

NORTHWEST PORTS CLEAN AIR STRATEGY

2016
IMPLEMENTATION REPORT

November 28, 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, and Metro Vancouver (Strategy partners). This 2016 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 and 2015 reports. This report also highlights key demonstration projects and pilot studies undertaken by the Ports and Strategy partners in 2016 that support the Strategy goals, and provides a summary of initiatives underway in 2016.

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 the purpose of this report, the Northwest Seaport Alliance, 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 last two sets of port-wide emission inventories conducted (2005 and 2010/2011), the average progress made toward the goals is as follows:

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 22% between 2005 and 2010/2011.

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 9% between 2005 and 2010/2011.

Progress toward these goals will be updated in the next implementation report after the Ports have updated port-wide emission inventories for 2015 (Port of Vancouver) and 2016 (NWSA, POS and POT).

Performance Target Status for 2016

The 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 on the following page summarizes the progress toward the 2020 (and 2017 for trucks) performance targets. Further details about this progress are included in the report.

Demonstration Projects and Pilot Studies in 2016

The Ports and their partners undertook pilot studies and demonstration projects in 2016. This report highlights one study or project undertaken at each port in 2016:

- Port of Seattle: Solar Energy Assessments
- The Northwest Seaport Alliance and Port of Tacoma: Truck Traffic Congestion Technology Pilot
- Port of Vancouver: Liquefied Natural Gas Bunkering Study

Key Initiatives for 2017

The Ports have numerous initiatives planned and/or underway for 2017, including implementing new programs to reduce emissions, updating existing programs, continuing to implement pilot studies and demonstration projects, and continuing to undertake emission reduction measures for administrative operations. All of the Ports are completing their updated emission inventory reports, which will be available to report progress toward the Strategy goals in the next implementation report. The Ports will also begin a review and update of this Strategy, building on the strong collaboration established among the Ports and Strategy partners over the last decade.

Table E-1. Status of 2017 and 2020 Performance Targets for 2016

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:  53% exceeded target	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:  31% 40%	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	 39% 80%	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:  24% 100%	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	 45% 100%	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: 25% 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 report on performance measures	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: All Ports slightly reduced the size of fleets B: 20% (on-road) and 49% (non-road) fleets use alternative fuels C: 13% 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.

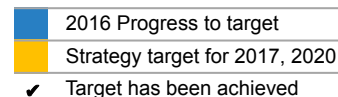


Table of Contents

	Executive Summary	i
	Table of Contents	iv
	List of Acronyms	v
	1. Introduction	1
	2. Clean Air Strategy Goals.....	4
	3. Ocean-Going Vessels	6
	4. Harbor Vessels.....	12
	5. Cargo-Handling Equipment.....	16
	6. Trucks	21
	7. Locomotives and Rail Transport	26
	8. Port Administration	30
	9. Pilot Studies and Demonstration Projects	37
	10. Port Initiatives & Pilots for 2017	39
	Acknowledgements.....	41

List of Acronyms

AESS	Automatic engine stop start
CHE	Cargo-handling equipment
CMAQ	U.S. Department of Transportation Congestion Mitigation and Air Quality
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
FWHA	US Federal Highway Administration
GHG	Greenhouse gas
IMO	International Marine Organization
LNG	Liquefied natural gas
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
RTG	Rubber-tired gantry crane
ScRAPs	NWSA Seaport Scrappage and Replacements for Air in Puget Sound
TLS	Port of Vancouver Truck Licensing System
ULSD	Ultra-low-sulfur diesel
WSDOT	Washington State Department of Transportation

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 August 2015 added a fourth Port partner to the Strategy.

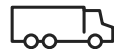
Several government agencies work in partnership with the Ports to support implementation of the Strategy, including the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), the Puget Sound Clean Air Agency (Clean Air Agency), Environment Canada, and Metro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

The Strategy was originally developed in 2007, and 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 2016 Implementation Report is the third to report progress against the 2013 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. The previous implementation reports focused on the progress made toward the 2015 performance targets. This year, the 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 2016, the Ports collectively moved over 172 million metric tons of cargo. Each of the ports 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 may have a greater overall impact on reducing port-related air emissions in the Georgia Basin-Puget Sound airshed. Further contextual information about each port is provided within each sector chapter.

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

Port	Total tonnage of cargo moved in 2016 (metric tons)	Number of Passengers	Number of Terminals	Types of business sectors served
Northwest Seaport Alliance	28,026,869	N/A	15	Automobile / Roll-on Roll-off Breakbulk Bulk Container
Seattle	4,389,089	983,539	3	Bulk Cruise
Tacoma	4,413,228	N/A	1	Bulk
Vancouver	135,583,055	826,820	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 139.5 million metric tons of cargo were moved through the four ports, and port-related activities resulted in the emission of 1,500 metric tons of DPM and 1.69 million metric tons of GHG emissions in the airshed.¹ The 2005 baseline intensity emissions were:

- 0.11 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.

Progress Toward Goals (2005 to 2010/2011)

Based on the 2010/2011 inventories, a total of 158.5 million metric tons of cargo were moved through the four ports, and port-related activities resulted in the emission of 1,250 metric tons of DPM and 1.66 million metric tons of GHG emissions.² Table 2 shows the change in emission intensity for each port, relative to 2005. The average change in emission intensity for 2010/2011 across the four ports was:

- DPM emissions / metric ton of cargo moved: 22% lower in 2010/2011, compared to 2005.
- GHG emissions / metric ton of cargo moved: 9% lower in 2010/2011, compared to 2005.

¹ Emissions are estimated for the "airshed" scale, which includes all emissions related to port activity that are released in the airshed boundaries (note that boundaries are defined differently in the Port of Vancouver inventory compared to the Ports of Seattle and Tacoma inventory). Emissions were obtained from the 2011 Puget Sound Maritime Air Emission Inventory (Starcrest, 2013), the Port Metro Vancouver 2010 Landside Emissions Inventory (SNC-Lavalin, 2012), and the 2010 National Marine Emissions Inventory for Canada (SNC-Lavalin). For the Port of Vancouver, fine particulate matter is reported for DPM because DPM was not quantified separately in past inventories, and therefore includes fine particulates from sources other than diesel.

² Ibid

Table 2. Changes in emissions intensity between 2005 and 2010/2011, by port

Port	Change in DPM emissions intensity in 2010/2011, relative to 2005	Change in GHG emissions intensity in 2010/2011, relative to 2005
Northwest Seaport Alliance³	N/A	N/A
Seattle	-34%	-14%
Tacoma	-12%	-3%
Vancouver	-21%	-8%

The Ports undertake emission inventories every five years. The 2015 Port of Vancouver emissions inventory is nearly finalized, and POS, POT and NWSA are in progress with their 2016 inventory. Results of these 2015/2016 inventories will be available for reporting progress toward the Strategy goals in next year's implementation report.

