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Oregon: Landscape of Renewable Energy Policy

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OREGON:
Landscape of Renewable Energy Policy

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I. Introduction

Leveraging its progressive politics and proximity to California's renewables markets, Oregon has taken a proactive approach to renewable energy development. Academic literature highlights the state's role as a leader in renewable energy policy in the U.S., crediting abundant wind and water resources complemented by favorable policy for renewable energies investment, economic development, and job creation.[1] Additionally, Oregonians generally hold a favorable attitude toward renewable energy, seeing it as a "source of energy independence, rural community development, and cleaner air."[2]

Wind generation took off in the late 1990s and early 2000s and accounted for approximately 10% of total electricity generation in 2017, although solar has yet to make a significant impact.[3] Hydroelectricity remains king in Oregon; in 2017, over 61% of the state's electricity comes from dams, and neither wind nor solar has the potential to supplant hydro as the top renewable resource in the state. Despite this, Oregon has not shied away from investing in expansion of non-hydro renewables. Since the beginning of the 21st century, a spate of climate policies and tax incentives have signaled the state's commitment to supporting and expanding renewables development. It aims to cut greenhouse gas emissions by at least 75% below 1990 levels by 2050, with an interim goal to reduce emissions 10% below 1990 levels by 2020.[4] Other explicit climate policies include a Renewable Portfolio Standard, the Clean Fuels Program, and the Clean Electricity and Coal Transition Act. In 2019, it is expected that the Oregon Climate Action Program, which would establish a "cap-and-invest" program, will become law, potentially further increasing the rate of deployment of renewable energy in Oregon.

Despite this, much of the wind development has been earmarked to export to California, where strong renewable portfolio standards drive high demand.[5] Siting has also posed a challenge: Oregon's farmland preservation interests wield a strong influence and some of the best resources are either off-shore (wind) or on federally-managed land subject to restrictions (solar). While utility-scale renewables development may have heralded the beginning of the renewables energy era, policy support for distributed and community-scale generation is also increasing. A smaller focus may help the state navigate the siting barriers that so frequently hinder utility-scale wind and solar. Ultimately, it remains to be seen whether Oregon will successfully navigate the barriers to utility-scale development, establish itself as a leader in small-scale renewables—or possibly both.

II. Background

Oregon's Physical, Economic, and Political Geographies

Oregon is the ninth-largest state and one of the nation's most geographically diverse, divided physically, economically and politically by the Cascade Mountains. Densely populated areas are concentrated to the west in Portland (50% of the state's population), Willamette Valley, and on the coast, with sparser populations in central, northeast, and southeast Oregon.[6] Despite an aging workforce, the state's population is increasing due to economic growth, job opportunities, and resulting immigration.[7]

Oregon contains a substantial amount of public land, with 53% of the state's 61 million acres under federal management and another 3% in state hands. Some agencies, like the Bureau of Land Management, claim streamlined processing for solar and wind rights-of-way (as well as pipelines and transmission lines) to promote state "energy independence."[8]

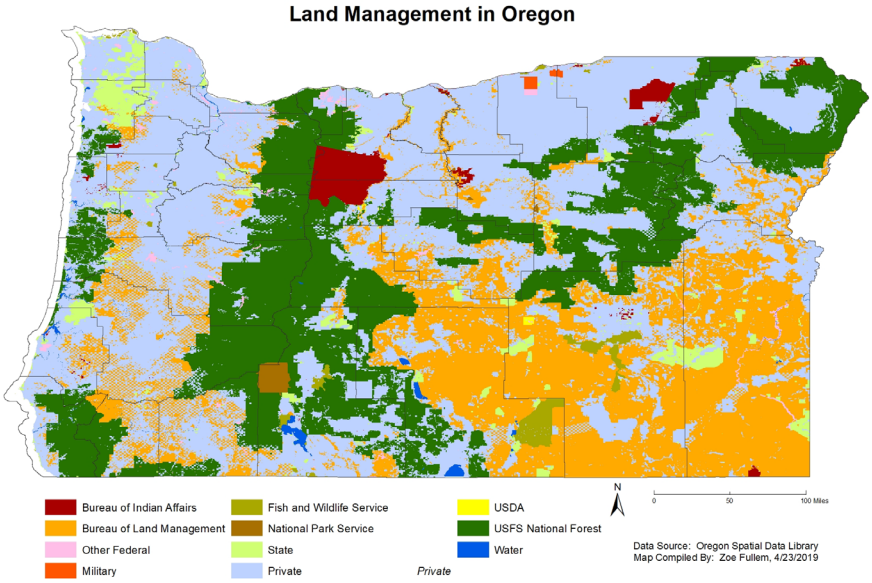


Figure 1: Land Management in Oregon.
Data Source: Oregon Spatial Data Library

Oregon's economy was historically resource-based, centered on timber, fishing and agriculture, with a shift in the 1980s towards services and mixed manufacturing. Clean/green technology has become significant, and Oregon has the highest percentage of its workforce in the clean energy tech sector in the nation.[9] In rural areas, agriculture remains important, and the state is a significant producer and $3 billion exporter of fruit, greenhouse and nursery commodities, cattle, and dairy products.[10] It also exports $500 million in forest products yearly.[11]

The persistence of agriculture, forestry, outdoor recreation, and fishing industries means that the state's economy is immediately and drastically affected by climate change, including reduced summer precipitation, earlier snowmelt, more acres burned in wildfire, and water shortages.[12] These concerns are apparent in early climate action, the re-election of Governor Kate Brown and election of pro-climate legislators in the 2018 "Green Wave." First proposed in early 2019, the Oregon Climate Action Program (HB 2020), formerly known as the Clean Energy Jobs bill, would establish carbon pricing through statewide cap-and-trade and is supported by Democrat Senate President Peter Courtney and Democrat House Speaker Tina Kotek.[13] Brown is also establishing the Oregon Climate Authority to "align state programs and expertise to achieve the state's climate policy goals."[14] Amidst this climate action, Oregon is increasingly experiencing an urban-rural and political divide, with partisan representation highly spatially correlated—although Governor Brown won by 7% statewide, only seven of Oregon's 36 counties chose her, predominantly in the metropolitan areas west of the Cascades.[15]

Existing Electricity Generation: Trends for the Last 20 Years

For the last twenty years, conventional hydroelectric power has dominated electricity generation in Oregon, comprising approximately 89% of the mix in 1997 to 61% in 2017.[16] Oregon's vast production and use of hydroelectricity makes it one of the top three hydroelectric power producers in the country, ultimately accounting for 12% of total U.S. hydroelectric generation.[17] The state's 31 hydroelectric projects are located along or around the Columbia River and the dams and reservoirs that make up the system are collectively known as the Federal Columbia River Power System.

Outside of hydroelectric power, natural gas, coal, wood and wood-derived fuels, wind, other biomass, and petroleum constituted the Oregon electricity generation mix from about 1997 to 2010 (refer to Figures 1 and 2).[18] During this period, coal accounted for an average of about 6.8% of electricity generation and natural gas accounted for about 22.5%. In the mid-1990s, natural gas quickly surpassed coal as the second-largest source of electricity generation after hydropower. In 2011, solar thermal and photovoltaic were added to the electricity generation mix with a nominal total of 90 megawatt hours (MWh), increasing to 6,412 MWh in 2012 and reaching 194,052 MWh by 2017, approximately 0.3% of the total electricity mix that year. Wind power took off much more significantly compared to solar power, first coming into production in Oregon in 1998. Wind power peaked in Oregon in 2014 when it reached 12.5% of total electricity production. In 2017, wind production was 9.93% of the total. (See Appendix A for electricity generation from 1997 to 2017 and Appendix B for clean energy electricity generation mix from 1997 to 2017.)

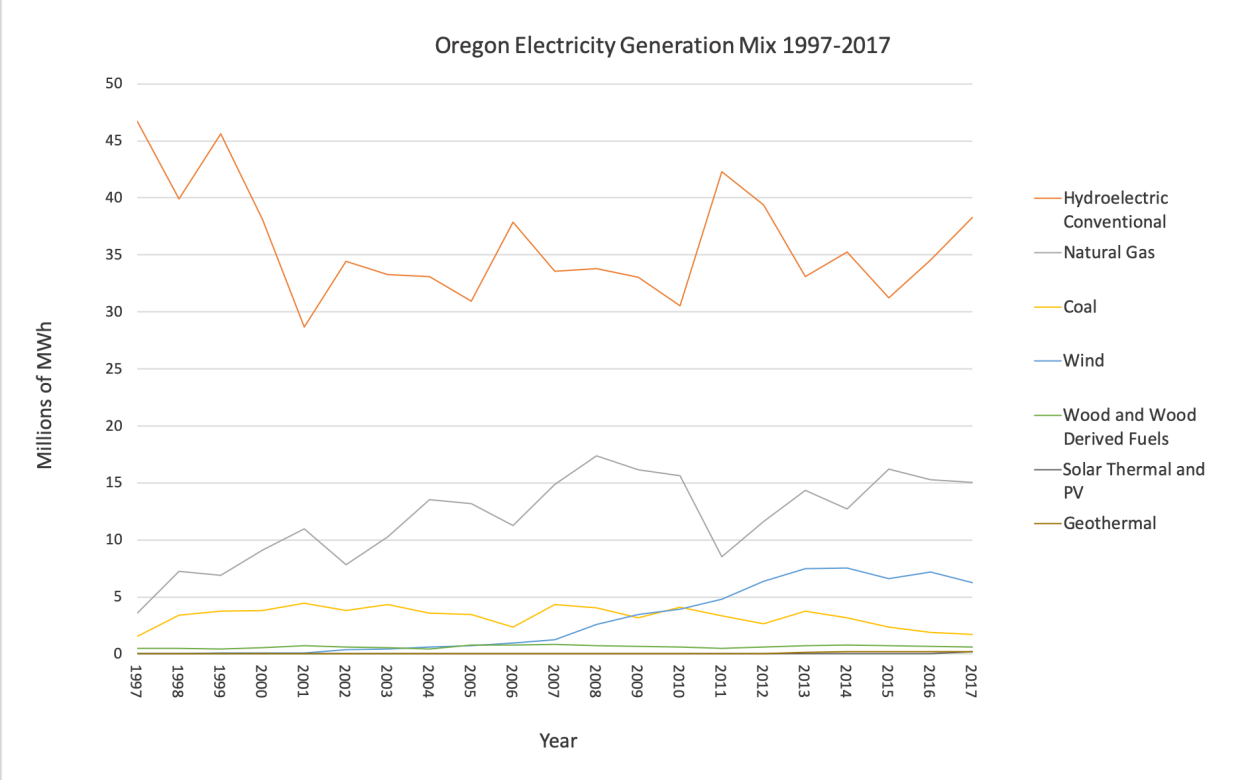


Figure 2: Oregon Electricity Generation Mix.
Source: U.S. Energy Information Administration[19]

