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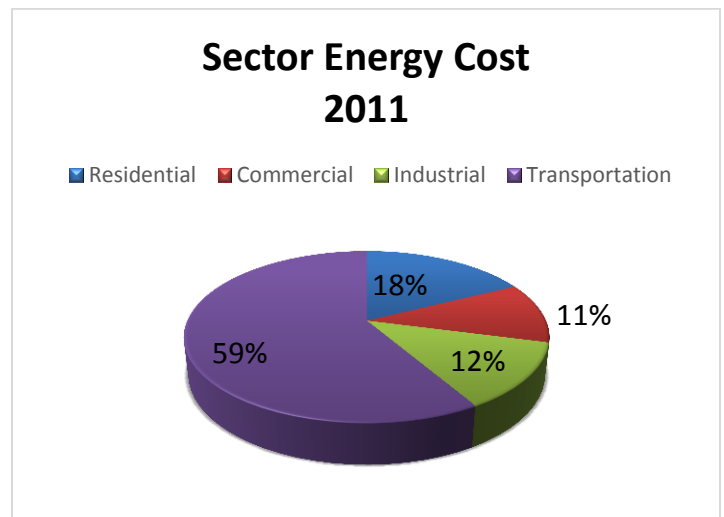
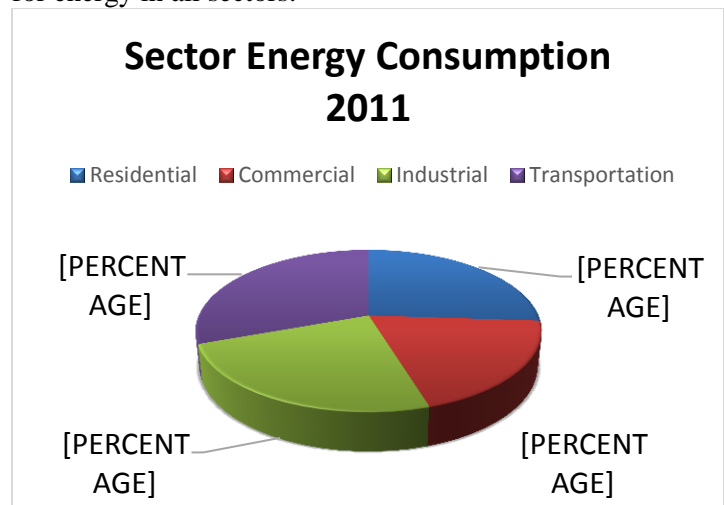
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Background Brief on ...

Renewable Fuels

Transportation accounts for approximately 31 percent of energy use in both Oregon and the United States. In 2011, gasoline and diesel cost Oregonians about \$7 billion, accounting for 59 percent of all the money spent for energy in all sectors.



In 2005, petroleum accounted for 98.4 percent of Oregon highway transportation fuels. Ethanol demand was 1.3 percent of the fuel used primarily as an oxygenate to

clean up emissions from gasoline. The remaining use was made up of Compressed Natural Gas and propane.

In 2013, transportation highway fuel use had dropped 8.1 percent from 2005 levels.

Petroleum gasoline and diesel products accounted for only 91.2 percent of demand. Ethanol and biodiesel now have a significant share of Oregon’s road use fuel at 7.39 percent and 1.3 percent respectively.

Oregon Transportation Fuel use and Mix for 2005 and 2013

Fuel Type	2005		2013	
	Gallons		Gallons	
Gasoline	1,499,996,000	69.61%	1,316,406,407	66.49%
Diesel	620,634,000	28.80%	488,617,693	24.68%
Ethanol	32,500,000	2%	146,267,379	7.39%
Biodiesel	0		25,716,721	1.30%
CNG	1,600,000	0.07%	2,083,239	0.11%
LPG	29,400	0.00%	566,561	0.03%
Electricity (GGE)	0		121,532	0.01%
Petroleum	2,120,630,000	98.40%	1,805,024,101	91.17%
All Others	34,129,400	1.60%	174,755,431	8.83%
Total	2,154,759,400		1,979,779,532	

All of these fuels were imported into the state in 2005. Of the more than 146 million gallons of ethanol consumed in Oregon in 2013, about 40 million gallons were produced at the Pacific Ethanol plant in Boardman. Additionally, the plant produced 350,000 tons of wet distillers grains sold to local dairies as feed.

Concerns about energy security, fossil fuel emissions (criteria pollutants and greenhouse gas emissions) and health consequences have made alternative fuels an attractive option. Biofuels such as ethanol and biodiesel can be used in combination with or instead of fossil fuels with only minor adjustments in existing infrastructure.

Ethanol

Ethanol is a renewable fuel made from various plant materials collectively known as biomass. More than 95 percent of U.S. gasoline contains ethanol in a low level blend to oxygenate the fuel and reduce air pollution.

