

IMPLEMENTATION REPORT

2017



Executive Summary

In 2013, the Port of Seattle (POS), Port of Tacoma (POT), and Port of Vancouver collaborated to create an updated Northwest Ports Clean Air Strategy (Strategy) with three objectives: reducing port-related air quality impacts of diesel particulate matter (DPM), reducing greenhouse gas (GHG) emissions, and helping meet air quality standards and objectives for the airshed. The Strategy is being implemented in partnership with several agencies, including the U.S. Environmental Protection Agency, the Washington State Department of Ecology (Ecology), the Puget Sound Clean Air Agency, Environment Canada, BC Ministry of Environment and Climate Change Strategy, and Metro Vancouver (strategy partners). This 2017 Implementation Report summarizes the progress made toward the goals and performance targets identified in the 2013 updated Strategy, building on the progress outlined in the 2014, 2015 and 2016 reports. This report also highlights key demonstration projects and pilot studies undertaken by the Ports and Strategy partners in 2017 that support the Strategy goals, and provides a summary of initiatives underway in 2018.

In August 2015, POS and POT formed The Northwest Seaport Alliance (NWSA) to jointly manage their marine cargo facilities and business. Going forward, NWSA will participate as a port partner in implementing the Strategy. For this report, the NWSA, and the ports of Seattle, Tacoma and Vancouver will be collectively referred to as “the Ports”.

Progress Toward Strategy Goals

The Ports conduct air emission inventories every five years, and these are used to track progress on the two strategy goals. Based on the 2015/2016 inventories, the ports collectively met the 2020 DPM and the 2020 GHG goals by the end of 2016.

Goal 1: Reduce DPM emissions per metric ton of cargo by 80% by 2020, relative to 2005

→ DPM emissions per metric ton of cargo were reduced by **80%** between 2005 and 2015/2016.

Goal 2: Reduce GHG emissions per metric ton of cargo by 15% by 2020, relative to 2005

→ GHG emissions per metric ton of cargo were reduced by **17%** between 2005 and 2015/2016.

Performance Target Status for 2017

Performance targets are organized into six sectors: ocean-going vessels (OGV), harbor vessels, cargo-handling equipment (CHE), trucks, locomotives and rail transport, and port administration. Table E-1 summarizes the progress toward the 2020 (and 2017 for drayage trucks) performance targets. Further details about this progress are included in the report.

Demonstration Projects and Pilot Studies in 2017

The Ports and their partners undertook pilot studies and demonstration projects in 2017. This report highlights three studies or projects undertaken at the ports in 2017, as follows:

- Port of Vancouver: Terminal Tractor Active Start Stop Installation
- Port of Seattle: Solar Energy Installation
- NWSA and Port of Tacoma: Shore Power Analysis

Key Initiatives for 2018

The Ports have numerous initiatives planned and/or underway for 2018, including creating port-wide greenhouse gas reduction strategies; installing new shore power terminals, solar arrays and electric vehicle charging stations; creating new staff positions to focus further efforts on air quality and climate action initiatives; and many others outlined in Section 10.

Starting in 2018, the Ports and strategy partners are undertaking a review and update of this Strategy with the intention to publish an updated Strategy in 2019 that builds on the strong collaboration established among the participants over the last decade. The goal of the strategy update is to continue to promote emission reductions of both DPM and GHGs and to encourage sustainable port operations.

Table E-1. Status of 2017 and 2020 Performance Targets for 2017

| Sector | 2020 Performance Targets* | Results | Status |
|---|---|--|--|
|  Ocean-Going Vessels | OGV 1: Ports track number of vessel calls with Tier 3 marine engines, shore power use, cleaner fuel, or other emission-reducing technologies | 4 of 4 Ports track these vessels, and 4% of vessel calls met this standard at the 4 ports | ✓ target met |
| | OGV 2: A: Ports participate in third-party certification programs B: 40% vessel calls participate in Port-designed or third-party certification programs that promote continuous efficiency improvements | A: 3 of 4 Ports participated in Green Marine B:  | A: not yet meeting B: ✓ target met |
|  Harbor Vessels | Harbor 1: A: Partners conduct outreach B: 90% of harbor vessel companies report best practices and engine upgrades | A: All ports conducted outreach events B: 30% of companies reported; 25% performed engine upgrades and best practices | A: ✓ target met B: not yet meeting |
| | Harbor 2: A: Ports participate in third-party certification programs B: 40% vessels participate in Port-designed or third-party certification programs | A: 3 of 4 Ports participated in Green Marine B:  | A: not yet meeting B: not yet meeting |
|  Cargo-Handling Equipment | CHE 1: 80% of CHE meets Tier 4 interim (T4i) emission standards or equivalent |  | not yet meeting |
| | CHE 2: A: Ports have fuel-efficiency plans for CHE B: 100% of terminals have fuel-efficiency plans for CHE | A: 3 of 3 Ports with CHE have plans B:  | A: ✓ target met B: not yet meeting |
|  Trucks | Truck 1: 100% of trucks meet or surpass EPA emission standards for model year 2007, by 2017 |  | not yet meeting (2017 target) |
| | Truck 2: A: Ports and terminals have fuel-efficiency plans for trucks B: 50% truck companies have fuel-efficiency plans | A: 0 of 4 Ports and 2 of 14 terminals at 1 of the ports had fuel-efficiency plans for trucks B: 21% of truck companies participated in SmartWay at 1 port | not yet meeting ** |
|  Rail | Rail 1: 100% of switcher locomotive owners/operators achieve performance measures of chosen fuel-efficiency program | 1 owner/operator (5%) was known to achieve performance measures of chosen program | not yet meeting ** |
| | Rail 2: 20% of unregulated switcher locomotive engines are upgraded or replaced to Tier 2 or better | 7% unregulated engines were known to be upgraded or replaced since December 31, 2013 at 3 of the ports | not yet meeting ** |
|  Port Administration | Admin 1: Ports increase use of cleaner vehicles and equipment | A: 2 Ports slightly increased the size of fleets B: 21% (on-road) and 47% (non-road) fleets use alternative fuels C: 15% of fuel used in fleets was alternative D: 2 of 3 Ports have fuel efficiency plans in place | in progress |
| | Admin 2: Ports apply clean construction practices for Port-led construction projects including idle-reduction requirements and enact a plan to address Tier 4 engine emission requirements | 3 of 3 Ports have clean construction practices for Port-led projects, but 0 of 3 Ports require Tier 4 non-road engines | not yet meeting |
| | Admin 3: Each Port completes 3 energy conservation projects | 3 of 3 Ports have completed at least 3 projects since 2013 | ✓ target met |

* Partners are striving to meet targets by December 31st of the target year. Note that 2017 is the target year for Trucks.

** Incomplete data is available for the 2016 report.



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List of Acronyms

| | |
|---------|---|
| AESS | Automatic engine stop start |
| CHE | Cargo-handling equipment |
| CNG | Compressed natural gas |
| DERA | EPA Diesel Emission Reduction Act |
| DPM | Diesel particulate matter |
| ECA | Emission control area |
| Ecology | Washington State Department of Ecology |
| EPA | U.S. Environmental Protection Agency |
| ESI | Environmental Shipping Index |
| FRATIS | Port of Tacoma Freight Advanced Traveler Information Systems |
| GHG | Greenhouse gas |
| HC | Hydrocarbon |
| IMO | International Marine Organization |
| LNG | Liquefied natural gas |
| NOx | Nitrogen oxides |
| NRDE | Port of Vancouver Non-Road Diesel Emissions program |
| NWSA | The Northwest Seaport Alliance |
| OGV | Ocean-going vessel |
| PM | Particulate matter |
| POS | Port of Seattle |
| POT | Port of Tacoma |
| PSCAA | Puget Sound Clean Air Agency |
| RNG | Renewable Natural Gas |
| RTG | Rubber-tired gantry crane |
| ScRAPs | NWSA Seaport Scrapage and Replacements for Air in Puget Sound |
| TLS | Port of Vancouver Truck Licensing System |
| ULSD | Ultra-low-sulfur diesel |
| VFPA | Vancouver Fraser Port Authority |

1. Introduction

The Northwest Ports Clean Air Strategy (Strategy) is a collaboration, established by the ports of Seattle (POS), Tacoma (POT) and Vancouver, with the aim of reducing air emissions from maritime and port-related activities that affect air quality and contribute to climate change. The formation of The Northwest Seaport Alliance (NWSA) in 2015 added a fourth port partner to the Strategy.

Several government agencies work in partnership with the Ports to support implementation of the Strategy, including the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), the Puget Sound Clean Air Agency (Clean Air Agency), Environment Canada, BC Ministry of Environment and Climate Change Strategy, and Metro Vancouver (strategy partners).

The Strategy, originally developed in 2007, was updated in 2013 based on new data and on lessons learned from the first six years of implementation, advances in emission-reduction technology, and changes in the regulatory landscape. The Ports and strategy partners issue annual implementation reports that summarize progress toward the goals and targets identified in the Strategy. *This 2017 Implementation Report is the fourth to report progress against the 2013 Strategy.* In 2018 and 2019, the Ports and Strategy partners will undertake a review and update of the Strategy.

The Strategy is organized by these six sectors:



Ocean-going vessels (OGV)



Trucks



Harbor vessels (Harbor)



Locomotives and rail transport (Rail)



Cargo-handling equipment (CHE)



Port administration (Admin)

Strategy Objectives, Goals and Targets

The updated 2013 Strategy has three primary objectives:

1. Reduce port-related air quality impacts from diesel particulate matter (DPM) emissions to decrease immediate and long-term effects on human health, the economy, and the environment in the Georgia Basin-Puget Sound airshed.
2. Reduce greenhouse gas (GHG) emissions to limit contributions to climate change and reduce associated environmental, health, and economic impacts.
3. Help meet air quality standards and objectives for the Georgia Basin-Puget Sound airshed.

To track progress on these objectives, two airshed-wide goals are included in the Strategy – one for DPM emissions and one for GHG emissions (see Section 2 for progress towards these goals).

Several targets were also defined in the Strategy within each of the sectors identified above. The strategy partners work with stakeholders to meet targets by the end of the stated calendar year—that is, the achievement date for 2020 targets is December 31, 2020. This report focuses on the progress made toward the 2020 (and December 31, 2017 for trucks) performance targets. The Ports continue to work toward achieving both the 2015 and 2020 targets where they have not yet met the 2015 performance targets.

Summary of the Participating Pacific Northwest Ports

In 2017, the ports collectively moved approximately 179 million metric tons of cargo. Each port has a unique operating context, including the amount of cargo moved annually, the number of terminals and other operations, and the types of business sectors served (see Table 1 for a summary of these by port). Despite different operating contexts, the Ports recognize that defining and working toward common goals can have a greater overall impact on reducing port-related air emissions in the Georgia Basin-Puget Sound airshed.

Table 1. Summary of terminals, cargo and passengers moved, and business sectors served at each port

| Port | Total tonnage of cargo moved in 2017 (metric tons) | Number of Passengers | Number of Terminals | Types of business sectors served |
|-----------------------------------|--|----------------------|---------------------|--|
| Northwest Seaport Alliance | 27,570,924 | n/a | 15 | Automobile / Roll-on Roll-off Breakbulk Bulk Container |
| Seattle | 4,362,603 | 1,071,594 | 3 | Bulk Cruise Commercial/Recreational Marinas |
| Tacoma | 4,893,609 | n/a | 1 | Bulk |
| Vancouver | 142,078,359 | 842,928 | 27 | Automobile / Roll-on Roll-off Breakbulk Bulk Container Cruise Other |

How this Report is Organized

This report is organized according to the following key elements from the 2013 Strategy:

- **Goals** for reducing port-related emissions in the Georgia Basin–Puget Sound airshed that focus on DPM and GHGs. *(Report Section 2)*
- **Performance targets** for 2017 and 2020 for reducing emissions in each of the six sectors. *(Report Sections 3 to 8)*
- Port commitments to undertake **pilot studies and demonstration projects** designed to advance emission-reduction technologies that can help meet the emission-reduction goals. *(Report Section 9)*

2. Clean Air Strategy Goals

The actions in the Strategy are intended to complement regulations and, together with the regulations, help to achieve the following emission reductions:

DPM Goal: *Reduce diesel particulate matter emissions per metric ton of cargo by 80% by 2020, to decrease immediate and long-term health effects on adjacent communities, relative to 2005.*

GHG Goal: *Reduce greenhouse gas emissions per metric ton of cargo by 15% by 2020, to limit contributions to climate change and reduce associated environmental, health, and economic impacts, relative to 2005.*

The Strategy goals focus on reducing the intensity of emissions that result from port activities (i.e. reducing the amount of emissions per metric ton of goods that are moved), relative to the baseline intensity of emissions in 2005. Tracking emissions intensity provides a mechanism for reporting progress even when the ports experience different rates of growth in economic activity.