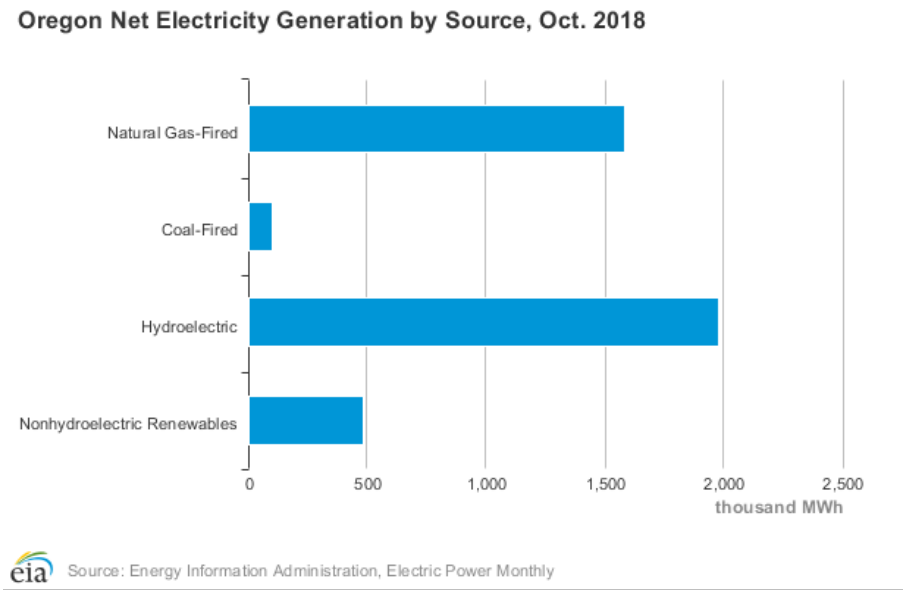


Figure 3: Oregon Net Electricity Generation by Source, Oct 2018.
Source: U.S. Energy Information Administration[20]

Electricity Imported & Exported Across State Lines

Due to electricity imported and exported across state lines, the electricity consumption mix is different from the state's electricity generation mix. According to the Oregon Department of Energy (ODOE), Oregon's electricity consumption is about 40.5% hydroelectric, 32% coal, 16.5% natural gas, 6.5% wind, and 3.25% nuclear with the remaining 1.25% from a mix of biomass, solar, geothermal, biogas, waste, petroleum, and others (Figure 4).

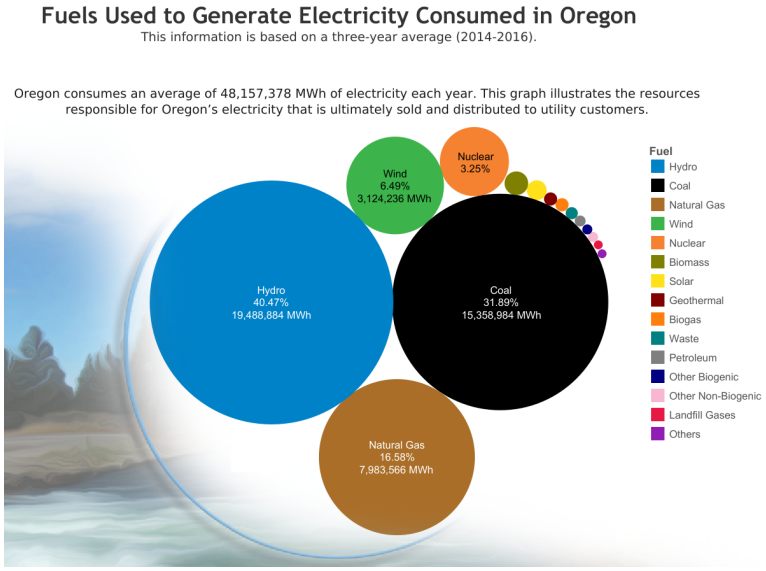


Figure 4: Fuels Used to Generate Electricity Consumed in Oregon.
Source: Oregon Department of Energy[21]

Oregon imports nuclear power from the Columbia Generating Station in Hanford, Washington and coal power from plants in Utah, Wyoming, and Montana.[22] Since 1998, much of Oregon's wind production has been exported to California to meet the latter state's strict renewable

energy mandates. Oregon also exports hydroelectric power to California, particularly during the spring months when hydropower peaks and the Northwest does not need all of the power for its own demand.[23] The Pacific DC Intertie is an electrical transmission line originating near the Columbia River outside of The Dalles, Oregon and ending in the Los Angeles area in California. It is operated by the Bonneville Power Administration (BPA) and can deliver a maximum of 7,900 megawatts (MW) of electric power.[24]

Changes to the Electricity Mix: Upcoming Developments

The addition of solar and wind power in Oregon over the last seven years suggests a shift toward renewables (beyond Oregon's steadfast hydroelectric power) as an important energy source in the state. In tandem with renewable energy growth, utilities are planning for early retirements of coal power plants. Oregon's only coal plant, Boardman, is scheduled to close by 2020. Operated by Portland General Electric with a 550 MW generating capacity,[25] Boardman will be the first coal plant to close in the Northwest.[26]

Oregon currently has a number of energy projects under review by the state. According to ODOE's monthly energy facility siting update, as of April 2019, there are three new solar projects and one new wind project under review[27] (see Appendix C for a complete list):

- Obsidian Solar Center – a proposed photovoltaic (PV) solar energy generation facility with generating capacity of up to 400 MW.
- Bakeoven Solar Project – a proposed PV solar energy generation facility with generating capacity of up to 303 MW and 100 MW of battery storage.
- Blue Marmot Solar Energy Facility – a proposed PV solar energy generation facility with generating capacity up to 60 MW.
- Nolin Hills Wind Project – a proposed wind energy facility of up to 350 MW peak generating capacity.

Additionally, the ODOE siting report highlights several approved energy projects that are under construction or have not yet been constructed[28]:

- Summit Ridge Wind Farm – 194.4 MW wind energy facility
- Montague Wind Power Facility – 404 MW wind energy facility
- Wheatridge Wind Energy Facility – 500 MW wind energy facility
- Perennial Wind Chaser Station – 415 MW natural gas facility

Electricity-Sector Actors

Oregon hosts three investor-owned electric utilities (IOUs): Idaho Power Company, Pacific Power (PacifiCorp), and Portland General Electric, which serve approximately 74% of electricity customers in the state.[29] The IOUs are regulated by the state's Public Utility Commission. In addition, there are 37 consumer or publicly owned electric utilities, comprised of 19 cooperative electric units, six people's utility districts (PUDs), and 12 municipal electric utilities (Table 1).[30]

Table 1: Electricity Suppliers in Oregon
Source: Oregon Public Utility Commission

The following types of electric suppliers served electric customers in Oregon on December 31, 2017:

Type of Electricity Supplier	Number	MWh Sales in Oregon (%)[3]	Customers in Oregon (%)[3]
Investor-Owned	3	63.8	74.0
Electricity Service Suppliers (ESS)[1]	6	4.7	< 0.1
Cooperative[2]	19	12.5	10.5
Municipal-Owned[2]	12	9.9	9.6
People's Utility District[2]	6	9.1	5.9

The BPA, a nonprofit federal power marketing administration, is the state's lone wholesale electricity supplier. It sells electric power from 31 federal hydroelectric power projects in the Pacific Northwest, as well as one nonfederal nuclear plant and several small nonfederal power plants.[31]

Renewable Energy Potential

Oregon (and the Pacific Northwest) is often cited as a renewable energy policy leader in case studies for wind, hydro, and sometimes solar, development. The literature credits this leadership to abundant wind and water resources, complemented by favorable policy for renewable energy investment, economic development, and job creation.[32] On face value, Oregon's high production of hydroelectric power and growing wind sector put it at an advantage to meet its 50%-by-2040 renewable portfolio standard. However, Oregon exports much of this power, and the subsequent import presents a challenge as it grapples with the need to quickly source more electricity from renewable energy sources. In addition, technical issues such as grid integration and intermittence pose challenges for Oregon to scale up renewable energy across the state.

