OREGON DEPARTMENT OF ENERGY

2020 Biennial Energy Report

An Introduction

Senate Energy and Environment

January 26, 2021

OREGON DEPARTMENT OF ENERGY

Leading Oregon to a safe, equitable, clean, and sustainable energy future.

Our Mission

The Oregon Department of Energy helps Oregonians make informed decisions and maintain a resilient and affordable energy system. We advance solutions to shape an equitable clean energy transition, protect the environment and public health, and responsibly balance energy needs and impacts for current and future generations.

What We Do

On behalf of Oregonians across the state, the Oregon Department of Energy achieves its mission by providing:

- A Central Repository of Energy Data, Information, and Analysis
- A Venue for Problem-Solving Oregon's Energy Challenges
- Energy Education and Technical Assistance
- Regulation and Oversight
- Energy Programs and Activities

2020 BIENNIAL ENERGY REPORT

Goal of the Report

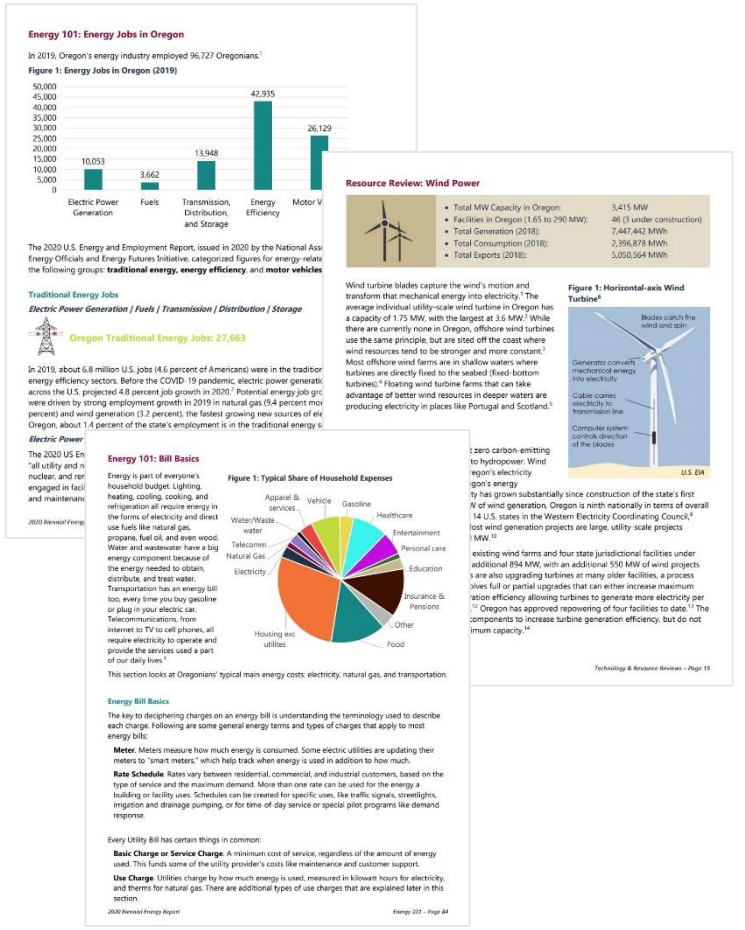
Pursuant to ORS 469.059, provide a comprehensive review of energy resources, policies, trends, and forecasts, and what they mean for Oregon.

Scoping the Report

Shaped by a data-driven process, equity considerations, and input from stakeholders and the public.

Designing the Report

Shorter briefs on a wider variety of energy topics, tear-away style. Themes cross sections for general 101 or technology reviews and deeper-dive policy briefs.



https://energyinfo.oregon.gov/ber

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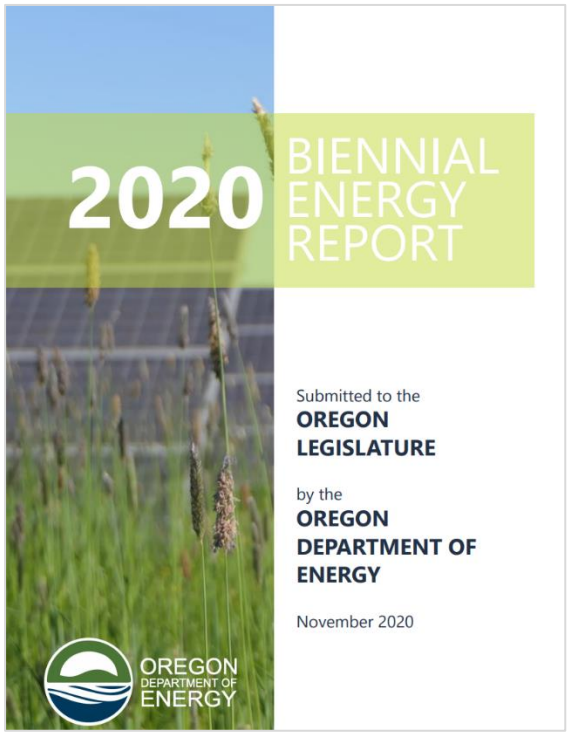

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Energy by the Numbers

Oregon's overall and sector-based energy use, energy production and generation, and energy expenditures.

Data and metrics track how Oregon produces, purchases, and uses various types of energy.

