposes.

Some workgroup members also suggested better sharing of the science and data across State agencies regarding the benefits and costs of small-scale renewable energy projects. These same workgroup members suggested that this better sharing of information would aid the state of Oregon in achieving its long-term goals.

28. Work on common language/definitions.

Some workgroup members suggested making sure there are common definitions and language developed by the state for terms related to small-scale and community-based renewable energy projects. For example, defining *resilience* was frequently raised as a need, as were *disadvantaged communities* and *environmental justice communities*.

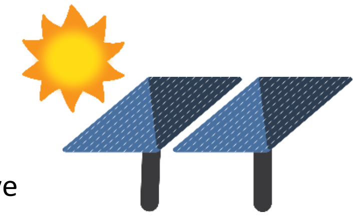
29. Additional tax exemptions for small-scale and community-based projects

Some workgroup members suggested creating property tax exemptions for commercial subscribers to community solar projects (comparable to residential customers pursuant to SB 1519, 2022). Other workgroup members suggested increasing property tax exemptions tailored for smaller projects.

30. Third-party study on costs of small-scale renewable energy projects

Some workgroup members suggested hiring an outside firm to conduct a study on the actual costs of different sized renewable energy projects in Oregon.

SECTION III. CONCLUSION



Work group members agreed at a high level that small-scale and community-based projects can play a role in addressing climate change, achieving state energy and climate goals, reducing impacts on land and natural resources, supporting local economic development, and providing local energy resilience for communities and organizations. Small-scale and community-based projects can have unique benefits that are customized to meet local and community expectations and goals. However, the individualized nature of these types of projects also make it difficult to provide an overarching assessment on the energy, environmental, economic, and social benefits and challenges of small-scale and community-based projects writ large. All energy projects involve trade-offs, and for small-scale and community-based projects those trade-offs will vary significantly but will also be more flexible to address community or local concerns and needs.

While large-scale projects will meet the bulk of Oregon's future energy needs, small-scale and community-based renewable energy projects have a role in achieving Oregon's clean energy goals. Oregon utilities and electricity service suppliers will need to acquire new renewable energy generation, both to displace existing fossil fuel generation and to meet increased demand for electricity. The scale of renewable development necessary to meet the state's goals is large, and it is critical that utilities and their regulators assess the potential rate effects of different procurement options. The workgroup acknowledged the potential for increasing rate pressure on utility customers when discussing the costs of incentivizing small-scale and community-based renewable energy project development and agreed that future policy decisions should be based on a *principle* of equitable distribution of costs and benefits. There were differing perspectives on the appropriateness of using regulated utility rates to pay for benefits that do not necessarily contribute to delivery of safe and reliable service at just and reasonable rates for *all* electricity customers. The workgroup acknowledges that policymakers will need to consider the difference between economic and other societal and local benefits versus utility system benefits.[64]

In addition to the clean energy benefits of small-scale and community-based renewable projects, there are other potential benefits that should be assessed for each project. These include local socio-economic value, improvements to community energy resilience, and establishing a local renewable energy project economy, including jobs and infrastructure. The value of these unique benefits for a particular project would need to be assessed on a case-by-case basis within the broader context of achieving an equitable clean energy transition.

REFERENCES

[1] Brown, M. A., Soni, A, Lapsa, M. V., Southworth, K. (2020). Low-Income Energy Affordability: Conclusions from a Literature Review. *Oak Ridge National Laboratory.* https://info.ornl.gov/sites/publications/Files/Pub124723.pdf

[2] Leon, W. *Map and Timelines of 100% Clean Energy States*. Clean Energy States Alliance. https://www.cesa.org/projects/100-clean-energy-collaborative/guide/map-and-timelines-of-100-clean-energy-states/

