

# NORTHWEST PORTS CLEAN AIR STRATEGY

2014

IMPLEMENTATION REPORT

Final  
October 27, 2015





## Executive Summary

In 2013, Port Metro Vancouver (PMV), the Port of Seattle (POS), and the Port of Tacoma (POT) collaborated to create an updated Northwest Ports Clean Air Strategy with three objectives: reducing port-related air quality impacts of diesel particulate matter, reducing greenhouse gas emissions, and helping meet air quality standards and objectives for the airshed. The 2013 Strategy is being implemented in partnership with several agencies, including the US Environmental Protection Agency, the Washington State Department of Ecology, the Puget Sound Clean Air Agency, Environment Canada, and Metro Vancouver. This 2014 Implementation Report is the first to report progress against the goals and performance targets identified in the 2013 Strategy. This report also highlights key demonstration projects and pilot studies undertaken by the Ports and partners in 2014 that support the Strategy goals, and provides a preview of initiatives underway in 2015.

### Progress Towards 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 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%

**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%

### Performance Target Status for 2014




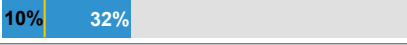


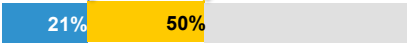
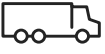




The performance targets are organized into six sectors: ocean-going vessels, harbor vessels, cargo-handling equipment, trucks, locomotives and rail transport, and port administration. Table 1 on the following page summarizes the progress towards the 2015 (and 2017 for trucks) performance targets. Further details about this progress are included in the report.

### Demonstration Projects and Pilot Studies in 2014

The Ports and their partners undertook six pilot studies and demonstration projects in 2014. This report highlights one study or project undertaken at each port in 2014:




- DP World and PMV study for converting diesel-fueled rubber-tire gantry cranes to natural gas
- POS pilot project to convert diesel-fueled drayage trucks to run on compressed natural gas
- POT pilot study to use information technology systems to improve drayage truck efficiency

Table 1. Status of 2015 and 2017 Performance Targets for 2014

Sector	2015/2017 Performance Targets*	Results	Status
 <b>Ocean-Going Vessels</b>	OGV 1: Early compliance with 2015 Emission Control Area (ECA) 0.1% fuel-sulfur level (or equivalent) while hotelling before 2015	13% of vessel calls met early 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: ✓
 <b>Harbor Vessels</b>	Harbor 1: A: Partners conduct outreach B: 50% of harbor vessel companies report best practices and engine upgrades	A: 5 outreach events conducted B: 24% of companies reported; 16% performed engine upgrades	A: ✓ B: not yet meeting
	Harbor 2: A: Ports participate in third-party certification programs B: 10% vessels participate in Port-designed or third-party certification programs	A: 1 Port provided incentives for Green Marine B: 	A: not yet meeting B: ✓
 <b>Cargo-Handling Equipment</b>	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
 <b>Trucks</b>	Truck 1: 100% of trucks meet or surpass EPA emission standards for model year 2007, by 2017		not yet meeting (2017 target)
	Truck 2: Ports have fuel-efficiency plans for trucks	No Ports had fuel-efficiency plans for trucks	not yet meeting
 <b>Rail</b>	Rail 1: 100% of switcher locomotive owners/operators institute a fuel-efficiency program **	(POS and POT only) 	not yet meeting (incomplete data)
	Rail 2: 10% of unregulated switcher locomotive engines are upgraded or replaced to Tier 2 or better **	0% unregulated engines were upgraded or replaced since December 31, 2013	not yet meeting (incomplete data)
 <b>Port Administration</b>	Admin 1: Ports report use of cleaner vehicles and equipment and other relevant information	3 of 3 Ports reported fleet information	✓
	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	3 of 3 Ports adopted clean construction practices for Port-led projects	✓
	Admin 3: Each port conducts 3 energy studies	2 of 3 Ports conducted at least 3 studies	not yet meeting

\* Partners are striving to meet targets by December 31st of the target year.

\*\* Incomplete data is available for the 2014 report.

 2014 Progress to target  
 Strategy target for 2015, 2017  
 Target has been achieved







## Key Initiatives for 2015

The Ports have numerous initiatives planned and/or underway for 2015, 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. PMV is also initiating their 2015 emission inventory project.

In August 2015, the Ports of Seattle and Tacoma formed the Northwest Seaport Alliance (NWSA) to jointly manage their marine cargo facilities and business. Going forward, the NWSA will be a port partner in implementing the Northwest Ports Clean Air Strategy. Port of Seattle will remain a partner with a focus on its cruise facilities and business (which are outside the scope of the NWSA).