2005 Baseline

In 2005, a total of 137.6 million metric tons of cargo¹ were moved through the four ports, and port-related activities resulted in the emission of 2,002 metric tons of DPM and 1.67 million metric tons of GHG emissions in the airshed.² The 2005 baseline intensity emissions were:

- 0.15 metric tons of DPM emissions / 10,000 metric tons of cargo moved.
- 121 metric tons of GHG emissions / 10,000 metric tons of cargo moved.³

Progress Toward Goals (2005 to 2015/2016)

Based on the 2015/16 inventories, a total of 174.8 million metric tons of cargo were moved through the four ports, and port-related activities resulted in the emission of 501 metric tons of DPM and 1.75 million metric tons of GHG emissions.⁴ As a result, **the ports met the DPM and GHG goals for 2020 by the end of 2016**. The average change in emission intensity for 2015/2016 across the four ports was (also shown in Figure 1, and by port in

Table 2):

- DPM emissions / 10,000 metric ton of cargo moved: **80% lower in 2015/16**, compared to 2005.

¹ 2005 cargo volumes were updated for Port of Seattle to reflect the 2016 Puget Sound Air Emissions Inventory report data. Past POT and NWSA cargo data were incorrectly reported due to unit conversion error.

² Emissions are estimated for the "airshed" scale, which includes all emissions related to port activity released in the airshed (note that boundaries are defined differently in the Port of Vancouver inventory compared to the Puget Sound inventory). Emissions were obtained from the 2016 Puget Sound Maritime Air Emission Inventory (Starcrest, October 2018) and the Port of Vancouver 2015 Port Emissions Inventory (VFPA, 2017). For the Port of Vancouver, fine particulate matter is reported for DPM because DPM was not quantified separately in past inventories.

³ The 2005 baseline intensity data in this report is different than previous reports, because the 2005 emissions were adjusted with an updated methodology in the 2015 and 2016 emission inventories.

⁴ 2015 Port of Vancouver Emissions Inventory and 2016 Puget Sound Maritime Air Emission Inventory.

- GHG emissions / 10,000 metric ton of cargo moved: **17% lower in 2015/16**, compared to 2005.

The significant reductions in DPM emissions are primarily the result of regulatory changes requiring the use of low sulfur fuels for ships (starting in 2015), in addition to cleaner engine standards in new vehicles and equipment. The reductions in the intensity of GHG emissions demonstrate an overall increase in efficiency of vehicles, equipment and operations over time.

Figure 1: Changes in emission intensity between 2005 and 2015/16, relative to 2020 targets

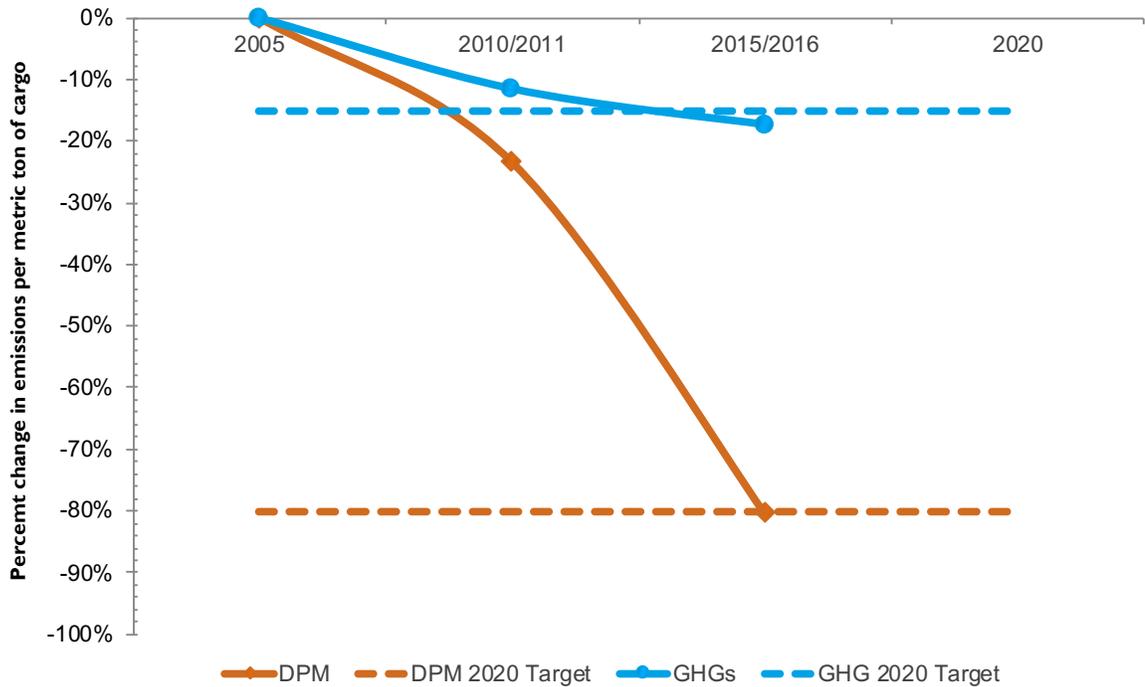


Table 2. Changes in emissions intensity between 2005 and 2015/16, by port

| Port | Change in DPM emissions intensity in 2015/16, relative to 2005 | Change in GHG emissions intensity in 2015/16, relative to 2005 |
|---|--|--|
| Northwest Seaport Alliance⁵ | -80% | -19% |
| Seattle | -79% | -8% |
| Tacoma | -77% | -22% |
| Vancouver | -78% | -10% |

⁵ Prior to formation of the Northwest Seaport Alliance in 2015, emissions were assigned to the ports of Seattle and Tacoma. The 2016 Puget Sound Maritime Emissions Inventory re-apportioned 2005 and 2011 emissions to align with each port's current operating scope.



3. Ocean-Going Vessels

Ocean-going vessels (OGV) include container ships, cruise ships, tanker ships, bulk cargo ships and breakbulk cargo ships. Performance reporting focuses on the types of engines and fuel being used, and participation in Port-designed or third-party rating programs.

Context

Based on the 2015/16 emission inventories, OGVs produced approximately 46% of DPM emissions and approximately 50% of GHG emissions from activities related to the ports within the airshed. Table 3 summarizes the number of unique vessels, and the total number of calls made by those vessels.

On August 1, 2012, the International Maritime Organization designated waters off North American coasts as an Emissions Control Area (ECA), with increasingly stringent restrictions going into effect between 2012 and 2015. These standards dramatically reduce air pollution from ships and deliver substantial air quality and public health benefits that extend hundreds of miles inland. By 2020, emissions from ships operating in the North American ECA are expected to be reduced by 90,000 metric tons for PM_{2.5} and 920,000 metric tons for SO_x annually (74%, and 86%, respectively, below predicted levels in 2020 absent the ECA).⁶ NO_x emissions are also anticipated to reduce as the number of Tier 3 vessels operating in the region increase over time.

⁶ <https://westcoastcollaborative.org/files/sector-marine/the-north-american-eca-1.pdf>

Table 3. Number of ocean-going vessels and vessel calls at the Ports in 2017

| Port | Number of vessels | Number of vessel calls |
|-----------------------------------|-------------------|------------------------|
| Northwest Seaport Alliance | 413 | 1,857 |
| Seattle | 81 | 287 |
| Tacoma | 69 | 71 |
| Vancouver | 1,675 | 3,278 |

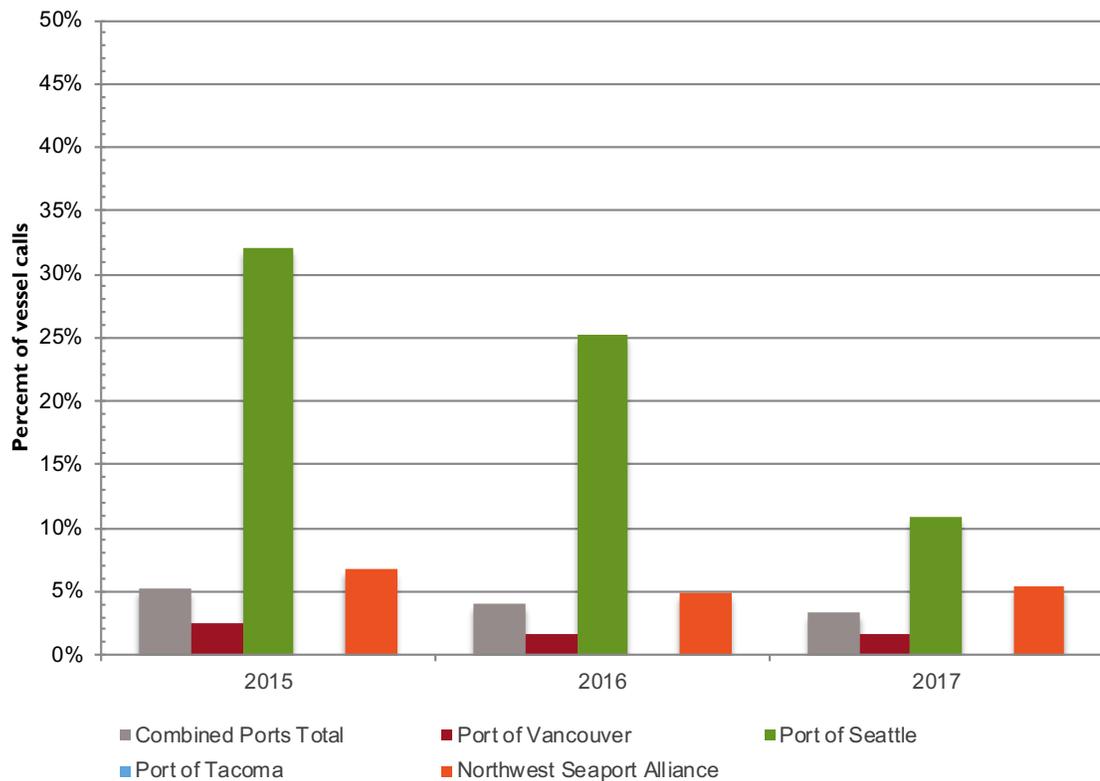
Performance Targets

OGV-1: Vessels surpass Emission Control Area requirements

| | |
|--------------------------------|--|
| <i>2015 Target</i> | <i>Early compliance with 2015 ECA 0.1% fuel-sulfur level (or equivalent) while hoteling</i> [TARGET COMPLETE] |
| 2020 Target | By 2020, Ports track number of vessel calls with Tier 3 marine engines, shore power use, cleaner fuel, or other emission-reduction technologies⁷ |
| What is being measured? | This measure reports the number of vessel calls to the Ports that have Tier 3 marine engines, and/or use shore power, cleaner fuel (liquefied natural gas), or other emission-reduction technologies, to the best of the Ports' knowledge. |
| Why is this important? | The Ports created this performance target to recognize the importance of supporting shipping lines in adopting fuels or technologies that reduce emissions beyond those required by the 2015 ECA. |
| How did we do? | In 2017, 3% of vessel calls had Tier 3 engines, used shore power, and/or used cleaner alternative fuel, compared to 4% in 2016. The number of vessel calls that meet the standard declined from 221 calls in 2016 to 187 calls in 2017. |
| Definition of terms | <i>Emission Control Area (ECA):</i> The North American ECA is a geographic boundary that extends approximately 200 nautical miles off the coast of the Pacific and Atlantic/Gulf coasts (excluding Mexico). Under the IMO rules, different standards apply to ships while operating outside emission control areas versus those operating in established ECAs. |

⁷ The OGV-1 2020 target was first reported in the 2015 Report based on the number of vessels, rather than the number of vessel calls. The 2016 report, and this report both present data based on vessel calls for all years, and includes vessel calls that were known to use shore power, or vessels that have a "keel laid date" on or after January 1, 2016 (which are presumed to have Tier 3 engines).