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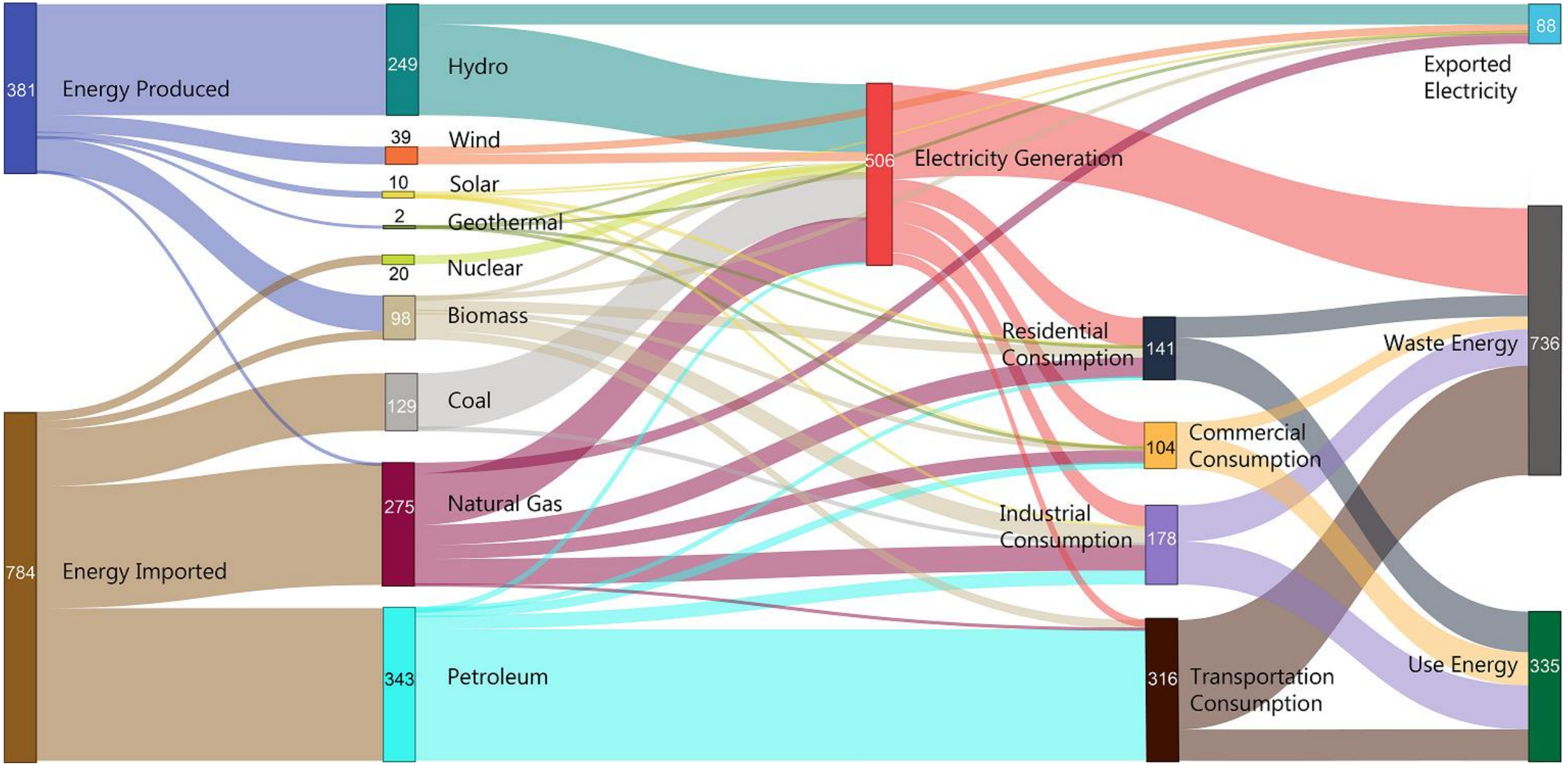
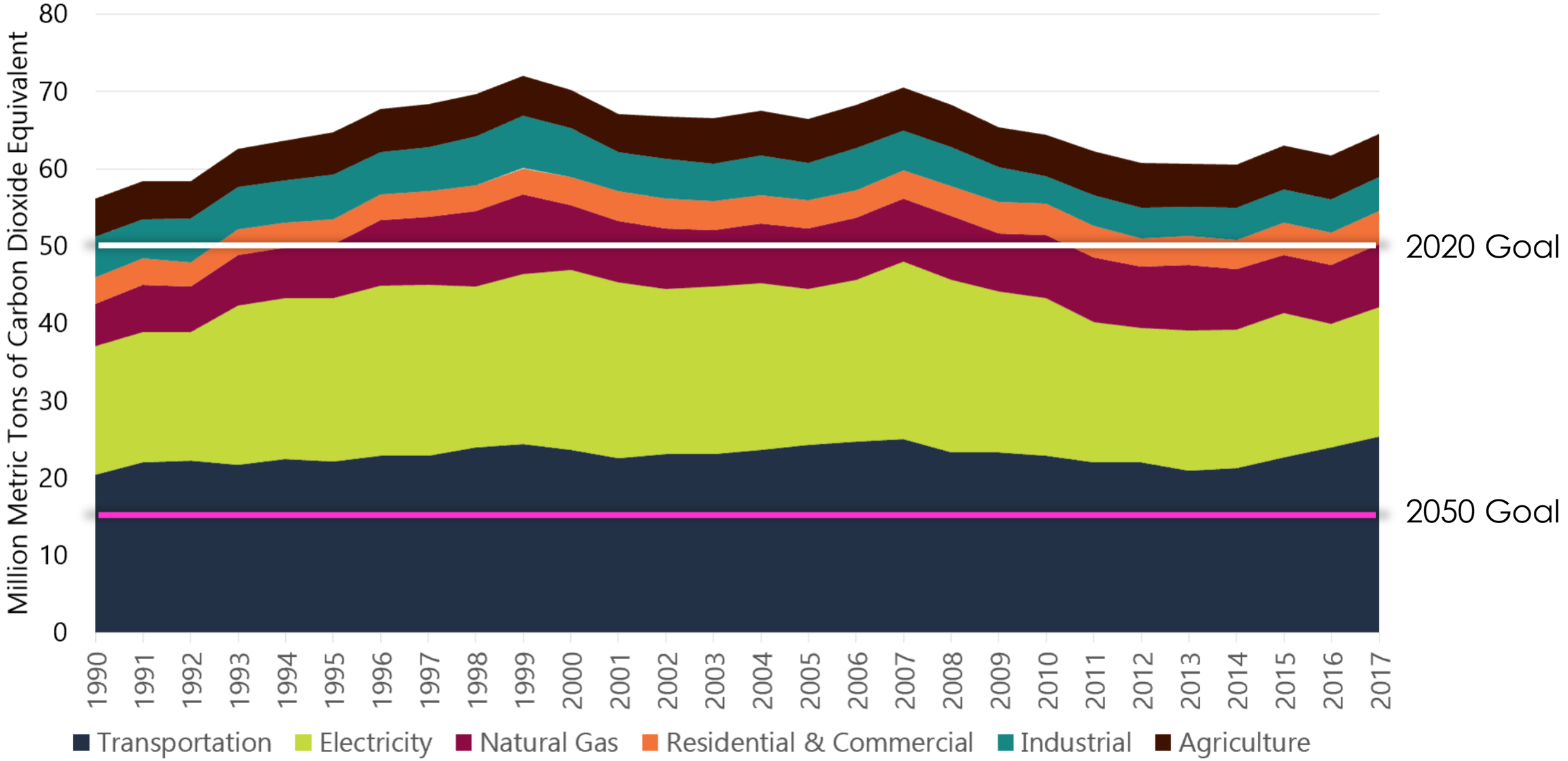
Oregon's Energy Flow



Numbers are in trillions of British thermal units (Btus)