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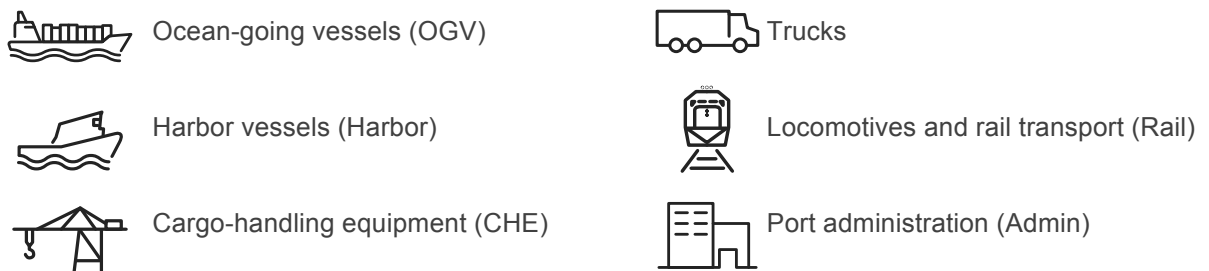
## List of Acronyms

AESS	Automatic engine stop start
CHE	Cargo-handling equipment
Clean Air Agency	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	POT's Freight Advanced Traveler Information Systems
GHG	Greenhouse gas
IMO	International Marine Organization
LNG	Liquefied natural gas
NRDE	PMV's Non-Road Diesel Emissions program
OGV	Ocean-going vessel
PMV	Port Metro Vancouver
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	PMV's Truck Licensing System
ULSD	Ultra-low-sulfur diesel

# 1. Introduction

The Northwest Ports Clean Air Strategy was developed in collaboration between Port Metro Vancouver (PMV), 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. 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 (Clean Air Agency), Environment Canada, and Metro Vancouver.

Every year since the Strategy was first developed in 2007, the three Ports, together with the Strategy partners, have issued annual implementation reports that provide a summary of the progress made towards the goals and targets identified in the Strategy. *This 2014 Implementation Report is the first to report progress against the 2013 Strategy.* The Strategy is organized by these six sectors:



## Summary of the 2013 Strategy

The Strategy was originally developed in 2007, and was then updated in 2013 based on data and lessons learned from the first six years of implementation, advances in emission-reduction technology, and changes in the regulatory landscape. 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 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.

The 2013 Strategy contains two new emission-reduction goals, updated performance targets for 2015 and new targets for 2020, including some in sectors that have not previously had any targets to report against (harbor vessels, locomotives and rail transport, and port administration). Because data has not previously been collected for some targets or sectors, the Ports and their partners are working to establish new mechanisms for tracking this information. Therefore, some data is not available for the 2014 year, and these gaps are noted within each sector chapter that follows.

## Summary of the Three Pacific Northwest Ports

The three Pacific Northwest ports (PMV, POS, and POT) collectively moved over 184 million metric tons of cargo in 2014. Each of the three 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 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 Georgia Basin-Puget Sound 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**

