ENERGY BY THE NUMBERS

Energy by the Numbers focuses on the metrics and data available to track how Oregon produces, purchases, and uses various types of energy.

Like the 2018 report, this includes energy use data by resource and by sector with data on electricity, transportation energy, and direct fuel use. Where possible, data showing how Oregon's energy system has changed over time has been included to provide context and history. New to this report is the energy flow diagram in Oregon, which is a visual summary of how energy is produced, imported, and used. This chart follows each resource through the energy flow. We also discuss energy production — where and what kind of energy Oregon produces, where and how we generate electricity, and what direct use and transportation fuels are produced in state. Oregon is a leading producer of renewable energy and this section explains why and how.

Readers will find data on what Oregon spends on energy, how energy costs burden Oregonians differently across the state, and what the energy industry gives back to Oregon in terms of jobs. The section also demonstrates how energy efficiency continues to serve as an important resource for Oregon. It concludes with highlights on the four end use sectors: residential, commercial, industrial, and transportation, including energy use, expenditures, and GHG emissions – and how each sector uses energy to provide goods and services.

Trends and What's New:

- Oregon has vast energy efficiency potential, but in the last two years the region hasn't been meeting the Northwest Power and Conservation Council's Seventh Power Plan goals for savings in electricity.
- Oregon exports more than half the wind, waste, and geothermal electricity we generate, and 38 percent of the hydropower.
- Oregonians spent more on energy in 2018 than in 2016, mostly due to an increase in the price of transportation fuels.
- Oregon has taken many steps to reduce greenhouse gas emissions, but the state is not on track to meet interim GHG emission reduction goals of 10 percent below 1990 levels by 2020. Transportation sector emissions have been on the rise since 2016.

Data Information

The Biennial Energy Report relies on a variety of data sources, such as the federal Energy Information Administration and the Northwest Energy Efficiency Alliance as well as local data compiled by state agencies. Each data set has strengths and limitations. The energy by the numbers section of the BER is divided into topics and each topic includes references to aid readers in finding source data. Some of the topics rely on data from multiple sources that has been analyzed and compiled to provide insights.

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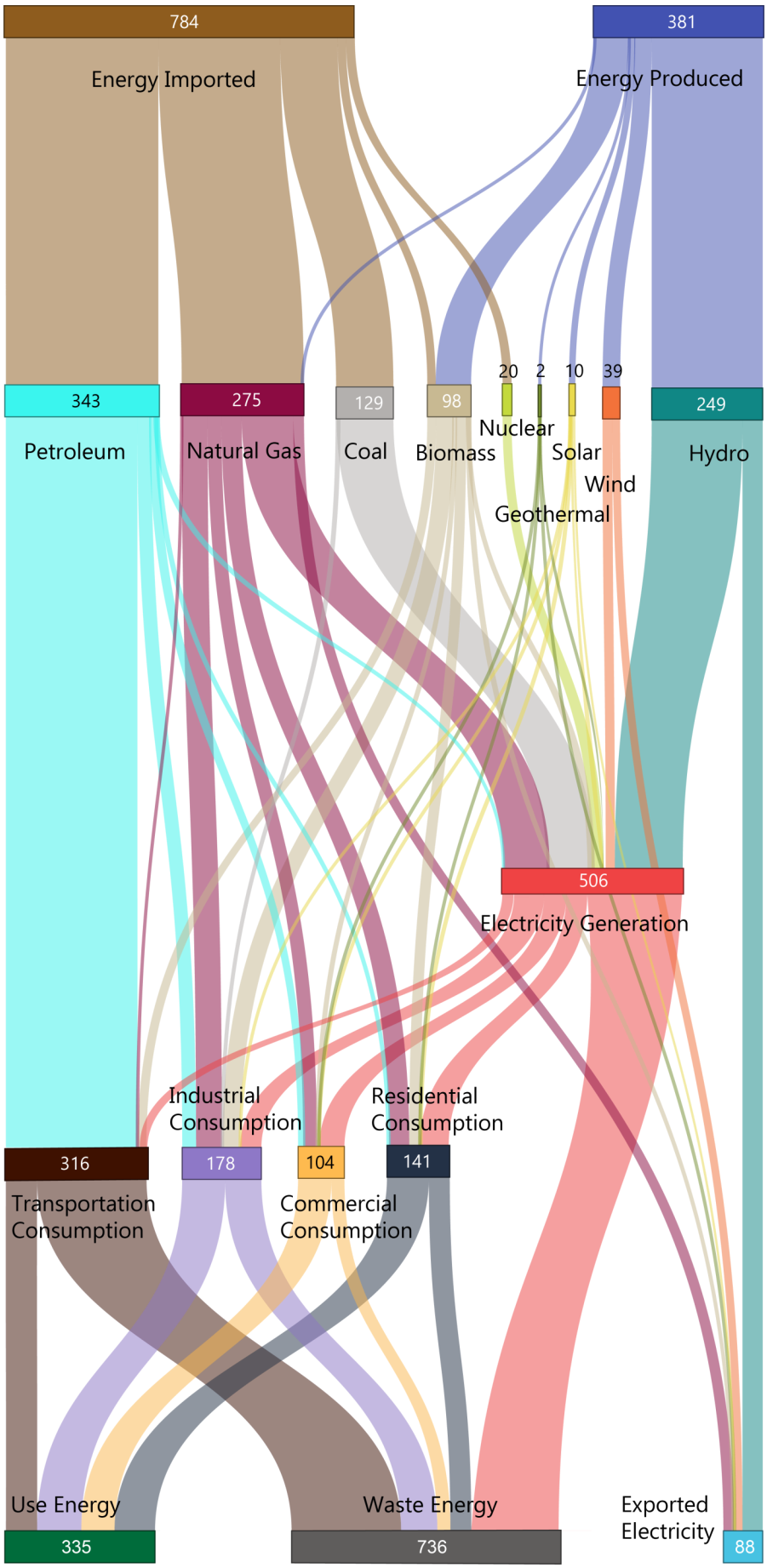
Understanding Oregon's Energy Story



Oregon's energy story has evolved over time thanks to new technologies, resource availability shifts, and policy changes. While the Pacific Northwest has a long history of using hydropower, 20 years ago, solar- and wind-generated energy was scarce.

Today, Oregon's energy resources are diverse. In the chart at left, start at the top to see imported energy and energy produced in Oregon.[1] **The numbers represent trillions of Btus of energy.**

The energy lines flow down to show the different types of resources (hydro, natural gas, solar, and others), and where they end up in Oregon's energy story — from transportation fuels to the natural gas and electricity that supplies homes and businesses. Some energy ultimately goes unused and some is exported to other states.

Btu

A **British Thermal Unit** is a measurement of the heat content of fuels or energy sources. Btu offers a common unit of measurement that can be used to count and compare different energy sources or fuels. Fuels are converted from physical units of measurement, such as weight or volume, into Btu to more easily evaluate data and show changes over time.

The chart provides a macro level look at the energy Oregonians consume, import, and export. Energy imports includes all imported energy, both in raw form or after transformation into other usable forms. For example, some resources are used to create electricity, which is then distributed to different sectors. Other resources are transported to sectors to be consumed as direct use fuels.

The flow to "waste energy" includes all of the energy that is not harnessed, from the point of extraction to the point of use. This includes energy lost as heat during combustion or transformation into electricity, transmission losses, and many other factors.

Energy Sources Used in Oregon

Solar. Photovoltaic technology converts energy radiating from the sun into electricity. Solar systems are located on homes, businesses, and large utility-scale arrays. As of 2018, there are more than 15,000 active residential solar systems in Oregon.[2]

Nuclear. Generated electricity from a nuclear reactor where thermal energy is released from the fission of nuclear fuel. Oregon's nuclear power comes from the Columbia Generating Station in Washington State, and the electricity produced is marketed by the Bonneville Power Administration.

Hydropower. Electricity generation harnessed from the natural flow of water through dams. Oregon has 65 large hydropower facilities, including four federal facilities on the Columbia River that span the Oregon and Washington border, and two facilities that span the Oregon and Idaho border.[3]

Wind. Generation of electricity by the force of wind turning turbines. As of 2018, Oregon has 44 operating facilities in the state with a total capacity of 3,383 MW.[4]

Geothermal. Energy extracted from hot water or steam from natural underground sources can be used for water/space heating or the generation of electricity. Oregon has two geothermal electric generation facilities with a capacity of 23.8 MW.[4]

Natural gas. Fossil fuel extracted from beneath the earth's surface. Oregon has a single natural gas field located in Mist. Oregon imports most of the natural gas it consumes for electricity and as a direct fuel. There are 18 natural gas electricity generation facilities with a combined capacity of 4,140 MW.[4] Natural gas is used directly for residential, commercial, industrial and transportation uses.

Coal. Combustible rock is burned for industrial processes and to create electricity. Oregon had one coal-generated power plant, the 575 MW Boardman facility, which closed in October 2020.[5] The state also imports coal-generated electricity from neighboring states.

Biomass. Includes all renewable biogas and biofuels derived from the energy of plants and animals. Wood and wood waste is Oregon's greatest source of biomass, which is used for space heating, cooking, electricity generation, and transportation. Oregon has 16 biomass and 25 biogas operating facilities converting waste products to electricity.[4] Oregon also produces plant-derived ethanol fuel and biodiesel from used cooking oil to be used as transportation fuels.

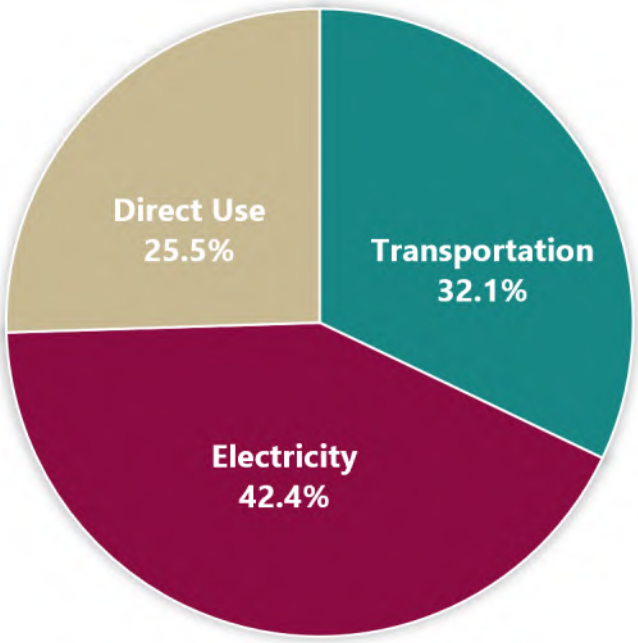
Petroleum. Fossil fuel extracted from beneath the earth's crust that includes gasoline, diesel, heating oil, lubricants, and other fuels we use for space heating, industrial equipment and transportation. Oregon imports the petroleum that it uses.

Energy Use in Oregon

Consumption by Source

Oregon relies on energy from a variety of resources. We import energy like transportation fuels, natural gas, propane, and other fuels. We use electricity from both in- and out-of-state sources—including coal, natural gas, nuclear, hydropower, wind, and other renewable resources.[1]

For this introduction to Oregon's energy use, the report sorts energy into three main categories:



42.4%
of Oregon's 2018 energy consumption

Electricity: this is where most people begin when thinking about energy—the critical resource that powers our day-to-day lives. The electricity Oregonians use comes from facilities across the western United States and in Oregon. This percentage also accounts for source fuels that come from out of state, such as natural gas, but generate electricity in-state.

25.5%
of Oregon's 2018 energy consumption

Direct Use Fuels: this category includes fuel oil and natural gas used to heat homes and commercial spaces, fuels used for other residential purposes, such as gas stoves, solar thermal heating, and fuels used directly in industrial processes.

32.1%
of Oregon's 2018 energy consumption

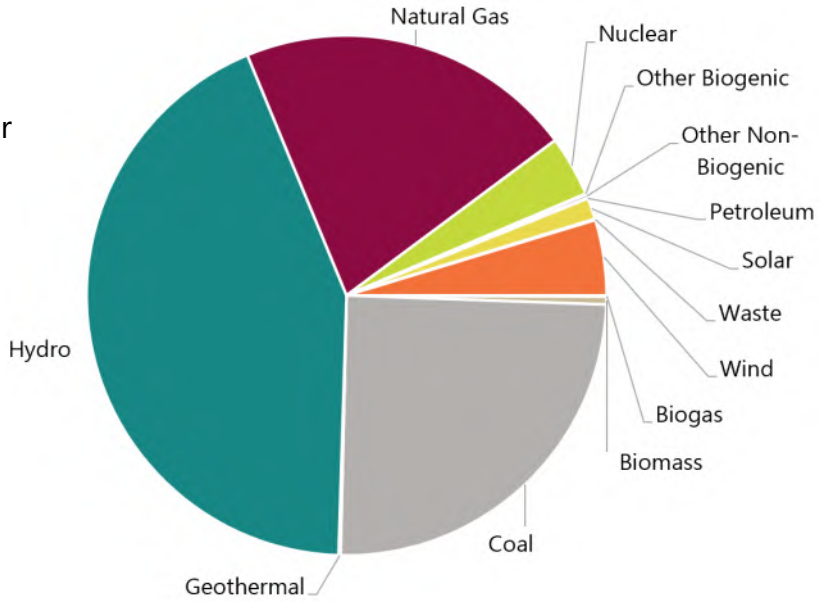
Transportation Fuels: this includes personal, passenger, and commercial vehicles, both on and off the roads, plus airplanes, boats, barges, ships, and trains. Nearly all transportation-related sources of energy are imported from out of state for in-state use.

Note to readers: *the methodology for calculating source energy has been updated since the 2018 Biennial Energy Report. The new methodology aligns with U.S. EIA efficiency values for electricity generation, attributing a greater source energy for hydroelectric generation than in the previous report. The overall consumption in Btus for Transportation and Direct Use fuels has not dropped since 2016, rather the portion of use attributed to electricity has grown.*

Electricity

42.4%
of Oregon's 2018 energy consumption

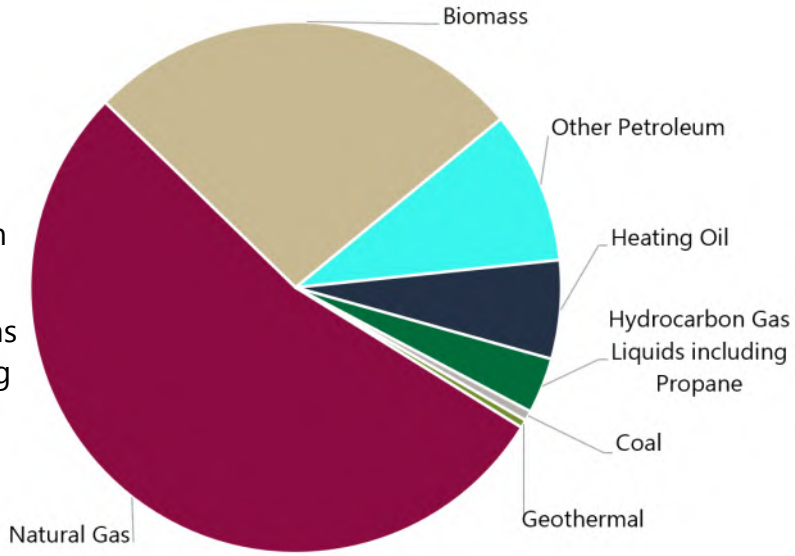
43.3%	Hydropower
24.8%	Coal
21.1%	Natural Gas
4.7%	Wind
3.8%	Nuclear
1.3%	Solar
0.5%	Biomass
0.1%	Geothermal
0.1%	Biogas



Direct Use Fuels

25.5%
of Oregon's 2018 energy consumption

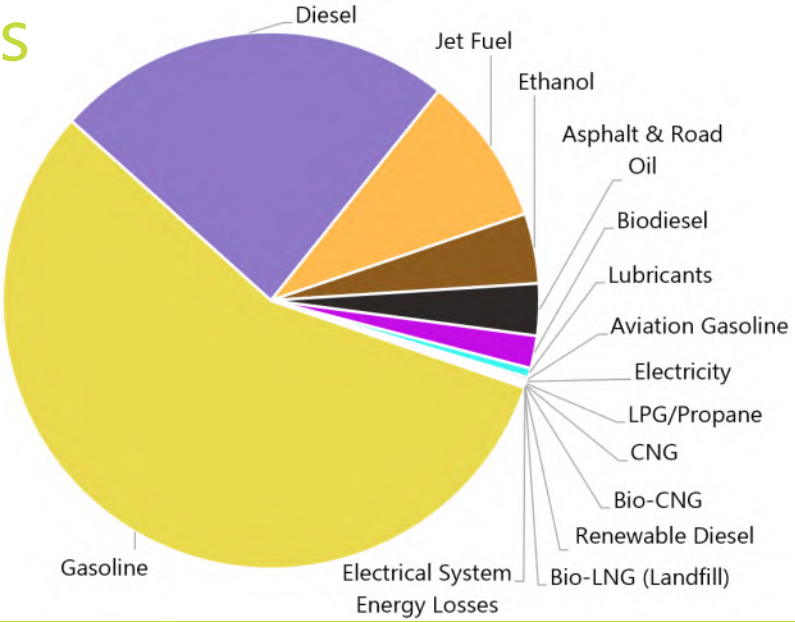
53.5%	Natural Gas
26.8%	Biomass
9.3%	Other Petroleum
6%	Heating Oil
3.4%	Hydrocarbon Gas Liquids Including Propane
0.6%	Coal
0.5%	Geothermal



Transportation Fuels

32.1%
of Oregon's 2018 energy consumption

56.4%	Gasoline
24.1%	Diesel
9.0%	Jet Fuel
4.2%	Ethanol
3.1%	Asphalt, Road Oil
2%	Biodiesel
0.6%	Lubricants
0.2%	Aviation Gas
0.1%	Electricity



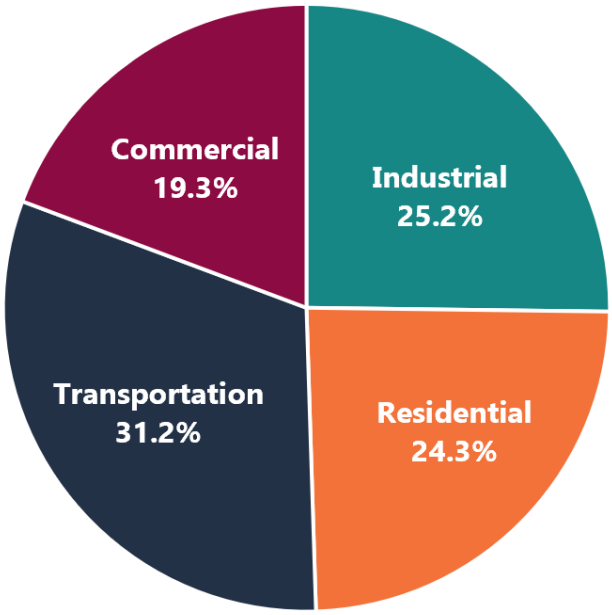
Note to readers: *Fuel percentages are rounded to the nearest tenth and not all are listed. .*

Energy Use in Oregon

Consumption by Sector

Energy consumption is also tracked by how it is used among four main end-use sectors: Residential, Commercial, Transportation, and Industrial.

In Oregon in 2018, those four sectors combined consumed 1,015 trillion Btu of energy, not including waste energy, as discussed early in Oregon's Energy Story.[1]



24.3%

of Oregon's 2018 energy consumption

Residential: this category includes single family, multi-family, and manufactured homes for Oregonians. Energy is used for lighting, to heat and cool living space, cooking, and appliances. Electricity is the most used energy resource in homes – with heat pumps, electric furnaces, and electric resistance heaters as examples of primary electric heat options.

19.3%

of Oregon's 2018 energy consumption

Commercial: this category includes businesses that provide goods and services, government and office buildings, grocery stores, and shopping malls. Energy is used to heat and cool spaces, power equipment, and illuminate facilities. It is Oregon's smallest energy-consuming sector, supported by the adoption of advanced energy codes, energy efficiency programs, and advancements in equipment and processes.

25.2%

of Oregon's 2018 energy consumption

Industrial: this category includes facilities used to produce, process, and manufacture products – including agriculture, fishing, forestry, manufacturing equipment, mining and energy production. Energy powers industrial equipment and machinery to manufacture products. This sector has seen contractions in aluminum, forestry, and manufacturing – with improvements in efficiency of industrial facilities and equipment.

31.2%

of Oregon's 2018 energy consumption

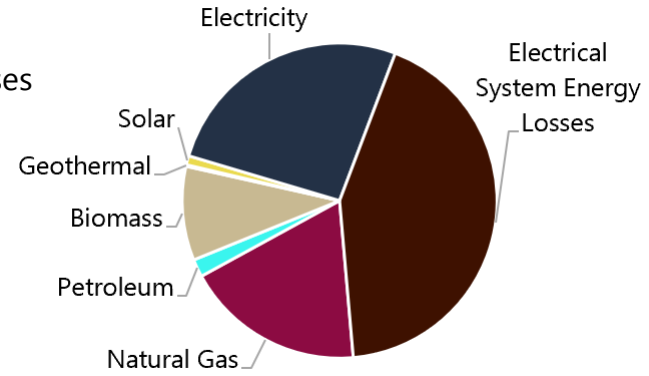
Transportation: Personal cars, fleets, shipments, airline travel, and more make up Oregon's transportation energy use. Petroleum is the most used resource and the largest contributor of greenhouse gas emissions in Oregon. Electric vehicle and alternative fuels like electricity and biofuels, zero-emission vehicle technology are now a growing part of this sector

Residential

24.3%

of Oregon's 2018 energy consumption

42.9%	Electrical System Losses
26.2%	Electricity
18.4%	Natural Gas
9.6%	Biomass
1.8%	Petroleum
0.9%	Solar
0.2%	Geothermal

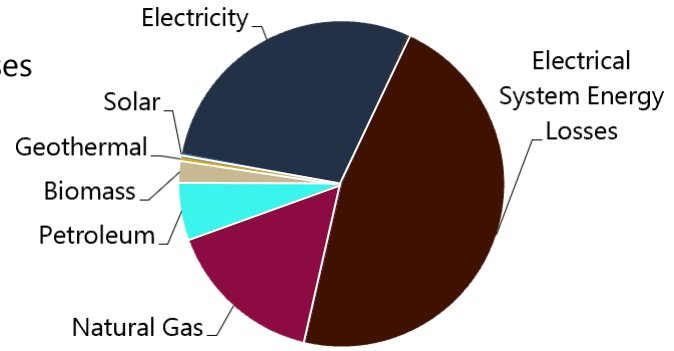


Commercial

19.3%

of Oregon's 2018 energy consumption

47.0%	Electrical System Losses
28.7%	Electricity
15.8%	Natural Gas
5.8%	Petroleum
2.0%	Biomass
0.4%	Geothermal
0.4%	Solar

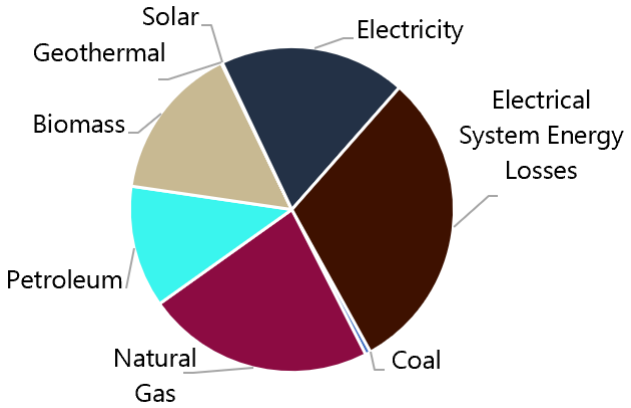


Industrial

25.2%

of Oregon's 2018 energy consumption

30.4%	Electrical System Losses
22.7%	Natural Gas
18.6%	Electricity
15.5%	Biomass
12.1%	Petroleum
0.6%	Coal
0.1%	Geothermal

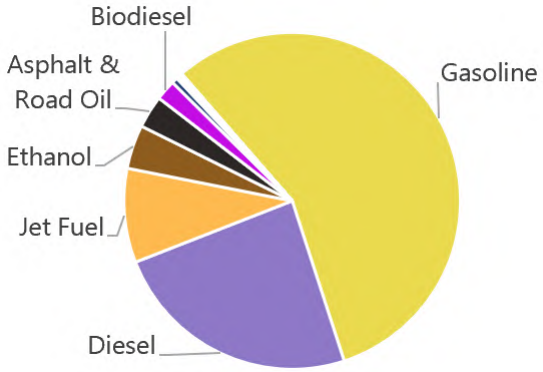


Transportation

31.2%

of Oregon's 2018 energy consumption

56.4%	Gasoline
24.1%	Diesel
9.0%	Jet Fuel
4.2%	Ethanol
3.1%	Asphalt, Road Oil
2.0%	Biodiesel



Note to readers: *Generation and transmission of electricity results in energy losses that are estimated and included in EIA consumption data. All percentages are rounded to the nearest tenth and not all are listed..*

Energy Use in Oregon

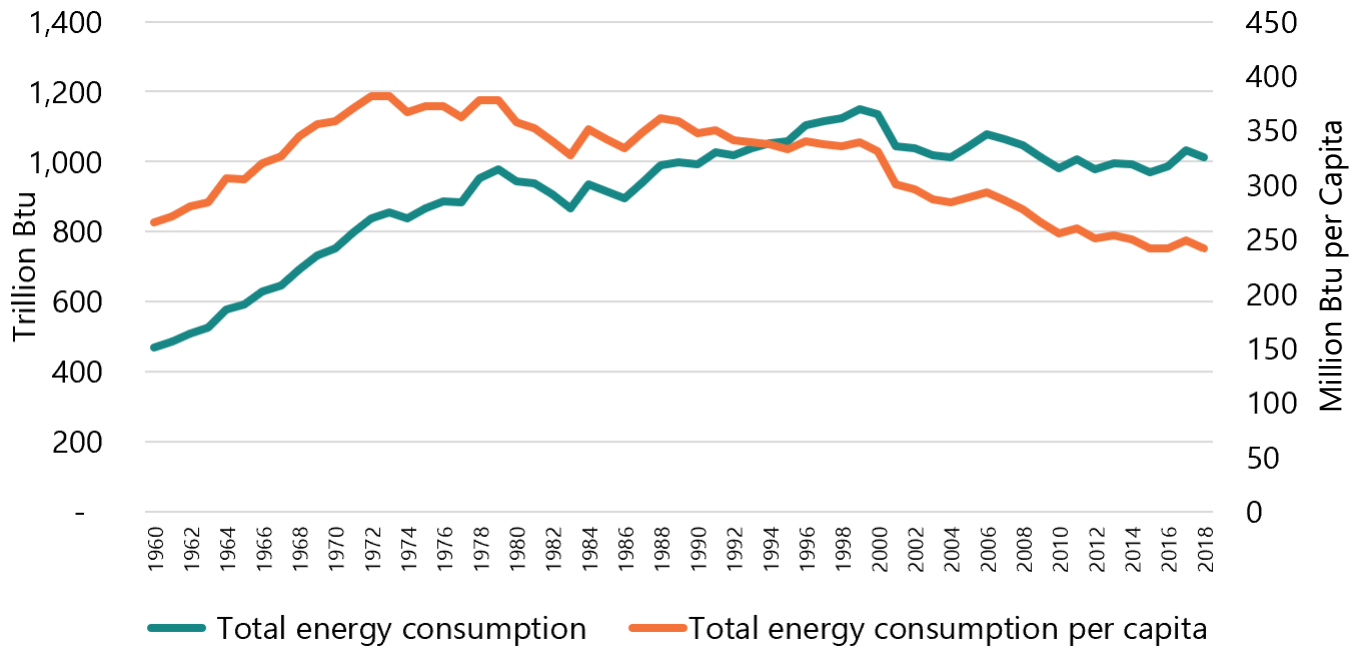
Oregon's Energy Consumption Over Time

13th

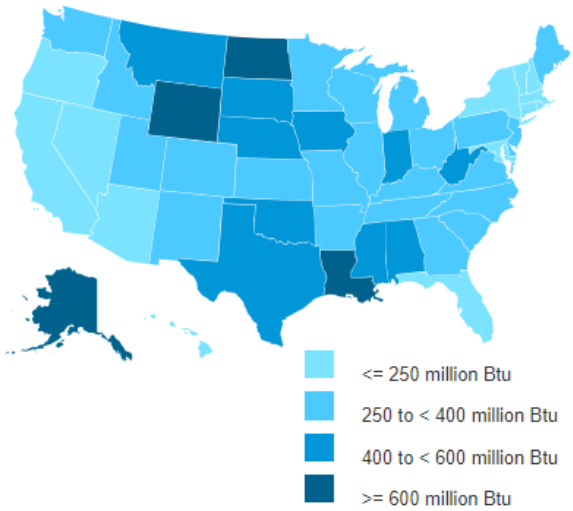
Oregon's rank for lowest per capita energy use in 2018 — the lowest in the Pacific Northwest.