Figure 2. OGV-1: Percent of vessel calls with known Tier 3 marine engines, shore power use, cleaner fuel, or other emission reduction technologies 2017



OGV-2: Ports and vessels participate in Port-designed or third-party programs that promote continuous improvement

| | |
|---|--|
| 2015 Target | By 2015, Ports and 10% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements [TARGET COMPLETE] |
| 2020 Target | By 2020, Ports and 40% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements [TARGET EXCEEDED] |
| What is being measured? | This measure reports whether the Ports participated in third-party programs. This measure also reports the percentage of calls to the four ports that are from vessels that participate in a Port-designed or a third-party program that promotes continuous improvement, to the best of the Ports' knowledge. |
| Why is this indicator important? | The Ports have the greatest influence over vessels when they are in port, at anchor, at dock, or maneuvering. Ports can encourage vessel operators to reduce emissions by incentivizing emission reductions through alternative fuels and technologies, or through participation in continuous improvement programs. This measure captures the level of participation in these programs. |
| How did we do? | In 2017, 3 out of the 4 Ports participated in the Green Marine program as ports. 69% of vessel calls to the ports were made by vessels participating in at least one continuous improvement program, as listed below, compared to 54% in 2016, due |

| | |
|----------------------------|---|
| | to an increase of participating vessels calling at the ports of Tacoma and Vancouver. |
| Definition of terms | <i>Port-designed programs:</i> For 2017, this includes the Port of Vancouver EcoAction Program, which helps to promote continuous improvement. |
| | <i>Third-party programs:</i> For 2017, programs included are the Environmental Ship Index (ESI), Green Award, RightShip, Clean Shipping Index (Port of Vancouver ships only), or Green Marine. Note that only RightShip participants that have verified Existing Vessel Design Index data are included. |
| | <i>Port participation in third-party certification programs:</i> For 2017, this included Ports that participated in the Green Marine Program. For all other programs, Ports were considered to participate if they incentivized participation in the program (e.g. provided discounts to visiting vessels that participate in the program). |

Figure 3. OGV-2: Percent of vessel calls participating in Port-designed or third-party certification programs⁸



⁸ Participating vessel calls at Port of Tacoma were updated for 2016 to include Rightship verified participants that were not previously counted in the 2016 report.

Implementation Efforts in 2017 by Port: OGV

| | |
|--|---|
| Port: | Port of Vancouver |
| How is the Port of Vancouver doing? | <p>OGV-1: In 2017, 54 calls were made by eight cruise vessels that connected to shore power, and two calls were made by vessels with Tier 3 engines, based on keel laid date only. Combined, this represents 2% of calls, and 0.6% of vessels. In 2017, the use of shore power at the Canada Place Cruise Terminal reduced emissions of GHGs by 2,126 tonnes, and particulate matter by 0.9 tonnes.</p> <p>OGV-2: In 2017, VFPA participated in the Green Marine Program as a port. VFPA also participated in ESI, Green Award, RightShip, Clean Shipping Index and Green Marine by offering discounts to vessels that participate in the programs.</p> <p>71% of calls were made by vessels participating in one or more of VFPA's EcoAction Program, ESI, Green Award, RightShip, Clean Shipping Index, or Green Marine. This represents 2,341 out of 3,278 calls for the year.</p> |
| Program for OGVs: | <p><i>EcoAction Program and Blue Circle Award</i></p> <p>In 2017, these programs continued to recognize and reward vessels that go beyond regulatory requirements to reduce air emissions (considering both air quality pollutants and greenhouse gases). Eligible options for discount through the EcoAction Program include acceptable scores in third-party environmental rating systems, and cleaner fuels and technologies.</p> <p>14 shipping lines received the Blue Circle Award for 2017. The award is given to those lines with the greatest proportion of participation in the EcoAction Program.</p> |
| Other initiatives: | <p>In 2017, VFPA continued to develop shore power at two of the four container terminals.</p> <p>VFPA is leading the development of an international collaboration on vessel emission reductions. In partnership with other ports and industry stakeholders, the intention is to develop an approach that aims to increase participation in vessel incentive programs and use of environmental infrastructure such as shore power, supporting further reduction of impacts from international shipping.</p> |
| Port: | Port of Seattle |
| How is the Port of Seattle doing? | <p>OGV-1: The Port has two cruise terminals with a total of three berths. The two berths at T91 are equipped with shore power. Of the homeport ships that are capable of plugging in to shore power, 31% (31 of 101) of vessel calls connected in 2017. Zero calls were made by vessels with Tier 3 engines or cleaner fuels. Looking at total POS vessel calls in 2017, this represents 11% of calls, and 1% of vessels that met this target. This figure is lower than in prior years, because POS had more accurate data on actual shore power connections in 2016 and 2017.</p> <p>OGV-2: In 2017, POS continued participating in Green Marine as a port. In 2017, 35% of vessel calls were made by ships participating in at least one third-party certification program, including ESI or RightShip (verified data only). This number is lower than in previous years because POS discontinued the Green Gateway Partners program in 2017, which most homeport cruise lines had joined in the past.</p> |
| Program for OGVs: | <p>The Port discontinued its Green Gateway Partners program. In its place, the Port initiated an "Environmental Excellence Awards" program, which was opened to all maritime sectors.</p> |
| Other initiatives: | <p>None to report for 2017.</p> |

| | |
|---|---|
| Port: | Port of Tacoma |
| How is the Port of Tacoma doing? | <p>OGV-1: In 2017, none of the 71 ship calls to Port of Tacoma had Tier 3 engines, used shore power or implemented other emission-reducing technologies.</p> <p>OGV-2: The Port of Tacoma is not participating in a third-party certification program.</p> <p>58 of the 71 ship calls to POT (82%) participated in at least one third-party certification program, including ESI and RightShip (where data is verified only). This is an increase from 66% in 2016.</p> |
| Program for OGVs: | None to report for 2017. |
| Other initiatives: | None to report for 2017. |

| | |
|---|--|
| Port: | The Northwest Seaport Alliance |
| How is the Northwest Seaport Alliance doing? | <p>OGV-1: In 2017, 5% of container ships calls to NWSA terminals used shore power.</p> <p>OGV-2: NWSA completed its first third-party verification of its Green Marine performance in 2017. This was the second year the NWSA completed the Green Marine program.</p> <p>In 2017, 49% of vessel calls (916 out of 1,857) were from vessels participating in at least one third-party certification program, including ESI and RightShip (where data is verified only).</p> |
| Program for OGVs: | TOTE Maritime Alaska continues to use shore power at berth for the Midnight Sun and the Northern Star. |
| Other initiatives: | The NWSA continues to track calls by shore power equipped vessels for planning future operations and shore power facilities. The NWSA is planning to expand shore power installation in both North and South Harbors. |



4. Harbor Vessels

Harbor vessels include harbor and ocean tugs; there are approximately 166 such vessels providing service at the ports. There are other types of harbor vessels operating near ports (e.g. ferry vessels, excursion vessels, and government vessels) but these are not directly related to port activity, and are not included in the scope of this report. Performance is tracked based on reporting best practices and engine upgrades, and participation in programs that promote continuous improvement.

Context

Port-related harbor vessels account for approximately 8% of DPM emissions and 8% of GHG emissions from activities related to the ports, based on the 2015/16 emission inventories. Since 2012, regulations have required the use of ultra-low sulfur diesel (ULSD) fuel, resulting in significant reductions in emissions from harbor vessels. Table 4 summarizes the number of harbor vessel companies and vessels at each port. Because the tug fleet for NWSA, POS and POT are the same companies operating in the same waters of Puget Sound, harbor vessel data for NWSA, POS and POT are reported together.

Table 4. Number of harbor vessel companies and vessels at the ports in 2017

| Port | Number of harbor vessel companies | Number of harbor vessels |
|-----------------|-----------------------------------|--------------------------|
| POS, POT & NWSA | 3 | 37 |
| Vancouver | 17 | 129 |

Performance Targets

Harbor-1: Strategy partners conduct annual outreach to port-related harbor vessel companies and recognize best practices and engine upgrades

| | |
|--------------------------------|---|
| 2015 Target | By 2015, partners conduct outreach and 50% of harbor vessel companies report best practices and engine upgrades [WORKING TOWARDS TARGET] |
| 2020 Target | By 2020, partners conduct outreach and 90% of harbor vessel companies report best practices and engine upgrades |
| What is being measured? | <p>In the 2013 Strategy, Ports and Strategy partners committed to identifying activities that increase fuel efficiency and reduce emissions, and to share this information with harbor vessel owners and operators. This measure reports whether partners conducted outreach with these owners and operators during 2017, including workshops, brown bag sessions, and meetings to discuss efficiency ideas, practices or projects.</p> <p>To support this measure, Ports and Strategy partners collect data directly from harbor vessel companies, or from relevant continuous improvement programs. The percentage of harbor vessel companies that reported and the percentage that undertook engine upgrades and best practices during 2017 are also reported.</p> |
| Why is this important? | <p>One way to reduce emissions from harbor vessels is to replace the vessels or repower them (replace their engines), but these efforts are expensive and beyond the control of the Ports. The Strategy partners believe promoting increased vessel fuel efficiency and best practices is the best way to work with this sector. Through annual outreach the Ports and Strategy partners will help keep harbor vessel owners and operators informed of best practices that reduce emissions.</p> <p>Tracking what companies are doing to incorporate best practices and upgrade or replace their engines provides an annual snapshot of emission reduction activities.</p> |
| How did we do? | <p><i>Partners conduct outreach:</i> In 2017, one Port hosted seven outreach sessions, while the Clean Air Agency worked with harbor vessel companies to successfully apply for and obtain an engine replacement grant from the EPA.</p> <p><i>Harbor vessel companies report on best practices and engine upgrades:</i> 45% (nine) companies reported their progress through participation in EcoAction, through submissions to Green Marine or through communication with Strategy partners.</p> <p><i>Companies undertook best practices and engine upgrades:</i> 40% (eight of 20) companies undertook best practices or engine upgrades – four through their participation in the Green Marine program, seven through the use of shore power, and one by replacing auxiliary engines on one vessel and retrofitting three tugs to be shore power capable in order to plug in at two new plug-in pedestals.</p> |
| Definition of terms | <p><i>Best practices:</i> Participation in Green Marine or in EcoAction, or using shore power are counted as following best practices.</p> <p><i>Engine upgrades:</i> This includes replacing the engine (also known as “repowering” the vessel), replacing the auxiliary engine, or installing a kit that reduces emissions by 25% (called a 1042 kit). Installing a 1042 kit is not counted as a best practice if the harbor vessel owner is required to install it (i.e. in the U.S. a kit is required if the owner is overhauling the engine, if the old engine was manufactured on or after 1973, and if the engine is greater than 800 horsepower).</p> |

Harbor-2: Ports and harbor vessels participate in Port-designed or third-party certification programs that promote continuous improvement

| | |
|--------------------------------|---|
| 2015 Target | By 2015, Ports and 10% of harbor vessels participate in Port-designed or third-party certification programs that promote continuous improvement [TARGET COMPLETE] |
| 2020 Target | By 2020, Ports and 40% of harbor vessels participate in Port-designed or third-party certification program that promote continuous improvement |
| What is being measured? | <p>This measure identifies whether the Ports participate in the Green Marine program (currently the only third-party certification program available for tugs) with respect to providing incentives to tug operators.</p> <p>This measure also reports the percentage of harbor vessels that participate in the Port of Vancouver EcoAction Program or in the third-party Green Marine Program, which both promote continuous improvement for harbor vessels.</p> |
| Why is this important? | <p>Programs that promote continuous improvement provide a consistent framework for companies to report progress on achieving various environmental measures. Participants either get higher scores for or must go beyond regulatory compliance in these programs.</p> <p>Although the Ports have little to no control over harbor vessel engines and fuel-efficiency practices, the Ports can influence these measures by providing incentives to companies that join and annually participate in third party certification programs, or by developing their own program to promote continuous improvement.</p> |
| How did we do? | <p>In 2017, three of the four Ports (Northwest Seaport Alliance, Seattle and Vancouver) participated in the Green Marine program. The Vancouver Fraser Port Authority also provided discounted harbor dues to those tugs operated by companies who are Green Marine certified, or that have shore power. POS, POT and NWSA did not offer incentives to tug companies, and no tug companies in Puget Sound were Green Marine certified.</p> <p>34% of harbor vessels participated in third-party certification programs. One port-related harbor vessel company reported engine upgrades.</p> |
| Definition of terms | <p><i>Certification programs:</i> Includes programs applicable to ports and harbor vessel companies that promote continuous improvement, either Port-designed or by a third party. The Port of Vancouver currently offers the Port-designed EcoAction program for harbor vessels.</p> <p><i>Third-Party Certification:</i> Currently Green Marine offers the only third-party environmental certification program for harbor vessels.</p> |