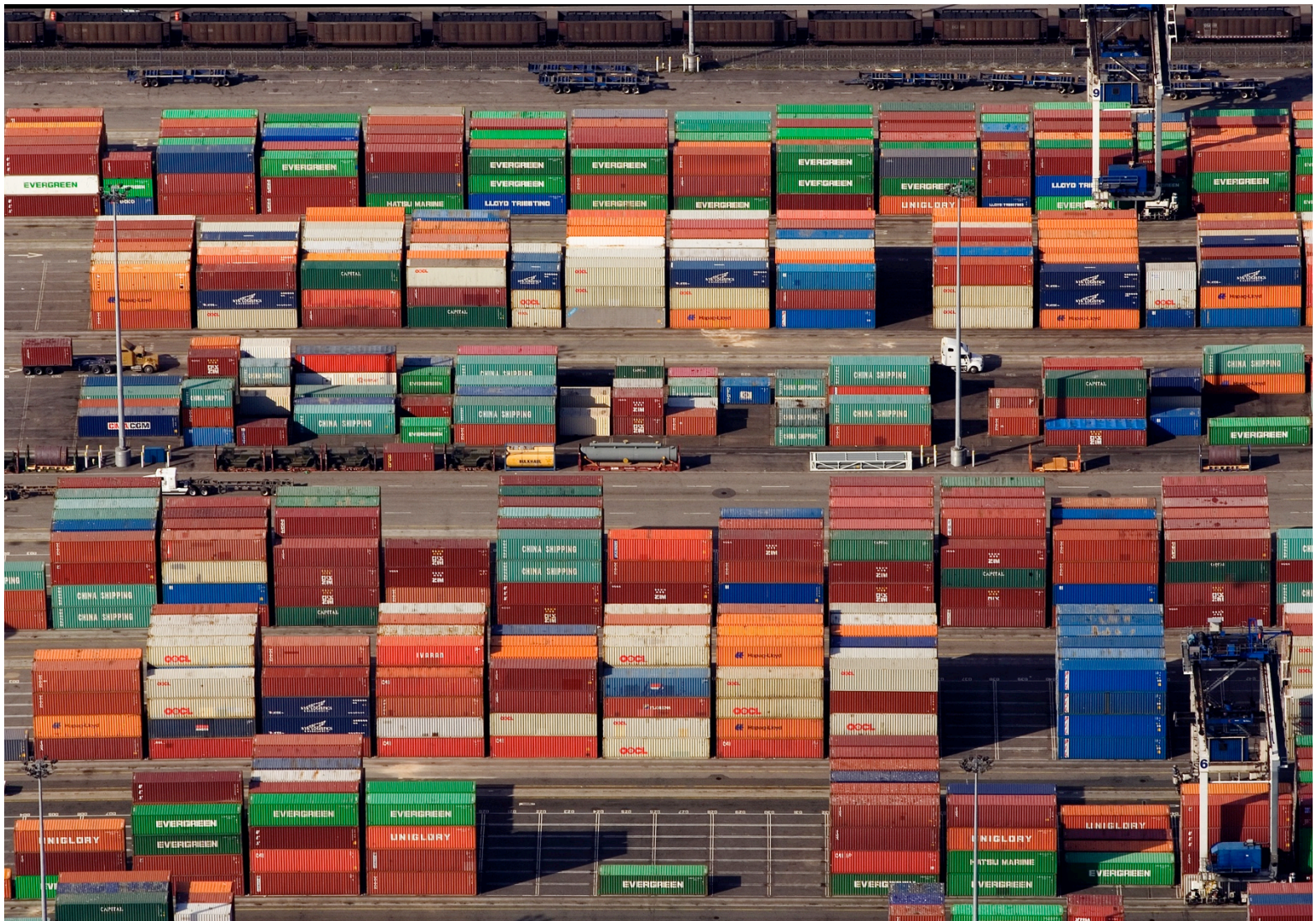
Port	Total tonnage of cargo moved in 2014 (metric tons)	Number of Terminals	Types of business sectors served
PMV	140,000,000	28 (and several other operations)	Automobile / Roll-on Roll-off Breakbulk Bulk Container Cruise Other
POS	16,600,000	7	Breakbulk Bulk Container Cruise
POT	18,600,000	9	Automobile / 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 for reducing 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 are working with stakeholders to meet targets by the end of the stated calendar year—that is, the 2015 targets will be achieved by December 31, 2015. This report focuses on the progress made towards the 2015 (and December 31, 2017 for trucks) performance targets. The 2020 targets are also included in the report for reference only.



## 2. Clean Air Strategy Goals

The actions in the 2013 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 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 three 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.<sup>1</sup> 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 Towards Goals (2005 to 2010/2011)

The Ports undertake emission inventories approximately every five years, and the most recent inventories were completed for 2010 (PMV) and 2011 (POS and POT). Based on the 2010/2011 inventories, a total of 158.5 million metric tons of cargo were moved through the three ports, and port-related activities resulted in the emission of 1,250 metric tons of DPM and 1.66 million metric

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<sup>1</sup> 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 PMV'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 PMV, 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.

tons of GHG emissions.<sup>2</sup> 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 three 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 went down 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 turnover of older equipment and trucks. The next inventory years will be 2015 (PMV) and 2016 (POS and POT).

**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
<b>PMV</b>	-21%	-8%
<b>POS</b>	-34%	-14%
<b>POT</b>	-12%	-3%

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<sup>2</sup>Ibid



### 3. Ocean-Going Vessels

Ocean-going vessels include 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.

#### Context

OGVs produced approximately 78% of DPM emissions and approximately 46% of GHG emissions from activities related to the three ports, as summarized in the 2013 Strategy. Table 4 summarizes the number of vessels and vessel calls for 2014 for each port.

