



Pacific Power & Light Company

Washington Energy and Emissions Intensity Metrics

2016 Report

June 1, 2017

Revised July 19, 2017

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 or Company), a division of PacifiCorp, submits this 2016 Energy and Emissions Intensity Report (Emissions 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 emissions associated with serving PacifiCorp's Washington customers between 2007 and 2016, compared to an estimate of the Company's 1990 carbon emissions. PacifiCorp's 1990 carbon 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, PacifiCorp estimates the Washington-allocated emissions from 2007 to 2016 to be between 2.5 and 3 million short tons of carbon annually; or between 106 and 125 percent of 1990 emissions.

Table 1

Year	Total Annual CO₂ Emissions (Short Tons)	Ratio of Annual CO₂ Emissions to 1990 Emissions
2007	2,680,795	111.74%
2008	2,766,051	115.30%
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	2,865,259	119.43%
2015	2,988,262	124.56%
2016	2,781,709	115.95%

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 megawatt-hour 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)
2007	17.86	285,296	92.31	15.89
2008	17.80	288,079	90.67	15.86
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	102.3	14.68
10-Year Average	17.15	296,457	96.21	15.26

PacifiCorp's Washington population had steady year-over-year growth between 2007 and 2016. However, the average MWh per residential customer 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 2007-2010 use a different methodology than years 2011-2016. The methodologies are described in greater detail in the report appendices.

Subtotal Metrics – Energy and Emissions from Unknown Generation Sources

The table below shows the annual Washington-allocated energy, emissions, and percentage of load served from unknown generation sources.

Table 3

Unknown Resource - Annual Metrics³			
Year	MWh	CO₂ Emissions	Percentage of Load Served
2007	141,670	85,130	3.20%
2008	(376,496)	(192,854)	-8.28%
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	30,176	1.31%
2015	596,016	311,655	13.28%
2016	847,919	455,239	19.13 %

³ Negative metrics are attributed to having more sales than purchases from unknown resources from 2008 through 2010.

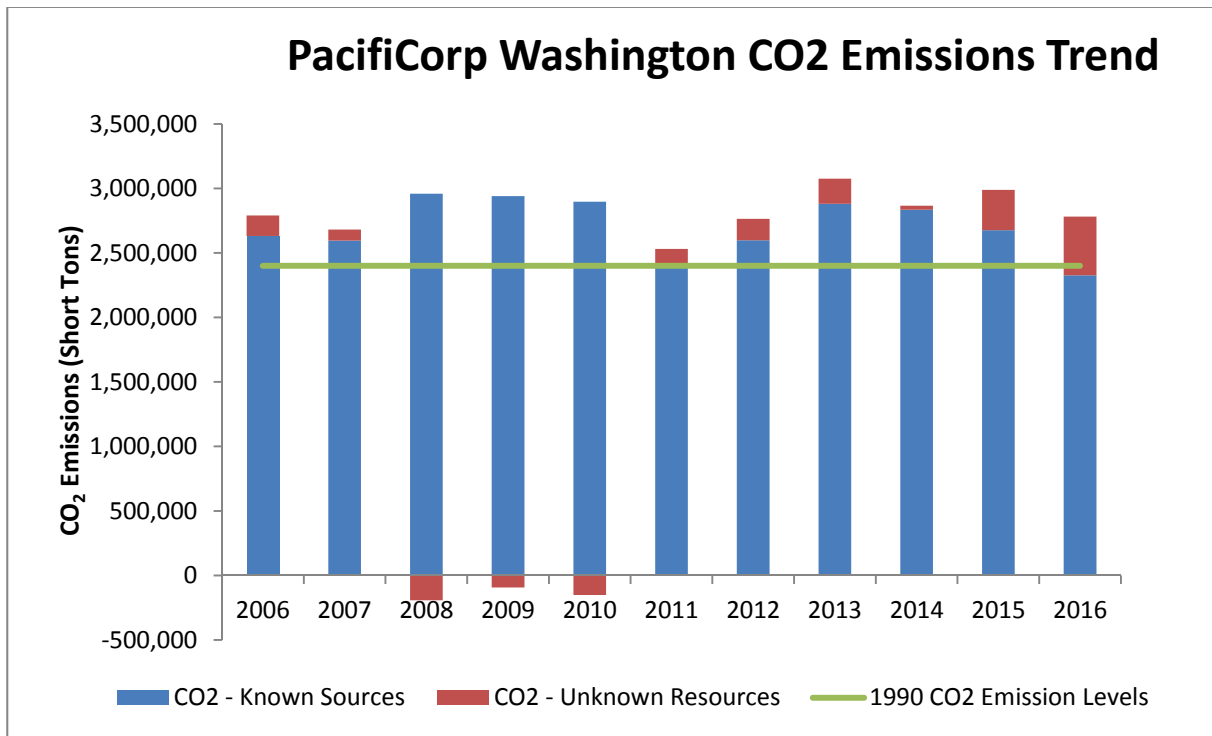
Carbon Emissions Trend Analysis

There are multiple factors that generally impact a utility's carbon 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
- Demand-side efficiency improvements

The figure below illustrates PacifiCorp's Washington-allocated carbon emissions between 2007 and 2016. The quantity of total emissions associated with Washington over this period of time is generally between 2.5 and 3 million short tons of carbon annually. As the figure indicates, carbon emissions generally increased from 2007 through 2010, with a relatively minor reduction in emissions in 2007. Carbon emissions then decreased over the 2010-2011 timeframe and increased again in 2012. Carbon emissions then decreased over the 2010-2011 timeframe and increased again in 2012.

