

Clean Transportation Fuels for Oregon

Harvesting the Economic and Climate Benefits of Clean Fuels

HIGHLIGHTS

Oregon is a pioneer in clean transportation with thousand of electric vehicles on the road and one of the nation's leading public transit systems in Portland. However, Oregon must continue to make progress cleaning up its transportation system in order to keep more transportation dollars in the local economy and cut global warming pollution. As Oregon moves into the future, the state must support the production and use of clean fuels, such as electricity and biofuels. Stable long-term policies such as the Clean Fuels Program create demand for clean fuels, giving innovators and investors the certainty and clarity they need to scale up the production of locally produced fuels that can lower the carbon intensity of Oregon's fuel supply.

Oregon has a proud heritage of technology leadership, with its “Silicon Forest” of high-tech companies specializing in computer chips and other electronics. This spirit of innovation is enabling Oregon to become a leader in clean energy and clean transportation, with one of the world’s largest wind farms, one of the country’s highest rates of electric vehicle (EV) registration, and a leading public transit system in Portland (EIA 2014a, Siemers 2012, Kurtzleben 2011).

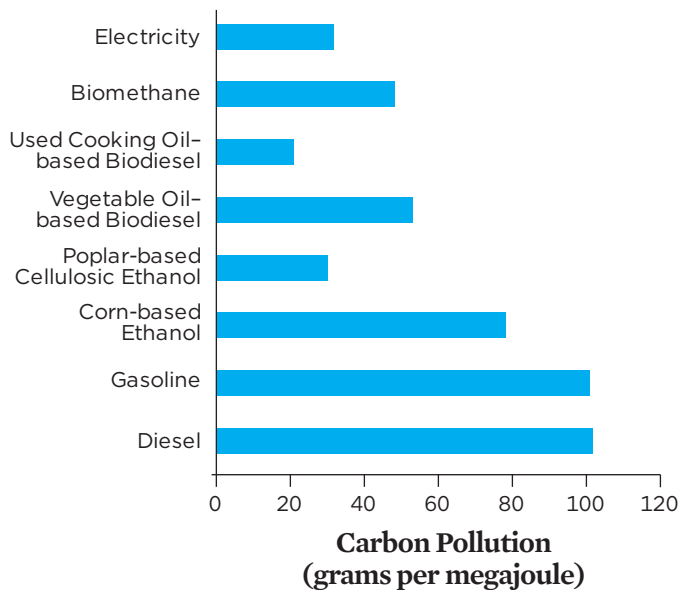
However, transportation, particularly oil for transportation, is the single-largest source of Oregon’s fossil-fuel carbon pollution, and Oregon drivers spent more than \$7 billion on gasoline and diesel fuel in 2013 (EIA 2015a, OGWC 2013). That’s why cutting the use of oil—with efficient vehicles, clean fuels, and development that is less dependent on cars—is a smart way to both help address climate change in Oregon and spend less money on oil.

Oregon already generates half of its electricity from hydropower and renewable resources like wind (ODE 2015), and it produces biodiesel from used cooking oil. It can steadily reduce oil use and carbon pollution even further by scaling up the share of transportation powered by clean electricity and increasing diverse biofuels. To do so, it can draw on diverse sources of waste-based fuels such as bi-methane from landfills and water treatment plants, while further driving innovation in the next generation of biofuels made from wood waste, hybrid poplar, and garbage. These fuels can also support research and innovation in industries that keep transportation dollars in the local economy while creating jobs.



Biofuels and electricity are already helping to reduce Oregon's contribution to global warming. Strong policies such as the Clean Fuels Program are critical to ensuring the state's low-carbon fuel market can continue to grow.

The Carbon Intensity of Transportation Fuels in Oregon



Clean electricity and low-carbon biofuels can reduce the carbon intensity of Oregon's fuel supply.

SOURCES: CARB 2015; ODEQ 2015; CARB 2009.

