



OREGON
DEPARTMENT OF
ENERGY

Powering the Northwest Salem City Club

**Oregon Department of Energy
Director Janine Benner
January 7, 2022**



- Meet ODOE
- An Energy System in Transition
- About the Biennial Energy Report
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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

ENERGY THEN AND NOW

~25
Years
Ago

Oregon passes the nation's first carbon emissions standard for energy facilities

The Toyota Prius is introduced

The "hockey stick" first used to explain the earth's changing temperatures

Enron

Atmospheric carbon dioxide is 370 parts per million

~15
Years
Ago

Oregon passes the Renewable Portfolio Standard

The Tesla Roadster is introduced

Crude oil trades above \$100/barrel

Residential solar PV costs \$9 per watt (it's less than \$4 today)

Atmospheric carbon dioxide is 386 parts per million

Now

Oregon passes 100% Clean Electricity Standard in 2021

Oregon's only coal plant closed in 2020

Nearly 42,000 electric vehicles are registered in Oregon as of Sept. 2021

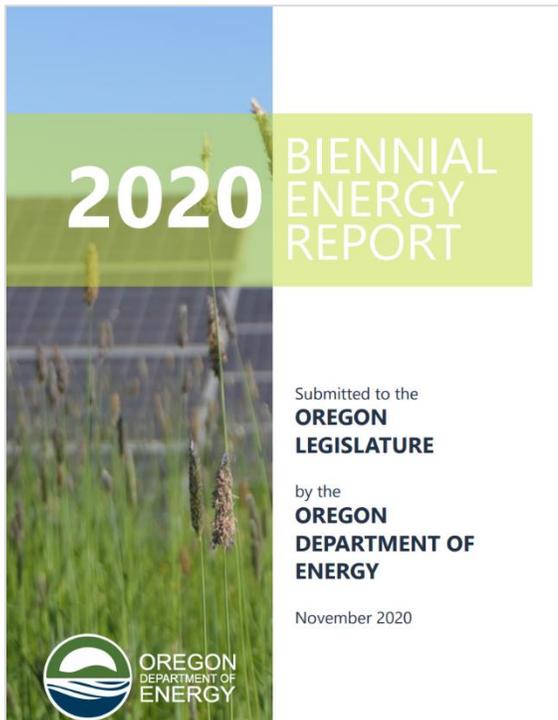
In 2021, Portland General Electric commits to net zero GHG emissions across company operations by 2040.

Atmospheric carbon dioxide is 415 parts per million (growing by ~2ppm/yr)

Three Main Themes

- 1** We're benefitting from clean energy technology costs going down.
- 2** We're seeing meaningful results from energy policies implemented in recent years.
- 3** We're committed to decarbonizing energy in Oregon.





energyinfo.oregon.gov/ber

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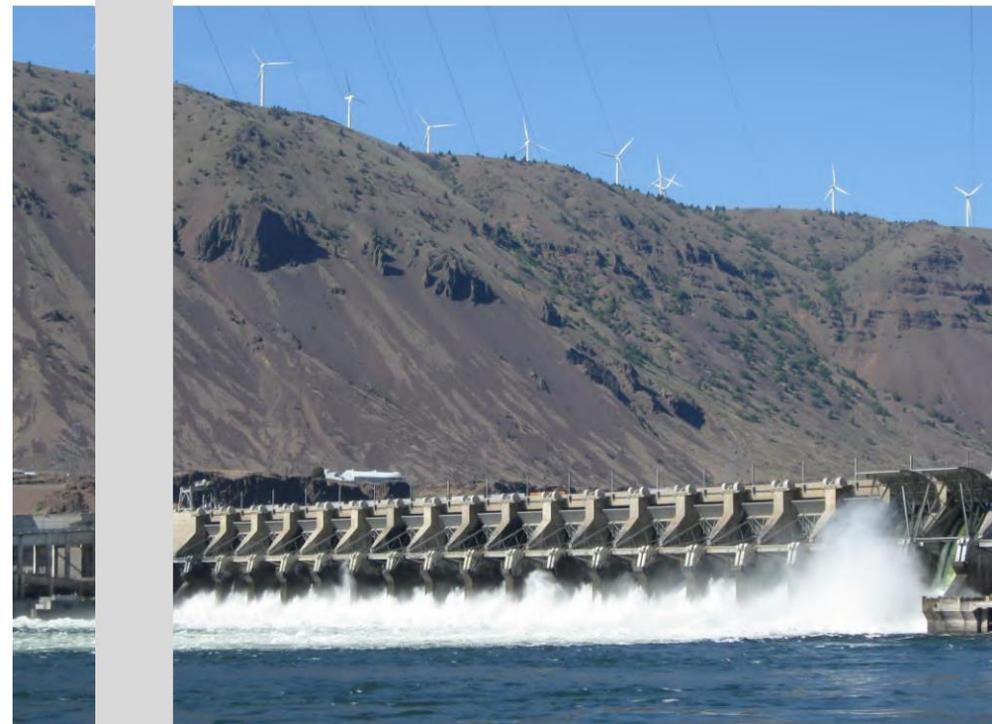
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Conclusion

About the Report

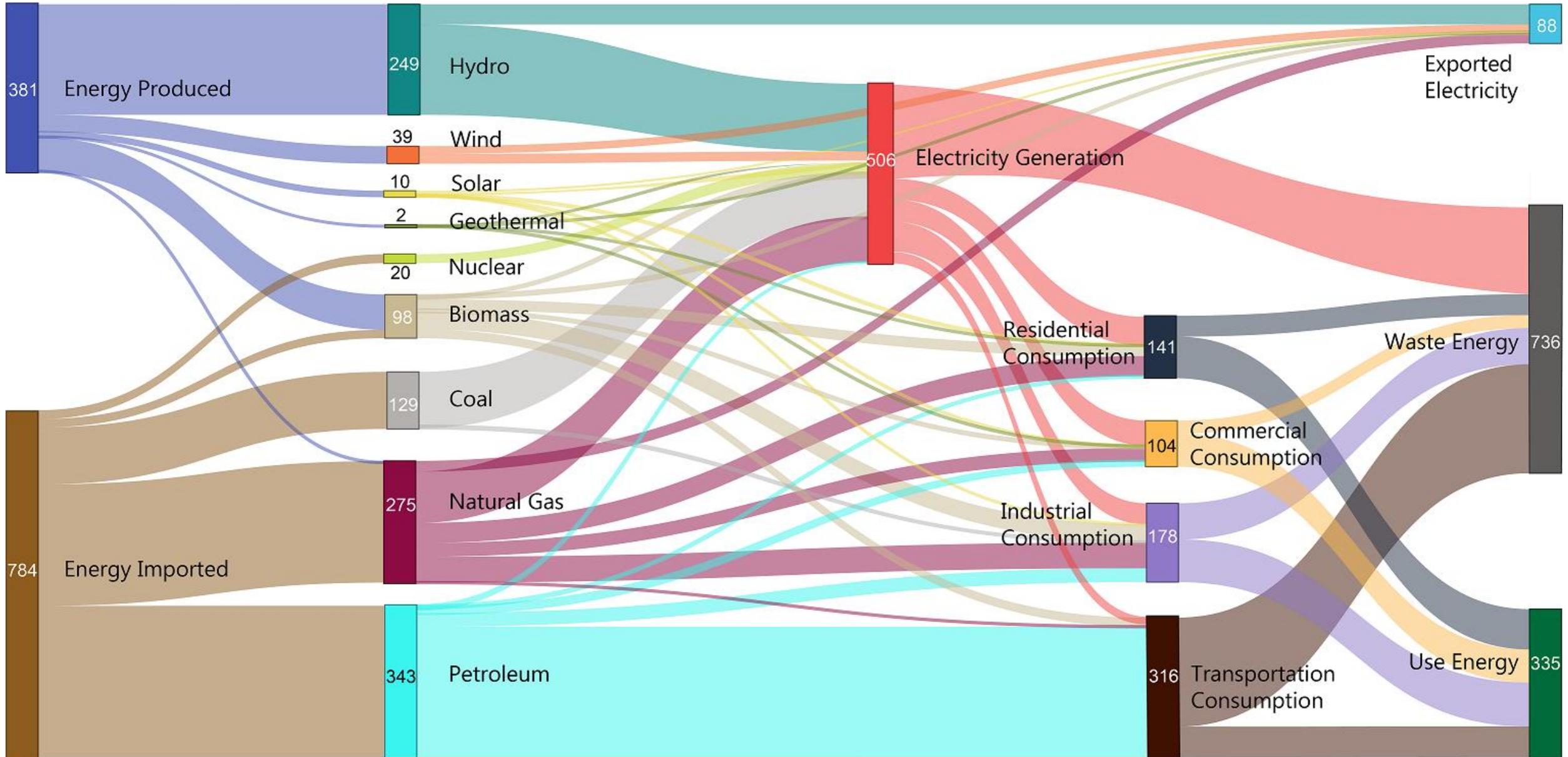


Energy by the Numbers

How does Oregon
produce, purchase,
and use various types
of energy?