**Table 4. Number of ocean-going vessels and vessel calls at the three ports in 2014**

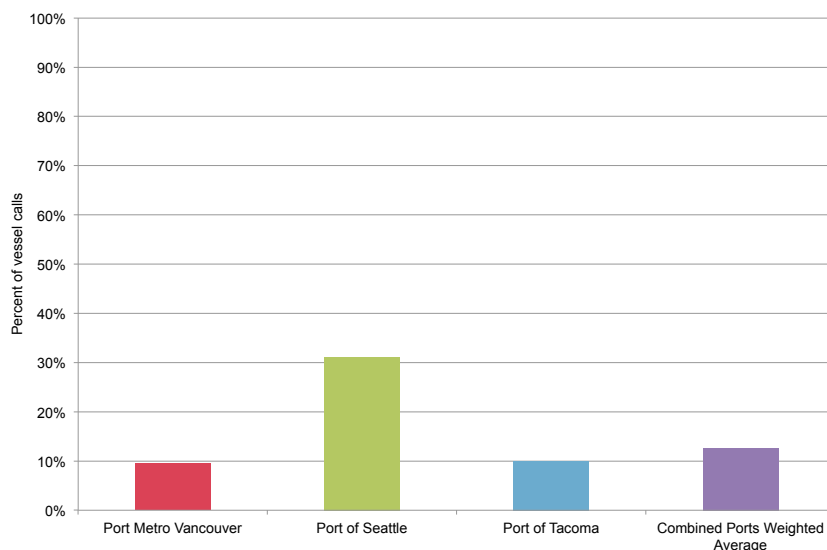
Port	Number of vessels	Number of vessel calls
PMV	1,720	3,213
POS	199	732
POT	376	1,258

## Performance Targets

### OGV-1: Vessels surpass Emission Control Area requirements

<b>2015 Target</b>	Early compliance with 2015 ECA 0.1% fuel-sulfur level (or equivalent) while hotelling before 2015
<b>2020 Target</b>	<i>By 2020, Ports track number of vessels with Tier 3 marine engines, shore power use, cleaner fuel, or other emission-reduction technologies</i>
<b>What is being measured?</b>	This measure reports the number of vessel calls that achieved early compliance with the 0.1% fuel-sulfur content IMO rules, or equivalent. Equivalent refers to vessels using shore power, that have scrubbers installed, or are fueled with liquefied natural gas (LNG).
<b>Why is this important?</b>	Low-sulfur fuels produce substantially lower emissions than high-sulfur fuels. The International Marine Organization (IMO) rules will further reduce emissions from ships as the next phase takes effect in 2015. The Ports created this performance target to recognize the importance of supporting shipping lines in adopting low-sulfur fuel standards in advance of regulatory requirements. The Ports also recognize the importance of shore power, scrubbers, and alternative fuels that result in equivalent reductions in emissions.
<b>How did we do?</b>	In 2014, 13% of vessel calls achieved early compliance with ECA while hoteling, or equivalent (see chart below).
<b>Definition of terms</b>	<p><i>IMO rules:</i> In 2010, the IMO officially designated the North American ECA and required specified emission reductions for vessels traveling within the ECA. Starting August 1, 2012 (in the US), and on April 18, 2013 (in Canada), the maximum fuel sulfur limit decreased to 1%. Starting January 2015, the maximum fuel sulfur limit decreased to 0.1%.</p> <p><i>Emission Control Area (ECA):</i> 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 while operating outside emission control areas versus those operating in established ECAs.</p>

Figure 1. OGV-1: Vessels surpass Emission Control Area requirements



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

<b>2015 Target</b>	By 2015, Ports and 10% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements
<b>2020 Target</b>	<i>By 2020, Ports and 40% of vessel calls participate in Port-designed or third-party programs that promote continuous efficiency improvements</i>
<b>What is being measured?</b>	<p>This measure reports whether the Ports participated in third-party programs.</p> <p>This measure also reports the percentage of calls to the three 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.</p>
<b>Why is this indicator important?</b>	<p>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.</p>
<b>How did we do?</b>	<p>In 2014, 2 out of the 3 Ports participated in the Green Marine program as ports. 42% of vessel calls to the three ports were made by vessels participating in at least one continuous improvement program, as listed below.</p>
<b>Definition of terms</b>	<p><i>Port-designed programs:</i> For 2014, this includes POS Green Gateway Partners Awards Program and the PMV EcoAction Program, which help to promote continuous improvement.</p> <p><i>Third-party programs:</i> For 2014, programs included are the Environmental Ship Index (ESI), Green Award, RightShip, Clean Shipping Index, or Green Marine. Note that only RightShip participants that have verified Existing Vessel Design Index data are included.</p> <p><i>Port participation in third-party certification programs:</i> For 2014, this included Ports that directly 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 vessels visiting the port that participate in the program).</p>