Oregon Greenhouse Gas Emissions by Source Over Time



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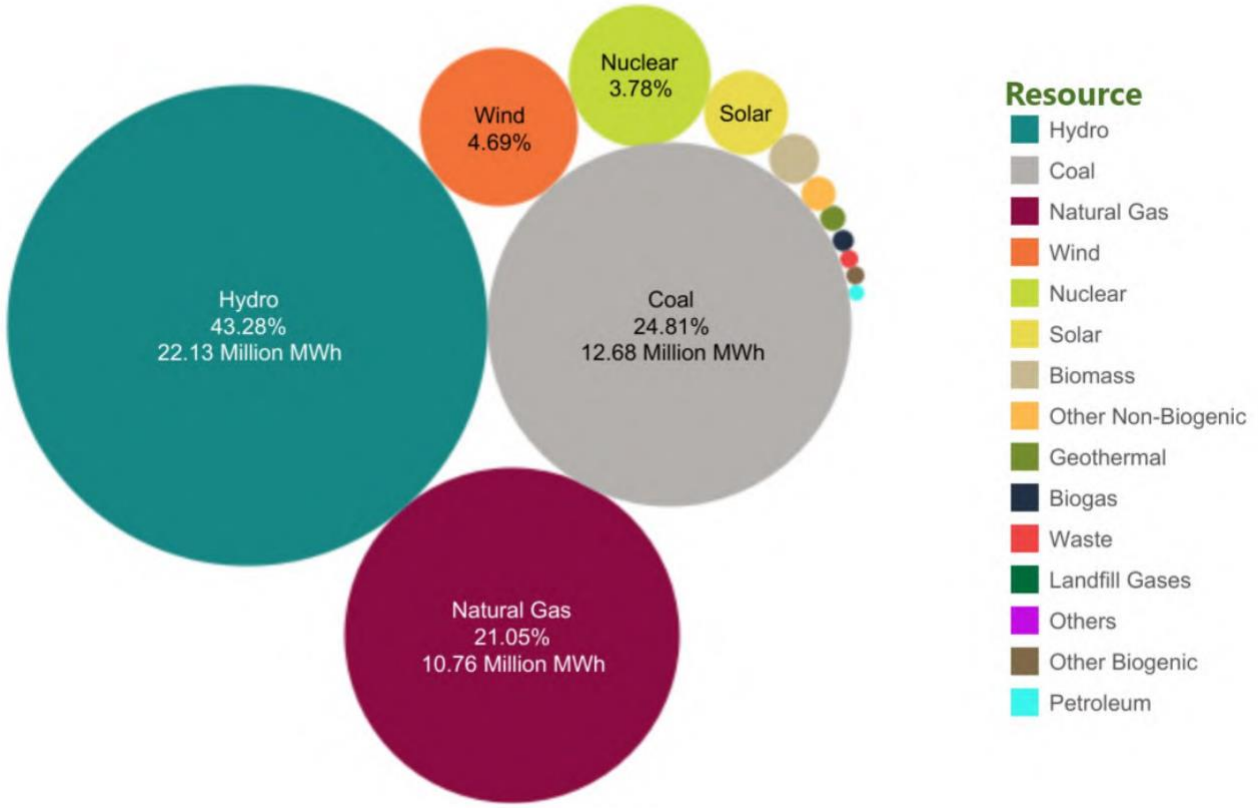
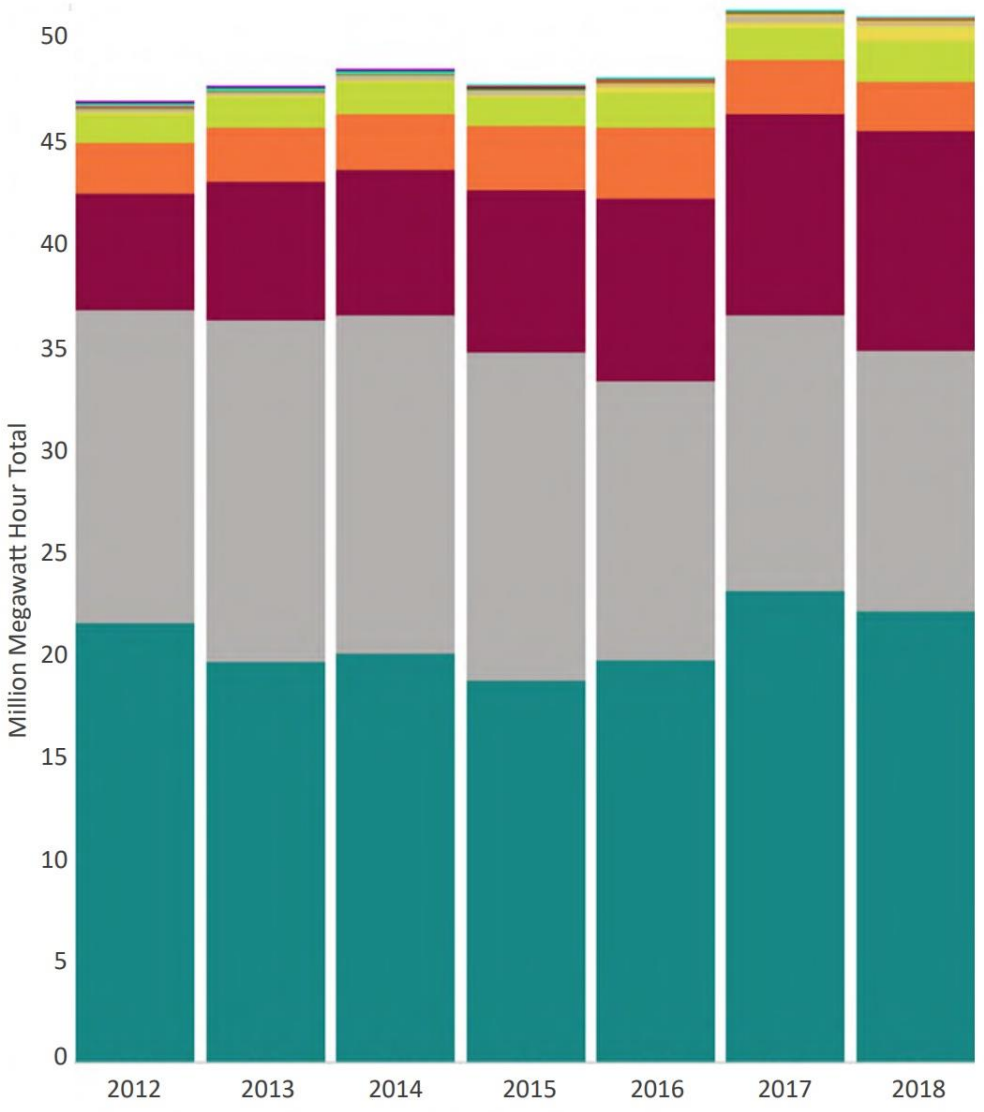
Resources Used to Generate Oregon's Electricity

Based on 2018 data, this chart shows the energy resources used to generate the electricity that is sold to Oregon's utility customers.



Oregon's Electricity Mix Over Time



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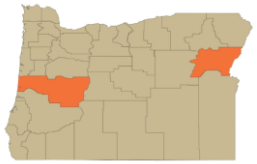
Oregon County Energy Profiles

	LANE	BAKER
 **County Info & Demographics**	**Population:** 365,940 **Regional Typical Income:** $44,103	**Population:** 16,510 **Regional Typical Income:** $41,098
 **Poverty & Energy Burden**	**Energy Burdened Households:** 29% **Annual Energy Burden Gap:** $643	**Energy Burdened Households:** 39% **Annual Energy Burden Gap:** $720
 **Homes**	**Homes Built Before 1990:** 70% **Owner-occupied Homes:** 59%	**Homes Built Before 1990:** 72% **Owner-occupied Homes:** 66%
 **Energy**	**Average Annual Electricity Cost:** $1,193 **Average Annual Natural Gas Cost:** $627	**Average Annual Electricity Cost:** $1,169 **Average Annual Natural Gas Cost:** $572
 **Home Primary Heating**	**Electricity:** 73% **Natural Gas**: 18%	**Electricity:** 28% **Natural Gas**: 40%
 **Travel**	**Annual Vehicle Miles Traveled:** 19,844 **VMT Cost:** $3,182	**Annual Vehicle Miles Traveled:** 20,665 **VMT Cost:** $3,314

Web-based Report| https://energyinfo.oregon.gov/counties-2020

History Timeline

The timeline of Oregon's energy history is meant to serve as a useful reference for readers as they review sections of the Energy Report, especially for energy data over time.

Portland during the early morning hours of pumping when gas was limited to five gallons per car on a first-come, first served basis, courtesy of David Falconer/EPA/US National Archives. (1973)

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Clean Energy Timeline

1941 – Grand Coulee Dam, the largest concrete structure ever built at the time, begins operation - but inundates an important, historic fishing ground at Kettle Falls under Lake Roosevelt in Washington state.

1983 – EFSC approves its first renewable energy project.

2001 – The Stateline Wind Project in Umatilla County becomes first utility-scale wind energy facility built in Oregon.

2007 – Oregon legislature passes a renewable portfolio standard requiring the state's largest utilities to provide 25 percent of retail sales from eligible renewable sources by 2025 (SB 838).

2016 – Oregon adopts a 50 percent renewable portfolio standard and becomes the first state to legislatively mandate an end to coal in the state's electricity mix by 2030 (SB 1547).

2017 – Oregon's first utility-scale solar PV project larger than 50 MW, the Gala Solar project Crook County, begins operation.

2020 – Construction underway on multiple large utility-scale wind and solar energy projects, including the Wheatridge Renewable Energy Facilities in Morrow County, the Montague Wind and Solar Projects in Gilliam County, and the Golden Hills Wind Facility in Sherman County.