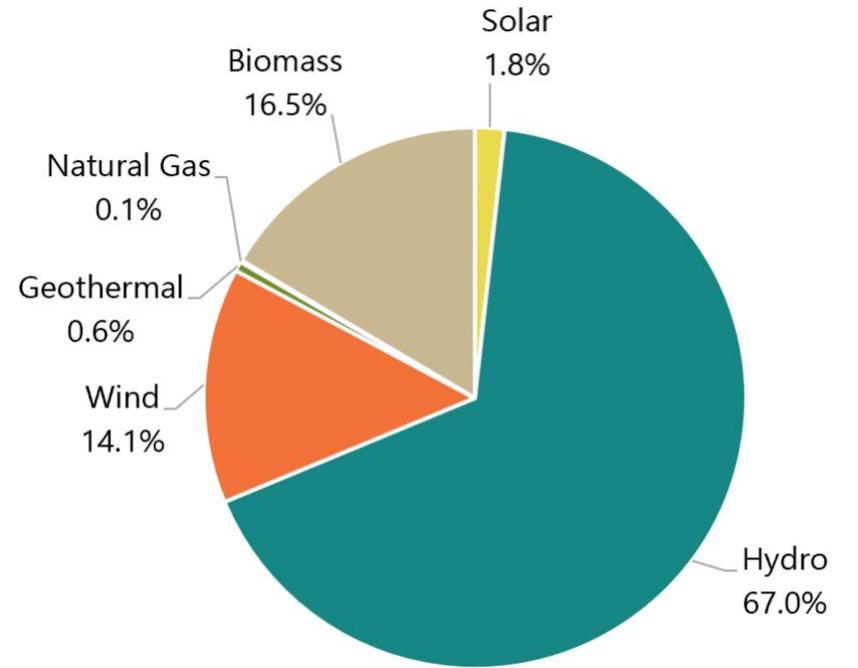
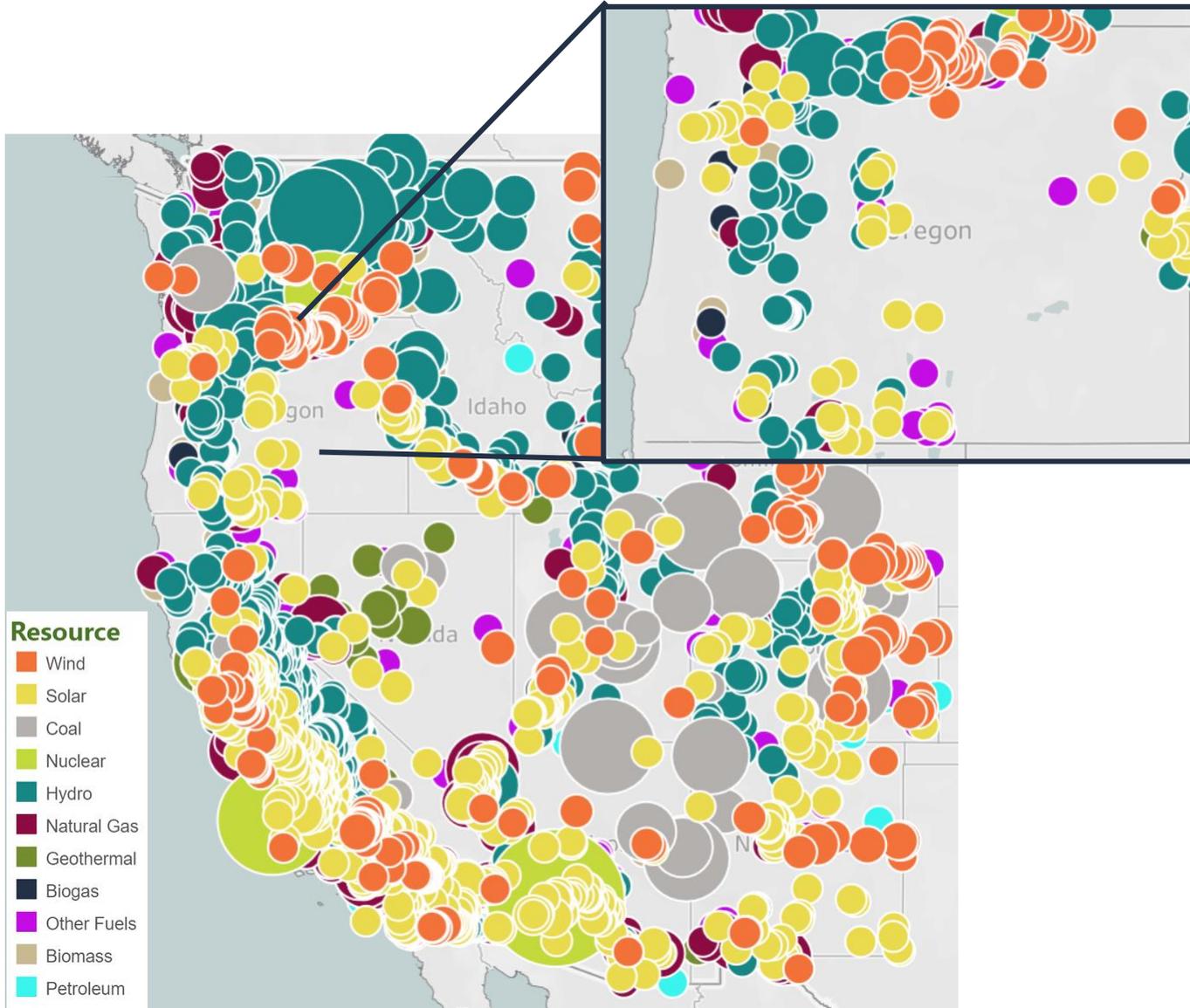


Oregon's Energy Flow



Numbers are in trillions of British thermal units (Btus)

Oregon's Energy Production (2018)

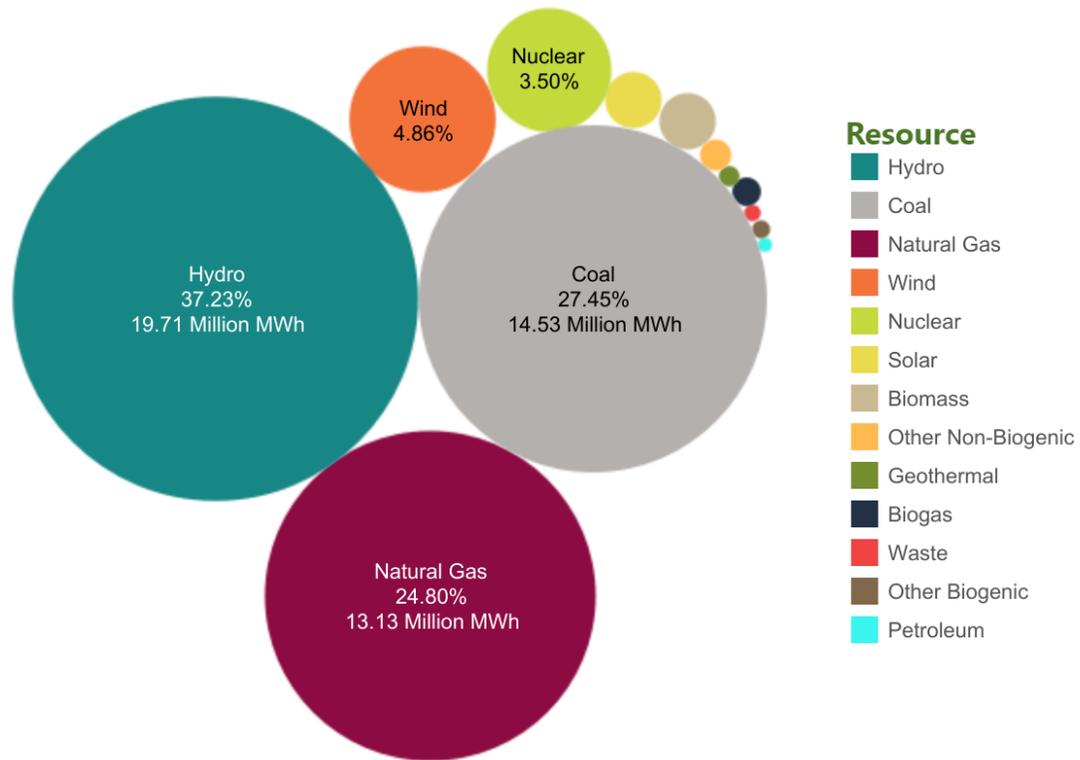


(2018)