Oregon saw an overall trend of increased energy use for almost four decades—an average of 3.6 percent growth per year from 1960 to 1999. During that time, we shifted from a reliance on fuel oil and wood to increased usage of natural gas and electricity in our homes and businesses. Oregon reached our highest consumption of energy in 1999. Since then, total energy use has been decreasing. The amount of energy we used in Oregon declined by 12.5 percent between 2000 and 2015. Energy consumption per capita does not directly correlate with overall energy use. In the last 20 years, Oregon has had steady population increase, during a period of slight decline in overall energy consumption. This translates to a steady decrease in energy consumption per capita.[2]

Oregon's Total Energy Consumption and Per Capita Energy Consumption Over Time



U.S. Per Capita Consumption



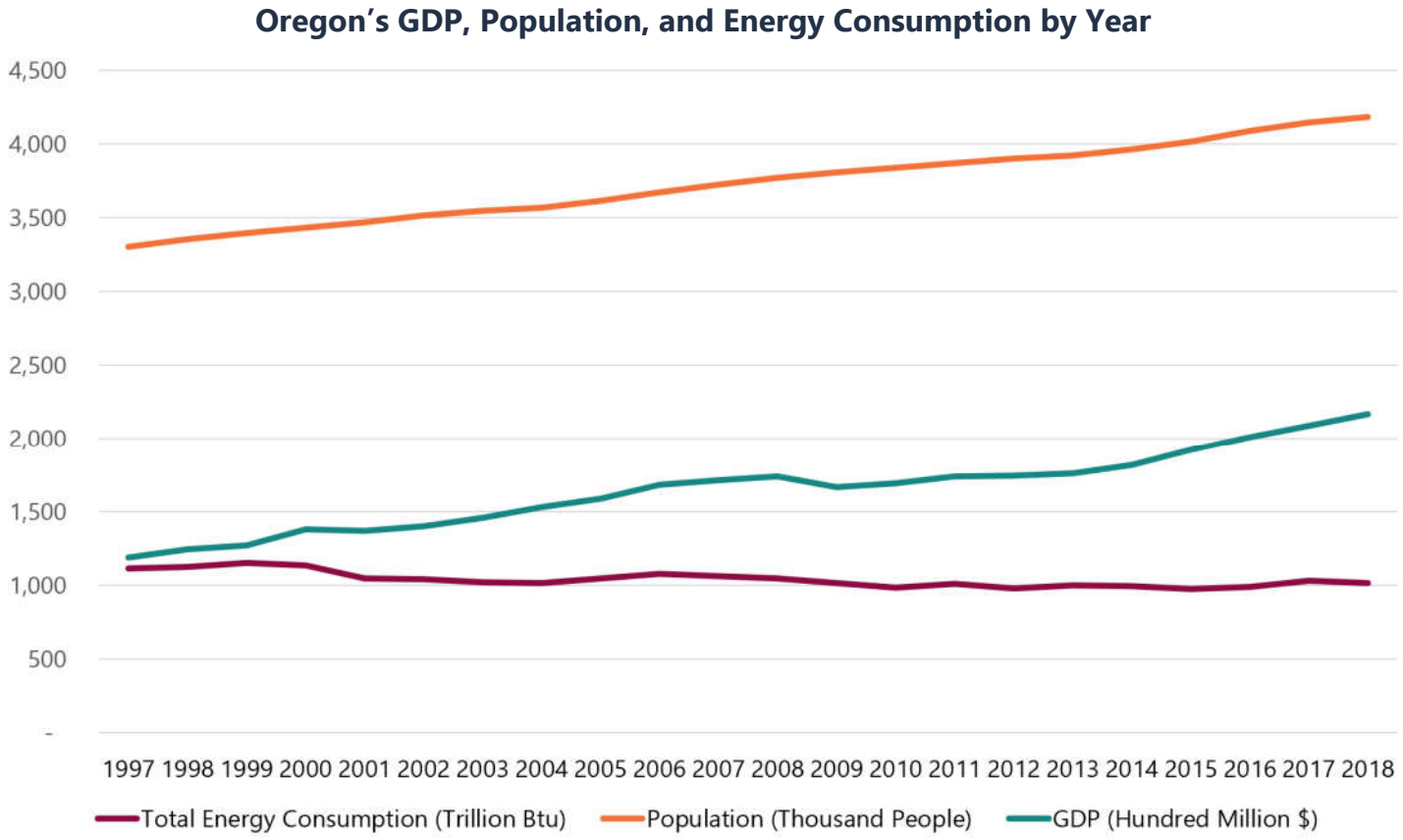
Energy Efficiency

While energy efficiency is not "consumed" like other resources, it is the second largest resource available in Oregon after hydropower. Efforts to increase energy efficiency effectively reduce overall energy consumption. Historically, Oregon has consistently met increased demand for electricity by implementing energy efficiency strategies. Learn more later in this report.

Energy Use in Oregon

Energy Consumption and Economic and Population Growth

Energy efficiency and changes in our economy have led to decreases in Oregon's total and per capita energy use over time. Oregon's emphasis on energy efficiency has helped reduce both total and per capita energy use despite an increasing population, thereby avoiding the need to build new electricity generation plants. The graph below shows that since about 2000, economic growth (measured by gross domestic product or GDP) does not correlate with increases in energy consumption. In fact, as the economy and our population have grown, our energy consumption has stayed relatively flat with a slight decline.[2]



This displays all three data sets on the same axis; refer to the legend to find the units for each. This chart allows us to review the overall trends of population, energy consumption, and GDP in comparison to each other. The chart is not adjusted for inflation.

Consumption & Use

In the energy sector, *consumption* typically describes the amount of energy used. *Use* sometimes has the same meaning, but is often specifically applied when talking about the purpose of energy. For example, a home's annual electricity *consumption* goes toward a variety of *uses* like lighting, heating, and appliances. Or a furnace is *used* for heating but *consumes* electricity and natural gas. For this report, consumption and use are included in a wide variety of ways and sometimes interchangeably.

Electricity Use

Resources Used for Oregon's Electricity Mix

In 2018, Oregon used 51.1 million megawatt hours (MWh) of electricity from both in-state and out-of-state sources. Hydropower, coal, and natural gas make up the bulk of Oregon's electricity resources, commonly called resource mix, although the share of each resource is constantly changing and evolving.

Oregon's only coal plant, Boardman, ceased operations in October 2020, and renewable energy makes up an increasingly larger share of the mix each year. The five largest sources of electricity are labeled; the other resources are each under 2 percent.[1]

25%

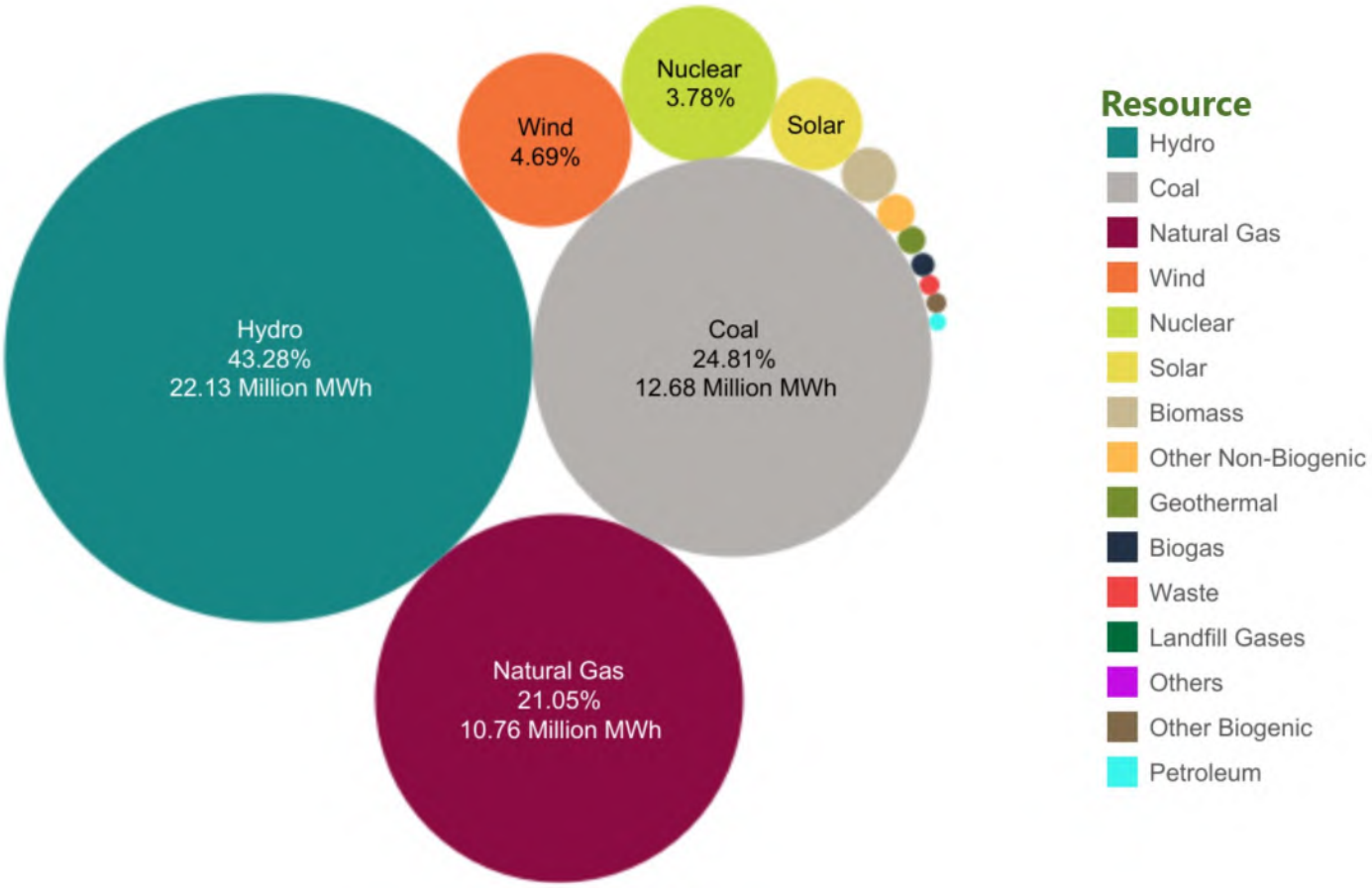
Percentage of Oregon's 2018 electricity mix that came from coal.

2030

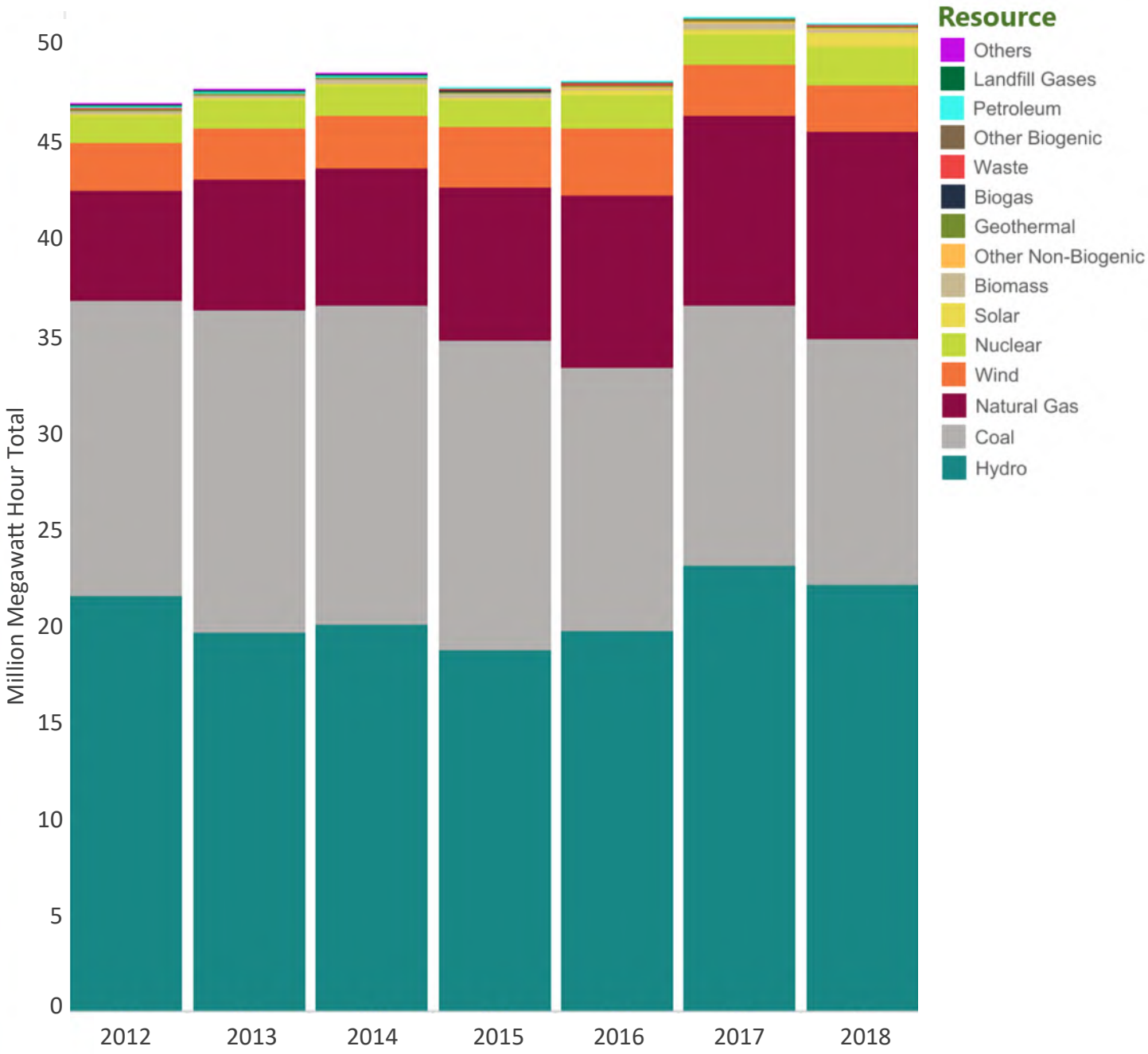
Year by which Oregon's two largest utilities will no longer be able to generate or contract for electricity from coal for use by Oregon consumers.

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



Learn more about Oregon's Electricity Resource Mix

The Oregon Department of Energy updates the state's electricity resource mix each year. On the agency's website, find the state's overall mix, a map of generation facilities, electricity mixes by utility, greenhouse gas emissions, and more.

www.tinyurl.com/OregonERM

Electricity Imports and Exports

Oregon is blessed with an abundance of renewable energy resources and is one of the leading producers of renewable energy in the country. In part because of this, and in part due to electricity markets, we end up exporting significant amounts of the renewable electricity generated in state.

Oregon imports all the petroleum, coal, and almost all of the natural gas fuels used to generate electricity at in-state facilities. Oregon does not have any coal mines and only extracts natural gas at one facility in Oregon.

Oregon also imports electricity from all over the western U.S.; this imported electricity comes from various resources.[2]

Oregon Exports

68% of wind generation

66% of geothermal generation

38% of hydroelectric generation

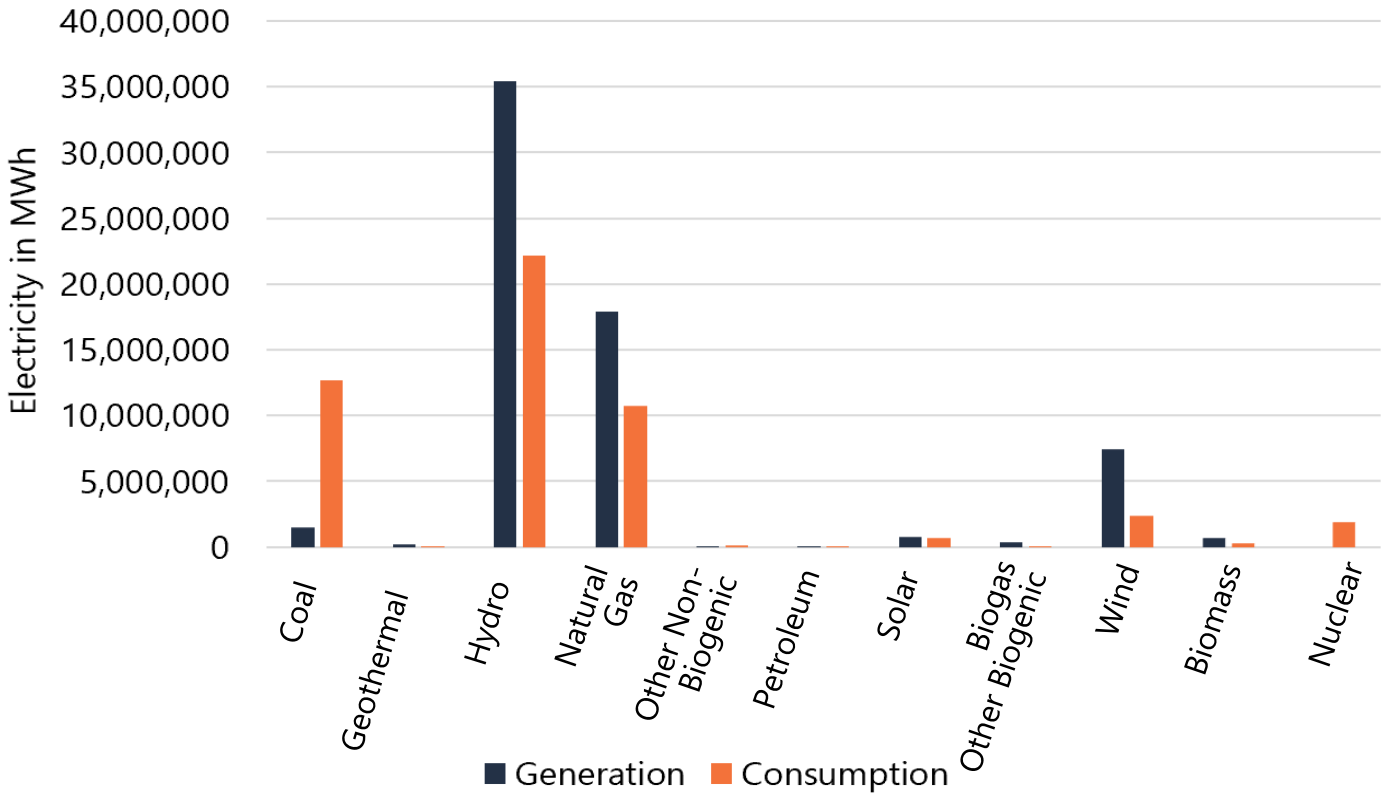
12% of solar generation

Oregon Imports

88% of coal based electricity

100% of nuclear electricity

Oregon's Electricity Generation and Consumption (2018)

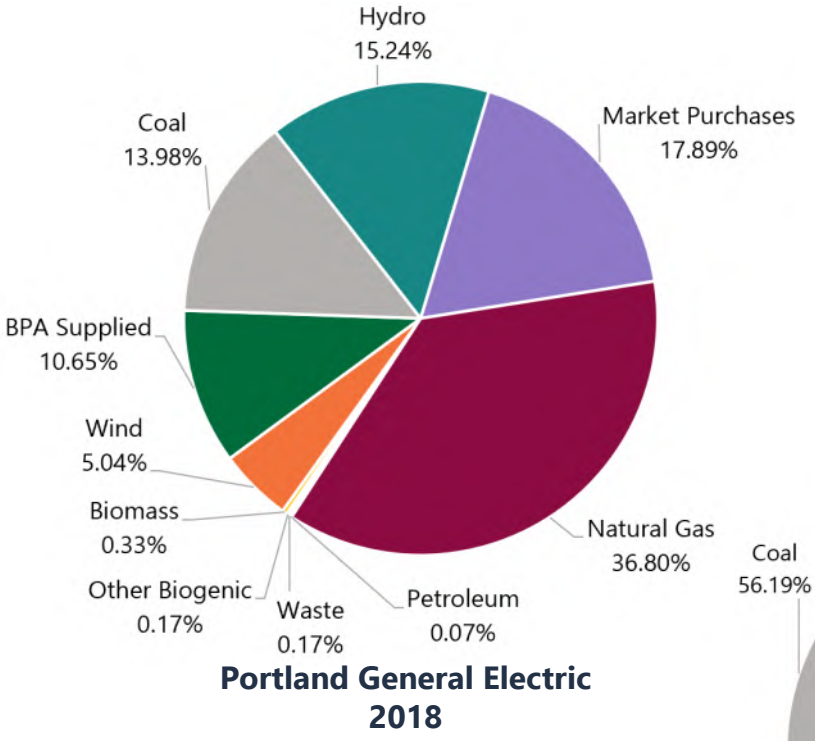


Megawatt (MW): One million watts of electricity capacity—the equivalent of 1,340 horsepower, or enough power to simultaneously illuminate 25,000 standard 40 Watt lightbulbs. **Megawatt Hour (MWh):** A unit of measurement for energy output that represents the amount of energy supplied continuously by 1 MW of capacity for one hour. **Average Megawatt (aMW):** Represents 1 MW of energy delivered continuously 24 hours/day for one year, or 8,760 MWh.

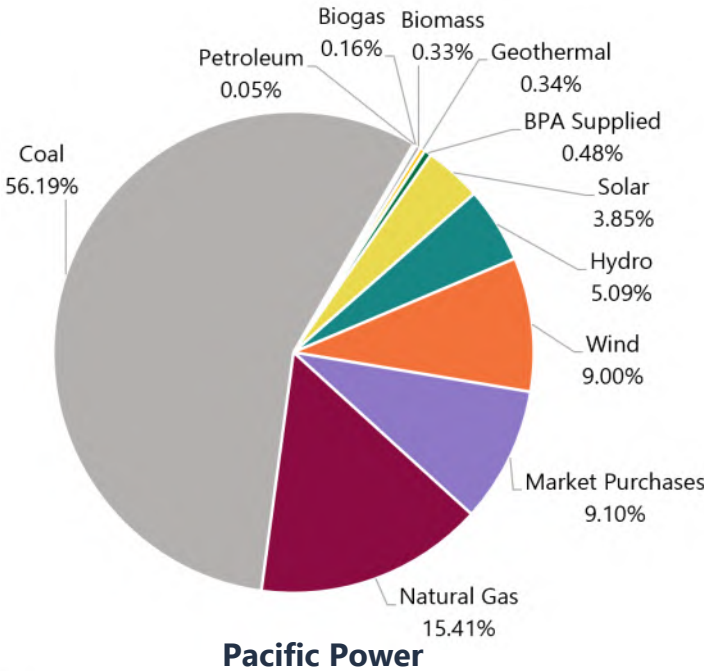
Electricity Use

Investor-Owned Utility Resource Mix

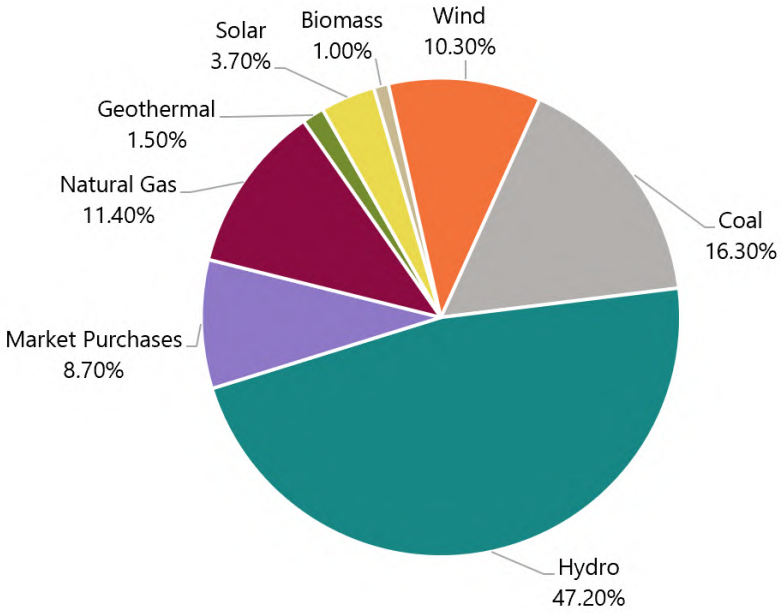
The resources utilities use to generate electricity consumed in Oregon vary depending on the utility provider. The electricity resource mixes for Oregon's three investor-owned utilities are shown below. Only 2018 data is shown for each utility; mixes will fluctuate year to year depending on the availability of certain resources like hydro. The information below includes real-time supplemental market purchases of electricity that utilities make to meet demand.[1]



Portland General Electric
2018



Pacific Power
2018

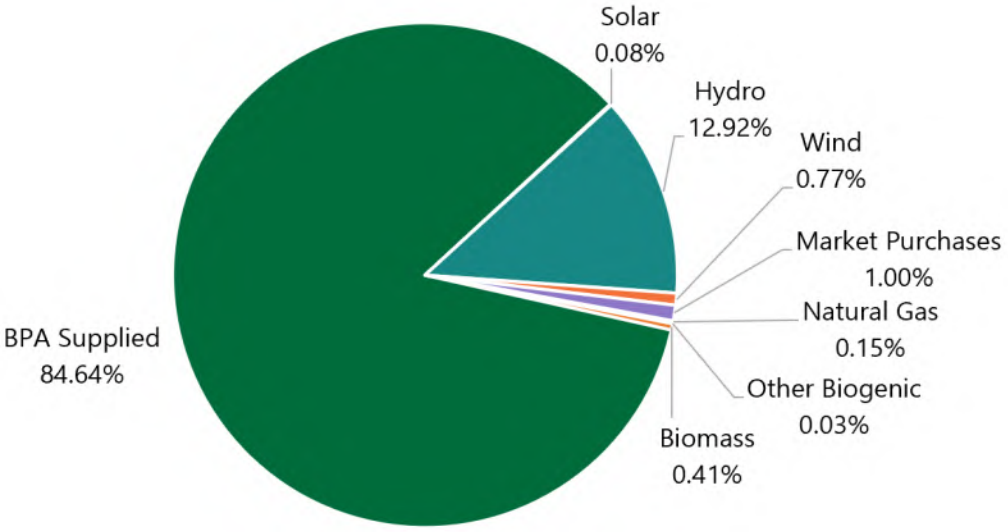


Idaho Power
2018

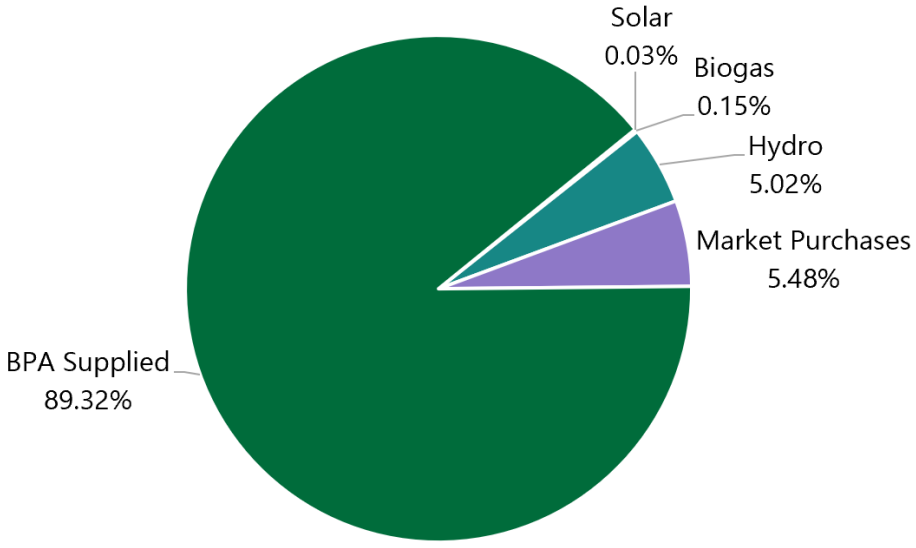
Electricity Use

Consumer-Owned Utility Resource Mix

The electricity resource mixes for the Eugene Water & Electric Board (the largest consumer-owned utility) and a composite of other COUs operating in Oregon are below. Only 2018 data is shown for the utilities; mixes will fluctuate year to year depending on the availability of certain resources like hydro. The information below includes real-time supplemental market purchases of electricity that utilities make to meet demand; these purchases are called "unspecified" because the exact mix delivered to COUs is not part of the purchase agreement and is therefore uncertain.[1]



Eugene Water & Electric Board
2018



Composite of Consumer-Owned Utilities
(not including EWEB)
2018

Did You Know?

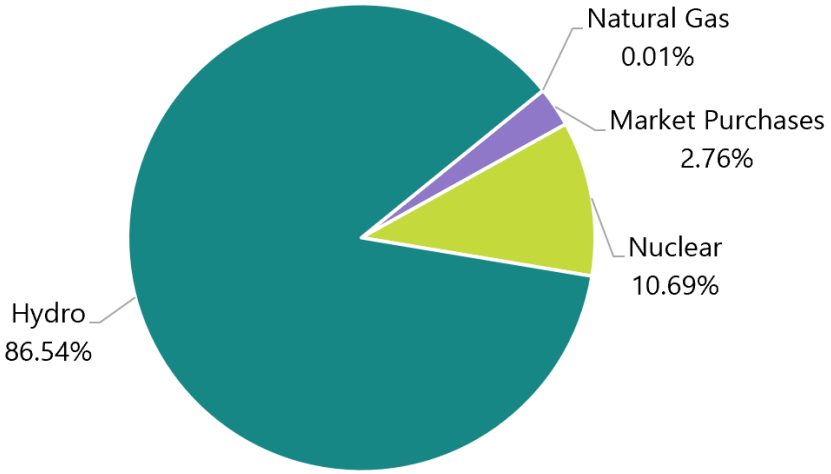
While the majority of power supplied by Oregon's consumer-owned utilities comes from the Bonneville Power Administration, COUs have also invested in their own energy-generation sources. For example, Central Lincoln People's Utility District on the central Oregon coast has community solar available, and the Eugene Water & Electric Board supplies some of its electricity from utility-operated dams.

Thanks to the BPA-supplied power and their own resources, COU electricity mixes have very low greenhouse gas emissions.

Electricity Use

Bonneville Power Administration and Market Purchases

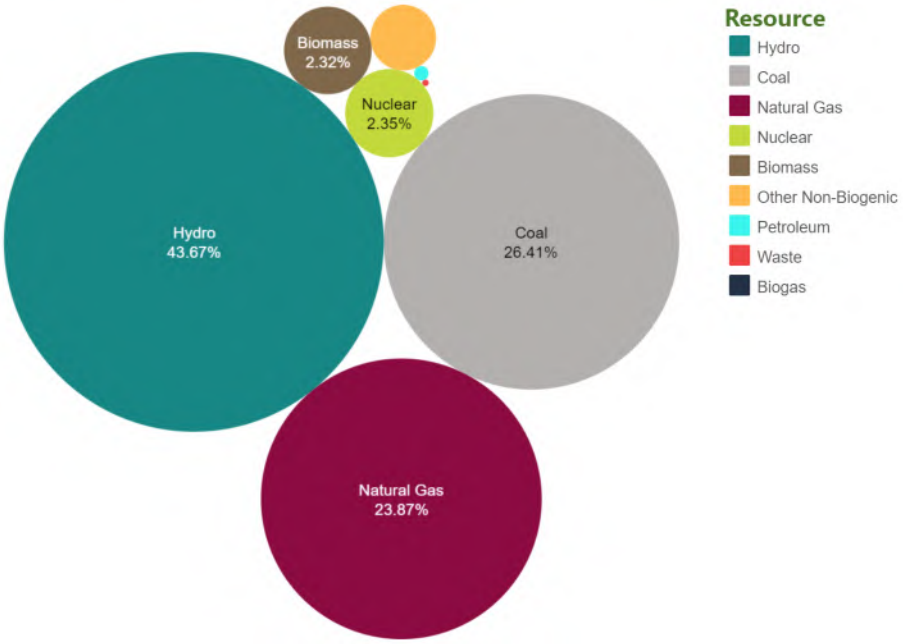
Consumer-owned utilities in Oregon purchase most of their electricity from the Bonneville Power Administration, a federal agency that markets wholesale electric power from 31 federal hydroelectric facilities in the Northwest, a non-federal nuclear power plant, and several other small non-federal power plants. The dams generating the hydroelectric power are operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation. BPA provides about 28 percent of the electricity used in the Northwest.[1]



Bonneville Power Administration 2018

Oregon electricity generation facilities sell electricity to Oregon utilities and the regional power market. Oregon electric utilities own facilities that generate power, but they also purchase power from the regional market to meet customer demand with the lowest-cost resources available at any given time. The chart below illustrates the resources of 2018 market purchases.