Oregon's hydroelectric system may be a key to solving intermittency issues related to solar and wind in the short-term. Although Oregon has already tapped into much of the hydroelectric potential available, NREL estimates that an additional 4 gigawatts (GW) or 18,184 gigawatt hours (GWh) of hydropower exists in the state.[33] However, in the long-term, hydropower may not be a viable or reliable option for serving as a baseload back-up for solar and wind. Public sentiment is unlikely to support construction of new large-scale hydropower, given its significant negative ecological effects. Hydropower is also threatened by climate change, as extreme weather events and drought increase, snowpack decreases, and rain patterns become less predictable.[34]

Geothermal may also be able to serve as a baseload clean energy source because it is a relatively constant source of electricity. Geothermal potential exists in the central and southeastern parts of Oregon and interest is growing in this source. NREL estimates the potential for this source is 116 GW or 914,105 GWh.[35] Geothermal opportunities are currently being explored in Lake County and Glass Butte.[36, 37]

While wind energy development has taken off, ODOE anticipates that new utility-scale wind projects will require significant transmission system investments and that small-scale wind projects may require expensive upgrades to the local grid.[38] Overall, NREL estimates on-shore

wind power potential in Oregon at 27 GW or 68,767 GWh (see Figure 8 for a map of onshore wind resources).[39] Off-shore, there is significant potential for wind power, at an estimated 225 GW or 962,723 GWh.[40] Wind speeds off-shore are prime for wind development (see Figure 5). Despite widespread interest in off-shore wind and a sustained push from the Pacific Ocean Energy Trust (POET) to advance offshore wind development, technical difficulties, such as ocean depth, have slowed development.[41]

Although currently a smaller portion of Oregon's renewable energy, solar development is also growing. A 2012 review of state financial incentives on solar deployment points to policy as particularly important in states like Oregon, which lack natural, strong sunlight capacity.[42] If realized, solar potential could equal Oregon's current wind production and help alleviate reliance on fossil fuels. NREL estimates the following for solar power potential:

- Urban utility-scale photovoltaics: 13GW or 25,783 GWh
- Rural utility-scale photovoltaics: 1,885 GW or 3,740,479 GWh
- Rooftop photovoltaics: 8 GW or 8,323 GWh
- Concentrating solar power: 1,017 GW or 2,812,126 GWh [43]

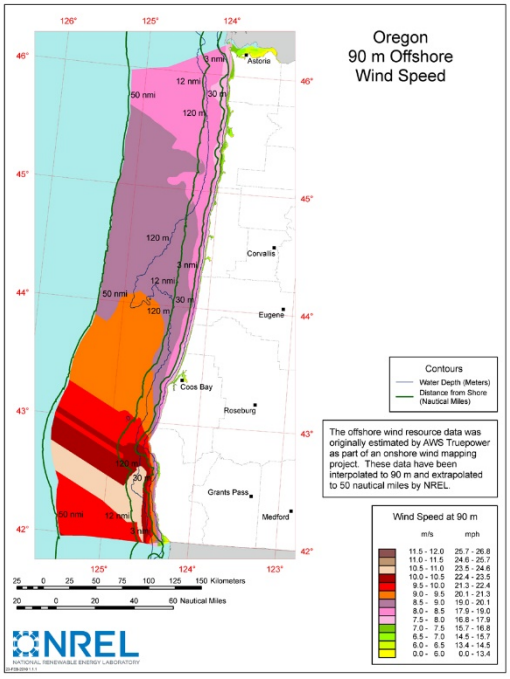


Figure 5: Oregon Offshore Wind Potential. Source: NREL

Other forms of renewables such as biopower and hydrothermal do not have significant potential, estimated at about 2 GW or 14,684 GWh and 2 GW or 18,200 GWh, respectively.[44]

While the technical potential exists for Oregon to invest in more renewable energy sources, it is not clear how feasible this endeavor will be from a land use perspective. The fact that the majority of land in central and eastern Oregon is owned by federal or state government agencies may alleviate issues related to convincing private-land owners to allow renewable energy infrastructure on their land, but presents challenges of its own.

III. Climate Change and Renewable Energy Policies

Many of Oregon's policies promoting renewable energy development find their origin in the state's attention to climate change, which began in 1988 with the formation of the Oregon Task Force on Global Warming by Democratic Governor Neil Goldschmidt.[45] Oregon's early commitment to addressing climate change hinged on the fact that its economy has historically been resource-based and centered on industries that are vulnerable to climate change, such as timber, fishing, and agriculture.[46] In 1990, the Task Force published a report that outlined potential climate impacts the state could face, in-state sources of greenhouse gas emissions, and recommendations

and actions state agencies should implement to mitigate and adapt to climate change.[47] One of the five conclusions reached by the Task Force was that "taking prudent actions to slow the emission of greenhouse gases" would insure Oregonians against some of the consequences of climate change.[48] The goal to reduce greenhouse gas emissions aligned with efforts already taking place in Oregon since the mid-1970s around energy conservation and renewable energy policy planning.[49] From this stemmed a series of ambitious climate change policies implemented at the state, county, and city levels over the last three decades, including policies specifically aimed at increasing renewable energy deployment.

Renewable Portfolio Standard

In 2007, Oregon enacted a renewable portfolio standard (RPS) as part of the Oregon Renewable Energy Act (SB 838). The RPS was later updated by SB 1547, the Clean Electricity and Coal Transition Act of 2016. This landmark renewable energy policy is implemented by the Public Utilities Commission (PUC), which regulates the state's investor-owned utilities, and mandates a host of measures concerning utilities' electricity portfolios. At present, PGE and PacifiCorp must derive 50% of their energy from renewable sources (which includes small, but not large, hydro) by 2040.[50] Along the way, they must achieve certain benchmarks: 27% by 2025, 35% by 2030, and 45% by 2035.[51] Smaller utilities are also regulated: providers that supply at least three percent of the state's electricity must meet 25% renewables by 2025, and the smallest utilities must meet five to 10% (depending their size) by the same year.[52] In addition to doubling renewables goals, the 2016 update to the RPS also mandated that PGE and PacifiCorp eliminate coal from their mix by 2030—a requirement that was highly controversial in the state legislature.[53, 54] Other elements of the RPS stipulate what proportion of renewable energy credits (RECs) can be unbundled (20% until 2020) and the criteria under which hydropower, biomass and municipal waste can "count" toward the portfolio standards.[55]

Senate Bill 1547, the 2016 RPS update, also significantly tightened restrictions on REC banking. Prior to 2016, investor-owned utilities could bank RECs indefinitely. Since SB 1547 went into effect, however, most RECs can only be banked for five years (there are a few exceptions).[56] According to Caroline Moore, Chief Utility Analyst for the Oregon PUC, the new policy aims for a "first in, first out" approach, to ensure that utilities' portfolios better align with the goal of increasing renewable electricity sources and decreasing fossil fuel sources.[57] Formerly, with indefinite banking (and weaker RPS targets), utilities could accrue a huge number of RECs and meet the targets without continuing to invest in renewables.

Small-Scale and Community Solar

The same bill that accelerated the RPS deadline and banned coal also mandates that small-scale (≤20 MW) renewables must account for eight percent of the state's electricity mix by 2025.[58, 59] This includes community solar as well as biomass cogeneration facilities. By law, PGE and PacifiCorp must allow community solar projects in their service areas and credit owners/subscribers on their electricity bill based on the resource value of solar.[60, 61] Community solar projects are required to be within Oregon's borders, creating a mandate for local small-scale development.[62] Additionally, the RPS offer a compliance multiplier of two per kilowatt hour for

small solar projects with capacity from 500 kilowatt (KW) to five megawatts.[63, 64] There are also incentives for photovoltaic solar from two to ten megawatts.[65]

Two policies directly impact customers. Following SB 1149, passed in 1999, PGE and PacifiCorp attach a three percent surcharge on all their customers' bills, with the funds earmarked for energy conservation, efficiency, and renewables projects.[66] Administered by the Energy Trust of Oregon and known as the Public Purchase Charge, approximately 17% of these funds incentivize installation of small-scale renewables (<20 MW) when project costs exceed market rates.[67,68] PGE and PacifiCorp are also required to offer customers a "green power plan," in which they can choose to pay a higher price to subsidize the utility's investment in more renewables. RECs associated with green power plans cannot also be counted toward the RPS.[69]

According to Moore, the PUC analyst, community-scale renewables are currently the focus of the commission's work. Community-scale projects have captured stakeholders' attention, driven in part by a belief that distributed generation has inherent value tied to local resilience, equity, affordability, and reliability. This interest means that policies concerning the resource valuation of solar, net metering, and interconnection have real implications for the future of renewables. Moore noted that, in particular, the resource valuation of solar—which would set a price on distributed solar—has the potential to "break down barriers for community solar."[70] However, distributed generation has not reached self-sustaining levels in the market and requires massive subsidization. At present, the impact of these community-scale policies remains to be seen.

Despite the seeming panoply of policies promoting renewables at the utility- and community-scales, Oregon also faces obstacles in scaling its renewables generation. Moore cited the state's transmission rules and processes as a "roadblock" to renewables development.[71] At the community scale, renewables may generate more electricity than existing interconnections were designed for, and the cost of updating the system is often born by a single project. Under shared jurisdiction of the Federal Energy Regulatory Commission and the state, interconnection laws are complex and increasingly outdated. The combination of these forces presents a significant obstacle to bringing new projects online and has prompted the state to revisit its interconnection policies to smooth the way toward more community-scale power.

