PACIFIC POWER
A DIVISION OF PACIFICORP

PacifiCorp dba Pacific Power & Light Company

Washington Energy and Emissions Intensity Metrics 2021 Report

June 2, 2022

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. On May 7, 2019, Washington Legislature passed the Clean Energy Transformation Act (CETA), which commits Washington to an electricity supply free of greenhouse gas emissions by 2045. The Commission amended WAC 480-109-300 effective January 28, 2021 following rulemaking by Washington Department of Ecology in WAC 173-444 that established compliance mechanism under CETA RCW 19.405.070 and 19.405.020(22), by defining the method for calculation of the greenhouse gas emissions content in electricity an electric utility supplies to its retail electric customer in Washington state. Specifically, it provided for methodology for determining the emissions factor for a specified generating unit and established an emissions rate for unspecified electricity.

Revised WAC 480-109-300 states, in relevant part:

> *(1) A utility must report its greenhouse gas content calculation and 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) Each utility must perform its greenhouse gas content calculation in accordance with the rules enacted by the department of ecology, consistent with RCW 19.405.020(22).*
> *(3) In addition to the greenhouse gas content calculation, the 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 metric tons of CO_{2e} emissions; and*
> *(e) Comparison of annual million metric tons of CO_{2e} emissions to 1990 emissions.*

PacifiCorp dba Pacific Power & Light Company (PacifiCorp) submits this 2021 Energy and Emissions Intensity Report (Emissions Report) to the Commission in accordance with reporting requirements established as part of the EIA and WAC 480-109-300 effective January 28, 2021.

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) equivalent (CO_{2e}) emissions associated with serving PacifiCorp's Washington customers between 2012 and 2021, compared to an estimate of the company's 1990 CO_2 emissions. PacifiCorp's 1990 CO_2 emission level is estimated to be 2,399,078 short tons or 2,176,408 metric 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 2012 to 2021 to be between 2.4 and 2.9 million metric tons of CO_2 annually, or between 115 and 135 percent of 1990 emissions.

Table 1

Year	Total Annual CO_2e Emissions (Short Tons)	Total Annual CO_2e Emissions (Metric Tons)	Ratio of Annual CO_2[1] Emissions to 1990 Emissions
2012	2,950,333	2,676,498	122.98%
2013	3,186,585	2,890,822	132.83%
2014	3,000,296	2,721,824	125.06%
2015	3,152,164	2,859,596	131.39%
2016	2,916,164	2,645,500	121.55%
2017	3,154,615	2,861,820	131.49%
2018	2,946,128	2,672,683	122.80%
2019	3,234,494	2,934,285	134.82%
2020	2,897,337	2,628,421	120.77%
2021	2,984,983	2,707,932	124.42%

[1] The ratio of Annual Emissions to 1990 Emissions is likely overstated because the 1990 emissions did not include CO_{2e} of nitrous oxide (N_2O) and methane (CH_4), nor emissions associated with generation used to cover transmission losses.

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.[2]

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)
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
2019	16.52	305,829	104.00	14.91
2020	14.43	308,836	99.72	15.55
2021	15.93	307,849	100.70	14.91
10-Year Average	**16.24**	**303,230**	**102.93**	**15.02**

PacifiCorp's Washington population had steady year-over-year growth between 2012 and 2020, with a slight reduction in 2021 from 2020. However, the average MWh per residential customer has generally stayed flat or declined, which could indicate increased adoption of energy efficiency.

[2] 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.

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.

Table 3

Unknown Resource - Annual Metrics[4]			
Year	**MWh**	**CO_{2e} Metric Tons Emissions**	**Percentage of Load Served**
2012	369,810	161,607	8.32%
2013	342,608	149,719	7.45%
2014	58,961	25,766	1.31%
2015	596,016	260,459	13.28%
2016	847,919	370,540	19.73%
2017	815,875	356,537	17.78%
2018	662,441	289,486	15.64%
2019	756,345	330,523	17.20%
2020	901,501	393,956	20.39%
2021	824,812	360,443	17.90%

[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.