³ Prior to formation of the Northwest Seaport Alliance in 2015, emissions were assigned to the ports of Seattle and Tacoma.



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 2010/2011 emission inventories, OGVs produced approximately 78% of DPM emissions and approximately 46% of GHG emissions from activities related to the ports within the airshed. The number of unique vessels, and the total number of calls made by those vessels are summarized in Table 3.

Since those inventories were completed, 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. In 2020, emissions from ships operating in the North American ECA are expected to be reduced by 320,000 metric tons for NO_x, 90,000 metric tons for PM_{2.5}, and 920,000 tons for SO_x annually (23%, 74%, and 86%, respectively, below predicted levels in 2020 absent the ECA.).⁴

⁴ <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 2016

Port	Number of vessels	Number of vessel calls
Northwest Seaport Alliance	435	1,986
Seattle	75	269
Tacoma	65	67
Vancouver	1,667	3,186

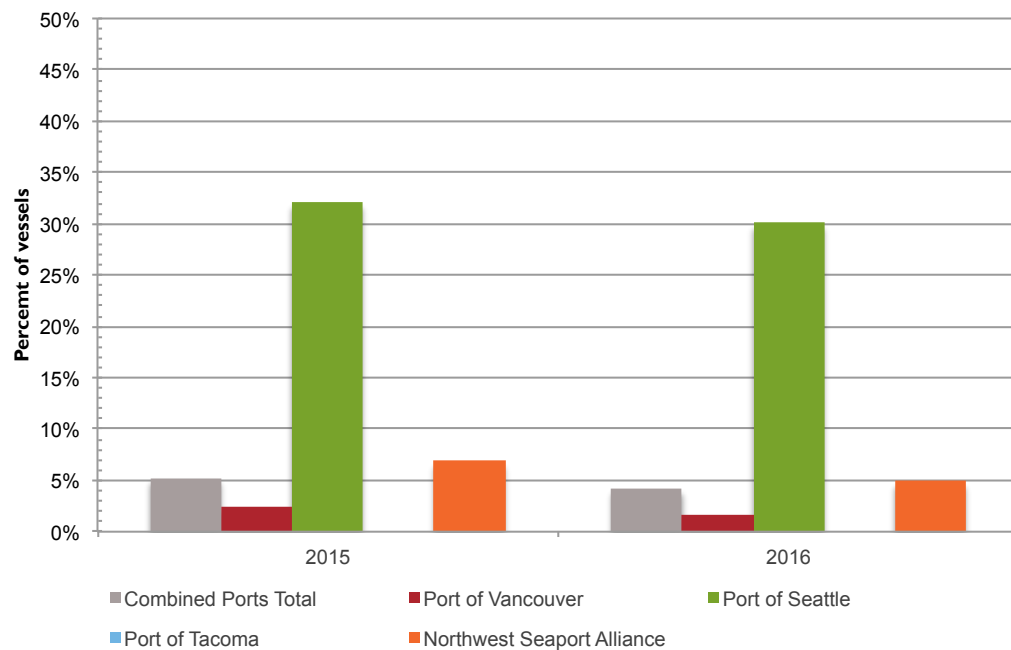
Performance Targets

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 technologies⁵
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 2016, 4% of vessel calls had Tier 3 engines, and/or used shore power, cleaner fuel, or other emission-reduction technologies, compared to 5% in 2015. The lower percentage of vessel calls meeting this target compared to 2015 is likely due to annual variation in which ships call the ports each year.
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.

⁵ The OGV-1 2020 target was first reported in the 2015 Report; however, the data presented in the 2015 Report was the number of vessels, rather than the number of vessel calls. This report presents updated data based on vessel calls for both 2015 and 2016. Additionally, NWSA and POT previously included all shore power-capable vessels as meeting the target. The data presented in this report includes only vessel calls that were known to use shore power in 2015 and 2016. NWSA continues to track shore power-capable vessel data, as it is useful for planning future operations and shore power facilities.

Figure 1. OGV-1: Percent of vessel calls with known Tier 3 marine engines, shore power use, cleaner fuel, or other emission reduction technologies in 2016



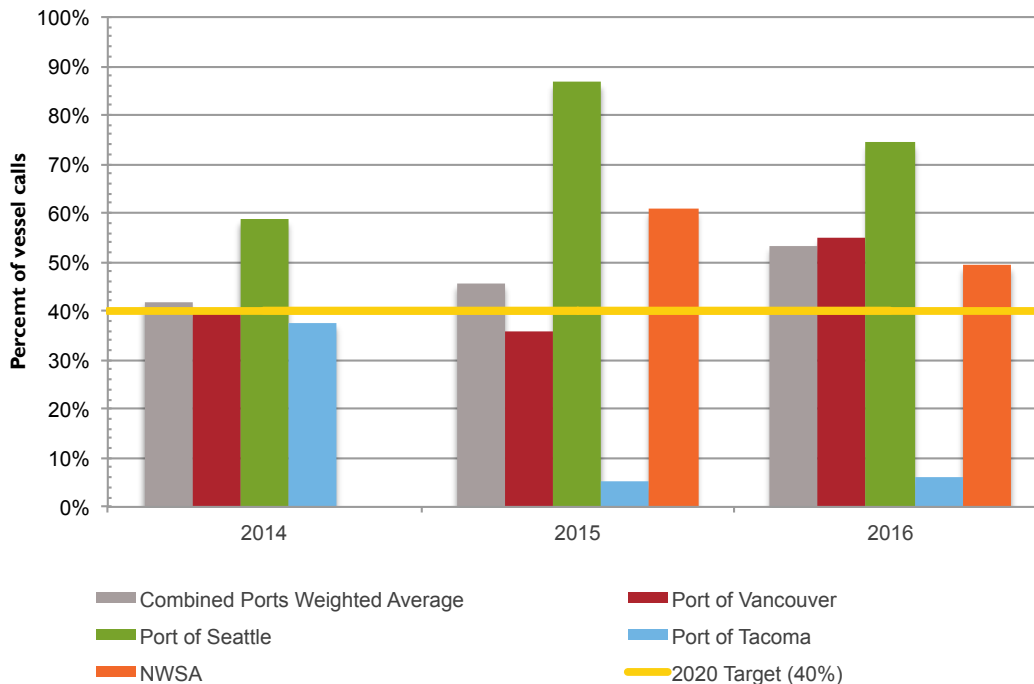
OGV-2: Ports and vessels participate in Port-designed or third-party programs that promote continuous improvement

<i>2015 Target</i>	<i>By 2015, Ports and 10% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements [TARGET COMPLETE]</i>
2020 Target	By 2020, Ports and 40% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements
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 2016, 3 out of the 4 Ports participated in the Green Marine program as ports. 53% of vessel calls to the ports were made by vessels participating in at least one continuous improvement program, as listed below, compared to 46% in 2015.
Definition of terms	<i>Port-designed programs:</i> For 2016, this includes the Port of Seattle Green Gateway Partners Awards Program and the Port of Vancouver EcoAction Program, which help to promote continuous improvement. <i>Third-party programs:</i> For 2016, 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.