Energy 101

This section is intended to help the reader understand the first part of the energy story: how energy is produced, used, and transformed.

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Codes & Standards

Codes and standards deliver energy efficiency at low cost. In 2019, 30 percent of the cumulative energy savings in the Pacific Northwest came from codes and standards. Additionally, from 2000-2018, 11 percent of regional savings came from market transformation efforts by the Northwest Energy Efficiency Alliance (NEEA) – work that directly leads to updates of codes and standards.

Figure 1: Status of State Energy Code Adoption for Residential Buildings[10]

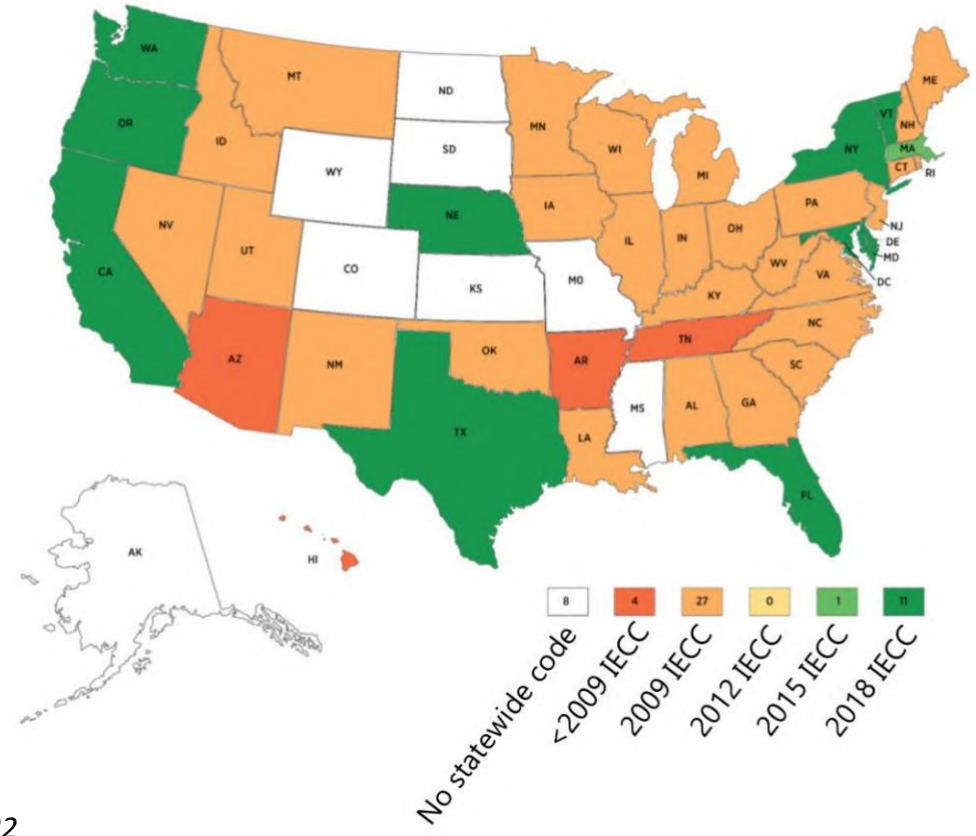
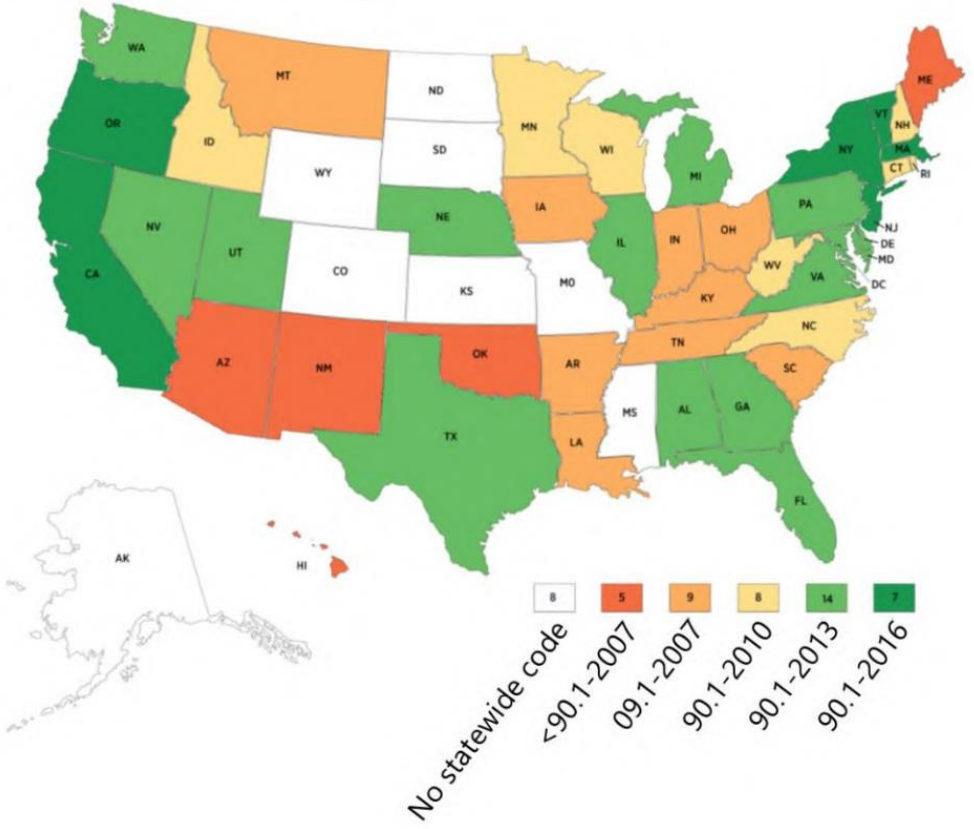


Figure 2: Status of State Energy Code Adoption for Commercial Buildings[10]



Resource & Technology Reviews

The reviews in this section cover the spectrum of traditional to innovative – and demonstrate the breadth of technology that is integral to the production and management of our energy system.

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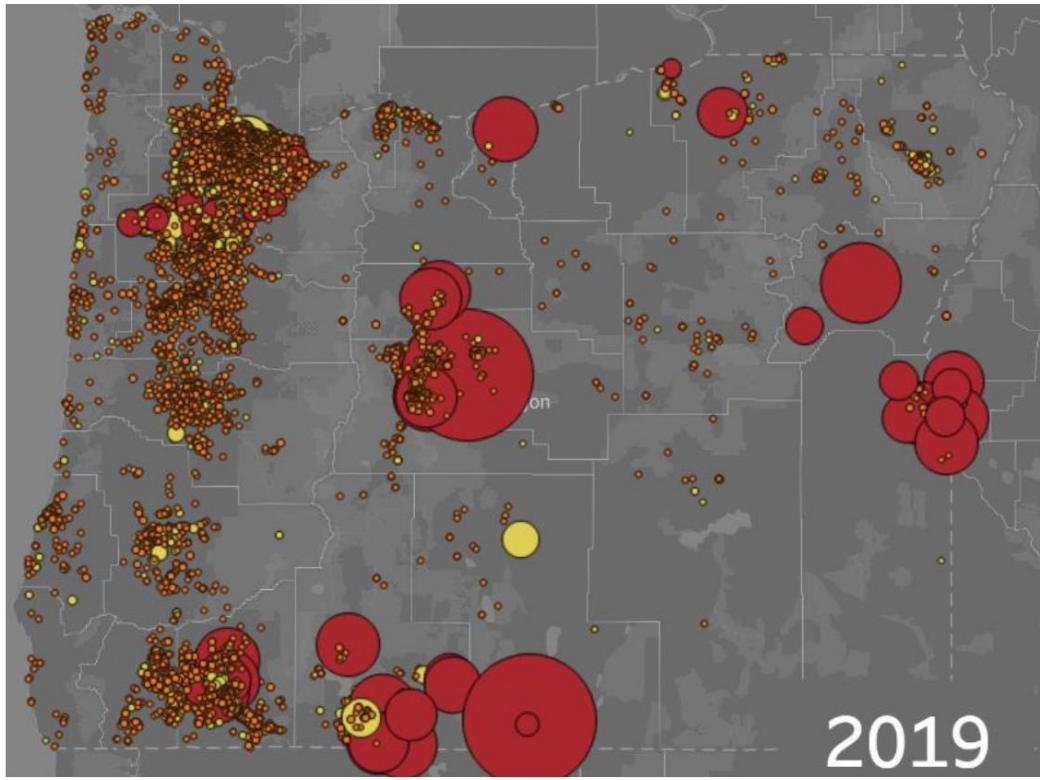
Solar

