Pacific Power & Light Company

Washington Energy and Emissions Intensity Metrics

2018 Report

May 31, 2019

Introduction

In November 2006, Washington voters approved Initiative 937, establishing the Energy Independence Act (EIA), which requires electric utilities serving at least 25,000 retail customers to use renewable energy and energy conservation in serving those customers. In September 2015, the Washington Utilities and Transportation Commission (Commission) adopted new administrative rules to implement several legislative changes to the EIA, including introducing WAC 480-109-300, pertaining to the reporting of energy and emissions intensity metrics. WAC 480-109-300 states, in relevant part:

> *(1) A utility must report metrics of energy and emissions intensity to the commission on or before June 1st of each year. The report must include annual values for each metric for the preceding ten calendar years. Each value reported must be based on the annual energy or emissions from all generating resources providing service to customers of that utility in Washington state, regardless of the location of the generating resources. When the metrics are calculated from generators that serve out-of-state and in-state customers, the annual energy and emissions outputs must be prorated to represent the proportion of the resource used by Washington customers.*
> *(2) The energy and emissions intensity report shall include the following metrics:*
> *(a) Average megawatt-hours per residential customer;*
> *(b) Average megawatt-hours per commercial customer;*
> *(c) Megawatt-hours per capita;*
> *(d) Million short tons of CO2 emissions; and*
> *(e) Comparison of annual million short tons of CO2 emissions to 1990 emissions.*

Pacific Power & Light Company (Pacific Power), a division of PacifiCorp, submits this 2018 Energy and Emissions Intensity Report to the Commission in accordance with reporting requirements established as part of the Energy Independence Act.

This report is consistent with the collaborative workshop documents addressing annual reporting requirements, in Docket UE-131723.

Executive Summary

This report includes the estimated carbon dioxide (CO_2) emissions associated with serving Pacific Power's Washington customers between 2009 and 2018, compared to an estimate of the company's 1990 CO_2 emissions. Pacific Power's 1990 CO_2 emission level is estimated to be 2,399,078 short tons, as established during workshops in Docket UE-131723, regarding the emissions reporting requirements.

As shown in Table 1 below, Pacific Power estimates the Washington-allocated emissions from 2009 to 2018 to be between 2.5 and 3 million short tons of CO_2 annually; or between 106 and 128 percent of 1990 emissions.

Table 1

Year	Total Annual CO_2 Emissions (Short Tons)	Ratio of Annual CO_2 Emissions to 1990 Emissions
2009	2,847,360	118.69%
2010	2,745,710	114.45%
2011	2,531,097	105.50%
2012	2,764,788	115.24%
2013	3,075,139	128.18%
2014	2,864,977	119.42%
2015	2,996,668	124.91%
2016	2,705,913	112.79%
2017	2,696,029	112.38%
2018	2,837,973	118.29%

Prior 10-year Annual Metrics for all Generating Resources Serving Washington Customers

Table 2 below provides the average megawatt-hour (MWh) per residential and commercial customer, the average MWh per capita, and estimated population served over time.[1]

The MWh per customer is determined by dividing the proportional MWh for each customer class by the number of customers for the same customer class. The MWh per capita represents the total annual load for the year, divided by the estimated population served for the year.

Table 2

Year	Average MWh per Residential Customer	Population (Residential)	Average MWh per Commercial Customer	MWh per Capita (Total)
2009	17.99	290,624	92.91	15.92
2010	17.38	292,271	86.89	15.11
2011	17.47	299,135	87.52	14.90
2012	16.99	301,385	90.90	14.88
2013	17.32	303,352	99.10	15.07
2014	16.64	302,069	108.42	15.15
2015	15.91	300,450	111.11	15.16
2016	16.15	301,905	102.30	14.68
2017	17.21	303,749	106.02	15.18
2018	15.33	296,875	107.02	14.69
10-Year Average	**16.84**	299,182	99.22	15.07

Pacific Power's Washington population had steady year-over-year growth between 2009 and 2017. However, the average MWh per residential customer has generally stayed flat or declined, which could indicate increased adoption of energy efficiency.[2]

[1] In this report, the term 'customer' represents the number of customers billed. The term 'population' refers to the estimated number of people served within the residential customer count.
[2] The change in 2010 to 2011 is largely attributed to how the population is calculated. Years 2008-2010 use a different methodology than years 2011-2018. The methodologies are described in greater detail in the report appendix.