[3] Kwok, G., Haley, B. Exploring Pathways to Deep Decarbonization for the Portland General Electric Service Territory. *Portland General Electric – Evolved Energy Research.* https://assets.ctfassets.net/416ywc1laqmd/2WzCHrdAKz3InBbp0ecdD8/57c8695890d8d3ee4b09f39c2089548b/exploring-pathways-to-deep-decarbonization-PGE-service-territory.pdf; *Climate Recovery Ordinance*. City of Eugene, Oregon. https://www.eugene-or.gov/3210/Climate-Recovery-Ordinance; *Community Climate Action Plan.* City of Bend, Oregon. https://www.bendoregon.gov/city-projects/sustainability/community-climate-action-plan

[4] Loken, R. Mahone, A., Kahri, F. (2021). Pathways Toward Carbon Neutrality – A Review of Recent Mid0Century Deep Decarbonization Studies for the United States. *California-China Climate Institute - Berkeley Law.* Chapter 1, p. 8.

[5] Cochran, J., Denholm, P. (2021). The Los Angeles 100% Renewable Energy Study. *Golden, CO: National Renewable Energy Laboratory*. https://www.nrel.gov/docs/fy21osti/79444-ES.pdf, p. 12.

[6] Kwok, G., Haley, B. Exploring Pathways to Deep Decarbonization for the Portland General Electric Service Territory. *Portland General Electric – Evolved Energy Research.* https://assets.ctfassets.net/416ywc1laqmd/2WzCHrdAKz3InBbp0ecdD8/57c8695890d8d3ee4b09f39c2089548b/exploring-pathways-to-deep-decarbonization-PGE-service-territory.pdf

[7] Wenzel, S., Mahajan, M., Strid, E. (2022) Oregon Energy Policy Simulator Insights: Recent Developments, Policies to Meet Emissions Goals. *Energy Innovation Policy & Technology, LLC.* https://energyinnovation.org/wp-content/uploads/2022/03/Oregon-Energy-Policy-Simulator-Insights.pdf, p. 4.

[8] *2020 Biennial Energy Report – Energy by the Numbers.* Oregon Department of Energy, https://energyinfo.oregon.gov/ber, p. 44.

[9] Oregon Clean Energy Pathways Analysis Executive Summary. https://uploads-ssl.webflow.com/5d8aa5c4ff027473b00c1516/6181e54b10541827d3142f8a_Oregon%20Clean%20Energy%20Pathways%20Analysis%20Executive%20Summary%20Final.pdf, p. 10; Cochran, J., Denholm, P. (2021). The Los Angeles 100% Renewable Energy Study. *Golden, CO: National Renewable Energy Laboratory*. https://www.nrel.gov/docs/fy21osti/79444-ES.pdf, pp. 10, 28.

[10] Oregon Clean Energy Pathways Analysis Executive Summary. https://uploads-ssl.webflow.com/5d8aa5c4ff027473b00c1516/6181e54b10541827d3142f8a_Oregon%20Clean%20Energy%20Pathways%20Analysis%20Executive%20Summary%20Final.pdf, p. 39.

[11] This figure excludes legacy hydropower facilities built that became operational before January 1, 1995.

[12] Form EIA-860 detailed data with previous form data (EIA-860A/860B), June 2022: https://www.eia.gov/electricity/data/eia860/

[13] Form EIA-860 detailed data with previous form data (EIA-860A/860B), June 2022: https://www.eia.gov/electricity/data/eia860/

[14] Representative Pam Marsh. House Chamber Convenes 06/25/2021 10:00 AM Oregon State Legislature (Accessed 12/03/2021), https://olis.oregonlegislature.gov/liz/mediaplayer?clientID=4879615486&eventID=2021061180&startStreamAt=2620

[15] SB 1547, 2016 Reg. Sess. (Ore. 2016). https://olis.oregonlegislature.gov/liz/2016R1/Downloads/MeasureDocument/SB1547/Enrolled.

[16] *Community Solar Basics.* Office of Energy Efficiency & Renewable Energy. https://www.energy.gov/eere/solar/community-solar-basics.