Implementation Efforts in 2017 by Port: Harbor Vessels

| | |
|--|--|
| Port: | Port of Vancouver |
| How is the Port of Vancouver doing? | <p>Harbor-1: VFPA hosted seven outreach events in 2017: two Port Environmental Managers Breakfast Sessions for tenants, including tug companies, which were forums for sharing information on environmental best practices and evolving regulations, and five sessions for Climate Smart Program participants. 2017 marked the third year that VFPA partnered with Climate Smart to offer training to tenants, including tug companies, on measuring, managing and communicating reductions in GHG emissions. Training was offered as a three-part series, with an additional information session and follow-up session also offered in 2017.</p> <p>Harbor-2: VFPA participated in Green Marine as a port, and with respect to harbor vessels by offering discounted fees to companies through its EcoAction Program. The primary harbor vessel companies at VFPA reported on air emission and other best practices in 2017 through Green Marine.</p> <p>43% of tugs operating within the Port of Vancouver participated in Green Marine, with 4 of 17 companies representing 56 of 129 tugs being members (Seaspan, Saam Smit, North Arm Transportation and Ledcor Resources).</p> |
| Other initiatives: | <p>Two tug companies received the Blue Circle Award for 2017, for their continuous leadership in air emissions reduction and environmental performance. Seven tug companies reported using shore power with their vessels.</p> |
| Port: | Port of Seattle |
| Port: | Port of Tacoma |
| Port: | The Northwest Seaport Alliance |
| How are the ports doing? | <p>Harbor-1: The Puget Sound Clean Air Agency worked with harbor craft companies to apply for a \$650,000 engine replacement grant from the EPA, which was awarded in fall of 2017.</p> <p>Harbor-2: Two of the three ports participated in Green Marine. None of the U.S. harbor companies participated in third-party continuous improvement programs, however two of the three completed engine upgrades.</p> |
| Other initiatives: | <p>The Clean Air Agency obtained funding from Ecology to support the installation of one shore power terminal with two-plug-ins and the retrofit of three tug boats with shore power capability in 2017. Another tug company purchased new clean vessels including two vessels with Tier 3 engines and one vessel with Tier 4 engines.</p> |



5. Cargo-Handling Equipment

Cargo-handling equipment (CHE) moves goods on marine terminals between ships, railcars, and trucks. Examples of CHE include: straddle carriers, rubber-tired gantry (RTG) cranes, reach stackers, top and side picks, forklifts, skid loaders, yard tractors / yard trucks, etc. Performance targets focus on achieving more stringent engine emission standards, recognizing the conversion of equipment to cleaner engines and improving fuel-efficiency practices.

Context

The CHE sector contributes 8% of DPM emissions and 6% of GHGs from activities related to the four ports, as summarized in the 2015/16 inventories. Table 5 summarizes the number of terminals operating CHE, and the total number of equipment at each port. Note that all CHE that was previously operated at POT is now accounted for under NWSA, as well as most POS CHE.

Table 5. Number of terminals with CHE, and number of units in 2017

| Port | Number of CHE ⁹ | Number of terminals with CHE | Total number of terminals |
|------------------|----------------------------|------------------------------|---------------------------|
| NWSA | 741 | 13 | 15 |
| Seattle | 63 | 3 | 3 |
| Tacoma | 0 | 0 | 1 |
| Vancouver | 1,510 | 27 | 27 and other operations |

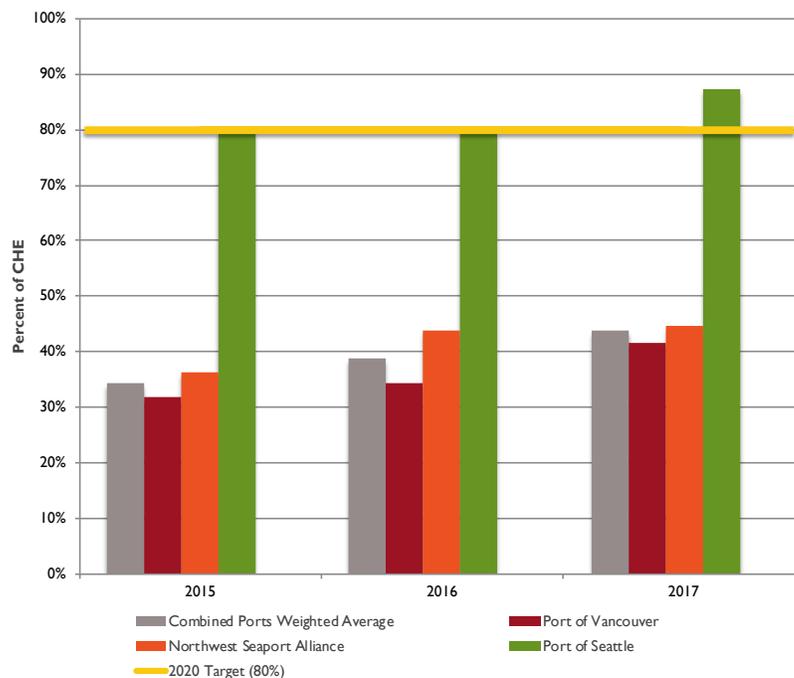
⁹ Number of CHE excludes equipment that is exclusively electric (e.g. conveyor belts and ship-to-shore cranes), but includes electric equipment that could operate on other fuels. Note that Vancouver data includes other non-road equipment.

Performance Targets

CHE-1: CHE meets Tier 4 interim (T4i) emission standards or equivalent

| | |
|--------------------------------|---|
| 2015 Target | By 2015, 50% of CHE meets Tier 4 Interim [WORKING TOWARDS TARGET] |
| 2020 Target | By 2020, 80% of CHE meets Tier 4 Interim |
| What is being measured? | This performance target tracks the percentage of CHE that has Tier 4i or better engines on a port-wide basis, regardless of terminal size or type of operation. This target recognizes engines with retrofits or repowers that result in Tier 4i equivalent PM emission rates and replacement of equipment (for example, replacing diesel with electric, gasoline, propane or natural gas-fuelled equipment). Where emission reduction technology has been installed that reduces emissions but does not achieve Tier 4i emission levels, partial credit is given (for example, Diesel Oxidation Catalysts or Diesel Particulate Filters on older equipment). |
| Why is this important? | Older diesel equipment, especially non-road engines, generate significantly more emissions per volume of fuel used. This target tracks the proportion of the fleet that meets Tier 4 Interim emission levels or better. It includes emission reductions achieved through retrofits or engine replacements. |
| How did we do? | 44% of CHE met Tier 4 Interim across all ports (see chart below), which is 5% more than 2016 (39%). ¹⁰ |
| Definition of terms | <i>Tier 4 Interim or T4i:</i> The Tier 4 Interim emissions standards required lower PM emissions prior to final Tier 4 standards that also required lower NO _x /HC emissions. |

Figure 4. CHE-1: Percent of CHE meeting Tier 4 interim emission standards or equivalent

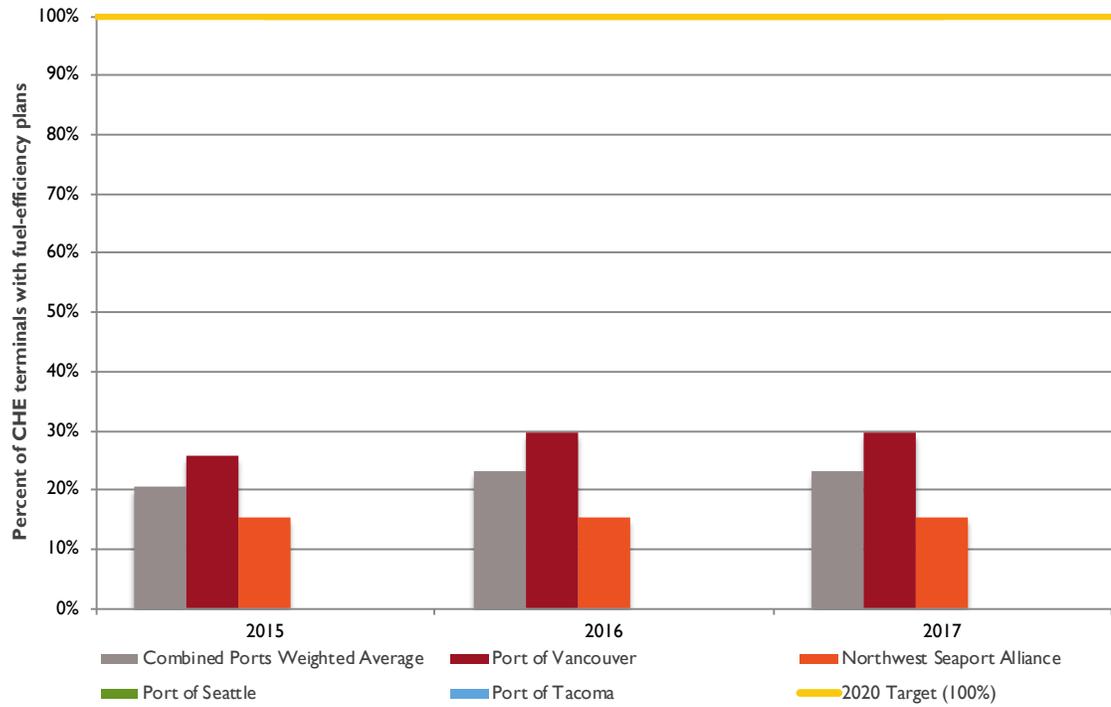


¹⁰ VFPA updated the numbers for 2015 as well as 2016 in this report (relative to previous reports) as a result of 1) methodology change due to new data available through the NRDE; and 2) updated 2015 port emission inventory. The latter includes a change in scope of tenants that are included or excluded resulting from a transition away from the port authority managing lands on behalf of the Province.

CHE-2: Ports and terminals have fuel-efficiency plans in place that promote continuous improvement

| | |
|--------------------------------|---|
| <i>2015 Target</i> | <i>By 2015, Ports and 50% of terminals have fuel-efficiency plans</i> [WORKING TOWARDS TARGET] |
| 2020 Target | By 2020, Ports and 100% of terminals have fuel-efficiency plans |
| What is being measured? | <p>This measure reports on whether each of the Ports had plans in place to address fuel efficiency of CHE.</p> <p>The measure also reports the percent of terminals that had fuel-efficiency plans for CHE, to the best of the Ports' knowledge.</p> |
| Why is this important? | Significant emission reductions come from replacement, repowering or exhaust retrofits, however these can be expensive, have limited available options, and can increase other operating and maintenance costs. Implementing fuel-efficiency plans promotes emission reductions in all equipment, including older equipment. |
| How did we do? | <p>In 2017, three of four ports with CHE had fuel-efficiency plans in place. The Ports facilitated fuel efficiency in relation to CHE in the following ways: the Vancouver Fraser Port Authority runs a program that requires tenants to have fuel-efficiency plans in order to be eligible for fee rebates; NWSA aims to reduce fuel consumption under their CHE idle-reduction plans.</p> <p>23% of terminals (10 out of 43) had a known fuel-efficiency plan for CHE in place, which represents no change from 2016.</p> |
| Definition of terms | <i>Fuel-efficiency plans:</i> A fuel-efficiency plan sets out goals or objectives to increase operational efficiency, reduce use of fuels, and/or seek alternative sources of fuel that improve efficiency and reduce emissions from equipment operating on port land. The plan may also identify policies or actions that will be put into place to achieve the goals or objectives. |

Figure 5. CHE-2: Percent of CHE terminals with fuel-efficiency plans¹¹



¹¹ Since 2015, POT has not operated any terminals with CHE. POS has three terminals with CHE, but these do not have fuel-efficiency plans and therefore are not visible on the graph.

