

# Oregon Clean Fuels Program

## 2018 Fuel Supply Forecast

### Background

Oregon Administrative Rule 340-253-2100 requires the Department of Environmental Quality to produce a fuel supply forecast in order to help implement the Forecasted Fuel Supply Deferral for the upcoming year. This document provides the forecast for the 2018 compliance period. The requirements to conduct the 2018 forecast were established in rules that were adopted by the Environmental Quality Commission on Dec. 9, 2015. The EQC adopted new rules on Nov. 10, 2017 that make several changes to future forecasts.

DEQ developed the 2018 Forecast in conjunction with the consultancy ICF. Under contract, ICF produced the 2017 forecast and will be producing a tool to help DEQ perform future forecasts. At a very high level, the forecast is an estimate of: a) the estimated credits needed to meet the clean fuel standard in 2018 and b) the total aggregated credits available. Since it is challenging to forecast fuel consumption and carbon intensities accurately in a market-based program, DEQ is approaching this forecast by using a low case and a high case to establish a range of potential outcomes. DEQ and ICF presented the draft results of the 2018 forecast during a webinar on Nov. 14, 2017. This final forecast incorporates comments received from webinar participants.

### Data Sources

The forecast uses available public and program data to develop the estimates of low-carbon fuels available to Oregon and estimated consumption of gasoline and diesel in Oregon. The sources of this data include:

- Oregon CFP Online System (the reporting tool for the Clean Fuels Program)
- Fuel Pathway Codes (carbon intensity values) approved in Oregon and California
- Oregon Department of Transportation's Revenue Forecast
- Oregon DMV vehicle registration data
- Annual Energy Outlook from the US Energy Information Administration
- Trade associations (Renewable Fuels Association and the National Biodiesel Board) on their members' production capacity

### Methodology

The methodology follows ICF's 2017 forecast and is based on the following components: a fuel demand component, a fuel supply component, and a carbon intensity component.

#### Demand Inputs

- Vehicle stocks – DEQ uses Oregon DMV vehicle registration data to analyze for which vehicle types are currently registered as well as historical trends.
- Fuel consumption – DEQ uses a combination of the ODOT Revenue Forecast and the EIA Annual Energy Outlook to analyze for projected and historical trends in fuel consumption.

#### Fuel Supply

- Fuels and associated feedstocks - DEQ reviews data regarding the supply of gasoline, diesel, ethanol, biodiesel, renewable diesel, natural gas, propane and electricity.
- Regional fuel supply – DEQ primarily uses data reported to CFP to analyze the volumes and types of fuels facilities are supplying fuels to Oregon. If needed, this information can be supplemented by information from California or British Columbia to demonstrate what fuels are broadly available to the West Coast.

#### Carbon Intensity

- Oregon and California-approved values – DEQ looks at individual carbon intensity values to facilities that have been approved by either itself or by the California Air Resources Board.



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## Deficit Generation from Fossil Fuel Consumption – Credits Needed

The amount of credits needed to comply with the 2018 clean fuel standards is based on assumptions about the consumption of fossil fuels that generate deficits.



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### Gasoline Consumption

1,586 million gallons of gasoline, including ethanol were consumed in 2016, the most recent year of data collected. DEQ estimates 0.94 percent growth for 2017 and 1.01 percent for 2018 based on information from ODOT fuel growth forecast. In comparison, AEO estimates 0.85 percent growth in 2017 and 0.95 percent in 2018 for the Pacific Region. CFP data shows that gasoline is being blended with ethanol statewide at 10.3 percent of the gasoline pool. Applying the consumption growth rates and the ethanol blend rate, approximately 1,437 million gallons of clear gasoline blendstock will be consumed in 2018, generating about 523,800 deficits.

### Diesel Consumption

766 million gallons of diesel, including biodiesel were consumed in 2016, the most recent year of data collected. DEQ estimates 3.85 percent growth for 2017 based on information from ODOT weight-mile forecast. In comparison, AEO estimates 3.54 percent growth in 2017 for the Pacific Region. The diesel pool has a greater variance in the amount of biodiesel and renewable diesel being blended with clear diesel blendstock. Therefore, DEQ developed a high and low case of diesel consumption and biodiesel/renewable diesel blend rates. The low fossil diesel demand case forecasts diesel consumption at 640 million gallons by blending 10 percent biodiesel and 6.5 percent renewable diesel into the diesel pool, resulting in 259,000 deficits generated in 2018. The high fossil diesel demand case forecasts diesel consumption at 730 million gallons by blending 5 percent biodiesel and 1.3 percent renewable diesel into the diesel pool, resulting in 290,600 deficits generated in 2018.