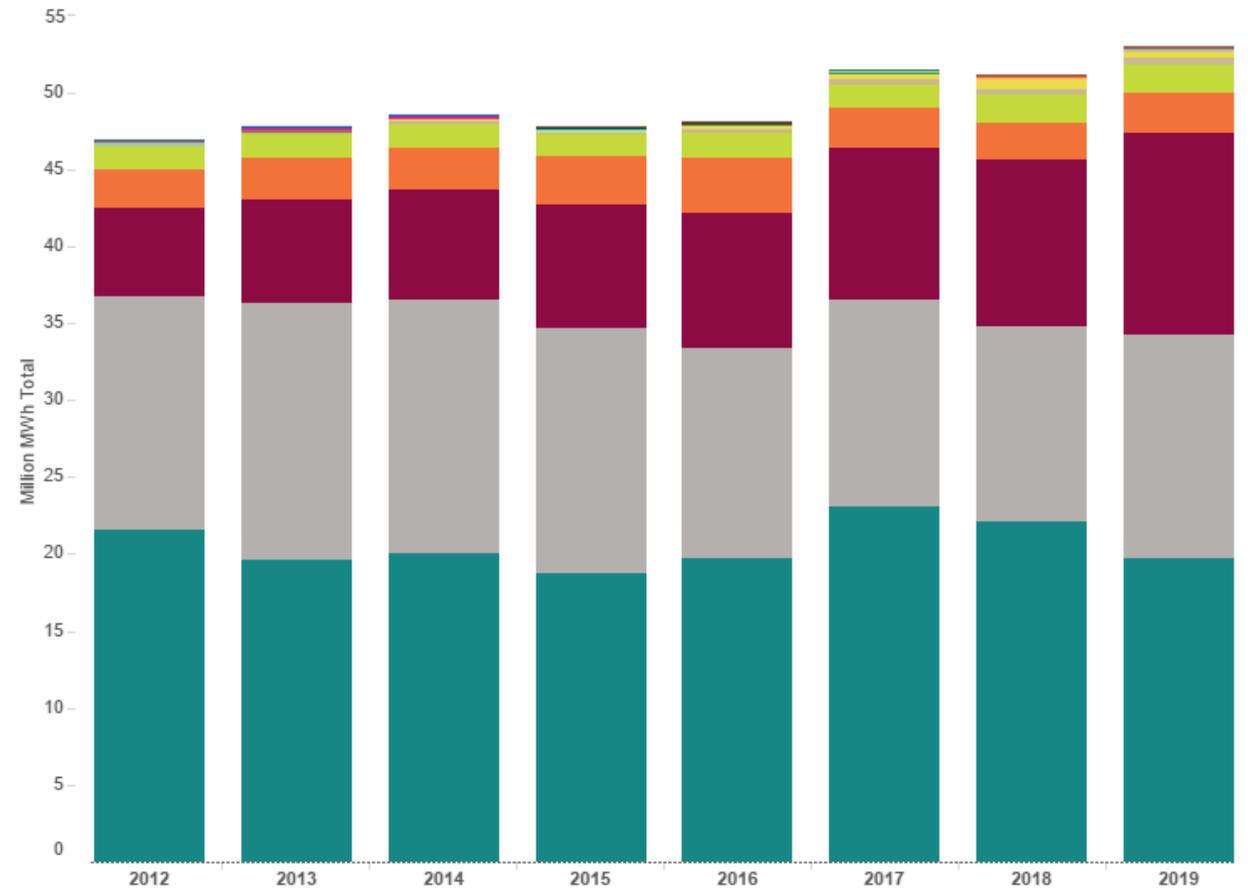
Oregon's Energy Use (2019)

Resources Used to Generate Oregon's Electricity

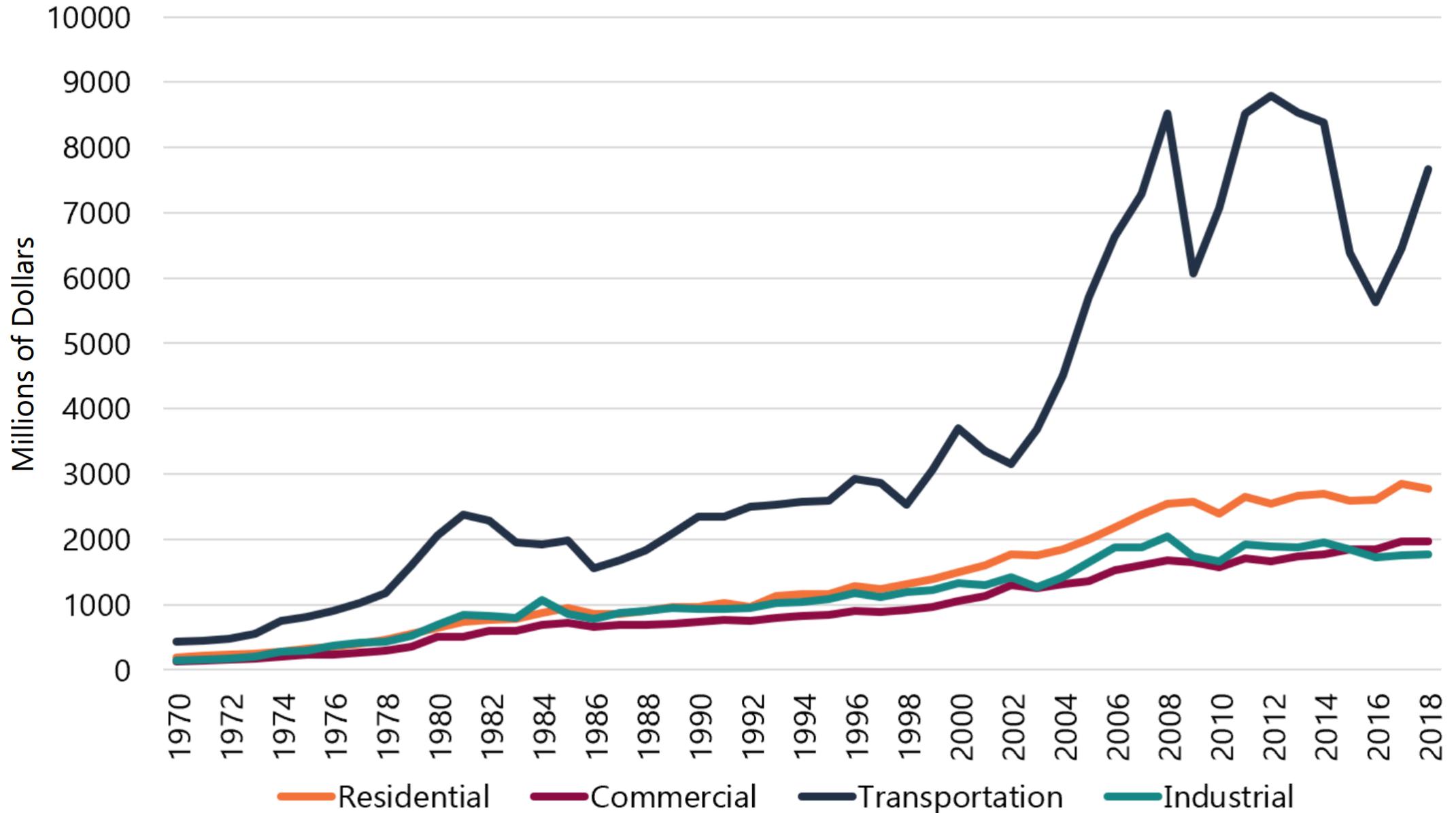
Based on 2019 data, this chart shows the energy resources used to generate the electricity that is sold to Oregon's utility customers.



