

NORTHWEST PORTS CLEAN AIR STRATEGY



2015
Implementation Report



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Executive Summary

In 2013, Vancouver Fraser Port Authority (VFPA), the Port of Seattle (POS), and the Port of Tacoma (POT) 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 US Environmental Protection Agency, the Washington State Department of Ecology (Ecology), the Puget Sound Clean Air Agency, Environment Canada, and Metro Vancouver. The 2014 Implementation Report was the first to report progress made toward the goals and performance targets identified in the 2013 updated Strategy. This 2015 Implementation Report builds on the progress outlined in the 2014 report. This report also highlights key demonstration projects and pilot studies undertaken by the Ports and partners in 2015 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 be a port partner in implementing the Strategy. However, POS and POT will remain stand-alone partners with a focus on their individual lines of business that are outside those of the NWSA.

For the purpose of this report, VFPA, NWSA, POS and POT will be collectively referred to as "the Ports".

Progress Toward Strategy Goals

The Ports conduct air emission inventories every five years, which are used in part to track progress toward the two Strategy goals. Based on the previous port-wide emission inventories, conducted in 2005 and 2010/2011, the average progress made towards the goals is as follows:

Goal 1: Reduce DPM emissions per metric ton of cargo by 75% by 2015; and by 80% by 2020, relative to 2005.

→ DPM emissions per metric ton of cargo were reduced by 22% between 2005 and 2010/2011.

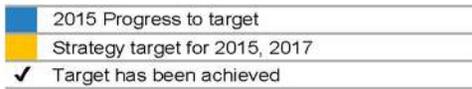
Goal 2: Reduce GHG emissions per metric ton of cargo by 10% by 2015; and by 15% by 2020, relative to 2005.

→ GHG emissions per metric ton of cargo were reduced by 9% between 2005 and 2010/2011.

Performance Target Status for 2015

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 1 on the following page summarizes the progress towards the 2015 (and 2017 for trucks) performance targets. Further details about this progress are included in the report

Table 1. Status of 2015 and 2017 Performance Targets for 2015

Northwest Ports Clean Air Strategy 2015 Progress Summary: Compilation of Ports of Seattle, Tacoma, Vancouver, BC and The Northwest Seaport Alliance				
Sector	2015/2017 Performance Targets*	Results	Status	
Ocean-Going Vessels	OGV 1: Early compliance with 2015 Emission Control Area (ECA) 0.1% fuel-sulfur level (or equivalent) while hotelling before 2015	The ports will no longer track this metric as it is internationally mandated (100% compliance)	n/a	
	OGV 2: A: Ports participate in third-party certification programs B: 10% vessel calls participate in Port-designed or third-party certification programs	A: 2 Ports participated in Green Marine B: 	A: not yet meeting B: ✓	
Harbor Vessels	Harbor 1: A: Partners conduct outreach B: 50% of harbor vessel companies report best practices and engine upgrades	A: 5 outreach events conducted B: 25% of companies reported best practices; 21% performed engine upgrades	A: ✓ B: not yet meeting	
	Harbor 2: A: All ports participate in third-party certification programs B: 10% vessels participate in Port-designed or third-party certification programs	A: 2 of 4 ports participated in 3 rd party certification B: 	A: not yet meeting B: ✓	
Cargo-Handling Equipment	CHE 1: 50% of CHE meets Tier 4 interim (T4i) emission standards or equivalent		not yet meeting	
	CHE 2: A: Ports have fuel-efficiency plans for CHE B: 50% of terminals have fuel-efficiency plans for CHE	A: No Ports had fuel-efficiency plans for CHE B: 	A: not yet meeting B: not yet meeting	
Trucks	Truck 1: 100% of trucks meet or surpass EPA emission standards for model year 2007, by 2017 (1/1/2018)		not yet meeting	
	Truck 2: Ports have fuel-efficiency plans for trucks	No Ports had fuel-efficiency plans for trucks	not yet meeting	
Rail	Rail 1: 100% of switcher locomotive owners/operators institute a fuel-efficiency program **		not yet meeting (incomplete data)	
	Rail 2: 10% of unregulated switcher locomotive engines are upgraded or replaced to Tier 2 or better **	4% unregulated engines were upgraded or replaced since December 31, 2013	not yet meeting (incomplete data)	
Port Administration	Admin 1: Ports report use of cleaner vehicles and equipment and other relevant information	VFPA, POS and POT reported fleet information. NWSA does not operate a vehicle fleet.	✓	
	Admin 2: Ports adopt clean construction practices for port-led construction projects including idle-reduction requirements and enact plan to address Tier 2 engine emission requirements	VFPA, POS and POT adopted clean construction practices for Port-led projects. NWSA does not manage construction projects.	✓	
	Admin 3: Each port conducts 3 energy studies	All ports conducted at least 3 studies. NWSA operates out of POS and POT facilities.	✓	
<p>Partners are striving to meet targets by December 31st of the target year. ** Incomplete data is available for the 2015 report.</p>				

Demonstration Projects and Pilot Studies in 2015

The Ports and their partners undertook pilot studies and demonstration projects in 2015. This report highlights one study or project undertaken at each port in 2015:

- VFPA partnered with *Climate Smart* to offer training to tenants, enabling them to better measure, manage and communicate greenhouse gas emissions and reductions.
- POS completed a pilot project to convert diesel-fueled drayage trucks to run on compressed natural gas.
- In 2015 the NWSA opened an Operations Service Center (OSC) focused on improving freight mobility by addressing gaps in technology and communications. The NWSA secured funding from the Federal Highway Administration, Washington State Department of Transportation and Washington State Department of Ecology to develop an Intelligent Transportation System pilot project to reduce terminal congestion, truck wait times and excess idling.

Key Initiatives for 2016

The Ports have numerous initiatives planned and/or underway for 2016, 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. VFPA is working towards completion of its 2015 emission inventory project while NWSA, POT and POS are collaborating on the 2016 Puget Sound Maritime Air Emissions Inventory.

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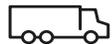
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List of Acronyms

AESS	Automatic engine stop start
CHE	Cargo-handling equipment
PSCAA	Puget Sound Clean Air Agency
CMAQ	US 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	US Environmental Protection Agency
ESI	Environmental Shipping Index
FRATIS	Freight Advanced Traveler Information Systems
GHG	Greenhouse gas
IMO	International Marine Organization
LNG	Liquefied natural gas
NRDE	POV's Non-Road Diesel Emissions program
NWSA	Northwest Seaport Alliance
OGV	Ocean-going vessel
POS	Port of Seattle
POT	Port of Tacoma
RTG	Rubber-tired gantry crane
ScRAPs	POS' Seaport Scrappage and Replacements for Air in Puget Sound
TLS	POV's Truck Licensing System
ULSD	Ultra-low-sulfur diesel (15 parts per million or less)
VFPA	Vancouver Fraser Port Authority

1. Introduction

The Northwest Ports Clean Air Strategy (Strategy) was developed in collaboration between Vancouver Fraser Port Authority (VFPA), the Port of Seattle (POS), and the Port of Tacoma (POT) 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 collaborative partner to the Strategy.

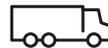
Several government agencies work in partnership with the Ports to support implementation of the Strategy, including the US Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), the Puget Sound Clean Air Agency (PSCAA), Environment Canada, and Metro Vancouver.

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 towards the goals and targets identified in the Strategy. This 2015 Implementation Report is the second to report progress made toward the goals and performance targets of the updated 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)

Summary of the Strategy

The Strategy has three primary objectives:

1. Decrease port-related air quality impacts from diesel particulate matter (DPM) emissions to reduce immediate and long-term effects on human health, the economy, and the environment within the 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 airshed.

Summary of the Participating Pacific Northwest Ports

The participating Pacific Northwest Ports (VFPA, POS, POT and NWSA) collectively moved over 171 million metric tons of cargo in 2015. 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 2. Summary of terminals, cargo moved, and business sectors served at each port for a summary of these by port). Despite different operating contexts, the Ports recognize that defining and working towards common goals may have a greater overall impact on reducing port-related air emissions in the airshed. Further contextual information about each port is provided within each sector chapter.