Figure 1



Given the many factors that contribute to the level of carbon 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 (EIM), and changes in PacifiCorp's resource fleet all contribute to the level of energy demand and associated emissions. However, a number of correlations may be drawn about PacifiCorp's estimated emissions in Figure 1:

- The global financial crisis of late 2007-2008 included a downturn in 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 ten-year period. Consequently, emissions from unknown resources in those years were two of the highest.
- In 2008, PacifiCorp 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.
- PacifiCorp added over 1,800 megawatts of renewable capacity to its system during the period of 2006-2015
- In 2016, PacifiCorp Washington-allocated emissions from known resources declined 12% from 5-year average⁴
- Specified sales made to California through the energy imbalance market in 2016 reduced the amount of non-emitting generation to Washington.

⁴ The decrease in emissions from owned resources in 2016 was largely attributable to reductions in emissions from coal resources owned by PacifiCorp.

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 2007 through 2016. 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 – 2016

Summary Energy and Emissions Intensity Report - 2016					
Utility :	PacifiCorp				
Reporting for year :	2016	MWh per Capita			
Population Served :	301,905	14.68			
<i>Energy Intensity Metrics</i>					
	MWh at Meter	MWh Proportion	Customer Count	MWh per Customer	
Residential Customers	1,749,590	39.5%	108,342	16.15	
Commercial Customers	1,612,645	36.4%	15,765	102.3	
Industrial Customers	868,534	19.6%	492	1,765.9	
Irrigation	190,139	4.3%	5,058	37.6	
Public Street & Highway Lighting	11,163	0.3%	241	46.3	
Total Load Served	4,432,072				
<i>Emissions Intensity Metrics</i>					
	Busbar MWh	Percent of Total Load	Short Tons CO ₂		
Known Resources Serving WA	3,448,690	80.3%	2,326,469		
Unknown Resources Serving WA	847,919	19.7%	455,239	% of 1990 CO₂	
	2016 Tons CO ₂		2,781,709	115.95%	
			1990 Short Tons CO ₂	2,399,078	
			<i>See UTC Docket UE-131723, General Order R-581, Page 7, Paragraph 19.</i>		
				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. Megawatt-hours (MWh) per Capita

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

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

A.1 Total Annual Washington Retail Load

Annual Washington retail load is derived from the Company's FERC Form 1 filings.

A.2 Population Served

During the UE-131723 workshops, the United States Census Bureau *American Communities Survey* (ACS) was identified as the preferred data source for calculating population served. However, the Company was only able to utilize this methodology for 2011-2016 populations due to the lack of consistent five-year-average ACS data for earlier years. An alternative method was used for years 2007 through 2010.

Method 1 – For each year between 2011 and 2016, 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:

$$\textit{County Average Household Size} \times \textit{Washington Residential Customers Served}$$

Method 2 – The alternate methodology used year-over-year population growth rates (% change) to estimate annual population from 2007 through 2010. Method 2 involved the following steps:

⁵ United States Census Bureau *American Communities Survey* (ACS) data for reporting years 2011 through 2016 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

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

(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 2007.

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

B. Megawatt-hour per Customer

WAC 480-109-300(2)(a) and (b) require a utility to annually report the average number of megawatt-hours 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.

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

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

II. Emissions Intensity Metrics

WAC 480-109-300(2)(d) requires utilities to report annual CO₂ emissions (millions of short tons).

A. Annual CO₂ 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 is consistent with the Commission-approved West Control Area Inter-Jurisdictional Allocation Methodology (WCA), 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 CO₂

⁶ Washington State Office of Financial Management *Population Trends* available at <http://www.ofm.wa.gov/pop/aprill/hseries/default.asp> and http://www.ofm.wa.gov/pop/aprill/hseries/ofm_aprill_intercensal_estimates_2000-2010.xlsx

attributed to Washington customers. Identified below are the steps taken to calculate total carbon emissions per annum.

(a) Assign each resource an annual emission factor (pounds of CO₂/MWh)

Unknown Resources

Consistent with WAC 480-109-300(3), generation from unknown resources were assigned the average electric power CO₂ 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

Sales made through the energy imbalance market were subtracted from the known resources generation. 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 CO₂ 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 CO₂ 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 CO₂ emissions.

B. Ratio of Annual CO₂ Emissions to 1990 CO₂ Emissions

⁷ Annual emission rates through 2015 provided by Washington Department of Commerce.

⁸ EPA's *Air Markets Program* Data (AMPD) 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.

WAC 480-109-300(2)(e) requires utilities to report a comparison of annual million short tons of 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:

$$\frac{\textit{Annual Short Tons of CO}_2 \textit{ Emitted}}{\textit{1990 Short Tons of CO}_2 \textit{ Emitted}}$$

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