## Implementation Efforts in 2014 by Port: OGV

<b>Port:</b>	<b>Port Metro Vancouver</b>
<b>How is PMV doing?</b>	<p>In 2014, PMV participated in the Green Marine program as a port. PMV also participated in ESI, Green Award, RightShip, Clean Shipping Index, and Green Marine by offering discounts to vessels that participate in these programs.</p> <p>At least 7% of vessels, representing 9% of vessel calls used fuel with maximum 0.1% sulfur level, or shore power. It is likely that more calls met the target, but only the first five calls per vessel were tracked for fuel sulfur used. Cruise ships that connected to shore power are included, which resulted in reduced emissions of GHGs by 2,656 metric tons and fine particulate matter by 2.6 metric tons.</p> <p>40% of vessel calls participated in one or more of PMV's EcoAction Program, Environmental Ship Index, Green Award, RightShip (verified data only), Clean Shipping Index or Green Marine. This represents 1,280 out of 3,213 total calls for the year.</p>
<b>Program for OGVs:</b>	<p><i>EcoAction Program and Blue Circle Award (OGV)</i></p> <p>In 2014, 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>Fourteen shipping lines received the Blue Circle Award.<sup>3</sup></p>
<b>Other initiatives:</b>	<p>PMV is compiling a list of container vessels calling its terminals that are equipped with shore power capability. This will help PMV better understand where and how often these vessels call, as well as any physical requirements the vessels have. The information will be used to support potential future shore power installations.</p>
<b>Port:</b>	<b>Port of Seattle</b>
<b>How is POS doing?</b>	<p>In 2014, POS participated in the Green Marine program as a port.</p> <p>15% of vessels, representing 31% of vessel calls, either used fuel containing a maximum of 0.1% sulfur while at berth, or connected to shore power.</p> <p>64% of cruise and container 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>
<b>Program for OGVs:</b>	<p><i>ABC Fuels Program</i></p> <p>The ABC Fuels Program continued to provide financial incentives to container and cruise vessels burning fuel with a maximum of 0.1% sulfur while at berth. An estimated 34 metric tons of sulfur dioxide were avoided under ABC Fuels in 2014.</p>
<b>Other initiatives:</b>	<p><i>Green Gateway Partners Awards Program</i></p> <p>In 2014, POS offered its fifth annual Green Gateway Partner Awards to recognize environmental initiatives, including air quality initiatives, by container and cruise lines that exceed regulatory compliance. Six applicants were recognized for their successful environmental programs.<sup>4</sup> In order to</p>

<sup>3</sup> Visit <http://www.portmetrovancouver.com/environment/air-energy-climate-action/marine/> for Blue Circle recipients.

<sup>4</sup> Visit <http://www.portseattle.org/Cargo/Green-Gateway/Pages/Green-Gateway-Awards.aspx>.

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qualify for the award, applicants had to either plug into shore power at POS or participate in ABC Fuels.

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<b>Port:</b>	Port of Tacoma
<b>How is POT doing?</b>	<p>In 2014, 9% of vessels used fuel containing a maximum of 0.1% sulfur while at berth, or shore power, and these represented 10% of all vessel calls. TOTEM Ocean Trailer Express continues to use shore power at berth for the <i>Midnight Sun</i> and the <i>Northern Star</i>. This reduced sulfate PM emissions by 2 metric tons in 2014.</p> <p>38% of vessel calls participated in at least one third-party certification program, including ESI, Green Award, and RightShip (where data is verified only).</p>
<b>Program for OGVs:</b>	Shipping lines are encouraged to use low-sulfur fuels and are recognized in an annual progress report to the POT Commission when they go beyond ECA standards.
<b>Other initiatives:</b>	<p>TOTEM Ocean Trailer Express has completed engineering and design for repowering their ships to use LNG fuel for transit by 2017, which will reduce their PM emissions by 79% (and DPM by 100%). In the fall of 2015, Totem Ocean will begin the process of converting its two ships, the <i>MV North Star</i> and <i>MV Midnight Sun</i>, to natural gas. The Orca-class vessels will be the third and fourth cargo ships in the United States (after TOTE's Marlin-class ships serving Puerto Rico) to run on liquefied natural gas.</p> <p>Puget Sound Energy (PSE) will supply Totem Ocean with liquefied natural gas for the vessels once converted. PSE is building a new LNG terminal at POT. This terminal is expected to be complete in 2018. This LNG infrastructure at POT will provide an incentive for other terminals to convert vessels to run on LNG.</p>

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## 4. Harbor Vessels

Harbor vessels include harbor and ocean tugs, and there are approximately 150 such vessels providing service at the three 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 three 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.