Table 2. Summary of terminals, cargo moved, and business sectors served at each port

Port	Total tonnage of cargo moved in 2015 (metric tons)	Number of Terminals	Types of business sectors served
VFPA	138,000,000	27	Automobile / Roll-on Roll-off Breakbulk Bulk Container Cruise Other
POS	3,778,476	3	Bulk Cruise
POT	2,789,755	1	Bulk
NWSA	26,563,752	15	Automobile / Roll-on Roll-off Breakbulk Bulk Container

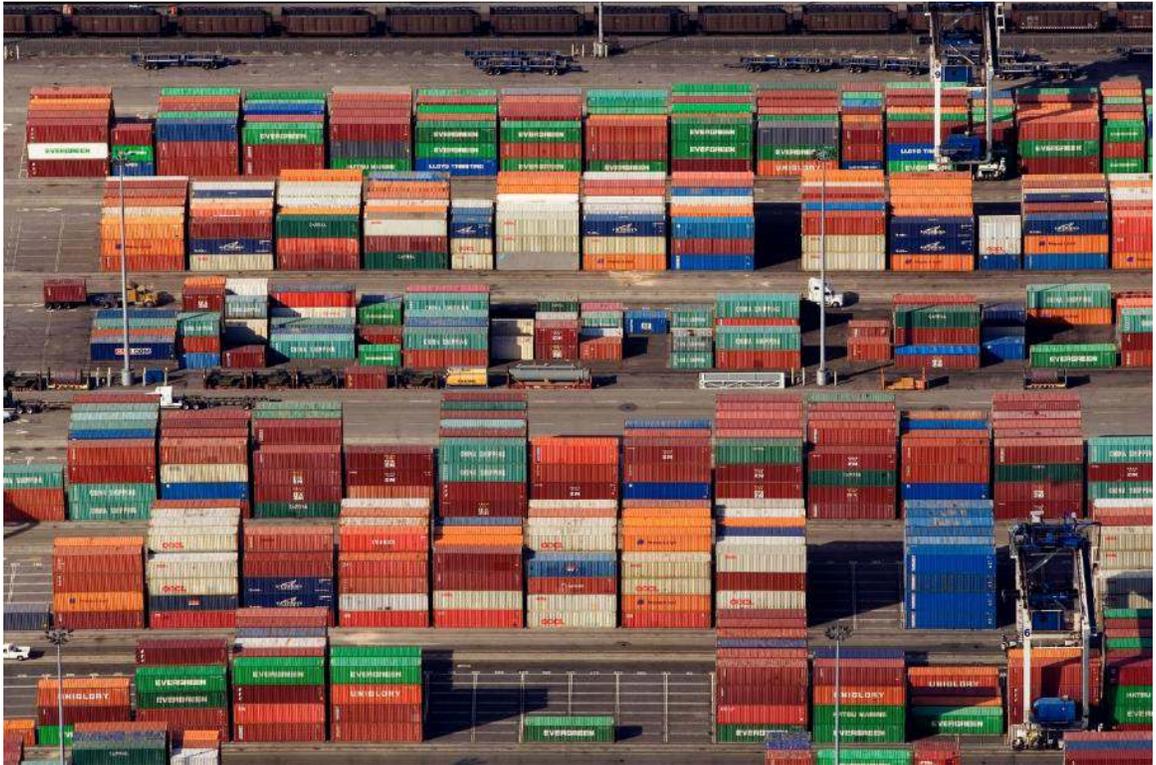
How this Report is Organized

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 2015 and 2020 to reduce emissions in each of 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*)

The Strategy partners work with stakeholders to meet targets by the end of the stated calendar year—that is, the achievement date for 2015 targets is December 31, 2015. This report focuses on the progress made towards the 2015 (and December 31, 2017 for trucks) performance targets except for OGV-1 whose 2015 target was made mandatory as a condition of the North American ECA. For

OGV the focus for OGV-1 is the 2020 target. The other 2020 targets are also included in the report for reference only.



2. Clean Air Strategy Goals

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

DPM Goal: Reduce diesel particulate matter emissions per metric ton of cargo by 75% by 2015 and 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 10% by 2015 and 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, as opposed to total emissions, 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 Ports, and port-related activities resulted in the emission of 1,500 metric tons of diesel particulate matter, and 1.69 million metric tons of greenhouse gases in the airshed.¹ The 2005 baseline intensity emissions² 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)

The Ports undertake emission inventories approximately every five years, and the most recent inventories were completed for 2010 (VFPA) and 2011 (POS and POT, and the segment of these two ports now managed under the NWSA. Based on the 2010/2011 inventories, a total of 158.5 million metric tons of cargo were moved through the 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.³ Table 3 shows the change in emission intensity for each port, relative to 2005. The average change in emission intensity for 2010/2011 across the 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.

The intensity of emissions decreased due to a number of factors, including the use of ultra-low-sulfur diesel (ULSD) in harbor vessels, cargo-handling equipment, trucks, and locomotives; use of lower-sulfur fuel in some ocean-going vessels; increased use of shore power; increased efficiency measures in locomotives; engine retrofits with emission reduction technologies; clean truck programs; and the normal turnover of older equipment and trucks. The next inventory years will be 2015 (VFPA) and 2016 (NWSA, POS and POT). Results of these inventories will not be available until 2017.

Table 3. 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
VFPA	-21%	-8%
POS	-34%	-14%
POT	-12%	-3%
NWSA ⁴	NA	NA

¹ Emissions are estimated for the "airshed" scale – all emissions related to port activity that are released in the airshed boundaries are included. The airshed boundaries are defined differently in VFPA's inventory compared to POS and POT's 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 VFPA, 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 NWSA is a marine cargo operating partnership of POS and POT that was formed in mid-2015. As a result, the 2005 and 2011 Puget Sound Maritime Air Emissions Inventories did not specifically name this entity, and all NWSA-related emissions were categorized as either POS or POT emissions.

³ Ibid

⁴ Prior to formation of the NWSA in 2015, emissions were assigned to POS or POT.



3. Ocean-Going Vessels

Ocean-going vessels (OGV) include for example container ships, cruise ships, tanker ships, bulk cargo ships and breakbulk cargo ships. Performance reporting focuses on the sulfur content in fuels, types of engines being used, and participation in Port-designed or third-party continuous improvement or certification programs.

In 2015, the Ports of Tacoma and Seattle formed the NWSA as a marine cargo operating partnership. Starting with this 2015 report, vessels calling at NWSA-managed terminals are associated with NWSA as opposed to the respective home port. Beginning in 2015, POS OGVs are limited to cruise ships and grain ships; while POT OGVs are exclusively grain ships. This has changed the way that OGVs are reported in this report. For example, POT reported 1,258 OGV calls in 2014 but only 39 calls in 2015. Conversely, the NWSA did not exist in 2014 (zero calls) but accounted for 1,487 OGV calls in 2015.

Context

As noted in the 2010/2011 emission inventories, OGVs produced approximately 78% of DPM emissions and approximately 46% of GHG emissions from activities related to the Ports. Since that time, 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 ECA are expected to be reduced annually by 320,000 metric tons for NO_x, 90,000

metric tons for PM2.5, and 920,000 tons for SOx, which is 23 percent, 74 percent, and 86 percent, respectively, below predicted levels in 2020 absent the ECA⁵.

Table 4 summarizes the number of vessels and vessel calls for 2015 for each port.

Table 4. Number of ocean-going vessels and vessel calls at the Ports in 2015

Port	Number of vessels	Number of vessel calls
VFPA	1,694	3,149
POS	64	249
POT	39	39
NWSA	468	1,487

Performance Targets

OGV-1: 2015 Goals Met; Ports track number of vessels with Tier 3 marine engines, shore power use, cleaner fuel or other emission reduction technologies

2015 Target	Early compliance with 2015 ECA 0.1% fuel-sulfur level (or equivalent) while hoteling before 2015. –COMPLETED
2020 Target	Ports track number of vessels with Tier 3 marine engines, shore power use, cleaner fuel, or other emission reduction technologies.
What is being measured?	The 2015 target was for early compliance with the January 1, 2015 ECA requirement to burn fuel with 0.1% sulfur level. The ports and their stakeholders worked together to achieve early compliance for some vessel calls, and with the ECA now in place this target is no longer relevant. Instead, the Ports will measure progress for the 2020 OGV-1 target. This measure reports vessel calls for vessels tracked by the Ports using shore power, equipped with Tier 3 engines, or fueled with liquefied natural gas (LNG).
Why is this important?	The Ports recognize the importance of cleaner engines, shore power, and alternative fuels as they have potential to further reduce emissions beyond ECA requirements.
How did we do?	Collectively, 8% of vessel calls (176 of 2,249) to the Ports had Tier 3 marine engines, or used shore power, cleaner fuel, or other emission-reduction technologies. ⁶

⁵ For more information visit: <https://www3.epa.gov/otaq/regs/nonroad/marine/ci/420f10015.pdf> and http://www.metrovancouver.org/services/air-quality/AirQualityPublications/Caring_for_the_Air-MV2016.pdf

