Calculating the Carbon Intensity of Electricity used in the CFP

2014-2018, effective for the 2020 compliance period

This document explains the calculation of carbon intensity of electricity used in the Clean Fuels Program for both the statewide electricity mix and several utility-specific mixes. The values provided here will apply to the 2020 compliance year and the same methodology will be applied to future years.

General Methodology

The CFP calculates the carbon intensity of transportation fuels on a lifecycle basis, which means that both direct and indirect emissions are accounted. For electricity, that means looking at both the direct emissions from the smokestacks of power plants as well as the indirect, upstream emissions from the extraction and transportation of the source of the electricity to the power plant. CFP uses the most recent five years' worth of data to develop the carbon intensity values; in this case, 2014 - 2018 data for the 2020 compliance period.

Direct Emissions

The electric sector is one of many that is required to report annually to DEQ's Greenhouse Gas Reporting Program. Utilities and electric generators report how much electricity they produce or procure and the source of their electricity generation. The emission rates are reported in tons per megawatt-hours and then converted to grams CO2e per megajoule of energy by using the following factors:

   1 mt = 1,000,000 g
   1 MWh = 1,000 kWh
   1 kWh = 3.6 MJ

Indirect Emissions

For electricity, indirect emissions represent anything upstream from the power plant. In the case of natural gas, it includes energy used at the wellhead and throughout the transmission system including fugitive methane emissions. In the case of coal, it includes energy used in mining and transportation to the power plant. There is no single set of data that contains the generation mixes of all of the utilities in Oregon so DEQ used a combination of 2015 statewide and BPA data. The OR-GREET 3.0 model was used to calculate the upstream emissions associated with that generation mix.

Statewide Mix Carbon Intensity for 2020

Statewide Direct Emissions

Here are the emission rates as reported to the GHG program for the statewide mix:

	2014	2015	2016	2017	2018	Average
mt/MWh	0.369	0.380	0.335	0.334	0.339	0.351
gCO2e/MJ	102.47	105.48	93.01	92.66	94.07	97.54

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Statewide Indirect Emissions
Here is the generation mix as reported to DEQ for the statewide mix and related upstream emissions as calculated in OR-GREET 3.0:

Fuel Type	Total Statewide (MWh)	Statewide %	gCO2e/MJ
Biogas	89,155	0.19%	
Biomass	76,106	0.16%	0.02
Coal	15,670,702	32.78%	5.21
Geothermal	55,766	0.12%	
Hydro	19,006,777	39.76%	
Natural Gas	8,044,610	16.83%	4.59
Nuclear	1,470,584	3.08%	0.09
Other Biogenic	50,733	0.11%	
Other Non-Biogenic	61,556	0.13%	0.03
Petroleum	38,327	0.08%	
Solar	53,328	0.11%	
Waste	42,553	0.09%	
Wind	3,142,712	6.57%	
Total	47,802,939	100.00%	9.95

BPA Indirect emissions for 2020

Here is the generation mix for the Bonneville Power Administration, which serves a number of smaller utilities in Oregon:

Fuel Type	Total BPA (MWh)	BPA %	gCO2e/MJ
Biogas	0	0.00%	
Biomass	17,425	0.13%	0.02
Coal	270,522	2.06%	0.31
Geothermal	0	0.00%	
Hydro	11,389,969	86.56%	
Natural Gas	125,766	0.96%	0.26
Nuclear	1,342,153	10.20%	0.08
Other Biogenic	4,204	0.03%	
Other Non-Biogenic	5,163	0.04%	0.01
Petroleum	2,660	0.02%	
Solar	0	0.00%	
Waste	0	0.00%	
Wind	0	0.00%	
Total	13,157,862	100%	0.67

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Utility-specific Calculations