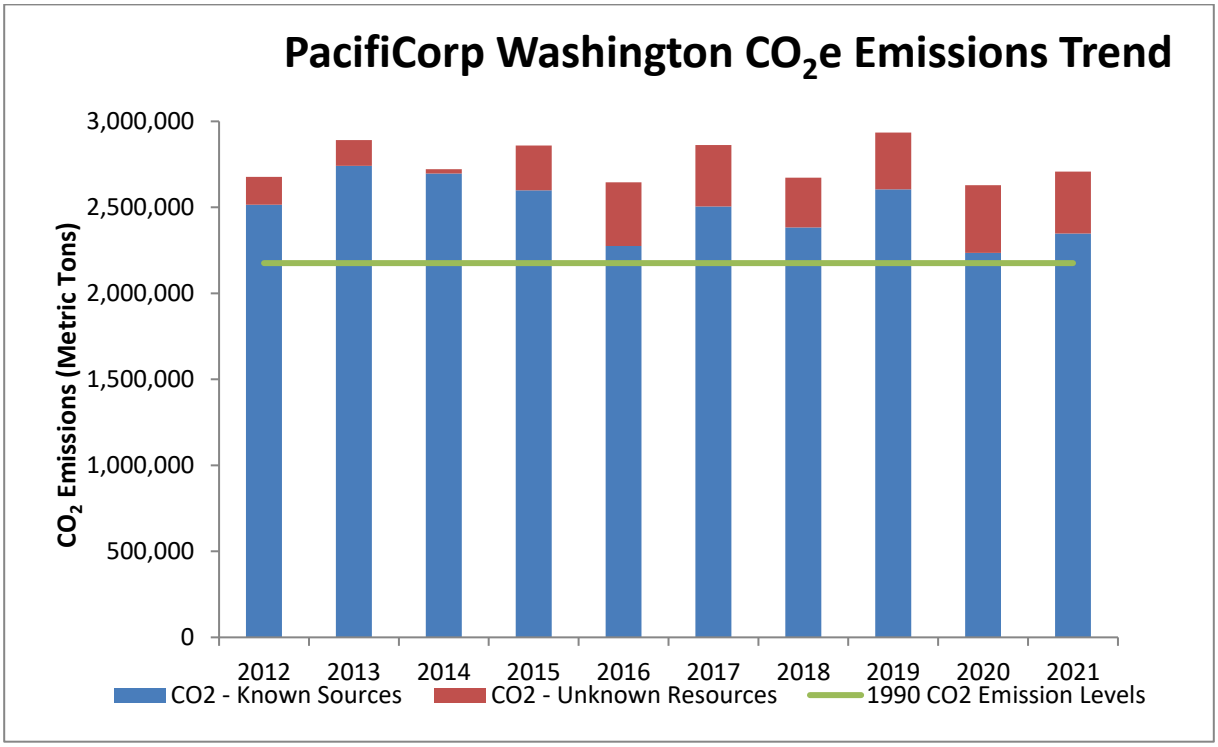
Carbon Emissions Trend Analysis

There are multiple factors that generally impact a utility's CO_{2e} 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 CO_{2e} emissions between 2012 and 2021. The quantity of total emissions associated with Washington over this period is generally between 2.5 and 2.9 million metric tons of CO_{2e} annually. As the figure indicates, CO_{2e} emissions generally increased between 2012 and 2013, with a reduction in emissions in 2014. Emissions fluctuate up and down between 2015 and 2021. An uptick in emissions in 2019 was in part due to wind facilities being offline while undergoing capital upgrades to increase output and efficiency. Emissions dropped in 2020 as wind generation picked back up following repowering. 2021 was only slightly higher than 2020 corresponding to load growth.

Figure 1



Given the many factors that contribute to the level of CO_{2e} emitted over time, 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 PacifiCorp's resource fleet all contribute to the level of energy demand and associated emissions. However, several correlations may be drawn about PacifiCorp's estimated emissions in Figure 1:

- Hydro conditions can have a substantial impact on annual emissions:
    - The 2012 hydro season 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, PacifiCorp acquired the 520-megawatt (MW) 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 MWs of renewable capacity to its system during the period of 2006-2015.
- PacifiCorp 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.
- A relatively large increase in emissions in 2019 was likely due to lower wind generation from wind facilities being offline for repowering. This tread was reversed in 2020 with wind facilities coming back online with increased generation from the repowering effort. Emissions in 2020 may have also been influenced by a 2.2 percent decrease in load from COVID 19.

.

Changes from Prior Years

PacifiCorp's 2021 Washington-allocated emissions increase by 3 percent compared to 2020 with a proportional 3 percent increase in Washington load.

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 2012 through 2021. The metrics calculated in this report are consistent with the mutually agreed upon methodologies identified in the workshops in Docket UE-131723, WAC 480-109-300 effective January 28, 2021 and 173-444 WAC GHG calculation methodology

Table 1 – Summary Energy and Emissions Intensity Report – 2021

Summary Energy and Emissions Intensity Report - 2021

Utility :	PacifiCorp	
Reporting for year :	2021	**MWh per Capita**
Population Served :	**307,849**	**14.91**

Energy Intensity Metrics

	MWh at Meter	MWh Proportion	Customer Count	MWh per Customer
Residential Customers	1,790,260	39.0%	112,370	15.93
Commercial Customers	1,685,738	36.7%	16,733	100.7
Industrial Customers	916,507	20.0%	469	1,954.2
Irrigation	194,206	4.2%	5,025	38.6
Public Street & Highway Lighting	4,318	0.1%	220	19.6
Total Load Served	4,591,029		134,817	

Emissions Intensity Metrics

	Busbar MWh	Percent of Total Load	**Metric Tons CO_2e**	
Known Resources Serving WA	3,782,145	82.1%		
EPA Methodology			2,347,489	
EIA Methodology				
Unknown Resources Serving WA	**824,812**	**17.9%**	**360,443**	**% of 1990 CO_2**
TOTAL GHG Content	2021	Tons CO_2e	**2,707,932**	**124.42%**

1990 Short Tons CO_2	2,176,429

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

	1990 Metric Tons CO_2	Short Tons CO_2
Avista	*1,026,905*	*1,131,957*
Pacific Power	*2,176,429*	*2,399,078*
Puget Sound Energy	*6,301,428*	*6,946,064*

I. Energy Intensity Metrics

A. MWh per Capita

WAC 480-109-300(3)(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 PacifiCorp'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 cost allocation methodology. 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 United States Census Bureau *American Communities Survey* (ACS) was identified as the preferred data source for calculating population served.

