LPRO: Legislative Policy and Research Office

RENEWABLE FUELS

BACKGROUND BRIEF

Transportation accounts for approximately 31 percent of energy use in both Oregon and the United States (see Figure 1). In 2014, gasoline and diesel cost Oregonians about $7.7 billion, accounting for 57 percent of all the money spent for energy in all sectors (see Figure 2).

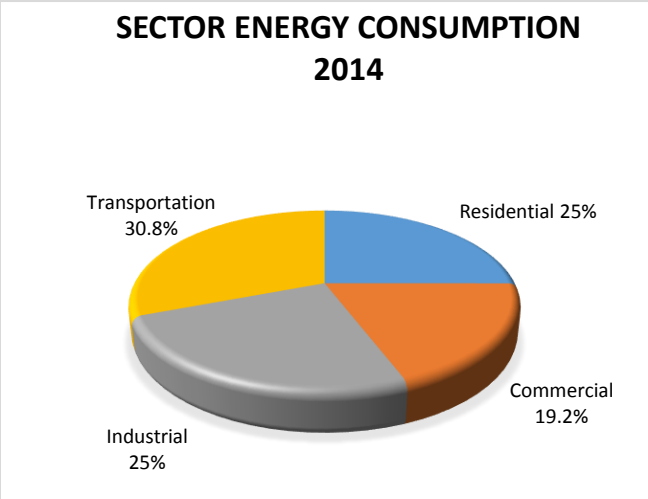

Figure 1: Oregon Energy Consumption

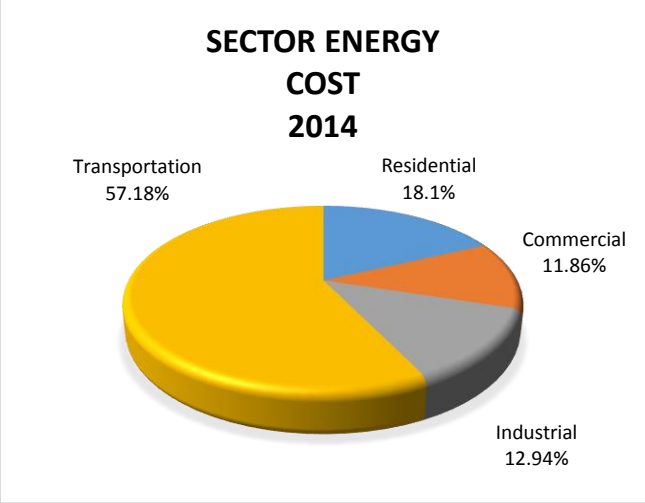

Figure 2: Oregon Energy Cost

In 2005, petroleum (gasoline plus diesel) accounted for 98.3 percent of Oregon highway transportation fuels. Ethanol accounted for 1.5 percent and was used primarily as an additive to clean up emissions from gasoline. The remaining use was made up of compressed natural gas **(CNG)** and liquid propane gas **(LPG)**.

In 2014, total transportation highway fuel use dropped three percent from 2005 levels. Petroleum gasoline and diesel products accounted for 91 percent of demand. Ethanol and biodiesel now have a significant share of Oregon's road use fuel at 7.1 percent and 1.6 percent respectively (see figure 3 on next page).

In 2005, all transportation fuel was imported into the state except for a small percentage of electricity generated in-state for electric vehicles. By 2014, of the more than 149 million Gasoline Gallon Equivalents **(gge)** of ethanol consumed in Oregon, about 40 million gallons were produced at the Pacific Ethanol plant in Boardman.

Factors such as energy security, fossil fuel emissions and health effects of fossil fuels have increased attention on alternative fuels. A major advantage of using biofuels such as ethanol and biodiesel is that blending them with fossil fuels requires only minor adjustments in existing infrastructure. However, there are concerns that biofuels produced from

crops, such as corn, may compete with food sources and that the energy intensity to produce this type of fuel is high.

OREGON TRANSPORTATION FUEL USE AND MIX FOR 2005 AND 2014

	2005		2014	
Fuel Type	GGE – Gas Gallon Equivalent		GGE – Gas Gallon Equivalent	
Biodiesel	850,455	0.04%	33,970,417	1.62%
Compressed Natural Gas (CNG)	1,403,773	0.06%	2,762,717	0.13%
Electricity	1,135,327	0.05%	2,188,929	0.10%
Ethanol	31,343,197	1.45%	149,637,805	7.12%
Liquid Propane Gas (LPG)	1,157,656	0.05%	929,178	0.04%
Petroleum	2,130,719,143	98.3%	1,911,762,278	90.98%
(Gasoline)	1,536,836,639	70.9%	1,346,740,245	64.09%
(Diesel)	593,882,504	27.4%	565,022,034	26.89%
All Others	35,890,408	1.7%	189,489,045	9.02%
Total	2,166,609,551		2,101,251,324	

Figure 3: Oregon Transportation Fuel Use and Mix

ETHANOL

Ethanol is a renewable fuel made from various plant materials, primarily corn. More than 95 percent of United States gasoline contains ethanol at a ten percent blend, mostly due to the United States Renewable Fuel Standard. Oregon's renewable fuel standard requires nearly all gasoline that is sold to be a ten percent ethanol blend.