• Total Capacity in Oregon (2019):[i]	592 MW
• Facilities in Oregon (2019): (1 kW to 56 MW)	18,000+ Residential/Commercial and 77 Utility-Scale
• Total Generation (2018):	776,000 MWh
• In-State Consumption (2018):	680,499 MWh
• Total Exports: (2018):	95,501 MWh

Oregon Solar Dashboard



www.tinyurl.com/OregonSolarDashboard

Oregon solar grew over five-fold between 2015 and 2019, with installed capacity growing from 91 MW to 592 MW, and generation increasing from 116,000 MWh to 776,000 MWh.

Energy Jobs:
Solar provided about 5,700 jobs for Oregonians in 2019.The median annual wage of a solar installation technician is $44,890.

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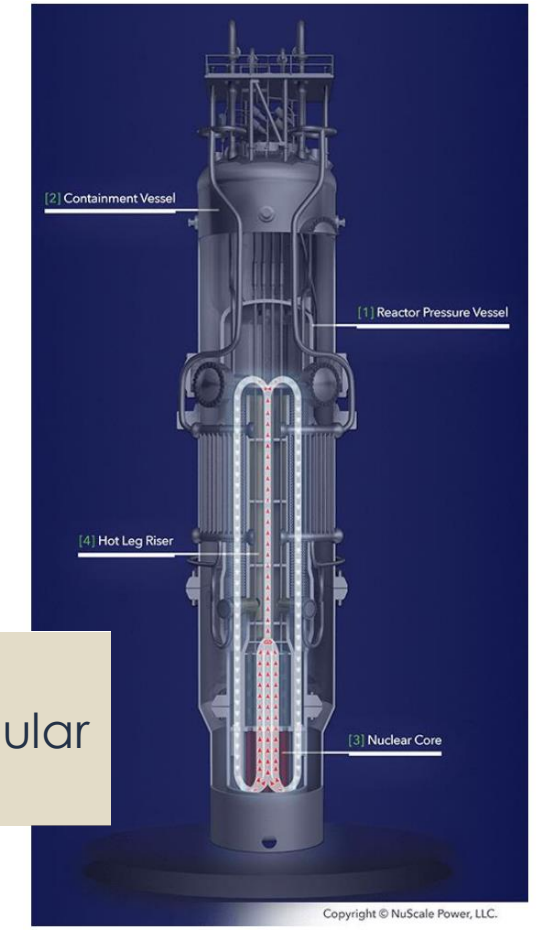
Small Modular Reactors

- Total Capacity and Facilities in Oregon: 0
- Range of Potential Sizes: 60 – 250 MW per module

Oregon-based NuScale developed the first modular reactor to receive design approval by the U.S. Nuclear Regulatory Commission.

While there are small, traditional nuclear reactors operating in the world, there are no new-generation SMRs yet in operation. The International Atomic Energy Agency reports that of the 50 or more designs being pursued, there are "four SMRs in advanced stages of construction in Argentina, China and Russia, and several existing and newcomer nuclear energy countries are conducting SMR research and development."

Oregon has statutory barriers to siting nuclear power plants in the state. One barrier: Oregon voters would have to approve any nuclear facility.



Design Illustration of NuScale Power Modular Reactor

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Power-to-Gas

- Established technology in Europe; emerging in the U.S.
- NW Natural and Eugene Water & Electric Board are evaluating an 8.5 MW project opportunity in Oregon.
- Douglas County PUD in Washington is planning a 5 MW facility
- Utah's ACES project expects to have 10 GWh of H2 storage capacity

Figure 2: Green, Blue, and Grey Hydrogen Explained[9]

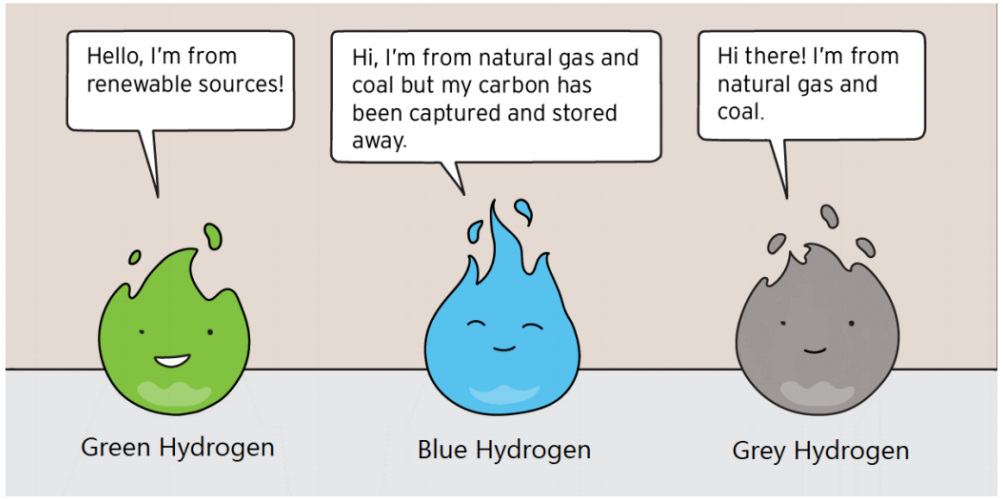
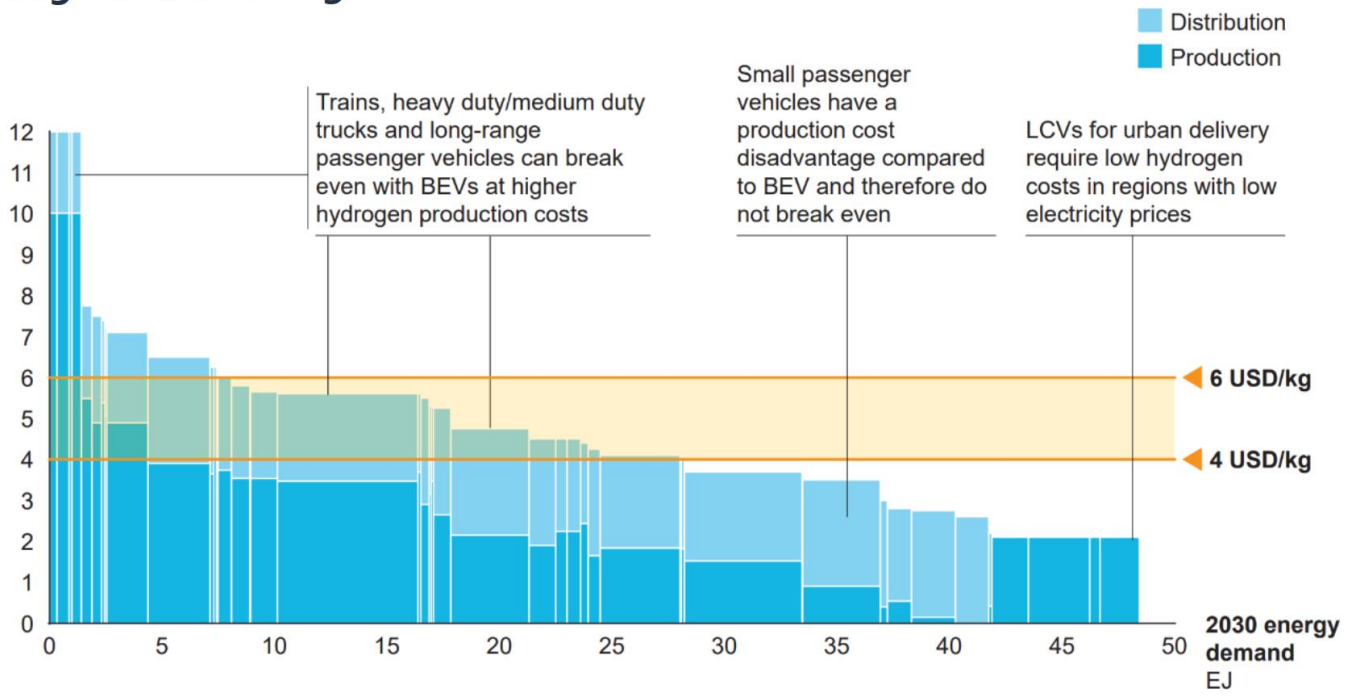