Oregon Electricity Mix Over Time



Oregon's Total Energy Expenditures by Sector Over Time



Oregon County Energy Profiles

MARION

JACKSON



County Info & Demographics

Population: 333,950
Regional Typical Income: \$49,583

Population: 213,765
Regional Typical Income: \$44,028



Poverty & Energy Burden

Energy Burdened Households: 28%
Annual Energy Burden Gap: \$583

Energy Burdened Households: 27%
Annual Energy Burden Gap: \$557



Homes

Homes Built Before 1990: 68%
Owner-occupied Homes: 60%

Homes Built Before 1990: 61%
Owner-occupied Homes: 62%



Energy

Average Annual Electricity Cost: \$1,177
Average Annual Natural Gas Cost: \$627

Average Annual Electricity Cost: \$1,236
Average Annual Natural Gas Cost: \$634



Home Primary Heating

Electricity: 51%
Natural Gas: 42%

Electricity: 54%
Natural Gas: 36%

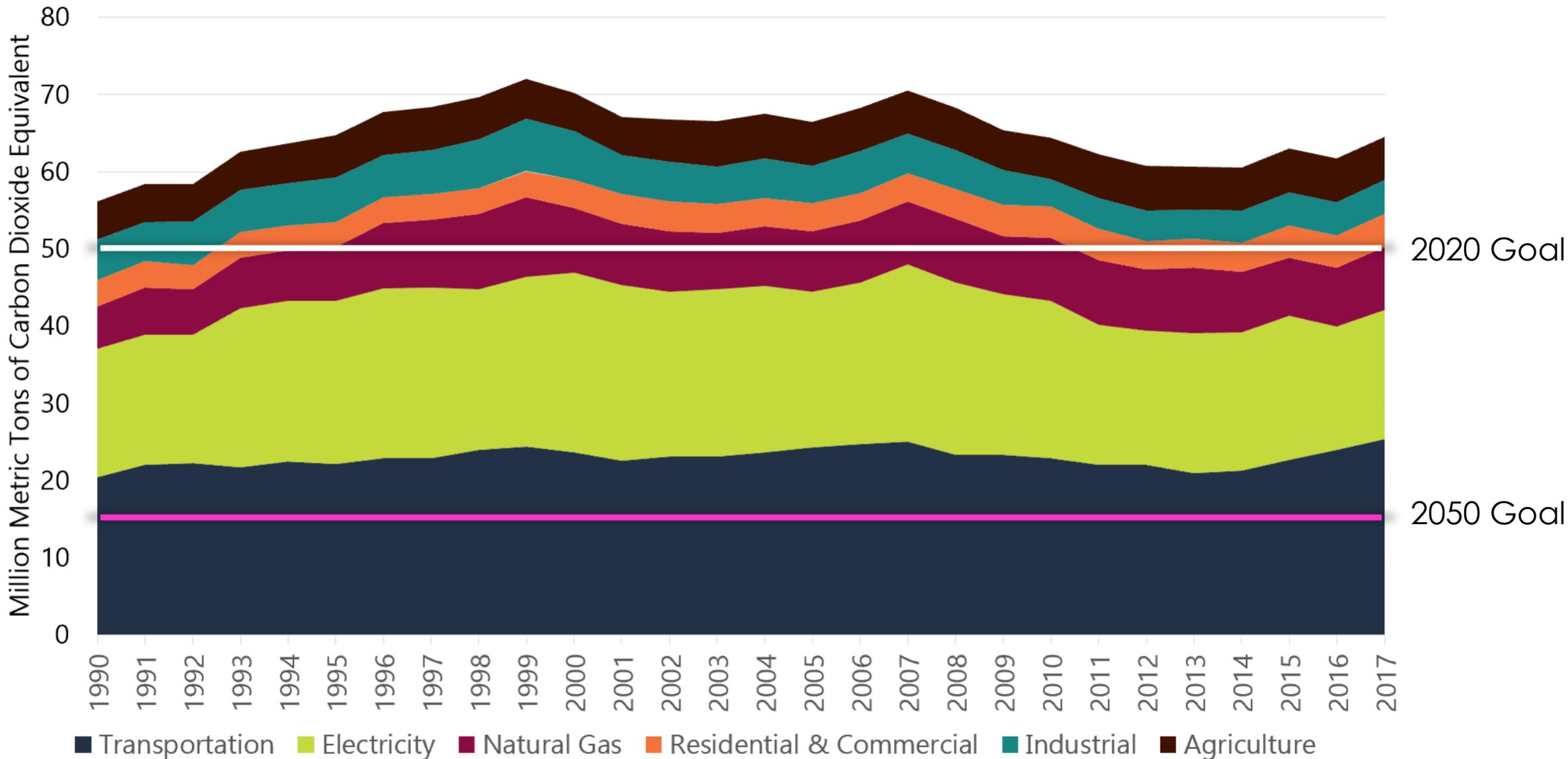


Travel

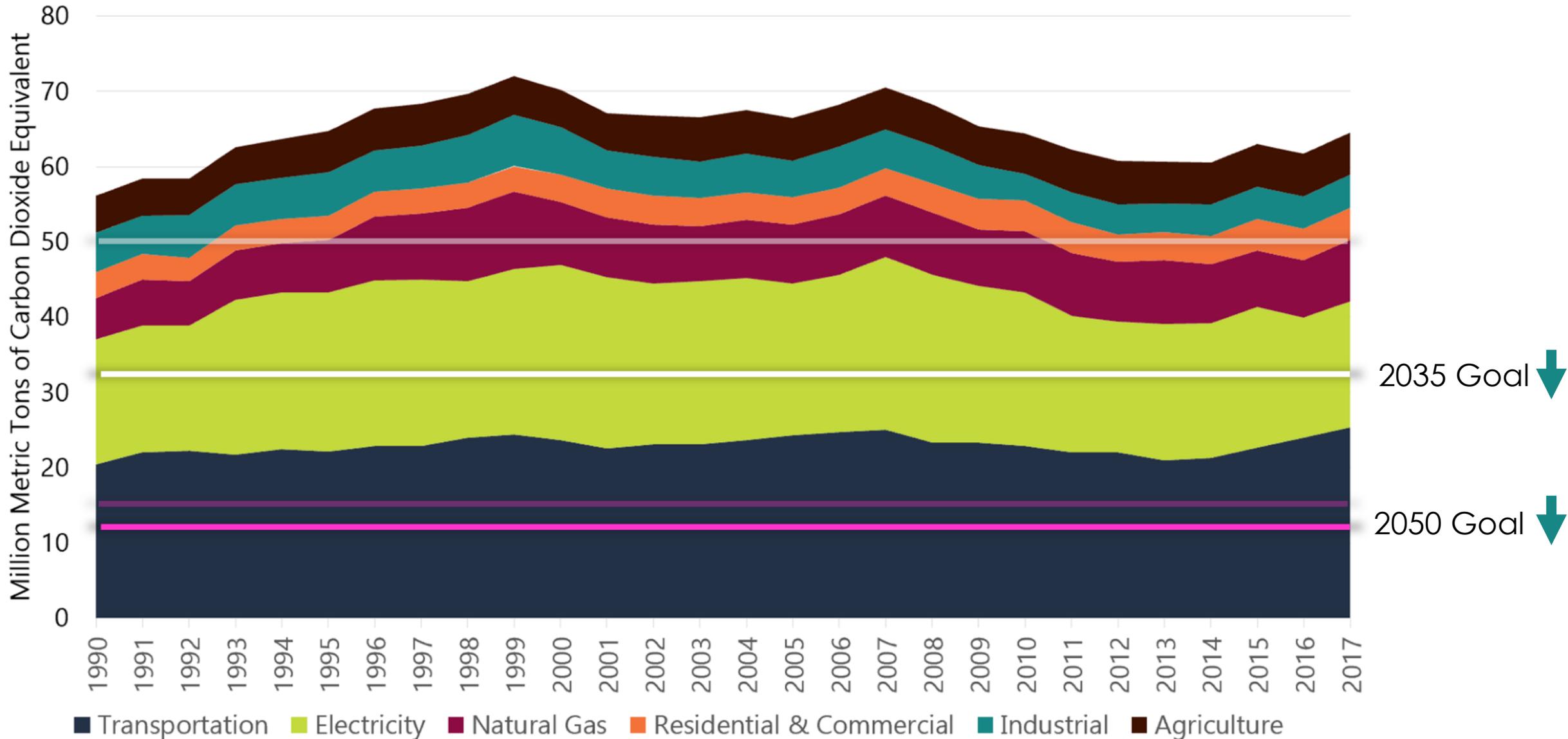
Annual Vehicle Miles Traveled: 20,996
VMT Cost: \$3,367

Annual Vehicle Miles Traveled: 20,867
VMT Cost: \$3,346

Oregon Greenhouse Gas Emissions by Source Over Time (2007 Reduction Goals)



Oregon Greenhouse Gas Emissions by Source Over Time (New 2020 Reduction Goals)



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.



Event

Energy policies enacted at state and federal levels



18,000 to 15,000 years ago – During the last ice age, the Missoula Floods, possibly the largest discharges of water in the history of the earth, shape the Columbia River Gorge and the Willamette Valley.¹

16,500 years ago – Archeological remains and artifacts – the oldest radiocarbon dated evidence of humans in North America – are found where Cooper’s Ferry, ID, now stands. This region is also known to the Nez Perce Tribe as the site of an ancient village named Nip.²



Missoula Flood Paths, courtesy of Washington Geological Survey.

2001 – The Western Energy Crisis of 2001 causes power shortages in California and skyrocketing electricity prices across the west, including Oregon. Wholesale energy prices in the PNW briefly jumped to over \$1,300 per megawatt hour, much higher than the typical price of under \$50 per MWh. New efforts at deregulation, combined with historic drought conditions and market manipulation contributed to the crisis.⁹²

2001 - Enron engages in criminal market manipulation, exacerbating the energy crisis. Enron's collapse leads to many PGE employees losing their jobs and much of their retirement savings.⁹³

2001 – By the end of the year, 10 aluminum smelters in the NW are shutdown. This direct service industry goes from using a high of about 3,000 aMW in 1995 to about 300 aMW by 2006.⁹⁴

2001 – The EFSC-approved Stateline Wind Project in Umatilla County becomes first utility-scale wind energy facility built in Oregon. The 222 MW facility has 229 turbines, each 440' tall.⁹⁵

2002 – Oregon becomes the first state to install solar panels on its state capitol building.⁹⁶

2002 – Energy Trust of Oregon begins operation to administer energy efficiency and renewable energy programs for investor owned utilities.⁹⁷



Wind turbine construction in Oregon.



2017 – With the passage of the Keep Oregon Moving Act (HB 2017), Oregon adopts an Electric Vehicle Rebate program that includes a “Charge Ahead” component for low-income participants.¹¹⁷ Oregon Governor Kate Brown issues Executive Orders 17-20¹¹⁸ and 17-21¹¹⁹ to reduce greenhouse gas emissions by accelerating energy efficiency in Oregon’s built environment and accelerating zero emission vehicle adoption.



2017 – The first utility-scale solar PV project larger than 50 MW in Oregon, the 56 MW Gala Solar project in Crook County, begins commercial operation. Just one year later, the Boardman Solar Project, with a capacity of 75 MW, receives a site certificate from EFSC. The project has not yet begun construction.¹²⁰



2019 – Oregon legislature passes HB 2618 creating ODOE’s Solar + Storage Rebate Program. The program issues rebates for solar electric systems and paired solar and solar storage systems. At least 25 percent of available rebate dollars are set aside for low- or moderate-income residential customers and low-income service providers.¹²¹



2019 – For the first time since 1952, U.S. domestic production of primary energy surpasses consumption and the country exports more energy than it imports.¹²²



2020 – Oregon Governor Kate Brown issues Executive Order 20-04 Directing State Agencies to Take Actions to Reduce and Regulate Greenhouse Gas Emissions.¹²³



2020 – Oregon has 31,977 registered electric vehicles as of July 1.¹²⁴



2020 – The Boardman Coal Plant, Oregon’s only coal power plant, closes on October 15.¹²⁵