[17] *Pacific Power Blue Sky.* Pacific Power. https://www.pacificpower.net/bluesky.

[18] *Renewable Power Options.* Portland General Electric. https://www.portlandgeneral.com/residential/power-choices/renewable-power/choose-renewable.

[19] *Innovation Landscape For A Renewable-Powered Future: Solutions To Integrate Variable Renewables.* IRENA. 2019. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Feb/IRENA_Innovation_Landscape_2019_report.pdf

[20] Brown, M. A., et al. (2020). Low-Income Energy Affordability: Conclusions from a Literature Review. *Oak Ridge National Laboratory.* https://info.ornl.gov/sites/publications/Files/Pub124723.pdf.

[21] *Oregon's Statewide Land Use Planning Goals.* Oregon Department of Land Conservation and Development. https://www.oregon.gov/lcd/op/pages/goals.aspx.

[22] *Oregon Statewide Planning Goals and Guidelines.* Oregon Department of Land Conservation and Development, July 2019. https://www.oregon.gov/lcd/Publications/compilation_of_statewide_planning_goals_July2019.pdf.

[23] *Oregon Energy Facility Siting Council Jurisdiction.* Oregon Department of Energy. https://www.oregon.gov/energy/facilities-safety/facilities/Pages/Council-Jurisdiction.aspx.

[24] ORS 469.310. https://oregon.public.law/statutes/ors_469.310.

[25] *A Public Guide to Energy Facility Siting in Oregon.* Oregon Department of Energy, July 2020. https://www.oregon.gov/energy/facilities-safety/facilities/Documents/Fact-Sheets/EFSC-Public-Guide.pdf.

[26] *The Multiple Benefits of Energy Efficiency and Renewable Energy.* Environmental Protection Agency, 2018. https://www.epa.gov/sites/default/files/2018-07/documents/mbg_1_multiplebenefits.pdf.

[27] *Oregon Resilience Plan: Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami* Oregon Seismic Safety Policy Advisory Commission, 2013. https://www.oregon.gov/oem/documents/oregon_resilience_plan_final.pdf.

[28] Petersen, M. D., Cramer, C. H., and Frankel, A. D., 2002, Simulations of seismic hazard for the Pacific Northwest of the United States from earthquakes associated with the Cascadia subduction zone: Pure and Applied Geophysics, v. 159, no. 9, 2147–2168. https://doi.org/10.1007/s00024-002-8728-5; Goldfinger, C., Nelson, C. H., Morey, A. E., Johnson, J. E., Patton, J. R., Karabanov, E., Gutiérrez-Pastor, J., Eriksson, A. T., Gràcia, E., Dunhill, G., Enkin, R. J., Dallimore, A., and Vallier, T., 2012, Turbidite event history — Methods and implications for Holocene paleoseismicity of the Cascadia subduction zone: U.S. Geological Survey Professional Paper 1661–F, 170 p. https://pubs.usgs.gov/pp/pp1661f/; Goldfinger, C., Galer, S., Beeson, J., Hamilton, T., Black, B., Romos, C., Patton, J., Elson, H. C., Hausmann, R., and Morey, A., 2017, The importance of site selection, sediment supply, and hydrodynamics: a case study of submarine paleoseismology on the northern Cascadia margin, Washington, USA: Marine Geology, v. 384, p. 4–16, 17, 24–46. https://doi.org/10.1016/j.margeo.2016.06.008.

[29] Dalton, M.M., P.W. Mote, and A.K. Snover [Eds.]. 2013. Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities. Washington, DC: Island Press. http://cses.washington.edu/db/pdf/daltonetal678.pdf; Dalton, M.M., K.D. Dello, L. Hawkins, P.W. Mote, and D.E. Rupp (2017) The Third Oregon Climate Assessment Report, Oregon Climate Change Research Institute, College of Earth, Ocean and Atmospheric Sciences, Oregon State University, Corvallis, OR. http://www.occri.net/media/1055/ocar3_final_all_01-30 -2017_compressed.pdf.