Ethanol is also available as E85, or high-level ethanol blends. This fuel can be used in flexible fuel vehicles, which can run on high-level ethanol blends, gasoline, or any blend of these. E85 is available at seven public retail locations in Oregon. Additionally, four fleet locations dispense the fuel into their vehicles, these fleets include the State of Oregon, Eugene Water and Electric Board and the Federal GSA.

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

- Biomass feedstocks are grown, collected, and transported to an ethanol production facility.
- Ethanol is produced from feedstocks at a production facility and then transported to a blender/fuel supplier.
- Ethanol is mixed with gasoline by the blender/fuel supplier and distributed to fueling stations.

The use of ethanol is required by the federal Renewable Fuel Standard (RFS) as well as the Oregon RFS. The U.S. produced 13.1 billion gallons of ethanol in 2013.

Experts expect that in the future cellulosic ethanol will become the dominant source of biofuel. 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 finally, one of the cellulosic components, lignin, has a high-energy content that, once separated, can be used to fuel the rest of the process. However, more processing is required to extract sugars from cellulosic portions of plants (stalks, leaves, trunks, branches, husks, etc.).

The Environmental Protection Agency approved the first commercial cellulosic ethanol plant in Florida from a firm named INEOS. The biorefinery uses vegetative, yard waste, and agricultural waste to produce cellulosic ethanol. Four cellulosic projects are scheduled to come online in 2014 including DuPont's plant in Nevada, Iowa at 30 million gallons per year; POET-DSM's plant in Emmetsburg, Iowa at 25 million gallons per year; Abengoa Bioenergy's plant in Hugoton, Kansas at 25 million gallons per year; and Quad County Corn Processors' 2 million gallons per year plant in Galva, Iowa.

There is particular interest in cellulosic ethanol in Oregon because its soil and climate is better suited to growing woody plants than other ethanol feedstock. There is a cellulosic ethanol demonstration project in Boardman, Oregon. ZeaChem Inc. has developed a cellulose-based biorefinery platform capable of producing advanced ethanol, fuels, and chemicals from poplar trees grown in eastern Oregon.

Biodiesel

Oregon consumed 488,617,693 gallons of on-highway diesel in 2013. The state Renewable Fuel Standard requires five percent biodiesel by volume accounting for just over 25.7 million gallons of biodiesel consumed in the state. Nearly seven

million gallons of that was produced in-state and the remainder is shipped by rail to local terminals from the Midwest. Most of the in-state production comes from SeSequential Biofuels in Salem. SeSequential's plant has a production capacity of 15 million gallons per year. SeSequential produces most of its fuel from waste vegetable oil feedstocks from restaurants and food processors around the region.

Biodiesel is produced from a diverse mix of feedstocks including recycled cooking oil, agricultural oils, and animal fats. Biodiesel is made by mixing vegetable oils or animal fats with alcohol (usually methanol) and a catalyst to produce fatty acid methyl esters (chemical name for biodiesel) and glycerin (by-product).

Currently, the USDOE Alternative Fuels Data Center shows 23 locations selling 20 percent or higher biodiesel blends in Oregon. Additionally, several fleets such as Oregon Department of Forestry, Oregon Department of Transportation, Eugene Water and Electric Board, Organically Grown, and the City of Portland use high blends of biodiesel in their fleets.

Renewable Natural Gas/Biogas

Renewable Natural Gas consists of biogas (methane) from landfill recovery, waste water treatment plants, anaerobic digesters at dairies, food processing, or waste processing facilities. Oregon currently has several of these facilities producing methane and converting it to electricity. Many facilities and entities are now analyzing the possibility of converting their waste methane into a higher value transportation fuel instead of electricity. Refining and processing biogas into a transportation grade fuel requires increasing the proportion of methane and decreasing the proportion of carbon dioxide and the removal of contaminants.

Renewable Fuel Standards

A Renewable Fuel Standard requires a certain percentage of renewable fuels to be used in the transportation fuel mix by a certain date. The federal RFS, included in the federal Energy Independence and Security Act of 2007, requires at least 36 billion gallons of renewable fuels be included in U.S. transportation fuels by 2022, 60

percent of which must be from advanced biofuels (i.e., biofuels not produced from corn starch and that achieve 50 percent reduction in greenhouse gas emissions).

Oregon adopted a RFS in 2007 (House Bill 2210) for ethanol, biodiesel, and other renewable diesel. The Oregon RFS requires all motor gasoline (with some exceptions) to be E10 (10 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.

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 it is 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 <u>Oregon Revised Statutes</u> 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 to encourage production and use of alternative fuels for producers and collectors of biofuel raw materials
Ethanol Exemptions	2008	Exempted certain non-road uses, including 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, 2018. (Reference <u>Oregon Revised Statutes</u> 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 <u>Oregon Revised Statutes</u> 319.530)
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Figure 1: Renewable Fuels Legislation

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