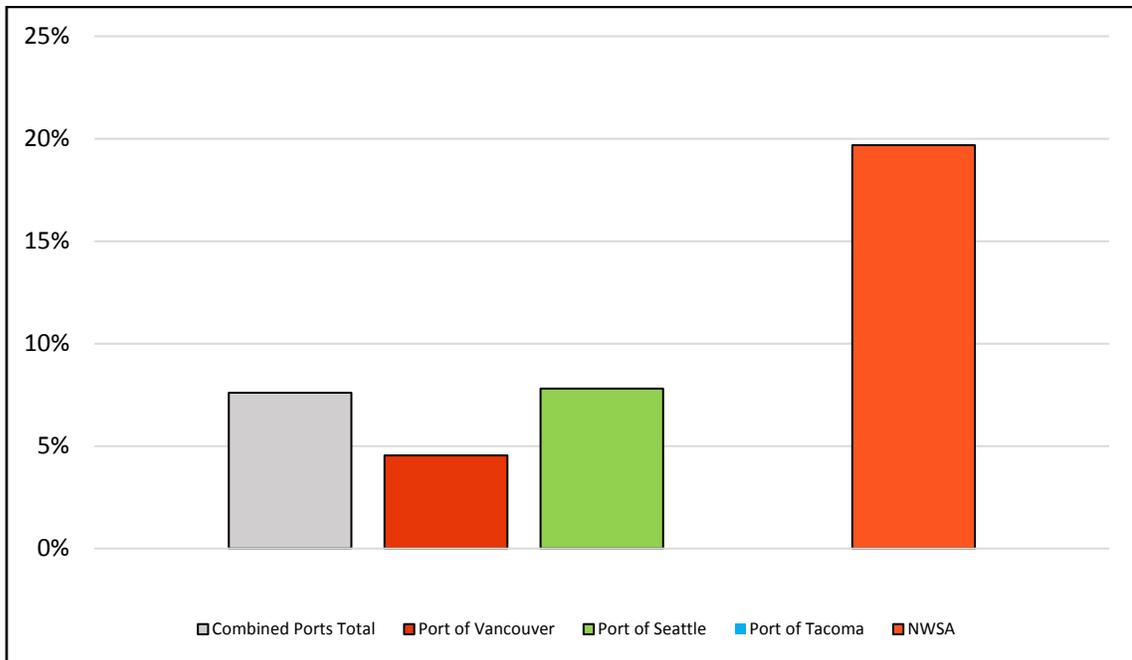
⁶ Based on available ship information. VFPA data includes shorepower only.

Definition of terms

Emission Control Area (ECA). The North American ECA is a geographic boundary that extends approximately 200 nautical miles off the coast of North America (except Mexico). Under the IMO rules different standards apply to ships when operating outside emission control areas versus those operating in established ECAs.

IMO rules: In 2010, the IMO officially designated the North American Emission Control Area (ECA) and required specified emission reductions for vessels traveling within the ECA. Starting August 1, 2012 (in the US) and April 18, 2013 (in Canada), the maximum fuel sulfur limit decreased to 1%. Starting January 1, 2015, the maximum fuel sulfur limit decreased to 0.1%.

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 2015.

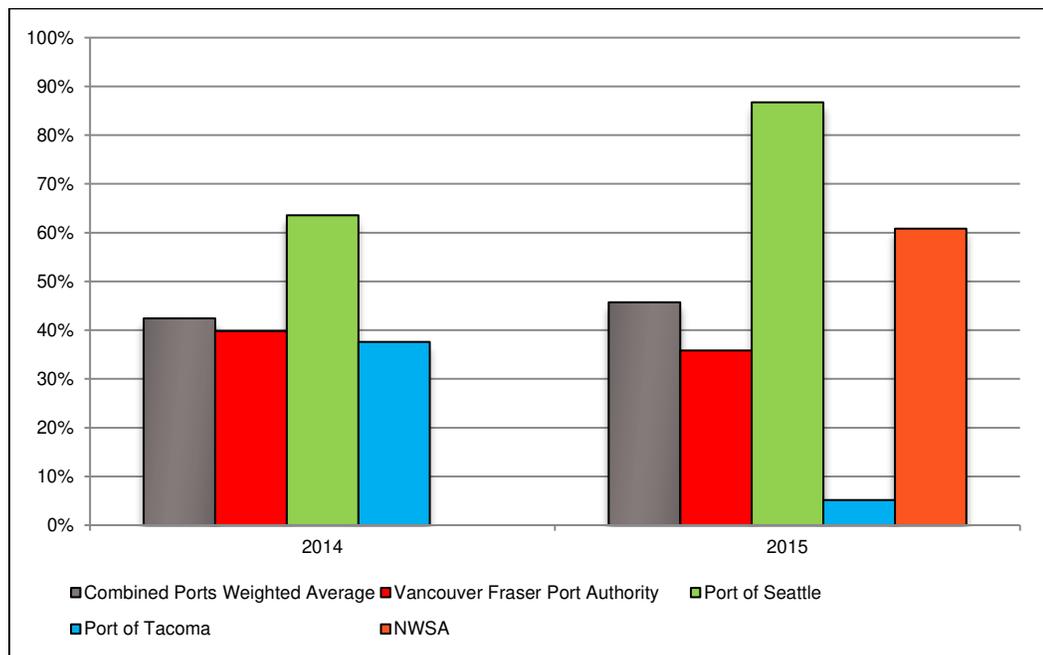


OGV-2: Ports and vessels participate in Port-designed or third party programs that promote continual improvement 2015 Target

2015 Target	By 2015, Ports and 10% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements
2020 Target	<i>By 2020, Ports and 40% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements</i>
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 Ports that are from vessels that participate in a Port-designed or a third-party continuous efficiency improvement program, 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 recognizing and incentivizing emission reductions through alternative fuels and technologies, or through participation in continuous improvement programs. Third-party programs require continuous improvement and encourage emission reduction activities. This measure captures the level of participation in these programs.
How did we do?	In 2015, 2 of the 4 Ports (POS and VFPA) participated in the Green Marine program as ports. Collectively, 46% of vessel calls participated in at least one continuous improvement program, as listed below. This is an increase of 4% from 2014.
Definition of Terms	<p><i>Port-designed programs:</i> For 2015 Port third-party programs include POS Green Gateway Awards Program and the VFPA EcoAction Program and Blue Circle Award, which help to promote continuous improvement.</p> <p><i>Third-party programs:</i> For 2015, third-party program include the Environmental Ship Index (ESI), Green Award, RightShip, Clean Shipping Index, and Green Marine. Note that for this report, only RightShip participants that have verified Existing Vessel Design Index data are counted as participating in a third-party certification program.</p> <p><i>Port participation in third-party certification programs:</i> For 2015 this included Ports that directly participated in the Green Marine Program or that have programs that incentivized participation in the program (e.g. provided discounts to vessels visiting the port that participate in the program) are counted as participating in a third-party</p>

Figure 2. OGV-2: Percent of vessel calls participating in port-designed or third-party certification programs⁷



⁷ 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 towards this goal.

Implementation Efforts in 2015 by Port: OGV

Port:	Vancouver Fraser Port Authority
How is POV doing?	<p>OGV-1 (2020): 77 calls by cruise vessels connected to shore power. In 2015 Canada Place Cruise Terminal was the only location with landside infrastructure in place. The cruise ship connections resulted in reduced emissions of GHGs by 2,811 metric tons and fine particulate matter by 1.1 metric tons.</p> <p>OGV-2: In 2015, VFPA participated in the Green Marine program as a port. VFPA also participated in ESI, Green Award, RightShip, Clean Shipping Index by offering discounts to vessels that participate in these programs.</p> <p>36% of vessel calls participated in one or more of VFPA's EcoAction Program, Environmental Ship Index, Green Award, RightShip (verified data only), Clean Shipping Index or Green Marine. This represents 1,129 out of 3,149 total calls for the year.</p>
Program for OGVs:	<p><i>EcoAction Program and Blue Circle Award (OGV)</i></p> <p>In 2015, these programs continued to recognize and reward vessels going beyond regulatory requirements to reduce air emissions, with emphasis on GHGs and efficiency through third-party programs, as well as cleaner fuels and technologies.</p> <p>Fifteen shipping lines received the Blue Circle Award for 2015.⁸</p>
Other initiatives:	<p>In July 2015, the Government of Canada and VFPA announced funding for shore power for container vessels at Global Container Terminal's Deltaport facility, and DP World's Centerm facility. Both shore power operations are expected to be operation in 2017.</p> <p>In support of container vessel shore power coming on-line, VFPA is compiling a list of container vessels calling its terminals that are equipped with shore power capability. This will help better understand where and how often these vessels call, as well as any physical requirements they have.</p>
Port:	Port of Seattle
How is POS doing?	<p>OGV-1(2020): 8% of vessels connect to shore-power. These vessels represent 31% of the total cruise and grain vessels.</p> <p>OGV-2: In 2015, POS participated in the Green Marine program as a port.</p> <p>87% of cruise and grain vessel calls participated in at least one third-party certification program, including ESI, RightShip (verified data only), or the Port's Green Gateway Partners Awards Program.</p>
Program for OGVs:	<p><i>Green Gateway Partners Awards Program</i></p> <p>In 2015, POS offered its sixth annual Green Gateway Partner Awards to recognize environmental initiatives, including air quality initiatives, by cruise lines that exceed regulatory compliance. Six cruise lines were recognized for their successful environmental programs. Two innovator awards were also given.⁹</p>
Other initiatives:	None.