Fuel	Demand		Deficits	
Gasoline Blendstock	1,437 million gallons		523,800	
Diesel Blendstock	640 million gallons	730 million gallons	259,000	290,600

## Credit Generation from Gasoline Substitutes and Alternatives

Credits can be generated by supplying transportation fuels that are lower in carbon intensity than the higher carbon fuels they replace. For gasoline, the most likely substitutes and alternatives are ethanol and electricity.

### Ethanol Consumption

In order to estimate the number of credits that may be generated from the ethanol available to Oregon, the volume and carbon intensities must be estimated. 165 million gallons of ethanol are estimated to be consumed in 2018, as shown above in the gasoline consumption discussion.

For carbon intensities, DEQ and ICF reviewed facilities that have Oregon-approved carbon intensity values, and focused on four of which are mostly like to deliver their ethanol to Oregon. They have a combined production capacity of 400 million gallons of ethanol, well in excess of the 165 million gallons needed, and are:

Facility	Location	Production Capacity	Carbon Intensity
Pacific Ethanol Columbia	Boardman, OR	110 million gallons	53.81 gCO <sub>2</sub> e/MJ
Guardian Energy Janesville	Janesville, MN	110 million gallons	62.40 gCO <sub>2</sub> e/MJ
Guardian Energy Hankinson	Hankinson, ND	132 million gallons	60.11 gCO <sub>2</sub> e/MJ
Pacific Ethanol Magic Valley	Burley, ID	60 million gallons	54.00 gCO <sub>2</sub> e/MJ

CFP data shows that the current average ethanol carbon intensity is 63.17 gCO<sub>2</sub>e/MJ and the forecast assumes that there will be no backsliding from this value. Based on the facilities shown above, the average CI of ethanol would generate between 463,500 – 588,500 credits in 2018.

DEQ and ICF also considered whether to include sugarcane ethanol from Brazil, but given the relatively low differences in carbon intensity values between corn and sugarcane ethanol in the CFP, decided to focus on corn ethanol. Although sugarcane ethanol was not necessary for compliance with the 2018 standard, it remains available in the global ethanol market and is appropriate for future consideration.

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### Electricity Consumption

In order to estimate the number of credits that may be generated from electricity used in light-duty vehicles, three factors must be considered: 1) the number of electric vehicles registered in Oregon, 2) the average amount of electricity consumed per vehicle, and 3) the carbon intensity of electricity.

Oregon DMV vehicle registration data shows that about 6,400 plug-in hybrid electric vehicles and 9,500 battery electric vehicles were registered in Oregon at the end of June 2017. DEQ estimates those numbers to increase to 7,900 PHEVs and 12,200 BEVs by the end of December 2017. Further, DEQ estimated that the growth rate of electric vehicles to be between 27.5 - 40% for 2018, consistent with projections made for compliance with the Zero Emission Vehicle (ZEV) program, which results in a range of between 10,100 - 11,100 PHEVs and 15,600 - 17,100 BEVs on the road in Oregon by the end of 2018.

DEQ and ICF estimates that on average, electricity consumption per vehicle is 10 kWh/day (or roughly 30 miles per day) and is driven 347 days per year, resulting in about 3,500 kWh of charging per year. The statewide electric mix carbon intensity is 31.85 gCO<sub>2e</sub>/MJ, which results in 68,000 - 74,600 credits generated in 2018. Also, note that some charging of electric vehicles will occur in places where the carbon intensity electricity is less than the statewide mix, but this was not factored into the forecast.

### **Credit Generation from Diesel Substitutes and Alternatives**

Credits can be generated by supplying transportation fuels that are lower in carbon intensity than the higher carbon fuels they replace. For diesel, the most likely substitutes and alternatives are biodiesel, renewable diesel, natural gas, propane and electricity.

### Biodiesel Consumption

In order to estimate the number of credits that may be generated from the biodiesels available to Oregon, the volume and carbon intensities must be estimated. For biodiesel, the blend rate varies between 5 percent and 10 percent, as shown above in the diesel consumption discussion, resulting in a range of 32 – 73 million gallons of biodiesel demand.