Figure 3: Cost Curve for Hydrogen for Transportation Sector Across Segments and Regions[21]



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Policy Briefs

This section provides deeper-dive insights on emerging energy trends, opportunities, and barriers in the energy sector.

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Agriculture and Energy

Oregon is well-known for its agricultural diversity – and this diversity of crops, livestock, soils, climates, and production methods is reflected in how Oregon farms use energy. Oregon farmers and ranchers use energy for many purposes: to power tractors and other farm equipment in the field, to chill milk and freshly-picked produce, to provide heat and light for greenhouses, to mechanically control weeds, to pump water, and to run equipment like hop dryers, seed cleaners, and mint oil distilleries.

Table 1: Oregon Farm Bureau Survey

Top 5 Uses of Electricity	Top 3 Uses of Natural Gas	Top 3 Uses of Propane
Irrigation	Greenhouses	Forklifts
Seed Cleaning	Dryers (hops, onions)	Greenhouses
Greenhouses	Shop/Farm	Shop/Farm
Shop/Farm		
Cold Storage		

For several rural consumer-owned utilities, farms are the primary customer base – and the seasonal dynamics of supplying energy to farms drives utility operations.

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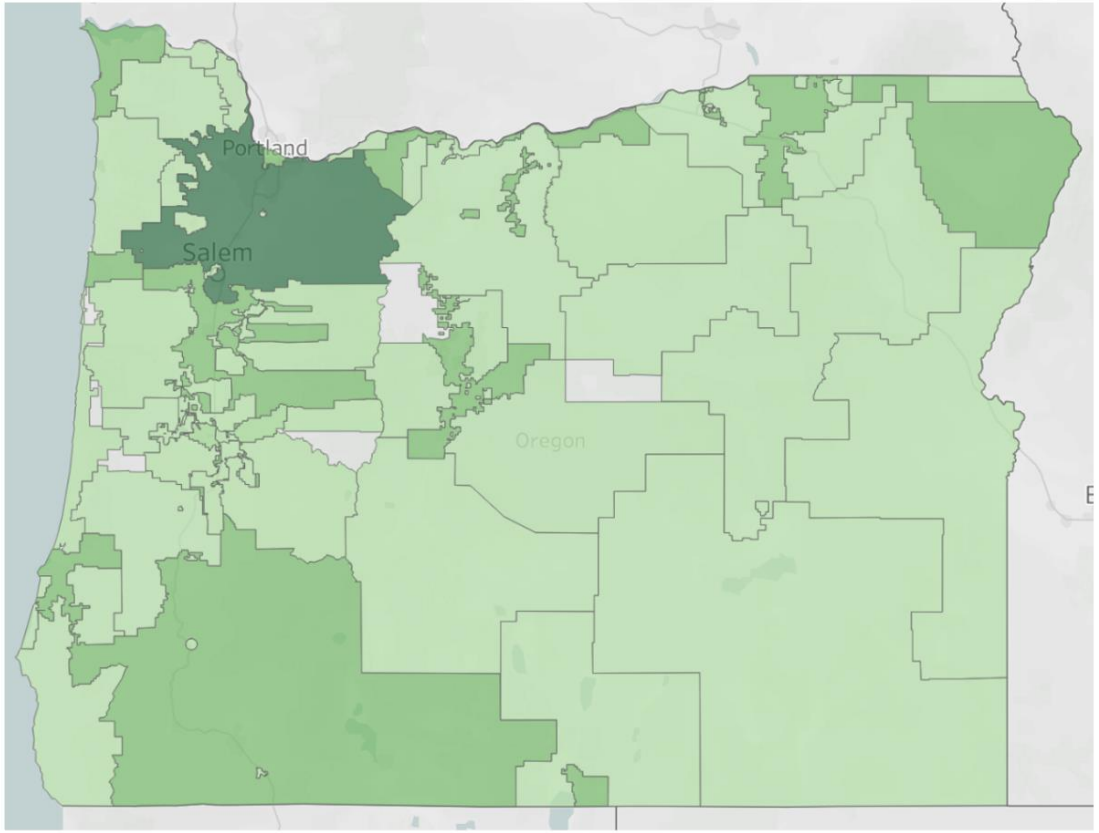
EVs on the Grid

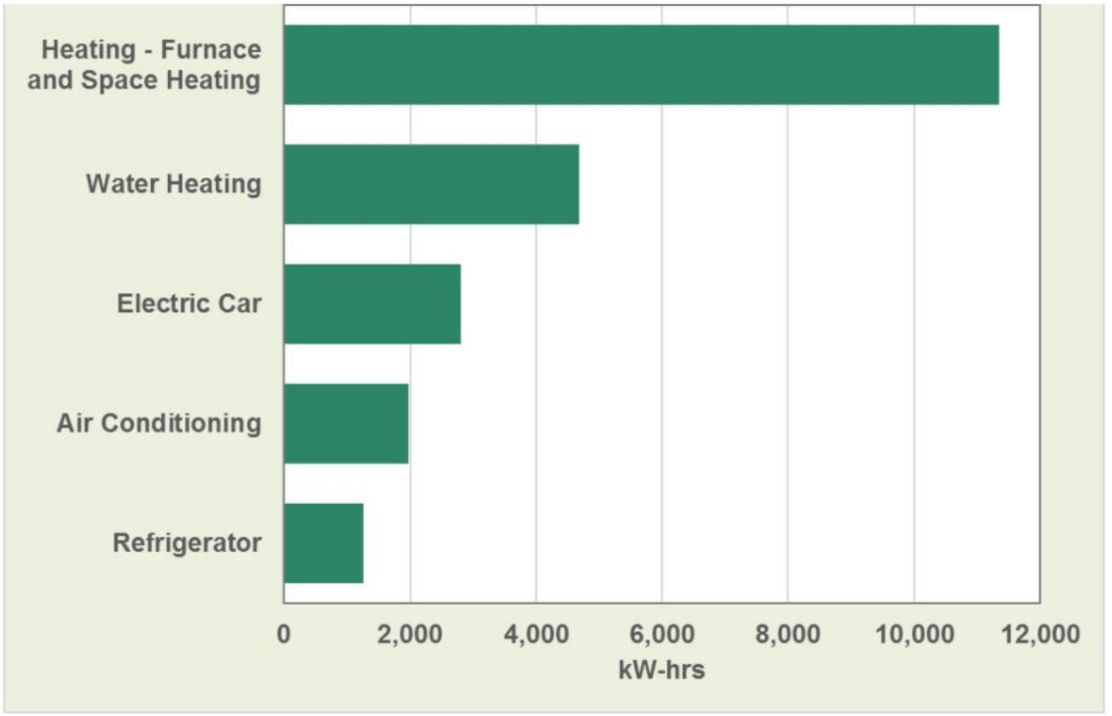
Electric vehicle adoption is increasing in the light-duty passenger vehicle sector. As of July 1, 2020, there are 31,977 EVs registered in Oregon, and that number continues to grow. Because EVs use electricity for fuel, utilities are already planning for and addressing this increase load on their system. Currently, the overall effect of EV charging is not distinguishable from normal fluctuations in electricity load. Where and when EVs are charging are important factors as utilities plan.