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.¹²⁶

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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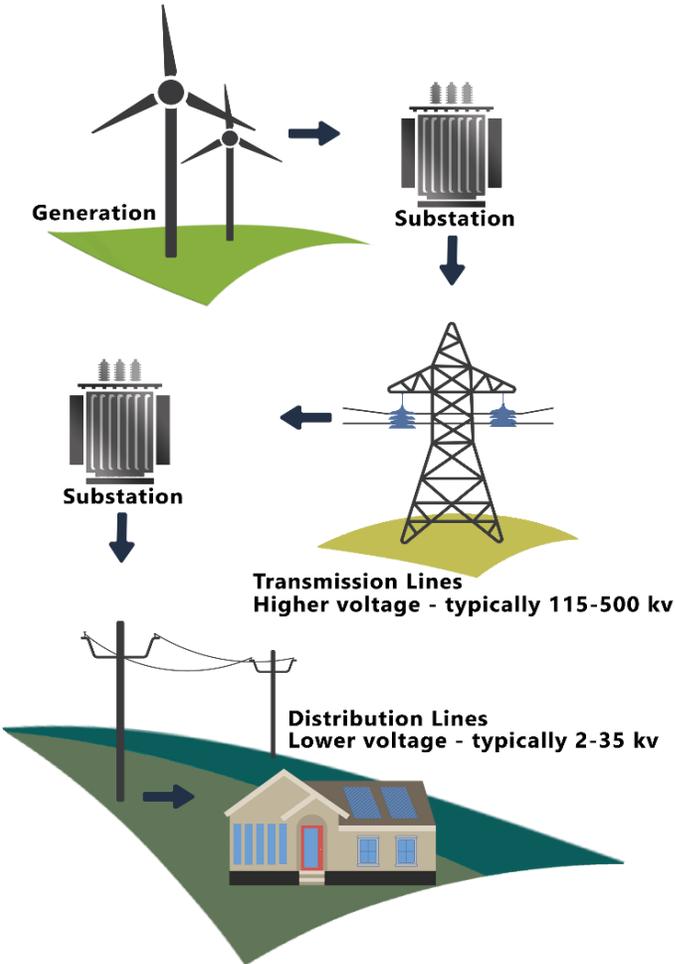
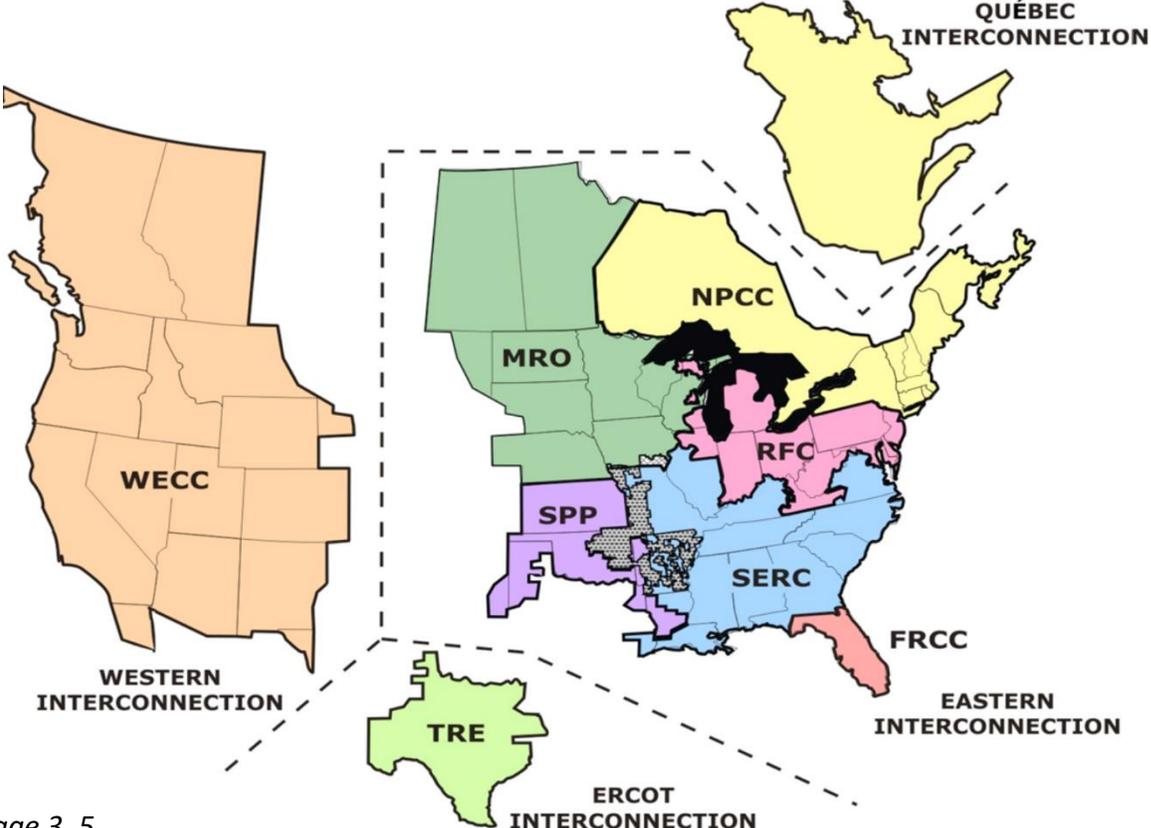
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Transmission

Transmission lines move large volumes of high-voltage electricity across long distances and are needed to connect large distant generating resources to electricity customers. The transmission network serves many important functions, including providing access to diverse energy resources, helping to ensure reliable electricity, and allowing generating resources to be centrally located and used to serve demand across a region.

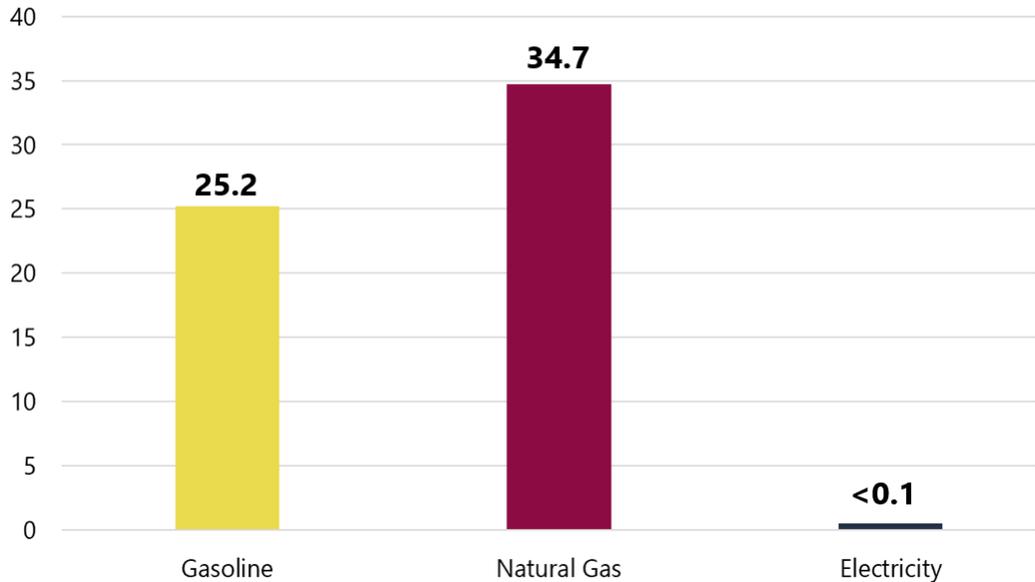
Four Interconnections in North America



Resource Adequacy

Resource Adequacy (or RA) is the term that grid planners and utilities use to refer to the evaluation of whether adequate generating capacity will be available to meet forecasted demand over the next several years (typically from one to five years).

Days of End-Use Fuel Storage in the U.S. Based on Average Daily U.S. Consumption by Fuel Type



Power System Reliability Over Different Timescales

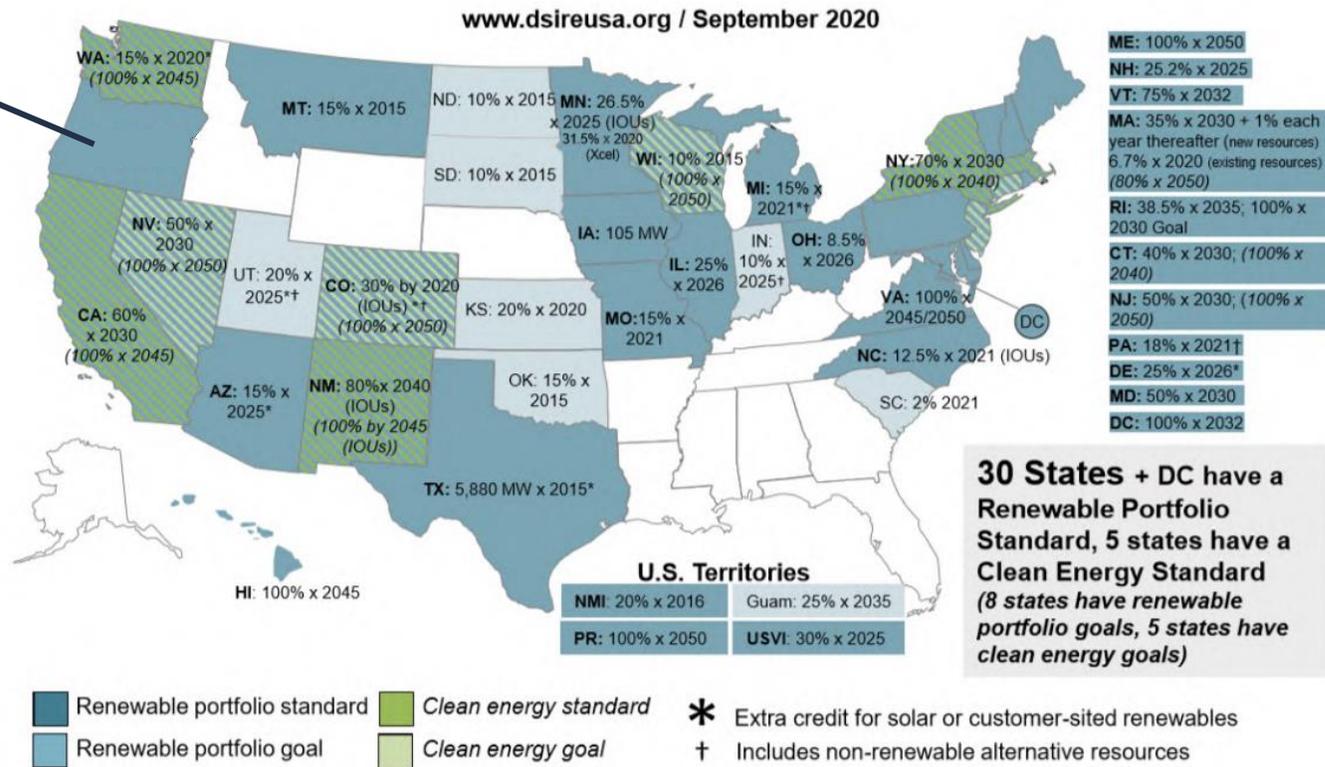
Short-term <i>(< 1 minute)</i>	System Stability	Short-term reliability (e.g., frequency response) focused on grid stability over very short time intervals
Medium-term <i>(Hourly or Daily)</i>	System Balancing	Medium-term reliability focused on managing imbalances on the system like those that occur between a day-ahead forecast and real-time conditions
Long-term <i>(1 to 5 years)</i>	Resource Adequacy	Long-term reliability focused on seasonal or year-to-year mismatches between supply-and-demand