[30] Preston, B., Backhaus, S., Ewers, M., Phillips, J., Silva-Monroy, C., Dagle, J., Tarditi, A., Looney, J., King Jr., T. (2016). Resilience of the U.S. Electricity System: A Multi-Hazard Perspective. https://www.energy.gov/

sites/prod/files/2017/01/f34/Resilience%20of%20the%20U.S.%20Electricity%20System%20A%20MultiHazard%20Perspective.pdf.

[31] IPCC, 2014a: Summary for policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32; USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6. https://science2017.globalchange.gov/.

[32] *ODOE Energy Storage Grant to Spur Eugene Water & Electric Board Toward a Cleaner, More Resilient Energy System [Press release].* Oregon Department of Energy. (2015, December 16). energyinfo.oregon.gov/blog/2015/12/16/odoe-energy-storage-grant-to-spur-eugene-water-electricboard-toward-a-cleaner-more-resilient-energy-system.

[33] U.S. Global Change Research Program (USGCRP). "The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment." Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. http://dx.doi.org/10.7930/J0R49NQX

[34] *Microgrid Definitions.* U.S. Department of Energy Microgrid Exchange Group. 2018. https://buildingmicrogrid.lbl.gov/microgrid-definitions.

[35] *Biennial Energy Report Chapter 5: Resilience.* Oregon Department of Energy (2018). https://www.oregon.gov/energy/Data-and-Reports/Documents/BER-Chapter-5-Resilience.pdf

[36] For a more in-depth exploration of community energy resilience and the contribution that microgrids can provide, see the Oregon Guidebook for Local Energy Resilience.

[37] Microgrids for Commercial and Industrial Companies. *World Business Council for Sustainable Development.* (November 2017). Section 1.1, page 6-7. https://docs.wbcsd.org/2017/11/WBCSD_microgrid_INTERACTIVE.pdf.

[38] Maloney, P., The Commercial and Industrial Microgrid: A Growing Number of Corporations Going Green. *Microgrid Knowledge* (November 2017). https://microgridknowledge.com/commercial-and-industrialmicrogrid/.

[39] Jerome, E., EWEB & Howard Elementary Open Emergency Water Purification Center. *KEZI, Channel 9 ABC News* (May 2019). https://www.kezi.com/content/news/EWEB--Howard-Elementary-open-emergency-waterpurification-center-509807511.html.

[40] *Public Safety Center: Project Information.* City of Beaverton (Oregon). Last updated August 14, 2020. https://www.beavertonpolice.org/153/Public-Safety-Center; Cohn, L., Earthquake Worries Prompt Oregon Cities to Install Microgrids for Resiliency. *Microgrid Knowledge* (October 2019). https://microgridknowledge.com/microgrids-resiliency-cities/#comments.

[41] Ramasamy, V., Feldman, D., Desai, J., & Margolis, R. (2021). U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks: Q1 2021 (NREL/TP-7A40-80694, 1829460, MainId:77478; p. NREL/TP-7A40-80694, 1829460, MainId:77478). https://doi.org/10.2172/1829460.

[42] Berkeley Lab. *Tracking the Sun Report*. September 2022. https://emp.lbl.gov/sites/default/files/2_tracking_the_sun_2022_report.pdf

[43] Berkeley Lab. *Tracking the Sun Report*. September 2022. https://emp.lbl.gov/sites/default/files/2_tracking_the_sun_2022_report.pdf

[44] See PUC Docket No. UM 2000, Investigation into PURPA Implementation. This review considers the changing resource mix toward more renewable energy resources with variable generation.

[45] Net metering also creates the potential for shifting the recovery of utility fixed costs to non-participating customers. See the OPUC's Investigation into the Effectiveness of Solar Programs in Oregon, July 1, 2014, page 33. Link: https://edocs.puc.state.or.us/efdocs/HAA/um1716haa101213.pdf.