Some utilities make "unspecified" market purchases to meet their demand. The utilities purchase the electricity on the power market and may not know the resource or facility that generated it. The mix shown here applies to all contracted unspecific market purchases in Oregon, totaling 8 million megawatt hours in 2018.[1]

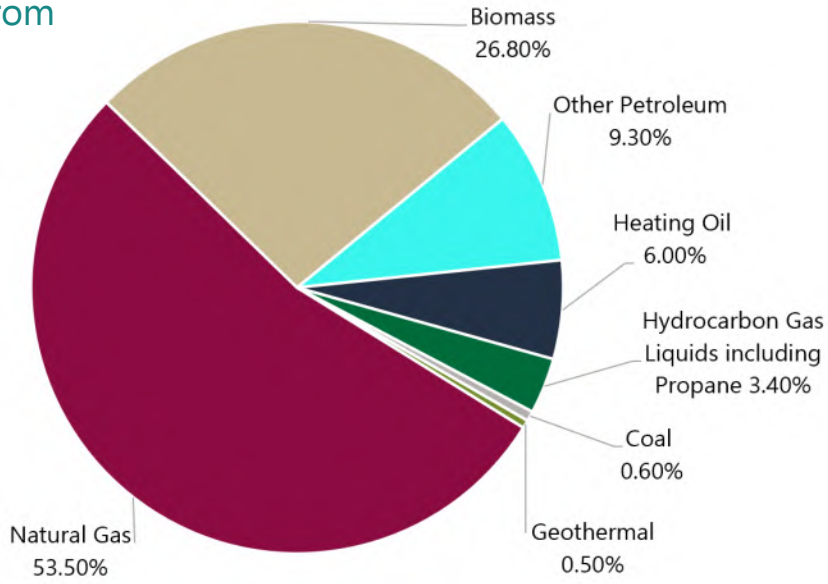


Electricity Market Purchases 2018

Direct Use Fuels

What We Use and Where it Comes From

In 2018, Oregon used 251.5 trillion Btu of direct use fuels to cook, heat buildings, and support commercial and industrial processes. Direct use fuels make up about 26 percent of the total energy consumption in Oregon. Direct use fuels include fuels that are used at the site in the residential, commercial, and industrial sectors. These do not include fuels used to generate electricity or support the transportation sector.[1] [2]



Natural Gas. A gaseous mixture of hydrocarbon compounds, primarily methane, natural gas is a fossil energy source from beneath the earth's surface that is produced abundantly in the United States. Natural gas is used directly for space and water heating, cooking, and many agricultural, commercial, and industrial processes. Renewable natural gas is made by capturing methane from food waste, agricultural manure, landfills and wastewater treatment plants. Natural Gas exploration, extraction, production, and transportation has an effect on the environment.

In 2018, Oregon used 134.5 trillion Btu of natural gas for direct uses — nearly all of it imported from Canada and the Rocky Mountain states. The Pacific Northwest's only natural gas extraction facility is located outside of the town of Mist, Oregon and is owned and operated by NW Natural, one of three investor-owned gas companies serving the state. The Mist field produced 0.53 trillion Btu of natural gas in 2018, which represents 0.2 percent of Oregon's use.[3] [4]

Natural Gas Consumption by Sector

Commercial Sector | 31 trillion Btu
Residential Sector | 46 trillion Btu
Industrial Sector | 58 trillion Btu[5] [6]

Biomass. Biomass in an organic material that comes from plants and animals that is burned to create energy. Biomass is considered a renewable source of energy, and comes from resources like wood, agricultural crops and waste, food or yard waste, and animal and human waste. The organic waste materials are collected and used to make energy that can be used on site or distributed to a utility instead of filling space in a landfill. While some biomass sources are the same as biogas, biomass also commonly refers to end-products such as wood chips, wood pellets, and charcoal that are used for thermal energy.

In 2018, Oregon consumed 67.5 trillion Btu of biomass as a direct use fuel.[7] Oregon has 15 wood and wood waste biomass-generating facilities. The biomass fuel contributions come primarily in the form of wood and wood waste, but there are also 25 agricultural waste, landfill gas, and wastewater biogas generating facilities.[8] Many industrial facilities in Oregon use woody biomass to generate electricity from products that would normally be wasted. Biomass is also used as a thermal energy source at commercial facilities, including schools and hospitals. About 7 percent of Oregon households heat their homes primarily with wood.[9]

Biomass Consumption by Sector

Commercial Sector | 4 trillion Btu
Residential Sector | 23.8 trillion Btu
Industrial Sector | 39.7 trillion Btu[10] [11]

Heating Oil. Heating oil is a petroleum distillate fuel that is used for primarily building space heating; some buildings also use it to heat water. Because space heating is the primary use for heating oil, demand is highly seasonal, and it is affected by the weather. Most Oregon heating oil use occurs during the heating season: October through March.

In 2018, Oregon used 15 trillion Btu of heating oil for direct uses, and almost 2 percent of Oregon homes use fuel oil for heating.[12] It is also used in commercial and industrial buildings. Oregon does not produce any heating oil in the state, so most of Oregon's petroleum supply comes from refineries in Washington.[13] Exploration, extraction, production, and transportation of oil has a significant effect on the environment. Oil leaks and spills at extraction sites, in transportation on ships and trains, and from oil tanks on Oregon properties can contaminate soil and groundwater.

Biodiesel heating oil is becoming more readily available in Oregon. Biodiesel heating oil is a renewable fuel made from vegetable oils, like soy and canola, that are grown domestically. Biofuels are mixed with regular heating oil at 5 to 20 percent to create a cleaner burning alternative fuel. The mixes can be used by typical oil furnaces in homes, but increasing the portion of vegetable oils in the blends does require adjustments to home oil furnaces.

Heating Oil Consumption by Sector

Commercial Sector | 3.01 trillion Btu
Residential Sector | 1.49 trillion Btu
Industrial Sector | 10.5 trillion Btu [14] [15]

Oregon History: Heating Oil Tanks

Oil was a popular fuel for heating pre-1960 residential and commercial properties. The Oregon Department of Environmental Quality estimates that a total of 200,000 underground heating oil tanks were installed in Oregon. Its use has declined dramatically and many underground tanks have been abandoned in place, often still containing oil. Underground tanks can leak and pollute groundwater, create harmful vapors, and ruin water wells or surface water. DEQ oversees the decommissioning and cleanup of underground heating oil tanks, which are usually found when homes are sold. More than 50,000 underground heating oil tanks have been reported to DEQ, including 1,707 in 2019.[22]

Learn more: www.oregon.gov/DEQ

Hydrocarbon Gas Liquids and Propane. HGLs are gases at atmospheric pressure and liquids under higher pressures, which can also be liquefied by cooling. Their versatility and high energy density in liquid form make them useful for many purposes, including as feedstock in petrochemical plants, as fuel for heating or cooking, and as transportation fuels, additives, or diluent. Propane is a hydrocarbon gas liquid that can also be used to power buses, locomotives, forklifts, taxis, farm tractors, backyard barbeques, and Zamboni machines at ice skating rinks. Propane remains a viable fuel over long periods of storage, making it a common backup fuel for essential facilities such as hospitals and a potential resource in emergency response to an event. Propane is a byproduct of natural gas production, and the environmental effects of its generation are similar to the challenges of natural gas mentioned above. As U.S. natural gas production has increased, the supply of propane has followed, making it an affordable and attractive option for many Oregonians.

Propane consumed in Oregon is imported. Based on the available data on propane production, imports, exports, and transportation, the Pacific Propane Gas Association estimates that more than 95 percent of the propane consumed in Oregon is sourced from natural gas processing plants in Alberta and British Columbia, Canada.[16]

Oregon consumed 8.5 trillion Btu of propane in 2018 as a direct use fuel. Consumption increased 5 percent between 2017 and 2018, and by 29 percent between 2008 to 2018.[17] Almost 2 percent of Oregon residents use to heat their homes, and even more use it for cooking.[18] While Propane use on-road as a transportation fuel is a small segment of the total fuel usage in Oregon, school districts have embraced propane as a fuel for bus fleets. There were an estimated 8,257 school buses in Oregon in 2019, and 1,159 — about 14 percent — were fueled by propane (the national average is 4 percent). Portland Public Schools has been using propane school buses for 30 years and is one of the largest school propane fleets in the country.[19]

Hydrocarbon Gas Liquids and Propane Consumption by Sector

Commercial Sector | 3.5 trillion Btu
Residential Sector | 2.9 trillion Btu
Industrial Sector | 2 trillion Btu [20] [21]

Geothermal. In 2018, Oregonians consumed 0.55 trillion Btu of geothermal energy to make electricity.[23] While geothermal is often used to generate electricity, it can also be used for thermal energy applications such as heating spaces and keeping bridges and sidewalks from icing over. The residential, commercial, and industrial sectors used 1.3 trillion Btu of geothermal energy to heat and cool spaces in Oregon.[24]

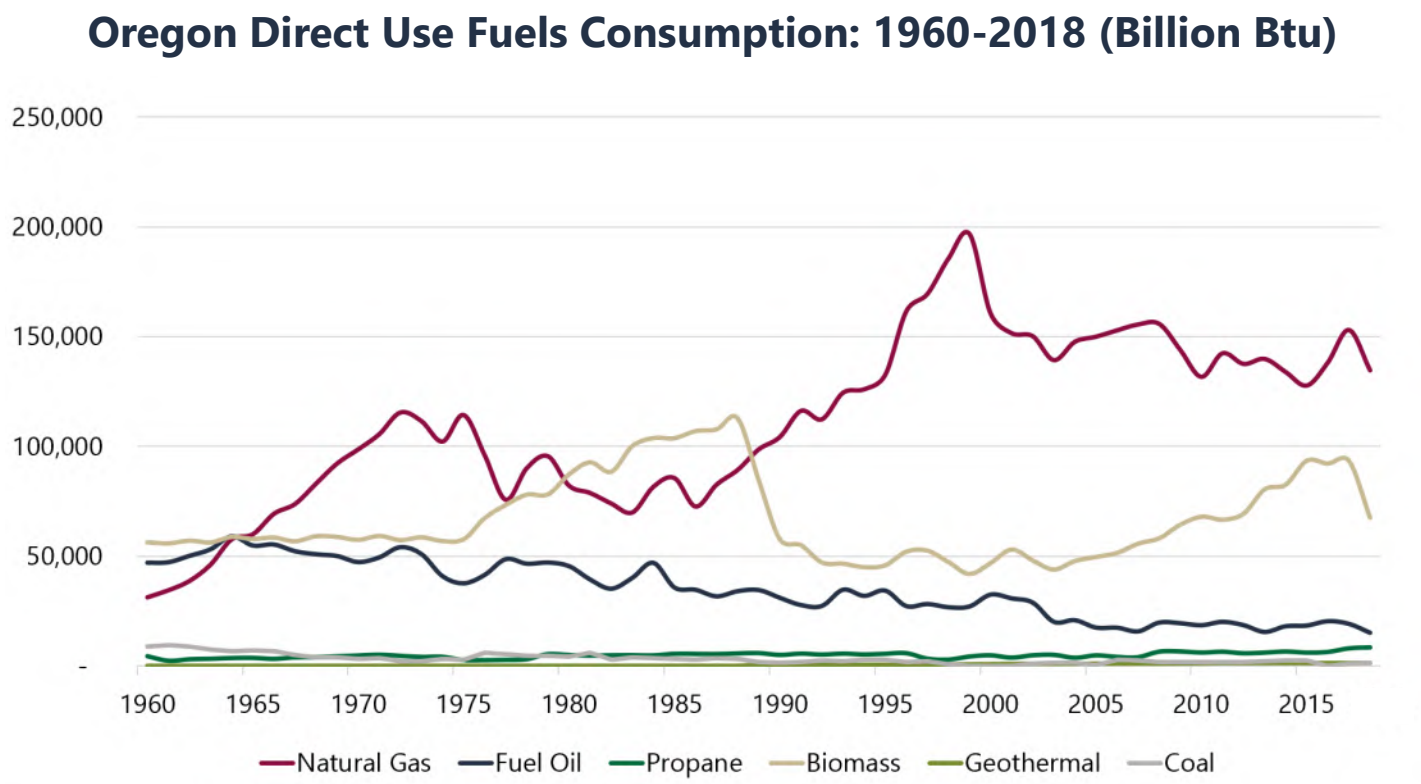
Coal. Coal is imported to Oregon to use as a direct fuel in the industrial sector. Oregon imported 1.4 trillion Btu of coal from neighboring states in 2018. Use of coal as a direct fuel in Oregon has declined by 84 percent since 1960.[25]

Geothermal and coal direct use fuels represent
just over 1 percent of Oregon's direct use fuels.[1]

Direct Use Fuels

Direct Use Fuels Over Time

Oregon's energy consumption has evolved over time. For direct use fuels in Oregon, that has meant decreasing wood and fuel oil use and an increased use of natural gas. The chart below uses data from the U.S Energy Information Administration to compare total consumption of direct use fuel types in Oregon's residential, commercial, and industrial sectors from 1960 to 2018. This chart does not include transportation fuels or fuels used to generate electricity used in the residential, commercial, and industrial sectors.[1]



Over time, as natural gas and electricity have replaced the use of coal and oil to heat homes and businesses in Oregon, coal and fuel oil have steadily declined as heating sources.

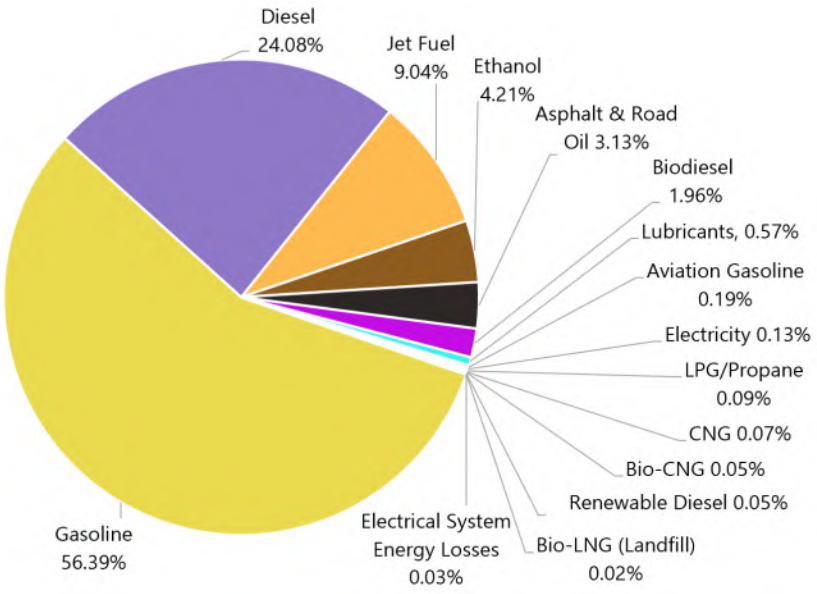
Geothermal consumption is one of the smallest of Oregon's direct use fuels in the chart. EIA began tracking geothermal consumption in 1989 with 0.38 trillion Btu. In 2018, Oregon consumed over 2.8 trillion Btu of energy from geothermal, an increase of 637% over that 30-year period.[2]

Biomass energy consumption in Oregon has increased steadily since 2002, due almost entirely to increased demand for biofuels. Biomass resources may be converted to biofuels such as ethanol, biodiesel, and other biomass-based diesel fuels. Oregon also consumes a significant amount of biomass energy from secondary waste products, like lumber mill residue, logging slash, and animal manure.

Transportation Fuels

What We Use

Oregon's transportation sector uses 31 percent — or 316 trillion Btu — of the energy consumed in Oregon. Transportation was the largest share of energy use among the sectors in 2018.[1] The transportation fuels consumed in Oregon are used in a variety of ways:



Gasoline. Petroleum product used by cars, motorcycles, light trucks, airplanes, and boats.

Diesel. Petroleum product used by trucks, buses, trains, boats, and ships.

Petroleum-based products make up 93 percent of Oregon's transportation fuel use.

Ethanol. Fuel produced from agricultural crops or wood that is blended with gasoline and used by cars and trucks.

Biodiesel. Fuel from organic oils and fats that can be blended with diesel fuel (up to 20 percent) and used by trucks, buses, trains, boats.

Electricity. Powers some public mass transit systems and electric vehicles.

Propane. Fuel from the natural gas and oil refinery process and used by cars, buses, and trucks.

Natural Gas. Compressed and liquefied natural gas used by cars, buses, trucks, and ships.

Renewable Natural Gas. Biogas from agricultural waste, wastewater, or garbage collected and refined to power natural gas cars and trucks.

Renewable Diesel. Fuel from organic oils and fats using a different production process than biodiesel to power diesel vehicles.[2] [3]

The U.S. Energy Information Administration tracks transportation sector consumption. The Oregon Department of Energy analyzes data from the Oregon Department of Transportation's fuel tax program and the Department of Environmental Quality's Clean Fuels Program to determine Oregon-specific transportation fuel sector and on-road transportation fuel consumption. In 2018, petroleum-based products accounted for 93 percent of fuel consumed in the transportation sector; biofuels like ethanol, biodiesel, and renewable diesel accounted for 6 percent; and electricity, and natural gas accounted for 0.3 percent of the fuels consumed.[4]

Learn more about where Oregon's transportation fuels come from in the Energy 101 section of this report.

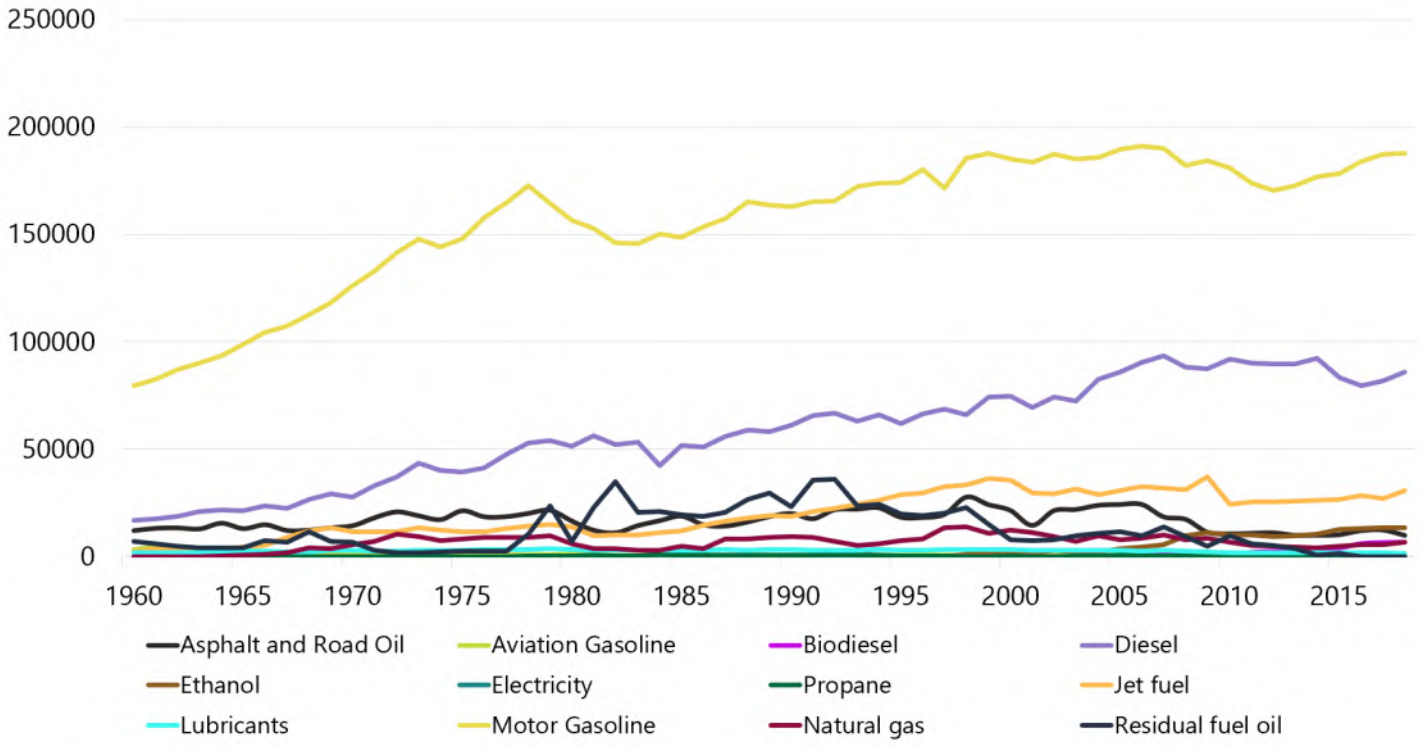
Transportation Fuels

Use Over Time

The U.S. Energy Information Administration has tracked national energy consumption and individual state consumption since 1960. In Oregon and nationally, overall transportation consumption increased between 1960 to 2018. In 1960, Oregon's transportation sector consumed 111 trillion Btu of energy compared to 316 trillion Btu in 2018 — a 185 percent increase in transportation energy consumption over that time.[5]

Petroleum product consumption has steadily increased over time and currently dominates the transportation fuel use in Oregon. Nearly all transportation fuels are imported into Oregon. In 2018, just 2 percent of transportation fuel used in Oregon was produced in the state, including 7.3 trillion Btu of biodiesel and fuel ethanol.[6] Oregon electric utilities provided 0.42 trillion Btu of electricity to fuel zero-emission vehicles in 2018, about 0.2 trillion Btu or 48 percent of which was produced from Oregon resources.[7] Oregon does not have crude oil reserves or refineries to process petroleum, so over 90 percent of the petroleum products delivered to and consumed in Oregon come from four refineries in Washington state. Crude oil used at Washington refineries comes from Alaska, western Canada, and North Dakota.

Oregon Transportation Sector Consumption: 1960-2018 (Billion Btu)



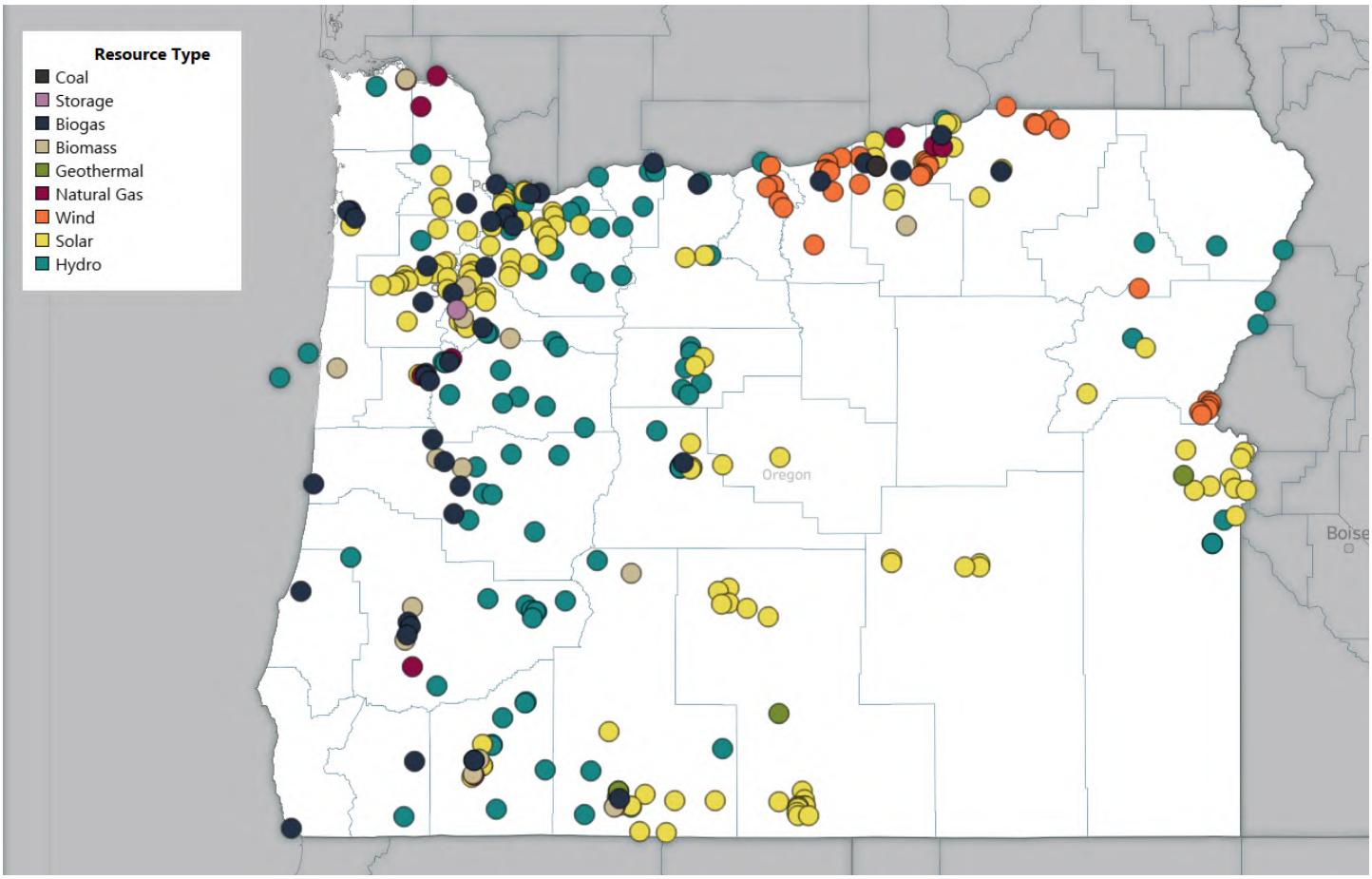
Oregon is exploring how to promote the use of more renewable natural gas, electricity, and biofuels in the transportation sector. Adoption of these Oregon-generated alternative transportation fuel options will allow Oregonians to consume less imported energy.

Learn more about alternative transportation fuel use in Oregon in the Policy Briefs section of this report.

Energy Production

Energy produced in Oregon comes from a variety of resources and facilities across the state. The Oregon Department of Energy is developing an Oregon Energy Dashboard, which will contain an inventory of facilities that produce energy in Oregon. ODOE expects the dashboard to be available in late 2020 on the agency's website, and will include standalone electric generation facilities supplying electricity to Oregon's grid, as well as primary energy production facilities that produce resources including natural gas, liquid biofuels, and biogas. The dashboard will show data on location, capacity, and annual production for these facilities in Oregon compiled from a variety of sources, including the U.S. Energy Information Administration and utility data. The dashboard will be complementary to ODOE's Oregon Solar Dashboard, which shows utility-scale solar facilities and behind-the-meter residential and commercial solar installations in Oregon. Data from the dashboard were used to inform analysis in multiple sections of the *Biennial Energy Report,* including developing summary statistics for each electricity generation resource and providing data for Policy Briefs.

The following map is derived from the dashboard and shows the locations of all 293 energy production facilities in Oregon, including two wave test centers off the Oregon coast. The online version of the dashboard will allow users to select resource types or individual facilities to see statistics including generation capacity and average annual production.

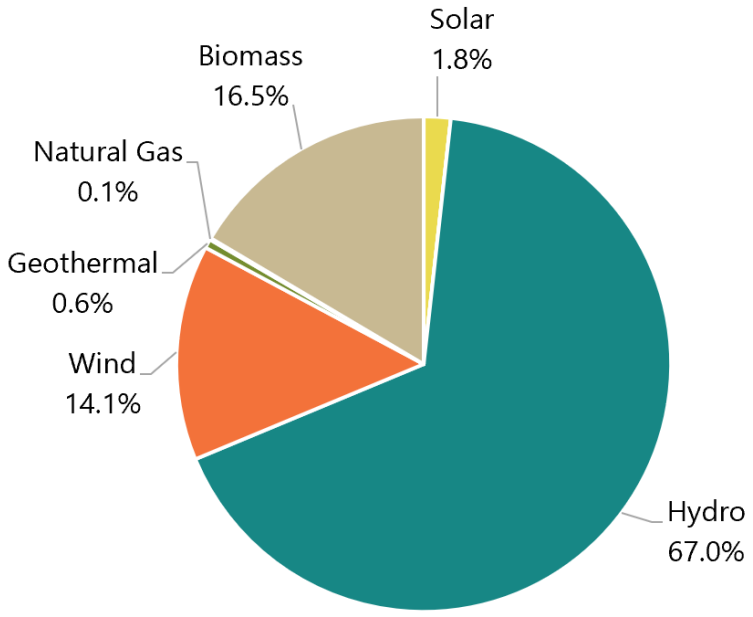


Energy Production

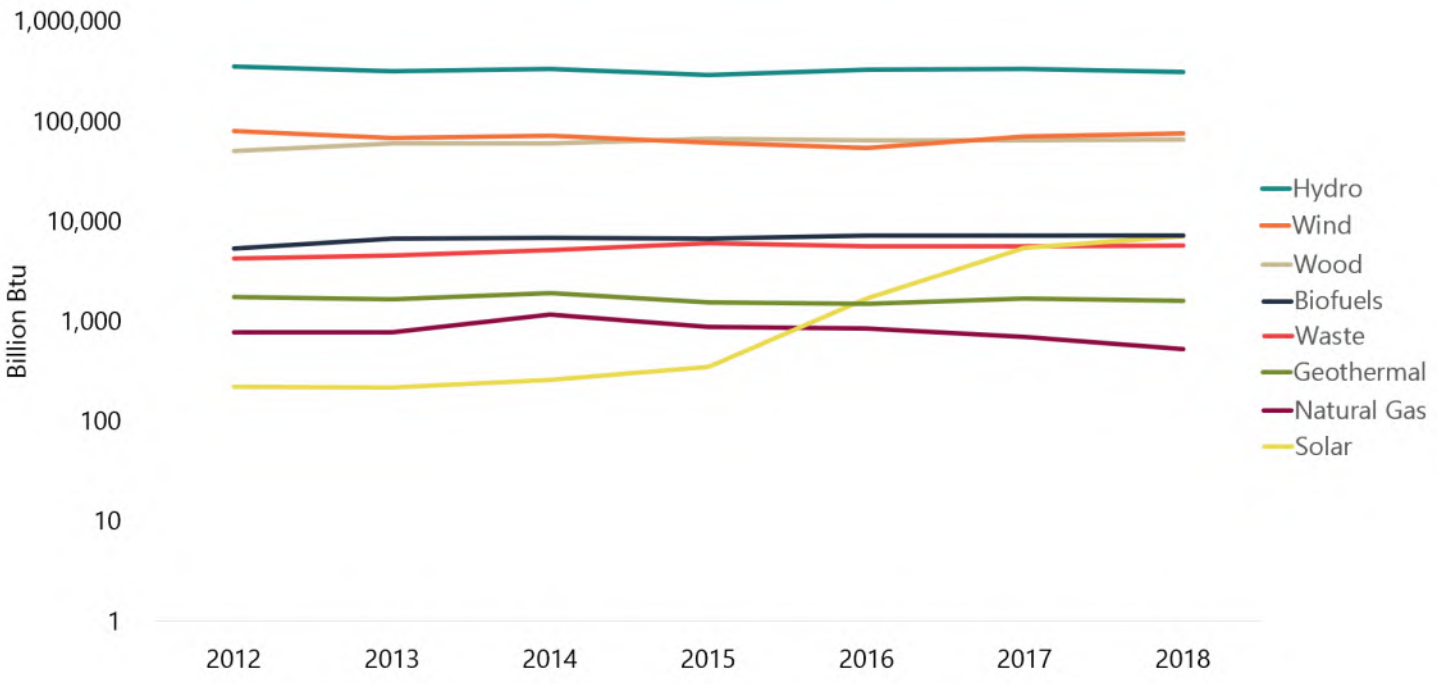
Overview

Primary energy production represents energy that is collected from Oregon's natural resources — it does not include energy that is imported for consumption or electricity generation in Oregon.