Implementation Efforts in 2017 by Port: CHE

| | |
|--|---|
| Port: | Port of Vancouver |
| How is the Port of Vancouver doing? | <p>CHE-1: In 2017, 42% of non-road equipment within the Port of Vancouver met Tier 4i equivalent standards or better.</p> <p>CHE-2: VFPA does not have operational control over CHE. As a result, its approach is to address fuel efficiency in this sector through the Non-Road Diesel Emissions (NRDE) Program.</p> <p>30% (8 of 27 terminals) plus 1 shipyard and 1 stevedoring company had known fuel-efficiency plans in place, based on participation in Green Marine.</p> <p>DP World Centerm, with the support of VFPA has been trialing the effectiveness of the Effenco Active Stop Start technology on their terminal tractors. Preliminary results are positive, more information on this project can be found in the pilot studies and demonstrations projects section later in this report.</p> |
| Program for CHE: | <p><i>Non-Road Diesel Emissions (NRDE) Program</i></p> <p>VFPA's NRDE Program, in place since 2015, requires tenants to pay fees for operating Tier 1 and older non-road diesel equipment. The program also includes requirements around reporting, labelling, opacity and auditing. In order to be eligible for fee rebates of up to 80% when the equipment is upgraded, retired and/or replaced with a Tier 2 or newer or equivalent engine, tenants are also required to maintain a fuel efficiency plan.</p> |
| Other initiatives: | <p>For the third year in a row, VFPA partnered with Climate Smart Businesses Inc. to offer training to tenants on measuring, managing and communicating reductions in GHG emissions. Training is offered as a three-part series, with an additional information session and follow-up session. Since VFPA started offering the program in 2015, 22 tenants have participated and have recorded a reduction of 4,341 tonnes of carbon dioxide equivalent and a \$1,277,897 in annual cost savings.</p> <p>Two terminals received the Blue Circle Award for 2017. The award is given to those companies that demonstrate leadership and achievements in energy conservation.</p> |
| Port: | Port of Seattle |
| How is the Port of Seattle doing? | <p>CHE-1: In 2017, 87% of CHE at POS terminals met Tier 4i equivalent standards or better.</p> <p>CHE-2: POS terminal operators did not have fuel efficiency plans in place for CHE.</p> |
| Program for CHE: | None to report for 2017 |
| Other initiatives: | None to report for 2017 |
| Port: | Port of Tacoma |
| How is the Port of Tacoma doing? | CHE is accounted for under NWSA below. The only terminal remaining under the POT umbrella is a grain terminal, which has no CHE. |

| | |
|---|--|
| Port: | The Northwest Seaport Alliance |
| How is the Northwest Seaport Alliance doing? | <p>CHE-1: In 2017, 45% of CHE at NWSA terminals met Tier 4i equivalent standards or better.</p> <p>CHE-2: Two of 13 terminals have a fuel efficiency plan in place.</p> |
| Program for CHE: | None to report for 2017. |
| Other initiatives: | <p>NWSA scrapped and replaced one Tier 1 yard truck, with a Tier 4 version in 2017, with partial funding assistance provided by EPA DERA and Ecology.</p> <p>Ecology continued to provide Diesel Particulate Filter cleaning services to CHE owners.</p> |



6. Trucks

The truck sector covers on-road heavy-duty container trucks that move cargo to and from marine terminals. Performance is reported through the age of the fleet of container trucks serving port activities, and the prevalence of fuel-efficiency plans. Since 2015, trucks hauling containers are reported for the Port of Vancouver and the Northwest Seaport Alliance only (containerized cargo of Ports of Seattle and Tacoma is now managed by the NWSA).

Context

Trucks account for 17% of DPM emissions and 20% of GHGs from activities related to the four ports, as summarized in the 2015/16 inventories. Table 6 summarizes the number of container terminals, and the total number of container truck companies and trucks operating at the Port of Vancouver and the Northwest Seaport Alliance terminals.

Table 6. Number of container terminals, truck companies, trucks in 2017

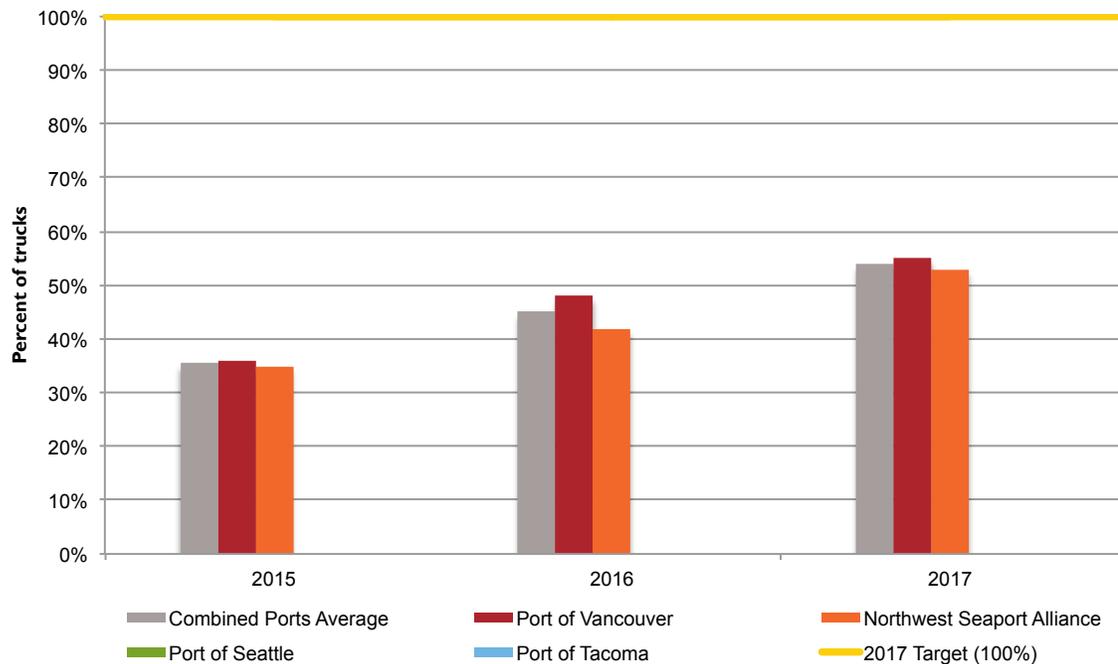
| Port | Number of container terminals | Number of truck companies | Number of trucks |
|-----------------------------------|-------------------------------|---------------------------|------------------|
| Northwest Seaport Alliance | 10 | 129 | 4,149 |
| Seattle | n/a | n/a | n/a |
| Tacoma | n/a | n/a | n/a |
| Vancouver | 4 | 123 | 1,847 |

Performance Targets

Truck-1: Trucks meet or surpass EPA emission standards or equivalent for model year 2007

| | |
|--------------------------------|--|
| 2017 Target | By 2017, 100% of trucks meet or surpass 2007 EPA emission standards |
| What is being measured? | This measure tracks the percentage of trucks that have engines that meet the equivalent PM emission standard of a 2007 or newer engine, including engines with retrofits or repowers that result in equivalent emission rates or lower. |
| Why is this important? | Newer truck engines generate significantly lower emissions due to more stringent federal vehicle standards. Model year 2007 engines are 10 times cleaner than 1994 to 2006 truck engines for PM emissions. This measure tracks how many trucks are being replaced with those that have newer, low-emission engines and associated emission controls. It also recognizes emission reductions achieved through retrofits or engine replacements. |
| How did we do? | The combined ports' average in 2017 is 54% (see chart below), which has increased annually since 2011 (when it was 15%). |
| Definition of terms | <i>2007 emission requirements:</i> The U.S. and Canadian federal governments set emission standards for heavy-duty diesel engines. In 2007, the allowed PM emissions dropped to 0.01 grams/brake horsepower-hour, 1/10 th of the 1994 to 2006 standard for PM emissions. |

Figure 6. Truck-1: Percent of trucks that meet or surpass U.S. EPA emission standards or equivalent for model year 2007



Truck-2: Ports, terminals, and truck companies have fuel-efficiency plans in place that promote continuous improvement¹²

| | |
|--------------------------------|--|
| <i>2015 Target</i> | <i>By 2015, Ports have fuel-efficiency plans</i> [WORKING TOWARDS TARGET] |
| 2020 Target | By 2020, Ports, terminals, and 50% of truck companies have fuel-efficiency plans |
| What is being measured? | This measure reports on whether each of the Ports and truck companies has adopted fuel-efficiency plans, based on participation in the EPA SmartWay Program. Port programs that facilitate fuel efficiency in trucks are also highlighted. |
| Why is this important? | Effective methods of reducing DPM emissions are to replace vehicles or repower them with engines (and corresponding emission controls) that are model year 2007 or newer, or to install exhaust retrofits. However, emission standards addressing GHGs did not take effect for new vehicles until 2014. Since trucks contribute almost 20% of the port-related GHG emissions, another way of reducing these emissions is to adopt fuel-efficiency practices. |
| How did we do? | In 2017, none of the Ports had fuel-efficiency plans in place. However, the Ports facilitated fuel efficiency in trucks through the following initiatives: the Truck Licensing System and Smart Fleet Initiative at the Port of Vancouver, and the Northwest Seaport Alliance FRATIS project. In 2017, 21% of trucking companies that service NWSA terminals participated in EPA's SmartWay Program, which has a focus on fuel efficiency. |
| Definition of Terms | <i>Fuel-efficiency plan:</i> A fuel-efficiency plan sets out goals or objectives to increase operational efficiency, reduce use of fuels, and/or seek alternative sources of fuel that improve efficiency and reduce emissions from equipment operating on port or terminal land. The plan may also identify policies or actions that will be put into place to achieve the goals or objectives. |

¹² In the 2013 Strategy, Truck-2 states that the number of trucks with fuel-efficiency plans will be tracked. Due to the difficulty of tracking individual trucks, the Ports will track the number of truck companies that have fuel-efficiency plans.

Implementation Efforts in 2017 by Port: Trucks

| | |
|---|---|
| Port: | Port of Vancouver |
| How is the Port of Vancouver doing? | <p>Truck-1: At the end of 2017, 55% of the entire drayage fleet met particulate matter engine emission limits of a 2007 or newer engine, based on trucks of model year 2008 or newer.</p> <p>Truck-2: VFPA does not have operational control over container trucks. Its approach to addressing fuel efficiency in this sector is to continue to implement a program that moves the fleet toward newer, cleaner models, coupled with good maintenance and idling limits.</p> |
| Program for Trucks: | <p><i>Truck Licensing System (TLS)</i></p> <p>VFPA continued to implement increasingly stringent environmental requirements on drayage trucks accessing the port through the TLS Program. Requirements in 2017 included:</p> <ul style="list-style-type: none"> • 2006 and older model year trucks and 2007 model year trucks with 2006 engines need to have an eligible emission reduction measure (e.g. diesel oxidation catalyst) installed, applicable to those trucks already in the TLS. 2005 and older trucks were previously required to install similar measures. • Trucks new to the TLS to be 2010 or newer. • 10-year and older trucks to be tested and pass 20% opacity limit. • All trucks not to exceed maximum three consecutive minutes idling in any 60-minute period. |
| Port: | The Northwest Seaport Alliance |
| How is the Northwest Seaport Alliance doing? | <p>Truck-1: At the end of 2017, 53% of approximately 4,400 trucks had 2007 or newer engines, or equivalent. In order to give drivers additional time to purchase compliant trucks beyond the original deadline of Jan 1, 2018, and ensure efficient movement of cargo through the gateway, the NWSA Managing Members took the following action in 2018:</p> <ul style="list-style-type: none"> • Effective April 1, 2018, all drayage trucks entering NWSA international container terminals must have a 2007 engine or newer or equivalent emissions control retrofits to be considered compliant (“2007 Emission Standard”). To continue to access the terminals after April 1, 2018, a driver with a non-compliant truck may apply for a Temporary Access Pass. This pass requires a commitment from the trucker to become compliant by the end of 2018. • Effective January 1, 2019, all non-compliant trucks will be turned away from NWSA international container terminals. <p>Managing Members also authorized for the NWSA to spend \$1 million to establish a Clean Truck Fund Program and to partner with certified Community Development Financial Institutions to ensure all drivers have access to fair and affordable financing.</p> <p>This additional time to meet the Truck-1 goal of the Strategy will allow drivers extra time to procure financing and secure an appropriate compliant truck; allow the NWSA to negotiate lease amendments with international container terminal operators and users to contractually obligate them to only allow compliant trucks onto their cargo terminals after April 1, 2018; allow the NWSA to offer additional resources, workshops and support to drivers to help them become compliant; and install a unified truck tracking technology across both Harbors.</p> |