Figure 2: Registered EVs by Oregon Utility Service Territory[4]



Darker shades of green = more registered EVs

Figure 4: Average Annual Energy Use for a Household[8]



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RNG Update

As states seek to enact or strengthen decarbonization goals, renewable natural gas (RNG) is increasingly seen as a way to reduce greenhouse gas emissions from waste sectors, like landfills and agricultural manure management, while also providing a renewable fuel for other applications that lack low-carbon alternatives, such as some industrial processes, medium- and heavy-duty transportation, and building heating.

Figure 1: Carbon Intensity of RNG Pathways Based on California's Low Carbon Fuel Standard[9]

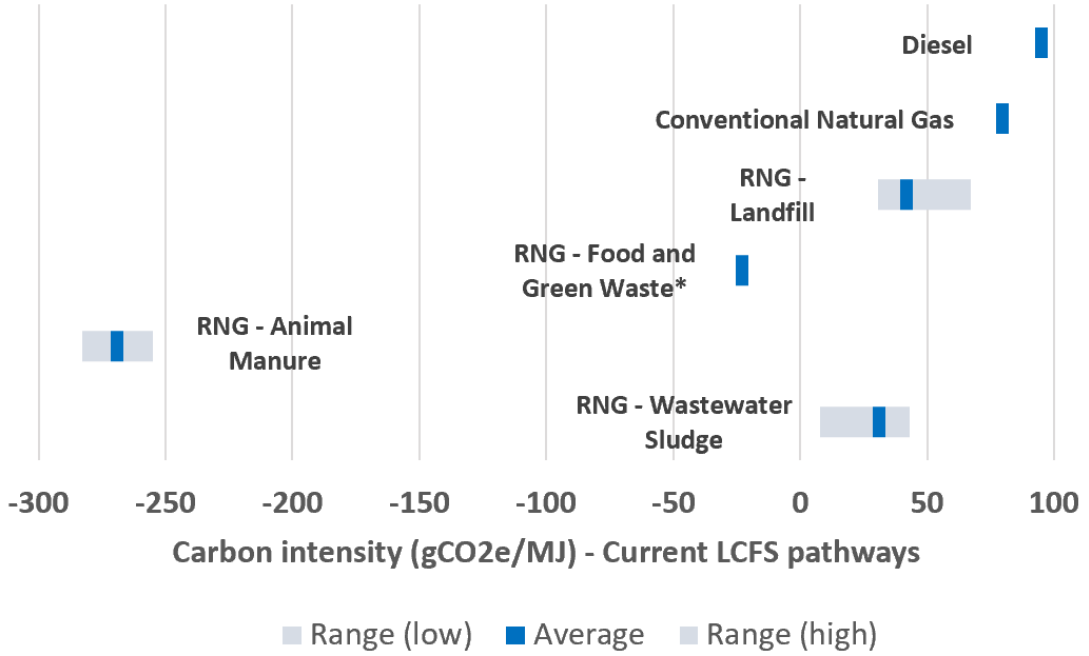

Table 1: Summary of State-Level RNG Inventory Resource Assessments in Billion Cubic Feet per Year (BCF/yr)[12]

State	Study Name	Assessed RNG Supply from Wet-Waste Sources
CA	The Feasibility of Renewable Natural Gas as a Large-Scale, Low Carbon Substitute. (2016)	90.6 BCF/yr (equivalent to 7% of 2016 residential & commercial NG consumption)
CO	Renewable Natural Gas (RNG) in Transportation: Colorado Market Study (2019)	19 BCF/yr (equivalent to 5% of 2016 residential & commercial NG consumption)
OR	Biogas and Renewable Natural Gas Inventory (2018)	10.4 BCF/yr (equivalent to 8% of 2016 residential & commercial NG consumption)
WA	Promoting Renewable Natural Gas in Washington State (2018)	14.7 BCF/yr (equivalent to 6% of 2016 residential & commercial NG consumption)

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Alternative Fuels for Medium- and Heavy-Duty Fleets

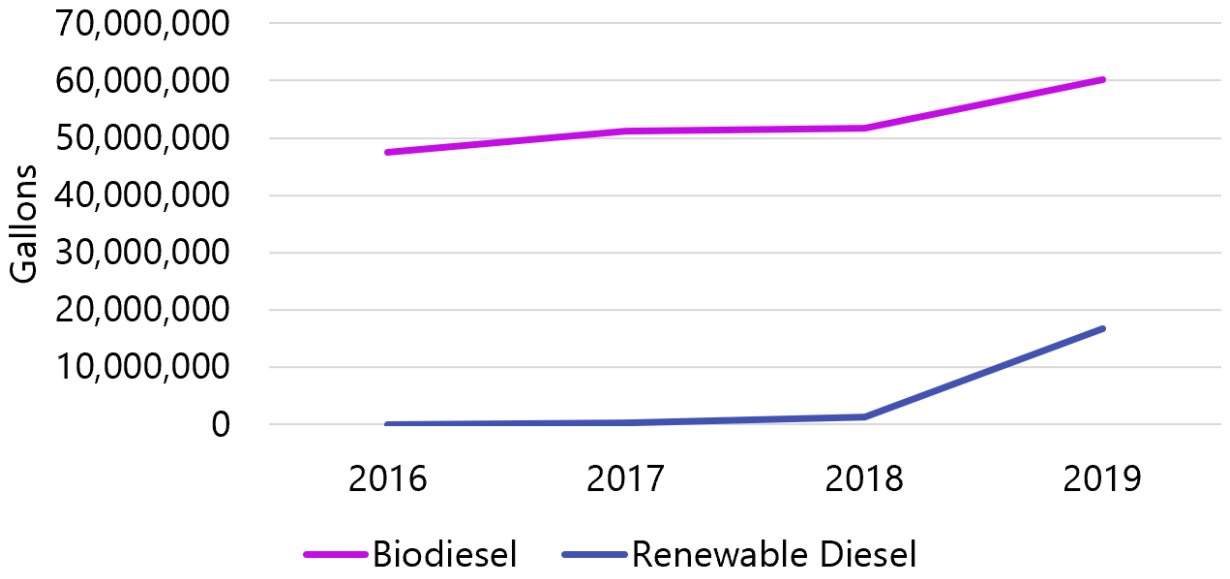
Alternative fuel use has been increasing in Oregon over the last 15 years. In 2019, nearly 9 percent of all on-highway transportation fuel consumption in Oregon came from alternative fuels. Use of these fuels can improve performance, reduce pollutants, and supports Oregon's energy independence.