The chart at right shows primary energy production in Oregon in 2018. Almost all the solar, wind, geothermal, and hydro primary energy is converted to *secondary* energy as electricity. Some of the biomass is used to make a variety of renewable fuels and some is combusted to produce heat and electricity.[1] [3]



Oregon Primary Energy Production Over Time

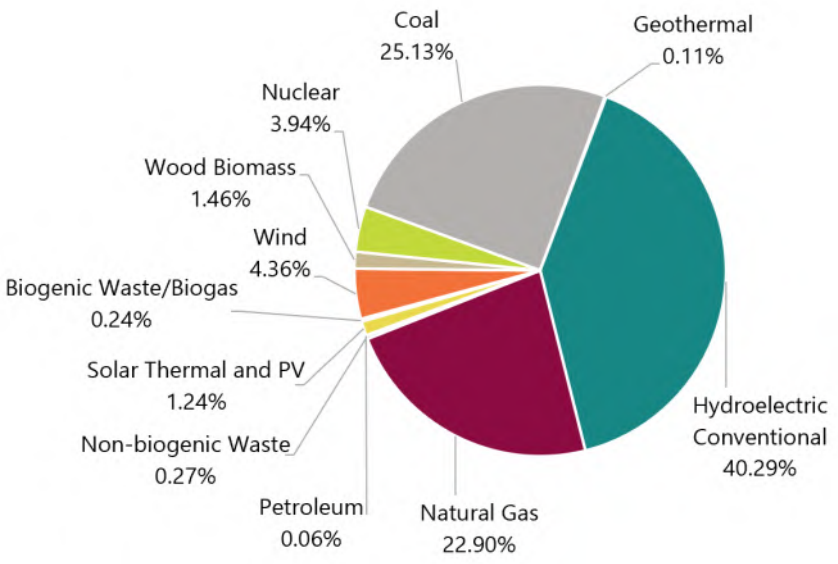


The chart above uses a logarithmic scale to more clearly compare energy production in the last six years. In a normal scale, the smaller contributors would lack detail and the annual variation in the larger contributors, such as hydro, would be more apparent Solar power has been steadily increasing since 2012 with accelerated increases starting in 2015. Since 2014, natural gas production has slowly been declining.[2]

Energy Production

Electricity

Oregon generates electricity from a variety of resources — hydropower, natural gas, and wind are the largest. In 2018, over 40 percent of Oregon's electricity generation came from hydroelectric facilities.[1] Oregon has 94 hydro facilities, including 12 large facilities with a production capacity of 100 megawatts or more.[2] Oregon is the second largest producer of hydroelectric power in the U.S. after Washington.[3]

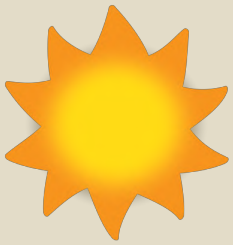


Electricity not consumed in Oregon is exported to neighboring states. Oregon's abundance of renewable electricity can be used in Oregon or sold the energy market to utilities in other states.

Resources like hydropower, wind and solar vary in their production based on the time of day and season. Many Oregon utilities also use resources like natural gas and coal to generate electricity in Oregon or they purchase electricity from neighboring states as needed to meet customer demand. Electricity from natural gas and coal can be purchased at attractive rates that to help utilities deliver electricity cost effectively and serve varying loads.

Oregon energy generation facilities import fuels like coal and natural gas from out of state. Oregon has a single site in Mist that produces natural gas, but is used primarily for natural gas storage. Oregon has no coal or petroleum resource extraction facilities

Utility-Scale Solar in Oregon



In February 2018, Oregon's Energy Facility Siting Council approved its first EFSC-jurisdictional solar energy facility. When built, the Boardman Solar Energy Facility will have a peak generating capacity of 75 megawatts.

In April 2020 EFSC approved a second solar facility, the 303-megawatt Bakeoven Solar Project, and as of October 2020 is reviewing five additional facilities (plus two facilities that include wind and solar).

64.3 Million

Megawatt hours of electricity generated in Oregon in 2018.[4]

51.1 Million

Megawatt hours of electricity consumed in Oregon in 2018.[4]

70%

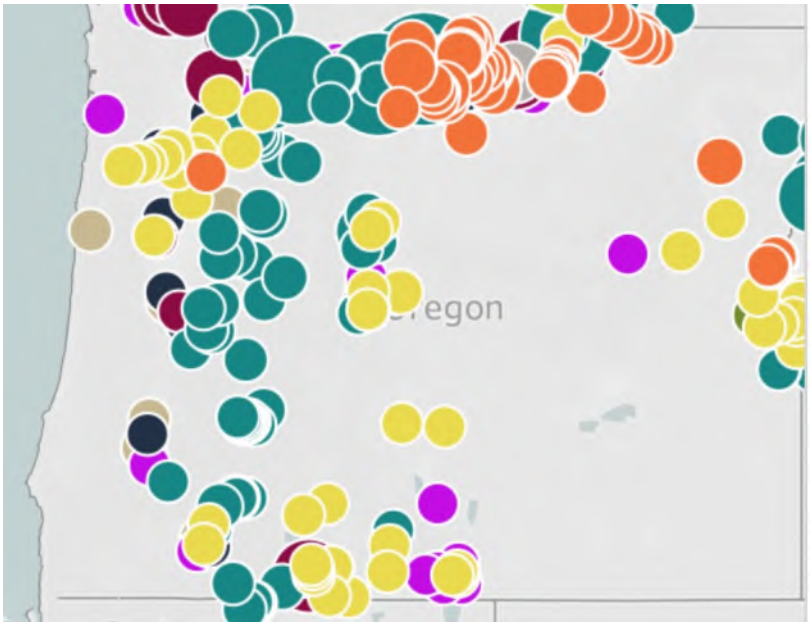
Percentage of Oregon's electricity generation that comes from renewable resources.[5]

79%

Percentage of Oregon's electricity generation that is used in-state.[6]

Energy Production

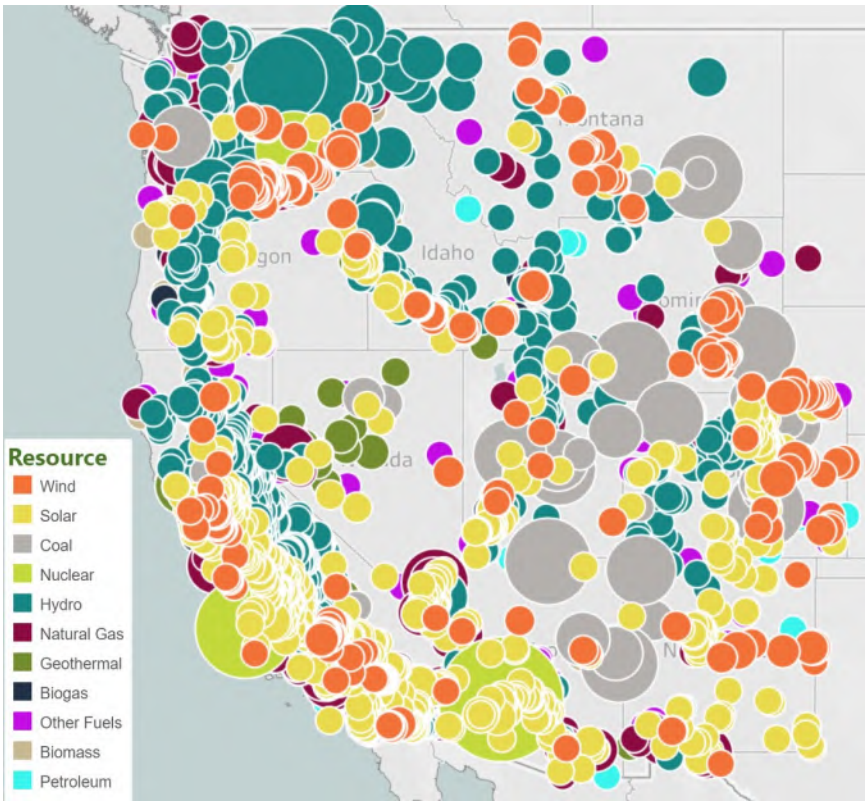
Electric Facilities



The map of Oregon at right shows where electricity generation sites are in the state. Facilities owned by Oregon utilities are included, as are third-party owned facilities, which can contract with utilities to provide power to Oregon consumers or sell their electricity on the open energy market. Note that the color of the circles corresponds to the resource used to generate electricity (see below), and the size of the circle is in relation to generation capacity of that facility.

Electricity used by Oregonians can come from facilities across the western United States. We rely on hydroelectric power produced on the Columbia River, access nuclear power from the Columbia Generating Station in Washington and wind turbines on the Columbia River Plateau, and use electricity generated at coal-powered facilities located in several western states.[7]

The map below shows the various electricity generation sources in the Western Electricity Coordinating Council. The WECC is a nonprofit organization that focuses on systemwide electricity reliability and security across a geographic region known as the Western Interconnection. This diverse region includes Oregon and most of the intermountain west and parts of Canada.[8]



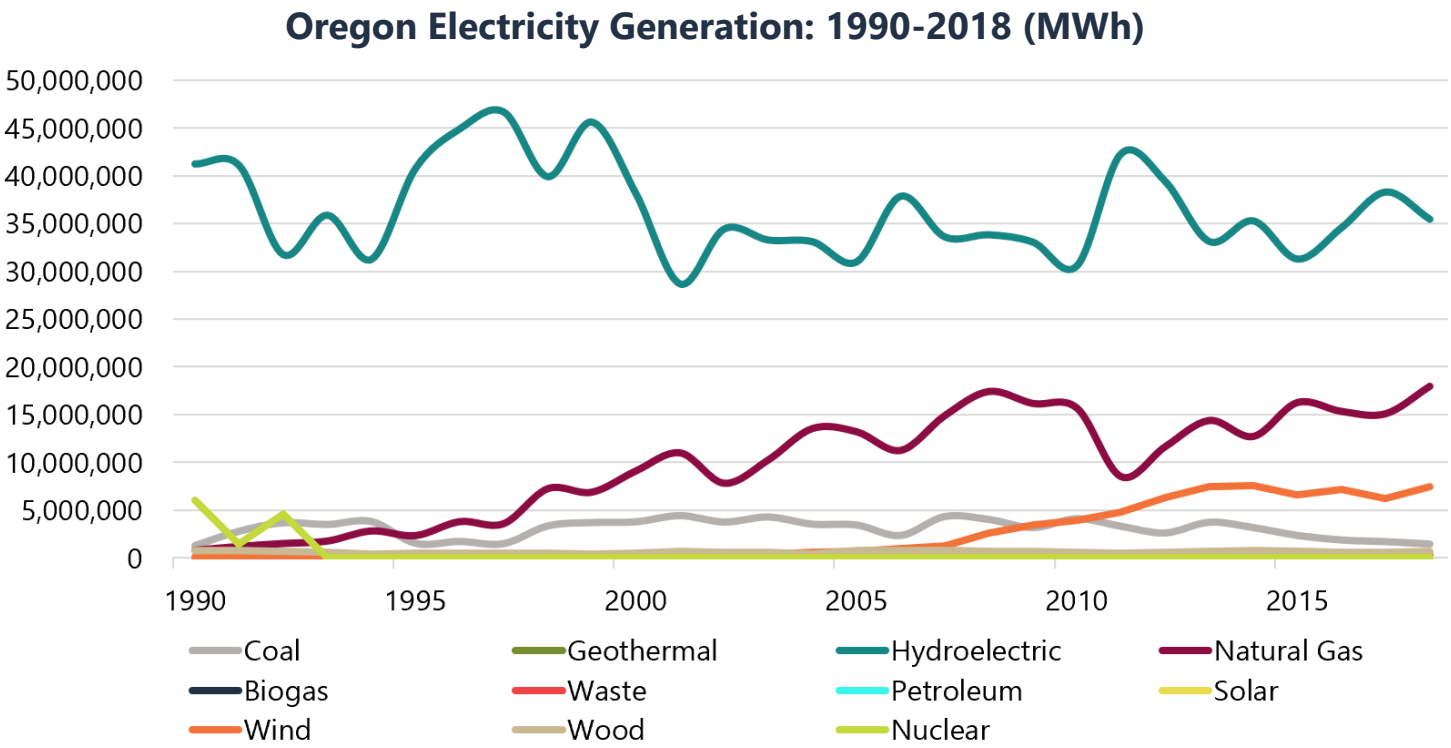
The map uses data from the U.S. Energy Information Administration and includes facilities with a nameplate capacity of 1 megawatt or greater.[9] Not all resources or facilities shown on the map contribute to Oregon's overall fuel mix, but many are available when Oregon utilities purchase electricity on the open market.

In the same way, electricity generated in Oregon may be sold through the energy market to support electricity needs in other states.

Energy Production

Electricity Over Time

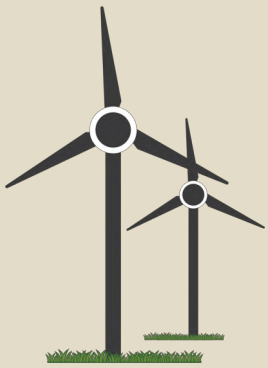
Oregon's electricity generation has changed over the years. Hydropower, which is Oregon's largest electricity resource, varies year-over-year as the amount of electricity produced depends upon water flow, volume, and pressure. Oregon hydropower reached a generation high in 1997 of 46.7 million MWh. Wind and natural gas have both seen a gradual increase in generation over time. As of 2018, natural gas is the second largest share of Oregon's energy production, at 17.9 million MWh. Coal generation has been steadily declining since 2010. Solar has increased each year since 2011, and is expected to continue to grow following increased investment by utilities.[10]



Wind Power in Oregon

Oregon's first approved state-jurisdictional wind facility was the Stateline Wind Project in Umatilla County. Stateline was approved in 2001, and continues to operate nearly 20 years later.

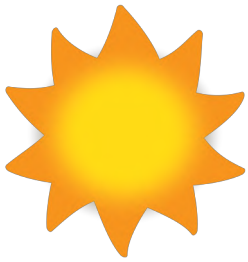
In May 2019, the Energy Facility Siting Council approved an amendment for the facility's Site Certificate to allow the wind facility to "re-power." Re-powering a wind facility can mean replacing existing wind turbine blades and nacelles (the part that hold the mechanical components). This allows turbines to continue generating electricity more efficiently, often with lower required wind speeds.



Energy Production

Renewable Electricity

Renewable electricity in Oregon has grown due to customer demand, dramatic decreases in costs, and policies like Oregon's Renewable Portfolio Standard and the City of Portland's goal of net-zero carbon emissions by 2050.



2012 Generation	2015 Generation	2018 Generation
6,400 MWh	24,200 MWh	571,700 MWh

12% of Oregon's solar generation was exported in 2018.[1]

Solar is Oregon's fastest growing electricity resource.[2]

2012 Generation	2015 Generation	2018 Generation
6.3 Million MWh	6.6 Million MWh	7.4 Million MWh

68% of Oregon's wind generation was exported in 2018.[1]

Oregon has 12 state-jurisdiction wind facilities approved, operating, or under review, plus 2 wind and solar facilities.[2]

2012 Generation	2015 Generation	2018 Generation
39.4 Million MWh	31.2 Million MWh	35.4 Million MWh

38% of Oregon's hydropower generation was exported in 2018.[1]

In some Oregon utility territories, hydropower provides over 90% of consumers' electricity.[2]

Energy Production

Direct Use Fuels

Direct use fuels are fuels used at the customer site, rather than in the generation of electricity, in the residential, commercial and industrial sectors. Direct use fuels include fuel oil and natural gas used to heat homes and commercial spaces, fuel for gas stoves, solar thermal heating, and fuels used directly in industrial processes.

Oregon currently produces small amounts of direct use fuels; most fuels consumed are imported into the state. In 2018, Oregon used 251 trillion Btu of direct use fuels or about 26 percent of the total energy consumed in Oregon.[3] The majority of Oregon's energy production comes from energy sources like hydropower, wind and solar, but Oregon does have direct use fuel sources. Biomass is the most-produced direct use fuel in Oregon. The production numbers below demonstrate fuels Oregon consumes directly (all fuels produced to create electricity have been removed). For example, in 2018 Oregon produced 2.25 trillion Btu of geothermal energy, but in the chart we are only showing the 1.3 trillion Btu that was used as a direct fuel:[1,2]

100%

Percentage of Oregon geothermal energy consumption that is produced in-state.

15

Number of woody biomass energy facilities in Oregon in 2018.

27%

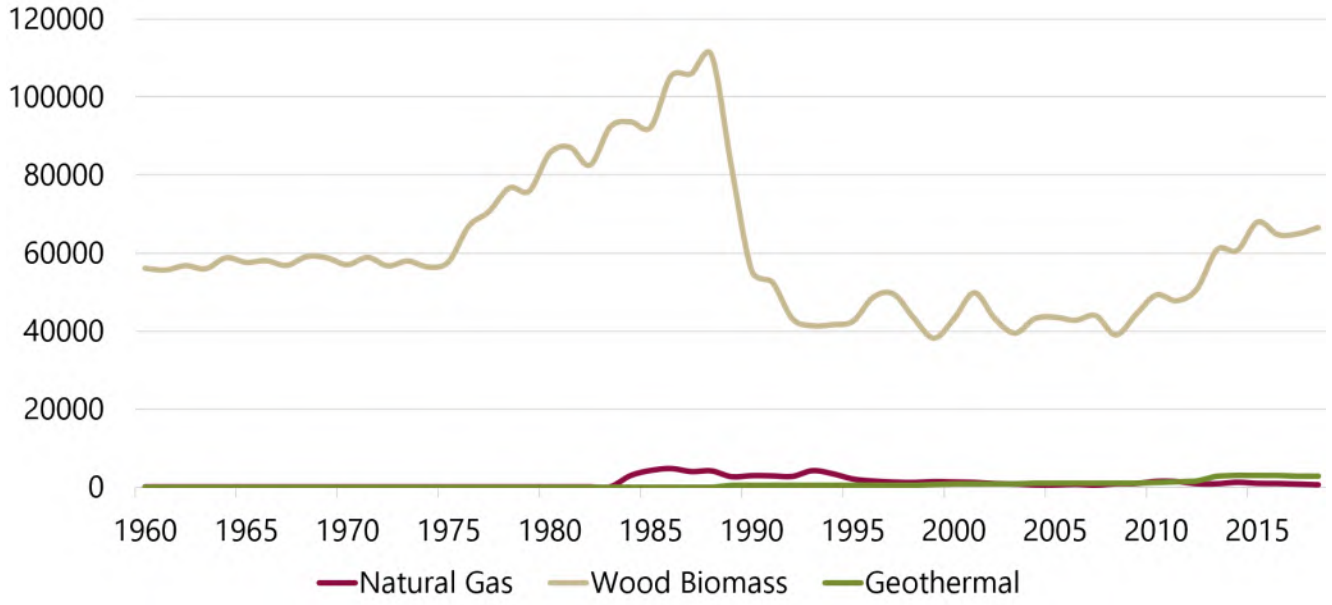
Percentage of Oregon overall direct use fuels consumption that is produced in-state.

Production & Consumption of Direct Use Fuels in 2018 (trillion Btu)

Resource	Consumption in Oregon	Oregon Production	Imported	Percent of Consumption Produced in Oregon
Geothermal	1.3	1.3	0	100%
Natural Gas	134.5	0	134.5	0%
Biomass	67.5	66.5	1	99%
Other Petroleum	23.3	0	23.5	0%
Heating Oil	15	0	15	0%
Hydrocarbon Gas & Liquids/ Propane	8.5	0	8.5	0%
Coal	1.4	0	1.4	0%
Totals	**251.5**	**67.8**	**183.88**	**27%**

Wood biomass has been Oregon's largest direct fuel production source since 1960. In 1988, wood production hit a high of 111 trillion Btu of production. Thirty years later, Oregon's production was 67 trillion Btu — a 40 percent decrease in production.[4]

Direct Use Fuel Energy Production in Oregon, 1960-2018 (billion Btu)



Natural Gas:

Oregon imports most of the natural gas we use from Canada and the Rocky Mountain states. The Pacific Northwest's only natural gas production is at a location outside of the town of Mist, northwest of Portland. The field is owned and operated by NW Natural Gas, one of three investor-owned gas companies serving the state. The Mist field produced 499 million cubic feet of natural gas or 0.5 trillion Btu of energy in 2018, representing 0.2 percent of Oregon's natural gas use in that year.[5,6] The Mist facility hit a production peak of 4.7 trillion Btu in 1986.[7] Mist is used primarily for natural gas storage today. Natural gas extracted from and stored at the facility is used to generate electricity. NW Natural pumps natural gas into the underground rock formations for use during cold weather events and to help balance additions and withdrawals to its pipeline system.

Renewable Natural Gas:

Renewable natural gas is a fuel derived from biogas or methane collected from municipal waste streams such as garbage, wastewater, and waste food as well as agricultural waste streams like manure. Redirecting these waste streams into controlled processes for optimization, capture, and utilization of the methane can be economically, socially, and environmentally beneficial to Oregon.[8] Currently, one RNG project is operational in Oregon, and four others are expected to come online in 2020 or 2021.[19] RNG alone has the potential to replace 10-20 percent of the natural gas being imported from out of state.[9] NW Natural and the City of Portland have partnered to collect Biogas emissions from the City of Portland's wastewater treatment plant and convert it to renewable natural gas that will be put in a NW Natural pipeline and into vehicles. It is estimated that the renewable natural gas generated from Portland's plant will replace 1.34 million gallons of diesel fuel with enough natural gas to run 154 garbage trucks for an entire year.[10]

A 2018 ODOE study found that up to 20% of Oregon's natural gas needs could be met with renewable natural gas.

Solar Thermal:

In addition to generating electricity, solar thermal energy is a resource used directly in Oregon homes. Solar thermal systems capture energy from the sun to provide water heating and space heating in buildings. Most systems installed in Oregon are solar water heating systems that provide supplemental energy to residential water heaters offsetting up to 70 percent of the households' water heating bills. In the last ten years, residential solar water heating systems have declined from over 300 installations per year to fewer than 100 installations per year. They make up a very small portion of Oregon's annual direct use energy total and are not represented in available energy production data.

Geothermal Energy:

More than 2,000 thermal wells and springs deliver direct heat to buildings, communities, and other facilities in Oregon.

Direct use geothermal energy uses hot water or steam from reservoirs below the earth's surface piped to end users for water or space heating.[11] Oregon produced 2.8 trillion Btu of geothermal energy in 2018 and 1.3 trillion Btu of it was consumed as a direct use fuel.[12,13] For decades, the city of Klamath Falls has used geothermal heat sources to heat buildings, residences, pools, and even sidewalks. Schools and hospitals in Lakeview use a geothermal well system to heat some buildings.

Other examples of direct use of geothermal heat in the state include drying agricultural products, aquaculture (raising fish), heating greenhouses, and heating swimming pools. There are more than 2,000 thermal wells and springs delivering direct heat to buildings, communities, and other facilities in Oregon.[14]

Biomass Wood Pellets and Charcoal Briquettes:

Oregon produced 66.5 trillion Btu of wood energy in 2018.[15] Residual material or waste from forest harvest and mill operations is converted into useful retail products. Wood pellets are manufactured from timber waste and used for residential and commercial heating. Charcoal briquettes and cooking pellets use timber waste to create a fuel source for cooking. Oregon manufacturers convert timber waste that would typically go into a landfill into these retail fuel sources for space heating and cooking. Wood waste is also burned in the manufacturing process as the products are heated up to remove moisture. Springfield, Oregon is home to one of Kingsford's manufacturing plants and is one of the largest charcoal briquettes plants in the western United States.[16] These wood waste derived products are biomass energy sources; biomass energy is energy from plants and plant-derived materials. Wood is the largest biomass energy resource in Oregon.[17] Oregon has 15 woody biomass power facilities, primarily in the wood-products industry.[18]

Energy Jobs: Springfield, Oregon is home to one of the largest charcoal briquette plants in the western U.S.

Learn more about direct use fuels in the Technology Review, Energy 101, and Policy Brief sections of this report.

Production

Transportation Fuels

Oregon's transportation sector consumed 316 trillion Btu of energy in 2018.[1] Two percent of transportation fuel used in Oregon was produced in the state in 2018. Oregon produces 37 percent of the biofuels the transportation sector uses, and biofuels make up 6 percent of Oregon's consumption of transportation fuels. In-state production of transportation fuels is in the generation of ethanol and biodiesel.

Electricity is also a growing source of transportation fuel, Oregon consumed 0.42 trillion Btu of electricity in 2018 or about 0.13% of total transportation consumption. An estimated 0.20 trillion Btu of electricity comes from Oregon-generated electricity.[2,3,4]

5%

Biodiesel blend is used in nearly all heavy-duty vehicles both on and off the highway.

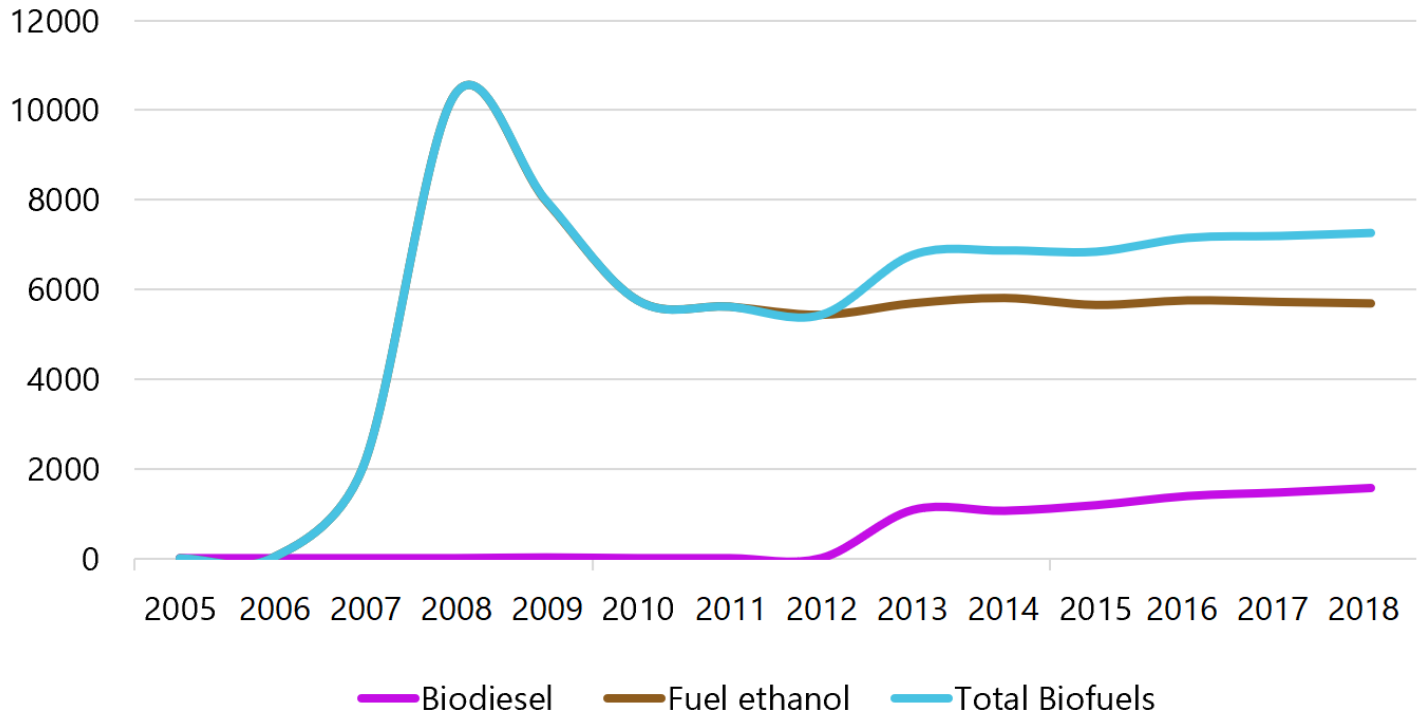
10%

Ethanol blend fuel is used in a majority of light-duty vehicles in Oregon.

Production & Consumption of Transportation Fuels in 2018 (trillion Btu)

Resource	Consumption in Oregon	Oregon Production	Imported	% of Consumption Produced in Oregon
Biodiesel	6.18	1.6	4.61	25%
Fuel Ethanol	13.31	5.7	7.62	43%
Gasoline	178.24	0	178.24	0%
Diesel	76.12	0	76.12	0%
Jet Fuel	28.57	0	28.57	0%
Asphalt & Road Oil	9.9	0	9.9	0%
Lubricants	1.8	0	1.8	0%
Aviation Gasoline	0.61	0	0.61	0%
Electricity (gge)	0.42	0.2	0.22	48%
LPG/Propane	0.27	0	0.27	0%
Compressed Natural Gas	0.21	0	0.21	0%
Bio-CNG	0.17	0	0.17	0%
Renewable Diesel	0.15	0	0.15	0%
LNG (Landfill)	0.05	0	0.05	0%
Totals	**316**	**7.3**	**308.7**	**2%**

Transportation Energy Production in Oregon, 2005-2018 (billion Btu)[5]



Ethanol

Oregon began producing fuel ethanol in 2007, and had its largest production year in 2008 with 10.3 trillion Btu of energy created. In 2018, Oregon produced 5.7 trillion Btu of ethanol.[6] Oregon has one commercial ethanol producer — the Columbia Pacific Ethanol production plant in Boardman — and it is the largest transportation fuel producer in the state. Carbon dioxide emissions from the plant are captured and used by the food and beverage industry, turning emissions into a beverage-grade liquid used to carbonate soft drinks and make dry ice.[7]

Biodiesel

The U.S. Energy Information Administration began tracking Oregon biodiesel production in 2013. In 2018, Oregon produced 1.6 trillion Btu of biodiesel. SeQuential Pacific Biodiesel is the second largest producer of transportation fuels in Oregon, and produces biodiesel from used cooking oil from local restaurants and businesses.[8] About 85 percent of the fuel SeQuential produces is sold in -state as part of a biodiesel blend, while the remainder is exported to regional neighbors Washington, California, Hawaii, and British Columbia.[9]

Renewable Natural Gas

This emerging biofuel that captures methane from waste streams has potential to displace some transportation fuels in Oregon.

Learn more about transportation fuels in the Technology Review, Energy 101, and Policy Brief sections of this report.

Energy Facility Siting in Oregon

Oregon's Energy Facility Siting Council is a governor-appointed body that oversees the siting of energy facilities in the state, and is staffed by the Oregon Department of Energy. The types and sizes of energy projects subject to EFSC jurisdiction have changed over time. While the bulk of applications have been for electric generation projects, EFSC has also reviewed site certificate applications for electrical energy transmission, pipelines, nuclear research reactors, ethanol production, liquified natural gas storage, and many others. More recently, EFSC has reviewed battery storage as part of other energy projects, even though battery storage is not by itself state jurisdictional.

EFSC also has ongoing responsibility for approved sites, including monitoring projects going into construction and operation, and reviewing site certificate amendment requests.

49

Total number of site certificates issued by EFSC — **37** are still valid.

18.5 Gigawatts

Capacity of EFSC-approved electricity facilities. Nearly **4.8 GW** is renewable.

2.5 Gigawatts

Capacity of renewable electricity generation under review or approved to begin construction.

"Site certificate" — under ORS 469.300(26) — means the binding agreement between the State of Oregon and the applicant, authorizing the applicant to construct and operate a facility on an approved site, incorporating all conditions imposed by the council on the applicant.