Port participation in third-party certification programs: For 2016, 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 2. OGV-2: Percent of vessel calls participating in Port-designed or third-party certification programs⁶



⁶ Container terminals from the Port of Seattle and the Port of Tacoma are now managed by the NWSA. This means that only grain ships are being included for Port of Tacoma and only cruise and grain ships are counted for the Port of Seattle. Because the baselines for these two ports have changed, the differences in percentages between 2014 and 2015 do not show trends in overall progress toward this goal.

Implementation Efforts in 2016 by Port: OGV

Port:	Port of Vancouver
How is the Port of Vancouver doing?	OGV-1: In 2016, 55 calls were made by eight cruise vessels that connected to shore power, and one call was made by a vessel with a Tier 3 engine, based on keel laid date only. Combined, this represents 2% of calls, and 0.5% of vessels. Use of shore power at the Canada Place Cruise Terminal reduced emissions of GHGs by 2,185 metric tons, and particulate matter by 1 metric ton. OGV-2: In 2016, Vancouver participated in the Green Marine Program as a port authority. The port also participated in ESI, Green Award, RightShip, Clean Shipping Index and Green Marine by offering discounts to vessels that participate in the programs. 55% of calls were made by vessels participating in one or more of the Port of Vancouver EcoAction Program, ESI, Green Award, RightShip, Clean Shipping Index, or Green Marine. This represents 1,753 out of 3,186 calls for the year.
Program for OGVs:	<i>EcoAction Program and Blue Circle Award</i> In 2016, 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. 15 shipping lines received the Blue Circle Award for 2016. The award is given to those lines with the greatest proportion of participation in the EcoAction Program.⁷
Other initiatives:	In collaboration with Transport Canada, GCT, and DP World Vancouver, the Vancouver Fraser Port Authority has been working to install shore power infrastructure at the Port of Vancouver, specifically the Deltaport and Centerm container terminals. Installations at both DP World-operated Centerm container terminal and GCT-operated Deltaport container terminal will be operational early in 2018. The port authority has continued to track calls by shore power equipped vessels, filling out its database of information on connection requirements, terminals called and frequency of calls.
Port:	Port of Seattle
How is the Port of Seattle doing?	OGV-1: In 2016, 7% of vessels, representing 30% of cruise and grain vessel calls to POS, connected to shore power. OGV-2: POS participated in Green Marine as a port. 74% of vessel calls participated in at least one third-party certification program, including ESI, RightShip (verified data only), or the Port's Green Gateway Partners Program.
Program for OGVs:	<i>Green Gateway Partners Awards Program</i> In 2016, POS offered its seventh annual awards to cruise lines to recognize environmental initiatives, including air quality initiatives that exceed regulatory compliance. Five cruise lines were recognized for their successful environmental programs, and one Innovator Award was given.⁸

⁷ Visit <http://www.portvancouver.com/environment/air-energy-climate-action/marine/> for Blue Circle recipients.

⁸ Visit <http://www.portseattle.org/Newsroom/News-Releases/Pages/default.aspx?year=2017#654>.

Port:	Port of Seattle
Other initiatives:	None to report for 2016.

Port:	Port of Tacoma
How is the Port of Tacoma doing?	OGV-1: In 2016, none of the 67 grain ship calls to POT had Tier 3 engines, used shore power or implemented other emission-reducing technologies. OGV-2: POT is not participating in a third-party certification program. Four of the 67 grain ship calls to POT (6%) participated in at least one third-party certification program, including ESI and RightShip (where data is verified only).
Program for OGVs:	None to report for 2016.
Other initiatives:	None to report for 2016.

Port:	The Northwest Seaport Alliance
How is the Northwest Seaport Alliance doing?	OGV-1: In 2016, 5% of container ships calls to NWSA terminals had Tier 3 engines, used shore power or implemented other emission-reducing technologies. OGV-2: NWSA participated in Green Marine as a port for the first time in 2016. This is NWSA's first self-evaluation, which will be used to provide a benchmark score across performance indicators in future years. In 2016, 49% of vessel calls (982 out of 1,986) were from vessels participating in at least one third-party certification program, including ESI and RightShip (where data is verified only).
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.

Vessels achieve an A+ in RightShip

Two vessels that called both the Northwest Seaport Alliance and the Port of Vancouver – the *Carl Shulte* and *Christa Shulte* are two of only 10 ships worldwide that achieve an A+ rating in RightShip.



4. Harbor Vessels

Harbor vessels include harbor and ocean tugs; there are approximately 150 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 4% of DPM emissions and 5% of GHG emissions from activities related to the ports, as summarized in the 2013 Strategy. 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 2016

Port	Number of harbor vessel companies	Number of harbor vessels
POS, POT & NWSA	3	26
Vancouver	17	131

Performance Targets

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

2015 Target	<i>By 2015, partners conduct outreach and 50% of harbor vessel companies report best practices and engine upgrades</i> [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?	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 2016, including workshops, brown bag sessions, and meetings to discuss efficiency ideas, practices or projects. 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 2016 are also reported.
Why is this important?	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. Tracking what companies are doing to incorporate best practices and upgrade or replace their engines provides an annual snapshot of emission reduction activities.
How did we do?	<i>Partners conduct outreach:</i> In 2016, Strategy partners conducted outreach events involving harbor vessel companies. These focused on information sharing, learning about measuring and managing GHG emissions, and participating in auxiliary engine replacement. <i>Harbor vessel companies report on best practices and engine upgrades:</i> 30% (six) of companies reported their progress – three through submissions to Green Marine and three through communication with Strategy partners. <i>Companies undertook best practices and engine upgrades:</i> 25% (five of 20) companies undertook best practices or engine upgrades – three through their participation in the Green Marine program and two by replacing auxiliary engines on at least one vessel.
Definition of terms	<i>Best practices:</i> Currently, only participation in Green Marine is counted as following best practices. <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).