| | |
|----------------------------|---|
| Port: | The Northwest Seaport Alliance |
| Program for Trucks: | <p>Truck-2: NWSA did not have a fuel-efficiency plan in place for trucks in 2017. Two of the 13 terminals have fuel efficiency plans that include drayage trucks. 21% of listed NWSA drayage providers participate in EPA's SmartWay program as truck carrier partners.</p> <hr/> <p><i>Drayage truck registry</i></p> <p>The NWSA continues to register drayage trucks serving the international container terminals at both the ports of Seattle and Tacoma. The drayage truck registry is the reference database to verify the age of a truck. In 2017, NWSA's South Harbor continued to issue stickers to trucks, and the North Harbor issued RFID (radio frequency identification) tags. [Note: during 2018, RFID technology has been installed at international container terminals in the South Harbor, and all trucks serving NWSA will utilize a unified RFID system by the end of 2018.]</p> <p><i>ScRAPs</i></p> <p>NWSA continued to support the ScRAPs (Seaport Scrappage and Replacements for Air in Puget Sound) program in 2017. The program was funded from several sources including a U.S. Department of Transportation Congestion Mitigation and Air Quality (CMAQ) grant, a Washington State Department of Ecology grant, an EPA Diesel Emission Reduction Act (DERA) grant, and a CMAQ supplemental grant, alongside matching funds from NWSA. This program provided financial incentives of \$20,000 to \$27,000 per truck to eligible owners who scrap old trucks. The program, administered by Puget Sound Clean Air Agency, replaced and scrapped a total of 413 trucks over the lifetime of the program, which ended in mid-2017.</p> <p>Puget Sound Clean Air Agency administered funds from EPA CMAQ and Ecology for scrapping and replacing 73 drayage trucks in 2017. Truck owners also made significant investments.</p> |
| Other Initiatives: | <hr/> <p>Over a 12-month pilot period in 2017, the NWSA conducted a study of a Vehicle Wait Time Awareness System at 8 of its marine terminals to monitor queuing times outside the terminal gates and on terminals. The goal was to improve operational efficiency by providing drivers, terminals and the port with real-time data that could inform their activities. Data was collected through Bluetooth signals from cellphones in the trucks.</p> <p>Although Bluetooth has been used successfully in highway applications to collect data for traffic planning studies, it struggled to provide real time reliability in the dynamic port environment where a smaller volume of vehicles move at slower speeds. Due to a lack of reliability, the app used by the drivers declined in use. Next steps include employing RFID technology to assess on-terminal turn times and looking for alternate methods to assess the length of the queue outside the gates.</p> <hr/> |



7. Locomotives and Rail Transport

The port-related rail sector consists of locomotives that move railcars within a rail yard (switching or yard locomotives, also known as "switchers") or move trains across the airshed and beyond (line-haul locomotives). Performance is reported through the prevalence of fuel-efficiency programs among owners or operators, and the rate of upgrade or replacement of unregulated engines.

Context

Locomotive emissions contribute approximately 20% of DPM emissions and 14% of GHGs from activities related to the four ports, as summarized in the 2015/16 inventories. Since 2012, regulations have required the use of ULSD fuel and this has resulted in significant reductions in emissions from locomotives. Table 7 summarizes the number of locomotive operators and switcher locomotives operating at each port.

Table 7. Number of switcher locomotive operators and switcher locomotives in 2017

| Port | Number of switcher locomotive operators | Number of switcher locomotives |
|-----------|---|--------------------------------|
| NWSA | 4 | 40 |
| Seattle | 1 | 2 |
| Tacoma | 1 | 3 |
| Vancouver | 16 | 22 |

Performance Targets

Rail-1: Switcher locomotive owners/operators participate in a fuel-efficiency program

| | |
|--------------------------------|--|
| <i>2015 Target</i> | <i>By 2015, 100% of owners/operators participate in a fuel-efficiency program</i> [WORKING TOWARDS TARGET] |
| 2020 Target | By 2020, 100% of owners/operators achieve performance measures of chosen program |
| What is being measured? | As stated in the 2013 Strategy, Strategy partners will focus on reducing emissions from locally managed switcher locomotives operating at ports. This measure identifies the percent of owners/operators of switcher locomotives that participate in a fuel-efficiency program. Operators that publish fuel-efficiency programs, including goals/objectives, actions, and progress on their websites are considered to participate in a fuel-efficiency program. |
| Why is this important? | Locomotives require significant investment to replace or upgrade the engines. Fuel-efficiency programs are useful for reducing emissions from both older engines that have not yet been replaced and newer engines. |
| How did we do? | In 2017, one owner/operator is known to have participated in a fuel-efficiency program with published goals and results at U.S. ports, and two owners/operators at the Port of Vancouver had known fuel-efficiency plans in place based on participation in Green Marine. VFPA has also partnered with Climate Smart to offer training to tenants, on measuring, managing and communicating reductions in GHG emissions. Training was offered as a three-part series, with an additional information session and follow-up session also offered in 2017. |
| Definition of Terms | <p><i>Automatic Engine Stop Start (AESS) technology:</i> This technology enables the engines to be safely shut down when not in use by ensuring engines do not freeze, charging batteries, and maintaining air pressure at 90 psi or greater.</p> <p><i>Fuel-efficiency program:</i> A fuel-efficiency program sets goals or objectives for improving fuel-efficiency, undertakes actions that achieve those, and reports progress. Examples of fuel-efficiency actions include: idle-reduction policies, equipping locomotives with AESS technology, installing Eco-Tip fuel injectors, engaging or training employees on fuel-efficiency practices, and improving maintenance practices.</p> <p><i>Class 1 Railroads:</i> Class 1 Railroads are the largest railroads in the industry including BNSF, UP, CN and Canadian Pacific.</p> |

Rail-2: Switcher locomotive owners/operators upgrade or replace unregulated engines (engine replacement will be Tier 2 or better)

| | |
|--------------------------------|---|
| <i>2015 Target</i> | <i>By 2015, 10% of unregulated locomotive engines are replaced with Tier 2 or better engines</i> [WORKING TOWARDS TARGET] |
| 2020 Target | By 2020, 20% of unregulated locomotive engines are replaced with Tier 2 or better engines |
| What is being measured? | This measure reports the percentage of unregulated locomotive engines that were present in fleets as of December 31, 2013 (when the 2013 Strategy came into effect) that are replaced with Tier 2 or better engines. |
| Why is this important? | Many locomotives in operation have old engines (pre-1973) that are exempt from emission standards and from requirements to install engine upgrade kits when overhauling engines. Older engines have a life expectancy of 10 to 50 years. Retiring or upgrading engines to Tier 2 or better significantly reduces emissions. |

| | |
|----------------------------|---|
| How did we do? | <p>Two unregulated locomotive engines have been repowered since 2013, both by Tacoma Rail (one in 2015 and one in 2016).</p> <p>Of the 67 port-related switcher locomotives operating at or near the four Ports, 27 are known to be unregulated and 13 are known to be Tier 2 or better. Note that the Vancouver Fraser Port Authority does not have information about the Class 1 railroads.</p> |
| Definition of Terms | <p><i>Unregulated locomotive engine:</i> An engine that was manufactured before the first set of U.S. EPA Emissions Standards for Locomotives were in effect (1973). Tier 0 standards apply to equipment manufactured from 1973 through 2001, Tier 1 standards apply to engines manufactured from 2002 through 2004, Tier 2 standards apply to 2005 through 2010, and Tier 3 apply to 2011 through 2014.</p> <p><i>Class 1 Railroads:</i> Class 1 Railroads are the largest railroads in the industry including BNSF, UP, CN, and Canadian Pacific.</p> |

Implementation Efforts in 2017 by Port: Rail

| | |
|--------------------------|---|
| Port: | Port of Vancouver |
| Rail initiatives: | <p>Rail-1: Effective 2015, all terminal operators are required to conform to the NRDE Program, which includes reporting, fees, labelling, opacity and auditing. It also includes a requirement to maintain a fuel-efficiency plan applicable to non-road diesel equipment including switcher locomotives, in order to be eligible for fee rebates. Additionally, two terminal operators with locomotives were participants in Green Marine, which includes a fuel efficiency component for the terminal.</p> <p>Rail-2: No new engine replacements to report. VFPA does not have data for Class 1 operated locomotives, however, for the 16 tenant owned/operated locomotives, eight are estimated to be unregulated (pre-tier) and the remaining are made up of one Tier 2, and six Tier 3 multi-gen sets. In addition, there are four VFPA tenant-owned/operated pushers that do the work of switcher locomotives but with a much smaller engine thereby reducing emissions. Of the four pushers, two are estimated to be unregulated with the remaining two being Tier 1 and Tier 2.</p> <p>Other: The six tenant-owned Tier 3 multi-genset locomotives are very fuel efficient in that they bring on only the number of engines (power) needed for the work at hand. Many also have automatic start-stop systems.</p> <p>VFPA is participating in the Gateway Transportation Collaboration Forum (GCTF), a collaborative effort focused on the development and delivery of critical gateway-related infrastructure projects of national significance. Working with the GTCF, the port authority has applied for and received over \$200 million in federal funding commitments through the National Trade Corridors Fund, which will allow for the development and delivery of projects that are beneficial to local communities and overall gateway sustainability.</p> |
| Port: | Port of Seattle |
| Rail initiatives: | <p>Rail-1: Rail companies do not have a fuel efficiency plan.</p> <p>Rail-2: Both locomotives are unregulated. No new engine replacements to report.</p> <p>Other: All rail companies employ idle reduction technology.</p> |

| | |
|--------------------------|---|
| Port: | Port of Tacoma |
| Rail initiatives: | <p>Rail-1: Rail companies do not have a fuel efficiency plan.</p> <p>Rail-2: All three locomotives are unregulated. No new engine replacements to report.</p> <p>Other: All rail companies employ idle reduction technology.</p> |

| | |
|--------------------------|---|
| Port: | The Northwest Seaport Alliance |
| Rail Initiatives: | <p>Rail-1: One Class 1 rail company has published and met its fuel efficiency goal of reducing fuel use by 0.5% per year.</p> <p>Rail-2: It is estimated that 14 of the 40 locomotives are unregulated. The Class 1 rail companies move around their locomotives so the NWSA can only estimate what it typical. No new engine replacements to report.</p> <p>Other: All of the rail companies have idle reduction technology on some or all of their switcher locomotives.</p> |



8. Port Administration

The administration sector encompasses the Ports' own sources such as Port-owned or leased vehicles and vessels, office buildings, support facilities and employee functions that are needed for the administration of port activities. The associated activity-related emissions include fleet fuel use, facility energy consumption, employee commuting, materials use, waste management and maintenance and construction projects.

Context

The proportion of DPM and GHG emissions associated with port administration have not been fully quantified independently of the other sectors, however, they are a very small portion of total port-related emissions (e.g. fleet vehicles accounted for 0.1% of DPM and 0.7% of GHG in the 2015/16 port emissions inventories). Table 8 outlines the number of vehicles and equipment by type in each Port's administrative fleet. Table 9 provides a summary of the quantity of fuel used in each Port's administration. Because NWSA operated out of POT and POS facilities and utilized their vehicle fleets, NWSA operated no vehicles and accounted for no fuel consumption.