Renewable Electricity EFSC Projects Summary (Megawatts)

Status	Wind	Solar	Geothermal	Hydro	Total MW
			Active		
Operational	2,220	-	-	-	2,220
In Construction	894	-	-	-	894
Approved	200	777	-	-	977
Under Review	350	1,223	-	-	1,573
Subtotal	**3,664**	**2,000**	**-**	**-**	**5,664**
			Inactive		
Approval Expired	640	-	35	-	675
Decommissioned	-	-	-	-	-
Denied	-	-	-	80	80
Withdrawn	2,445	-	180	200	2,825
Subtotal	**3,085**	**-**	**215**	**280**	**3,580**
Total MW	**6,749**	**2,000**	**215**	**280**	**9,244**

Non-Renewable Electricity EFSC Projects Summary (Megawatts)

Status	Coal	Nuclear	Natural Gas	Other*	Total MW
Active					
Operational	550**	-	3,237	51	3,838
In Construction	-	-	415	-	415
Approved	-	-	-	-	-
Under Review	-	-	-	-	-
Subtotal	**550**	**-**	**3,652**	**51**	**4,253**
Inactive					
Approval Expired	109	5,040	3,221	38	8,408
Decommissioned	-	1,130	-	-	1,130
Denied	-	-	-	-	-
Withdrawn	431	-	5,147	109	5,687
Subtotal	**540**	**6,170**	**8,368**	**147**	**15,225**
Total MW	**1,090**	**6,170**	**12,020**	**198**	**19,478**

**Other includes waste steam cogeneration, mill waste cogeneration, and biomass.*
***This is the Boardman Coal Plant, which ceased operation in October 2020.*

Non-Electricity Generation EFSC Projects Summary (Number) — Part 1

Status	Research Reactors & ISFSI*	Electric Transmission Line	Natural Gas Storage	Liquefied NG Storage	Total Projects
Active					
Operational	3	1	1	-	5
Under Review	-	2**	-	-	2
Subtotal	**3**	**3**	**1**	**-**	**7**
Inactive					
Withdrawn	-	1	-	2	3
Subtotal	**-**	**1**	**-**	**2**	**3**
Total MW	**3**	**4**	**1**	**2**	**10**

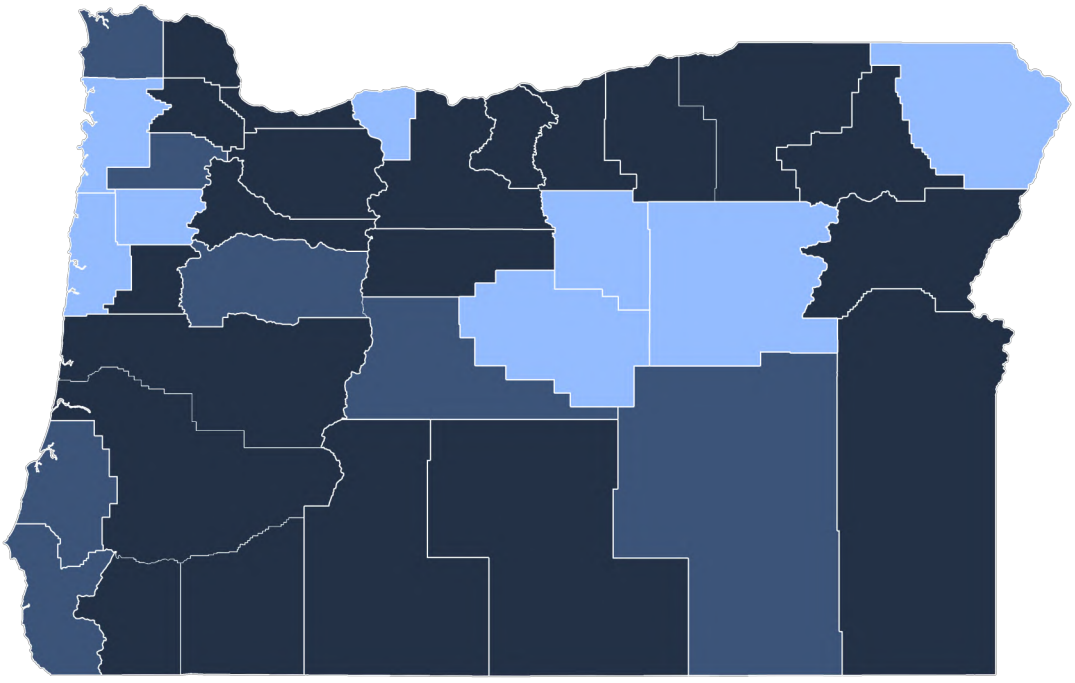
**Portland General Electric's Independent Spent Fuel Storage Installation Facility at decommissioned Trojan Power Plant.*
***One of these is an amendment to the existing in-service Eugene to Medford 500 kV transmission line.*

Non-Electricity Generation EFSC Projects Summary (Number) — Part 2

Status	Natural Gas Pipeline	Ethanol Production	Total Projects
Active			
Operational	2	1	3
Under Review	-	-	0
Subtotal	**2**	**1**	**3**
Inactive			
Withdrawn	-	1	1
Subtotal	**-**	**1**	**1**
Total MW	**2**	**2**	**4**

Total Projects (Parts 1 and 2)	**14**

Oregon Counties with State Jurisdictional Energy Projects



Counties with existing site certificates and/or applications

Counties with prior but not current site certificates and/or applications

Counties with no current or prior site certificates and/or applications

More information on Oregon's state-jurisdictional energy projects is available online:

tinyurl.com/EFSC-projects

Energy Costs & Economy

What We Spend

Oregon spent $11.7 billion on energy in 2016 – the lowest amount since 2005. In 2018, Oregon spent $14.2 billion, with increases each year since 2016.[1] This includes electricity and fuel for homes and businesses, industrial energy uses, and petroleum used in the transportation sector. Transportation accounts for more than half of our state's energy expenditures and sees the largest swings in price. The variability in what we spend on energy is driven primarily by transportation fuel costs. Oregonians send about $5.4 billion of our transportation dollars each year to other states and countries where extraction, processing, and refining of transportation fuels occurs.

$14.2 billion

Oregonians spent on energy in 2018.[1]

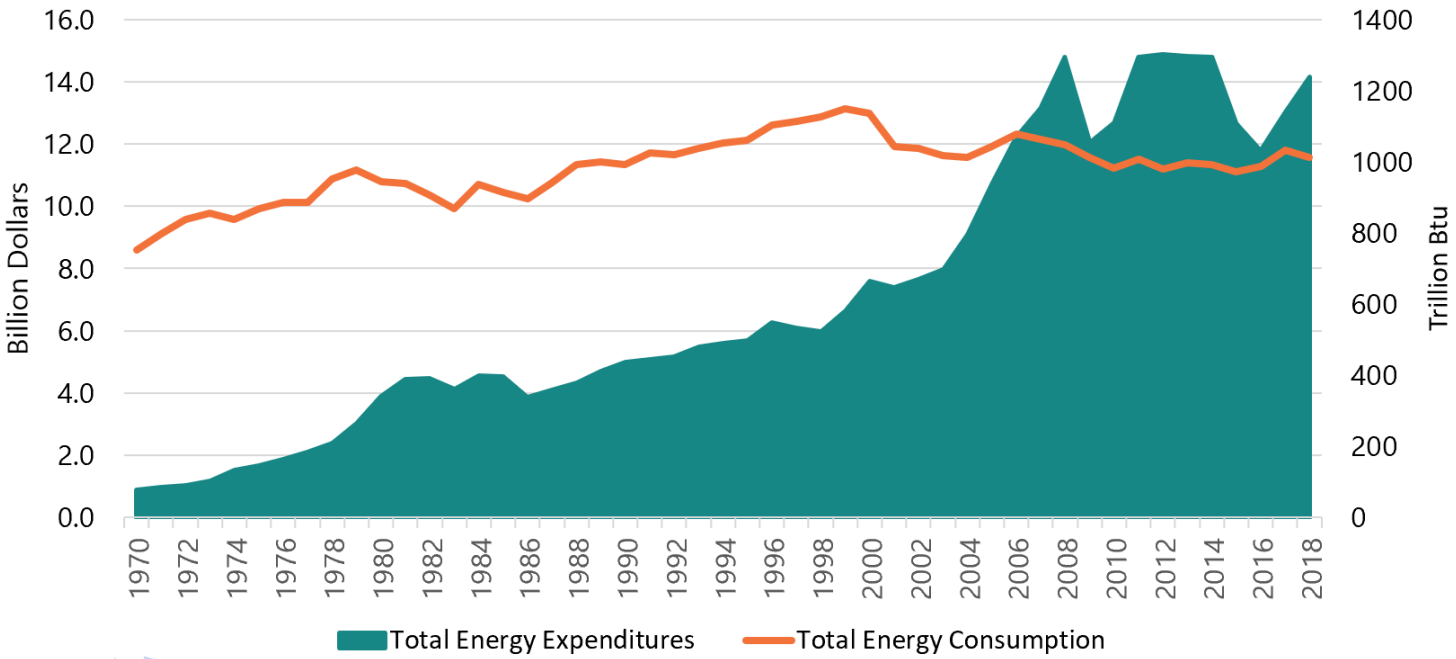
8.85 cents

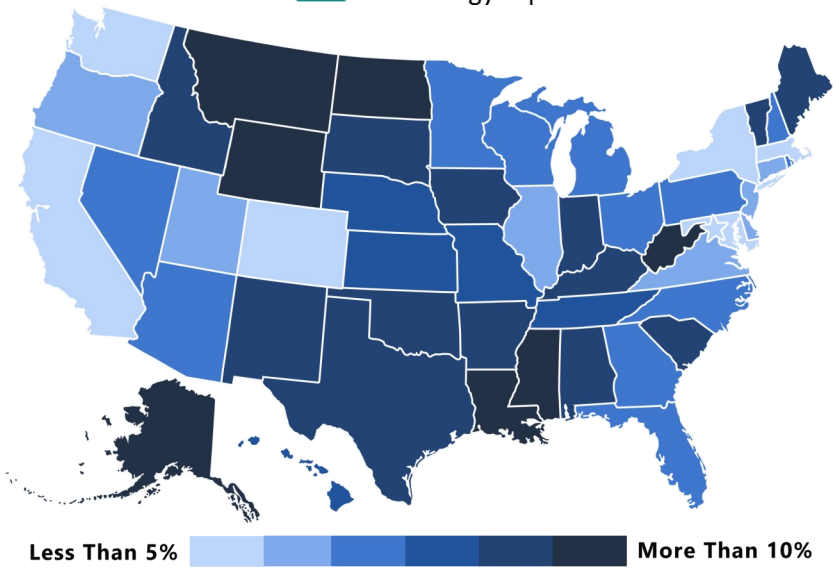
Oregon's average retail price per kilowatt hour of electricity in 2018.[2]

5.9%

Percentage of Oregon's GDP spent on energy in 2018.[1]

Oregon's Total Energy Expenditures vs. Total Energy Consumption[1]



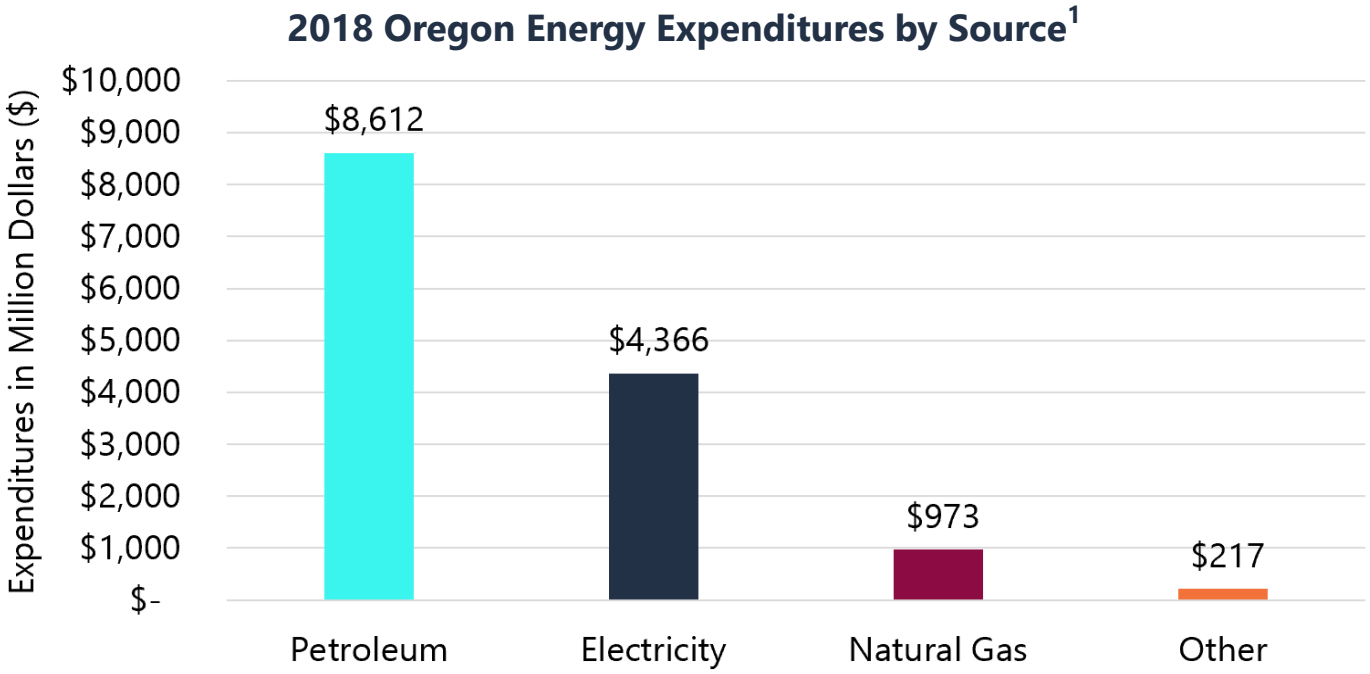


State Total Energy Expenditures as a Percentage of State Gross Domestic Product (2018)[1]

Energy Costs & Economy

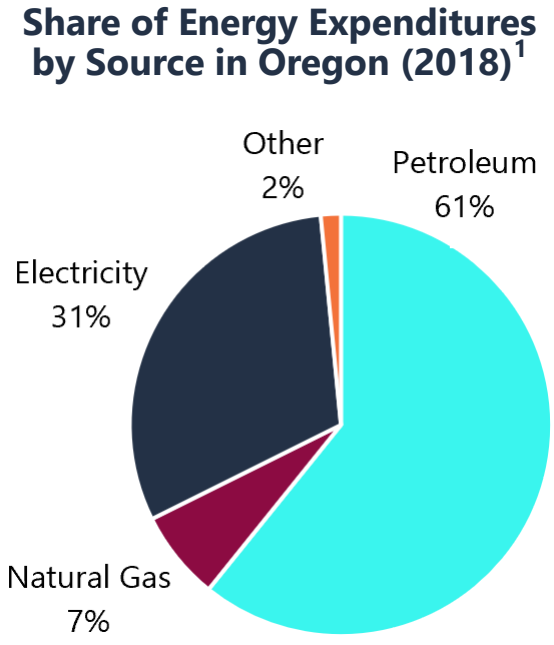
Oregon Energy Expenditures by Source

Oregon's energy expenditures of $14.2 billion can be divided among three main source categories; electricity, direct use of natural gas, and petroleum products.[1] A small portion of Oregon's energy expenditures do not fall into the three main categories. These include industrial, commercial, and residential expenditures on other energy sources for uses other than electricity generation. In Oregon, these sources include wood, waste, and some coal.



The petroleum products category is dominated by transportation fuels. Transportation fuels account for $7,667 million in expenditures and include some natural gas and electricity expenditures. As shown in the sector-based comparison later in this section, transportation energy use is the largest portion of Oregon's overall energy use.

The price of electricity has remained consistent due, in large part, to Oregon's vast hydroelectric resources.[2] Natural gas makes up a smaller portion of the expenditures and therefore its price variability has less effect on Oregon's overall expenditures. Petroleum products, however, experience a high level of price volatility with impacts from global market pressures as well as from more localized taxes and storage and distribution costs. Increased cost per unit of energy in petroleum products in 2018 gives the petroleum category an outsized portion of the annual energy expenditures.



Energy Costs & Economy

Energy Burden

Home energy burden is the percent of household income spent on home energy bills. Energy bills include electricity, natural gas, and other home heating fuels, and are compared to the total income of the people in that household. If a household is spending greater than 6 percent of their income on home energy costs, they are considered burdened.[4] The energy affordability gap is the difference between a household's actual energy costs and an "affordable" energy burden level equal to six percent of the household's income. With so many low-income Oregonians facing significant energy burden, Oregon's energy affordability gap is estimated to be over $289 million per year, or eight times the federal funding Oregon receives for energy assistance.[5] For more information on energy burden, see the Energy 101 section of this report.

3x

Nationally, low-income households spend three times more of their income on energy costs compared to the median spending of non low-income households.[1]

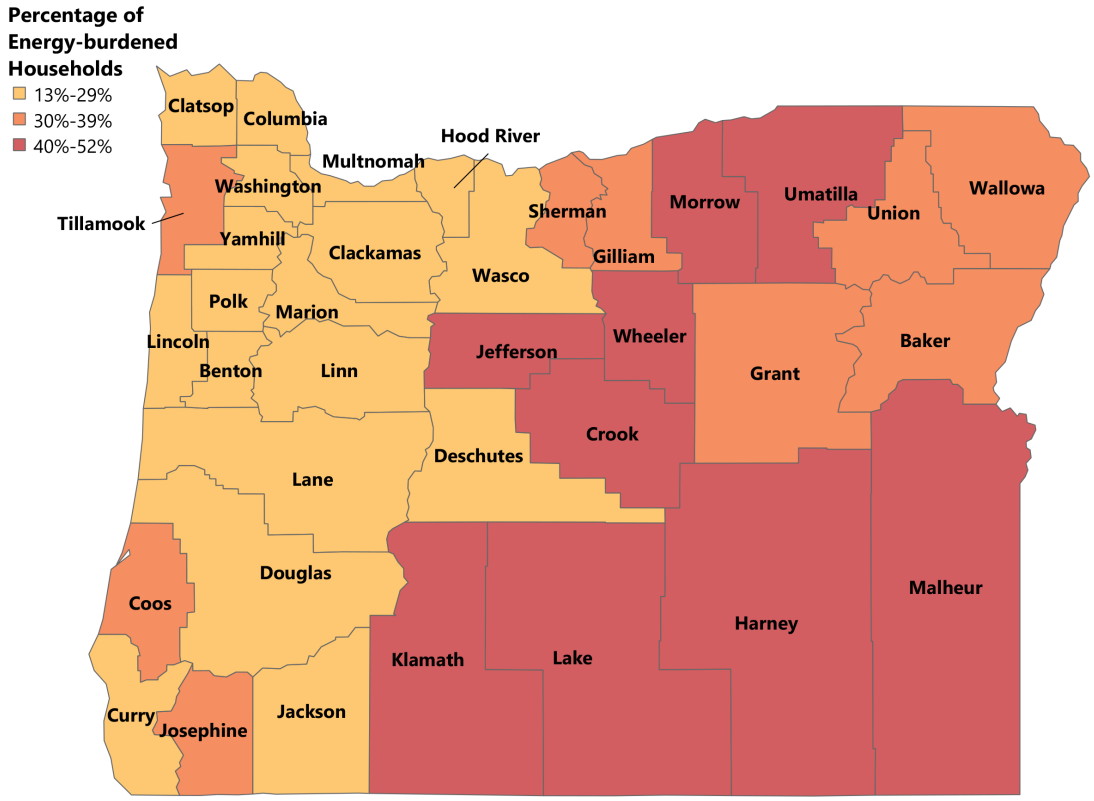
391,263

Number of Oregon households that were energy burdened in 2019.[2]

25%

Percentage of all Oregon households that were energy burdened in 2019.[3]

Percentage of Oregon Households Considered Energy Burdened and Earning 200 Percent or Below Federal Poverty Level by County[6]



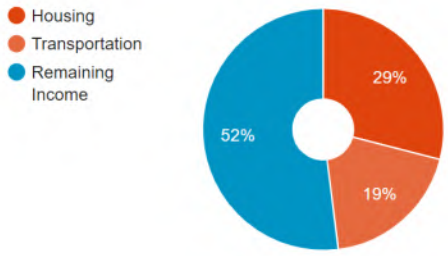
Transportation burden represents the total annual transportation costs of households in comparison to income of the household.[7] Home and transportation energy burdens are combined to discuss the whole energy burden of a household — and both are important indicators of affordability for Oregonians.

Below are three cities in Oregon with different median incomes and remaining income after housing and transportation costs. Please note low-income households are not specifically identified in this tool shown. In Oregon there can be a significant mix of income levels in an area, so the tool may not accurately identify all low-income households. To learn more about the Housing + Transportation Affordability Index and look up your own town, please visit **htaindex.cnt.org/map/**

Portland, OR: Median Household Income $60,286

Average Housing + Transportation Costs % Income

Factoring in both housing *and* transportation costs provides a more comprehensive way of thinking about the cost of housing and true affordability.



Transportation Costs

In dispersed areas, people need to own more vehicles and rely upon driving them farther distances which also drives up the cost of living.

$11,751
Annual Transportation Costs

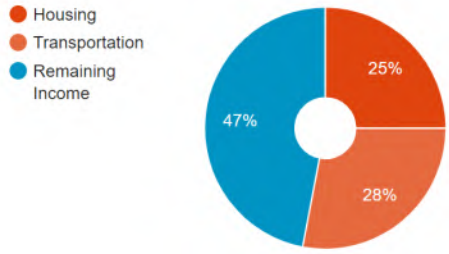
1.54
Autos Per Household

16,355
Average Household VMT

Baker City, OR: Median Household Income $41,098

Average Housing + Transportation Costs % Income

Factoring in both housing *and* transportation costs provides a more comprehensive way of thinking about the cost of housing and true affordability.



Transportation Costs

In dispersed areas, people need to own more vehicles and rely upon driving them farther distances which also drives up the cost of living.

$11,303
Annual Transportation Costs

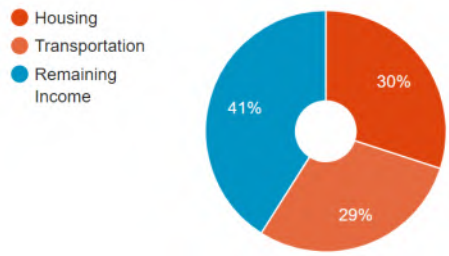
1.52
Autos Per Household

18,619
Average Household VMT

Coos Bay, OR: Median Household Income $38,605

Average Housing + Transportation Costs % Income

Factoring in both housing *and* transportation costs provides a more comprehensive way of thinking about the cost of housing and true affordability.



Transportation Costs

In dispersed areas, people need to own more vehicles and rely upon driving them farther distances which also drives up the cost of living.

$11,371
Annual Transportation Costs

1.59
Autos Per Household

19,735
Average Household VMT

The Oregon Department of Transportation is developing public transportation solutions to increase the affordability of Oregon communities. Learn more about ODOT's innovative solutions in its Oregon Public Transportation Plan: **tinyurl.com/ODOT-OPTP**

Energy Costs & Economy

Energy Jobs

Oregonians hold a number of jobs in the energy industry — from energy utility workers to wind turbine technicians to solar installers.

Energy employment is often sorted into traditional energy, energy efficiency, and motor vehicles jobs. In Oregon, most energy-industry employees work in energy efficiency, including high-efficiency and traditional HVAC, renewable heating and cooling firms, and others.

Dive in to more details about energy jobs in Oregon in the Energy 101 section of this report.

96,728

Number of Oregonians employed in the energy industry in 2019.[1]

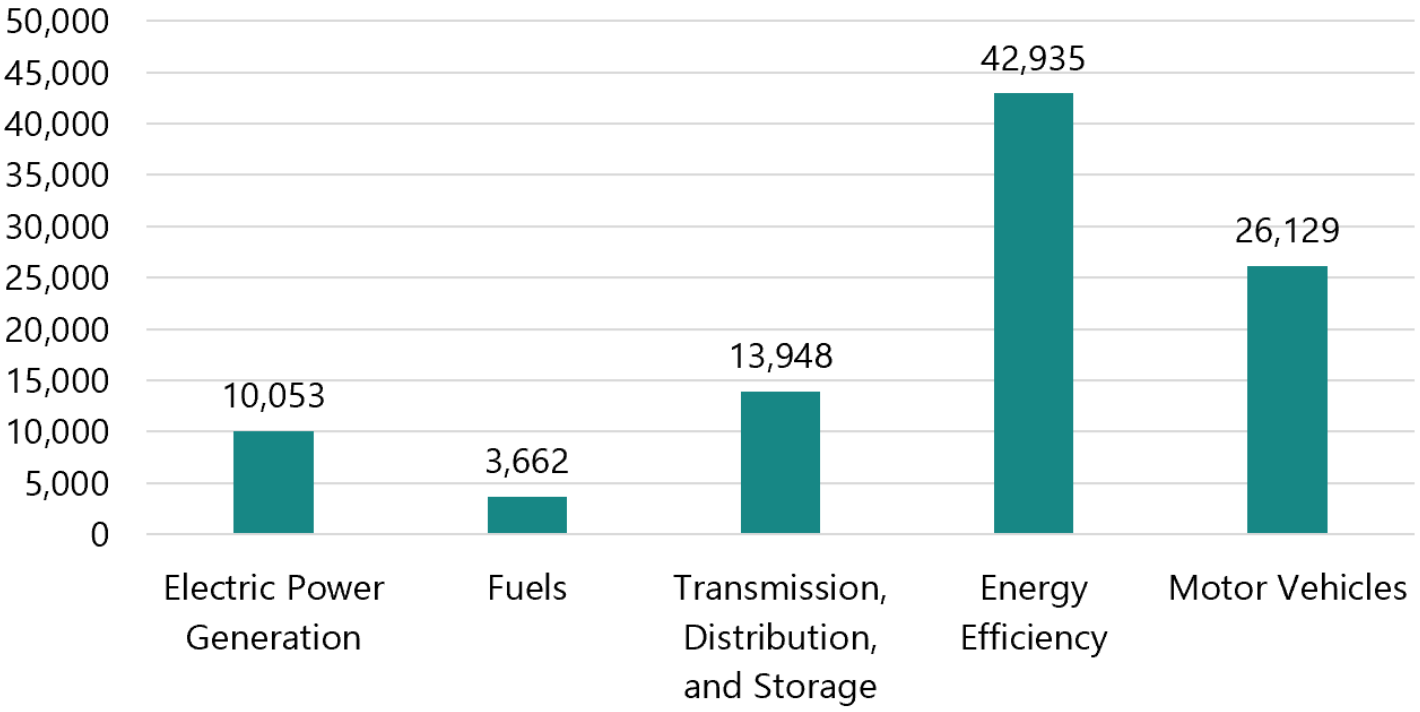
55,406

Number of clean energy jobs in Oregon in 2019.

3,200

Number of clean energy jobs added in July 2020 nationwide following the COVID-19 economic downturn in the early spring.

Number of Energy Jobs in Oregon by Type (2019)[1]



Nationally, 249,983 people work in the solar industry; Oregon makes up about 2.3 percent of those jobs, with 166 solar companies operating in the state. In 2019, 5,759 Oregonians worked on solar projects. The industry added 96 new solar jobs in Oregon in 2019, resulting in 2.6 percent job growth.[2]

Energy Efficiency

Oregon's Second Largest Resource

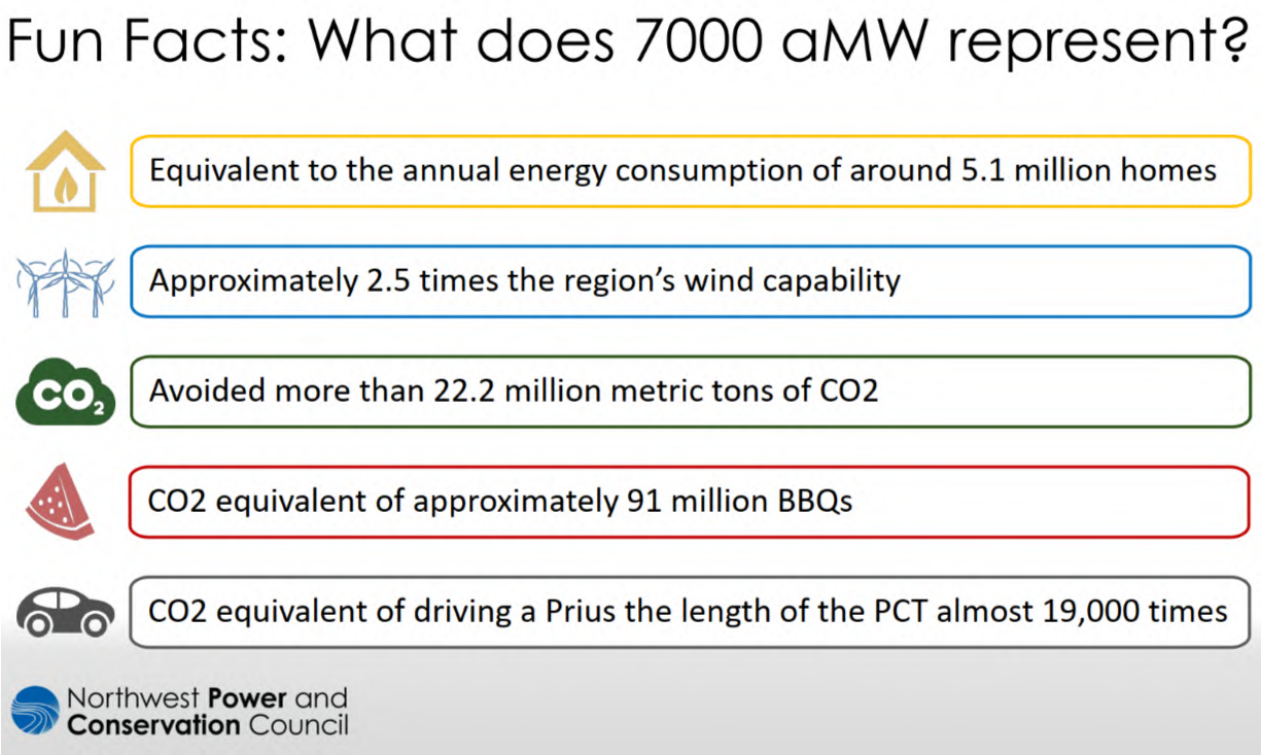
Energy efficiency plays a critical role in our state. It is the second largest resource in Oregon after hydropower, and Oregon has consistently met increased demand for electricity by implementing energy efficiency strategies. The Northwest Power & Conservation Council reports that since 1978, the Pacific Northwest has produced about 7,000 average megawatts (aMW) of savings through efficiency programs and improvements.[1] That's more electricity than the whole state of Oregon uses in a year.