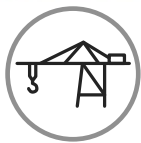
Harbor-2: Ports and harbor vessels participate in Port-designed or third-party certification programs that promote continuous improvement

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?	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. 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.
Why is this important?	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. Although the Ports have limited 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.
How did we do?	In 2016, 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. 31% of harbor vessels participated in third-party certification programs. Two port-related harbor vessels reported engine upgrades.
Definition of terms	<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. <i>Third-Party Certification:</i> Currently Green Marine offers the only third-party environmental certification program for harbor vessels.

Implementation Efforts in 2016 by Port: Harbor Vessels

Port:	Port of Vancouver
How is the Port of Vancouver doing?	Harbor-1: The Vancouver Fraser Port Authority hosted seven outreach events in 2016 at the Port of Vancouver: - Two Port Environmental Managers Breakfast Sessions for tenants, including tug companies, which were forums for sharing information on environmental best practices and evolving regulations. - Climate Smart Program – 2016 marked the second year that the Vancouver Fraser Port Authority partnered with Climate Smart to offer training to Port of Vancouver 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 2016. Harbor-2: The Port of Vancouver 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 the Port of Vancouver reported on air emission and other best practices in 2016 through Green Marine. 37% of tugs operating within the Port of Vancouver participated in Green Marine, with 3 of 17 companies representing 49 of 131 tugs being members (Seaspan, Saam Smit and North Arm Transportation).
Other initiatives:	None reported.

Port:	Port of Seattle
	Port of Tacoma
	The Northwest Seaport Alliance
How are the ports doing?	Harbor-1: PSCAA completed the auxiliary engine replacement program, which originally launched in September of 2014. The program was open to all harbor craft in the area including port related and non -port related harbor craft. In 2016, all three port-related harbor vessel companies serving POS, POT and NWSA regions reported their progress for 2016. Two of the three companies replaced auxiliary engines on at least one of their vessels. Harbor-2: Of the three U.S. Ports, POS and NWSA are Green Marine certified. None of the three U.S. Ports offer incentives to harbor vessel companies with third-party certifications. None of the harbor vessel companies operating at these ports participated in the Green Marine program in 2016.
Other initiatives:	None reported.



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 5% of DPM emissions and 7% of GHGs from activities related to the four ports, as summarized in the 2013 Strategy. 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 2016

Port	Number of CHE ⁹	Number of terminals with CHE	Total number of terminals
NWSA	808 ¹⁰	13	15
Seattle	63	2	3
Tacoma	0	0	1
Vancouver	1,544	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 non-road equipment.

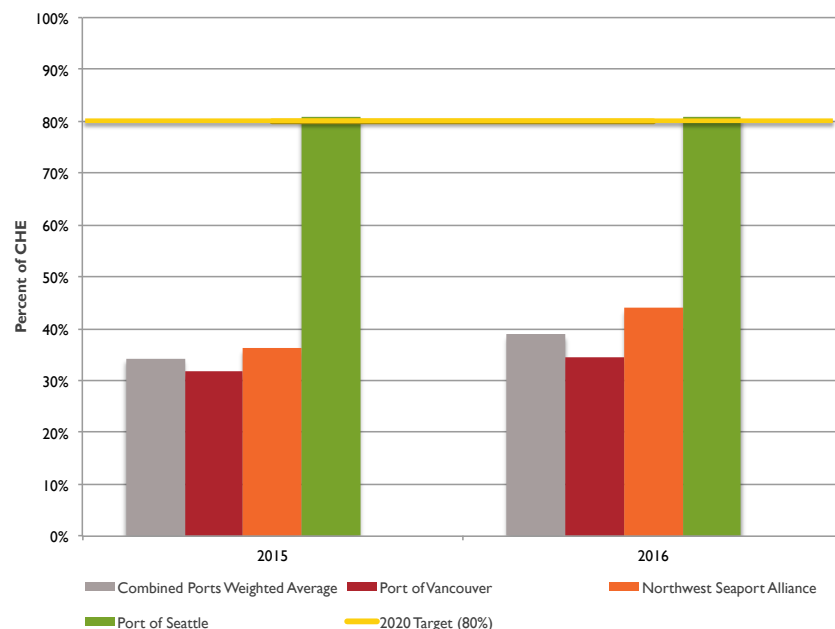
¹⁰ The number of CHE at NWSA is higher than past years due to omission of the following CHE from previous reports: (1) CHE at terminal 115; (2) Matson's own CHE at APM in Tacoma; and (3) electric CHE.

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?	39% of CHE met Tier 4 Interim across all ports (see chart below), which is 5% more than 2015 (34%). ¹¹
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 3. CHE-1: Percent of CHE meeting Tier 4 interim emission standards or equivalent

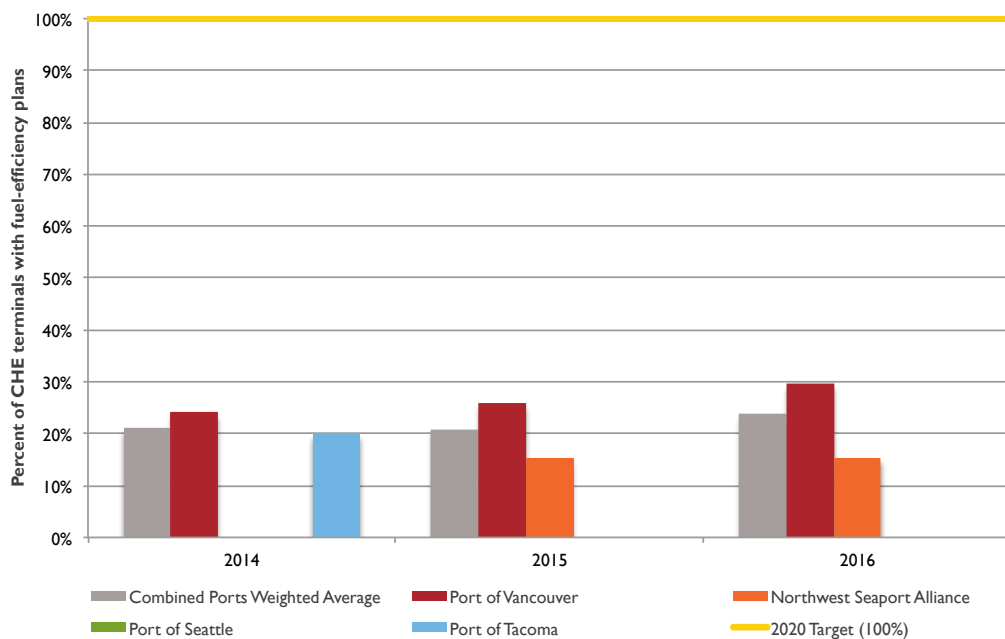


¹¹ The Vancouver Fraser Port Authority updated the numbers for 2015 as well as 2016 in this report. These are different than previously reported as a result of 1) methodology change due to new data available through the NRDE; and 2) updated 2015 port emission inventory. The latter includes a change in 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