<u>Utility-specific Direct Emissions</u>

Utility	2014	2015	2016	2017	2018	Average
Ashland Electric Department	4.71	4.07	3.23	2.48	3.26	3.55
Blachly-Lane Electric Cooperative	4.45	3.87	3.06	2.35	3.07	3.36
Cascade Locks	4.71	4.07	3.23	2.48	3.26	3.55
Central Electric Cooperative, Inc	4.71	4.05	3.21	2.46	3.23	3.53
Central Lincoln PUD	4.71	4.07	3.23	2.48	3.26	3.55
Clatskanie PUD	17.68	20.23	8.38	9.16	9.93	13.08
Clearwater Power Company	4.71	4.07	3.23	2.48	3.26	3.55
Columbia River PUD	4.71	4.07	3.23	2.48	3.26	3.55
Consumers Power, Inc	4.45	3.84	3.05	2.35	3.06	3.35
Coos-Curry Electric Cooperative, Inc	4.71	4.06	3.23	2.48	3.26	3.55
Emerald PUD	33.83	39.06	30.09	26.50	33.18	32.53
Eugene Water & Electric Board	3.93	3.52	2.73	4.65	4.07	3.78
Forest Grove Light & Power	4.24	3.64	2.89	2.23	2.93	3.19
Hermiston Energy Services	4.71	4.07	3.23	2.48	3.26	3.55
Lane Electric Cooperative, Inc	4.66	4.02	3.22	2.48	3.25	3.52
McMinnville Water & Light	4.87	4.54	3.23	2.48	3.26	3.68
Midstate Electric Cooperative	4.71	4.07	3.23	2.48	3.26	3.55
Milton-Freewater City Light & Power	3.62	3.27	2.58	2.02	2.62	2.82
Northern Wasco PUD	4.41	3.67	2.39	1.72	6.23	3.69
Oregon Trail Electric Cooperative	4.71	4.07	3.23	2.48	3.26	3.55
Salem Electric	4.71	4.07	3.23	2.48	3.26	3.55
Springfield Utility Board	4.71	4.07	3.23	2.48	3.26	3.55
Tillamook PUD	4.66	4.03	3.22	2.48	3.24	3.52
Umatilla Electric Cooperative	5.23	2.77	3.66	5.05	28.04	8.95
West Oregon Electric Cooperative, Inc	4.71	4.07	3.23	2.48	3.26	3.55

<u>Utility-specific Indirect Emissions</u>
For utilities that reported a mix of BPA and other sources, DEQ applied the BPA indirect emissions to their first 3.86 grams of carbon intensity and then prorated the statewide mix upstream emissions value for the remainder.

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Carbon Intensity Values for 2020

Below are the carbon intensity values for the statewide mix and utilities that have requested a utility-specific CI score.

	Direct Emissions (gCO2e/MJ)	Indirect Emissions (gCO2e/MJ)	Carbon Intensity (gCO2e/MJ)
Statewide Mix	97.54	10.38	107.92
Ashland Electric Department	3.55	1.19	4.74
Blachly-Lane Electric Cooperative	3.36	1.17	4.53
Cascade Locks	3.55	1.19	4.74
Central Electric Cooperative, Inc	3.53	1.18	4.72
Central Lincoln PUD	3.55	1.19	4.74
Clatskanie PUD	13.08	2.20	15.28
Clearwater Power Company	3.55	1.19	4.74
Columbia River PUD	3.55	1.19	4.74
Consumers Power, Inc	3.35	1.17	4.52
Coos-Curry Electric Cooperative, Inc	3.55	1.19	4.73
Emerald PUD	32.53	4.27	36.80
Eugene Water & Electric Board	3.78	1.21	4.99
Forest Grove Light & Power	3.19	1.15	4.34
Hermiston Energy Services	3.55	1.19	4.74
Lane Electric Cooperative, Inc	3.52	1.18	4.71
McMinnville Water & Light	3.68	1.20	4.88
Midstate Electric Cooperative	3.55	1.19	4.74
Milton-Freewater City Light & Power	2.82	1.11	3.93
Northern Wasco PUD	3.69	1.20	4.89
Oregon Trail Electric Cooperative	3.55	1.19	4.74
Salem Electric	3.55	1.19	4.74
Springfield Utility Board	3.55	1.19	4.74
Tillamook PUD	3.52	1.18	4.71
Umatilla Electric Cooperative	8.95	1.76	10.71
West Oregon Electric Cooperative, Inc	3.55	1.19	4.74

Want more information?
For information about the Clean Fuels Program, go to the program webpage at:
http://www.oregon.gov/deq/aq/programs/Pages/Clean-Fuels.aspx.

Accessibility
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