Electricity

The concept of electricity as a transportation fuel is relatively new, yet EVs have already gained impressive market share in Oregon and are poised to play a huge role in the state's shift to clean fuels. When running on electricity, EVs produce zero tailpipe emissions. Moreover, with a clean electricity grid drawing heavily on wind and hydropower, the "upstream" emissions (i.e., the emissions associated with the generation of electricity used to charge an EV) are also very low. An average EV charged in Oregon produces the carbon emissions equivalent of a gasoline-powered vehicle that achieves 75 miles per gallon (Anair 2014). And driving an EV will produce even less pollution as Oregon phases out electricity generated from coal-fueled power plants and increases the use of renewable energy resources such as wind and solar.

Driving an EV in Oregon is not just clean; it is also cheaper than driving on gasoline. In 2014, driving an EV in Oregon cost \$3.41 per 100 miles; the cost for driving a comparable gasoline-powered vehicle was \$12.16 (EIA 2014b; EIA 2014c).¹ What's more, the money that Oregon EV drivers spend on

fuel goes to power companies that employ Oregonians, pay local taxes, and have a stake in the state economy. In contrast, most of the money that drivers spend to fill up conventional vehicles pays for crude oil, which is extracted and refined outside Oregon (EIA 2015b). For every dollar spent on gasoline in the United States in the past five years, 70 cents went to extracting and refining crude oil, while less than a dime went to the local gas station (UCS 2013, with calculations updated for Oregon using data from EIA 2015c).

Biofuels

Oregon has near- and long-term opportunities to produce biofuels from sustainable local resources.

FUEL FROM WASTES AND RESIDUES

Local companies, such as Sequential Biodiesel and Beaver Biodiesel, already produce biodiesel made from used cooking oil, and Oregon has the potential to produce millions of gallons per year of this and other types of low-carbon fuel. Biomethane from landfills and wastewater treatment facilities can also replace fossil sources of natural gas used in buses, trucks, and other transportation applications, cutting life cycle emissions by half (CARB 2015). UCS research finds that Oregon has the potential to produce biomethane equivalent to 25 million gallons of diesel fuel per year to power buses, garbage trucks, and other heavy-duty vehicles (UCS 2015).

Oregon also has a variety of sources of biomass waste and residue that can be used to make advanced biofuels. These include mixed waste paper and other urban wastes, as well as agricultural residues such as corn stalks, wheat straw, and grass straw. Some of the agricultural residues are needed to protect soil from erosion and for ecological purposes, but a significant portion goes unused and is available for fuel production. Similarly, Oregon's large timber industry produces significant amounts of woody biomass residues—sawmill residues as well as limbs and tree tops that are left behind

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¹ These figures assume an electric car with an efficiency of 0.30 kilowatt-hour per mile, which is the rating for a 2014 Nissan Leaf, and a similar-sized gasoline vehicle that gets 28.8 miles per gallon, which is representative of this vehicle size. Fuel prices are 2014 averages for West Coast (PADD 5) region gasoline and residential electricity in Oregon, as reported by the Energy Information Administration. For references and detail on methodology, see Anair 2014.



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Hybrid poplar is a promising source of sustainable biomass in Oregon. It is one of the fastest-growing tree species and well-suited to the state's climate.

when trees are harvested for lumber. Some of these materials could be collected productively to make biofuels, helping to reduce the risk of wildfire without affecting the sustainability of the forest. The Oregon Department of Environmental Quality estimates that the state's forest and agricultural residues could produce 182 million to 282 million gallons of gasoline-equivalent biofuels per year by 2025. (ODEQ 2011).

Oregon is also well suited to producing purpose-grown energy crops, including trees such as hybrid poplar. These fast-growing trees, which are planted in farms rather than harvested from the forest, are an important potential source of sustainable biomass. Greenwood Resources, which is growing 7.5 million poplar and alder trees on a farm in Boardman, Oregon, is a partner in a \$40-million project aimed at developing a process to make low-carbon jet fuel from hybrid poplar (Meyers 2011). According to the Oregon Department of Environmental Quality, the state could produce more than 200 million gallons of fuel per year from this abundant local resource (ODEQ 2011).