2015 Target	By 2015, Ports and 50% of terminals have fuel-efficiency plans [WORKING TOWARDS TARGET]
2020 Target	By 2020, Ports and 100% of terminals have fuel-efficiency plans
What is being measured?	This measure reports on whether each of the Ports had plans in place to address fuel efficiency of CHE. The measure also reports the percent of terminals that had fuel-efficiency plans for CHE, to the best of the Ports' knowledge.
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?	In 2016, three of three 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 at the Port of Vancouver; the Ports of Seattle and Tacoma aim to reduce fuel consumption under their idle-reduction plans. 24% of terminals (10 out of 42) had a known fuel-efficiency plan for CHE in place.
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 4. CHE-2: Percent of CHE terminals with fuel-efficiency plans¹²



¹² Since 2015, POT has not operated any terminals with CHE. POS has two terminals with CHE, but these do not have fuel-efficiency plans and therefore are not visible on the graph.

Implementation Efforts in 2016 by Port: CHE

Port:	Port of Vancouver
How is the Port of Vancouver doing?	CHE-1: In 2016, 34% of non-road equipment within the Port of Vancouver met Tier 4i equivalent standards or better. CHE-2: The Port of Vancouver 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. 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.
Program for CHE:	<i>Non-Road Diesel Emissions (NRDE) Program</i> The Port of Vancouver 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.
Other initiatives:	For the second year in a row, in 2016 the Vancouver Fraser Port Authority partnered with Climate Smart Businesses Inc. to offer training to Port of Vancouver 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. Eight tenants renewed their certification and four new tenants became certified in 2016. As of June 2016, Climate Smart tenants from the first (2015) cohort alone have recorded a total annual reduction of 2,788 tonnes of carbon dioxide equivalent and \$670,000 in cost savings.
Port:	Port of Seattle
How is the Port of Seattle doing?	CHE-1: In 2016, 81% of CHE met Tier 4i equivalent standards or better (no change from 2015). CHE-2: Neither POS nor its cruise or grain terminals had implemented fuel efficiency plans for CHE in 2016.
Program for CHE:	None to report.
Other initiatives:	Ecology continued to provide Diesel Particulate Filter cleaning services to CHE owners.
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?	CHE-1: In 2016, 44% of CHE met Tier 4i equivalent standards or better. CHE-2: Two of 13 terminals have a fuel efficiency plan in place.
Program:	None to report.
Other initiatives:	Ecology continued to provide Diesel Particulate Filter cleaning services to CHE owners.



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 5% of DPM emissions and 28% of GHGs from activities related to the four ports, as summarized in the 2013 Strategy. 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 2016

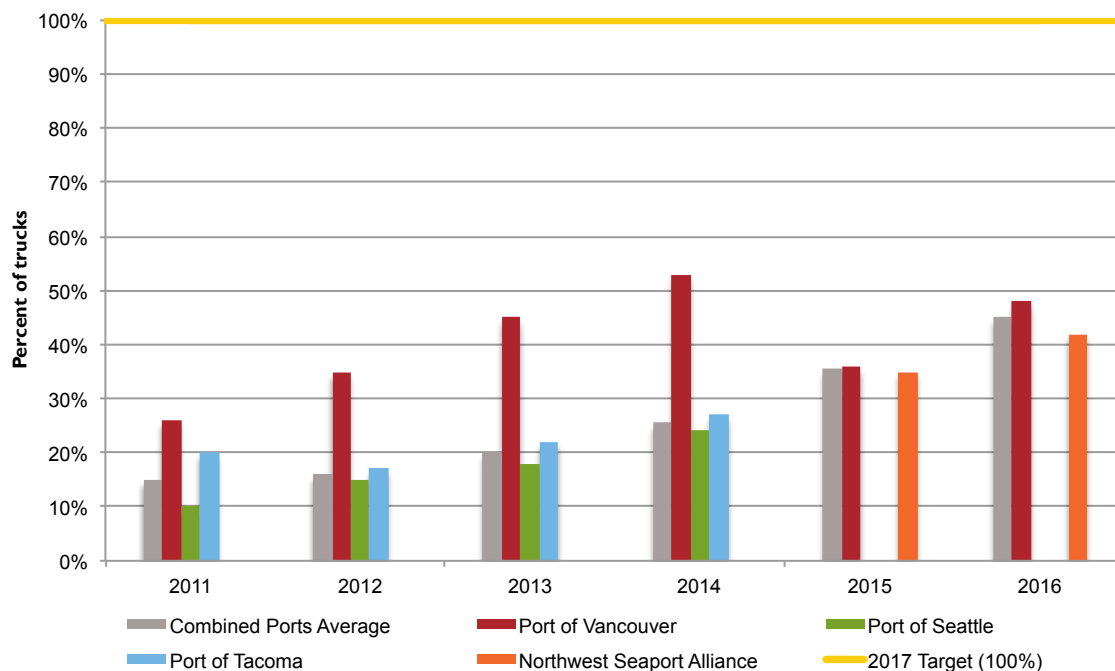
Port	Number of container terminals	Number of truck companies	Number of trucks
Northwest Seaport Alliance	10	101	4,414
Seattle	0	0	0
Tacoma	0	0	0
Vancouver	4	109	1,813

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' weighted average in 2016 is 45% (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 5. Truck-1: Percent of trucks that meet or surpass U.S. EPA emission standards or equivalent for model year 2007¹³



¹³ In 2016, the Vancouver Fraser Port Authority determined that 100% of 2007 model year trucks in the Truck Licensing System had 2006 engines at the Port of Vancouver. Since 2015, progress toward the target of 2007 or equivalent PM emissions are being reported for the Port of Vancouver based on 2008 model year trucks and newer (rather than 2007 or newer) – which explains the change visible between 2014 and 2015. Since 2015, trucks that previously served POS and POT terminals are now within the scope of NWSA terminals.