Clean Fuels Program

Noting that one-third of Oregon's greenhouse gas emissions come from the transportation sector, the Clean Fuels Program aims to reduce the average carbon intensity of Oregon's transportation fuels by 10% over a 10-year period.[72] The program outlines clean fuel standards that must be implemented between 2016 and 2025 with increasing reductions in carbon intensity each year (see Appendix D for the annual clean fuel standards). Oregon's inclusion of electricity as an alternative fuel signals the need for greater renewable energy development. Additionally, the Governor's Climate Agenda report includes a goal to expand electric vehicle infrastructure and incentives to support 50,000 electric vehicles by 2020 as well as to decarbonize the electricity sector.[73]

Oregon Climate Action Program

The Oregon Climate Action Program (House Bill [HB] 2020), which, as of April 2019, is expected to pass in the state legislature in 2019, has potential to impact renewable energy development in Oregon. Since 2016, multiple iterations of this bill have failed to pass through three legislative sessions, but the Joint Interim Committee on Carbon Reduction release of a first draft of the new bill in January 2019 demonstrated the government's renewed commitment.[74, 75] If passed, HB 2020 would enact a "cap-and-invest" system by 2021, in which entities emitting more than 25,000 metric tons of carbon dioxide equivalent annually would either adopt technology to lower emissions or purchase an emission allowance.[76, 77] Large emitters included in the cap-and-invest program would include electricity, natural gas, transportation, and large industrial sources, which account for about 85% of total climate pollution in the state.[78] Not included are waste disposal sites, agricultural sources, airplanes, boats, railroads, and cogeneration facilities that produce both electricity and heat operated by a public university or the state.[79]

The resulting revenue, estimated to be in the hundreds of millions of dollars, would be used for clean energy investments, hopefully leading to greater deployment of utility- and community-scale renewable energy projects. However, an analysis of the first draft of the bill by Sightline Institute, a non-profit sustainability think tank, noted that the majority of the revenue "will go for free to utilities and industrial facilities, as well as to the Highway Trust Fund."[80] The permits, or allowances, that the program uses to enforce limits on pollution allow the holder to emit one ton of pollution. The analysis explains that by not auctioning off the allowances, "which sets a market price for pollution and generates revenue," Oregon is choosing to give allowances to emitters for free.[81] Electric utilities would get allowances for free through 2030, and the same may be true for natural gas utilities. This would result in less revenue to reinvest in renewable energy development and other initiatives, particularly in the program's early years.[82] However, this is subject to change as amendments to the bill are proposed. An amendment dated March 27, 2019 proposed the allowances for certain industries be reduced from 100% to 95% in the first three years of the program. It is possible future amendments will target the allowances.[83] In summary, the Clean Energy Jobs bill could further spur renewable energy development in Oregon, particularly through supplying more financial support for smaller scale projects, but the extent of the impact remains to be seen.[84]

IV. Tax Policy

Oregon generates tax revenue primarily through personal income tax, property tax, capital gains tax, excise tax on certain commodities, corporate income tax, and estate and inheritance taxes. The state does not have a sales tax. The majority of tax revenue comes from the personal income tax, accounting for about 75% in 2016.[85] At a county level, property tax is the most important source of revenue.[86] In terms of renewable energy, Oregon assesses real and personal property tax for wind farms and solar farms are subject to a fee in lieu of taxes.[87]

Oregon has enacted several tax and subsidy policies that aim to spur renewable energy development across the state. Prominent policies at the state level include the Rural Renewable Energy Development Zones (RREDZ) program, a fee in lieu of property taxes for solar

developments, and the Alternative Energy Systems abatement. In addition to state-level policies, the city of Portland has a tax on large businesses known as the Clean Energy Community Benefits Initiative.

Rural Renewable Energy Development Zones

RREDZ is a property tax abatement encouraging renewable energy development in which businesses investing and hiring in an enterprise zone receive exemption from local property taxes on new plants and equipment for three to five years.[88] RREDZ incentivizes new investments that harness wind, geothermal, solar, biomass or other unconventional forms of energy in Oregon to generate electricity or that produce, distribute, or store any of a wide variety of biofuels. The RREDZ program began in 2003, with the first designation awarded to Lake County, located in the south-central part of the state, in 2008. By 2018, there were a total of ten RREDZ in Oregon, with three counties (Crook, Linn, and Polk) receiving designation in 2018 (see Appendix D for full list of RREDZ). There are no limits to the number of RREDZ designations, and a RREDZ is permitted anywhere outside the urban growth boundary of a city with 30,000 people or more.[89] The fact that RREDZ is a short-term tax abatement is attractive to communities who welcome and plan on the tax revenue from renewable energy projects after the abatement expires. Therefore, RREDZ encourages renewable energy development from both a developer and community lens.

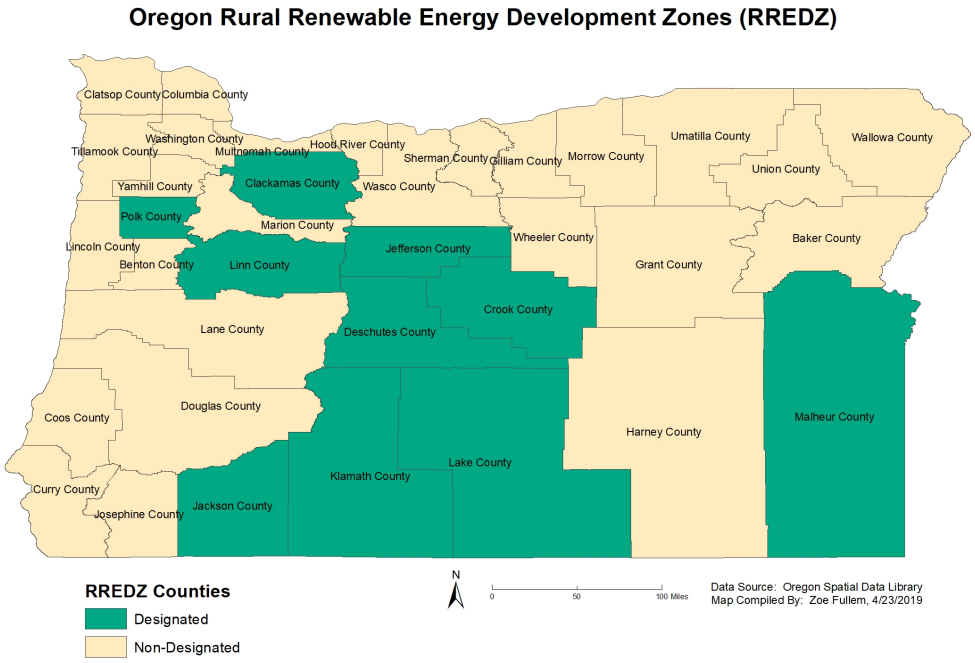


Figure 6: Map depicting counties in Oregon that are designated as RREDZ.
Data Source: Oregon Spatial Data Library

Fee in Lieu of Property Taxes

Implemented in 2015, the fee in lieu of property taxes program allows solar projects to be exempt from property taxes for up to 20 years in lieu of a county/city fee equal to $7,000 per megawatt of the project's nameplate capacity per annum.[90] According to an interview with

Kimberly Herb, Energy Incentives Coordinator at Business Oregon, many developers take advantage of the fee in lieu of property taxes program. It is attractive to solar developers because it provides certainty over the long-term. Over the 20-year period, developers do not need to worry about variance in future tax rates, as they would under the tax abatement program offered by RREDZ.[91] This certainty may lead to increasing solar development in Oregon in coming years. The fee is distributed to local entities in the counties where the projects are sited.

Strategic Investment Program

Created in 1990, the Strategic Investment Program (SIP) provides a 15-year property tax exemption on a portion of large capital investments. To qualify for SIP, a project must serve a "traded sector" industry, or sector in which "member firms sell their goods or services into markets for which national or international competition exists."[92] Additionally, a project's cost must be at least $25 million in a rural area or $100 million in other areas, although in actuality the investment would need to be much bigger since the exemption is on property value in excess of a taxable portion. Windfarms and other renewable energy projects in Oregon are becoming big enough that developers are able to take advantage of SIP. Similar to the fee in lieu of property taxes program, SIP provides long-term certainty for developers, making it an attractive incentive. SIP also has a built-in incentive for communities through the community service fee. For example, the upcoming Wheatridge Renewable Energy Facility, which combines wind, solar, and battery power and will be sited in Morrow County, qualified for SIP. If built to full capacity, the project could result in about $5 million in annual SIP payments to the county over the 15 year period and also includes at least $1 million directed to Morrow County schools.[93]

Alternative Energy Systems Abatement

The Alternative Energy Systems Abatement, which was scheduled to expire in 2018, allows for an alternative energy system to be exempt from ad valorem property taxation if the system is a net metering facility or primarily designed to offset onsite electricity use .[94] "Alternative energy system" is defined as solar, geothermal, wind, water, fuel cell, or methane gas energy used for heating, cooling, or generating electricity.[95] Essentially, this abatement provides a "tax exemption for any changes in the real market value of a property due to installing a qualifying renewable energy system."[96] Since 2011, the program granted a tax exemption to more than 5,700 alternative energy projects, with the total value of exemptions exceeding $236 million. (See Appendix E for yearly number of projects and exemption amounts from 2011 to 2016.)

Business Energy Tax Credit

Previously, Oregon also offered the Business Energy Tax Credit, which offered a maximum incentive of $10 million for wind energy development and $20 million for solar array manufacturing.[97] Passed in 2007, it was reformed only three years later after investigations revealed widespread abuse of the program.[98] However, the reform only came after developers were able to capitalize in the incentives. In 2011, the Shepherds Flat wind farm, located along the Columbia River in the eastern part of the state, was expected to be the largest wind development in the world, with 338 turbines covering over 30 square miles.[99,100] Controversy stemmed from

the sheer size of the subsidies collected by the developer: almost $1.2 billion from federal, state and county programs.[101] One local man who sold out to the developers, was "outraged": "'This is taking money out of your pocket, my pocket, everybody's pocket,' he said. 'This is a boondoggle of boondoggles. It's a huge waste of our state and federal money.'"[102] The Portland-based *Oregonian*, which quoted the man, agreed:

> [This project] illustrates how Oregon taxpayers subsidize California's renewable energy demand. It shows how developers have used the program's loose administrative rules to qualify for multiple tax credits for the same project. And it reveals how a program that was originally intended to promote conservation and clean energy morphed into an extravagantly expensive green jobs program.[103]

The wind credit and the manufacturing credit expired in 2012 and 2014, respectively.[104]

Portland Clean Energy Community Benefits Initiative

At the local level, Portland has taken steps to incentivize renewable energy development through tax policy. In November 2018, Portland residents voted to institute the Portland Clean Energy Community Benefits Initiative, a tax to fund clean energy projects and job training. The measure levies a one percent tax on businesses that make over $ billion in gross revenues nationally and $500,000 locally. Proponents of the tax estimate that it will raise about $30 million annually.[105] As of yet, it is unclear how this tax will impact renewable energy deployment in Oregon.

