Port of Vancouver USA

2023 Greenhouse Gas Emissions Inventory Summary

Section 1

Introduction

This inventory report provides an analysis of the greenhouse gas (GHG) emissions from operations at the Port of Vancouver (Port) in calendar year 2023. The results are compared against previous inventories compiled by the Port for the years 2005 (baseline year), 2008, and 2019. The Port's inventory follows international best practice for GHG emissions accounting; specifically, the GHG Protocol Corporate Accounting and Reporting Standard (GHG Protocol) that was jointly developed by the World Research Institute (WRI) and World Business Council Sustainability Development (WBCSD) and the latest mobile emission models from the U.S. Environmental Protection Agency (USEPA).

GHG Emissions Scopes

Scope 1 emissions are direct emissions from sources owned and controlled by the Port, including the Port's vehicle fleet, mobile equipment fuel consumption, and stationary engines emitting on site.

Scope 2 emissions are indirect GHG emissions that result from the production of purchased electricity for Port-controlled operations and buildings from a utility provider.

Scope 3 emissions refer to other activities occurring in and around the Port, from sources not owned or directly controlled by the Port. Examples of these activities include transportation of goods (trains, vessels, cargo handling equipment, trucks, and harbor craft), energy use by Port tenants (heating and cooling, lighting, etc.), and employee travel and commuting.

The operational boundary of the 2023 inventory includes Port-owned and -controlled activities – namely, all scope 1 and scope 2 emissions sources as defined by the GHG Protocol.[1] Accordingly, the inventory includes direct and indirect emission sources. Direct emissions (scope 1) are those associated with fuel combustion from the Port's on-road vehicle fleet, off-road equipment fleet, and stationary sources, including fuel combustion in stationary equipment and natural gas use in buildings. Indirect emissions (scope 2) are those associated with the production of purchased electricity for Port-controlled operations and buildings.

[1] The Port uses the GHG Protocol's *control* approach to determine the operational boundary, where the reporting organization accounts for 100 percent of the GHG emissions from operations over which it has control.

Section 2

Results

2.1 2023 GHG Emissions

The Port's 2023 GHG inventory includes emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), expressed as metric tons of carbon dioxide equivalents ($MTCO_2e$). **Table 1** summarizes annual emissions by scope and by source. Emission totals are presented with and without inclusion of renewable energy certificate (REC) purchases, which have been used to reduce the Port's scope 2 emissions from electricity since 2007.

The Port's 2023 GHG emissions totaled approximately 1,844 $MTCO_2e$ (without accounting for REC purchases). Scope 1 emissions accounted for 654 $MTCO_2e$ and scope 2 emissions accounted for 1,189 $MTCO_2e$. When accounting for the purchase of RECs, the 2023 inventory totals 654 $MTCO_2e$.

Table 1
Port of Vancouver 2023 GHG Emissions by Source and Scope

Scope	Category	Source	Emissions ($MTCO_2e$)
Scope 1	Direct – Mobile Combustion	On-Road Vehicles	282
		Off-Road Equipment	301
	Direct – Stationary Combustion	Stationary Sources	71
Scope 2	Indirect – Electricity Generation	Purchased Electricity	1,189
		Scope 1 Subtotal	654
		Scope 2 Subtotal	1,189
		REC Purchase Reduction	-1,189
		Total Excluding RECs	**1,844**
		Total Including RECs	**654**

Note: Totals may not sum precisely due to rounding.

In 2023, purchased electricity contributed the largest portion of total emissions (1,189 $MTCO_2e$, or 65 percent of the total when excluding RECs). Off-road equipment was the next highest contributor at 16 percent followed by on-road vehicles at 15 percent. The smallest contributing source was stationary sources at 4 percent. When REC purchases are considered, off-road equipment becomes the greatest contributor of emissions at 46 percent, followed by on-road vehicles at 43 percent, and stationary sources at 11 percent. **Figure 1** depicts the Port's 2023 GHG emissions by source, with and without the effects of purchasing RECs.