Subtotal Metrics – Energy and Emissions from Unknown Generation Sources[3]

The table below shows the annual Washington-allocated energy, emissions, and percentage of load served from unknown generation sources. Unknown resources, or "Spot Market" purchases,

Table 3

Unknown Resource - Annual Metrics[4]			
Year	**MWh**	**CO_2 Emissions**	**Percentage of Load Served**
2009	(166,660)	(93,229)	-3.65%
2010	(254,053)	(151,380)	-5.80%
2011	265,797	120,228	6.02%
2012	369,810	166,994	8.32%
2013	342,608	193,937	7.45%
2014	58,961	29,893	1.31%
2015	596,016	320,061	13.28%
2016	847,919	379,444	19.73%
2017	815,875	312,888	17.78%
2018	662,441	323,271	15.64%

[3] Energy supply where the source of generation cannot be specified is categorized under, "Unknown Resources," such as market purchases and sales. In contrast, "Known Resources" are those where generation can be directly attributed to a specific facility, such as an owned resource or long-term contract.
[4] Negative metrics are attributed to having more sales than purchases from unknown resources from 2008 through 2010.

Carbon Emissions Trend Analysis

There are multiple factors that generally impact a utility's CO_2 emissions levels. These factors include, but are not limited to:

- Changes in demand due to economic growth or recession;
- The price of different fuel and energy sources ;
- Variations in generation and the relative resource mix in a particular year;
- State policy developments such as renewable portfolio standards and emissions performance standards; and
- Demand-side efficiency improvements.
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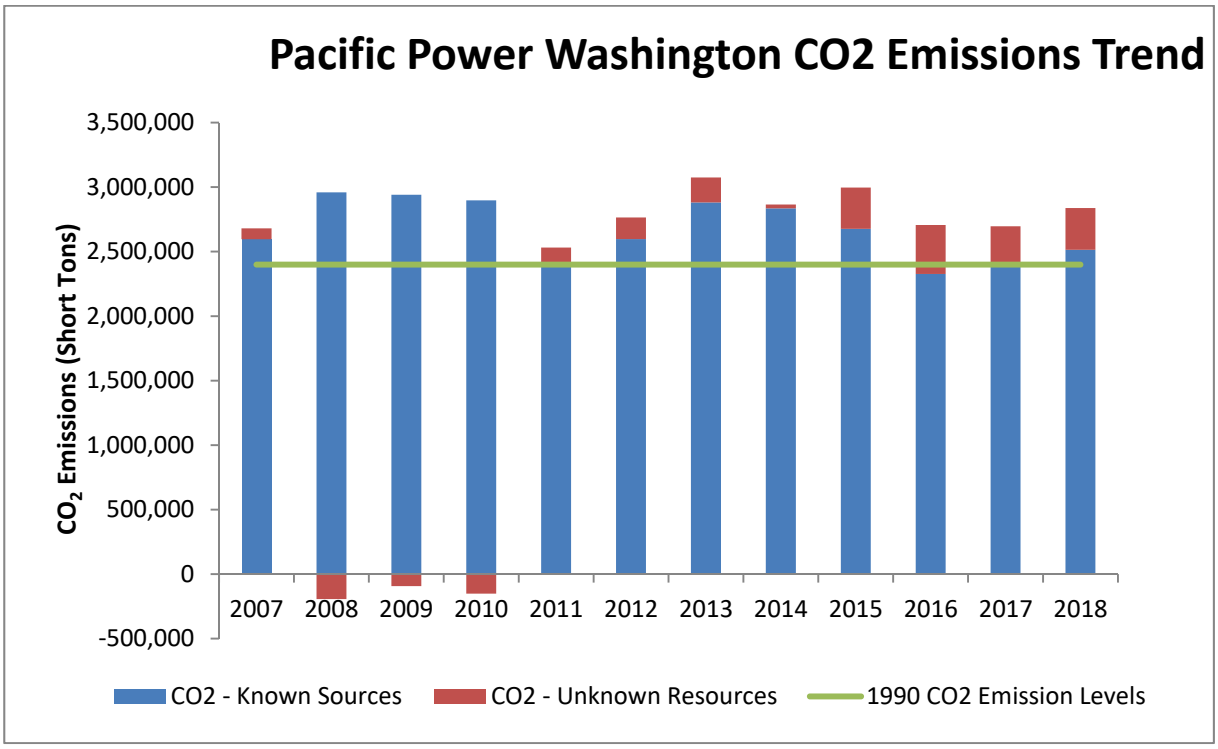
The figure below illustrates Pacific Power's Washington-allocated CO_2 emissions between 2009 and 2018. The quantity of total emissions associated with Washington over this period of time is generally between 2.5 and 3 million short tons of CO_2 annually. As the figure indicates, CO_2 emissions generally increased from 2008 through 2010, with a relatively minor reduction in emissions in 2007. CO_2 emissions then decreased over the 2010-2011 timeframe and increased again in 2012. There was a decline from 2015 to 2017 and an uptick in 2018.