V. Siting Policy

Large Projects: Energy Facility Siting Council

In 1975, the Oregon Legislature created the Oregon Department of Energy (ODOE) and the Energy Facility Siting Council (EFSC) in response to the federal energy crisis.[106] ODOE's mission is to "[lead] Oregon to a safe, clean, and sustainable energy future – one where our state stays on the leading edge of energy efficiency and renewable energy," and the EFSC supports this by overseeing and reviewing large-scale energy facilities and infrastructure across the state, renewable and otherwise.[107]

All large-scale, utility proposed energy facilities must be approved through the EFSC. The threshold for wind projects to require the EFSC review process is 105 MW maximum capacity or 35 MW average capacity, while for solar it varies based on soil quality and acreage (100 acres or greater for USDA-appointed high value farmland, and 300 acres or greater for non-farmland).[108] Upon completion of the review process, projects that meet the EFSC siting standards are awarded an EFSC site certificate allowing the projects to be built. As of April 2019, there is some traction in the Oregon House of Representatives to increase these thresholds to reduce processing time and the EFSC's control over smaller sites (see the discussion below of House Bill 2329).[109]

The EFSC review process is administered by the Energy Facility Siting Division of the ODOE, which is responsible for the application process, permitting, and recommendations for all projects. Ultimately, however, the EFSC makes the final decision on a project. With a small

council of only seven members—appointed by the Governor and confirmed by the Senate—the preferences and experiences of the members have a sizable impact on project siting. With new appointments, the council aims to ensure consistent and broad geographic representation across the state and, more recently, input from the state's nine federally recognized tribes.[110,111]

Small Projects: Local Control

While the siting of large energy facilities is controlled by the EFSC, smaller facilities falling under the 150 MW threshold for wind projects and 100- or 300-acres thresholds for solar projects are regulated by local government zoning and permitting. The ODOE and the EFSC have provided guidance for counties and cities to proactively "prescribe [zoning] limitations designed to encourage and protect the installation and use of solar and wind energy systems."[112, 113] In 2005, the EFSC published a model ordinance with clear recommendations, organization, and user-friendly templates for local governments to permit and site commercial wind and solar projects under 105 megawatts in their communities.[114, 115] These recommendations are backed by research suggesting that community ownership of wind projects reduces opposition and increases support, translates to more local economics benefits, and takes advantage of existing grid infrastructure.[116]

First, the model ordinance identifies facilities that should be exempt based on capacity, height less than 200ft (extremely local or household-scale), short-term residence (less than two months), and buildings' immediate and or adjacent use (photovoltaics less than 400sq ft). For noise and setback regulations, the model ordinance defaults to the EFSC's standard that "all above-ground parts of the nearest wind turbine structure are set back from the property line by a distance that is at least 1.5 times the height of the wind turbine structure, including the rotor swept area, except when the wind energy project extends onto the abutting property."[117] Regarding solar energy, the ordinance proposes that a "solar energy project would occupy less than [40] acres on land zoned for commercial or industrial use or less than [20] acres on land zoned for Exclusive Farm Use," significantly smaller than the EFSC guidelines.[118]

Despite high hopes for the 2005 model ordinance, a staff member from the Energy Facility Siting Division at ODOE confirmed that the ordinance was never adopted by any county, meaning there is no standardized processes for smaller, exempt renewable energy facilities.[119] Initially, some believed that exempt facilities may voluntarily opt-in to the EFSC process instead of dealing with the unpredictability of local jurisdictions, but this has not occurred.[120] ODOE has had conversations about what an updated ordinance would look like, with consensus that it would need to be more in tune with local land use ordinances to be applicable and adoptable.[121]

Some local governments have taken steps to ensure their regions will continue to attract renewable development on their own terms, such as the 2007 taskforce in Oregon's Columbia Plateau along the Washington border. The region is home to a substantial portion of the state's wind generation (Wasco, Sherman, Gilliam, Morrow, and Umatilla counties) and locals are adamant that renewables be consistent with their wildlife and ecological protections. Through federal, state, and local collaboration, the task force created wind energy siting and permitting guidelines, adding to the state-level EFSC process, to site, design, and permit wind projects in a "manner that supports both the conservation of important wildlife and habitat resources and the realization of the multiple environmental and economic benefits of wind energy."[122] This early

collaboration among local counties and developers incorporated local concerns and reduced future conflict.

Farmland Preservation and Community Response

In addition to wildlife concerns, many of Oregon's statues for renewable energy siting stem from the state's agricultural productivity and prioritization of farmland. The Oregon Department of Land Conservation and Development's land use goals include preserving and maintaining agricultural land (Goal 3) and conserving forestlands (Goal 4). Administrative rules OAR 660-033-0130(37) and (38) accordingly limit energy development to areas with minimal wildlife and farming value. Particularly in Exclusive Farm Use areas with high quality farming soil, solar panels are limited to 100 acres, while up to 320 acres may be used in areas with poor soils and no water rights.[123] Exceptions to this can be made, permitting that the utility facility does not encourage changes in the accepted farm or forest practices protected on nearby lands or significantly increase the cost to implementing these practices, or if the "proposed exception site and the use of activity requires a location near the source."[124] These exceptions are favorable to wind policy as they fit the location-specific caveats.

Farmland preservation is taken very seriously in Oregon—the state has some of the country's strongest policies, backed by popular support—and renewable energy development has sparked significant community opposition. In recent years, solar development has been a source of conflict in Willamette Valley, a 150-mile long valley that runs south from Portland and contains the state's best agricultural lands. In 2017, Cypress Creek Renewables planned to site five new solar farms in two Willamette Valley counties. Earlier that year, farm and land preservation advocacy groups had backed ultimately unsuccessful state legislation that would have required developers to prove that there was no alternative to their chosen site.[125] In anticipation of more solar developments on farmland, Willamette Valley counties acted to stop allowing construction of solar arrays on high-value soil. Between March and June 2018, two Willamette counties voted to stop accepting solar permit applications, and the State's Land Use Board of Appeals overturned a large solar project on the basis of farmland use restrictions.[126, 127, 128, 129] In January 2019, the Oregon Land Conservation and Development Commission voted to severely restrict solar farms on high-value soils until at least 2022, effectively halting many of the projects originally permitted under the previous rules.[130, 131132] The decision will set aside almost 300,000 acres of prized land in Marion County.[133]

The opposition efforts are led by land-use advocacy group 1,000 Friends of Oregon and its local affiliates. Friends of Marion County President Roger Kaye was quoted in 2019 in the *Statesman Journal*: "We see a threat to high-value farmland so that's what this rulemaking is all about. In my experience, solar arrays are another of these uses that are chewing up Oregon's prime farmland."[134] However, even if all 24 projects proposed in Marion County were developed, the total area would amount to less than 0.1% of all high-value farmland in the county.[135]

In at least some parts of Oregon's less populated regions, larger developments do not appear to have been met with the same level of resistance (although 1,000 Friends of Oregon and locals have opposed some). During the construction of a modest Cypress Creek development in the northeastern corner of the state, the town's airport manager told the *East Oregonian*, "We had

to scoot over a few cows when they got into the stakes, but otherwise [construction is] going smoothly."[136]

In some areas, such as Lake County, new solar projects, as well as a biomass facility, signal a hopeful future for economically-depressed rural communities.[137] However, the familiar issues are inescapable: questions about the number of permanent jobs produced, concerns about impacts of wildlife habitat, and—again—the desire to preserve high-value agricultural land.

VI. Use of Public Lands

Despite the debate over siting renewables on farmland, most of Oregon's potential for utility-scale onshore renewable energy development exists on federally-managed land. This is not surprising, given that the federal government owns approximately 53% of all the state's land (see Figure 7).[138] Of these federally managed lands, the best wind and solar resources exist on lands administered by the Bureau of Land Management (BLM) (Figure 8).

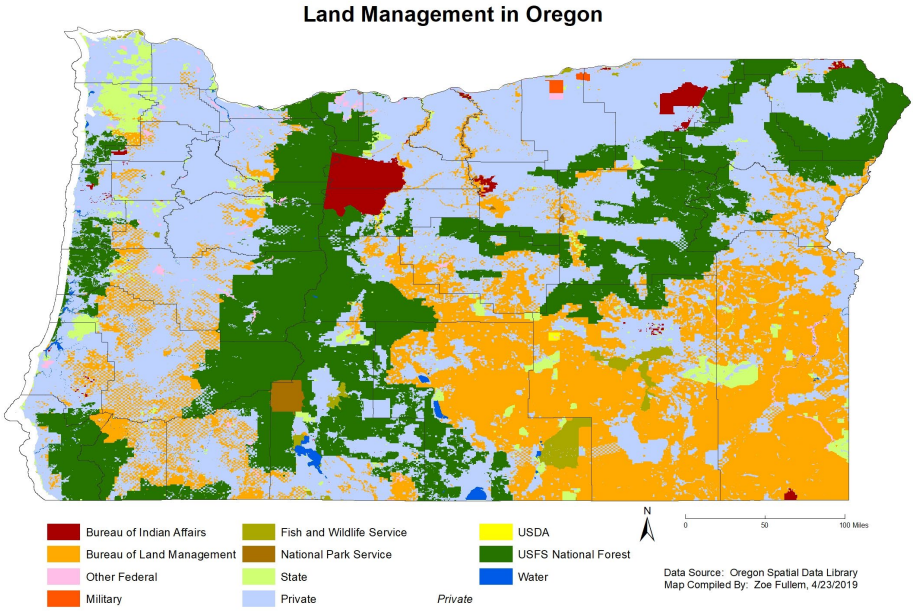


Figure 7: Land Management in Oregon
Source: Oregon Spatial Data Library[139]