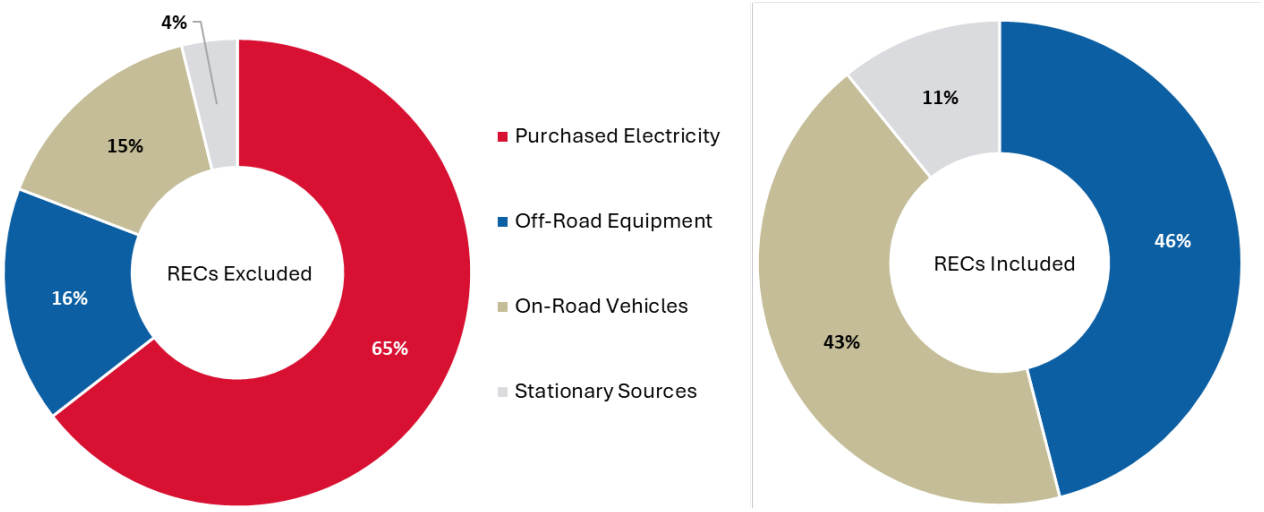

Figure 1
Port of Vancouver 2023 GHG Emissions by Source – Including vs. Excluding RECs

2.2 Source Analysis

To support the Port's emission reduction planning efforts, this section includes an in-depth analysis of emission sources including vehicles, equipment, and facilities.

Mobile Combustion

Mobile combustion is the main source of the Port's scope 1 emissions. Mobile combustion captures fuel consumption of both on-road vehicles and off-road equipment, including gasoline, renewable diesel, conventional diesel, and propane. All Port vehicles and equipment that are diesel-powered use renewable diesel, with the exception of the two mobile harbor cranes, which run on conventional diesel. **Table 2** summarizes the emissions associated with each fuel type for both mobile combustion sources.

Table 2
Port of Vancouver 2023 Mobile Combustion Emissions by Fuel Type

Mobile Combustion Source	Fuel Type	Emissions ($MTCO_2e$)	Percent of Inventory	
			Excluding RECs	Including RECs
On-Road Vehicles	Gasoline	199	11%	30%
	Renewable Diesel	84	5%	13%
Off-Road Equipment	Renewable Diesel	148	8%	23%
	Conventional Diesel (Mobile Cranes)	140	8%	21%
	Gasoline	12	1%	2%
	Propane	2	< 1%	<1%
	Total	**584**	**32%**	**89%**

Note: Totals may not sum precisely due to rounding.

As shown in **Figure 2**, the majority of mobile combustion emissions come from on-road vehicle gasoline consumption (199 $MTCO_2e$, 34 percent) followed by off-road equipment renewable diesel consumption (148 $MTCO_2e$, 25 percent), and mobile harbor crane conventional diesel consumption (140 $MTCO_2e$, 24 percent). In terms of total emissions, excluding RECs, gasoline use in on-road vehicles makes up 11 percent, conventional diesel use in mobile cranes makes up 8 percent, and renewable diesel use in off-road equipment makes up another 8 percent.