Figure 1



Given the many factors that contribute to the level of CO_2 emitted over a time period, it is very difficult to identify a single contributing factor to substantiate an emissions trend. Load levels, energy market prices and dynamics, hydroelectric resource levels, renewable penetration, energy efficiency and demand side management additions, participation in the energy imbalance market, and changes in Pacific Power's resource fleet all contribute to the level of energy demand and associated emissions. However, a number of correlations may be drawn about Pacific Power's estimated emissions in Figure 1:

- The global financial crisis of late 2007-2008 included a downturn in United States (U.S.) economic activity from 2008-2012, which may have contributed to a reduction in demand and associated emissions over this time period.
- Hydro conditions can have a substantial impact on annual emissions:
    - The 2011 and 2012 hydro seasons began earlier and lasted significantly longer than in years prior to 2011, resulting in significant displacement of fossil-fueled energy over those years.
    - 2013 and 2015 had the lowest hydro generation over the 10-year period. Consequently, emissions from unknown resources in those years were two of the highest.
    - 2018 had a lower hydro year due to lower generation.
- In 2008, Pacific Power acquired the 520-megawatt natural gas Chehalis Generating Facility, which could have contributed to the increase in emissions from known resources.
- Lower emissions in 2007 are likely a result of Marengo I and Leaning Juniper wind facilities coming online.
- Pacific Power added over 1,800 megawatts of renewable capacity to its system during the period of 2006-2015.
- Pacific Power has seen a decrease in its coal operations since 2016 and emissions from owned coal resources has continued at a lower level of emissions since then.
- The uptick in 2018 emissions is likely attributable, in large part, to lower hydro generation and an increase, over 2017, in the net system power mix emissions factor calculated by the Department of Commerce.

Changes from Prior Year

Pacific Power's 2018 Washington-allocated emissions increased by 5.3 percent compared to 2017 Washington-allocated emissions. This increase is most likely related to lower hydro generation and a 3 percent increase in emission from unknown resources due to an increase in the net system mix emissions factor.

Appendix – Metrics Calculation Methodology, Information Sources and Formula Explanations

This appendix identifies the calculation methodologies, data sources and formulas used to compile the Energy and Emissions Intensity Summaries for 2009 through 2018. The metrics calculated in this report are consistent with the mutually agreed upon methodologies identified in the workshops in Docket UE-131723.

