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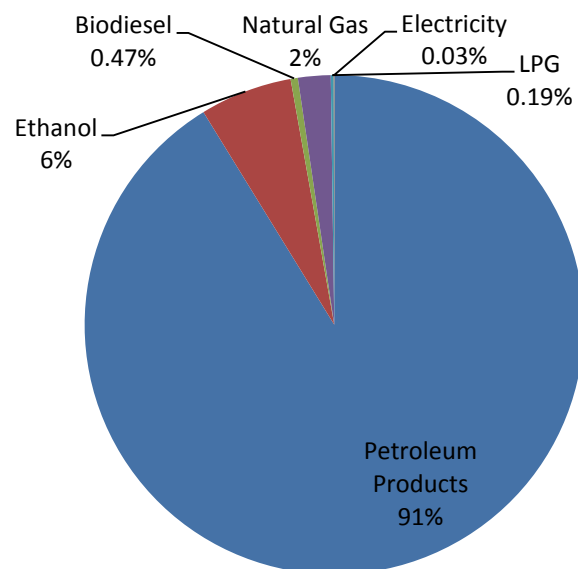
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Background Brief on ...

Renewable Fuels

Transportation accounts for approximately 33 percent of energy use in both Oregon and the United States (U.S.). Gasoline and diesel are the most common transportation fuels, 60 and 20 percent respectively. These two fuels account for more than 50 percent of Oregonians' energy costs. 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. In 2010, biofuels accounted for 6.45 percent of Oregon's transportation fuel supply, with the majority being ethanol (5.98 percent ethanol and 0.47 percent biodiesel). The U.S. is the highest ethanol-producing country in the world.

Oregon Transportation Fuel Type Consumption, 2010



Transportation use of natural gas is gas consumed in the operation of pipelines, primarily in compressors, and gas consumed as vehicle fuel.

Ethanol

U.S. producers manufacture ethanol in one of two ways: conversion of ethylene (a petroleum by-product and non-renewable) or the fermenting of sugars found in plants, with the latter accounting for 90 percent of U.S. ethanol production. Since all plants contain sugars, most plants can be a source, or feedstock, for ethanol. In a process similar to brewing beer, the plant sugars are fermented using yeast, and then distilled to the final product. Sugar-based plants such as sugar cane and sugar beets require less processing to produce ethanol and are the dominant feedstock in Brazil, the second highest ethanol-producing country. In the U.S., corn and other starch-based plants are more common. The process is the same for making ethanol from starch-based plants as with sugar-based plants, except the starches first have to be converted to sugars. Ethanol production in the U.S. is growing rapidly; between 2000 and 2009 production capacity increased by a factor of 20. In 2009, ethanol constituted 7.8 percent of the U.S. gasoline pool, equating to 10,750 million gallons. The vast majority of U.S. ethanol is produced from corn (up to 90 percent); other sources include wheat, barley, potato skins, rice and yard clippings. The top five ethanol producing states are Iowa, Nebraska, Illinois, Minnesota and South Dakota.

Ethanol comprised approximately six percent of Oregon's transportation fuel mix in 2008, equating to about 150 million gallons. About 40 million gallons are produced in Oregon each year; the balance is imported from the Midwest.

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. 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

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). Nationwide the most common feedstock is soybean oil; however most Oregon produced biodiesel is made from used cooking grease. In 2010, Oregon biodiesel production capacity increased to 15 million gallons per year; the rest is imported from the Midwest. Biodiesel blends for sale in Oregon include B5 (five percent biodiesel, 95 percent diesel), B20, B99 and B99.9.

Renewable Fuel Standard

A Renewable Fuel Standard (RFS) 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 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 required 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, Oregon. 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, Oregon reached that capacity and the B5 standard was implemented in April 2011.

Renewable Fuels Legislation

Legislation	Year Enacted	Summary
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.
Alternative Fuel-Related Tax Credits	2007	Two separate tax credits to encourage production and use of alternative fuels: 1) for producers and collectors of biofuel raw materials; and 2) for consumers of alternative fuels (85 percent ethanol or 99 percent biodiesel).
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	Allows addition of diesel additives between October 1 and February 28 to prevent congealing.

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