⁸Visit <http://www.portvancouver.com/environment/air-energy-climate-action/marine/> for Blue Circle recipients.

⁹ Visit <http://www.portseattle.org/Cargo/Green-Gateway/Pages/Green-Gateway-Awards.aspx>.

Port	Port of Tacoma
How is POT doing?	<p>OGV-1 (2020): In 2015, none of the 39 grain ships that called POT had Tier 3 engines, used shore power or implemented other emission reducing technologies.</p> <p>OGV-2: POT is not participating in a third party certification program.</p> <p>Two of the grain ships (5%) calling POT participated in at least one third-party certification program, including ESI, Green Award, and RightShip (where data is verified only).</p>
Program for OGVs:	None.
Other initiatives:	Puget Sound Energy (PSE) is planning to build a Liquefied Natural Gas (LNG) plant at POT to supply Totem Ocean Express with LNG for its vessels that are being converted to run on this fuel (see description under NWSA). The PSE facility located at the Port of Tacoma is not part of the NWSA. PSE's facility is expected to be complete in 2019. This LNG infrastructure may encourage other shipping lines to convert vessels to run on LNG.

Port:	The Northwest Seaport Alliance
How is NWSA doing?	<p>OGV-1 In 2015, 20% of container ships calling NWSA terminals had Tier 3 engines, used shore power or other emission reducing technologies.</p> <p>OGV-2: 61% of vessel calls were made by ships participating in a port-designated or third party certification program. This exceeds the 2015 OGV-2 goal of 10% of vessel calls</p>
Program for OGVs:	TOTEM Ocean Trailer Express continues to use shore power at berth for the <i>Midnight Sun</i> and the <i>Northern Star</i> .
Other initiatives:	TOTEM Ocean Trailer Express has completed engineering and design for repowering their ships to use LNG fuel. This will reduce their sulfur oxide (SOx) emission by 100 percent; particulate matter (PM) by 91 percent; nitrogen oxide (NOx) by 90 percent; and carbon dioxide (CO2) by 35 percent. ¹⁰ The ship conversion was originally scheduled to begin in 2015 and was later rescheduled for 2016. On August 17 th , 2016 TOTEM Ocean Trailer Express announced it has postponed its engine conversion for 2016 and will provide an updated schedule when available.

¹⁰ Emission reduction estimates provided by TOTEM Ocean Trailer Express at <http://www.saltchuk.com/about-us/environment>



4. Harbor Vessels

Harbor vessels include harbor and ocean tugs; and 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 continuous improvement programs.

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 ULSD fuel, resulting in significant reductions in emissions from harbor vessels. Table 5 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 5. Number of harbor vessel companies and vessels at the Ports in 2015

Port	Number of harbor vessel companies	Number of harbor vessels
VFPA	21	128
NWSA, POS & POT	3	22

Performance Targets

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

2015 Target	By 2015, partners conduct outreach and 50% of harbor vessel companies report best practices and engine upgrades
2020 Target	<i>By 2020, partners conduct outreach and 90% of harbor vessel companies report best practices and engine upgrades</i>
What is being measured?	<p>In the 2013 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 2015, including workshops, brown bag sessions, and meetings to discuss efficiency ideas, practices or projects.</p> <p>This measure also commits the Ports and partners to collecting data reports from harbor vessel companies to better understand how to encourage emission reductions in the sector. The percent of harbor vessel companies that reported and the percent that undertook engine upgrades and best practices during 2015 are also reported.</p>
Why is this important?	<p>One way to reduce emissions from harbor vessels is to replace the vessels or repower them (replace their engines), but these efforts are expensive and beyond the control of the Ports. The Strategy partners believe promoting increased vessel fuel efficiency and best practices is the best way to work with this sector. Through annual outreach the partners will help keep harbor vessel owners and operators informed of best practices that reduce emissions.</p> <p>Tracking what companies are doing to incorporate best practices and upgrade or replace their engines provides an annual snapshot of emission reduction activities.</p>
How did we do?	<p><i>Partners conduct outreach:</i> In 2015, Strategy Partners conducted 5 outreach events and 1 outreach program for harbor vessel companies. These focused on information sharing, optimizing vessel operation, and best practices.</p> <p><i>Port-related harbor vessel companies report on best practices and engine upgrades:</i> five companies reported their progress – three through submissions to Green Marine and three verbally to Strategy partners.</p> <p><i>Port-related harbor companies undertook best practices and engine upgrades:</i> 21% (5 of 24) companies undertook best practices or engine upgrades – three through their participation in the Green Marine program, and two by replacing unregulated auxiliary engines with new, cleaner engines on at least one vessel.</p>
Definition of terms	<p><i>Best practices:</i> Currently, only participation in Green Marine is counted as following best practices.</p> <p><i>Engine upgrades:</i> This includes replacing the engine (also known as “repowering” the vessel), 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 US a kit is required if the owner is overhauling the engine, if the old engine was manufactured on or after 1973, and if the engine is greater than 800 horsepower).</p>

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

2015 Target	By 2015, Ports and 10% of harbor vessels participate in Port-designed or third-party certification programs that promote continuous improvement
2020 Target	<i>By 2020, Ports and 40% of harbor vessels participate in Port-designed or third-party certification program that promote continuous improvement</i>
What is being measured?	<p>This measure identifies whether the Ports participate in the Green Marine program (currently the only third-party certification program available for tugs with respect to providing incentives to tug operators).</p> <p>This measure also reports the percent of harbor vessels that participate in VFPA's EcoAction Program or in the third-party Green Marine Program, which both promote continuous improvement for harbor vessels.</p>
Why is this important?	<p>Continuous improvement programs provide a consistent framework for companies to report progress on achieving various environmental measures. Participants must go beyond regulatory monitoring and show continuous improvement year-over-year in order to continue participating.</p> <p>Although the Ports have limited control over harbor vessel engines and fuel-efficiency practices, the Ports can influence these by providing incentives to companies that join and annually participate in these programs, or by developing their own continuous improvement program.</p>
How did we do?	<p>In 2015, 2 of the 4 Ports (POS and VFPA) participated in the Green Marine program. VFPA provided discounted harbor due rates to those tugs operated by companies who are Green Marine certified, or that have shore power. POS and POT did not offer incentives to tug companies, and no tug companies in Puget Sound were Green Marine certified.</p> <p>32% of harbor vessels participated in third-party certification programs. Three port related harbor vessels reported engine upgrades.</p>
Definition of terms	<p><i>Certification programs:</i> Includes programs applicable to ports and harbor vessel companies that promote continuous improvement, either Port-designed or by a third party. PMV currently offers the Port-designed EcoAction program for harbor vessels.</p> <p><i>Third-Party Certification:</i> Currently Green Marine offers the only third-party environmental certification program for harbor vessels.</p>

Port:	Vancouver Fraser Port Authority
How is POV doing?	<p>Harbor-1: VFPA hosted five outreach events in 2015:</p> <ul style="list-style-type: none"> • Two Port Environmental Manager Breakfast Sessions for tenants (including tug companies), which were forums for sharing information on environmental best practices and evolving regulations. • A series of three training sessions offered through Climate Smart, focused on measuring GHG emissions, identifying and implementing emission reduction opportunities and communicating results. <p>Harbor-2: VFPA participated in Green Marine with respect to harbor vessels by offering discounted fees to participating companies through its EcoAction Program. The primary harbor vessel companies at VFPA reported on air emission best practices in 2015 through Green Marine.</p> <p>38% of tugs operating within VFPA participated in Green Marine, with three of 21 companies representing 48 of 128 tugs being members (Seaspan, Saam Smit and North Arm Transportation).</p>
Other initiatives:	None reported.

Port:	Port of Seattle
	Port of Tacoma AND
	The Northwest Seaport Alliance
How are NWSA, POS and POT doing?	<p>Harbor-1: In 2015, All port-related harbor vessel companies serving POS and POT regions reported their progress for 2015.</p> <p>In September of 2014 PSCAA launched an auxiliary engine replacement program funded by the Washington Department of Ecology and reached out to all harbor vessel companies in the region. In 2015, two of the three companies participated in the auxiliary engine replacement program. Each participating company replaced two auxiliary engines on a vessel. In addition to the program one company replaced another two auxiliary engines on another vessel and is conducting pilot projects with computer based machinery condition monitoring systems on two vessels, which may lead to greater operational efficiency.</p> <p>Harbor-2: Of three U.S. ports only POS is Green Marine certified. None of the three ports offer incentives to harbor vessel companies with third-party certifications. None of the harbor vessel companies operating at POS or POT participated in the Green Marine program in 2015.</p>
Other initiatives:	In addition to the auxiliary engine replacements described above, five other companies not directly related to port activities participated in the auxiliary engine replacement program and together replaced a total of 14 auxiliary engines. This program reduced DPM, increased harbor vessel efficiencies, and helped PSCAA develop working relationships with the harbor vessel community. The program is scheduled for completion in 2016.