For carbon intensities, DEQ and ICF reviewed facilities that are mostly like to deliver biodiesel to Oregon. They have a combined production capacity of 135 million gallons of biodiesel, well in excess of the gallons needed, and are:

Facility	Location	Production Capacity	Carbon Intensity
Sequential Biodiesel	Salem, OR	15 million gallons	18.12, 14.63 gCO <sub>2e</sub> /MJ
REG Grays Harbor	Grays Harbor, WA	100 million gallons	52.87, 18.62 gCO <sub>2e</sub> /MJ

CFP data shows that the current average biodiesel carbon intensity is 50.34 gCO<sub>2e</sub>/MJ and the forecast assumes that there will be no backsliding from this value. Based on the facilities shown above, the mix of biodiesel carbon intensities would generate between 221,200 – 592,400 credits in 2018.

### Renewable Diesel Consumption

In order to estimate the number of credits that may be generated from renewable diesel available to Oregon, the volume and carbon intensities must be estimated. In 2016, DEQ estimates that approximately 5 million gallons of renewable diesel were supplied to Oregon based on a DEQ survey. Additionally, EIA data shows that 200 million gallons of renewable diesel was supplied to the West Coast in 2016 and DEQ projects that between 10 - 50 million of those gallons are available to be supplied to Oregon, which would be between 1.3 - 6.5 percent of the state's diesel pool. For carbon intensities, DEQ assumed California-approved carbon intensities for tallow and soy oil feedstocks with a range of 30 – 52 gCO<sub>2e</sub>/MJ. Those volumes and carbon intensities would result in between 60,200 - 443,200 credits generated in 2018.

### Natural Gas and Propane Consumption

In order to estimate the number of credits that may be generated from natural gas used in medium and heavy-duty vehicles, DEQ reviewed Oregon DMV vehicle registration data and volumes reported to CFP to date. DEQ estimates that between 3 - 5 million diesel gallon equivalents of natural gas will be consumed in Oregon in 2018. Additionally, by reviewing data reported to Oregon and California, DEQ

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estimates that 60 – 80 percent of the natural gas consumption will be in the form of renewable natural gas. The carbon intensities of renewable natural gas can vary greatly, from manure digesters, wastewater treatment plants and landfills. For the forecast, DEQ assumed a conservative carbon intensity of 50.26 gCO<sub>2</sub>e/MJ for landfill gas. Those volumes and carbon intensities would result in between 8,400 - 17,300 credits generated in 2018.

In order to estimate the number of credits that may be generated from propane used in medium and heavy-duty vehicles, DEQ reviewed Oregon DMV vehicle registration data and volumes reported to CFP to date. DEQ estimates that between 1 - 1.5 million gasoline gallon equivalents of propane will be consumed in Oregon in 2018. The statewide carbon intensity value for propane is 83.05 gCO<sub>2</sub>e/MJ, which results in between 1,800 - 2,500 credits generated in 2018.

## Electricity Consumption

For electricity used in public transit, ICF estimated credit generation from light rail, street cars, and aerial tram in their 2017 Additional Electrification memo. ICF estimated that 20,300 credits would be generated in 2018. In addition, electricity used in public transit buses were not included in the forecast but credits will be generated in 2018 for this category. Also note that some charging of electric vehicles will occur in places where the carbon intensity electricity is less than the statewide mix, but this was not factored into the forecast.

## **Banked Credits**

The number of credits is taken from the CFP Online System. As of the end of June 2017, there were approximately 263,000 banked credits. Projecting to the end of 2017, ICF estimated that there would be approximately 345,000 banked credits. It is important to note that credits were not generated for residential electric vehicle charging in 2016 and 2017 but will be retroactively generated as per recent changes to the regulation, these credits are not included in that bank.

## **Data Summary**

The table below summarizes the forecast for deficit generation, banked credits and credit generation.

	<b>Fuel</b>	<b>Low</b>	<b>High</b>
<b>Deficits</b>	Gasoline blendstock	-523,800	-523,800
	Diesel blendstock	-290,600	-259,000
<b>Credits</b>	Ethanol	463,500	588,500
	Electricity, Light-duty EVs	68,000	74,600
	Biodiesel	221,200	592,400
	Renewable Diesel	60,200	443,200
	Natural Gas	8,400	17,300
	Propane	1,800	2,500
	Electricity, Public transit	20,300	20,300
<b>Total</b>		<b>29,000</b>	<b>956,000</b>

## **Forecasted Fuel Supply Deferral Analysis & Determination**

If DEQ forecasts a shortfall in clean fuel credits greater than 5 percent of the credits that are estimated to be needed for compliance, then the forecasted fuel supply deferral is triggered. As shown above, this forecast demonstrates that there will be no shortfall of clean fuel credits in 2018. Under both the low and high cases, more credits will be generated than are needed to comply with the 2018 Clean Fuel Standards so it is DEQ's determination that the Forecasted Fuel Supply Deferral is not triggered for 2018.

## **Accessibility**

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