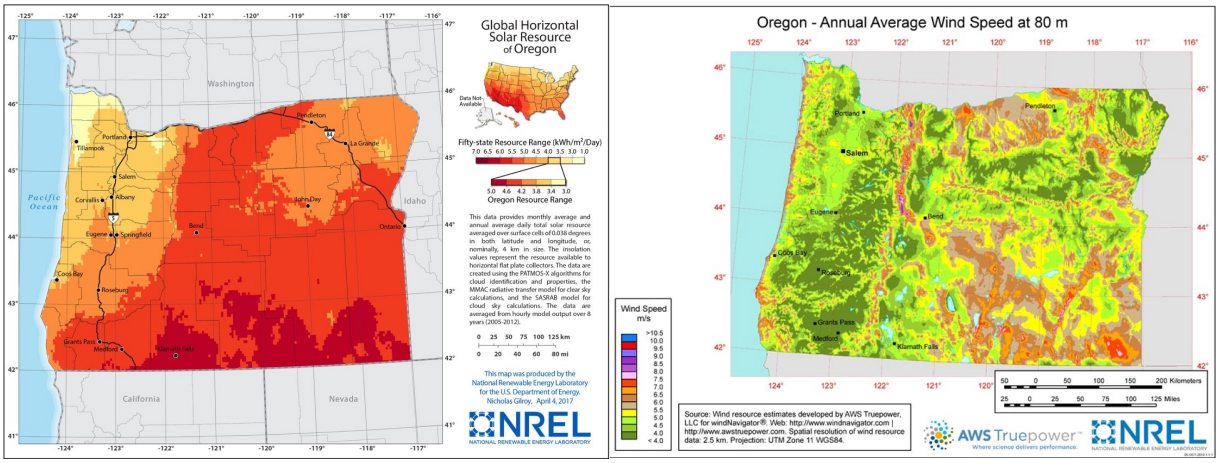


Figure 8: Global horizonal solar resource (kWh/m^2/day) (left) and annual average wind speed at 80m off the ground (m/s) (right). Oregon's resources range from less than four to 10 m/s for wind and three to five kWh/m^2/day for solar. Some of the best resources overlap with BLM-administered land (see Figure 7). Source: WINDExchange/U.S. Department of Energy[140] (right) and National Renewable Energy Laboratory[141] (left).

Bureau of Land Management

With a history of permitting oil, gas, coal, and rights-of-way on the lands it manages, BLM is well-positioned to also administer renewables. In 2017, the agency released its Wind and Solar Leasing Rule, which creates "designated leasing areas" (DLAs) in preferred locations for wind and solar development, with the goal of facilitating renewables on federal lands while providing market value return to taxpayers.[142, 143] DLAs represent land with the highest resource value and lowest potential for conflict.[144] The rule creates a number of incentives for developers, including less frequent rent adjustments, longer phase-in periods for fees, fee structure adjustments in response to the declining costs of renewables, and an easier leasing process.

While this rule certainly streamlines the process of developing renewables on BLM lands, federal law precludes a quick path to development. Major projects undertaken on federal land are subject to the National Environmental Policy Act (NEPA), which mandates an environmental review process requiring public input and consideration of alternatives. Potential projects are also subject to the Endangered Species Act, which requires consultation from the U.S. Fish and Wildlife Service and severely restricts actions that would adversely impact threatened or endangered species.

In 2009, BLM signed a memorandum of understanding (MOU) with Oregon regarding environmental review for commercial wind development and wind energy transmission in the state. The MOU outlines how the review process for projects on or adjacent to BLM-administered land would be jointly shared by BLM and ODOE. The intention of the MOU is to "facilitate a harmonious relationship" between the three parties when reviewing permits for wind development.[145] Coordination between the government bodies creates advantages for both their staff and developers seeking permits. Staff work is less likely to be duplicative, and because developers require both a right-of-way from BLM and a cite certification from EFSC, bureaucratic inertia is presumably streamlined by cross-agency communication.[146]

Despite the policies intended to streamline wind and solar development, opportunities to realize the renewables potential of Oregon's federal lands are heavily curtailed by land use restrictions that overlap with the areas of greatest renewables potential. Reasons for exclusion and restriction include: national monuments, national landmarks, and designated wilderness; impacts on Department of Defense activities; and protected habitat and uses. As a result of these restrictions, only 0.4% of BLM-administered land with potentially developable wind resources (meaning annual average wind speed of greater than five meters per second) has no siting considerations (Table 2), and 77% of potentially developable wind resources have a high level of siting considerations.[147] A single, 108-acre, three-megawatt wind facility exists on BLM-administered land in Oregon, along with numerous wind testing rights-of-way and geothermal leases (see Figure 9).[148]

Solar resources appear to have neither been developed on BLM-administered land in Oregon nor evaluated in a manner comparable to wind. Generally, BLM's solar development activities appear heavily focused on the southwestern U.S., where solar resources are considerably greater (see inset in Figure 8).[149]

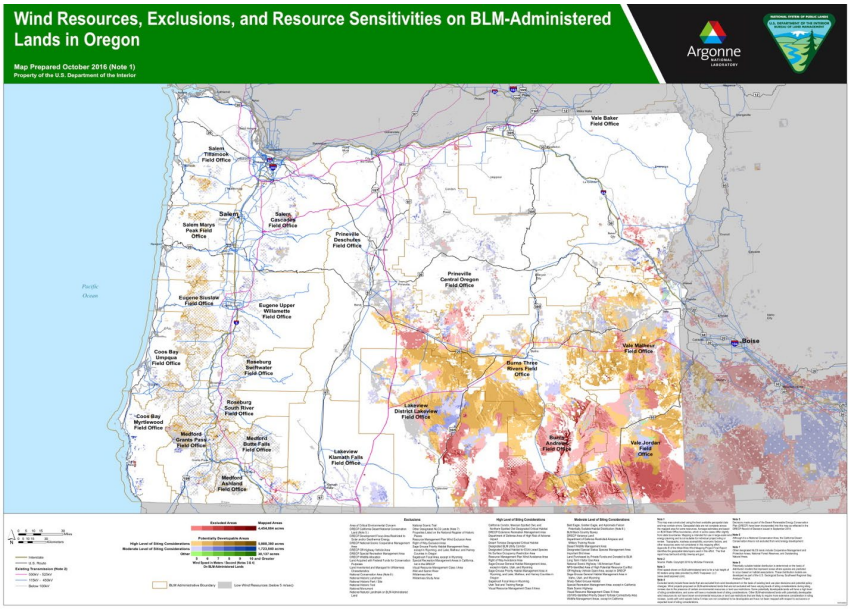


Figure 9: Wind development exclusions (in red) and siting restrictions (high in orange and moderate in blue) cover much of BLM-administered land in Oregon. Source: Bureau of Land Management[150]

Table 2: Land area (acres) with wind development potential, siting exclusions, and siting considerations on BLM-administered lands in Oregon. Areas with annual average wind speeds of less than 5 m/s are not considered potentially developable. Adapted from West-Wide Wind Mapping Project/Argonne National Laboratory[151]

BLM-Administered Lands (Total=15,695,673)	Existing or Potential Exclusions	4,454,884
	Potentially Developable Wind Resources	7,642,356
	Annual Average Wind Speeds <5 m/s	3,598,428
Potentially Developable Wind Resources (Total=7,642,356)	High Level of Siting Considerations	5,888,380
	Moderate of Level of Siting Considerations	1,723,840
	Other with Annual Average Wind Speeds >5 m/s	30,137

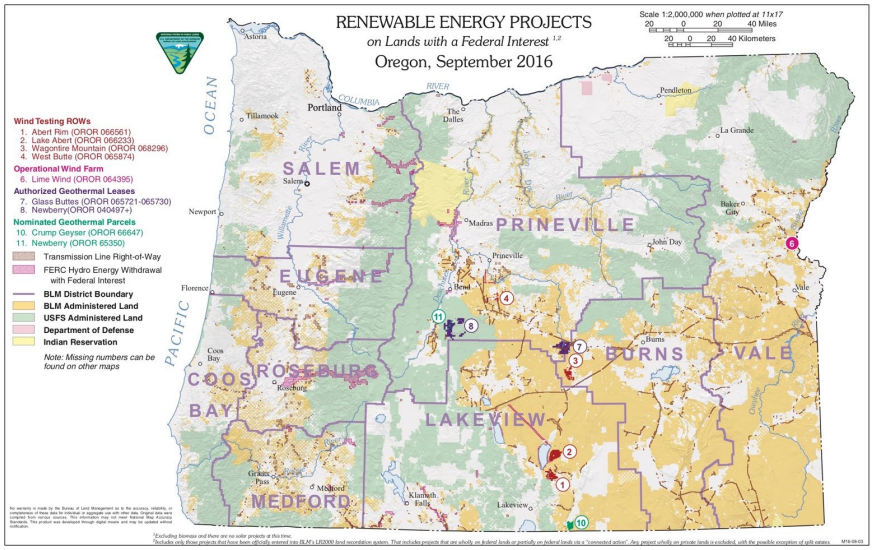


Figure 10: Renewable energy projects on federally-managed lands in Oregon. Source: Bureau of Land Management[152]