A higher blend of ethanol known as E85 is also available in Oregon. This fuel can only be used in flexible fuel vehicles, which can use any combination of gasoline and ethanol blends. E85 is available at five public retail locations in Oregon. Additionally, five government entities dispense this fuel into their own fleet of vehicles: the Oregon Department of Administrative Services, Oregon Department of Transportation, Oregon Department of Forestry, Eugene Water and Electric Board and Veterans Affairs Portland Campus.

Several steps are involved in making ethanol available as a vehicle fuel:

- Feedstocks are grown, collected, and transported to an ethanol production facility;
- Ethanol is made from these feedstocks at a production facility along with byproducts such as animal feed and corn oil.
- The fuel is transported to a blender/fuel supplier; and
- Ethanol is mixed with gasoline by the blender/fuel supplier and distributed to fueling stations.

Experts expect cellulosic (non-edible plant material) ethanol will become the dominant source of biofuel in the future. Cellulosic feedstock has several advantages over sugar and starch feedstock including: cellulose cannot be used as food, so there is no potential for conflicts with food resources; there are a wide variety of potential sources (i.e., trees, orchard clippings, corn stover, rice hulls, switchgrass, etc.); and one of the cellulosic components, lignin, has a high-energy content that, once separated, could provide the energy required to convert the cellulosic material to a usable form of fuel. However, currently more energy-intensive processing is required to extract sugars from the cellulosic portions of plants.

In the last few years, five cellulosic ethanol plants have opened in the United States. Several of these are no longer operating, but at least two plants currently manufacture cellulosic ethanol (neither is located in Oregon). Production of this type of ethanol is trending upward. In 2015, the United States produced 2.2 million gallons of cellulosic ethanol.

Oregon is interested in cellulosic ethanol because the state's soil and climate is better suited to growing woody plants than other ethanol feedstock. A cellulosic ethanol demonstration project in Boardman, built by ZeaChem, Inc., developed a cellulose-based biorefinery platform capable of producing advanced ethanol, fuels, and chemicals from poplar trees grown in eastern Oregon. The project produced some ethanol, but it was deemed uneconomical and has shut down. No future cellulose-based ethanol plants are currently being planned in Oregon.

BIODIESEL

Oregon consumed 520,863,000 gallons of on-highway diesel in 2014. The state Renewable Fuel Standard requires that five percent of diesel consumed in the state be biodiesel, which accounts for just over 26 million gallons. Another 3.5 million gallons of biodiesel was consumed in the state through higher blends such as B20, which is a mix of 20 percent biodiesel and 80 percent conventional diesel. The state produces nearly seven million gallons of B20, and the remainder is shipped by rail from the Midwest. Most of the in-state production comes from SeQuential Biofuels in Salem, which has a production capacity of 15 million gallons per year. Currently, SeQuential sells their fuel at 62 locations in Oregon. Several fleets such as those operated by the Oregon Department of Forestry, Oregon Department of Transportation, Eugene Water and Electric Board, City of Portland and Organically Grown, use high blends of biodiesel.

Companies produce biodiesel from a diverse mix of feedstocks including recycled cooking oil, agricultural oils, and animal fats. For example, SeQuential produces most of its fuel from waste vegetable oil feedstocks generated by regional restaurants and food processors.

RENEWABLE DIESEL

Hydrogenation-derived renewable diesel **(HDRD)**, also known as green diesel, is the product of fats or vegetable oils—alone or blended with petroleum—refined by a process called hydrotreating. This fuel is cleaner and has a lower carbon footprint than petroleum-based diesel, and can also operate at colder temperatures than standard diesel or biodiesel. HDRD meets the petroleum diesel American Society for Testing and Materials **(ASTM)** specification, which makes it usable as a direct substitute for petroleum-based diesel without the blending limitations that apply to biodiesel. Several

fleets in Oregon have used the fuel since September 2015. Most of the renewable diesel consumed in Oregon is imported and currently only available in limited quantities.

RENEWABLE NATURAL GAS/BIOGAS

Renewable natural gas consists of biogas (methane) from landfill recovery, wastewater treatment plants, anaerobic digesters at dairies and food or waste processing facilities. Oregon currently has several of these facilities producing methane and converting it to electricity. Many facilities and entities, such as Clean Water Services in Washington County and Columbia Boulevard Wastewater Treatment Plant in Portland, are now considering converting their waste methane into a higher value transportation fuel instead of electricity. However, making biogas into a transportation grade fuel requires additional refining and processing of the biogas in order to meet U.S Environmental Protection Agency transportation fuel standards. Additional challenges include price structures, access to pipelines and standards for biogas quality.