5. Cargo-Handling Equipment

Cargo-handling equipment (CHE) moves goods at 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, wharf cranes, and conveyor belts. Performance targets focus on achieving higher engine emission standards, and improving fuel-efficiency practices.

Context

The CHE sector contributes 5% of DPM emissions and 7% of GHGs from activities related to the Ports, as summarized in the 2013 Strategy. Table 6 summarizes the number of terminals operating CHE, and the total number of equipment at each port.

Table 6. Number of terminals with CHE, and number of units in 2015¹¹

Port	Number of terminals with CHE	Number of CHE
VFPA	27 terminals and several other operations	1,650
POS	2 terminals	63
POT	1 terminal	0
NWSA	13 terminals	682

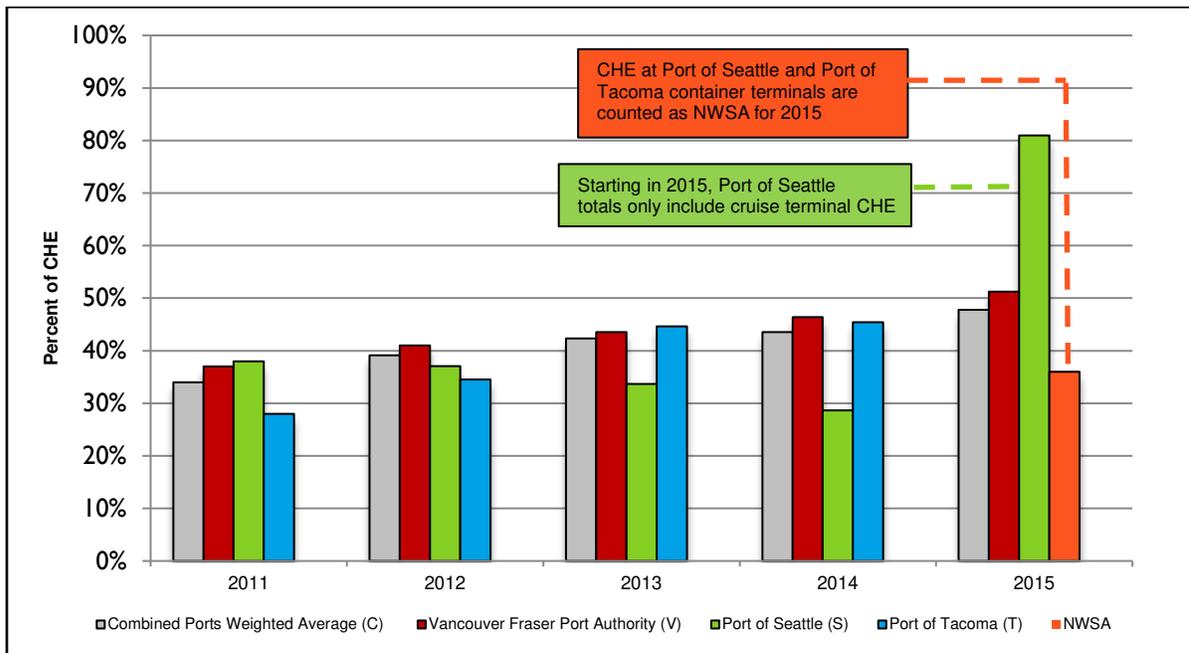
¹¹ None of the Ports include large stationary electric cranes in this CHE listing. VFPA includes all non-road equipment in their inventory (not just those that handle cargo) from all port operations (27 terminals and several other operations). POS includes equipment used to handle cargo at cruise terminals. The NWSA CHE inventory covers its container terminals. Because all POT container terminals are now operated under NWSA, the POT total is zero.

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
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 4 Interim or better engines on a port-wide basis, regardless of terminal size or type of operation. This target includes engines with retrofits or repowers that result in Tier 4 interim equivalent PM emission rates and considers other improvements on a pro-rated basis.
Why is this important?	Older diesel equipment, especially non-road engines, generate significantly more emissions per volume of fuel used. This target tracks how much old diesel equipment is being replaced with newer, lower-emission equipment. It also recognizes emission reductions achieved through retrofits or engine replacements.
How did we do?	48% of CHE met Tier 4 Interim across the Ports (see chart below), a 4% increase relative to 2014.
Definition of terms	Tier 4 Interim or T4i: The Tier 4 Interim emissions standards required lower PM emissions prior to final Tier 4 standards that also required lower NOX/HC emissions.

Figure 3. CHE-1: Percent of CHE meeting Tier 4 interim emission standards or equivalent¹²



¹² Container terminals from the Port of Seattle and the Port of Tacoma are now managed by NWSA. This means that for the purpose of this 2015 report Port of Tacoma does not have any CHE to report on and POS is only reporting on cruise terminals. The total number of CHE included POS for 2015 is approximately 10% of what was included for POS in 2014. Because the baselines for these two ports have changed, the differences in percentages between 2014 and 2015 do not show trends in overall progress towards this goal.

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
2020 Target	By 2020, Ports and 100% of terminals have fuel-efficiency plans
What is being measured?	Partners commit to identifying and sharing activities that increase fuel efficiency and reduce emissions from CHE in order to foster adoption of best practices among terminals. 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 2015, 3 of 4 Ports had fuel-efficiency plans in place. The Ports facilitated fuel efficiency in relation to CHE in the following ways: VFPA launched a new program that will require tenants to have fuel-efficiency plans; POS NWSA aimed to reduce fuel consumption under their idle-reduction plans. Ecology led a project that provided idle reduction technologies for an NWSA terminal operator. At the Ports, 23% (10 out of 43) of terminals 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 or terminal land. The plan may also identify policies or actions that will be put into place to achieve the goals or objectives.

Implementation Efforts in 2015 by Port: CHE

Port:	Vancouver Fraser Port Authority
How is POV doing?	CHE-1: In 2015, 51% of non-road equipment at VFPA met Tier 4i equivalent standards or better, excluding electrical equipment. CHE-2: As VFPA does not have operational control over CHE, its approach is to address fuel efficiency in CHE by developing a new program requiring tenants to adopt fuel-efficiency plans (see "Program for CHE" below). 26% (7 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 Program (NRDE)</i> VFPA's NRDE Program came into effect January 1, 2015. VFPA's NRDE program requires owners/operators to pay fees for operating Tier 1 and older non-road equipment. It also includes requirements around reporting, labeling, idle reduction, fuel efficiency, opacity and auditing.
Other initiatives:	VFPA partnered with Climate Smart Businesses Inc. to offer training to port tenants that would enable them to measure their greenhouse gas emissions, identify opportunities to reduce emissions, implement those reductions and communicate results. Eleven tenants went through the training in 2015, realizing a reduction 2,788 metric tons of carbon dioxide equivalents, an 11% average reduction in emission intensity within the first year and \$670,000 (CDN) aggregated annual cost savings.

Port:	Port of Seattle
How is POS doing?	<p>CHE-1: In 2015, 81% of CHE met Tier 4i equivalent standards or better.</p> <p>Container terminals are now managed by NWSA.; however POS is including the CHE inventory of its two cruise terminals in the 2015 progress report) The total number of CHE included POS for 2015 is approximately 10% of what was included for POS in 2014, which helps explain why the jump in CHE meeting the Tier 4i standards.</p> <p>Neither POS nor its cruise terminals had implemented fuel-efficiency plans in 2015.</p>
Program for CHE:	None to report.
Other initiatives:	None to report.

Port:	Port of Tacoma
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How is POT doing?	CHE is accounted for under NWSA below. The only terminal remaining under the POT umbrella is a grain terminal which has no CHE.
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Port:	The Northwest Seaport Alliance
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How is NWSA doing?	In 2015, 36% of CHE met Tier 41 equivalent standards or better. Two of 13 terminals have a fuel efficiency plan in place.
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Program for CHE:	None to report.
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Other initiatives:	Under a project managed by Ecology, 31 idle reduction retrofits were installed at Washington United Terminal in the NWSA South Harbor in 2015. Ecology continued to provide Diesel Particulate Filter (DPF) cleaning services for terminal operators who had CHE equipped with DPFs.
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6. Trucks

For the purposes of the strategy, the truck sector covers on-road heavy-duty container trucks that move cargo to and from marine terminals, also known as drayage trucks. Performance is reported through the age of the fleet of container trucks serving port activities, and the prevalence of fuel-efficiency plans. In this report, trucks hauling containers are reported for VFPA and NWSA only because containerized cargo of POS and POT is now managed by NWSA.

Context

Trucks account for 5% of DPM emissions and 28% of GHGs from activities related to the Ports, as summarized in the 2013 Strategy. Table 7 summarizes the number of container terminals, and the total number of container truck companies and trucks operating at VFPA and NWSA in 2015.