Offshore Energy

The elephant in the room regarding public lands renewable energy development in Oregon is offshore wind, which is easily Oregon's greatest wind resource (see Figure 11). Few policies exist that explicitly regulate offshore wind, but it is generally recognized that in the Pacific Northwest, most utility-scale offshore wind would be from three to 100 nautical miles offshore, placing it under the jurisdiction of the Bureau of Ocean Energy Management (BOEM) in the Department of Interior.[153] BOEM has had an Outer Continental Shelf Renewable Energy Program since 2009, but under the Coastal Zone Management Act, any projects would also need approval from the state, which in Oregon would be regulated by the Territorial Sea Plan.[154] In 2012, the U.S. Department of Energy (DOE) provided grants to private developers to test wind development off the Oregon coast, but the developers ran into a variety of challenges, including a failure to secure power purchase agreements.[155] It was deemed that the power would be approximately five times too expensive.[156] In 2016, DOE cancelled the NEPA process for the project.[157]

Finally, tidal energy, while not yet viable, would likely be located within the three nautical miles of shore under Oregon state jurisdiction.[158]

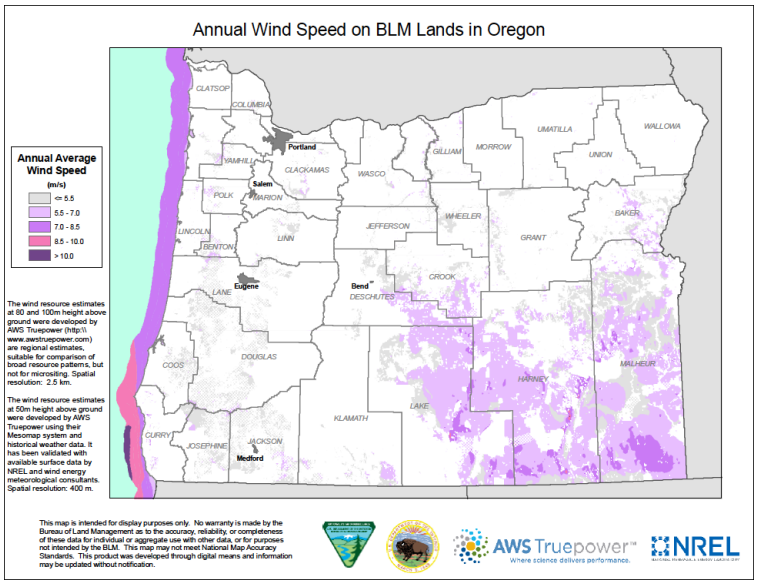


Figure 11: Annual average wind speed (m/s) at 50m off the ground on BLM-administered lands. All offshore wind resources are at least 7 m/s. Source: Bureau of Land Management.[159]

VII. Infrastructure Investment

Renewable Energy Development Grants

Part of Oregon's success in renewable energy deployment can be attributed to past infrastructure investments that have ensured continual growth in renewable energy deployment. In addition to tax credits, energy loan programs, and energy incentive programs, ODOE supports investment into renewable energy infrastructure through Renewable Energy Development (RED) grants. RED grants offer up to $250,000 in grants for electricity-producing projects like solar and wind, as well as biomass, geothermal, hydroelectric, wind, landfill gas, biogas, and ocean/wave energy. These grants are available to public, private, and non-profit entities, with 73 projects completed and $7 million awarded since 2012.[160]

Transmission

Transmission lines are often targeted as a major factor in slowing a states' renewables transition. In Oregon, a large, established transmission structure across the Columbia River plateau has helped ensure that transmission is not always a major impediment.[161] The majority of this structure is owned and operated by the Bonneville Power Administration and was built in conjunction with the significant hydropower development in the Pacific Northwest. Until 2009, at least, the state was able to provide immediate transmission access to most renewable energy projects, as early wind projects were often located near BPA transmission lines.[162] However, limited transmission infrastructure elsewhere in the state may constrain the development of Oregon's other wind resources, including on the coast, offshore, in southeastern Oregon, and in the Cascade Mountains.[163]

Similar to the siting of renewable energy generation facilities, the siting of some high-voltage transmission lines is overseen by the Energy Facility Siting Council and must comply with

the statewide planning goals.[164] Transmission lines are also required to meet the standards for reducing impact on wildlife and habitat disruption laid out by the Oregon Department of Fish and Wildlife.[165] As a matter of "prudent avoidance," ODOE recommends that transmission lines be located at least 200 feet away from any residences or places of regular business and encourages the use of multi-line structures, whenever possible, to avoid the need for new transmission line corridors.[166]

VIII. Analysis and Conclusions

Summary

With valuable wind and solar energy resources, a history of ranking in the top states for hydroelectric power, and a governor focused on climate change action, Oregon is poised to continue to be a leader in renewable deployment. The current state of affairs favors renewable energy development, with progressive policies which complement each other in promoting renewable. However, the precise path for renewable energy deployment remains unknown. As of April 2019, the Oregon legislature is actively debating the policy mechanisms of climate action. How the state will meet its ambitious RPS goals is generating discussion about the compatibility of utility-scale and community/distributed renewables. Most uncertain is the impact of siting policy on renewables development, as the legislature also weighs two bills that would change siting policy. One of these bills would pave the way for more large-scale renewables development, while the other would likely create new barriers (see analysis below for further details).

Analysis

Over the past few decades, Oregon has implemented a suite of progressive policies that broadly support renewable energy development. Its strongest action on renewables are tied to climate and tax policies. The legislature has passed bills establishing emissions reduction targets for the entire state and the transportation sector (a major source of carbon emissions). It has also passed strict renewable portfolio standards requiring that electric utilities incorporate considerable proportions of renewable energy into their mix and phase out coal entirely by 2035. A set of tax incentives are designed to spur investment in and development of renewable energy generation at both the utility and distributed scales.

With aggressive climate goals and RPS standards that seem to necessitate large-scale development, and a second set of both tax and utility policies favoring smaller-scale projects, it appears that Oregon is attempting to strike a balance between utility-scale and community-scale and distributed renewables. For any government serious about meeting its renewables goals, an "all of the above" approach is not unreasonable. Large-scale developments are realistically part of Oregon's energy future, backed by strong climate and tax policies and state-level siting of large facilities. Meanwhile, incentives for small-scale projects, which have local siting authority, could advance renewable energy generation in places that could not or would not host a large project, especially in the more populated western part of the state. Given the paucity of opportunities for renewables development on federally-owned land and the middling value of Oregon's onshore resources (see Figure 2), the state may see distributed generation as an important element of its

future energy mix. With aggressive portfolio standards and encouraging trends for the cost of renewable energy, Oregon's PUC may be inclined to allow large-scale development to work itself out and instead focus on the host of issues related to scaling up community solar.

While Oregon's policy landscape is broadly pro-renewables, several bills working their way through the state legislature in April 2019 stand to have a significant impact. The Oregon Climate Action Program, which would implement a state-wide "cap-and-invest" system, would send a strong signal to utilities and developers to ramp up renewable energy development. It would also provide more financial support for small-scale, distributed projects and earmark revenue for disadvantaged and rural communities. The Climate Investment Fund would dedicate 10% of program funds to federally recognized tribes in Oregon and 40% to "impacted" communities, which includes rural communities.[167] This focus on disadvantaged and rural communities aligns with Oregon's renewable energy tax policies, which ensure revenue from renewable energy projects is injected into local communities. Combined, the state's climate and tax policies lay a foundation to overcome the common NIMBY attitude renewable energy developers often face.

Until now, Oregon has kept state control over large energy facility siting without compromising its commitments to farmland preservation and natural resources protection. In an effort to ensure that the state can keep up with its increasingly ambitious RPS, a bill introduced in January 2019 aims to significantly change the siting process and requirements. House Bill 2322 would require the Land Conservation and Development Commission to amend its statewide land use planning goals to include renewable energy facilities as part of Goal 13, which promotes energy conservation.[168] The passage of this bill would be a significant departure from the emphasis on protecting rural lands from energy development. In doing so, it would make siting large facilities easier.

In contrast, HB 2329 would grant significantly more jurisdiction to counties in energy facility siting. Proposed in early 2019, it would remove all energy projects from state jurisdiction except for solar projects above 160 acres on high value farmland (up from the current 100 acres).[169] This would drastically shift the siting processes for the state, as it would starkly diminish the role of the Energy Facility Siting Division's consistent, standardized review process for siting large-scale, utility sized projects. Siting authority would be delegated to local jurisdictions, which could effectively prevent facility siting in counties where it has already proven to be controversial. The outcome of these ongoing debates regarding siting may bear significantly on the development of utility-scale renewable energy capacity in Oregon, as other states have shown that siting authority is often the lynchpin in renewable energy development. As of April 2019, HB 2329 had passed the House Committee on Energy and Environment and was under consideration by the Joint Committee on Ways and Means.[170]

Although ODOE has "no position on this bill as introduced" and would "welcome the opportunity to work with the Chair and members of the committee as they contemplate changes to how Oregon sites renewable energy facilities," testimony from Todd Cornett, the Associate Director of the Energy Facilities Siting Division at ODOE, discussed the potential impacts of HB 2329.[171] The processes under HB 2329 would align closely with neighboring Washington's, where developers can opt in to a state-level process. Because specialists are hired only as needed, this opt-in approach creates staffing uncertainty for the agency. Cornett also mentioned the potential

for inconsistent review and deployment of these key energy projects, as counties could either facilitate or prevent siting opportunities independent of each other.[172]