Truck-2: Ports, terminals, and truck companies have fuel-efficiency plans in place that promote continuous improvement¹⁴

<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, where known through 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 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 30% of the port-related GHG emissions, another way of reducing these emissions is to adopt fuel-efficiency practices.
How did we do?	In 2016, 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 2016, 25% 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.

¹⁴ 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 2016 by Port: Trucks

Port:	Port of Vancouver
How is the Port of Vancouver doing?	Truck-1: At the end of 2016, 48% 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. Truck-2: The Vancouver Fraser Port Authority does not have operational control over container trucks at the Port of Vancouver. 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.
Program for Trucks:	<i>Truck Licensing System (TLS)</i> The Vancouver Fraser Port Authority continued to implement increasingly stringent environmental requirements on drayage trucks accessing the Port of Vancouver through the TLS Program. Requirements in 2016 included: • 2006 model year trucks and 2007 model year trucks with 2006 engines 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?	Truck-1: At the end of 2016, 42% of approximately 4,400 trucks had 2007 or newer engines, or equivalent. Truck-2: NWSA did not have a fuel-efficiency plan in place for trucks in 2016. Two of the 13 terminals have fuel efficiency plans that include drayage trucks. One quarter of NWSA drayage providers participate in EPA's SmartWay program as truck carrier partners.
Program for Trucks:	<i>Drayage truck registry</i> 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 2016, POT continued to issue stickers to trucks, and POS issued RFID (radio frequency identification) tags. <i>ScRAPs program</i> NWSA continued to support the ScRAPs (Seaport Scrappage and Replacements for Air in Puget Sound) program in 2016. The program is 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 provides 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 187 drayage trucks in 2016 – a total of \$4.7 million in vouchers awarded and \$6.4 million in private sector investment in clean trucks in 2016 alone.

Port:	The Northwest Seaport Alliance
Other Initiatives:	In 2016, NWSA partnered with FHWA, WSDOT and Ecology on a pilot to test real-time vehicle wait time awareness systems at NWSA container terminals. The pilot, which began in mid-2016, will run one year, fully completed by the end of 2017, and is designed to be scalable to all terminals. The goal of the system is to facilitate dynamic route planning, reduce truck wait times and reduce excess idling.



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 9% of DPM emissions and 13% of GHGs from activities related to the four ports, as summarized in the 2013 Strategy. 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 2016

Port	Number of switcher locomotive operators	Number of switcher locomotives
NWSA	4	40
Seattle	1	2
Tacoma	1	3
Vancouver	16	22 (plus 4 pushers) ¹⁵

¹⁵ The Vancouver Fraser Port Authority did not collect data from operators on Class 1 railroads.

Performance Targets

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

2015 Target	<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 2016, one owner/operator is known to have participated in a fuel-efficiency program with published goals and results at U.S. ports (Union Pacific), and two owners/operators at the Port of Vancouver had known fuel-efficiency plans in place based on participation in Green Marine.
Definition of Terms	<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. <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. <i>Class 1 Railroads:</i> Class 1 Railroads are the largest railroads in the industry including BNSF, UP, CN and Canadian Pacific.

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

2015 Target	<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. The Ports and Strategy partners are currently working to establish the baseline number of unregulated 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?	Two unregulated locomotive engines have been repowered since 2013, both by Tacoma Rail (one in 2015 and one in 2016). 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.
Definition of Terms	<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. <i>Class 1 Railroads:</i> Class 1 Railroads are the largest railroads in the industry including BNSF, UP, CN, and Canadian Pacific.

Implementation Efforts in 2016 by Port: Rail

Port:	Port of Vancouver
Rail initiatives:	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. Rail-2: No new engine replacements to report. The Vancouver Fraser Port Authority does not have data for Class 1 operated locomotives, however, for the 16 port tenant-owned/operated locomotives, eight are estimated to be unregulated (pre-tier) and the remaining seven are made up of one Tier 2, and six Tier 3 multi-gen sets. In addition, there are four port 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. 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. At the Port of Vancouver, the Vancouver Fraser Port Authority is participating in the Gateway Transportation Collaboration Forum (GCTF), a collaboration effort which primarily focuses on the development and delivery of gateway-related infrastructure projects of national significance through the Trade and Transportation Corridors Initiative (TTCI), in a manner that is beneficial to local communities and overall gateway sustainability. The port authority is currently conducting a pilot project designed to track all railcar activity at the Port of Vancouver. The information collected through this tracking program will support the port authority's rail network analysis and transportation planning to help ensure continued rail efficiency through the Port of Vancouver. This information may also support ongoing efforts to reduce rail switching related noise and emissions. The port authority is leading a working group focused on improving rail operations on the south shore of Burrard Inlet.

Port:	Port of Seattle
Rail initiatives:	Rail-1: Rail companies do not have a fuel efficiency plan although they all employ idle reduction technology. Rail-2: No new engine replacements to report.
Port:	Port of Tacoma
Rail initiatives:	Rail-1: Rail companies do not have a fuel efficiency plan although they all employ idle reduction technology. Rail-2: No new engine replacements to report.
Port:	The Northwest Seaport Alliance
Rail Initiatives:	Rail-1: UP is the only rail company that has a fuel-efficiency program with published goals and results. Two of the four rail companies have published strategies that they have implemented to reduce fuel use but were not included because they did not have published goals and results. All of the rail companies have idle reduction technology on some or all of their switcher locomotives. The majority of the switchers have idle reduction equipment such as AESS. Rail-2: In 2016, Tacoma Rail completed a project that began in 2014 to repower a switcher and replace its unregulated engine with a Tier 3-compliant engine that is also equipped with AESS idle reduction technology. A total of two unregulated locomotives have now been repowered since 2013.



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 0.004% of DPM and 0.2% of GHG in the 2011 Puget Sound Maritime Air Emissions Inventory). 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	0	13	5	27	156	2	27	1	0	21	6	1	16	11
Tacoma	0	1	0	0	108	0	9	0	45	0	26	0	22	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	12,831	18,925	65,498	942	446	Unknown
Tacoma	7,496	0	57,983	2,618	0	0
Vancouver	818	0	5,518	127	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?	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: (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?	(a) Total number of fleet vehicles at each Port was slightly reduced, primarily due to consolidation, fleet planning efforts and annual fluctuations in fleet size. The number of conventionally-fueled units in each fleet also decreased, and POS added one new piece of electric hybrid equipment to its fleet in 2016. (b) The percentage of vehicles and equipment that use alternative fuels across all Port fleets combined increased from 18% to 20% (on-road) and from 48% to 49% (non-road) between 2015 and 2016. (c) The proportion of total fuel used that is non-conventional (i.e. not gasoline or conventional diesel) decreased from 15% to 13% between 2015 and 2016. (d) Two of three Ports 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, while the Ports of Seattle and Tacoma have only included mobile equipment in the non-road category. <i>Cleaner vehicles and equipment:</i> 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

2015 Target	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 [TARGET COMPLETE]
2020 Target	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
What is being measured?	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.
Why is this important?	Ports can directly support the Strategy goals through appropriate clean construction practices and requirements.
How did we do?	In 2016, 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. 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.
Definition of Terms	<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.