For each year between 2012 and 2021, 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, to determine a total population served for each year. Method 1 uses the following formula:

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

B. MWh per Customer

WAC 480-109-300(3)(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.

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

[5] United States Census Bureau *American Communities Survey* (ACS) data for reporting years 2010 through 2021 were derived from *Detailed Tables* and *Block Group Data* accessed from https://www.census.gov/geo/maps-data/data/tiger-data.html.

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(3)(d) requires utilities to report annual CO_2e emissions (millions of metric tons).

A. Annual CO_2e Emissions

The company's total annual emissions are calculated by aggregating the emissions from all generators allocated to serving Washington customers. The generation identified to have served Washington is consistent with the Commission-approved cost allocation methodology effective during the year of reporting. Through 2020, Washington allocations were based on Commission-approved West Control Area Inter-Jurisdictional Allocation Methodology, which isolates costs associated with the assets, purchases and sales in the west control area. Starting in 2021, the cost allocation methodology transitioned to the Washington Inter-Jurisdictional Allocation Methodology, which includes renewable generation across PacifiCorp system but continues to attribute only west control area thermal generation.

To calculate total annual emissions, the company first assigned an annual emission factor to each generation source following rule, Chapter 173-444 WAC, adopted by Department of Ecology in January 2021. The emission factor was then applied to Washington's allocated share (MWhs) of the resource's annual output. Annual company emissions is the sum of all plant emissions and emissions from unknown resources.

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

(a) Calculation for Washington-allocated MWh generation. Washington's share of generation MWh of each resource is based on the state's cost allocation methodology consistent with Net Power Cost application. MWhs s are consistent with generation reported on FERC Form 1.

$$\textit{Washington Allocated MWh} = \textit{Annual MWh} \times \textit{CAGW Allocation Factor (\%)}$$

(b) Assign each resource an annual emission factor (pounds of CO_{2e} per MWh).

Unknown Resources

Consistent with WAC 173-444-040(4), generation from unknown resources were assigned 0.437 metric tons CO_{2e}/MW of electricity converted to 963 pounds of CO_{2e} / MWh.

Known Resources

Non-carbon-producing resources as defined by WAC 173-444-020 (23) such as wind, hydro, geothermal and biogas were assigned an emission factor of zero.

Carbon emitting resources such as coal and natural gas were assigned an emissions factor following WAC 173-444-040(2) outlined methodology.

1) Environmental Protection Agency (EPA) plant GHG emissions - Emissions for each resource were calculated by using emissions and heat rate information published by the EPA in its EPA *Air Markets Program*.[6] Emissions for coal and gas units from N_2O or CH4 were calculated and converted to CO_{2e} following 40 C.F.R. Part 98 methodology, then combined with direct CO_2 emissions to derive total CO_{2e} emissions for each plant.
2) Plant Net Electric Generation - Plant net electric generation was referenced from the EIA's form EIA-923 program.
3) Cogeneration correction factor – Accounts for nonelectric heat used at the power plant calculated from EIA-923
4) WAC 173-444-040(2)(b) allows the use of the most recent five year rolling average published emissions values.

$$Plant\ Emission\ Factor\left(\frac{MT}{MWh}\right) = \frac{(EPA\ plant\ GHG\ (metric\ tons)\ x\ cogeneration\ correciton\ factor)}{Plant\ net\ electric\ generation\ (MWh)}$$

5) Transmission Losses were added to carbon emitting resource generation calculated under section (a) above consistent with WAC 480-109-300(5). The energy transmission loss factor is 3.503 percent as determined by PacifiCorp Washington 2018 Electric System Loss Study dated June 2020.

$$Plant\ Emission\ (MT) = (WA\ Allocated\ MWh\ )x\ (1 + Trans.Loss\ Factor) * Plan\ Emission\ Factor\ \left(\frac{MT}{MWh}\right)$$

B. Ratio of Annual CO_{2e} Emissions to 1990 CO_2 Emissions

WAC 480-109-300(3)(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.

$$\frac{Annual\ Short\ Tons\ of\ CO_{2_e}\ Emitted}{1990\ Short\ Tons\ of\ CO_2\ Emitted}$$

[6] 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/.

The 1990 carbon emission values for each utility were developed in UE-131723 workgroups. 1990 values were calculated by Washington Department of Commerce following its methodology applied to Washington State Electric Utility Fuel Mix Disclosure Report. This methodology should be compared to the Department of Ecology adopted rules in WAC 173-444 to confirm appropriate comparison between the years to determine if both methodologies cover equivalent emissions (transmission losses, a consistent unspecified factor, non-CO_2 emissions, etc.).