9th

Oregon's 2019 rank among U.S. states for energy efficiency by the American Council for an Energy Efficient Economy.[2]

13

Years in a row that Oregon has landed in the top 10 most energy efficient states.[2]



Over the past decade, Oregon reduced per capita energy use despite our state population growing, and energy efficiency is one reason why. Oregon's gains in energy efficiency have been helped by federal appliance standards, state policies and programs, natural gas and electric utility programs, Energy Trust of Oregon utility programs, and other nongovernmental organizations. For the region's cumulative savings, 60 percent comes from utility and Bonneville Power Administration programs. Energy efficiency gains are cumulative and continue paying dividends for our region over time.

Learn more about energy efficiency in the Energy 101 section of this report.

Energy Efficiency

Oregon Electricity Savings

The Northwest Power & Conservation Council's Seventh Power Plan, published in 2016, concludes that cost-effective efficiency can meet a large amount of new load growth in the region – allowing Oregon to grow without needing significant new electricity resources. The plan calls on the region to develop new energy efficiency programs equivalent to acquiring 4,300 average megawatts of power by 2035. Integrated Resource Plans from Oregon's large electric utilities also identify energy efficiency as a key strategy they will use to meet demand over their planning horizon.

The Regional Conservation Progress Report to the Northwest Power and Conservation Council in September 2020, however, demonstrates that there is significant cost-effective energy efficiency in the electric sector still available, but that regional energy efficiency in the electric sector is on a downward trend – this means that each subsequent year of the Plan will deliver fewer savings.

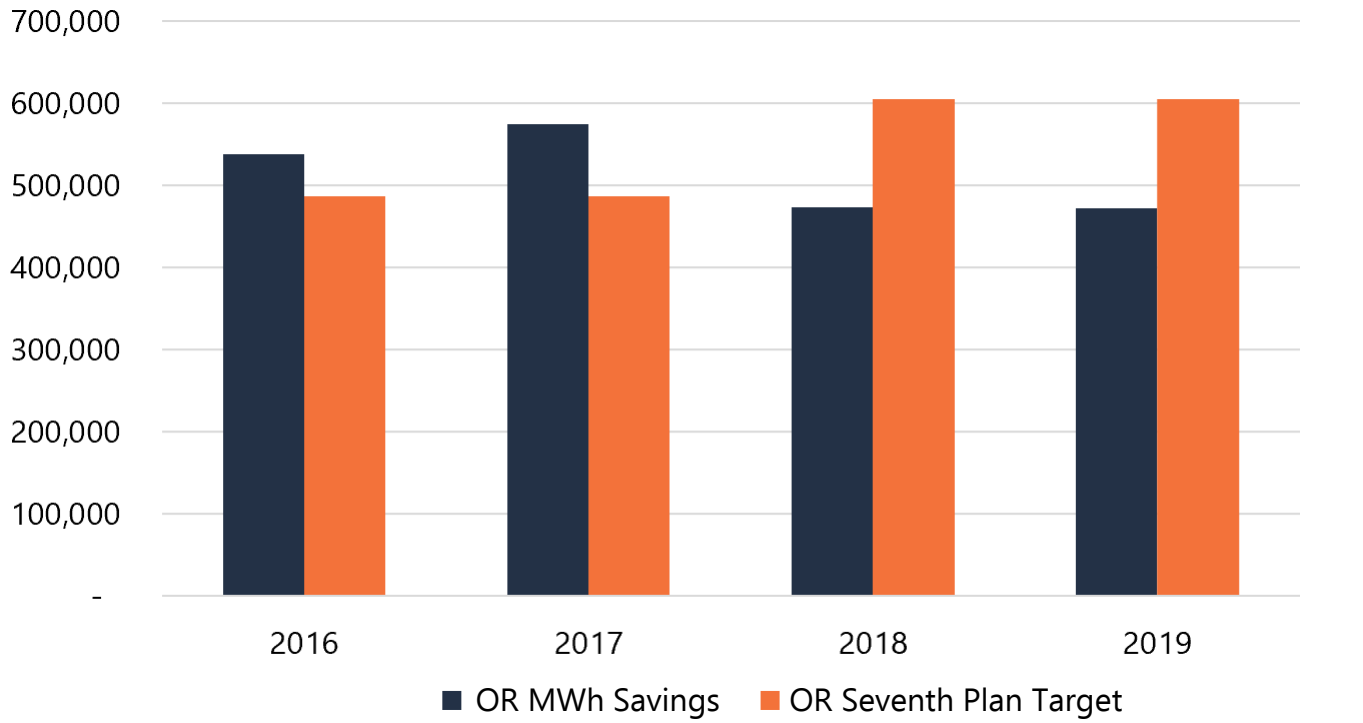
7,000

Average megawatts of regional electricity savings from energy efficiency (1978-2019).

2,200

Average megawatts of Oregon electricity savings from energy efficiency (1978-2019).

Oregon Electricity Savings and Estimated Share of the Seventh Power Plan Goal



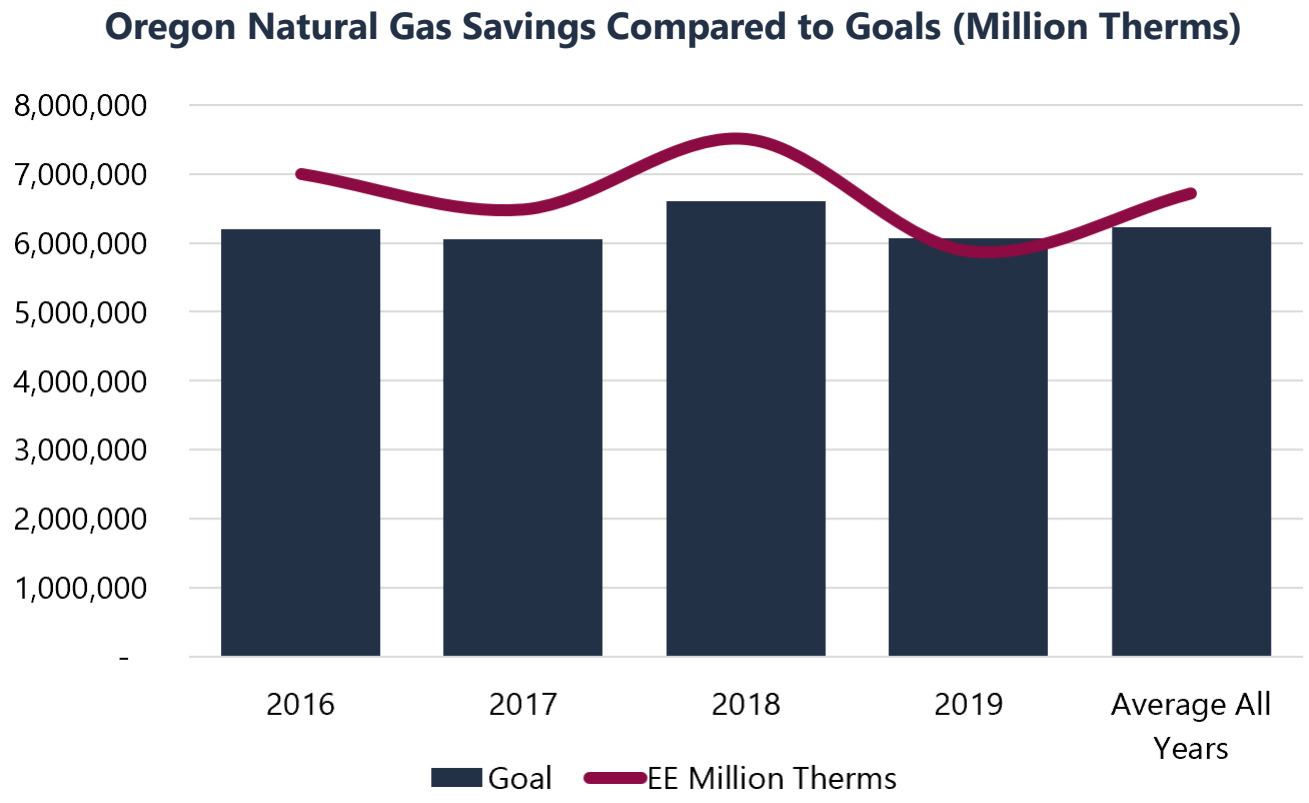
The savings in the chart above are a sum of reported savings by utility, Bonneville Power Administration, and Energy Trust of Oregon programs.

Energy Efficiency

Oregon Natural Gas Savings

Natural gas goals are developed in each utility's Integrated Resource Plan submitted to the Oregon Public Utility Commission. Natural Gas utilities' savings exceeded goals from 2016-2018 with a slight decline in 2019.[3] Energy Trust of Oregon implements energy efficiency programs for natural gas utilities. Programs are funded by customer rates, and cost effectiveness tests of natural gas measures assures that efficiency investments cost less than building new natural gas resources.

For more about cost-effectiveness, see Chapter 6 of the *2018 Biennial Energy Report.*



Integrated Resource Planning

From the Oregon Public Utility Commission's website:

Oregon was one of the first states to require utilities to file integrated resource plans (IRPs). The IRP presents a utility's current plan to meet the future energy and capacity needs of its customers through a "least-cost, least-risk" combination of energy generation and demand reduction. The plan includes estimates of those future energy needs, analysis of the resources available to meet those needs, and the activities required to secure those resources. What began thirty years ago as a simple report by each utility has grown into a large, stakeholder-driven process that results in a comprehensive and strategic document that drives utility investments, programs, and activities.

Learn more: **www.oregon.gov/puc/utilities/Pages/Energy-Planning.aspx**

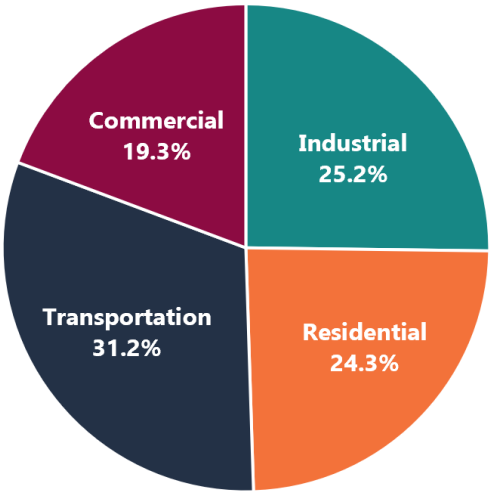
Energy End Use Sectors

Consumption

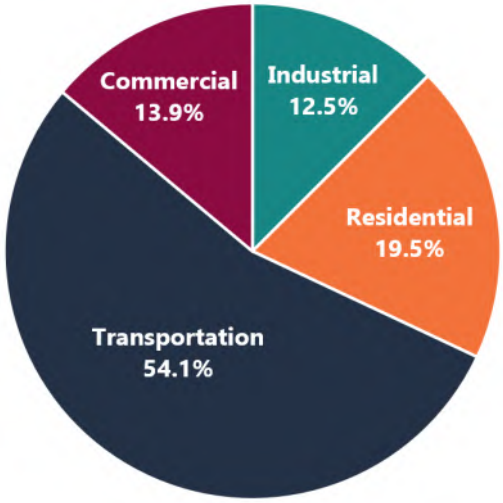
As noted early in this section, energy metrics are commonly divided into four end-use sectors: residential, commercial, industrial, and transportation.

Consumption and cost of energy varies across the sectors. In 2018, transportation accounted for 31 percent of energy consumption and 54 percent of expenditures due to higher per-unit cost of transportation fuels. The industrial sector used a quarter of the total energy but accounted for only 12 percent of expenditures due to cheaper per unit costs relative to the other sectors.[1]

Oregon Consumption by End-Use Sector (2018)

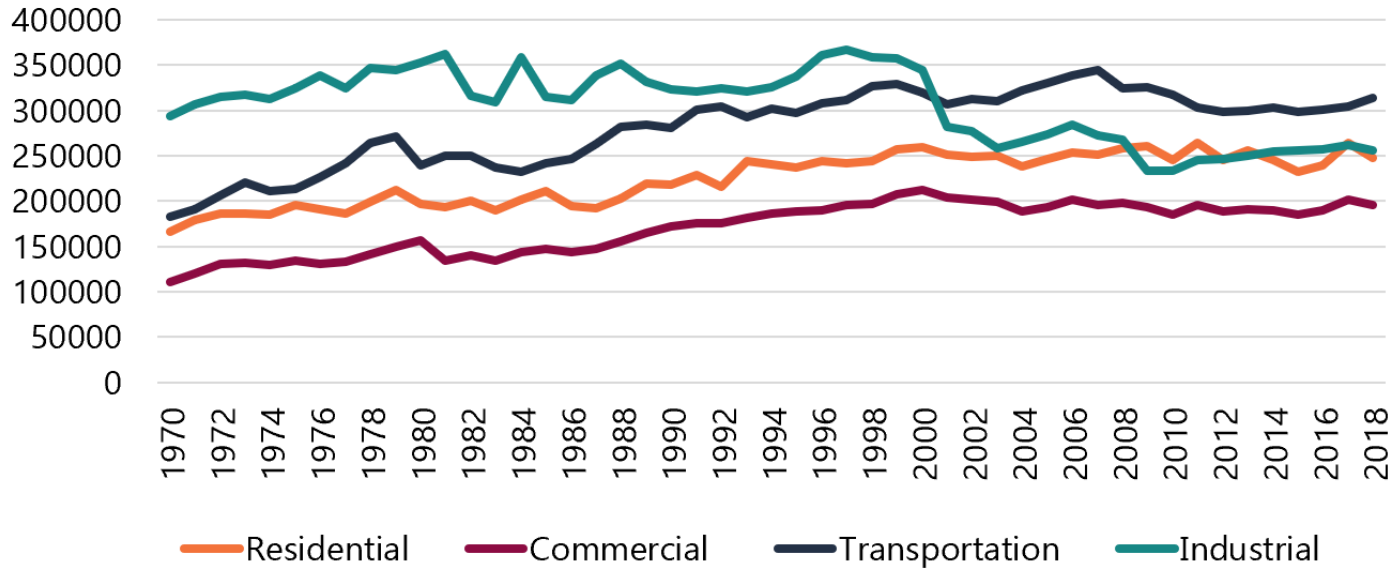


Oregon Expenditures by End-Use Sector (2018)



Energy consumption in the industrial sector dropped significantly in the late 1990s, largely related to Oregon aluminum smelters closing. Energy consumption across all sectors has remained relatively steady in recent years. Increased population, GDP, and vehicle miles traveled, which all increase energy use, have been offset by efficiency gains and a shift toward less energy intensive industries.

Oregon Consumption by Sector Over Time (Billion Btu)[2]



Energy End Use Sectors

Expenditures

Oregonians' 2018 energy expenditures can be separated by sector. While the transportation sector represents 31 percent of energy consumption, it accounts for more than half of expenditures due to the much higher per-unit cost of transportation fuels. Because nearly all our transportation fuel is imported, most of this money goes out of state.

While Oregon's residential, commercial, and industrial sectors have experienced gradual increases in spending, transportation sector expenditures reflect both increasing consumption and price volatility in the transportation fuels market.

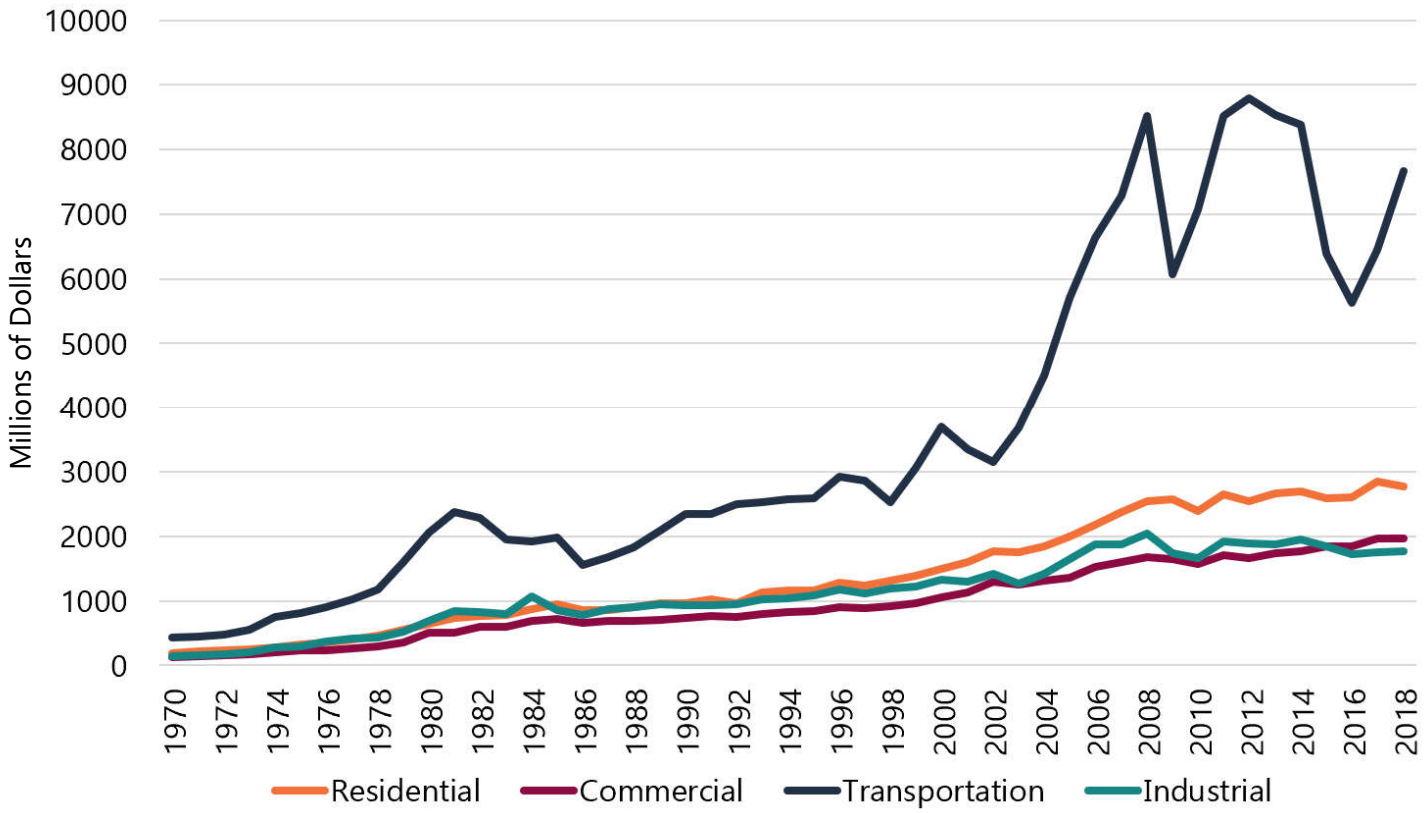
$3,388

Per capita (per person) energy expenditures in Oregon in 2018.[3]

43rd

Oregon's rank in the U.S. for per capita energy expenditures.[3]

Oregon's Total Energy Expenditures by Sector Over Time[4]



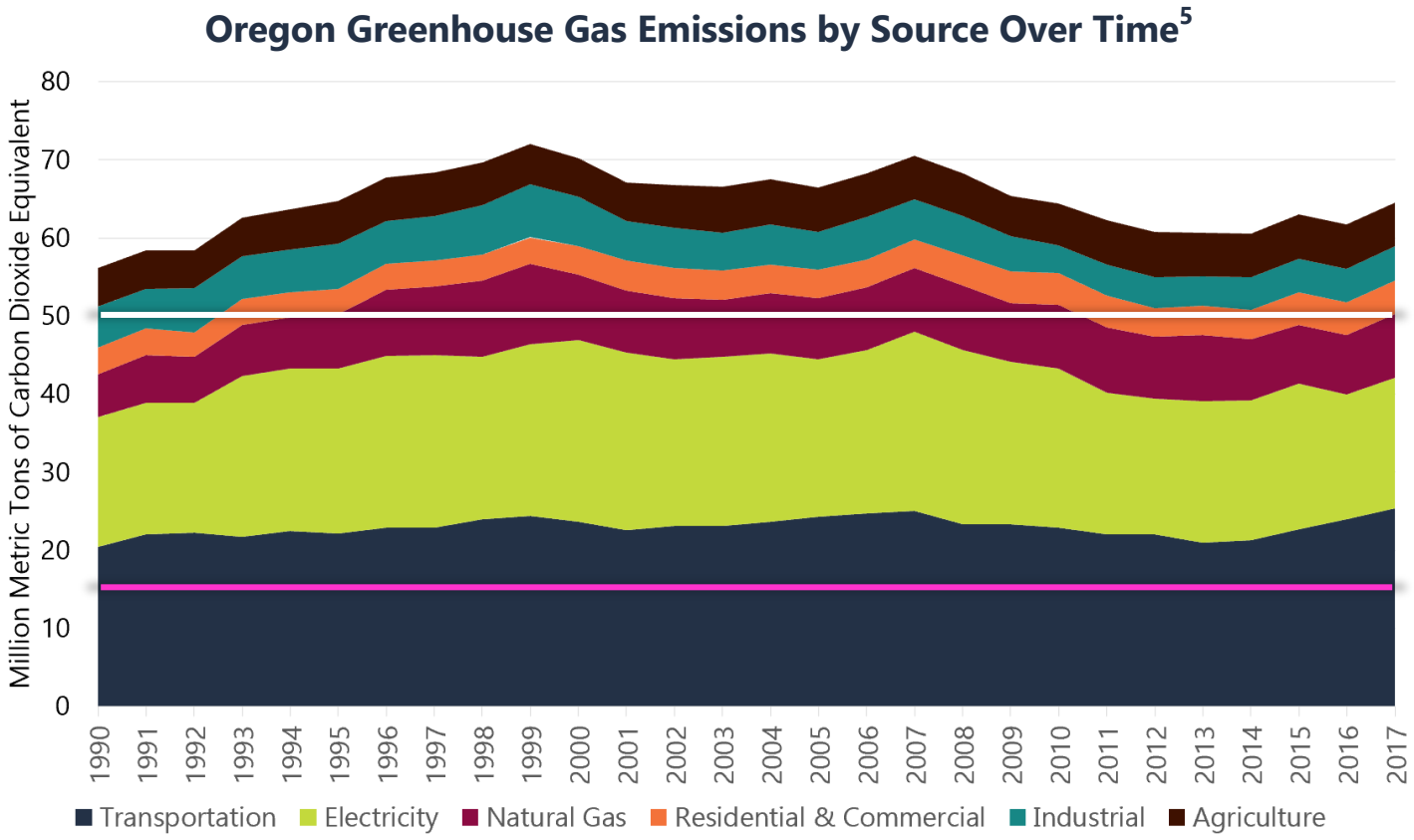
The U.S. EIA reports prices in current dollars per million Btu and expenditures in current dollars — the chart is not adjusted for inflation.
Learn more: https://www.eia.gov/state/seds/

Learn more about Oregon's changing transportation sector in the Energy 101 and Policy Briefs sections of this report. Hint: alternative fuels are often less expensive both for the fuels themselves and associated vehicle maintenance.

Energy End Use Sectors

Greenhouse Gas Emissions

Greenhouse gas emissions can be categorized in multiple ways, by the productive use that creates emissions, by the sector that use falls within, and by the source of the emissions. Most of Oregon's GHG emissions come from the energy we use every day. The data presented here is based on the Oregon Department of Environmental Quality's GHG emissions inventory. When analyzing the data, various methods of categorization can reveal new insights.



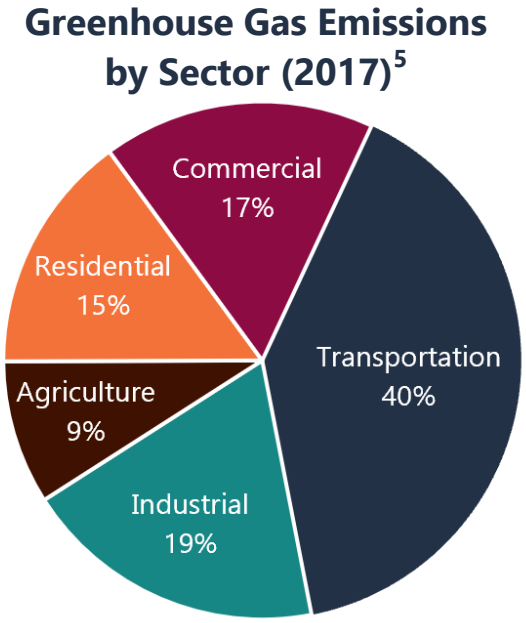
The values for Electricity and Natural Gas above include use for each of the end use sectors: Agriculture, Industrial, and Residential & Commercial. The GHG effects of each sector are lower because that use is accounted for in the Natural Gas and Electricity Use values. Electricity emissions increased from 1990 through about 2007, and has seen a steady decline in the last 10 years. The Agricultural, Industrial, Residential & Commercial, and Natural Gas areas in the chart remain at relatively consistent thickness over the recent 20-year period. Transportation emissions have grown as a share of Oregon's statewide total GHG emissions. Transportation went from 35 percent of the statewide total in 2014 to 40 percent in 2017, while electricity use emissions decreased from 30 percent to 26 percent. All other sectors stayed relatively constant over the same period. While total transportation emissions have fluctuated over the years, GHG emissions per vehicle have gone down thanks to improved fuel efficiency.[6]

The target year for Oregon to reduce GHG emissions by 75 percent below 1990 levels is 2050. This goal is shown as a pink line on the chart. There is also an interim goal to reduce emissions by 10 percent below 1990 levels by 2020, shown in white.

Energy End Use Sectors

GHG Emissions by Sector

Earlier in this Biennial Energy Report, data is broken out into four sectors — transportation, residential, commercial, and industrial. For greenhouse gas emissions, data is also broken out for the agricultural sector (which is typically included in industrial).

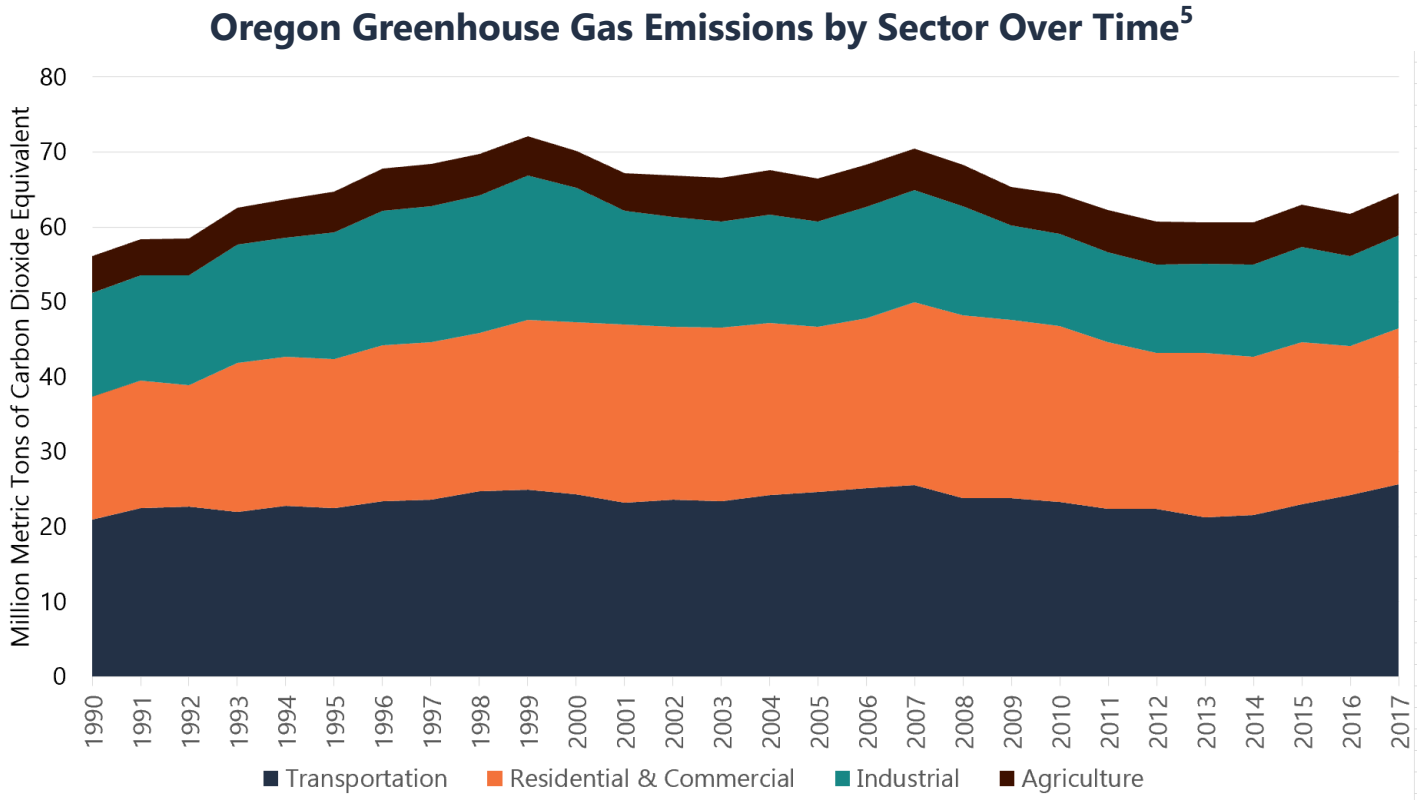


Agriculture GHGs. Primarily from waste streams like methane and nitrogen-based fertilizers for soil management. This sector is distinct because emissions primarily come from methane and nitrous oxide, versus carbon dioxide.

Industrial GHGs. In addition to emissions from electricity generation and natural gas direct use, GHG emissions in the industrial sector come primarily from non-transportation petroleum combustion, industrial waste and wastewater, and manufacturing.

Commercial & Residential GHGs. In addition to emissions from electricity generation and natural gas direct use, GHG emissions in this sector stem primarily from fuel oil for heating and emissions from waste and wastewater.

Transportation GHGs. The state's largest single source of GHG emissions, primarily from direct combustion of petroleum products, including emissions from on- and off-highway vehicles (like vehicles used in the industrial, agricultural or commercial sectors). Of the emissions generated, about 62 percent are from passenger cars and trucks, while about 27 percent are from heavy-duty vehicles.[6]



Energy End Use Sectors

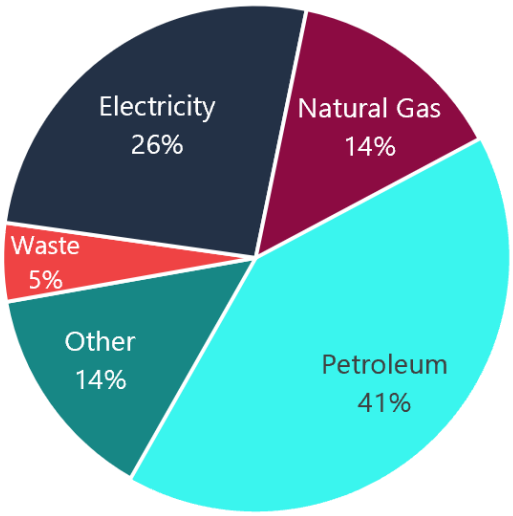
GHG Emissions by Resource

Greenhouse gas data can also be shown by resource, which shows that petroleum products are the largest source of emissions. This correlates to transportation representing the largest sector source of Oregon's GHG emissions.

Petroleum. This represents transportation fuels including diesel, gasoline, propane for on- and off-highway use, equipment use, and jet fuels.

Electricity. This accounts for electricity used in all sectors, which is down from 30 percent in 2015 and includes emissions associated with generation of electricity used in the state, regardless of where it is generated. Emissions from electricity generated in Oregon but used out of state are not included.