RENEWABLE FUEL STANDARDS

A Renewable Fuel Standard **(RFS)** requires a certain percentage of renewable fuels be used in the transportation fuel mix by a specific date. The federal RFS, included in the federal Energy Independence and Security Act of 2007, requires at least 36 billion gallons of renewable fuels in the national transportation fuels mix by 2022. Advanced biofuels (i.e., biofuels not produced from corn starch and that achieve 50 percent reduction in greenhouse gas emissions) must constitute 60 percent of the fuel mix. It is not certain if the United States is on track to achieve this goal.

Oregon also adopted a RFS in 2007 (House Bill 2210) for ethanol, biodiesel and renewable diesel. The Oregon RFS required all motor gasoline (with some exceptions) be E10 (ten percent ethanol, 90 percent gasoline) as soon as Oregon's production capacity for ethanol reached 40 million gallons per year. This capacity was met in September 2007 when Pacific Ethanol opened its ethanol production facility in Boardman. The diesel portion of the standard was implemented in two phases. By 2009, all diesel sold in Oregon had to be B2 (two percent biodiesel, 98 percent diesel), with a few exceptions. Once Oregon production capacity reached 15 million gallons, the standard increased to B5 (five percent biodiesel, 95 percent diesel). In August 2010, SeQuential-Pacific Biodiesel in Salem reached that capacity and the B5 standard was implemented in April 2011.

CLEAN FUELS PROGRAM

The 2009 Oregon Legislature passed House Bill 2186 establishing a low carbon fuel standard to reduce carbon emissions by ten percent in the transportation sector over a ten-year period. The bill contained a provision that included a 2015 sunset of the program. Senate Bill 324 (2015) extended the timeline for achieving the ten percent reduction to 2025 and removed the sunset. The following table describes Oregon renewable fuels legislation since 2005.

Legislation	Year Enacted	Summary
Biofuels Production Property Tax Exemption	2005	Property used to produce biofuels, including ethanol and biodiesel, may be eligible for a property tax exemption if located in a designated Renewable Energy Development Zone. The Oregon Business Development Department must receive and approve an application from a qualified rural area to designate the area as a Rural Renewable Energy Development Zone. (Reference ORS 285C.350 through 285C.370)
Renewable Fuel Standard (RFS)	2007	Established minimum requirements for biodiesel, ethanol, and other renewable diesel to be included in Oregon's diesel and gasoline supplies.
Biomass Collector Credit	2007	Tax credits for producers and collectors of biofuel raw materials to encourage production and use of alternative fuels. This program is scheduled to sunset with the 2017 tax year, with the exception of animal manure used in a biodigester, which will sunset with the 2021 tax year.
Ethanol Exemptions	2008	Exempted fuel for certain non-road uses, including fuel for airplanes, water craft, Class I and Class III off-road vehicles, antique vehicles, racing vehicles, snowmobiles, and tools, from ethanol blending requirements established in the RFS.
Diesel Additives	2010	Allowed addition of diesel additives between October 1 and February 28 to prevent congealing.
Energy Incentive Program Alternative Fuel Infrastructure	2011	Business owners and others may be eligible for a tax credit of 35 percent of eligible costs for qualified alternative fuel infrastructure projects. Qualified infrastructure includes facilities for mixing, storing, compressing, or dispensing fuels for vehicles operating on alternative fuels. Qualified alternative fuels include electricity, natural gas, gasoline blended with at least 85 percent ethanol (E85), propane, and other fuels that the Oregon Department of Energy approves. The credit is available through December 31, 2017 when the program is scheduled to sunset. (Reference ORS 315.336, 469B.320, and 469B.323)
Biodiesel Tax Exemption	2013	Biodiesel blends containing at least 20 percent biodiesel derived from used cooking oil are exempt from the $0.30 per gallon state fuel excise tax. The exemption does not apply to fuel used in vehicles with a gross vehicle weight rating of 26,001 pounds or more, fuel not sold in retail operations, or fuel sold in operations involving fleet fueling or bulk sales. The exemption expires after December 31, 2019. (Reference ORS 319.530)

Clean Fuels Program	2009 - 2016	HB 2186 (2009) required the Oregon Department of Environmental Quality to implement a low carbon fuel standard if the program was technically and financially feasible. The bill included a sunset provision. The legislature removed the sunset in 2015 (SB 324) and the program began January 1, 2016. The program is meant to lower carbon emissions in the transportation sector over a ten-year period.

Figure 4: Renewable Fuels Legislation

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