[46] House Bill 2914 (2015) directed the OPUC to recommend "the most effective, efficient and equitable approach" to incentivizing the development and use of solar photovoltaic systems in Oregon. See HB 2914 Solar Incentives Report, October 28, 2016. Link: https://www.oregon.gov/puc/forms/Forms%20and%20Reports/2016-HB-2941-Solar-Incentives-Report.pdf.

[47] See HB 2021 (2021), Sections 1-15. https://olis.oregonlegislature.gov/liz/2021R1/Measures/Overview/HB2021.

[48] See HB 2475 (2021), implemented under PUC Docket No. UM 2211. https://olis.oregonlegislature.gov/liz/2021R1/Measures/Overview/HB2475.

[49] See PUC Docket No. UM 2114, Investigation into the Effects of the COVID-19 Pandemic on Utility Customers.

[50] Wheeling charges are fees charged by utilities to allow for power to be exported through their service territories.

[51] Section 18 of HB 2021 directs ODOE to "*convene a workgroup to examine opportunities to encourage development of* ***small-scale*** *and* ***community-based*** *renewable energy projects in this state that contribute to economic development and local energy resiliency.*"

[52] *Small-Scale Renewable Energy Project Study Workshop #3.* Oregon Department of Energy. https://www.youtube.com/watch?v=qViWNrcdyZw.

[53] Others suggested looking to the Hawaii model for Distributed Energy Resources support. It is important to note that Hawaii's retail electricity rates are very high due to its geographic isolation. This makes projects more cost effective to develop than in Oregon.

[54] Oregon Oks dual PGE approach to procure renewables for business customers. *Utility Dive* (March 7, 2019). https://www.utilitydive.com/news/oregon-oks-dual-pge-approach-to-procure-renewables-for-business-customers/549955/; PacifiCorp proposes green tariff in Oregon. *Portland Business Journal* (March 23, 2022). https://www.bizjournals.com/portland/news/2022/03/23/pacificorp-vret.html.

[55] *Bioenergy Feed-in Tariff Program (SB 1122).* California Public Utility Commission. https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/rps/rps-procurement-programs/rps-sb-1122-biomat.

[56] *Oregon Renewable Energy Siting Assessment Tool.* Oregon Department of Energy. https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=renewable.

[57] *Growing Plants, Power, and Partnerships Through Agrivoltaics – Solar and Agriculture Pair Well Together, Thanks to Planning and Cooperation.* National Renewable Energy Laboratory (August 18, 2022). https://www.nrel.gov/news/program/2022/growing-plants-power-and-partnerships.html.

[58] HB 2520 (2021). https://olis.oregonlegislature.gov/liz/2021R1/Downloads/MeasureDocument/HB2520/Introduced

[59] *Regional Transmission Organization – Oregon Perspectives.* Oregon Department of Energy (December 2021). https://www.oregon.gov/energy/Data-and-Reports/Documents/2021-Regional-Transmission-Organization-Study.pdf.

[60] Currently, the report is not available online. ODOE has a copy.

[61] *Introduction to Oregon's Indian Tribes.* Oregon Secretary of State. https://sos.oregon.gov/blue-book/Pages/national-tribes-intro.aspx.

[62] A virtual power plant is a network of decentralized, small-scale power generation projects. The projects' power generated is aggregated to trade or sell the power as a larger entity.

[63] *Community Renewable Energy Grant Program.* Oregon Department of Energy. https://www.oregon.gov/energy/Incentives/Pages/CREP.aspx.

[64] House Bill 2914 (2015) directed the OPUC to recommend "the most effective, efficient and equitable approach" to incentivizing the development and use of solar photovoltaic systems in Oregon. See HB 2914 Solar Incentives Report, (October 28, 2016) https://www.oregon.gov/puc/forms/Forms%20and%20Reports/2016-HB-2941-Solar-Incentives-Report.pdf.