CLEAN FUELS DRIVE INVESTMENT AND INNOVATION

Oregon has significant potential to produce biomass-based fuels, and Oregon State University is part of two major collaborations to develop this technology, Advanced Hardwood Biofuels (AHB 2014) and the Northwest Advanced Renewables Alliance (NARA 2015). While the state lacks the capacity to produce biomass-based fuels at a commercial scale, the first cellulosic biofuel refineries of that size have recently started production in the United States and abroad. Facilities

The Clean Fuels Program aligns with existing policies in neighboring California and British Columbia, creating a large regional market for low-carbon alternatives to petroleum-based fuels.

with capacities of 20 million gallons per year or more now operate in Iowa, Kansas, Brazil, and Italy.

In Boardman, ZeaChem completed construction of a 250,000-gallon-per-year, demonstration-scale cellulosic biofuels facility in 2013. While the company has struggled financially and is not producing commercial volumes of fuel, it provides services to companies scaling up new biofuel technologies (PR Newswire 2015). Another company, Colorado-based Red Rock Biofuels, recently announced plans to build a \$200 million facility in Lakeview, Oregon, to make bio-based diesel and jet fuel, and it has agreements to sell fuel to Southwest Airlines and FedEx (Proctor 2015).

To secure such investments in commercial-scale biofuel production and foster the associated infrastructure, Oregon



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Mile for mile, driving an EV in Oregon is both cleaner and cheaper than driving a comparable gasoline-powered vehicle. And as the state brings more renewable energy to its electric grid, the environmental benefits of EVs will increase.

requires a stable policy environment that promotes demand for clean fuels over a multiyear timeframe. Oregon’s Clean Fuels Program will provide that assurance to investors—so long as it remains intact.

Oregon’s Clean Fuels Program

Oregon is already experiencing impacts consistent with climate change driven by the use of fossil fuels. These come in the form of more frequent and severe heat waves, wildfires, and droughts, making climate change among the most significant public health, economic, and security threats facing the state (Melillo, Richmond, and Yohe 2014). With transportation accounting for more than a third of Oregon’s fossil carbon pollution, it is critical to reduce emissions from the fuel supply in order to reduce the impact of climate change on the state’s communities (OGWC 2013).

Oregon has the natural resources to be a leader in clean transportation, but transitioning from oil to cleaner fuels requires both time and supportive, stable public policies. In 2015 the Oregon Legislature renewed the Clean Fuels Program, a flexible but ambitious program that will gradually increase the use of clean fuels in the state.

The Clean Fuels Program does not specify targets for the adoption and use of any particular fuel type. Rather, it allows all fuel types—advanced biofuels, electricity, biomethane, and those yet to be developed—to compete based on their carbon benefits. (This evaluation is based on a full life cycle analysis, including significant indirect sources of emissions such as changes in land use). This structure preserves maximum

flexibility for consumers and suppliers, while ensuring that the policy is based on the best available science on the carbon benefits of different types of fuels. The program requires transportation fuel to get steadily cleaner on average, achieving a 10 percent reduction in carbon emissions per unit of fuel by 2025. Along with electricity, advanced biofuels made from wastes, residues, and energy crops have the greatest long-term potential for in-state production of clean fuels, yet other fuels can compete in the Oregon marketplace as well.

It is critical that Oregon fully implement this program, sending a strong signal to investors that the state has a durable and growing market for clean fuels. Fortunately, the Clean Fuels Program aligns with existing policies in neighboring California and British Columbia, creating a large regional market for low-carbon alternatives to petroleum-based fuels. This will increase economies of scale that can bring down the cost of clean fuels more quickly, while supporting regional investment and enabling Oregon to become a leader in the growing global marketplace for clean transportation technologies.

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