Table 8. Admin-1: Number of engines used in Port operations by equipment and fuel type

| Port | Marine vessels | | On-road vehicles | | | | | | Non-road equipment | | | | | |
|------------------|----------------|----|------------------|-----|-----|---|----|---|--------------------|-----|----|---|----|----|
| | D | G | D | B20 | G | C | H | E | D | B20 | G | H | P | E |
| NWSA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Seattle | 1 | 11 | 5 | 27 | 158 | 2 | 33 | 0 | 4 | 32 | 14 | 1 | 15 | 18 |
| Tacoma | 0 | 1 | 0 | 0 | 107 | 0 | 9 | 0 | 58 | 0 | 29 | 0 | 23 | 0 |
| Vancouver | 5 | 2 | 4 | 0 | 11 | 0 | 5 | 0 | 2 | 0 | 3 | 0 | 8 | 0 |

D=diesel, B20=20% biodiesel; G=gasoline, C=compressed natural gas, H=hybrid gasoline-electric, E=electric, P=propane

Table 9. Admin-1: Quantity of fuels used in equipment for Port operations by fuel type

| Port | Diesel (gal) ^[A] | Biodiesel 20 (gal) | Gasoline (gal) ^[B] | Propane (gal) | CNG or LNG (gal) | Electricity |
|-----------|-----------------------------|--------------------|-------------------------------|---------------|------------------|-------------|
| NWSA | 0 | 0 | 0 | 0 | 0 | 0 |
| Seattle | 14,547 | 19,453 | 61,038 | 1,348 | 705 | unknown |
| Tacoma | 10,712 | 0 | 55,227 | 3,425 | 0 | 0 |
| Vancouver | 674 | 0 | 4,751 | 149 | 0 | 0 |

[A] Diesel fuel sold in Washington State and British Columbia contained an average 2% and 4% renewable fuel, respectively

[B] Gasoline sold in Washington State and British Columbia contained an average of 2% and 5% renewable fuel, respectively

Performance Targets

Admin-1: Ports own and operate cleaner vehicles and equipment and have fuel-efficiency plans in place that promote continuous improvement

| | |
|--------------------------------|--|
| 2015 Target | By 2015, Ports report cleaner vehicles and equipment and other relevant information [TARGET COMPLETE] |
| 2020 Target | By 2020, Ports increase use of cleaner vehicles and equipment |
| What is being measured? | <p>This measure reports how the Port fleets are incorporating use of cleaner vehicles and equipment over time. "Cleaner" means that the PM and/or GHG emissions per distance traveled are lower for the same activity, measured as follows:</p> <ul style="list-style-type: none"> (a) replacement or modification of vehicles, equipment or procedures to increase use of cleaner vehicles and equipment, (b) percentage of vehicles and equipment that use non-conventional fuels (fuels other than diesel or gasoline), (c) proportion of total fuel used that is non-conventional (alternative), and (d) fuel-efficiency plans and other efficiency measures in place. |
| Why is this important? | Reducing emissions from vehicles and equipment contributes to improving air quality and reducing contributions to climate change. These actions also illustrate the Ports' commitment to achieving the Strategy goals. |
| How did we do? | <ul style="list-style-type: none"> (a) POS added one new piece of non-road electric-hybrid equipment and one piece of bio-diesel non-road equipment. (b) The percentage of vehicles and equipment that use alternative fuels across all Port fleets did not change significantly between 2016 and 2017, with a combined increase from 20% to 21% for on-road and decrease from 49% to 47% for non-road. (c) The proportion of total fuel used that is non-conventional (i.e. not gasoline or conventional diesel) increased from 14% to 15% between 2016 and 2017. (d) Two of three Ports who own vehicles and equipment have fuel-efficiency plans in place for their fleets. |
| Definition of Terms | <i>Port-owned and operated vehicles and equipment:</i> The scope of equipment reported includes all equipment (on and non-road) that is owned, rented or leased and operated by the Ports. At the Port of Vancouver, non-mobile equipment is |

included in the non-road category. Starting in 2017, the Ports of Seattle and Tacoma included non-mobile equipment in the non-road category.¹³

Cleaner vehicles and equipment: Vehicles and equipment are considered "cleaner" under a few circumstances: (1) the vehicle or equipment is altered or replaced to use a fuel that is cleaner than the previous fuel used; (2) the vehicle or equipment is replaced with a new unit that is cleaner; (3) the Port puts in place measures to prioritize use of cleaner vehicles and equipment. Examples of cleaner vehicles and equipment include:

- Switching to use of B20 diesel to replace standard diesel fuel
- Replacing a gasoline vehicle with a hybrid or electric vehicle
- Replacing a Tier 1 diesel engine with a Tier 4 engine
- Installing a diesel particulate filter on an engine
- Creating a fleet management system that prioritizes use of electric vehicles before gasoline or diesel vehicles

Fuel-efficiency plan: A fuel-efficiency plan sets out goals or objectives to increase operational efficiency, reduce use of fuels, and/or seek alternative sources of fuel that improve efficiency and reduce emissions from equipment operating on port or terminal land. The plan may also identify policies or actions that will be put into place to achieve the goals or objectives.

Admin-2: Ports apply clean construction standards to engines used on Port-led construction projects

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|--------------------------------|--|
| <i>2015 Target</i> | <p><i>By 2015, Ports adopt clean construction practices for Port-led construction projects including idle-reduction requirements and enact a plan to address Tier 2 engine emission requirements</i></p> <p>[TARGET COMPLETE]</p> |
| 2020 Target | <p>By 2020, Ports continue to apply clean construction practices for Port-led construction projects including idle-reduction requirements and enact a plan to address Tier 4 engine emission requirements</p> |
| What is being measured? | <p>This measure captures efforts to reduce emissions from equipment used in Port-led construction projects. The Ports identify whether clean construction practices have been adopted, including idle-reduction requirements and requirements for the use of Tier 4 engines.</p> |
| Why is this important? | <p>Ports can directly support the Strategy goals through appropriate clean construction practices and requirements.</p> |
| How did we do? | <p>All Ports have adopted clean construction practices in various forms, including: sustainable procurement guidelines, use of the Envision Sustainable Infrastructure rating system, and the West Coast Ports Sustainable Design Checklist.</p> <p>All of the Ports have requirements for Tier 2 non-road equipment in contracts (at least for major projects), but none of the Ports have a plan to require Tier 4 non-road engines in contracts at this time.</p> |
| Definition of Terms | <p><i>Clean construction standards:</i> For example, American Association of Port Authorities Sustainability Checklist, EPA Best Practices for Clean Diesel Construction, Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (prepared for Environment Canada), or equivalent best management practices.</p> |

¹³ The 2016 Puget Sound Emissions Inventory included non-mobile equipment such as compressors, welders, and pressure washers in the non-road category of equipment.

Admin-3: Ports facilitate energy studies and conservation projects at Port operations or tenant facilities to identify and address energy conservation opportunities in building systems, operations, and yard lighting

| | |
|--------------------------------|---|
| <i>2015 Target</i> | <i>By 2015, each Port conducts 3 energy studies</i> [TARGET COMPLETE] |
| 2020 Target | By 2020, each Port completes 3 energy conservation projects |
| What is being measured? | This measure includes energy conservation projects resulting in reduced energy use for Port or tenant operations. |
| Why is this important? | Reducing energy use in facilities can contribute to reducing GHG and air quality emissions. |
| How did we do? | Each of the three Ports has exceeded this target by completing more than three projects since 2014. In 2017, the Ports collectively completed 16 energy studies and 21 energy conservation projects for Port or tenant facilities. |
| Definition of Terms | <i>Energy study:</i> A study that identifies a facility's current energy use and opportunities for reducing energy use in future through conservation activities and technologies, or through alternative energy technologies. <i>Energy conservation project:</i> A project that implements identified opportunities for reducing energy consumption in a Port or tenant facility. Facilities may include building systems, operations, or yard lighting. |

Implementation Efforts in 2017 by Port: Port Administration

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| | <p>Port: Port of Vancouver Fraser Port Authority</p> |
| <p>How is the Port of Vancouver doing?</p> | <p>Admin-1: (a) On-road fleet and non-road fleet stayed the same.</p> <p>(b) The proportion of the on-road fleet using alternative fuels stayed the same at 25%, the non-road fleet remained the same at 62%.</p> <p>(c) The proportion of fuel used that is non-conventional increased slightly in 2017 compared to 2016 (2% to 2.7%).</p> <p>(d) VFPA does not currently have a fuel efficiency plan in place for its fleet.</p> <p>Admin-2: For 2017, VFPA Engineering continued to apply Green Infrastructure Guidelines to Port-led infrastructure projects, giving consideration to the economic, environmental and social impacts that the projects may impart. In 2017, there were five Engineering-led Port projects valued at \$500k+, for which metrics were recorded and reported via the Corporate Balanced Scorecard. For these five projects, 76% of the applicable Green Infrastructure Guidelines were implemented.</p> <p>Admin-3: In 2017, eight tenant engagement activities (one of which included five sessions), 11 energy studies and 15 energy conservation projects were undertaken. Much of this work falls under VFPA's Energy Action Initiative, established in 2012 in partnership with BC Hydro.</p> |
| <p>Other initiatives:</p> | <p>VFPA has reported corporate energy consumption and associated GHG emissions annually since 2010 in accordance with the ISO 14064-Part 1 standard for reporting GHG emissions and the Global Reporting Initiative's G4 Sustainability Reporting Guidelines, core. In 2017 VFPA was also working towards Climate Smart certification.</p> <p>Since 2010, VFPA has purchased carbon offsets to render its operations carbon neutral, with emissions assertions assured by Ernst & Young. This captures the use of fleet vehicles, patrol vessels, and other equipment, electricity and heating at facilities, employee commuting, paper consumption, waste, and air and other travel. Progress toward targets for electrical consumption, waste and sustainable commuting is also tracked, reported to staff, and integrated into individual incentive plans.</p> <p>VFPA continued to participate in the Green Marine Program as a port authority, and also participated in the Green Marine West Coast Advisory Committee.</p> <p>In 2017, 33% of employees took part in a Commuter Challenge to encourage sustainable commuting.</p> <p>VFPA continued its SortSmart waste management program in 2017, which includes organic waste composting and recycling of paper, glass, metal, plastics, and cardboard. Collection and recycling of binders, pens, markers, batteries and ink cartridges is also conducted through its stationary supplier. In 2017, VFPA achieved an overall 84% waste diversion rate.</p> |

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| <p>Port: Port of Seattle</p> <p>How is the Port of Seattle doing?</p> | <p>Admin-1: There are minor differences reported in the on-road and non-road fleets for POS in 2016 and 2017; these are likely due to updated vehicle characterization in the Port's database. In 2017, POS continued development of a Green Fleet Plan to address air quality and climate impacts associated with the Port's fleet. The Green Fleet Plan will provide measurable strategies to reduce vehicle energy use and emissions and will incorporate innovative technologies, advanced fuels and best management practices such as vehicle procurement guidance. The plan is expected to be completed with implementation underway in 2019.</p> <p>Admin-2: In 2017, the Port began revisions to capital project and design review procedures to increase focus on sustainable building practices, carbon reduction, DPM reduction, renewable energy, resilience and social equity. Work will be completed in 2019.</p> <p>Admin-3: POS conducted two energy assessments in 2017 (one solar feasibility study and one energy audit) and was awarded a Washington State Department of Commerce Energy Efficiency and Solar Grant to support the installation of a solar array on the Port's Headquarters at Pier 69. Additionally, the Port installed energy-conserving lighting at three locations, which reduced energy use by 70,000 kWh per year. POS also completed a pilot study of solar power at Fishermen's Terminal (see discussion under Pilot Studies).</p> |
| <p>Other initiatives:</p> | <p>POS helped complete the 2016 Puget Sound Maritime Air Emissions Inventory. The Port's Commute Trip Reduction Steering Committee began a multi-year process to develop alternatives and shared mobility strategies to reduce employees' needs to drive alone to and from work.</p> <p>The Port began a GHG Accounting project to include Scope 3 sources into its current and prior years' Maritime GHG inventories. This work will be completed in 2018.</p> <p>POS completed waste audits at three maritime facilities, began implementing waste reduction strategies at two facilities, and trained Port staff on waste diversion strategies. The Pier 69 waste diversion rate increased by six percent between 2016 and 2017.</p> <p>POS continued to participate in the Green Marine Program as a port authority, and also participated in the Green Marine West Coast Advisory Committee.</p> |
| <p>Port: Port of Tacoma</p> <p>How is the Port of Tacoma doing?</p> | <p>Admin-1: (a) The Port of Tacoma removed one gasoline unit from its on-road fleet in 2017, and added one propane unit to its non-road fleet. In assessing the results of the 2016 Port of Tacoma Greenhouse Gas Inventory, the Port is preparing to upgrade its on-road administrative fleet to electric vehicles to reduce GHG in this sector.</p> <p>(b) The proportion of the fleet using alternative fuels stayed the same between 2016 and 2017 for on-road (8%) and non-road (21%).</p> <p>(c) The proportion of fuel used that is non-conventional increased to 5% in 2017 compared to 2016 (4%).</p> <p>(d) POT implemented a vehicle purchasing policy that emphasizes fuel economy and low-emission vehicles (e.g., the purchase of low- or zero-emission vehicles). Port of Tacoma used 5% less gasoline in 2017 compared to 2016, and 2% more diesel. There is normal fluctuation in fuel usage from year to year, based on operational, maintenance, and construction activities. There has been an Idle Reduction Plan in place at the Port of Tacoma since 2010.</p> <p>Admin-2: The Port of Tacoma uses standard contract language that requires a minimum emission standard of Tier 2 equipment for Port construction contracts.</p> |

Admin-3: In 2017 the Port of Tacoma completed three energy studies – a port-wide greenhouse gas inventory looking at energy use at all port and tenant operated facilities, and two LED lighting assessments. The Port undertook two energy conservation projects in 2017 – installation of LED lighting at Ross Way, and PCT Maintenance building envelope repairs, installing new windows and doors to reduce heat loss.