Greenhouse Gas Emissions by Resource (2017)[5]

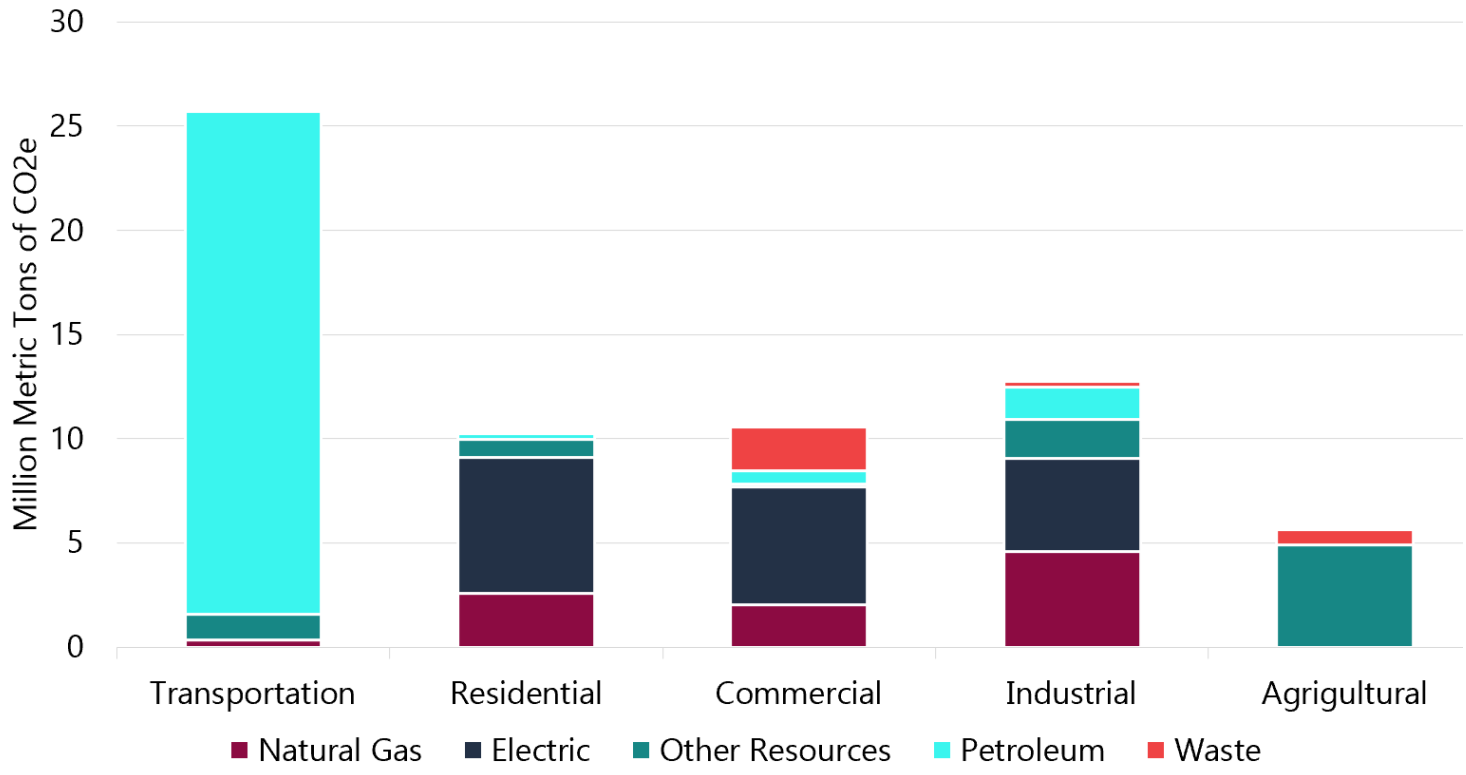


Natural Gas. Direct use of natural gas in all sectors, plus fugitive emissions from distribution. It does not include emissions associated with natural gas-fired power plants.

Other. This category includes uses specific to a sector's activity, such as fertilizer, cement and soda ash production and consumption, semiconductor manufacturing, use of refrigerants and solvents, etc.

Waste. Treatment of waste products from the various sectors including landfill waste and agricultural waste. Some of these emissions result from the combustion of waste.

Oregon Greenhouse Gas Emissions by Sector and Resource (2017)[5]

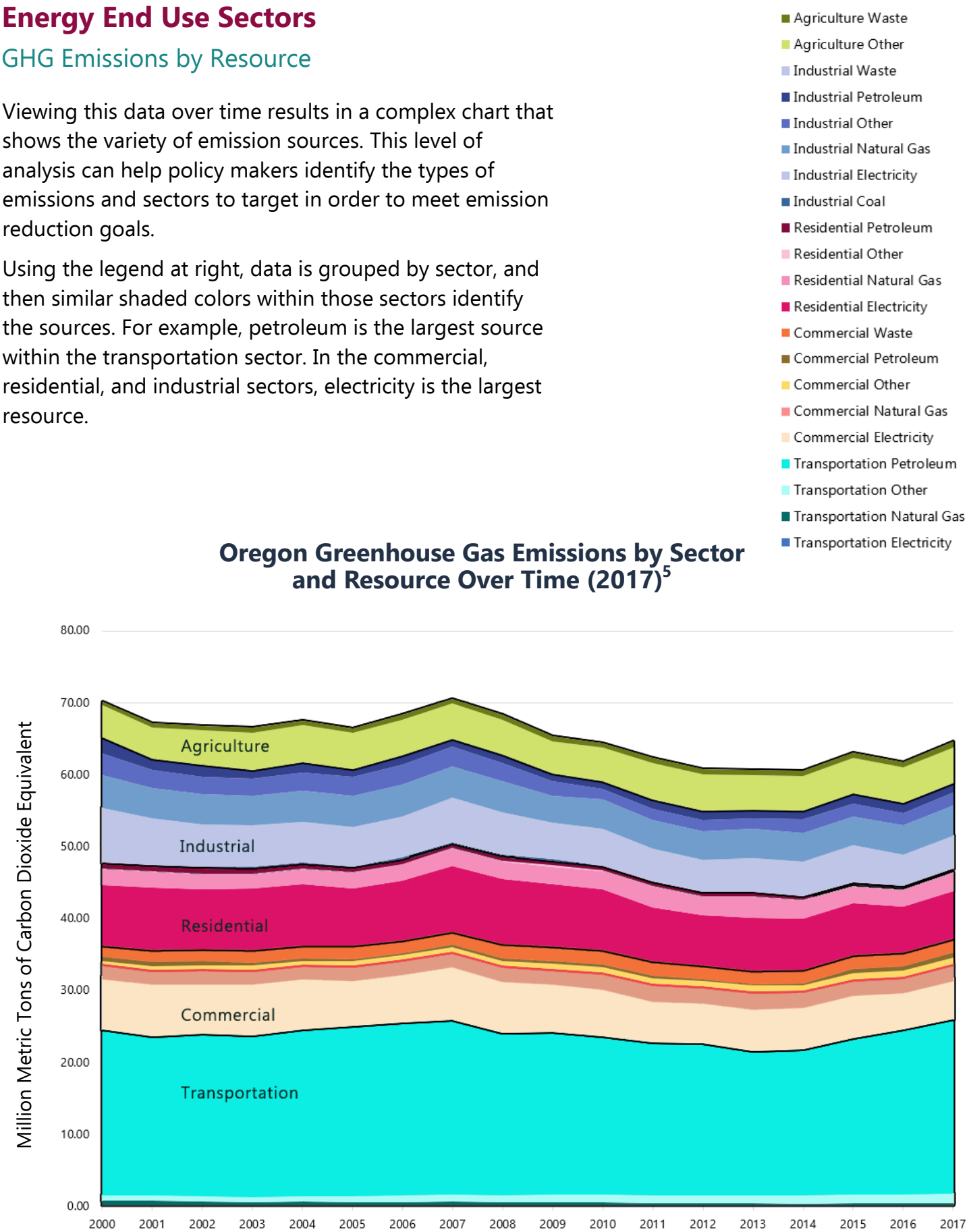


Energy End Use Sectors

GHG Emissions by Resource

Viewing this data over time results in a complex chart that shows the variety of emission sources. This level of analysis can help policy makers identify the types of emissions and sectors to target in order to meet emission reduction goals.

Using the legend at right, data is grouped by sector, and then similar shaded colors within those sectors identify the sources. For example, petroleum is the largest source within the transportation sector. In the commercial, residential, and industrial sectors, electricity is the largest resource.



Sector Profiles

Residential

The residential sector consists of living quarters for private households. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and appliances. Residential energy use is closely tied to weather, housing vintage (decade a home is built), and type of housing.

24.3%

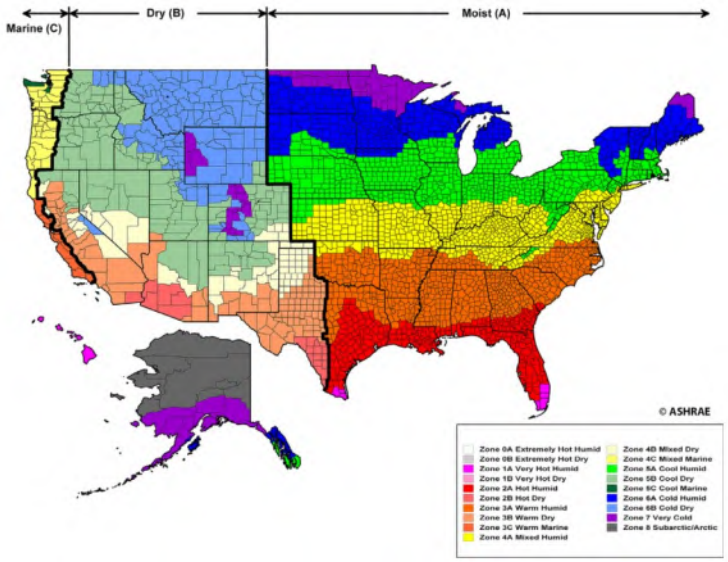
Residential sector's share of Oregon's energy use.

1.6 Million

Number of housing units in Oregon. (2018)[1]

Weather

Oregon is divided by two climate zones with different energy needs and weather patterns. The map to the right from The American Society of Heating, Refrigerating and Air-Conditioning Engineers demonstrates the climates zones in the U.S.[2] In Oregon, west of the Cascade mountain range is a temperate mixed marine climate zone in yellow. East of the Cascade mountain range in green, is a cool dry climate with more heating and cooling days, requiring more heating and cooling energy use. Buildings in Eastern Oregon have a higher average energy use index, meaning they typically use more energy per square foot.



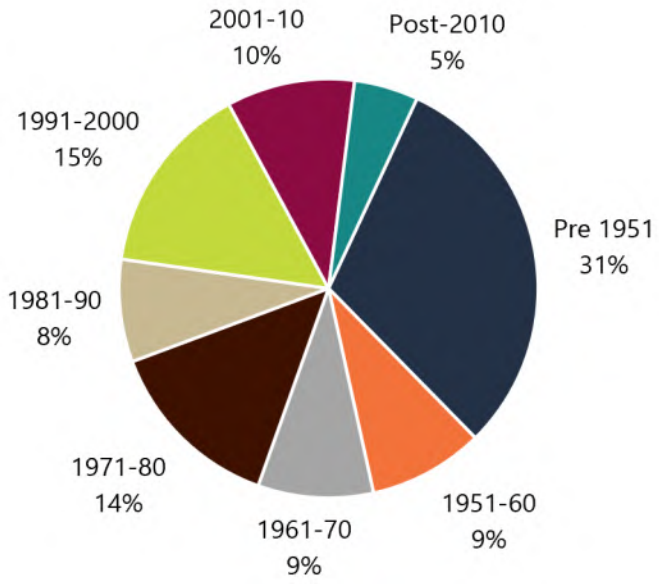
Vintage

The residential sector includes new construction and existing construction — and energy use is very different between them, especially when comparing a newly built home to a decades-old home. Oregon's residential energy code has made significant performance increases since Oregon's first energy code in 1974.

Older homes with less insulation and older equipment use more energy for heating and cooling than newer, more efficient homes. Home vintage can indicate opportunities for updating heating and cooling equipment, water heating, insulation, windows, and house weatherization.[3]

About 71 percent of all homes are pre-1990.

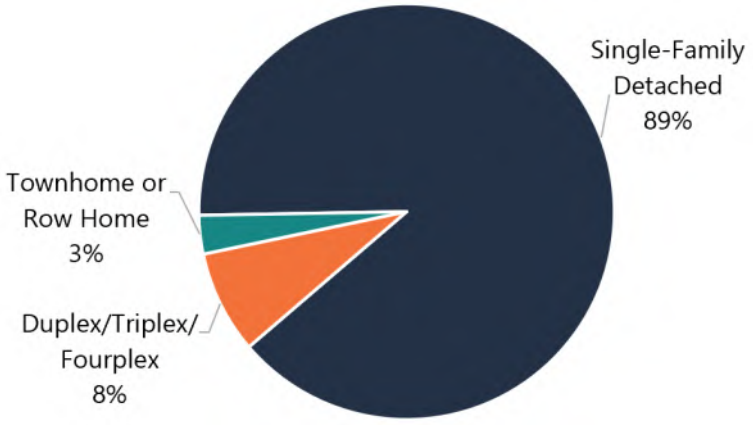
Oregon Homes by Vintage[4]



Type of Housing

Single-family detached homes comprise more than 80 percent of Oregon's single-family housing stock. Attached homes can use less energy for heating and cooling because they have less surface area exposed to the elements.

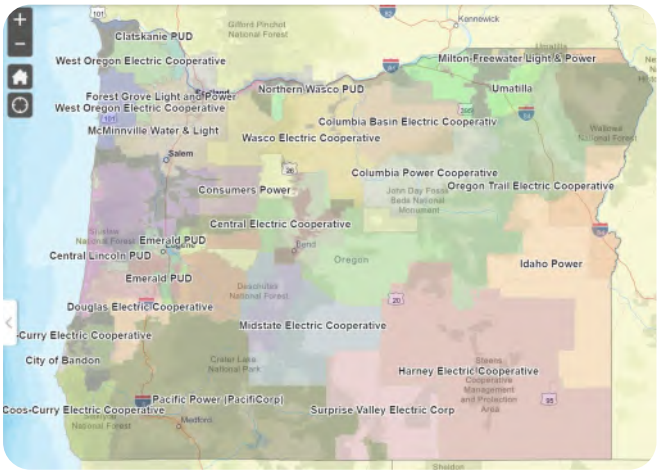
Oregon Housing Types[4]



Ownership and Vintage

Another way to look at housing stock in Oregon is by ownership and vintage across the region. Oregon's northwest region has the largest number of housing units, as well as the highest percentage of rental units. The distribution also shows most housing units were built prior to year 2000, with half being built prior to 1980. Ownership is not necessarily a factor in energy use, but it can affect investment in retrofits that can reduce energy costs of older homes.[4]

Region	Total Occupied Housing Units	Share of Units That Are Rental Properties	Share of Units That Are Pre-1980 Homes	Share of Units That Are Pre-2000 Homes
East Oregon	209,655	35%	49%	78%
NW Oregon	1,176,679	39%	55%	83%
SW Oregon	205,501	35%	53%	82%
All of Oregon	1,591,835	38%	54%	82%



Looking for your local utility? Use the Oregon Department of Energy's online lookup tool: **www.tinyurl.com/FindYourUtility**

Residential Energy Efficiency

Oregon's energy efficiency programs and policies save residential customers energy and money while increasing household comfort. If average residential energy consumption per person remained constant at 1990 levels, total energy consumption would have been 26 percent higher — about 1,600 average megawatts — according to the Northwest Power and Conservation Council. Regional annual residential per capita electricity use in 2015 was about 1,000 kilowatt-hours per year lower than in 1990, a 20 percent reduction.[6]

There is room for improvement when it comes to energy saving opportunities for homes. The Northwest Power and Conservation Council's 2019 Annual Regional Conservation Progress Report lays out these opportunities:

Lighting. 42 percent of Oregon homes have converted to Compact Fluorescents or LED lighting — more than half retain older, less efficient lighting.[8]

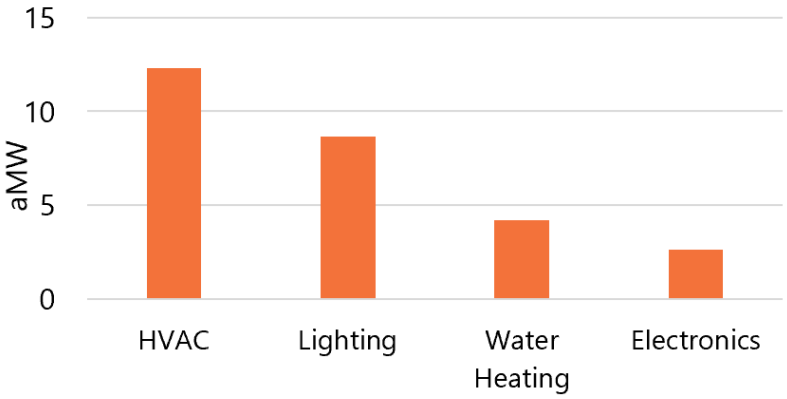
Heating, Ventilation and Air Conditioning. 57 percent of homes in the region have furnaces. Upgrading an electric furnace to a heat pump can cut heating electricity use in half.[8]

Electronics. Homes have a lot of electronic devices, and most of them are plugged in all the time. Simple controls that turn off equipment when nobody is in the room can significantly reduce energy use.[8]

Water Heating. Just 2 percent of homes in the region have upgraded to a heat pump water heater. A heat pump water heater can reduce the electricity used to heat water by half or better.[7 8]

The chart at right shows savings potential in average megawatts if the options above were adopted. A typical Oregon home uses about 12,000 kwh each year. These savings projections are equal to the electricity use of more than 20,000 homes.[6]

Oregon Residential Savings Potential (aMW)
NWPCC Seventh Power Plan



Trends in Single Family Housing[8]

- LEDs have increased from less than 1 percent six years ago to nearly a quarter of all installed bulbs.
- Connected lighting, bulbs that connect to home Wi-Fi, are found in 2 percent of homes.
- 7 percent of homes have smart thermostats.
- More homes are using gas equipment for primary heating, water heating, and cooking.
- More homes are using efficient heating and cooling equipment.
- Television technology has changed and improved in efficiency from an average power draw of 112 watts down to 83 watts.
- Tests reveal that homes on average are becoming tighter with less air leakage.

Residential Heating and Cooling

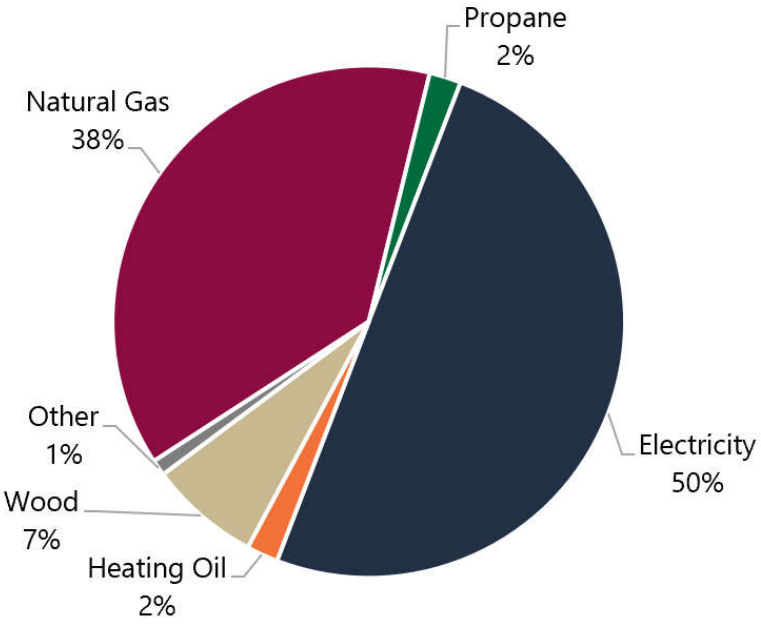
More than half of Oregon homes heat with electricity. Cooling types vary among Oregon homes, and the percentage of homes using air conditioning increased from 42 to 57 percent between 2012 and 2017.[9]

12,642 kWh

Average annual residential electricity use in Oregon in 2018.

673 therms

Average annual residential natural gas use in Oregon in 2018.

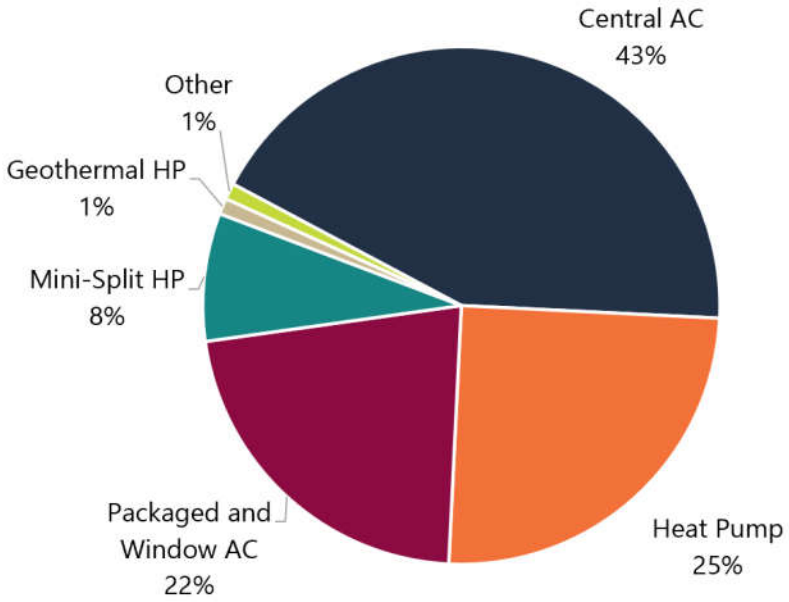


Average Heating Types Across Oregon Homes[9]

County Profiles

The web version of this report provides county-by-county energy information:

energyinfo.oregon.gov/ber



Average Cooling Types Across Oregon Homes[9]

Sector Profiles

Commercial

The commercial sector is diverse and includes buildings of various types and sizes, such as offices and businesses, government, schools and other public buildings, hospitals and care facilities, hotels, malls, warehouses, restaurants, and places of worship and public assembly. Total floor area of common commercial space types in our region is approximately 3.4 billion square feet, with an average annual growth of approximately 1.9 percent since 1990.[1] The commercial sector is distributed across buildings of various sizes, with buildings less than 5,000 square feet accounting for nearly as much total area as buildings greater than 100,000 square feet.[2]

19.3%

Commercial sector's share of Oregon's energy use.

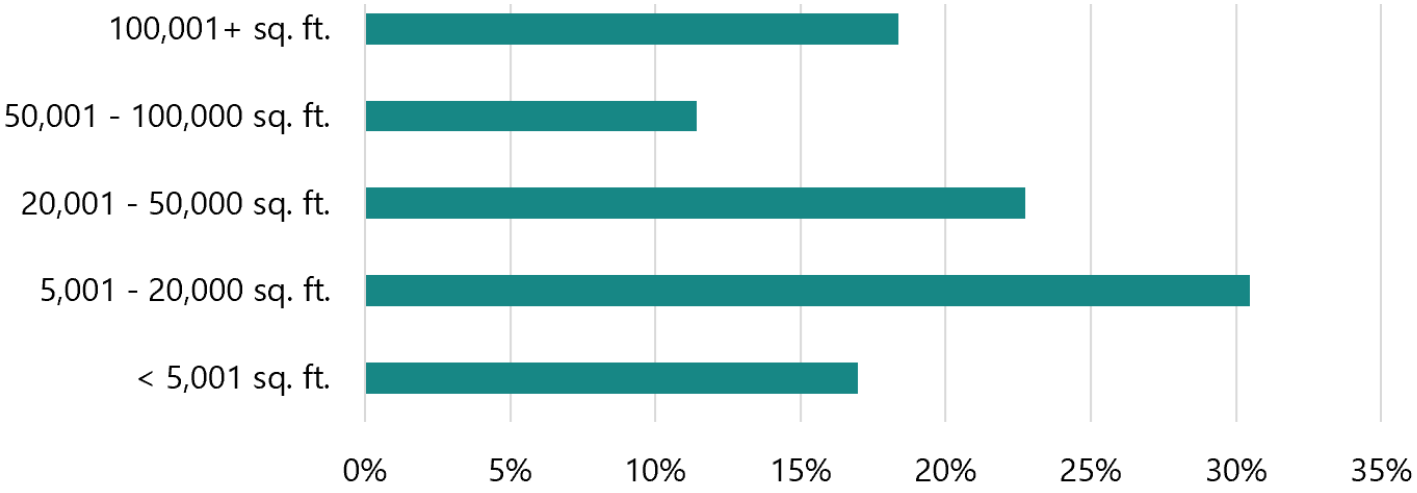
7.6%

Percentage reduction in energy use by the sector since 2000.[4]

64%

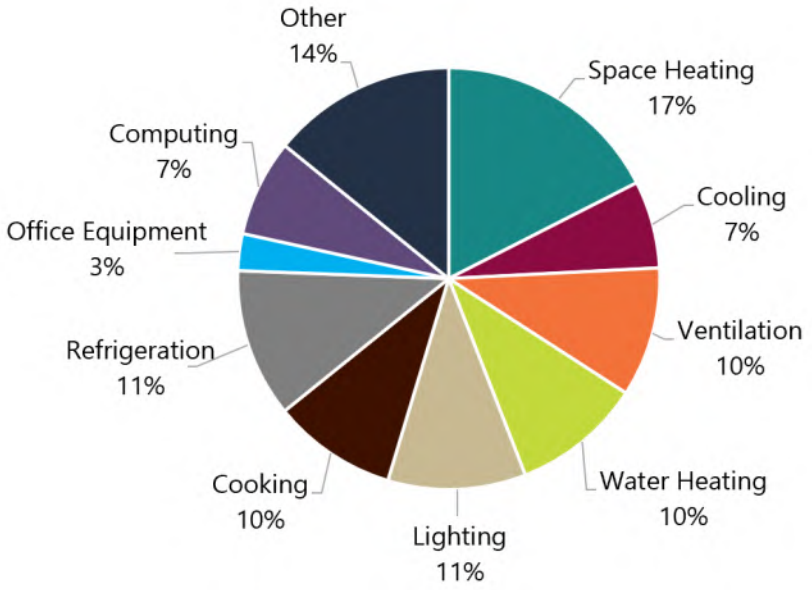
Percentage of northwest buildings that were built before 1990.[3]

Distribution of Regional Floor Space by Building Size in the Northwest



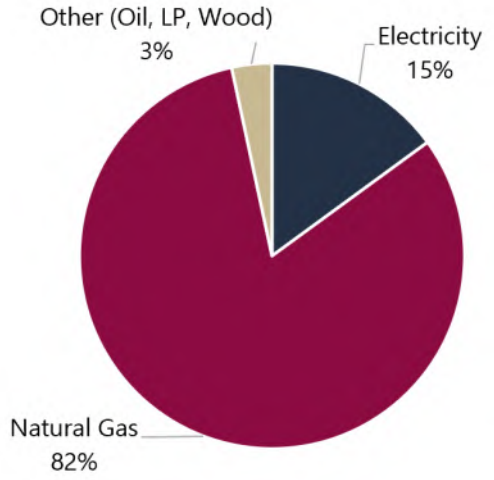
Regional Commercial Energy End Uses

In our region, energy — from all sources, including electricity, natural gas, or other fuels — is used for HVAC, lighting, computing, and other commercial needs.[5]



Energy Use

Oregon Commercial Building Primary Heating System Type[6]



Heating, cooling, and ventilation, which are responsible for the largest share of electricity and natural gas use in a commercial building, are provided through central systems, individual units, or a combination of both. The majority of commercial spaces in our region continue to use natural gas as a fuel source; however, recent studies suggest a shift toward a greater percentage of electrically heated spaces in new construction.[7] Over 95 percent of commercial buildings use electricity or natural gas for heating.

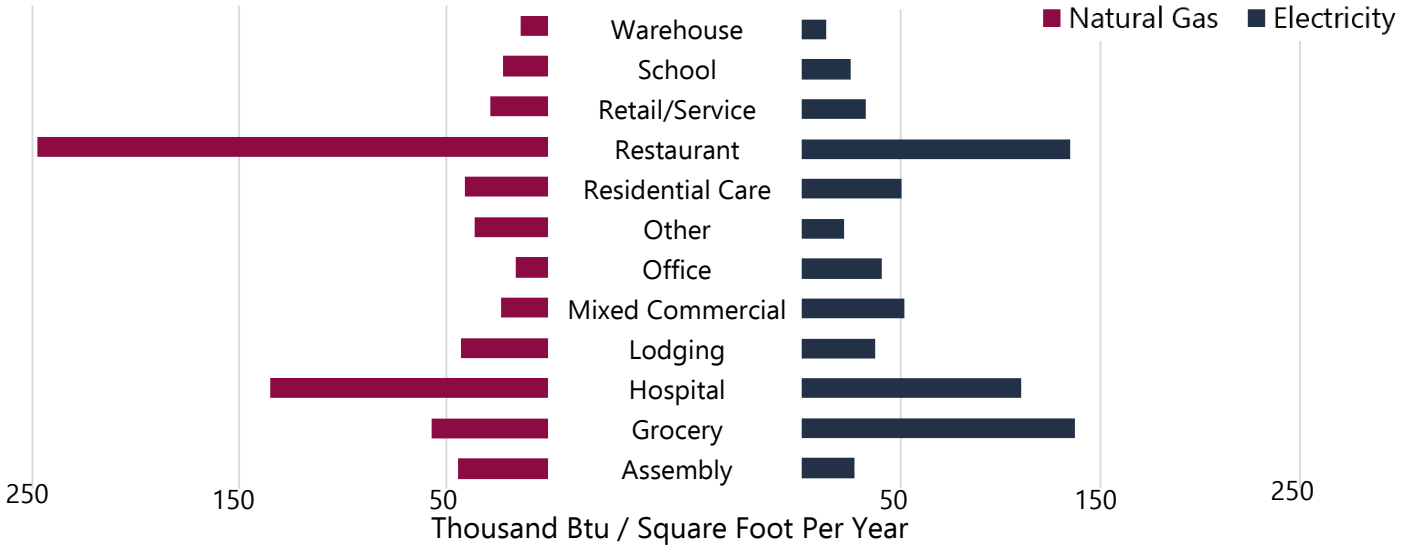
Lighting is the third largest share of energy use for commercial buildings. Efficiency and type of lighting are evolving as incandescent and fluorescent lighting is replaced with energy-efficient LEDs. Refrigeration and cooking use a lot of energy, with refrigeration accounting for about 18 percent of overall electricity use and cooking accounting for about 25 percent of natural gas use in commercial buildings in the Northwest.[8] [9]

Energy Performance

Energy Performance is often measured by comparing a building's annual energy use to its size, and depends on a building's construction, equipment efficiency, operation, and location. This metric combines all energy consumption (like electricity and natural gas) into common units that are normalized to building area, and commonly uses units of kBtu per square foot per year. This is often referred to as a building's EUI, or Energy Use Intensity. In commercial buildings, floor space, the type of building, and its activities drive energy use.