Table 1: Number of Fueling Stations in Oregon for Select Alternative Fuels[20]

	Public Stations	Private Stations
Biodiesel (B20 and above)	37	0
CNG	4	11
LNG	1	1
Electricity[a]	1,801	259
Hydrogen	0	0

[a] *Does not include residential charging infrastructure*

Figure 10: Total Gallons of Biodiesel and Renewable Diesel Reported to Oregon Clean Fuels Program for 2016-2019[48]



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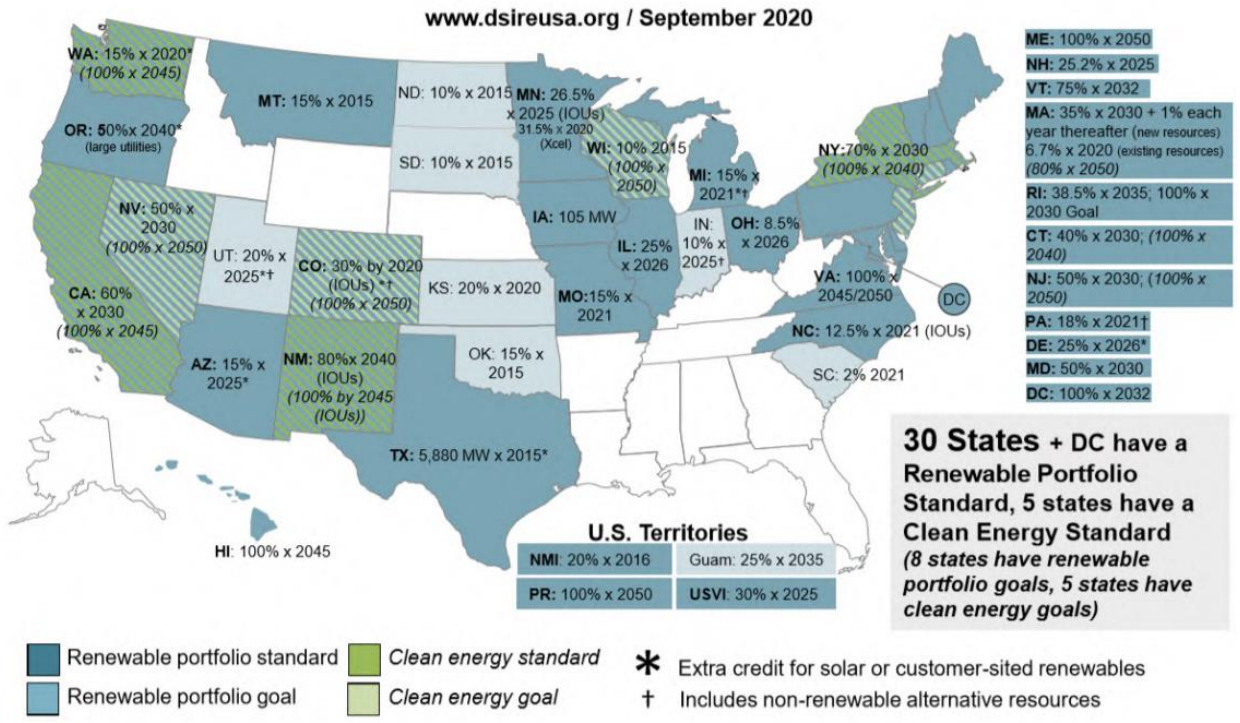
CROSS-SECTIONAL TOPICS

Resource Adequacy & Clean Energy Standards

Resource adequacy ensures there are sufficient resources available to meet electricity needs. As more coal plants head toward retirement and renewable energy facilities come online, addressing resource adequacy will become even more important.

- Energy 101: Clean & Renewable Standards
- Policy Brief: Renewable & Zero Emission Standards
- Technology Reviews: Storage, Solar, Wind, Etc.
- Energy 101: Resource Adequacy
- Policy Brief: Resource Adequacy

Figure 1: Renewable and Clean Energy Standards in the United States



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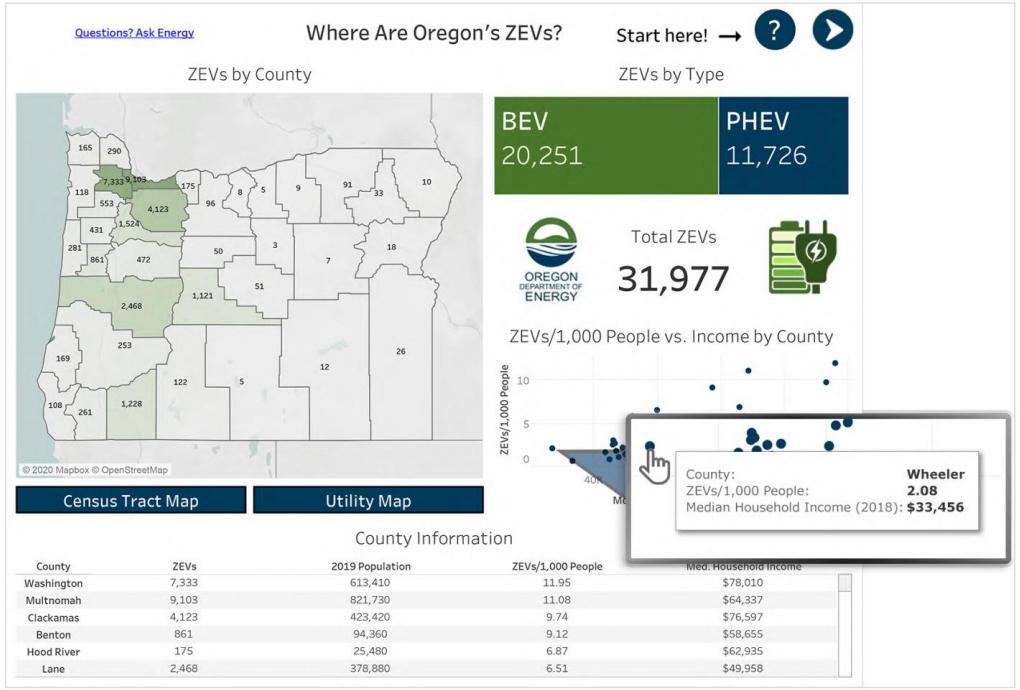
Key Considerations for a Clean Energy Standard

- How should equity be centered?
- How can the policy be designed to maximize cost effectiveness?
- What should be the final target date?
- Which electricity generation resources should be eligible?
- How can the policy ensure enough electricity to meet demand at all times?
- Which entities should be subject to a standard?

CROSS-SECTIONAL TOPICS

Oregon Electric Vehicle Dashboard



Alternative Fuels and Electric Vehicles

Transportation is the largest contributor of greenhouse gas emissions in Oregon, so increasing low- and zero-emission vehicle options can help address climate change. Sections discuss the technologies, how increased adoption can affect utilities and the electric grid, and more.

- Energy by the Numbers: Transportation Fuel Production, Consumption, Expenditures, and Emissions
- Energy 101: Where Transportation Fuels Come From
- Technology Reviews: Electric Vehicles, Charging, & Hydrogen Cars
- Policy Brief: Assessing & Managing Effects of EVs on the Grid
- Policy Brief: Using Truck Efficiency to Reduce Fuel Consumption and Emissions
- Policy Brief: Alternative Fuels Assessment for Medium- & Heavy-Duty Fleets

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Questions/Comments?

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RESOURCES:

Energy Report online: energyinfo.oregon.gov/ber

ODOE's website: www.oregon.gov/energy