**Table 5. Number of harbor vessel companies and vessels at the three ports in 2014**

Port	Number of harbor vessel companies	Number of harbor vessels
PMV	22	133
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

<b>2015 Target</b>	By 2015, partners conduct outreach and <b>50%</b> of harbor vessel companies report best practices and engine upgrades
<b>2020 Target</b>	<i>By 2020, partners conduct outreach and 90% of harbor vessel companies report best practices and engine upgrades</i>
<b>What is being measured?</b>	<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 2014, 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 2014 are also reported.</p>
<b>Why is this important?</b>	<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>
<b>How did we do?</b>	<p><i>Partners conduct outreach:</i> In 2014, Strategy Partners conducted 5 outreach events for harbor vessel companies. These focused on information sharing, optimizing vessel operation, and best practices.</p> <p><i>Harbor vessel companies report on best practices and engine upgrades:</i> 24% (six) companies reported their progress – three through submissions to Green Marine and three verbally to Strategy partners.</p> <p><i>Companies undertook best practices and engine upgrades:</i> 16% (four) companies undertook best practices or engine upgrades – three through their participation in the Green Marine program, and one by replacing an unregulated engine with a new engine meeting the newest engine emission standards.</p>
<b>Definition of terms</b>	<p><i>Best practices:</i> Currently, only participation in Green Marine is counted as following best practices. The Strategy partners are working to identify a list of best practices for harbor vessels, and these will be described in future reports.</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 1042 kits). 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>

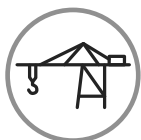
## Harbor-2: Ports and harbor vessels participate in Port-designed or third-party certification programs that promote continuous improvement

<b>2015 Target</b>	By 2015, Ports and <b>10%</b> of harbor vessels participate in Port-designed or third-party certification program that promote continuous improvement
<b>2020 Target</b>	<i>By 2020, Ports and <b>40%</b> of harbor vessels participate in Port-designed or third-party certification program that promote continuous improvement</i>
<b>What is being measured?</b>	<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 PMV's EcoAction Program or in the third-party Green Marine Program, which both promote continuous improvement for harbor vessels.</p>
<b>Why is this important?</b>	<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>
<b>How did we do?</b>	<p>In 2014, PMV provided discounted harbor due rates to those tugs operated by companies who are Green Marine certified. 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.</p>
<b>Definition of terms</b>	<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>

## Implementation Efforts in 2014 by Port: Harbor Vessels

<b>Port:</b>	<b>Port Metro Vancouver</b>
<b>How is PMV doing?</b>	<p>PMV hosted four outreach events in 2014:</p> <ul style="list-style-type: none"> <li>• Two Port Environmental Manager Breakfast Sessions for tenants (including tug companies), which were forums for sharing information on environmental best practices and evolving regulations.</li> <li>• A Port 2050 Energy Forum that was attended by over 150 customers including tug operators, where industry and academic leaders discussed increasing energy efficiency and alternative energy options.</li> <li>• A Fall 2014 workshop to discuss long-term sustainability scenarios including the role of energy efficiency and alternative energy.</li> </ul> <p>PMV 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 in PMV reported on air emission best practices in 2014 through Green Marine.</p> <p>37% of tugs operating within PMV participated in Green Marine, with three of 22 companies representing 49 of 133 tugs being members (Seaspan, Saam Smit and North Arm Transportation).</p>
<b>Other initiatives:</b>	None to report for 2014.