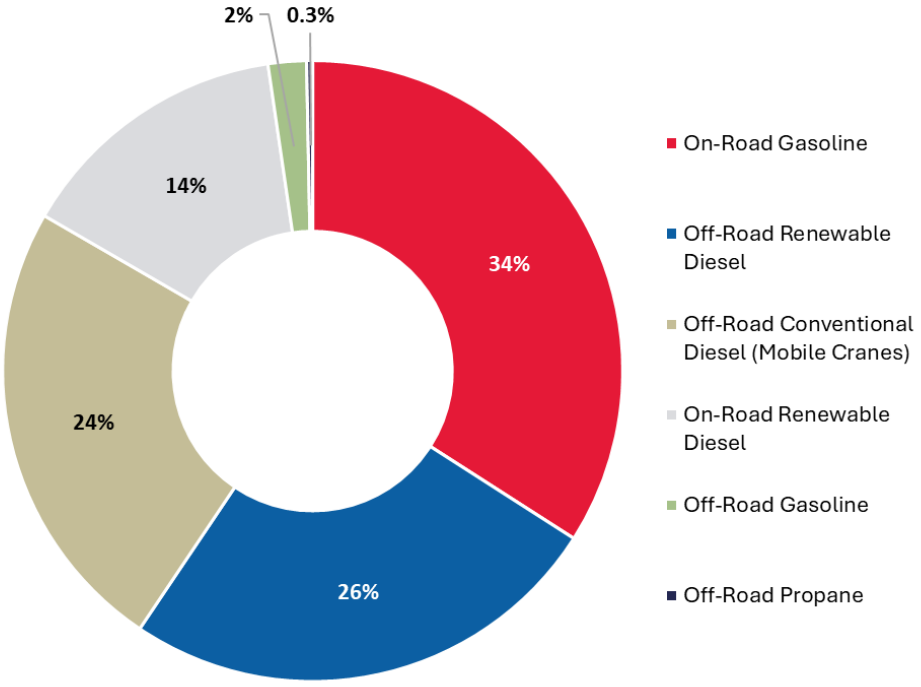

Figure 2
Port of Vancouver 2023 Mobile Combustion Emissions by Source and Fuel Type

The Port has identified four departments that operate a total of 110 on-road vehicles and pieces of off-road equipment. Understanding which departments are responsible for emission types can help the Port better identify emission reduction opportunities. Mobile combustion emissions are broken down by department in **Figure 3**.

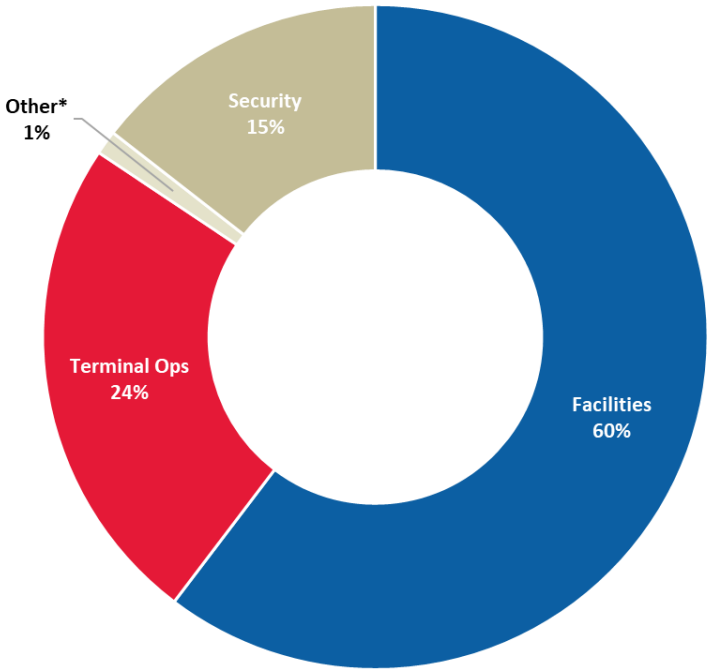

Figure 3
Port of Vancouver 2023 Mobile Combustion Emissions by Department

**Other includes Safety, Environmental, and Admin.*

The departments responsible for significant portions of mobile combustion emissions are Facilities (60 percent) and Terminal Operations (24 percent).