Financial incentives, improved building code and appliance standards, and energy efficiency programs are helping commercial buildings improve energy performance. The Portland Commercial Energy Performance Reporting policy requires buildings to benchmark and report annual energy use.[11]

Energy Use Intensity by Building Type[10]



Sector Profiles

Industrial

The industrial sector includes all facilities and equipment used for producing, processing, or assembling goods. The U.S. Energy Information Administration defines the industrial sector to include manufacturing, agriculture, construction, fishing, forestry, and mining (which includes oil and natural gas extraction).[1]

Every industry uses energy, but three industries account for most of the total U.S. industrial sector energy consumption. The U.S. Energy Information Administration estimates that in 2019, the bulk chemical industry (the largest industrial consumer of energy), the refining industry, and the mining industry combined accounted for about 58 percent of total U.S. industrial sector energy consumption.[2]

25.2%

Industrial sector's share of Oregon's energy use.

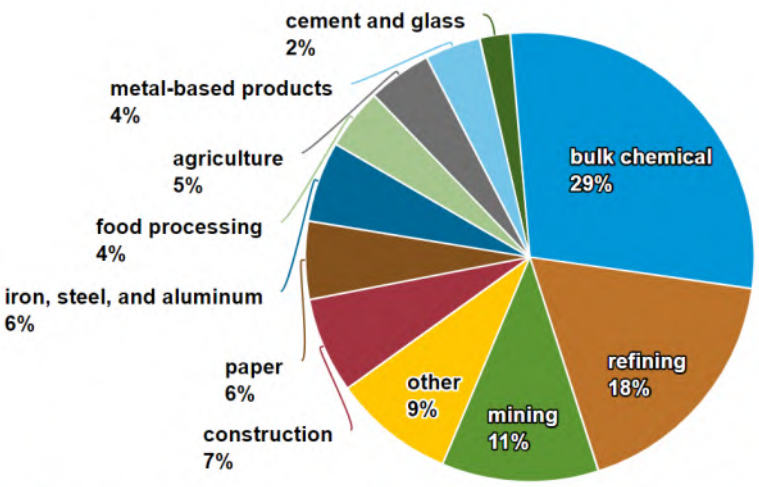
22%

Oregon industrial sector's share of 2018 state GDP.[4]

70%

Manufacturing's share of Oregon's industrial GDP.[4]

U.S. Industrial Sector Energy Consumption by Type of Industry (2019)[2]



Note: Includes electricity purchases and energy sources used as feedstocks for making products. *Other* includes wood products (2%), plastics products (1%), and all others (6%).

Source: U.S. Energy Information Administration, *Annual Energy Outlook 2020*, Tables 24-34, January 2020

Oregon has no petroleum refining, little bulk chemicals processing, and limited mining. Oregon's industrial economy includes other (wood products, computers, and electronics included here), construction, paper, food processing, and agriculture.

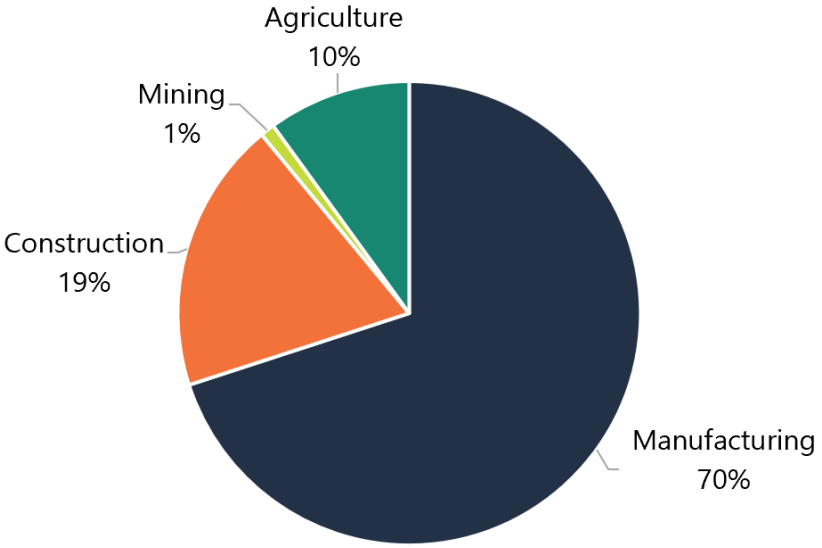
Energy is used in a wide variety of ways in industrial facilities. Fuels fire furnaces and boilers to provide process heat, e.g., steam to dry, heat, or separate product flows. Electricity powers motor systems that pump fluids and compress gases or air and move them around, as well as cooling/ refrigeration, lighting, and appliances.

Despite the range of energy end uses, just a few pieces of equipment consume most of the fuel or electricity in most plants. Typical industrial facilities use the greatest amount of electricity for motor systems followed by process heating and cooling. Process heating, boiler fuel, and combined heat and power processes typically use the largest amounts of fuel.[3]

Oregon has five operating wood pellet manufacturing facilities with a combined production capacity of more than 250,000 tons per year, or about 2 percent of the nation's total.[5]

The majority of Oregon's gross domestic product (GDP) is from non-energy intensive businesses. Around one-seventh of Oregon's 2018 GDP came from manufacturing, with computers and electronic products accounting for almost half of the state's manufacturing GDP.[6] Computer and electronic manufacturing have relatively low energy intensity especially relative to their high value. However, Oregon's industrial sector energy does include agriculture, food processing, and forestry/forest products manufacturing, which tend to be energy intensive. Many forest products/paper operations in Oregon offset natural gas for heat and electricity from the grid by using residual woody biomass/ black liquor for cogeneration of electricity and steam for process heat.[5]

Industrial GDP Broken Down by Subsector[4]

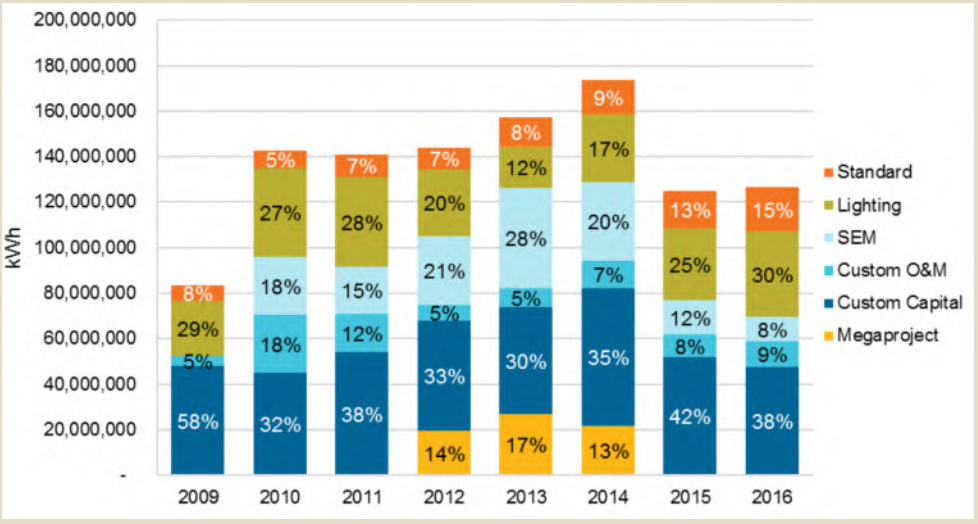


Oregon Industrial Sector Efficiency Insights

Energy Trust of Oregon published a report in 2017 describing production efficiency trends in the industrial and agricultural sector.[7] The report looked at systems, markets, and sources savings over a seven-year period. While Energy Trust's report does not quantify or characterize the entire industrial sector in Oregon, it does provide some insights regarding the industrial sector's energy use. For 2016, lighting, compressed air, refrigeration, primary process, and irrigation were the top five electricity energy efficiency measures for kWh savings. Steam, primary processes, and greenhouses were the top three gas efficiency measures in therms savings.

When Energy Trust was recruiting industrial firms to take part in Strategic Energy Management 2020 cohorts, they found an increasing focus on comprehensive energy management strategies among firms.

This chart from Energy Trust's report shows electric sources of savings from 2009-2016 (kWh)[7]



Sector Profiles

Agriculture

3.5%

Agriculture's share of energy use in Oregon's industrial sector.

225

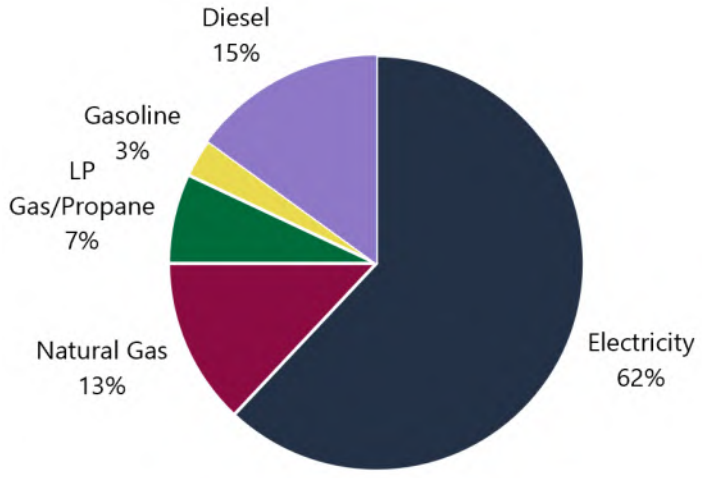
Approximate number of commodities produced in Oregon.[1]

Agriculture is an important part of Oregon's economy and is especially important to many local communities across the state. Oregon is the number one producer in the U.S. of hazelnuts, Christmas trees, and a number of different seeds.[2] ODOE estimates that Oregon agriculture annual direct energy use is about 8,900 billion Btus of energy,[3] or 3.5 percent of total Industrial Sector energy use,[4] and a little less than 1 percent of total U.S. agriculture direct energy usage.[5]

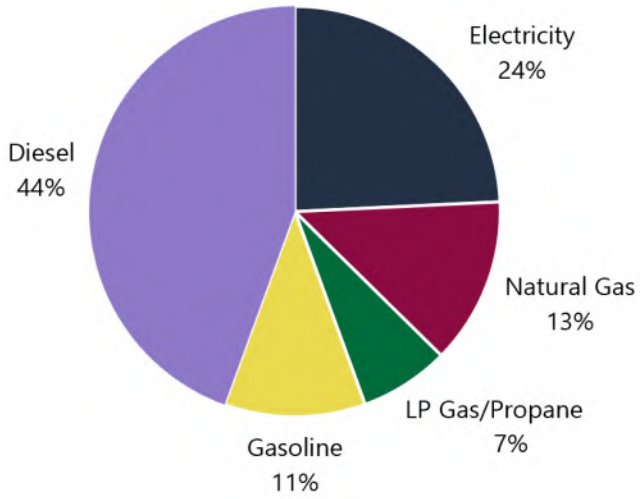
This represents the first time the Oregon Department of Energy has estimated agriculture energy usage. It was challenging to find complete, accurate, and vetted datasets for the various fuels used. ODOE used a mix of state agency, utility, and industry trade association sources by fuel type to generate the estimates. Most of the data was not generated for the purpose of reporting on agriculture energy consumption, meaning that much of the data is not collected or compiled for the agricultural sector but is aggregated with data for other industries. Where possible, the agency used 2018 data to be consistent with industrial sector EIA data, but used 2019 and even a small amount of 2020 data in order to get a full year of reliable data when 2018 data was not available. Though the numbers are estimates, ODOE is confident in the relative size and fuel mix used in comparative analysis and will continue to refine the data in the future.

In 2016, the U.S. agricultural sector consumed about 1,872,000 billion Btu of total energy, or about 1.9 percent of total U.S. primary energy consumption. About 60 percent of the energy was consumed directly on farms and ranches, while the other 40 percent was consumed indirectly in the form of fertilizer and pesticides. Farms and ranches used a variety of direct energy fuels: diesel, electricity, natural gas, gasoline, and liquefied petroleum gas/propane.[6] Despite some variability, neither U.S. agriculture total energy usage nor the fuel mix has changed dramatically over the last decade.[7]

Oregon Estimated Agriculture Energy Consumption (2018-20)[8]



U.S. Energy Consumption in Agriculture (2016)[6]



Sector Profiles

Transportation

The transportation sector covers the movement of goods, services, and people—including passenger and commercial vehicles, trains, aircraft, boats, barges, and ships. Fuel, mostly in the form of petroleum products, is used directly for transportation vehicles and to fuel equipment.

Transportation fuel costs tend to be higher in Oregon because of the region's distance from fuel supplies and a limited number of refineries. The largest portion of the transportation sector's energy use comes from passenger vehicles — and in Oregon, passenger vehicles are older than the national average. The percentage of SUVs and pickup trucks registered in Oregon is greater than national average.

31.2%

Transportation sector's share of Oregon's energy use.

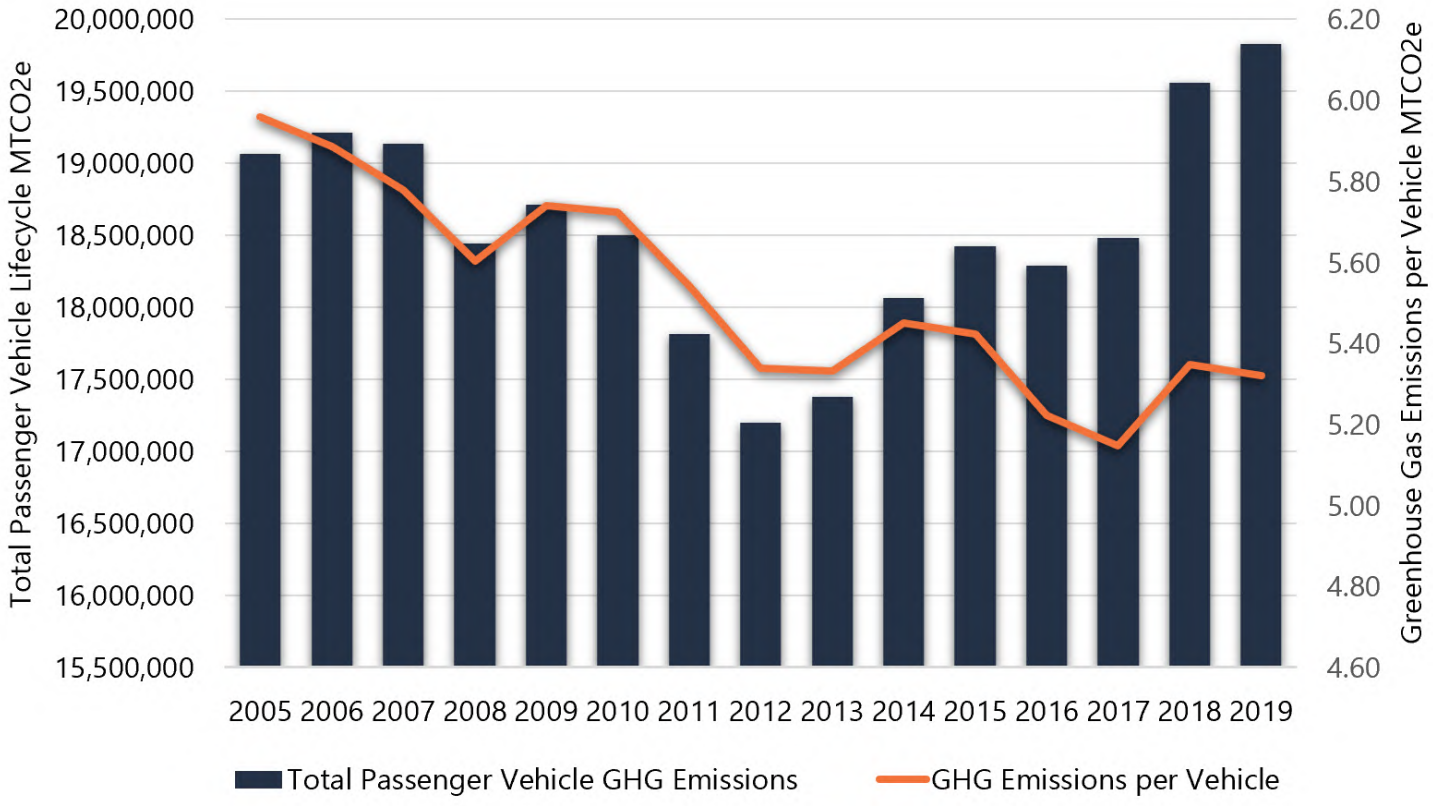
2005 Vehicle

Used 493 gallons of fuel, emitting 5.93 million metric tons of CO2 equivalent per year. (Typical model.)[1]

2019 Vehicle

Used 450 gallons of fuel, emitting 5.32 million metric tons of CO2 equivalent per year. (Typical model.)[1]

Total Passenger Vehicle Lifecycle Emissions and Greenhouse Gas Emissions per Vehicle (Million Tons of Carbon Dioxide Equivalent)



Of the transportation fuels, gasoline creates the largest amount of greenhouse gas emissions — over 19 million metric tons of carbon dioxide equivalent in 2019. Diesel is the second largest contributor of emissions at almost 8 million metric tons of CO2 equivalent. Increased consumption of lower-emitting and renewable fuel sources such as electricity, biodiesel, renewable natural gas, and renewable diesel present an opportunity to reduce emissions from the transportation sector.[2]

Transportation Fast Facts

In 2019, nearly 1.7 billion gallons of gasoline powered vehicles on Oregon roads.[3]

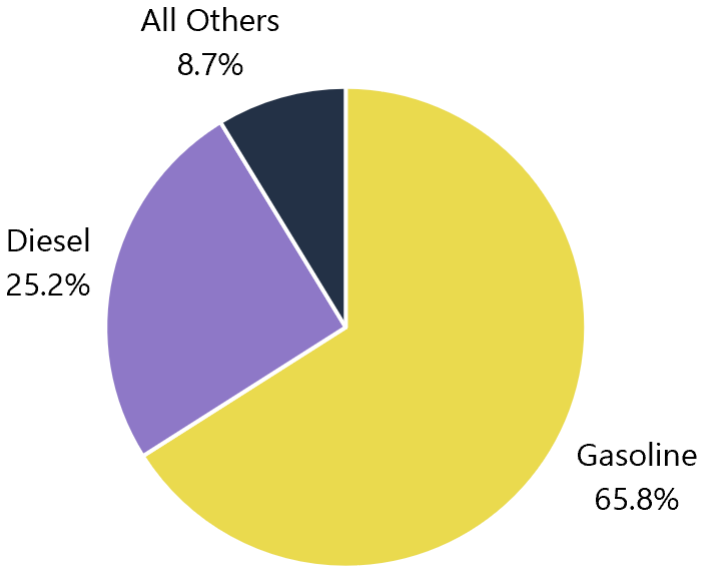
That's over 398 gallons per Oregonian.

The typical Oregon household has at least two cars.[4]

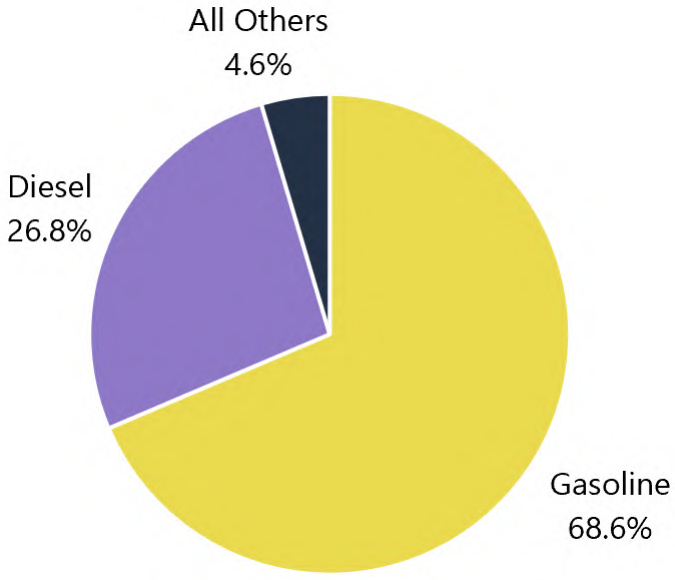
The average retail price of gasoline was $3.02 in 2019.[5]

For electric vehicle drivers, no matter where a car is fueled in Oregon, drivers are reducing greenhouse gas emissions by 50 to 95 percent by fueling with electricity.[6]

Percent of On-Highway Consumption in Oregon (2019)



Percent of Greenhouse Gas Emissions Among Fuel Types (2019)



Learn more about transportation in Oregon in the Technology Review and Policy Briefs sections of this Biennial Energy Report.

Electric Vehicles

January 2011: **672 registered EVs**

June 2020: **31,977 registered EVs**

More than 30,000 EVs in 10 Years

- In 2017, Governor Brown set a target to have at least 50,000 registered electric vehicles on Oregon roads by the end of 2020.[4]
- In 2019, the Oregon Legislature passed Senate Bill 1044, which included additional long-term EV adoption targets.[5]
- Increased adoption and use of electric vehicles is one strategy for reducing Oregon's GHG emissions, fuel consumption, and overall transportation costs for Oregonians.[6]

Oregon EVs by the Numbers

3,726,401 registered passenger vehicles

31,977 registered electric vehicles

0.86% of registered vehicles are EVs[1]

11,726 are plug-in hybrid EVs

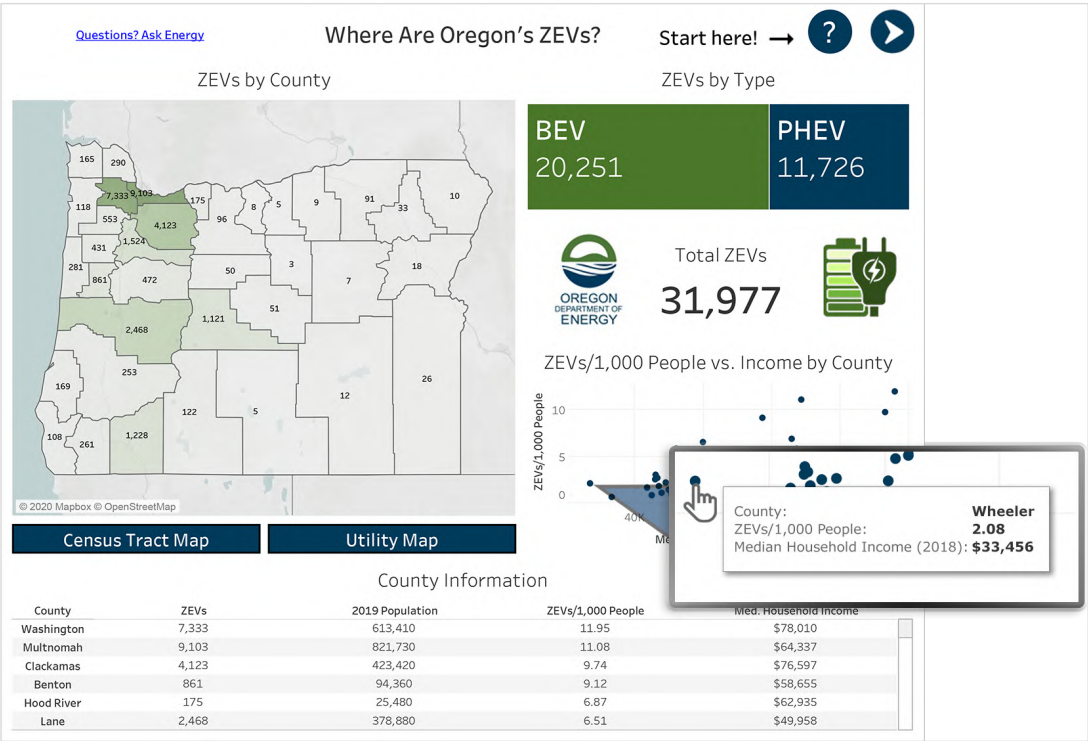
Oregon's EV Charging

9 charging networks

1,796 public EV chargers[3]

650 charging locations

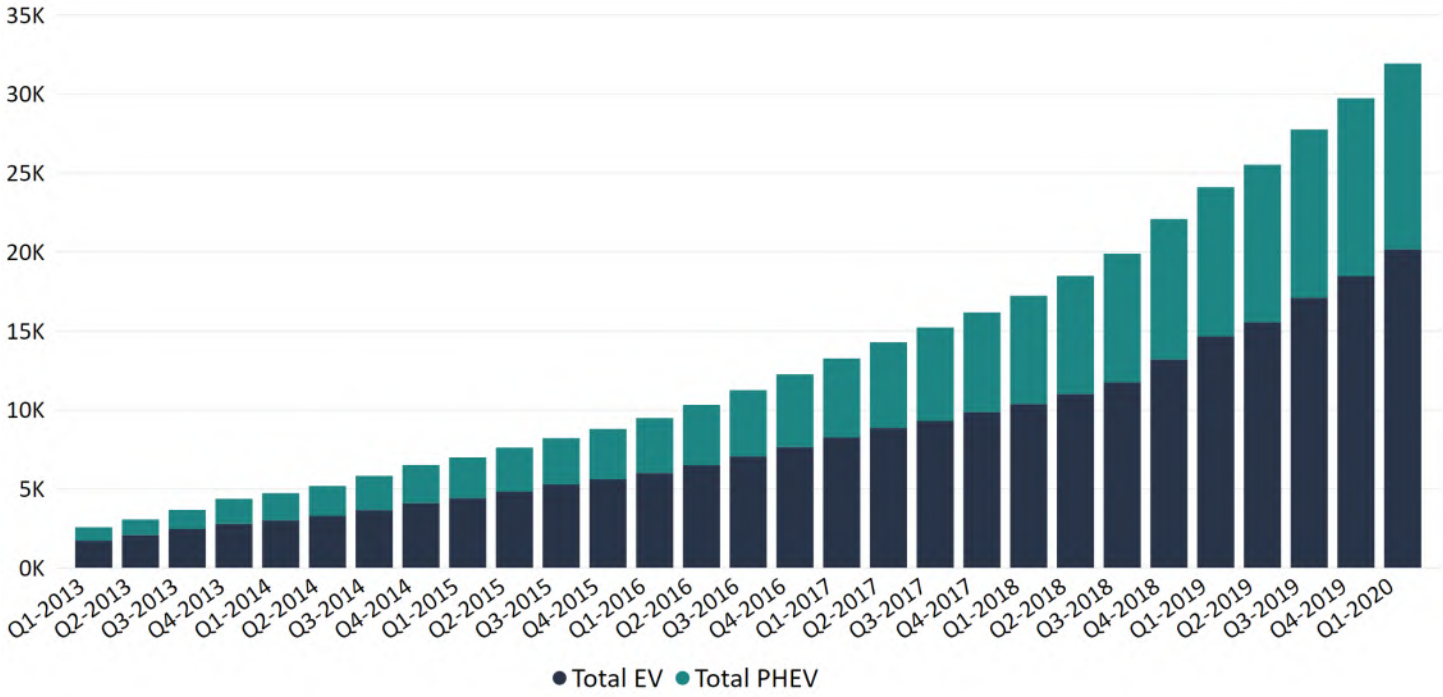
Oregon Electric Vehicle Dashboard



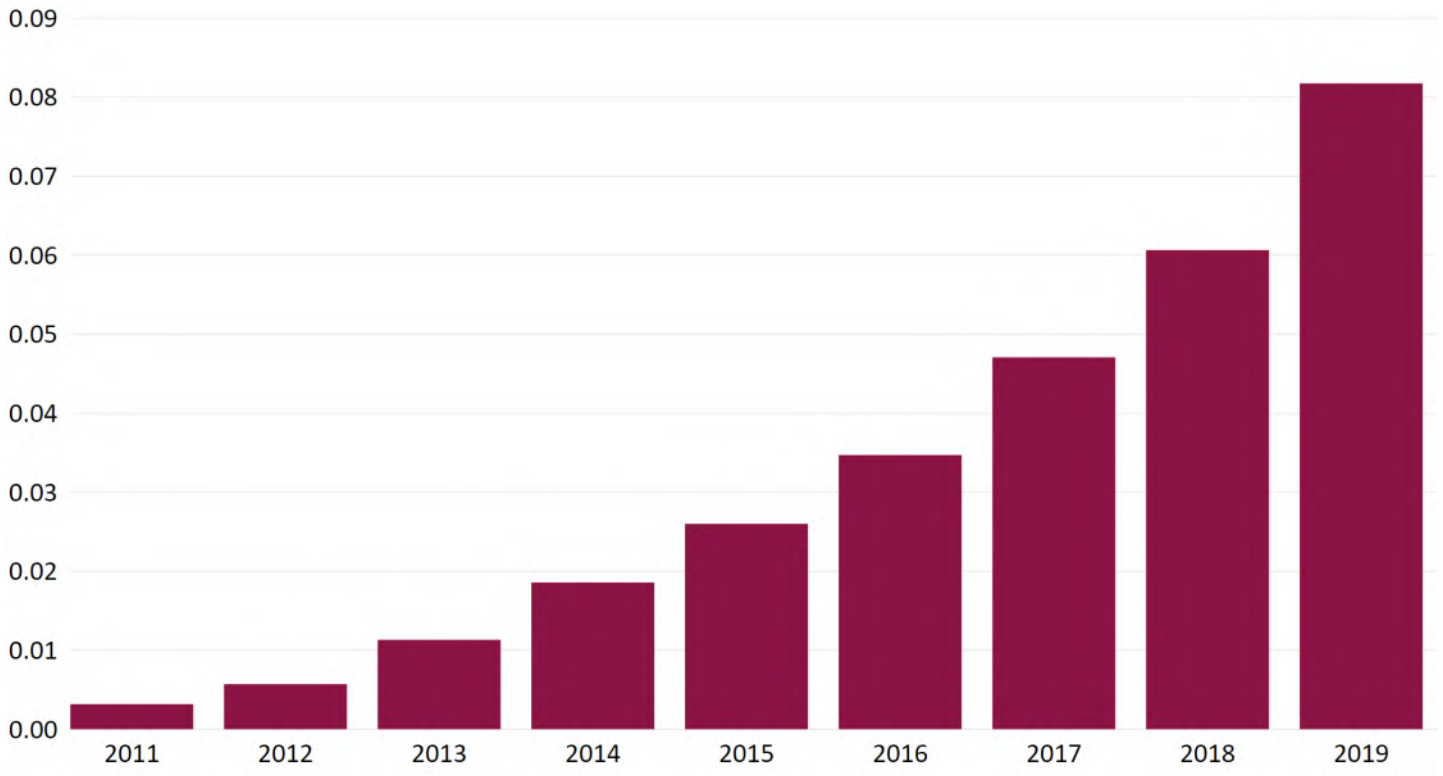
www.tinyurl.com/OregonEVDashboard

In September 2020, the Oregon Department of Energy launched a new interactive Electric Vehicle Dashboard, which shows county-by-county EV adoption information, popular EV models, and other data. The dashboard also includes a calculator to show Oregonians estimated savings by making the switch to an EV.

Cumulative Oregon EVs and PHEVs by Quarter Year (2013—Q1 2020)



EVs and PHEVs as a Percent of Total Fleet by Year



Learn more about EVs in the Technology Review and Policy Briefs sections of this Biennial Energy Report.

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