<b>Port:</b>	<b>Port of Seattle AND</b>
	<b>Port of Tacoma</b>
<b>How are POS and POT doing?</b>	<p>In 2014, the Clean Air Agency held a workshop for harbor vessel companies operating in POS and POT areas that focused on optimizing harbor craft operations.</p> <p>All harbor vessel companies serving POS and POT regions reported their progress for 2014, and one of the three companies repowered a vessel (Crowley repowered their <i>Tioga</i>, replacing the unregulated engines with Tier 3 engines).</p> <p>None of the harbor vessel companies operating at POS or POT participated in the Green Marine program in 2014.</p>
<b>Other initiatives:</b>	<p>The Clean Air Agency received a grant from Ecology to develop an auxiliary engine replacement program. The program launched in 2014, allowing the replacement of unregulated auxiliary engines on up to 15 vessels (30 engines) with Tier 2 or better replacement engines. This program reduces DPM, increases harbor vessel efficiencies, and helps the Clean Air Agency develop working relationships with the harbor vessel community. The program is scheduled for completion in 2016.</p>



## 5. Cargo-Handling Equipment

Cargo-handling equipment (CHE) moves goods on marine terminals between ships, railcars, and trucks. Examples of CHE include: straddle carriers, rubber-tired gantry (RTG) cranes, reach stackers, top and side picks, forklifts, skid loaders, yard tractors / yard trucks, 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 three 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. POT operates one of the terminals, and tenants operate all other terminals.

**Table 6. Number of terminals with CHE, and number of units in 2014<sup>5</sup>**

Port	Number of terminals with CHE	Number of CHE
<b>PMV</b>	28 terminals and several other operations	1,646
<b>POS</b>	4 terminals	361 <sup>6</sup>
<b>POT</b>	5 terminals	361

<sup>5</sup> PMV includes all non-road diesel equipment in their inventory (not just those that handle cargo) from all port operations (28 terminals and several other operations). POS and POT only include equipment used to handle cargo at container and bulk terminals, but do not include electric container cranes.

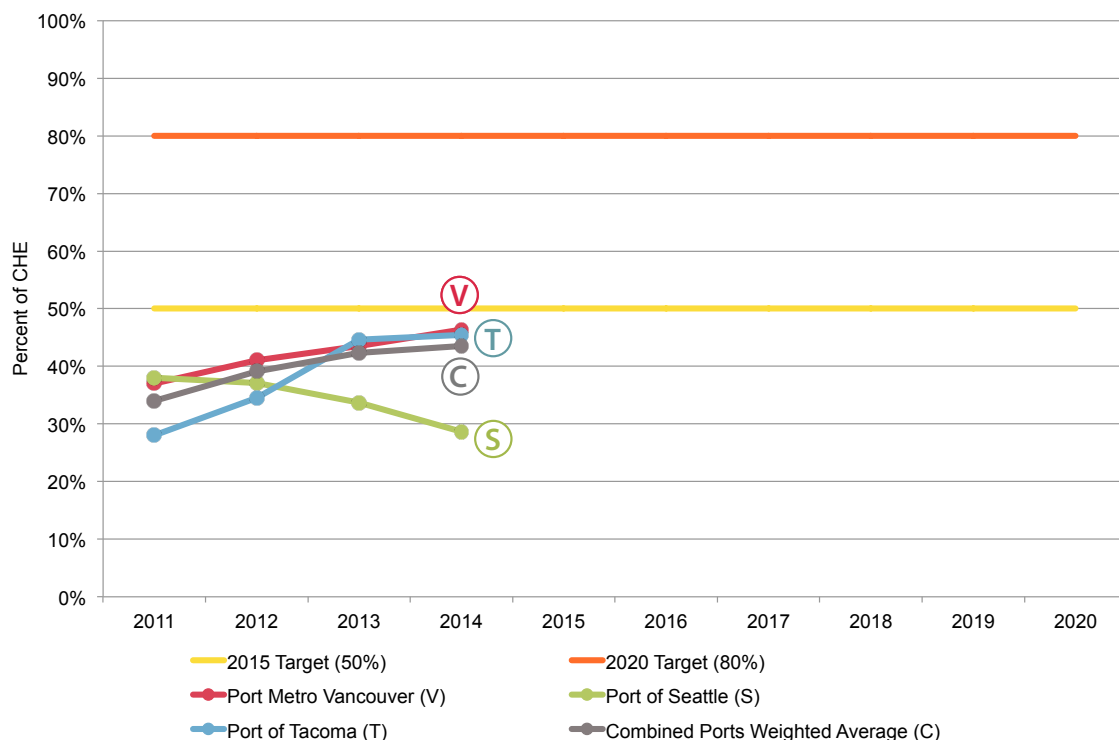
<sup>6</sup> Total POS number does not include CHE at the cruise terminals.