Clean & Renewable Standards

Portfolio standards require utilities and other energy suppliers to procure a certain minimum amount of their energy portfolio from eligible resources. These policies create demand for targeted energy resources, increase their development and use, and help to overcome market barriers to adoption, thereby enabling society to capture the environmental, economic, and other benefits associated with these resources.

Oregon:
 RPS: 50% by 2040 (large utilities)
 CES: 100% by 2040 (IOUs and ESSs)

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



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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Energy Storage

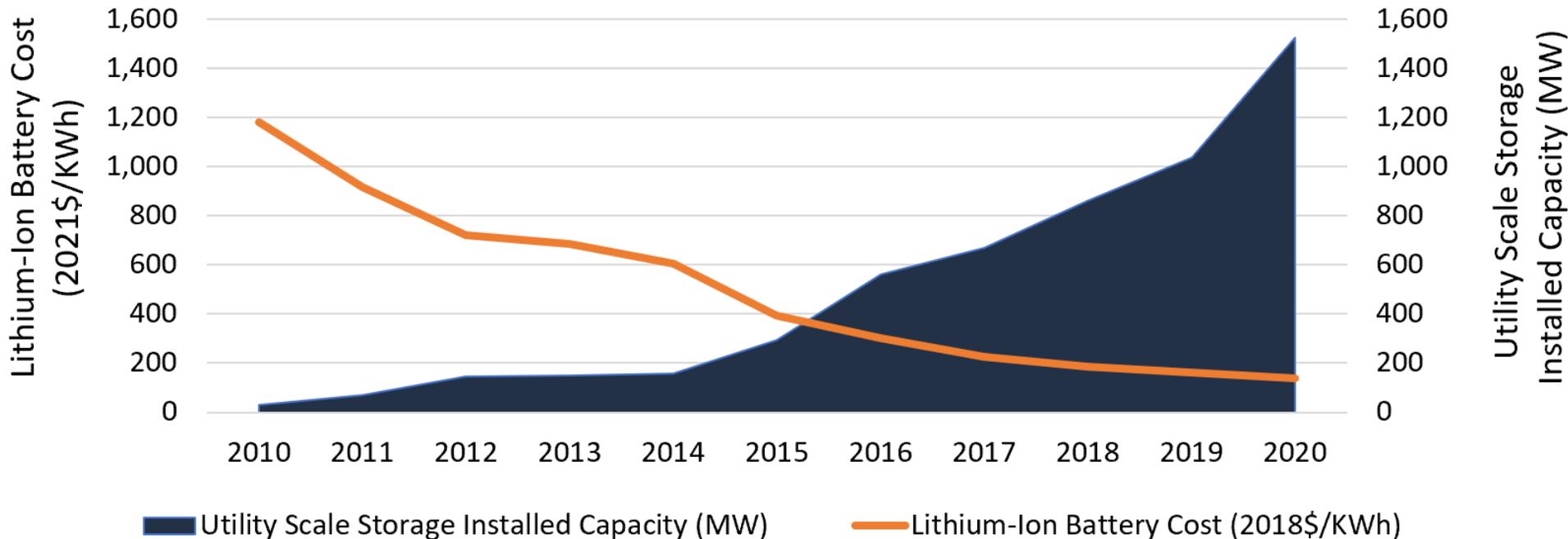
Residential Storage

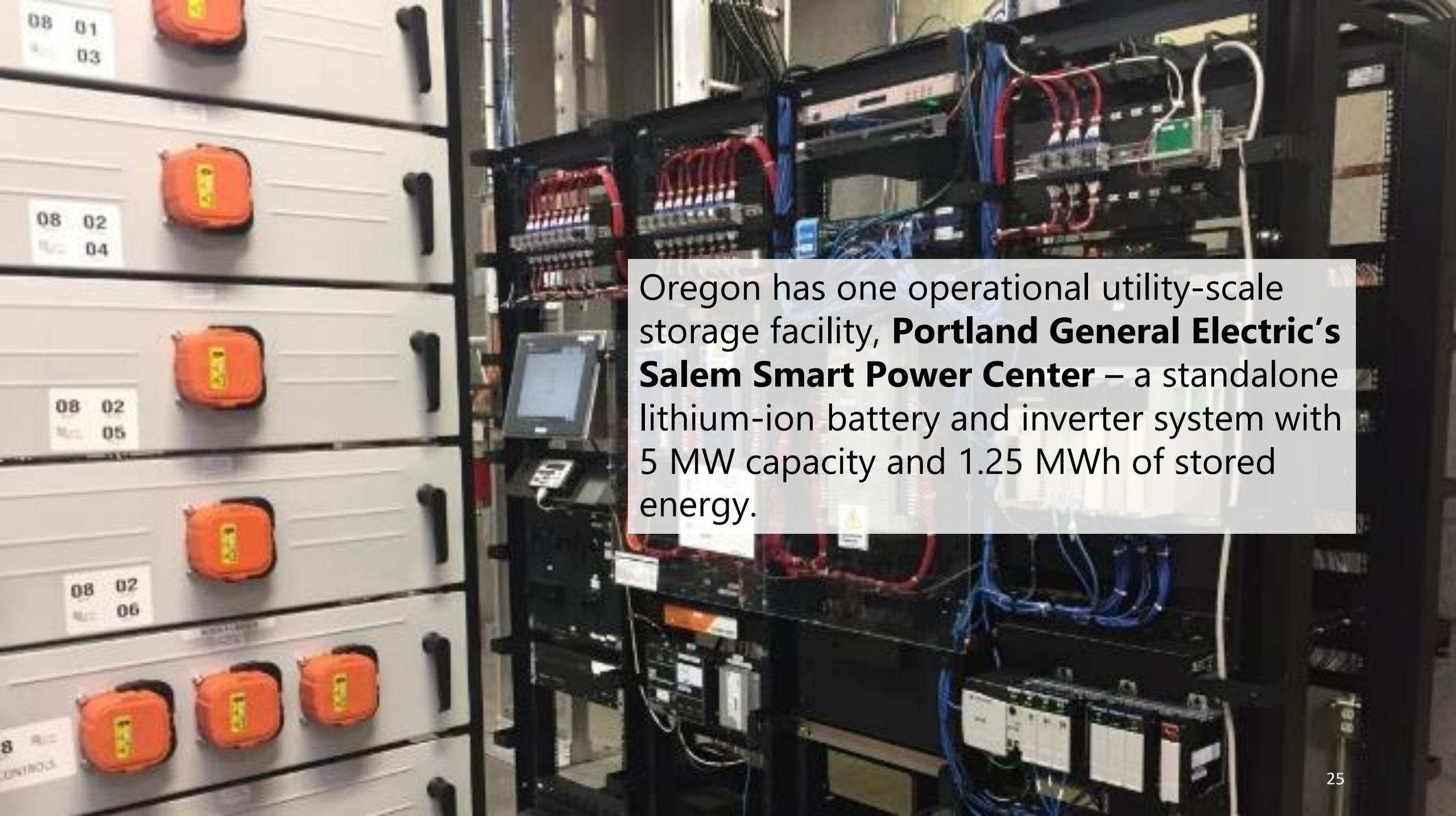
- Peak Power Capacity in Oregon: 670 kW
- Facilities in Oregon: 291
- Maximum Stored Energy in Oregon: 1,440 kWh
- Range of Sizes: 2.4 to 46 kWh

Utility-Scale Storage

- Peak Power Capacity in Oregon (2019): 5 MW
- Facilities in Oregon (2019): 1 (5 MW)
- Total Capacity of Storage Under Construction: 430 MW
- Maximum Stored Energy in Oregon (2019): 1.25 MWh
- Total Energy Discharged (2018): 545 MWh

Storage Cumulative Installations and Costs per KWh





Oregon has one operational utility-scale storage facility, **Portland General Electric's Salem Smart Power Center** – a standalone lithium-ion battery and inverter system with 5 MW capacity and 1.25 MWh of stored energy.