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?	Collectively, eight energy conservation projects were completed in 2016 for Port or tenant facilities. Each of the three Ports has completed more than three projects since 2014.
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 2016 by Port: Port Administration

Port:	Port of Vancouver Fraser Port Authority
How is the Port of Vancouver doing?	Admin-1: (a) The Vancouver Fraser Port Authority, which manages federal lands and waters at the Port of Vancouver, removed one gasoline-fueled and two hybrid vehicles from their on-road fleet and added one newer hybrid, while the non-road fleet stayed the same. (b) The proportion of the on-road fleet using alternative fuels decreased from 26% to 25% from 2015 to 2016, while the non-road fleet remained the same at 62%. The proportion decreased primarily due to efforts to reduce the overall size of the fleet and consolidate trips into a fewer number of vehicles. (c) The proportion of fuel used that is non-conventional stayed the same in 2016 compared to 2015 (2%). Note that the consumption of electricity for electric vehicles is not tracked, which can skew this proportion. Additionally, there is normal fluctuation in fuel usage from year to year, based on operational, maintenance, and construction activities. (d) The port authority does not currently have a fuel efficiency plan in place for its fleet. Admin-2: The port authority procurement process continues to be informed by sustainable procurement guidelines. In 2016, the port authority developed Green Infrastructure Guidelines (“GIG”) to support the vision to be “the world’s most sustainable port”. Metrics will be developed in 2017 to track and monitor utilization of these guidelines as they pertain to the port authority engineering and tenant-led infrastructure projects. Admin-3: In 2016, four tenant engagement activities (one of which included five sessions), 17 energy studies and six energy conservation projects were undertaken. Much of this work falls under the Port of Vancouver Energy Action Initiative, established in 2012 in partnership with BC Hydro.
	The port authority 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. Also since 2010, the port authority 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. Other initiatives: The Vancouver Fraser Port Authority continued to participate in the Green Marine Program as a port authority, and also participated in the Green Marine West Coast Advisory Committee. In 2016, 35% of employees took part in a Commuter Challenge to encourage sustainable commuting. The port authority continued its SortSmart waste management program in 2016, 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 stationery supplier. In 2016, the port authority achieved an overall 86% waste diversion rate.

Port:	Port of Seattle
How is the Port of Seattle doing?	Admin-1: (a) POS added four hybrid electric vehicles to its on-road fleet in 2016, and removed several conventionally-fueled vehicles. POS also added one electric hybrid aerial lift to the non-road fleet. (b) The proportion of the on-road fleet using alternative fuels increased from 22% to 26% from 2015 to 2016, while the non-road fleet increased from 82% to 89%. (c) The proportion of fuel used that is non-conventional decreased from 24% to 21% between 2015 and 2016. Note that the consumption of electricity for electric vehicles is not tracked, which can skew this proportion. Additionally, there is normal fluctuation in fuel usage from year to year, based on operational, maintenance, and construction activities. (d) In 2016 the Port conducted a comprehensive assessment of its energy portfolio, and ascertained that about 10% of its carbon emissions are due to fossil fuels used by its vehicle fleet. As a result, in 2017, POS will begin developing a Green Fleet Plan to reduce those emissions. Admin-2: POS continued to use the West Coast Ports Sustainable Design checklist as a tool to implement principles of sustainable development for select projects. In 2016, idle reduction and cleaner engines during construction were included as mitigation measures for air quality impacts in the Final Environmental Impact Statement for the Terminal 5 modernization project. Based on 2016 input from its Energy & Sustainability Advisory Committee, POS plans to revise capital project and design review procedures to include a stronger focus on carbon reduction, renewable energy, and climate resilience. Admin-3: POS conducted two energy assessments (solar feasibility and outdoor lighting) and completed one energy conservation project (HVAC improvements). Additionally, in 2016 POS developed an Energy Plan that identified renewable and energy conservation opportunities for both Maritime and Aviation divisions. The Plan includes a matrix of the renewable energy and energy conservation opportunities available to POS, whether each opportunity is commercially available, current costs, and if not commercially available, potential steps and costs necessary to develop that opportunity.
Other initiatives:	In 2016, POS developed an environmental scorecard that measures the Port's environmental footprint; it will serve to guide and monitor reduction efforts in all Port operating and non-operating divisions. In 2016, the POS Commission chartered an Energy and Sustainability Advisory Committee representing environmental, business, labor, social justice, academia, construction, and government agencies. The group proposed various policy directives to guide the Port's GHG reduction efforts. The group's final recommendations were provided in mid 2017. POS will review and act on recommendations starting in 2017. POS continued to conduct an annual GHG inventory of port-operated sources. POS also continued its on-going program to recycle paper, cardboard, plastic and metal containers, toner cartridges, batteries, and electronics; and to compost food waste.

Port:	Port of Tacoma
How is the Port of Tacoma doing?	Admin-1: (a) POT removed four gasoline and one hybrid electric units from its on-road fleet, and removed six gasoline and two propane units from its non-road fleet in 2016. POT is conducting a GHG Inventory for 2016 that will include an analysis of its fleet (on-road and non-road fleets). (b) The proportion of the fleet using alternative fuels stayed the same between 2015 and 2016 for on-road (8%) and non-road (24%). (c) The proportion of fuel used that is non-conventional stayed the same in 2016 compared to 2015 (4%). (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). POT used 3% less gasoline in 2016, as compared to 2015, and 8% less diesel for POT-owned vehicles. 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 since 2010. Admin-2: POT uses standard contract language that requires a minimum emission standard of Tier 2 equipment for Port construction contracts. Admin-3: In 2016, the Port completed one energy study and one energy conservation project – the electrical system and lighting were upgraded in building 407 at the Earley Business Center. Lighting was updated to LED lights with motion sensors.
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.
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 2016 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, three pilot studies and demonstration projects were undertaken at the ports in 2016, and these are profiled below.