While the Facilities department has the highest percentage of emissions, it also has the highest vehicle/equipment count. **Table 3** depicts the vehicle/equipment counts and average emissions per vehicle/equipment for each department.

Table 3
Port of Vancouver 2023 Fleet Count and Emissions Intensity by Department

Departments	Vehicle and Equipment Count	Average Emissions per Vehicle/Equipment ($MTCO_2e$)
Terminal Operations	5	28
Security	7	12
Facilities	91	4
Other*	7	1

**Other includes Safety, Environmental, and Admin.*

Terminal Operations has the lowest operational vehicle/equipment count (five) but the highest average emissions per vehicle/equipment (28 $MTCO_2e$). Terminal Operations controls the Port's two mobile harbor cranes, which are a significant emissions source at the Port. The two mobile harbor cranes operate at an average of 70 $MTCO_2e$ per machine per year and, combined, contribute 21 percent of mobile combustion emissions.

Purchased Electricity

The Port's scope 2 emissions are comprised solely of purchased electricity from Clark Public Utilities (CPU). The Port consumed a total of 8,412 megawatt-hours (MWh) in 2023 emitting 1,189 $MTCO_2e$.

Understanding energy emissions at the facility level can help the Port target energy efficiency and conservation strategies to lower emissions and energy costs. There are 63 electricity accounts across the Port. **Table 4** lists the top ten sources of electricity consumption at the Port and the contribution of each to the inventory. The top ten users are responsible for 64 percent of scope 2 emissions and 41 percent of total emissions. **Table 4** lists the top ten Port facilities, their uses, and their emissions.

Table 4
Port of Vancouver 2023 Top 10 Electricity Users

Account	Usage Details	Electricity Use (MWh)	Emissions ($MTCO_2e$)	Percent of Inventory
7207-314, 7207-392	Berth 13/14 (Shore Power)	1,773	251	14%
7207-611	Maintenance Shop, Security Office, & Terminal 3 West Lighting	870	123	7%
7207-334	Terminal 3 South Lighting & Warehouses	415	59	3%
7207-393	Groundwater Treatment Extraction Well	385	54	3%
7207-378	Terminal 4 Northeast Lighting	378	53	3%
7428-889	Pump House #1	365	52	3%
7207-398	Terminal 5 Rail Corridor Lighting	339	48	3%
7207-526	Admin Building	291	41	2%
7207-605	Terminal 2 Lighting	290	41	2%
7207-433	Terminal 3 North Lighting & Terminal Ops Building	255	36	2%
	Total	**5,361**	**758**	**100%**

Note: Totals may not sum precisely due to rounding.

Historical Inventory Analysis

The 2023 GHG inventory is the Port's fourth GHG emissions inventory after 2005, 2008, and 2019. This section will compare 2023 emissions with previous years to obtain a relative understanding of how the Port's emissions have changed over time. **Table 5** summarizes inventories for 2005, 2008, 2019, and 2023 by scope and by source category. For each inventory year, emissions totals are shown with and without the effects of REC purchases, which have been used to reduce the Port's scope 2 electricity emissions since 2007. Minor adjustments were made to past years' emissions estimates to ensure methodological consistency and allow for accurate comparisons of the inventories.[2]

The Port's total emissions for 2023, excluding RECs, are estimated to be 1,844 $MTCO_2e$, representing a 7 percent decrease from 2019 emissions, and a 13 percent increase from the 2005 baseline of 1,627 $MTCO_2e$. When REC purchases are taken into consideration, 2023 emissions are estimated to be 654 $MTCO_2e$, a reduction of 60 percent compared to the Port's 2005 baseline.