Table 7. Number of container terminals, truck companies, trucks in 2015

Port	Number of container terminals	Number of truck companies	Number of trucks
VFPA	4	128	1,936
NWSA ¹³	10	120	4,900

Performance Targets

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

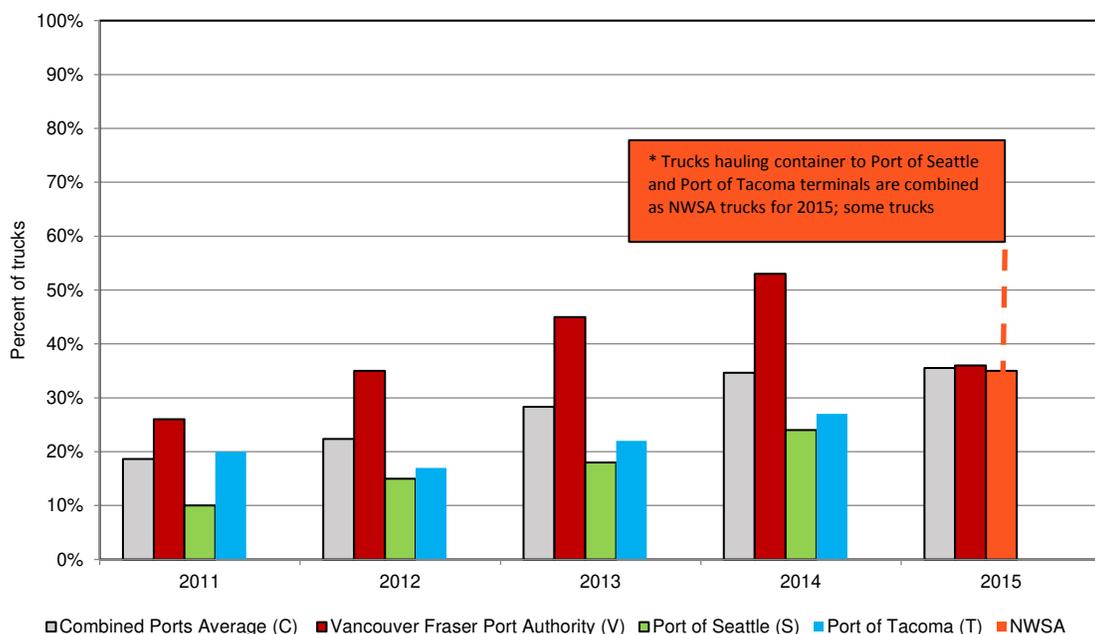
2017 Target By 2017¹⁴, 100% of trucks meet or surpass 2007 EPA emission standards

¹³ The NWSA clean truck program was in place at 7 international container terminals in 2015.

¹⁴ As with other performance measures, the milestone is the end of the stated calendar year. In this case, the target date is December 31, 2017.

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 for trucks meeting or surpassing EPA emissions standards for the model year 2007 was 36% in 2015 (see chart below). NWSA continued its second drayage truck scrappage/ replacement program titled ScRAPs 2 (Seaport Scrappage and Replacements for Air in Puget Sound).

Figure 4. Truck-1: Percent of trucks that meet or surpass US EPA emission standards or equivalent for model year 2007¹⁵



¹⁵ In 2016, VFPA undertook a special assessment of 2007 model year trucks to determine engine model year. Through that assessment it was determined that 100% of 2007 trucks in the Truck Licensing System had a 2006 engine. Starting with this 2015 implementation report, VFPA is making the assumption that none of the 2006 engines met 2007 emission limits, and so progress toward the target of 2007 or equivalent PM emissions are being reported for VFPA based on 2008 model year trucks and newer (whereas previously, it had been based on 2007 or newer).

Truck-2: Ports, terminals, and truck companies have fuel-efficiency plans in place that promote continuous improvement¹⁶

2015 Target	By 2015, Ports have fuel-efficiency plans
2020 Target	By 2020, Ports, terminals, and 50% of truck companies have fuel-efficiency plans
What is being measured?	In the 2013 Strategy, partners committed to identifying and sharing activities that increase fuel-efficiency and reduce emissions in order to foster adoption of best practices among terminals and truck companies. The 2015 measure reports on whether each of the Ports has adopted fuel-efficiency plans for drayage trucks.
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 2015, 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 VFPA, , and the FRATIS project at NWSA. Eight trucking companies that service NWSA terminals participated in EPA's SmartWay Program which has a focus on fuel efficiency

Implementation Efforts in 2015 by Port: Trucks

Port:	Vancouver Fraser Port Authority
How is POV doing?	At the end of 2015, 36% of the entire drayage truck fleet was 2007 or newer based on truck model year.
Program for Trucks:	<p><i>Truck -1Truck Licensing System (TLS)</i> - VFPA continued to implement increasingly stringent environmental requirements on drayage trucks accessing the port through the TLS program. Requirements in 2015 included:</p> <ul style="list-style-type: none"> • 2005 model year trucks already in the TLS had to have an eligible emission reduction measure (e.g. diesel oxidation catalyst) installed, • Trucks new to the TLS had to be 2007 or newer, • Trucks 2005 and older had to be tested and pass a 20% opacity limit, and • All trucks were not to exceed a maximum of three minutes consecutive idling in any 60-minute period. <p>Truck-2: As VFPA does not have operational control over container trucks, its approach is to address fuel efficiency in trucks by continuing to implement a truck program that requires replacement of old engines, retrofits, a minimum age for trucks being added as well as opacity limits and idling limits.</p>
Retrofits or Replacements:	The TLS program required retrofits or replacements, as outlined above.

¹⁶ 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.

Port:	Vancouver Fraser Port Authority
Alternative fuels:	None to report for 2015.
Other initiatives:	None to report for 2015.

The Northwest Seaport Alliance

How is NWSA doing?	<p>Truck-1 In 2015, 35% of trucks had model year 2007 or newer engines or equivalent.</p> <p>Truck-2: NWSA did not have a fuel-efficiency plan in place for trucks in 2015; however, it facilitated the FRATIS pilot study to improve truck efficiency.</p>
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Program for Trucks:	<p><i>Clean Truck Program</i></p> <p>Prior to the formation of NWSA, POS and POT had two separate clean truck programs. In 2015, the NWSA made plans to consolidate the two programs to the extent practicable. Both POT and POS have had a drayage truck registry in place since 2009. POS uses a RFID (radio frequency identification) program in place to identify trucks meeting the Strategy target, and POT uses stickers.</p> <p>NWSA continued its second drayage truck scrappage/ replacement program titled ScRAPs 2 (Seaport Scrappage and Replacements for Air in Puget Sound). The Program is funded from several sources including a US Department of Transportation Congestion Mitigation and Air Quality (CMAQ) grant (\$3.5M), a Washington State Department of Ecology grant (\$500,000), an EPA Diesel Emission Reduction Act (DERA) grant of (\$1.2M), and a CMAQ supplemental grant (\$640,000). This program provides financial incentives of \$20,000 to \$27,000 per truck to eligible owners who scrap old trucks. In 2015, 83 trucks were scrapped and replaced under this project, for a total of 240 since mid-2014 when the program launched.</p> <p>The Clean Air Agency received CMAQ and Ecology grants for a joint POS and POT drayage truck replacement program; this program (ScRAPs 3) will begin in 2016.</p> <p>Ecology provided grant funding to expand the Port's optical character recognition/license plate reader system to improve truck monitoring and truck age studies. This project was started in 2014 and completed in 2015.</p>
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Other initiatives:	<p>In 2015, POS continued to advocate for the City of Seattle to establish a Heavy Haul Corridor to increase allowable cargo weight on standard chassis operating on truck routes linking marine terminals to local railheads and nearby transload facilities. Besides providing improved mobility and safety, the Heavy Haul Corridor could reduce the number of truck trips and associated air emissions by about 20%.</p> <p>POS also completed construction of the Argo Yard Truck Roadway to provide a safer and faster truck route from marine terminals to the Union Pacific Argo Yard rail gate.</p> <p>Additionally, POS partnered with the Seattle Department of Transportation on the Seattle Industrial Areas Freight Access Project to identify projects that would reduce congestion and environmental impacts including GHG emissions.</p> <p>In 2015, POT began work with EPA, US Department of Transportation, Washington State Department of Transportation, Ecology and POT's Clean Truck Program Stakeholder Workgroup to develop a preliminary project scope for Freight Advanced Traveler Information Systems (FRATIS). The purpose of FRATIS is to provide POT trucking stakeholders with real time traffic information and encourage better decision making to shorten drayage pick-up and delivery queues.</p>
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POT published traffic conditions, terminal gate information and rail information to improve truck terminal efficiencies and reduce idling time.



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 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 8 summarizes the number of locomotive operators and switcher locomotives operating at each port.