Table 1 – Summary Energy and Emissions Intensity Report – 2018

Summary Energy and Emissions Intensity Report - 2018

Utility :	PacifiCorp	
Reporting for year :	2018	**MWh per Capita**
Population Served :	**296,875**	**14.69**

Energy Intensity Metrics

	MWh at Meter	MWh Proportion	Customer Count	MWh per Customer
Residential Customers	1,678,995	38.5%	109,499	15.33
Commercial Customers	1,731,270	39.7%	16,177	107.0
Industrial Customers	758,032	17.4%	481	1,575.9
Irrigation	183,425	4.2%	5,051	36.3
Public Street & Highway Lighting	9,484	0.2%	245	38.7
Total Load Served	4,361,207			

Emissions Intensity Metrics

	Busbar MWh	Percent of Total Load	**Short Tons CO_2**	
Known Resources Serving WA	3,572,300	84.4%	2,514,702	
Unknown Resources Serving WA	**662,441**	**15.6%**	**323,271**	**% of 1990 CO_2**
	2018	Tons CO_2	**2,837,973**	**118.29%**

1990 Short Tons CO_2	2,399,078

See UTC Docket UE-131723, General Order R-581, Page 7, Paragraph 19.

	1990 Short Tons CO_2
Avista	*1,131,957*
Pacific Power	*2,399,078*
Puget Sound Energy	*6,946,064*

I. Energy Intensity Metrics

A. MWh per Capita

WAC 480-109-300(2)(c) requires a utility to annually report the number of MWh used per capita. The MWh per capita metric estimates the amount of energy consumed annually by each person in Pacific Power's Washington service area, using the following calculation:

$$\frac{Total\ Annual\ Washington\ Retail\ Load}{Annual\ Population\ Served}$$

A.1 Total Annual Washington Retail Load

Annual Washington retail load is derived from the company's Federal Energy Regulatory Commission (FERC) Form 1 filings. Load data is not available by customer class, therefore Washington load by customer class was determined using the proportion of retail sales by customer class. The small difference between load and generation is a function of the allocation factors, which are applied based on the West Control Area cost allocation methodology (WCA). The total load served is metered data and the busbar MWh are allocated based on both load/energy and capacity.

A.2 Population Served

During the UE-131723 workshops, the U.S. Census Bureau *American Communities Survey* (ACS) was identified as the preferred data source for calculating population served. However, the company was only able to use this methodology for 2011-2018 populations due to the lack of consistent five-year-average ACS data for earlier years. An alternative method was used for years 2008 through 2010.

Method 1 – For each year between 2011 and 2018, Census block-level ACS data was used to calculate an average household size.[5] The average household size was then applied to the number of residential customers by county, in order to determine a total population served for each year. Method 1 uses the following formula:

$$County\ Average\ Household\ Size\ \ x\ \ Washington\ Residential\ Customers\ Served$$

Method 2 – The alternate methodology used year-over-year population growth rates (% change) to estimate annual population from 2008 through 2010. Method 2 involved the following steps:

[5] United States Census Bureau *American Communities Survey* (ACS) data for reporting years 2011 through 2018 were derived from *Detailed Tables* and *Block Group Data* accessed from https://www.census.gov/geo/maps-data/data/tiger-data.html

(a) Calculating year-over-year percentage growth rates for the reporting period, using population data from the Washington State Office of Financial Management.[6]

$$\left[\frac{(Population\ Year\ 2 - Population\ Year\ 1)}{(Population\ Year\ 1)}\right] x\ 100$$

(b) Using the 2015 population calculated with Method 1 as a starting point, apply the year-over-year, county-level growth rates to estimate the annual population going back to 2008.

$$2015\ Populuation \times (1 + growth\ rate)^{year-2015}$$

B. MWh per Customer

WAC 480-109-300(2)(a) and (b) require a utility to annually report the average number of MWhs per residential customer and per commercial customer. The average MWhs per customer is determined by dividing Washington's annual retail load (MWh at meter) serving a customer class by the number of customers in the same class, in any given year.

$$\frac{Total\ Annual\ Retail\ Load\ Serving\ the\ Customer\ Class}{Annual\ Customers\ in\ Class}$$

Annual retail load (MWhs sold) and number of customers are derived from Pacific Power's annual FERC Form 1 filings.