Port of Vancouver: Liquefied Natural Gas Bunkering Study

On behalf of the Vancouver Fraser Port Authority, Lloyd's Register conducted a Liquefied Natural Gas (LNG) Bunkering Study, to develop an estimate of future demand for LNG as a marine fuel at the Port of Vancouver. The objective of the study was to provide preliminary insight into customer demand, forecasted timeline, and key issues to consider, in order to inform the development of a medium-term plan to support LNG bunkering at the Port of Vancouver.

To help inform the study results, an online survey and interviews with customers were undertaken to assess demand, bunkering preferences, and timelines. Additionally, Lloyd's Register conducted a regulatory scan and engaged with industry and Transport Canada to identify the current state of LNG bunkering and gaps. Lastly, an analysis of the potential demand forecast and operational and market factors was performed to develop recommendations for conceptual LNG bunkering options.

The study found that LNG capable vessels are likely to begin calling the Port of Vancouver in the 2020 to 2025 time period, with modest demand for bunkering expected to increase by 2030. Recommended fuelling options include bunker barges or a feeder vessel. This would be over and above the existing truck-to-vessel LNG bunkering services for short-sea vessels (BC Ferries and Seaspans Ferries). In the meantime, the port authority continues to work with marine customers, other ports, and industry stakeholders in order to support development of the infrastructure and operational procedures needed to enable LNG bunkering at the Port of Vancouver.

Port of Seattle: Solar Energy Assessments

In 2016, POS partnered with the University of Washington to conduct a pilot study on deploying solar energy panels for various applications on several port properties. Work included analyzing the feasibility of solar installations at various port facilities and prioritizing the best prospects, developing initial engineering plans and cost estimates, calculating energy and greenhouse gas savings, and identifying potential financing options. The study will not be completed until mid-2017, and results will be reported in the 2017 Implementation Report.

Northwest Seaport Alliance and Port of Tacoma: Truck Traffic Congestion Technology Pilot

In 2016, the NWSA applied for and received State grant funding to deploy a technology pilot project to measure truck traffic congestion on, at, and near NWSA container terminals and reduce congestion by providing real-time truck wait and queuing information to the trucking community. The project includes deploying the data collection, sharing, and communications infrastructure and services for a Freight Advanced Traveler Information System (FRATIS) for trucks moving cargo to NWSA container terminals. This will enable drivers to make informed routing decisions.

Today's port intermodal freight system is not well connected with information technology. Ineffective links among modes degrade the reliability and performance of carriers, shippers, and terminal operators. Moreover, the lack of effective information sharing among stakeholders causes inefficiencies resulting in unnecessary delays in the movement of containerized freight. These inefficiencies can have an impact on economic competitiveness, air quality, safety, and social justice.

The NWSA selected Leidos as the technology provider for the pilot project. Leidos developed DrayQ, an off-the-shelf cloud-based web portal and mobile application to provide drivers with real-time vehicle wait times.

The pilot will run through the end of 2017 and results will be reported in the 2017 Implementation Report.

10. Port Initiatives & Pilots for 2017

The key air initiatives that are planned by the Ports for 2017 include:

Port of Vancouver

- Complete the 2015 Port Emission Inventory, including release of a public report on results.
- Complete the Port of Vancouver's first Greenhouse Gas Reduction Strategy Analysis.
- Complete the third year of the Non-Road Diesel Emissions Program, targeting Tier 1 and Tier 0 equipment, and undertake a review of the program looking beyond 2020.
- Undertake a third year of partnering with Climate Smart Businesses Inc. to support tenants in tracking their GHG emissions, implementing emission reductions, and communicating successes to stakeholders. Additionally, become Climate Smart Certified corporately for the first time.
- Develop recommendations on incorporating electric vehicles into corporate fleet.
- Fund testing of Effenco Active Start-Stop System on container terminal non-road equipment.
- Undertake a review of the EcoAction Program and Blue Circle Award for ships, including updating environmental criteria and exploring ways to collaborate on an international scale to increase the number of calls by cleaner, quieter ships locally, as well as increase their prevalence in the global fleet.
- Make substantial progress toward completion of shore power at Centerm and Deltaport container terminals.
- Complete LNG Bunkering Demand Study and join international collaborative efforts including Society for Gas as Marine Fuel, and a Memorandum of Understanding with eight to ten other signatory ports to promote uptake of LNG as a cleaner marine fuel.
- Undertake "Low Carbon Drayage Study" to evaluate and understand trade-offs associated with transitioning the regional drayage sector to a low-carbon-operating model.
- Conduct solid waste management assessment for Port facilities.

Port of Seattle

- Help complete the 2016 Puget Sound Maritime Air Emissions Inventory, and analyze results.
- Continue developing a Green Fleet Plan for the POS fleet that will estimate potential emissions reductions and financial costs from existing and emerging vehicles, including innovative technologies and advanced fuels, and provide recommendations to upgrade our fleet and reduce emissions. In addition, it will incorporate fuel efficiency elements.
- Begin revisions to capital project and design review procedures to increase focus on carbon reduction, renewable energy, and climate resilience.
- Expand annual GHG inventory of Port-operated sources to include employee commuting and other elements.

- Partner with POT and NWSA to harmonize GHG emission inventory methodologies.
- With assistance from the University of Washington, complete assessment to evaluate solar energy feasibility for POS maritime facilities. Conduct additional energy audits of port facilities.
- Construct solar energy pilot project on the Fishermen's Terminal net sheds. The construction will be completed in 2017 and the project will serve to inform further renewable energy projects for the Port of Seattle.
- Perform waste audits for several Port facilities.

Port of Tacoma

- Help complete the 2016 Puget Sound Maritime Air Emissions Inventory, and analyze results.
- Track total energy consumption at Port facilities to improve efficiency and reduce GHG emissions.
- Perform waste audit for Port facilities.
- Partner with POS and NWSA to harmonize GHG emission inventory methodologies.

Northwest Seaport Alliance

- Facilitate and produce the 2016 Puget Sound Maritime Air Emissions Inventory.
- Track total energy consumptions at Port facilities to improve efficiency and reduce GHG emissions.
- Partner with POS and POT to harmonize GHG emission inventory methodologies.

Collectively, the Ports will begin 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. Black carbon will be added to the suite of pollutants to be evaluated in the 2016 Puget Sound Maritime Air Emissions Inventory.

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 2016 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 continued support of their partners and stakeholders in continuing to implement the Strategy in 2017 and beyond.

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