Table 8. Number of switcher locomotive operators and switcher locomotives in 2015

Port	Number of switcher locomotive operators	Number of switcher locomotives
VFPA	16	22 (+ 4 pushers) ¹⁷
POS	1	2
POT	1	3
NWSA	4	48 ¹⁸

Performance Targets

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

2015 Target	By 2015, 100% of owners/operators participate in a fuel-efficiency program
2020 Target	<i>By 2020, 100% of owners/operators achieve performance measures of chosen program</i>
What is being measured?	As stated in the 2013 Strategy, partners will focus on reducing emissions from locally managed switcher locomotives operating at the 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 2015, 17 of 22 (77%) of owners/operators participated in a known fuel-efficiency program. All 16 of the VFPA terminal operators are required to have fuel efficiency plans. VFPA did not collect data for Class 1 locomotives. Of the four NWSA owner/operators only one had a fuel-efficiency program with published goals and results. Two of the four have published strategies that they have implemented to reduce fuel use but were not included because they did not have published goals and results. The owner/operators at POS and POT do not have fuel efficiency plans.
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 and Canadian Pacific.

¹⁷ VFPA did not collect data from Class 1 rails.

¹⁸ NWSA was able to collect data on 21 locomotives from Class1 rails in 2015 that it was unable to collect in previous years.

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

2015 Target	By 2015, 10% of unregulated locomotive engines are replaced with Tier 2 or better engines
2020 Target	<i>By 2020, 20% of unregulated locomotive engines are replaced with Tier 2 or better engines</i>
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 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?	<p>VFPA does not have data for Class 1 operated locomotive tiers, however for the 15 tenant owned/operated locomotives, 8 are estimated to be unregulated (pre-tier) and the remaining 7 are Tier 2 or better. In addition, there are 4 VFPA tenant-owned/operated pushers that do the work of switcher locomotives but with a much smaller engine thereby reducing emissions. Of the 4 pushers, 2 are estimated to be unregulated with the remaining two being Tier 1 and Tier 2.</p> <p>Of the 53 port related switcher locomotives operating at or near the three US ports, 17 are unregulated and 6 are Tier 2 or better.</p> <p>Of all 25 identified unregulated switcher locomotives, one (4%) has been repowered since 2013.. The repower was completed by Tacoma Rail in 2015.</p>
Definition of Terms	<p><i>Unregulated locomotive engine:</i> An engine that was manufactured before the first set of EPA Emissions Standards for Locomotives were in effect (1973). Tier 0 standards apply to equipment manufactured from 1973 through 2001, Tier 1 standards apply to engines manufactured from 2002 through 2004, Tier 2 standards apply to 2005 through 2010, and Tier 3 apply to 2011 through 2014.</p> <p><i>Class 1 Railroads:</i> Class 1 Railroads are the largest railroads in the industry including BNSF, UP, CN and Canadian Pacific.</p>

Implementation Efforts in 2015 by Port: Rail

Port:	Vancouver Fraser Port Authority
Rail initiatives:	<p>Effective 2015, all terminal operators are required to conform to the NRDE Program, which includes reporting, fees, labelling, opacity, auditing and maintaining a fuel-efficiency plan applicable to non-road diesel equipment including switcher locomotives.</p> <p>VFPA is participating in the Gateway Transportation Collaboration Forum (GCTF), a collaboration built on previous successes which focuses on the development and delivery of transportation and related infrastructure through the New Building Canada Plan, in a manner beneficial to local communities</p> <p>VFPA is currently conducting a pilot project designed to track all railcar activity within the Vancouver Gateway. The information collected through this tracking program will support VFPA rail network analysis and transportation planning to help ensure continued rail efficiency through the Port of Vancouver. This information may also support VFPA's ongoing efforts to reduced rail switching related noise and emissions</p> <p>The collaborative supply chain agreement between VFPA and CN and CP in 2010 continued to result in improved operational performance.</p>

Port: Port of Seattle

Rail initiatives: None to report for 2015.

Port: Port of Tacoma

Rail initiatives: None to report for 2015.

Port: The Northwest Seaport Alliance

Rail initiatives: In 2014, POT, in partnership with Tacoma Rail, was awarded a \$600,000 DERA grant to replace / repower one Tier 0 switcher locomotive engine with a Tier 3 or better certified diesel engine equipped with AESS and microprocessor tractive control systems. Project work began in 2014. Also in 2014, Ecology independently awarded Tacoma Rail a \$200,000 diesel emissions reduction grant to be applied towards the replacement / repower project. Tacoma Rail provided the remaining matching funds for a total project cost of \$2.1M. Upon completion, all Tacoma Rail switchers will be equipped with AESS technology.



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 emission sources include fleet fuel use, facility energy consumption, employee commuting, materials use, waste management, and maintenance and construction projects.

Because NWSA operated out of POT and POS facilities and utilized their vehicle fleets, NWSA operated no vehicles and accounted for no fuel consumption. As such, NWSA is omitted from the data presented below.

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).

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
2020 Target	By 2020, Ports increase use of cleaner vehicles and equipment
What is being measured?	This measure aims to report the number of cleaner vehicles and equipment operated by the Ports, and then to demonstrate a shift toward use of these cleaner vehicles over time, while decreasing the use of older, less efficient equipment. The measure also identifies whether fuel-efficiency plans and other efficiency measures are in place.
Why is this important?	Reducing emissions from buildings, 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?	Table 9 outlines the baseline number of administrative vehicles and equipment by type, and Table 10 outlines the baseline amount of fuel consumed by type, for each Port. These serve as a starting point to track and report progress annually.
Definition of Terms:	<i>Port-owned and operated vehicles and equipment:</i> The scope of equipment reported included all equipment (on and off-road) that is owned, rented or leased and operated by the Ports. VFPA has included non-mobile equipment in the non-road category, while POT and POS have only included mobile equipment in the non-road category.

Table 9. 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	G	C	H	E	D	G	C	P	E
VFPA	5	2	4	13	0	6	0	2	3	0	8	0
POS	0	5	37	196	2	23	0	7	5	0	15	17
POT	0	1	0	112	0	10	0	45	32	0	24	0

D=diesel, G=gasoline, C=compressed natural gas, H=hybrid gasoline-electric, E=electric, P=propane

Table 10. 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
VFPA	586	0	5,529	113	0	0
POS	16,798	19,800	51,980	1,390	488	0
POT	11,323	0	60,579	3,210	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

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 plan to address Tier 2 engine emission requirements
2020 Target	<i>By 2020, Ports continue to apply clean construction practices for Port-led construction projects including idle-reduction requirements and enact plan to address Tier 4 engine emission requirements</i>
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 2 or 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 2015, the Ports applied clean construction practices in various forms, including: a Sustainable Procurement Policy, the West Coast Ports Sustainable Design Checklist, and including requirements for a minimum standard of Tier 2 non-road equipment in contracts.
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

2015 Target	By 2015, each port conducts 3 energy studies
2020 Target	<i>By 2020, each port completes 3 energy conservation projects</i>
What is being measured?	This measure includes energy investigations that provide recommendations on how to conserve energy in buildings and operations, projects that take action on those recommendations, and other 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 emissions.
How did we do?	Collectively, 18 energy studies and 32 energy conservation projects were completed for Port or tenant facilities. Two of the Ports conducted at least three energy conservation projects.
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 2015 by Port: Port Administration

Port:	Vancouver Fraser Port Authority
How is POV doing?	<p>Admin-1: Since 2010, VFPA has reported energy consumption and associated emissions data for its corporate operations including marine and vehicle fleet, in accordance with the ISO 14064 Standard for GHG Management and Global Reporting Initiative Sustainability Reporting Guidelines. Progress toward targets for electrical energy consumption, waste and eco-commuting is tracked on a monthly basis, reported to all staff, and integrated into individual incentive plans.</p> <p>Admin-2: VFPA's procurement process was informed by sustainable procurement guidelines, which encourage sustainable practices. <i>VFPA completed the Low Level Road Project in 2015, for which it use the Institute for Sustainable Infrastructure Envision rating system. The project received a Platinum Award, and was the first Transportation Project to receive the highest distinction under Envision rating system. VFPA is expanding the use of this system to other major infrastructure projects such as:</i></p> <ul style="list-style-type: none"> • <i>Centerm Expansion Project,</i> • <i>Truck staging Facility,</i> • <i>Tsawwassen Container Examination Facility (site works only)</i> <p>Admin-3: In 2015, four tenant engagement activities and fifteen energy studies/walkthrough assessments were conducted, in addition to thirty-one energy conservation projects that were implemented or studied by port tenants. This work falls under VFPA's Energy Action Initiative, established in 2012 in partnership with BC Hydro.</p>
Other initiatives:	<p>VFPA continued to participate in the Green Marine Program as a port authority, and also participated in the Green Marine West Coast Advisory Committee.</p> <p>In 2015, 44% of employees took part in a Commuter Challenge to encourage sustainable commuting.</p> <p>Since 2009, VFPA has completed an annual corporate emission inventory, and since 2010 has purchased carbon offsets to render its operations carbon neutral. VFPA's 2015 GHG Inventory and carbon neutral assertion were assured by Ernst & Young.</p> <p>VFPA continued its SortSmart waste management program in 2015, which includes organic waste composting and recycling of paper, glass, metal, plastics, cardboard, film, and foil plastics. In 2015, VFPA achieved an 82% waste diversion rate.</p>
Port:	Port of Seattle
How is POS doing?	<p>Admin-2: POS used the West Coast Ports Sustainable Design checklist as a tool to implement principles of sustainable development for select projects.</p> <p>Admin-3: POS conducted one energy study in 2015 and one energy audit focused on cruise parking and pier outdoor lighting in 2015.</p>
Other initiatives:	<p>In 2015, POS continued its membership in the Green Marine Program as a port authority. POS also participated in the Green Marine West Coast Advisory Committee.</p> <p>POS was a member of The Climate Registry and conducted an annual GHG inventory of port-operated sources.</p> <p>POS has had a green fleet policy in effect since 2008.</p> <p>The POS Public Affairs department has prepared and updated numerous handouts about our emission reductions programs, including the Clean Truck Program and ScRAPs.</p>