II. Emissions Intensity Metrics

WAC 480-109-300(2)(d) requires utilities to report annual CO_2 emissions (millions of short tons).

A. Annual CO_2 Emissions

The company's total annual emissions are calculated by aggregating the emissions from all generation allocated to serving Washington customers. The generation identified to have served Washington customers is consistent with the Commission-approved WCA cost allocation methodology, which isolates costs associated with the assets, purchases and sales in the west control area.

To calculate total annual emissions, the company first assigned an annual emission factor to each generation source. The emission factor was applied to Washington's allocated share (MWhs) of the resource's annual output to calculate the annual short tons of emitted CO_2 attributed to Washington customers. Identified below are the steps taken to calculate total carbon emissions per annum.

[6] Washington State Office of Financial Management *Population Trends* available at http://www.ofm.wa.gov/pop/april1/hseries/default.asp and http://www.ofm.wa.gov/pop/april1/hseries/ofm_april1_intercensal_estimates_2000-2010.xlsx.

(a) Assign each resource an annual emission factor (pounds of CO_2/MWh)

Unknown Resources
Consistent with WAC 480-109-300(3), generation from unknown resources were assigned the average electric power CO_2 emissions rate described as the net system mix (spot market) in the Washington state electric utility fuel mix disclosure reports compiled by the Department of Commerce.[7]

Known Resources
Non-carbon-producing resources such as wind, hydro, cogeneration and biogas were assigned an emission factor of zero.

Carbon emitting resources such as coal and natural gas were assigned an emissions factor using CO_2 emission data from the Environmental Protection Agency's (EPA) *Air Markets Program*,[8] and each resource's MWh generation reported in the Company's annual FERC Form 1 filings. The formula to calculate a resource's emission factor is:

$$\frac{(Annual\ Short\ Tons\ CO_2\ Emissions\ \ x\ \ 2000)}{Annual\ Generation}$$

(b) Allocate Washington's share of WCA generation (MWh) of each resource using the state's control area generation west (CAGW) allocation factor, as shown below.[9]

$$Total\ Annual\ Generation\ \ x\ \ CAGW\ Allocation\ Factor(\%)$$

(c) Calculate Short Tons of CO_2 emissions using the following formula:

$$\frac{(Washington\ Allocated\ MWh\ Generation\ \ x\ \ Emission\ Factor)}{2000}$$

(d) Sum all emissions from unknown and known resources to determine total annual Short Tons of CO_2 emissions.

[7] Annual emission rates through 2018 provided by Washington Department of Commerce.
[8] EPA's *Air Markets Program* Data contains current and historical data collected as part of the EPA's emissions trading programs. Accessed from: https://ampd.epa.gov/ampd/.
[9] Consistent with PacifiCorp's West Control Area Inter-Jurisdictional Allocation Methodology.

B. Ratio of Annual CO_2 Emissions to 1990 CO_2 Emissions

WAC 480-109-300(2)(e) requires utilities to report a comparison of annual million short tons to 1990 emissions. This metric is a simple percentage calculation of each reporting year's total calculated emissions as described above, relative to the utility's estimated carbon emissions in 1990: This ratio is presented in Table 1.

$$\frac{Annual\ Short\ Tons\ of\ CO_2\ Emitted}{1990\ Short\ Tons\ of\ CO_2\ Emitted}$$

The 1990 carbon emission values for each utility were developed in UE-131723 workgroups.