Other initiatives:

The POT Corporate Social Responsibility team (Green Team), made up of members from across the Port, meets monthly and hosts information sessions on topics ranging from electric vehicles to recycling.

POT encourages telecommuting and van and car pools under its Commuter Trip Reduction program. Employees are incentivized to share trips by logging trips on 'Pierce Trips' to enter a monthly prize draw. POT uses GPS tracking to reduce vehicle idling and improve efficient use of POT-owned and operated vehicles.

Since 2008, the Port maintains an agreement with Tacoma Power to purchase 100% green power for the administrative services facility. Tacoma Power's Evergreen Options service plan allows the Port to buy electricity produced from renewable energy sources, including non-polluting wind or solar generators in the Northwest.

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| Port: | The Northwest Seaport Alliance |
| How is the Northwest Seaport Alliance doing? | Not applicable because NWSA operated out of Port of Seattle and Port of Tacoma facilities. |

9. Pilot Studies and Demonstration Projects

Pilot studies and demonstration projects are important for advancing new and existing emission-reduction technology for the maritime industry. In the 2013 Strategy, each Port committed to evaluating or engaging in at least one pilot study or demonstration project each year to advance knowledge. The Ports also committed to convening workshops, webinars, or meetings among relevant stakeholders to share information and results. Findings from pilot studies and demonstration projects that took place in 2017 are summarized in this section.

Pilot studies refer to preliminary desktop studies that evaluate feasibility, time, cost, adverse events, and other factors prior to engaging in a full-scale project. **Demonstration projects** are small-scale implementation projects that test feasibility and effectiveness of a technology or change in operation in a real-world application. Overall, eight pilot studies and demonstration projects were undertaken at the ports in 2017, and three of these are profiled below.

Port of Vancouver: Terminal Tractor Active Stop-Start™ Installation

In 2017, DP World Centerm started a demonstration project to evaluate the effectiveness of the Effenco Active Stop-Start™ technology for terminal tractors. The goal of this project is to determine if this technology is effective at reducing emissions when deployed on terminal tractors at DP World and other terminals at the Port of Vancouver. In support of the demonstration, VFPA funded the purchase and installation of two units.

The Active Stop-Start™ technology provides electric power to the fifth wheel, cab and chassis accessories including the HVAC system while the tractor engine is off, reducing engine run time, saving fuel and reducing GHG emissions.



Preliminary results, based on data from DP World are as follows:

- On average, the tractors are immobile 51% of the time.
- Current Effenco unit programming has reduced engine idle time by 61%, resulting in a 31% reduction in engine use.
- Reduced engine run time translated into 19% reduction in diesel fuel consumption.
- Reduced engine run time results in fewer maintenance services per month, and less downtime for each tractor.

The technology has been well received at DP World, and thus has led to the installation of six more units (currently in progress). Results have generally improved over time since the technology became operational in May 2017. The demonstration project will continue through 2018, with VFPA expanding

its funding contribution to include two more units for testing and evaluation at Global Container Terminals (GCT) Vanterm.

Port of Seattle: Solar Energy Installation



In 2017, POS continued a pilot study to deploy solar panels on port properties. In December 2017, 44 solar panels were installed on Net Shed 5 at Fishermen's Terminal. The net sheds are used to store gear for the North Pacific Fishing Fleet. Solar energy offsets lighting and heating loads in the buildings. In addition to generating clean energy, this project is intended to gain empirical knowledge on solar

installations, maintenance, and production. Solar energy production from this project is expected to generate over 20,000 kWh annually.

Northwest Seaport Alliance and Port of Tacoma: Shore Power Operational Cost Analysis

In 2017, the NWSA and Port of Tacoma conducted a Shore Power Operational Cost Analysis, investigating the feasibility of implementing shore power at both North and South Harbors. An at-berth operational cost analysis for ocean-going vessels was calculated to assess the tradeoffs of meeting auxiliary power demands using shore-side electricity (shore power) rather than burning marine gasoil (MGO) in on-board generators.

This analysis considered the power demands from ships calling the gateway, hoteling duration, fuel costs, labor costs, the number of vessels using shore power, and electricity rate structures. The results of this study indicate that plugging in to shore power would likely create operational cost savings when compared with traditional on-board auxiliary power generation, but is sensitive to the cost of fuel, the cost of electricity, the structure of electricity rates, and the number of ships that call each month.

The analysis indicated that an electricity rate without a demand charge would reduce risk to the shipping lines, terminal operators, and ports and help facilitate the adoption of shore power. The NWSA and Port of Tacoma are working closely with Tacoma Power and Seattle City Light to develop an electricity rate for shore power that will create financial incentive for vessels to plug in.

10. Port Initiatives & Pilots for 2018

The key air initiatives that are planned by the Ports for 2018 include:

Port of Vancouver

- Further develop the Port of Vancouver's first Greenhouse Gas Reduction Strategy Analysis.
- Complete annual corporate GHG emission inventory for 2018 by March 2019.
- Undertake a fourth year of partnering with Climate Smart Businesses Inc. to support tenants in tracking their GHG emissions, implementing emission reductions, and communicating successes to stakeholders. Continue to work toward Climate Smart certification for a second year.
- Complete the fourth year of the Non-Road Diesel Emissions Program, targeting Tier 1 and Tier 0 equipment.
- Expand funding for testing of Effenco Active Stop-Start™ System on container terminal non-road equipment to GCT Vanterm.
- Complete installation and commissioning of shore power infrastructure at Centerm and Deltaport container terminals.
- Lead development of an international collaboration on vessel emission reductions through optimization of vessel incentive programs and environmental infrastructure. This will include hosting of quarterly teleconferences, and retaining a consultant to provide support for the first phase of work, focused on stakeholder engagement, and validation and refinement of a path forward.
- Partner with FortisBC Energy Inc. to develop a Natural Gas Specialist position within Environmental Programs to support the use of natural gas for international marine carriers, domestic fleet operators and the heavy class 8 trucking drayage sectors operating at the Port of Vancouver.
- Conduct solid waste management assessment for Port facilities.

Port of Seattle

- Collaborate on completion of the 2016 Puget Sound Maritime Air Emissions Inventory and help analyze results.
- Create and fill two new staff positions in the Port's Maritime Environmental Department to focus on air quality, sustainability and greenhouse gas emission reduction strategy development and implementation.
- Evaluate opportunities to increase and improve access to shore power for cruise ships visiting Port of Seattle.
- Complete maritime GHG accounting project to include Scope 3 (port-influenced) sources of GHGs such as waste management, tenant activities and employee commuting.

- Begin development of a Port of Seattle Maritime Greenhouse Gas Emission Reduction Strategy.
- Continue developing a Green Fleet Plan to guide emission reduction efforts and air quality improvements in POS fleets.
- Continue updating the Port's Commute Trip Reduction program to improve first and last mile connections to transit, reduce roadway congestion, and enable alternative work arrangements to reduce Port employee commute times and drive-alone rates.
- Continue work toward installation of a solar array at Pier 69; once complete, the array will generate an estimated 100,000 kWh annually.
- Install four level 2 electric vehicle charging stations at the Fisherman's Terminal and start a project to install at least four additional level 2 electric vehicle charging stations at Shilshole Bay Marina.
- Continue revisions to Port capital project and design procedures to increase focus on sustainability, carbon reduction, renewable energy, and resilience, and include air quality considerations
- Comply with City of Seattle's Building Tune-Up ordinance and identify low cost/no cost operational improvements to reduce building energy demand and reduce carbon emissions.
- Establish a Port-wide Energy Service Contractor roster to streamline the contracting process and improve access to building and facility energy efficiency support.
- Conduct energy audits in at least one Port-owned building, and one tenant operated space.
- Conduct additional waste audits to identify waste management infrastructure improvements and support development of best management practices for buildings and facilities.

Port of Tacoma

- Help complete the 2016 Puget Sound Maritime Air Emissions Inventory, and analyze results.
- Conduct first Port of Tacoma Greenhouse Gas Inventory (Scopes 1, 2 and 3) of Port facilities.
- Partner with POS and NWSA to harmonize GHG emission inventory methodologies.
- Research & report out recommendations to bring cleaner vessels to the gateway in collaboration with other WC ports.
- Develop 5 Year Port Maintenance Fleet Replacement Plan.
- Train and accredit select staff on GHG emissions and tracking through Climate Smart training program.
- Perform waste audit for Port facilities.

Northwest Seaport Alliance

- Facilitate and produce the 2016 Puget Sound Maritime Air Emissions Inventory.
- Conduct NWSA Greenhouse Gas Inventory (Scopes 1, 2 and 3) of Port facilities.

- Partner with POS and POT to harmonize GHG emission inventory methodologies.
- Develop a GHG Reduction Implementation Plan.
- Complete first third-party verification of Green Marine certification.
- Train and accredit select staff and tenants on GHG emissions and tracking through Climate Smart training program.
- Implement updated Clean Truck Program, and provide support package for non-compliant truck owners.
- Pass a bill within the 2018 Washington legislative session regarding ports' ability to invest in emission controls.
- Research and report out recommendations to bring cleaner vessels to the gateway in collaboration with other West Coast ports.
- Work with Environmental Defence Fund to examine future trends and options in cargo-handling equipment

Collectively, the Ports have begun a review and update of this Strategy, building on the strong collaboration established among the Ports and strategy partners over the last decade. The Ports will also identify opportunities for measuring, tracking, and reducing sources of GHG emissions and black carbon, recognizing the increasing importance of black carbon and its potential impacts on air quality and climate change.

After ten years of collaboration on reducing port-related air emissions in the Northwest, the Ports are committed to continued and renewed efforts to invest in studies, projects, programs, and other efforts that result in improved air quality and reduced contributions to climate change.

Acknowledgements

The Vancouver Fraser Port Authority, Port of Seattle, Port of Tacoma and the Northwest Seaport Alliance are thankful to all partners and stakeholders that contributed to the implementation of both the 2007 and 2013 Strategies over the last ten years. Significant investment is required to undertake each of the initiatives identified in the Strategy. Funding made available by various agencies in 2017 continues to move forward initiatives that are valuable in reducing port-related air emissions in the Northwest. The Ports also recognize that numerous stakeholders and equipment owners have made significant investments of private resources into cleaner technologies, without which the achievements of the Northwest Ports Clean Air Strategy would not have been possible. The Ports look forward to the ongoing support of their partners and stakeholders to continue implementing the Strategy in 2018, and to review and update the Strategy in 2018 and 2019.

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