POS 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 POT doing?

Admin-1: POT implements a vehicle purchasing policy that emphasizes fuel economy and low-emission vehicles (e.g. the purchase of low or zero emission vehicles).

Admin-2: POT used standard contract language, and required a minimum emission standard of Tier 2 equipment for Port construction contracts.

Admin-3: POT conducted one energy study and one energy conservation project in 2015.

Other initiatives:

POT's Corporate Social Responsibility Team developed goals for CO₂e emissions related to fuel use in Port owned and operated equipment in 2015. Quarterly reporting began in 2015.

POT reduced CO₂e emissions by 22 metric tons by encouraging telecommuting, and van and car pools under its Commuter Trip Reduction program. POT uses GPS tracking to reduce vehicle idling and improve efficient use of POT-owned and operated vehicles.

POT's external affairs created a handout highlighting POT environmental improvement for 2015.

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 2015 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.

VFPA: Climate Smart Training for Tenants:



In 2015, VFPA partnered with Climate Smart Businesses Inc., a Vancouver-based social enterprise, to offer training to port tenants that would enable them to measure their greenhouse gas emissions, identify opportunities to reduce emissions, implement those reductions, and communicate results. Climate Smart does this through a unique three-part training series, software and client support.

The opportunity was well received within the broader Port of Vancouver community, with 11 tenants participating, doubling the target audience. Example emission reduction initiatives shared through the Climate Smart process include replacements with electric forklifts, high mast lighting retrofits and transitioning toward T4 final equipment, as well as more efficient models. "As of June 2016, Port of Vancouver Climate Smart businesses had measured and reduced an estimated 85,077 and 2,788 metric tons of CO₂-e respectively, an 11% improvement in emission intensity, and \$670,000/yr in cost savings."



Port of Seattle: Conversion of Diesel Trucks to CNG

POS funded a multi-year demonstration project to convert diesel-powered drayage trucks to run completely on compressed natural gas and the project was complete in 2015. Omnitek Engineering was selected for a pilot project to demonstrate its diesel-to-natural gas engine conversion technology for drayage trucks serving the Port.

The project's goal was to provide an alternative for replacing older diesel engine trucks to meet 2007 EPA emission standards under the Ports Clean Truck Program.

The company's diesel-to-natural gas engine conversion system was selected as the best technology under a competitive grant process for the agency's "Piloting Engine Upgrade Technologies in the Freight Mobility Sector" project. Omnitek's technology reduced particulate emissions as well as nitrogen oxides and carbon dioxide. The pilot project led by Omnitek Engineering includes American Strategic Group, trucking fleets and related service providers.



The project was managed by the Clean Air Agency, which contracted with Omnitek to develop new conversion systems, take them through the EPA's alternative fuel certification process, and deploy several demonstration trucks that haul containers at POS. The conversion products were developed for the Detroit Diesel Series 60 engines and the CAT

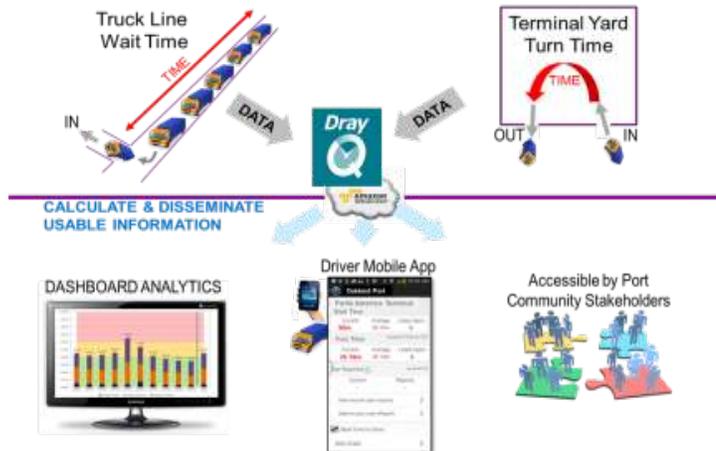
C15 series engines, and are considered "dedicated natural gas conversions" (as opposed to dual-fuel systems that retain the existing diesel-fueled system and add a second fuel capability).

Northwest Seaport Alliance: Operations Service Center

In 2015 the NWSA opened an Operations Service Center (OSC) focused on improving freight mobility by addressing gaps in technology and communications. This required working closely with transportation partners; the rail roads, trucking companies, terminal operators and labor to make sure landside transportation and waterway systems work efficiently. The NWSA partnered with regional transportation partners to evaluate intelligent transportation technology (ITS) to improve drayage truck efficiency and reduce air emissions.

The Federal Highway Administration (FHWA), Washington State Department of Transportation (WSDOT) and other regional transportation partners have tested and implemented intelligent transportation systems (ITS) regionally for Puget Sound Regional transportation corridors, but not for freight arterials leading to and from Puget Sound ports. There was an

opportunity to work with FHWA and WSDOT to leverage their knowledge and experience to improve freight mobility at NWSA container terminals. In 2015, the NWSA secured funding from FHWA, WSDOT and Washington State Department of Ecology to develop a ITS system pilot project to reduce terminal congestion, truck wait times and excess idling.



10. Port Initiatives & Pilots for 2016

The key air initiatives that are planned by the Ports for 2016 include:

VFPA

- Substantially complete the 2015 Port Emission Inventory and its first ever Greenhouse Gas Reduction Strategy Analysis.
- Complete the first full cycle for the Non-Road Diesel Emissions Program including issuance of invoices for use of older Tier 1 and Tier 0 equipment.
- Embark on a second round of Climate Smart training with tenants. Explore in more detail the incorporation of electric vehicles into its corporate fleet.
- The last of the container truck fleet older than 2008 models will have diesel oxidation catalysts installed.
- With Lloyd's Register, conduct an LNG Bunkering Study, to provide insight into customer demand, forecasted timeline and key issues to consider, in order to inform development of a medium-term plan.

NWSA

- Manage the regional effort to conduct the 2016 Puget Sound Maritime Air Emission Inventory.
- Implement a pilot study of commercially available vehicle wait time awareness system(s) in collaboration with Ecology, Federal Highway Administration, and the Washington State Department of Transportation
- Provide matching funds and assist PSCAA in implementing for a new multi-port drayage truck replacement program for 125 trucks.

POS

- Update the Green Gateway Partner Awards for OGVs.
- Develop and implement fuel-efficiency plans and other port administration improvements.
- Complete the current drayage truck scrap and replacement program (ScRAPS 2),
- On behalf of the NWSA, POS will finalize an environmental impact statement for modernization of Terminal 5 which will include an assessment of air quality impacts and potential mitigation measures.

POT

- Focus on port administration fuel efficiency improvements to reduce GHG emissions.
- Repower a locomotive with clean engine technology.
- Install high efficiency yard lighting at port terminals.

Collectively, the Ports will identify opportunities for measuring, tracking, and reducing sources of greenhouse gases 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.

The Ports and their partners will also work to fill gaps in data for reporting progress on the 2013 Strategy goals and targets, and will develop an approach for more effectively engaging with the locomotive sector.

After eight years of collaboration on reducing port-related air emissions in the Northwest, VFPA, NWSA, POS, and POT 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

Vancouver Fraser Port Authority, The Northwest Seaport Alliance, Port of Seattle, and Port of Tacoma are thankful to all partners and stakeholders that contributed to the implementation of both the 2007 and 2013 Strategies over the last eight years. Significant investment is required to undertake each of the initiatives identified in the Strategy. Funding made available by various agencies in 2015 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 and practices, 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 2016 and beyond.