Policy Briefs

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

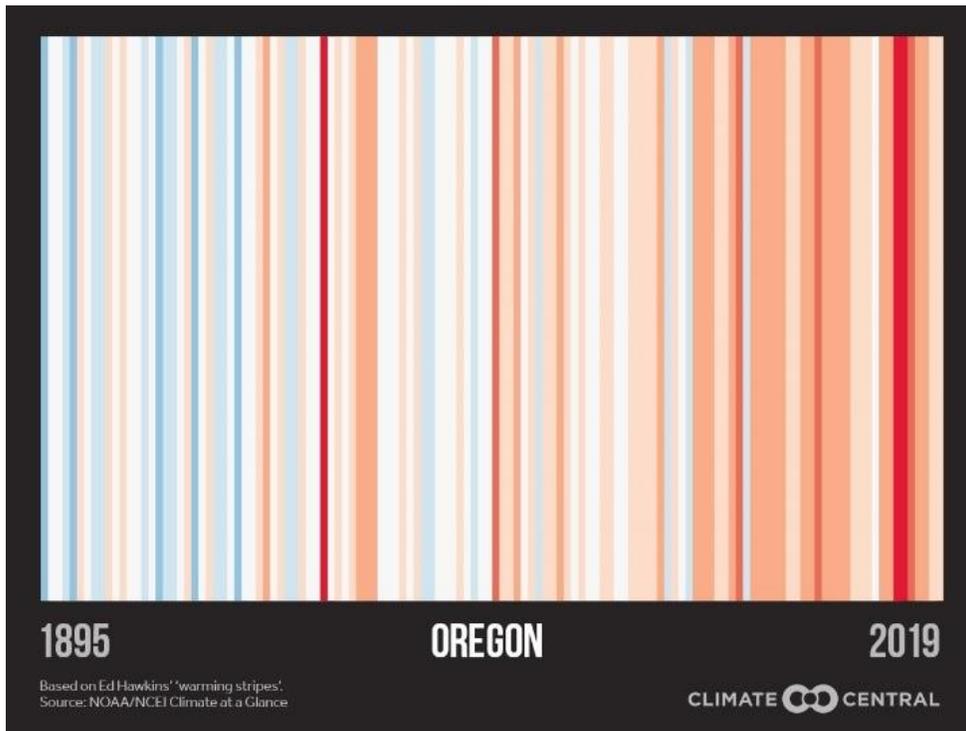
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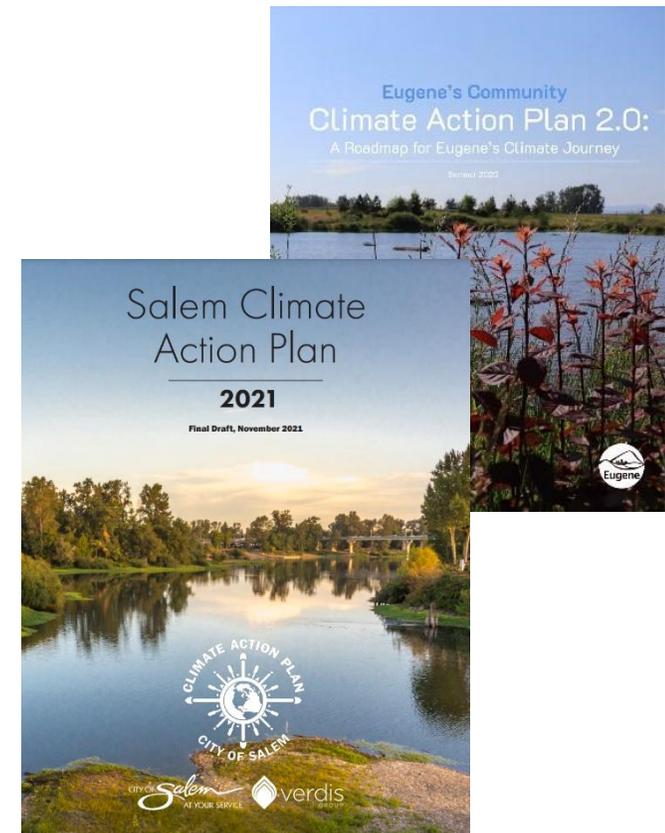
Climate Change

Extensive research has shown that a 2°C (3.6°F) increase in global average temperatures would result in significant and unprecedented risks to society and the environment. Oregon's current GHG emissions trajectory is contributing to that global limit, threatening human health, livelihoods, and ways of life. Communities across Oregon are already suffering from more extreme weather events and air pollution resulting from GHG emissions and wildfires.



<https://showyourstripes.info/>

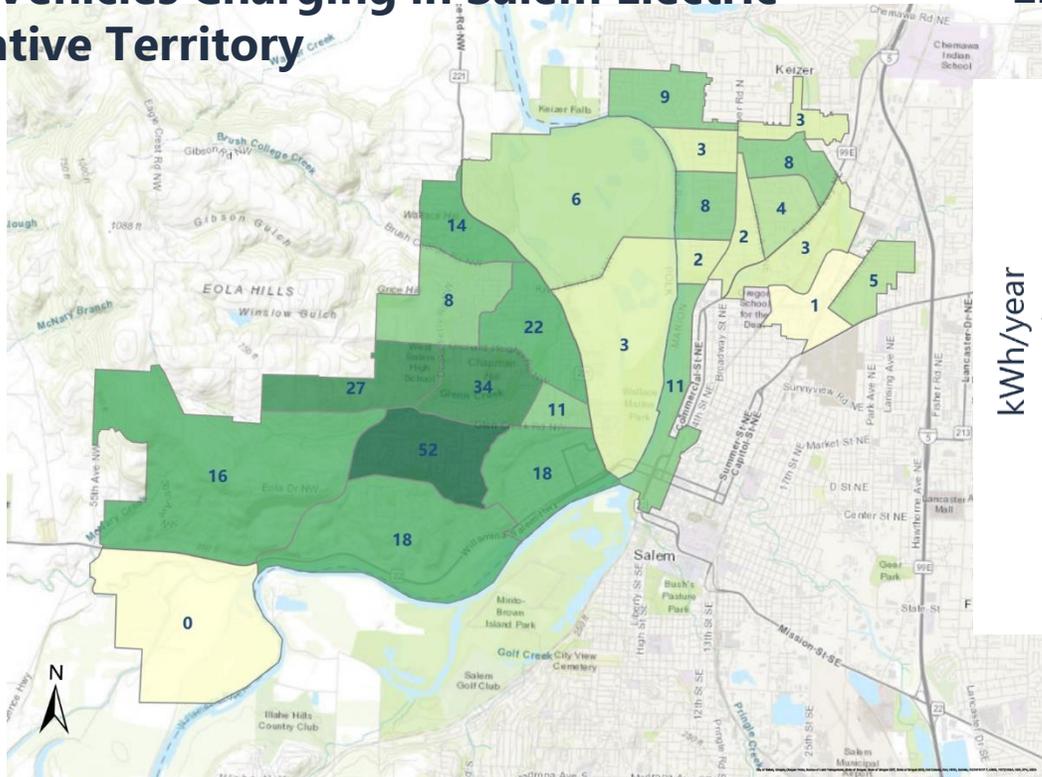
Transitioning to cleaner energy resources and technologies provides more reliable energy, increased energy independence, new living-wage jobs, sustainable transportation options, and reduced operating and maintenance costs.



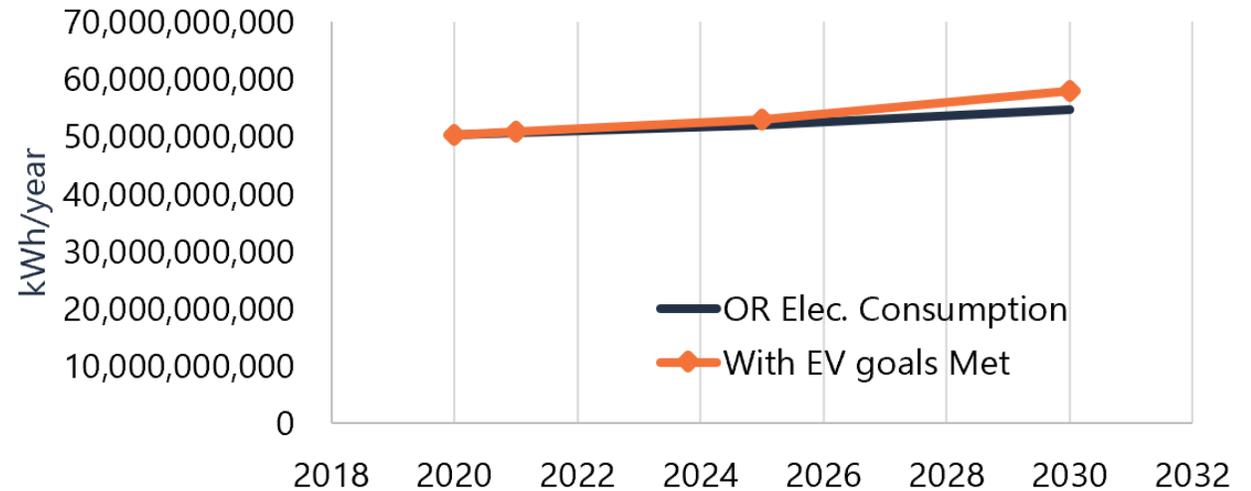
EVs on the Grid

As electric transportation fuel becomes a larger portion of the overall load, EV charging may become more obvious in daily electricity load profiles. The cumulative amount of electricity for charging is only one piece of the puzzle as utilities plan for increasing numbers of EVs on their system. Of more importance is *where and when* they are charging