Table 5
Port of Vancouver Historical GHG Emissions by Source and Scope

Scope	Category	Source	Emissions ($MTCO_2e$)			
			2005	2008	2019	2023
Scope 1	Direct – Mobile Combustion	On-Road Vehicles	164	182	273	282
		Off-Road Equipment	95	109	378	301
	Direct – Stationary Combustion	Stationary Sources	28	64	357	71
Scope 2	Indirect – Electricity Generation	Purchased Electricity	1,339	1,902	974	1,189
		Scope 1 Subtotal	288	355	1,008	654
		Scope 2 Subtotal	1,339	1,902	974	1,189
		REC Purchase Reduction	0	-1,134	-974	-1,189
		Total Excluding RECs	**1,627**	**2,257**	**1,982**	**1,844**
		Total Including RECs	**1,627**	**1,123**	**1,008**	**654**

Notes: Totals may not sum precisely due to rounding. Stationary equipment usage was not tracked separately prior to 2012.

2 The Port's 2005 and 2008 inventories were developed by Weston Solutions in 2009. The 2019 inventory was developed by Ramboll in 2021.

Figure 4 illustrates the Port's emissions by source over time excluding REC purchases, while **Figure 5** incorporates the reductions associated with purchasing RECs.

In 2023, the Port was responsible for 22 percent more electricity emissions and 3 percent more on-road vehicle emissions than in 2019. Between 2019 and 2023, the Port saw significant reductions in stationary sources (80 percent) and off-road equipment emissions (20 percent). The Port's electricity consumption is anticipated to continue increasing, while mobile combustion emissions are anticipated to continue decreasing due to the Port's efforts to electrify vehicles and equipment.

Compared to the 2005 baseline, 2023 electricity emissions decreased by 11 percent while all other emission sources increased. Off-road equipment saw the greatest increase of 216 percent between 2005 and 2023, followed by stationary sources(150 percent) and on-road vehicles (72 percent). Despite the significant increases in these emission sources, the Port's total emissions increased by only 13 percent from 2005 to 2023, which can likely be attributed to the Port's operational growth.