Conclusion

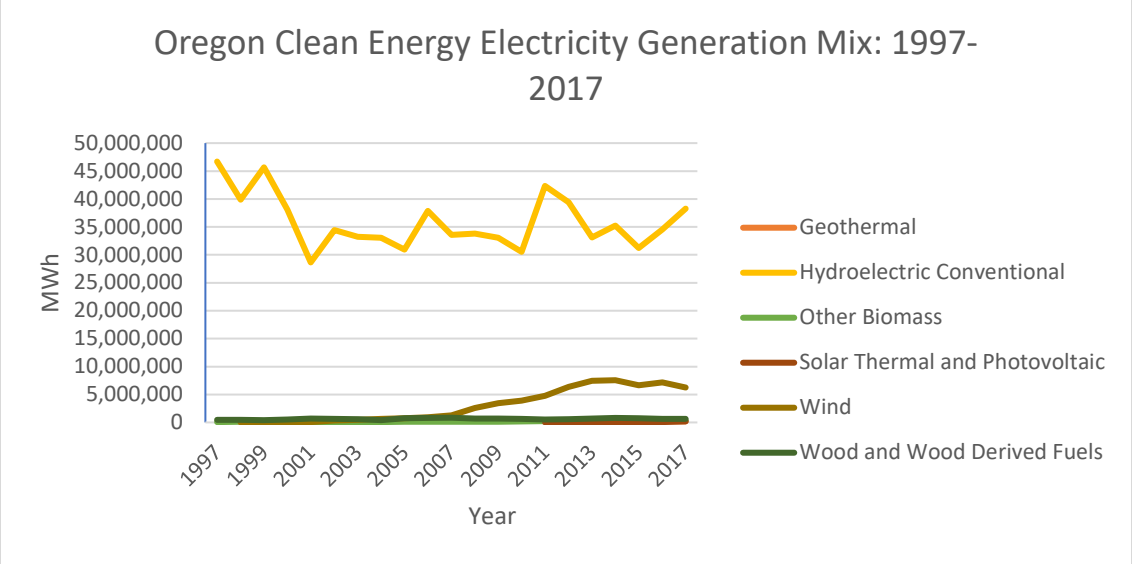
Oregon has the potential to benefit from its past and current policies to continue promoting more renewable energy generation. With ambitious RPS and climate goals, the state has given itself strong incentives to ensure that its renewable energy policies facilitate additional deployment. Finally, the importance of the geography of the solar and wind resources cannot be overlooked. To effectively facilitate renewables development, lawmakers and administrators must ensure that policies are relevant to and compatible with those locations with high resource potential.

Appendices

Appendix A: Oregon Electricity Generation by Source – 1997-2017. Modified from U.S. Energy Information Administration.[173]

YEAR	Coal	Geothermal	Hydroelectric Conventional	Natural Gas	Nuclear	Other	Other Biomass	Other Gases	Petroleum	Solar Thermal and Photovoltaic	Wind	Wood and Wood Derived Fuels
1997	2.90%	0.00%	89.11%	6.86%	0.00%	0.00%	0.17%	0.00%	0.03%	0.00%	0.00%	0.93%
1998	6.60%	0.00%	78.01%	14.17%	0.00%	0.00%	0.18%	0.00%	0.07%	0.00%	0.04%	0.93%
1999	6.55%	0.00%	80.28%	12.10%	0.00%	0.00%	0.16%	0.00%	0.01%	0.00%	0.15%	0.74%
2000	7.34%	0.00%	73.60%	17.57%	0.00%	0.00%	0.18%	0.00%	0.13%	0.00%	0.13%	1.05%
2001	9.87%	0.00%	63.58%	24.38%	0.00%	0.08%	0.11%	0.00%	0.23%	0.00%	0.20%	1.56%
2002	8.02%	0.00%	73.07%	16.59%	0.00%	0.08%	0.10%	0.00%	0.01%	0.00%	0.80%	1.33%
2003	8.79%	0.00%	67.90%	20.92%	0.00%	0.08%	0.17%	0.00%	0.09%	0.00%	0.91%	1.13%
2004	6.92%	0.00%	64.38%	26.32%	0.00%	0.08%	0.17%	0.00%	0.12%	0.00%	1.20%	0.80%
2005	7.03%	0.00%	62.74%	26.74%	0.00%	0.08%	0.20%	0.00%	0.16%	0.00%	1.49%	1.56%
2006	4.44%	0.00%	70.96%	21.07%	0.00%	0.08%	0.19%	0.00%	0.02%	0.00%	1.75%	1.50%
2007	7.90%	0.00%	60.98%	26.98%	0.00%	0.07%	0.25%	0.00%	0.03%	0.00%	2.26%	1.53%
2008	6.89%	0.00%	57.57%	29.61%	0.00%	0.08%	0.22%	0.00%	0.03%	0.00%	4.39%	1.22%
2009	5.64%	0.00%	58.27%	28.46%	0.00%	0.08%	0.23%	0.00%	0.01%	0.00%	6.12%	1.19%
2010	7.49%	0.00%	55.40%	28.39%	0.00%	0.08%	0.37%	0.00%	0.01%	0.00%	7.11%	1.15%
2011	5.58%	0.00%	70.88%	14.24%	0.00%	0.09%	0.37%	0.00%	0.01%	0.00015%	8.00%	0.82%
2012	4.32%	0.04%	64.68%	19.08%	0.00%	0.08%	0.38%	0.00%	0.01%	0.01%	10.41%	0.98%
2013	6.28%	0.27%	55.26%	23.98%	0.00%	0.06%	0.49%	0.00%	0.01%	0.03%	12.45%	1.17%
2014	5.31%	0.31%	58.65%	21.12%	0.00%	0.07%	0.58%	0.00%	0.02%	0.04%	12.57%	1.33%
2015	4.11%	0.31%	54.01%	28.06%	0.00%	0.07%	0.64%	0.00%	0.01%	0.04%	11.46%	1.29%
2016	3.15%	0.31%	57.41%	25.43%	0.00%	0.07%	0.60%	0.00%	0.01%	0.07%	11.89%	1.07%
2017	2.76%	0.28%	61.06%	24.02%	0.00%	0.06%	0.58%	0.00%	0.02%	0.31%	9.93%	0.99%

Appendix B: Oregon Clean Energy Electricity Generation Mix. Source: U.S. Energy Information Administration.[174]



Appendix C: Energy Facilities Under Review - February 2019. Source: Oregon Department of Energy.[175]

New Energy Facilities – 5 Proposed Facilities

Facility	Phase	Status	Location
Boardman to Hemingway Transmission Line *Requires federal and EFSC review/approval*	Application Submittal	Received Complete Application for Site Certificate; Drafting the Draft Proposed Order	Morrow, Umatilla, Union, Baker, and Malheur counties
Obsidian Solar Center	Application Submittal	Received Preliminary Application for Site Certificate; Department/Agency completeness review	Lake County
Bakeoven Solar Project	Notice of Intent	Project Order issued; Certificate holder submittal of preliminary Application for Site Certificate anticipated in April/May 2019	Wasco County
Nolin Hills Wind Project	Notice of Intent	Pending certificate holder submittal of preliminary Application for Site Certificate	Umatilla County
Blue Marmot Solar Energy Facility	Notice of Intent	NOI review temporarily suspended	Lake County

Approved Energy Facilities – 6 Proposed Amendments

Facility	Phase	Status	Location
Summit Ridge Wind Farm Amendment #4	Draft Proposed Order	Department drafting the Proposed Order.	Wasco County
Stateline Wind Project Amendment #5	Draft Proposed Order	Draft Proposed Order issued; Public comment period through April 29, 2019	Umatilla County
Montague Wind Power Facility Amendment #4	Amendment Submittal	Received updated Design Scenario C on March 25, 2019; Department drafting the Draft Proposed Order.	Gilliam County
Eugene to Medford Transmission Line ("Sams Valley Reinforcement Project") *Requires federal and EFSC review/approval* Request for Amendment #4	Amendment Submittal	Certificate holder revising preliminary Request for Amendment in response to Department's request for additional information	Lane, Douglas and Jackson Counties (amendment components in Jackson and Josephine Counties)
Perennial Wind Chaser Station Amendment #1	Amendment Submittal	Certificate holder revising preliminary Request for Amendment in response to Department's request for additional information	Umatilla County
Wheatridge Wind Energy Facility Amendment #4	Amendment Submittal	Department drafting Draft Proposed Order; supplemental information from certificate holder anticipated in June/July 2019	Morrow County

Appendix D: Annual Clean Fuel Standards under the Oregon Clean Fuels Program. Source: Oregon Department of Environmental Quality.[176]

Clean Fuel Standards

The clean fuel standards are the annual average carbon intensity that a regulated party must comply with. There is a standard for gasoline and gasoline substitutes and one for diesel and diesel substitutes. The baseline year for the program is 2015 and represents 10 percent ethanol blended with gasoline and 5 percent biodiesel blended with diesel. The rule requires a 10 percent reduction in average carbon intensity from 2015 levels by 2025. The annual clean fuel standards are shown here:

	Clean Fuel Standards (gCO2e/MJ)									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
% reduction	0.25	0.50	1.00	1.50	2.50	3.50	5.00	6.50	8.00	10.00
Gasoline	98.37	98.13	97.66	97.16	96.18	95.19	93.71	92.23	90.75	88.78
Diesel	99.39	99.14	98.61	98.12	97.12	96.12	94.63	93.14	91.64	89.65

Appendix D: Designated Rural Renewable Energy Development Zones in Oregon. (Source: Business Oregon www.oregon4biz.com)

Designated Zones

Clackamas County*	Effective May 3, 2011
Crook County	Effective July 1, 2018
Deschutes County*	Effective January 8, 2015
Jackson County*	Effective December 12, 2014
Jefferson County	Effective February 5, 2010
Klamath County	Effective August 25, 2009
Lake County	Effective December 8, 2008
Linn County*	Effective July 1, 2018
Malheur County	Effective January 1, 2015
Polk County*	Effective July 1, 2018

*Excluding any area within metropolitan/large-city urban growth boundary (UGB).

Appendix E: Alternative Tax Exemption Projects 2011 to 2016. (Source: Oregon Department of Revenue via Public Utility Commission of Oregon)

Year	Number of Projects		Exemption Amounts
2011	430	$	14,725,863
2012	740	$	27,586,500
2013	840	$	33,969,199
2014	1,050	$	45,518,398
2015	1,280	$	53,457,810
2016	1,400	$	61,432,938
Total 2011-15	**5,740**	**$**	**236,690,708**

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