Electric Vehicles Charging in Salem Electric Cooperative Territory

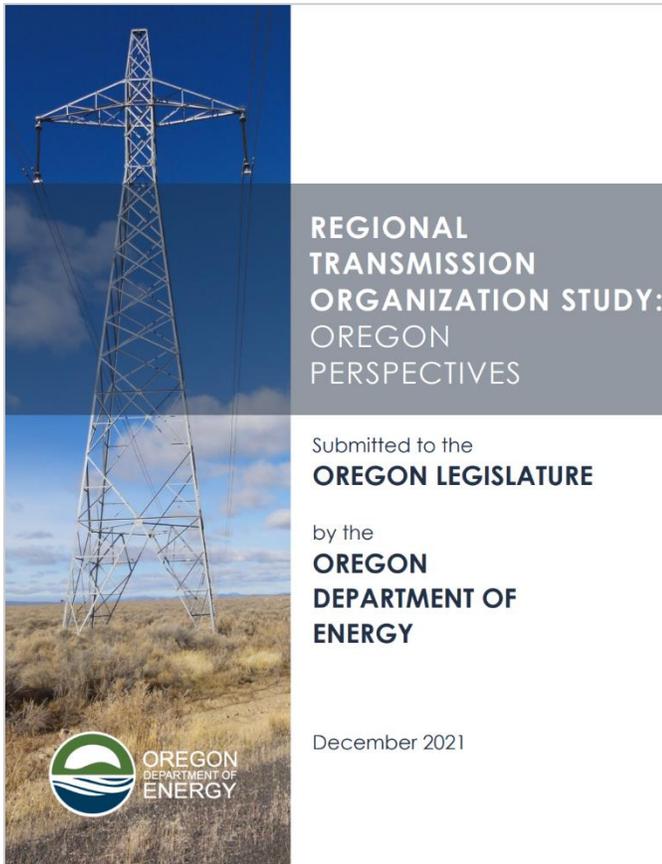


Electricity Load Needed to Meet EV Targets by Year



Evolving
Electricity
Markets

Changes in the energy landscape are combining to drive interest in the evolution of wholesale electricity markets in Oregon and across the west. Utilities are exploring whether participation in broader regional markets can facilitate the integration of renewables at lower cost, help to manage the closure of coal plants and constraints on the transmission system, and support long-term capacity procurement.



Just
published!

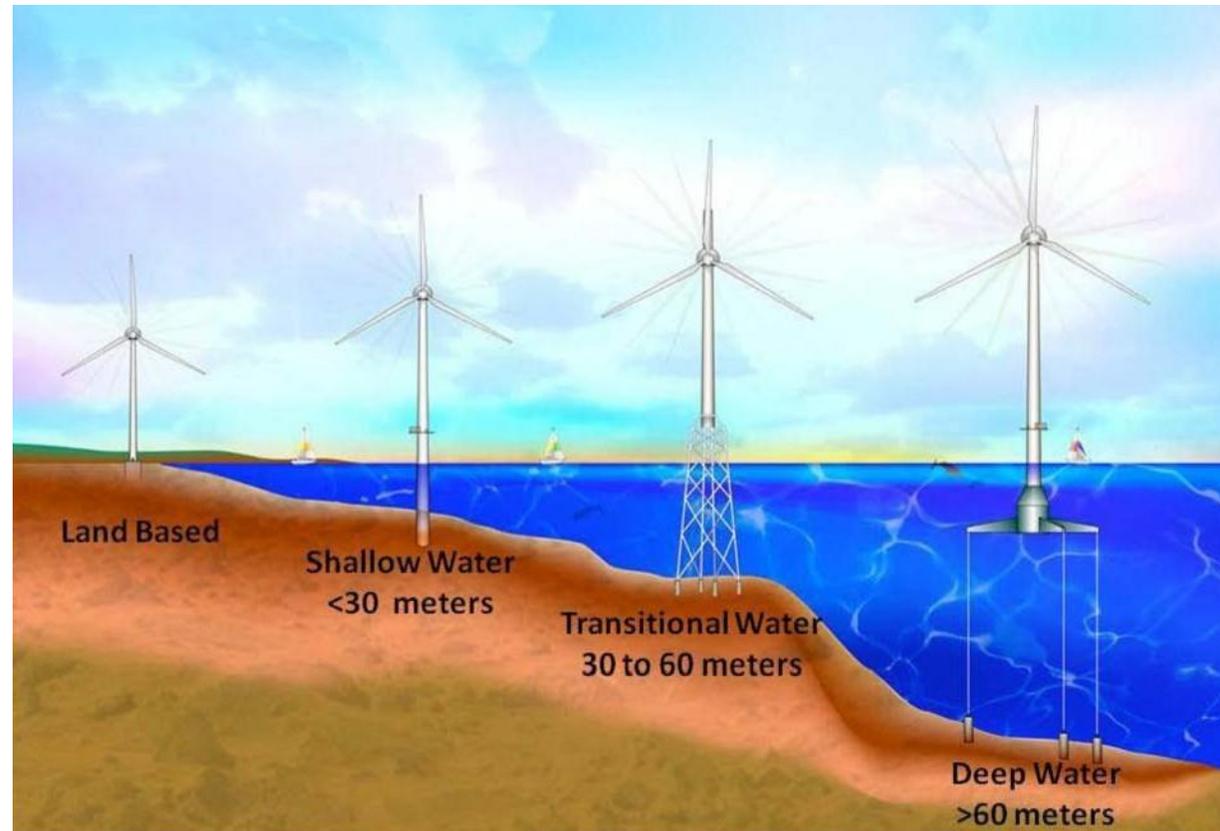
Active and Pending Energy Imbalance Market Participants



Offshore Wind

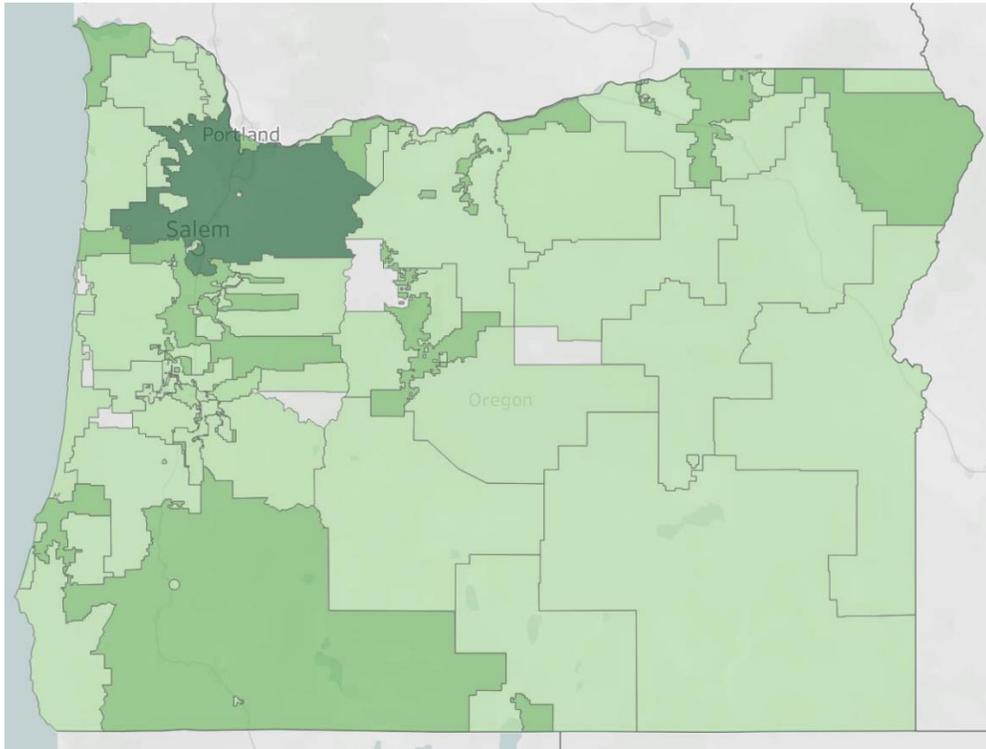
In the case of the Oregon coastline, anchoring offshore wind turbines is complex and expensive due to the significant depth of the ocean floor along the coast. To date, nearly all global offshore wind development has been fixed-bottom, which is only feasible in shallower waters. Deeper waters require more complicated support systems consisting of anchored, floating platforms that indirectly fix wind towers to a targeted location but allow for some movement.

**New
study
coming in
2022**



CONNECTING THE DOTS

Figure 2: Registered EVs by Oregon Utility Service Territory⁴



Darker shades of green = more registered EVs

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: EV Data
- ➔ 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

Oregonians
+
Energy

Every Oregonian uses energy – at home, on the road, at school, and at work. What should Oregon energy consumers know? How can they help with the clean energy transition?



Oregonians Are Proactively Choosing Cleaner Power

- PGE and PacifiCorp have two of the most successful voluntary green power programs in the country.
- Consumers are increasingly looking to either support green power programs, produce their own renewable energy, and make the switch to EVs.
- Businesses are purchasing green power and installing renewable energy to demonstrate their environmental commitments.



Incentives

Oregon Solar + Storage Rebate Program

Rural & Agricultural Energy Audit Program

Community Renewable Energy Grant Program

Energy Efficient Wildfire Rebuilding Program

Electric Vehicle Rebates (DEQ)





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Thank you!

www.oregon.gov/energy

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