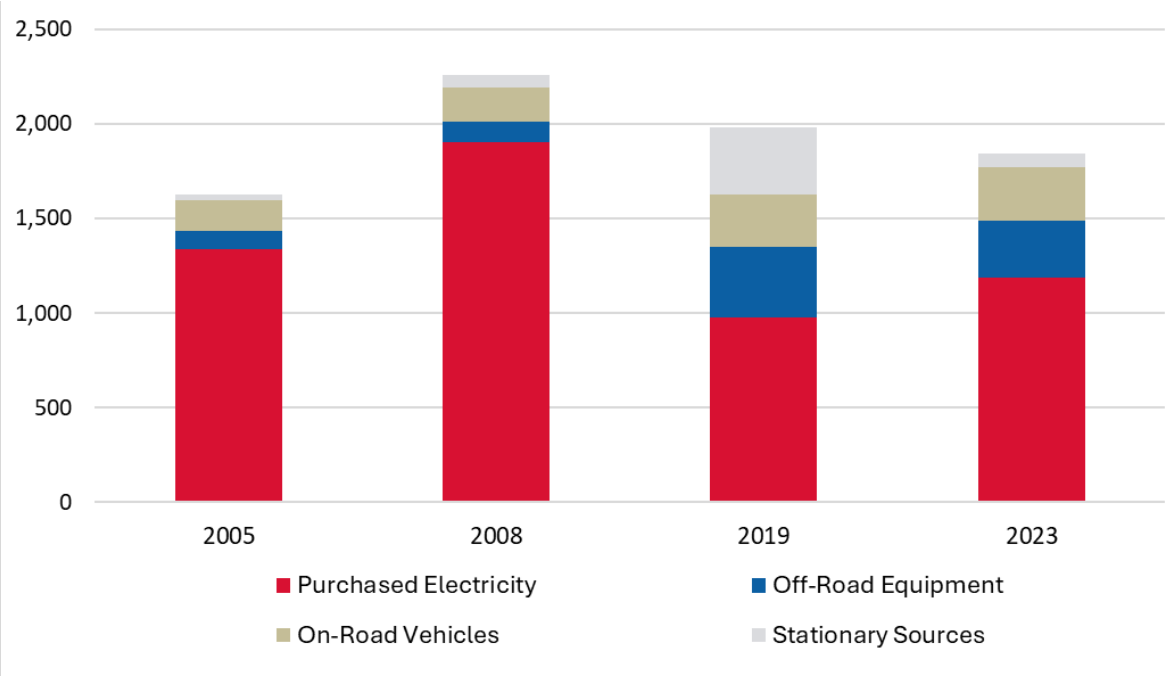

Figure 4
Port of Vancouver GHG Emissions by Source – All Years, Excluding RECs

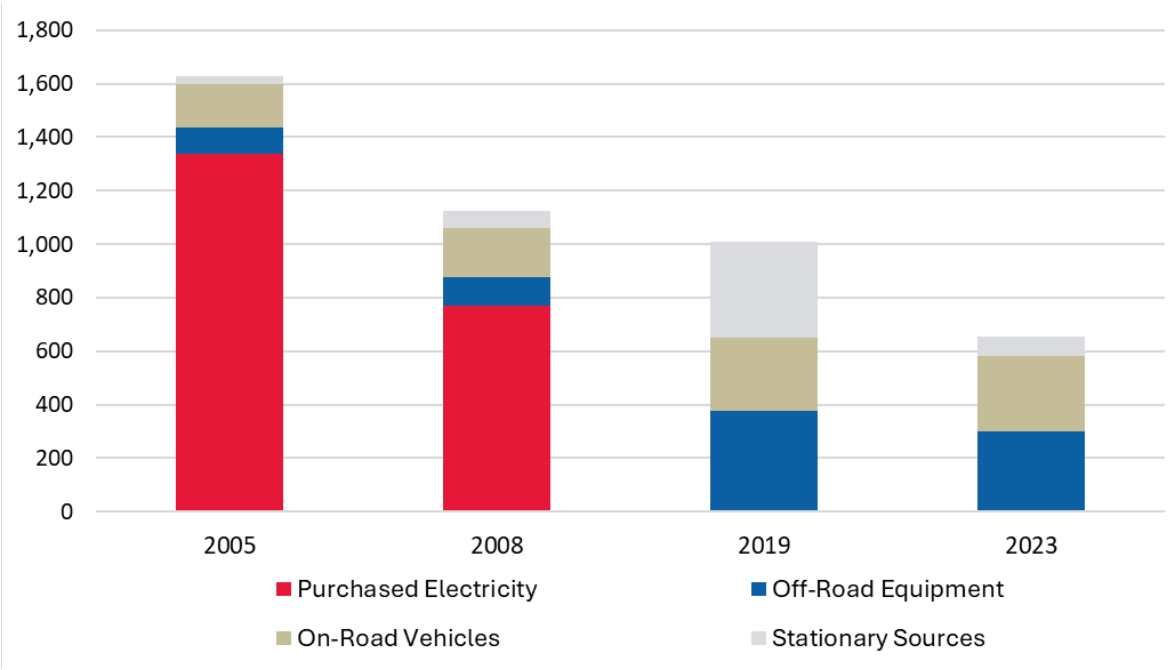

Figure 5
Port of Vancouver GHG Emissions by Source – All Years, Including RECs

Section 3

Methods and Assumptions

This section summarizes the GHG calculation methods and assumptions for each emission source included in the Port's 2023 GHG inventory. Consistent with the GHG Protocol, the Port's 2023 inventory relies on activity data (e.g., fuel consumption) rather than relying on direct measurements of emissions at the source. The Port supplied activity data for most of the emission sources; ESA then used standard source-specific emission factors to calculate total emissions generated by each source, using the following general equation:

$$Activity\ Data \times Emission\ Factor = CO_2\ emissions$$

For example, the Port reported that annual electricity use was 8,412 MWh in 2023. CPU, which supplies electricity to the Port, provided a utility specific electricity intensity factor for 2022 that equated to 311.66 pounds (lbs) of carbon dioxide equivalent (CO_2e) per MWh. Thus, total annual CO2 emissions from electricity at the Port are:

$$8{,}412\ MWh \times 311.7\ lbs\ CO_2e/MWh = 2{,}621{,}776\ lbs\ CO_2e\ (1{,}189\ MTCO_2e)$$

The robustness of calculated emissions is dependent upon the accuracy of the data provided by the Port and on the accuracy of emission factors used by ESA. To the greatest extent possible, ESA used utility-specific emission factors and emission factors from the IPCC and the GHG Protocol. In addition, ESA used factors from other scientifically vetted sources including the United States Environmental Protection Agency (EPA) and The Climate Registry (TCR), the Bureau of Transportation Statistics (BTS), the United States Department of Energy (DOE), and others.

3.1 Mobile Combustion

Mobile combustion emissions calculations include the consumption of fuel across all Port owned/operated on-road vehicles and off-road equipment.

On-Road Vehicles

- Annual fuel consumption data was provided by the Port, which was converted into miles based on the DOE's average vehicle miles per gallon (MPG). The MPG allocated to vehicles was categorized by vehicle type. ESA used vehicle descriptions provided by the Port to place vehicles into categories.
- All diesel vehicles were assumed to use renewable diesel. A 4 percent emission reduction was applied to diesel vehicle emissions to account for the lower tailpipe emissions associated with renewable diesel.[3]

[3] Renewable diesel produces 4 percent less tailpipe emissions compared to conventional diesel, according to the National Renewable Energy Laboratory's study *Renewable Diesel Evaluation in UPS Fleet Vehicles*.

Off-Road Equipment

- Annual off-road equipment gasoline and diesel consumption data was provided by the Port. Off-road equipment was categorized into the EPA's vehicle emission factor categories based on fuel type and equipment description.
- All diesel equipment except for the two mobile cranes were assumed to use renewable diesel. A 4 percent emission reduction was applied to diesel equipment emissions to account for the lower tailpipe emissions associated with renewable diesel. Emissions from mobile crane fuel use were based on conventional diesel emission factors.
- Fuel cans with 'POVxx' fuel tags were assumed to use gasoline in small equipment.
- Propane purchase data was provided by the Port. All recorded purchased propane was included in the 2023 inventory. The price of propane per gallon was assumed to be consistent with the price provided by Central Welding Supply ($3.07).

3.2 Stationary Combustion

Stationary combustion emissions calculations include fuel use associated with stationary equipment and natural gas use in buildings.

Stationary Equipment

- Fuel (diesel and propane) consumption for stationary equipment was provided by the Port. Fuel consumption used in calculations was pulled from the Port-allocated fuel tag. If a fuel tag did not record fuel use, fuel consumption for that piece of equipment was pulled from the Port's Southwest Clean Air Agency report.

Natural Gas

- The Port provided purchased natural gas bills from NW Natural for Port owned/operated facilities. Natural gas consumption at vacant leased facilities that was billed to the Port was included in the 2023 inventory.

3.3 Purchased Electricity

Purchased electricity emission calculations include electricity usage from Port owned/operated facilities metered for electricity.

- The Port provided purchased electricity bills from CPU for Port owned/operated facilities. Electricity use associated with vacant leased facilities that was billed to the Port was included in the 2023 inventory.
- CPU provided a 2022 electricity emission factor; this was used for the calculations due to a delayed release of the 2023 emission factor.

References

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