## Performance Targets

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

<b>2015 Target</b>	By 2015, 50% of CHE meets Tier 4 Interim
<b>2020 Target</b>	By 2020, 80% of CHE meets Tier 4 Interim
<b>What is being measured?</b>	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 includes engines with retrofits or repowers that result in Tier 4i equivalent PM emission rates and considers other improvements on a pro-rated basis.
<b>Why is this important?</b>	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.
<b>How did we do?</b>	44% of CHE met Tier 4 Interim across all three ports (see chart below), a 2% increase relative to 2013.
<b>Definition of terms</b>	<i>Tier 4i engine or equivalent:</i> Engine tiers are defined by the EPA and provide emission standards for newly built non-road engines (note that Canada has mirrored the EPA standards). Tier 4 is the newest standard and is being phased in for new-build engines from 2008 through 2015. Tier 4 equipment introduces substantial reductions in emissions (NO <sub>x</sub> and PM). The "i" in Tier 4i refers to interim, which means engines meet the Tier 4 standard for PM, but may not meet the Tier 4 standard for NO <sub>x</sub> .

Figure 2. CHE-1: Percent of CHE meeting Tier 4 interim emission standards or equivalent



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

<b>2015 Target</b>	By 2015, Ports and 50% of terminals have fuel-efficiency plans
<b>2020 Target</b>	By 2020, Ports and 100% of terminals have fuel-efficiency plans
<b>What is being measured?</b>	<p>Partners committed 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.</p> <p>The measure also reports the percent of terminals that had fuel-efficiency plans for CHE, to the best of the Ports' knowledge.</p>
<b>Why is this important?</b>	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.
<b>How did we do?</b>	<p>In 2014, none of the Ports had fuel-efficiency plans in place. Each of the three Ports facilitated fuel efficiency in relation to CHE in the following ways: PMV finalized a new program that will require tenants to have fuel-efficiency plans, POS facilitated a grant for installation of idle-reduction retrofits, and POT created a template fuel-efficiency plan, shared it with two terminals, and encouraged its adoption.</p> <p>21% (eight out of 38) of terminals had a fuel-efficiency plan incorporating CHE, to the best of the Ports' knowledge.</p>
<b>Definition of terms</b>	<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 2014 by Port: CHE

<b>Port:</b>	Port Metro Vancouver
<b>How is PMV doing?</b>	<p>In 2014, 46% of non-road equipment at PMV met Tier 4i equivalent standards or better, excluding electrical equipment.</p> <p>As PMV does not have operational control over CHE, PMV's 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).</p> <p>24% (7 of 28 terminals plus 1 shipyard) had known fuel-efficiency plans in place, based on participation in Green Marine. This represents a 33% increase over 2013 participation levels.</p>
<b>Program for CHE:</b>	<p><i>Non-Road Diesel Emissions Program (NRDE)</i></p> <p>PMV completed consultation on and finalized the <i>NRDE</i> program in 2014, in preparation for launch on January 1, 2015. <i>NRDE</i> 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.</p>
<b>Other initiatives:</b>	None to report.
<b>Port:</b>	Port of Seattle
<b>How is POS doing?</b>	<p>In 2014, 29% of CHE met Tier 4i equivalent standards or better.<sup>7</sup></p> <p>Neither POS nor its container terminals had implemented fuel-efficiency plans in 2014.</p>
<b>Program for CHE:</b>	Under a grant from Ecology, administered by the Clean Air Agency, 69 idle-reduction retrofits were installed on CHE in 2014.
<b>Other initiatives:</b>	POS had an idle-reduction policy in place.
<b>Port:</b>	Port of Tacoma
<b>How is POT doing?</b>	<p>In 2014, 45% of CHE at container terminals met Tier 4i equivalent standards or better.</p> <p>POT created a template fuel-efficiency plan, shared it with two terminals, and encouraged its adoption. One of the five terminals had a fuel-efficiency plan in place.</p>
<b>Program for CHE:</b>	POT encourages terminal operators to purchase new equipment meeting the most stringent EPA emission standards. Under a grant from Ecology, administered by the Clean Air Agency, 14 idle-reduction retrofits were installed on CHE in 2014.
<b>Other initiatives:</b>	CHE owned and operated by POT used 5% biodiesel blend. POT had an idle-reduction policy in place.

<sup>7</sup> POS noted some discrepancies in past years' data which may account for a difference of plus or minus 10% of equipment meeting Tier 4i equivalency. Numbers reported include CHE operating at Terminal 5 at the time of its closure in mid-2014. Percentage does not include CHE used at cruise terminals.



## 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.

### Context

Trucks account for 5% of DPM emissions and 28% of GHGs from activities related to the three 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 each port.

**Table 7. Number of container terminals, truck companies, trucks in 2014**

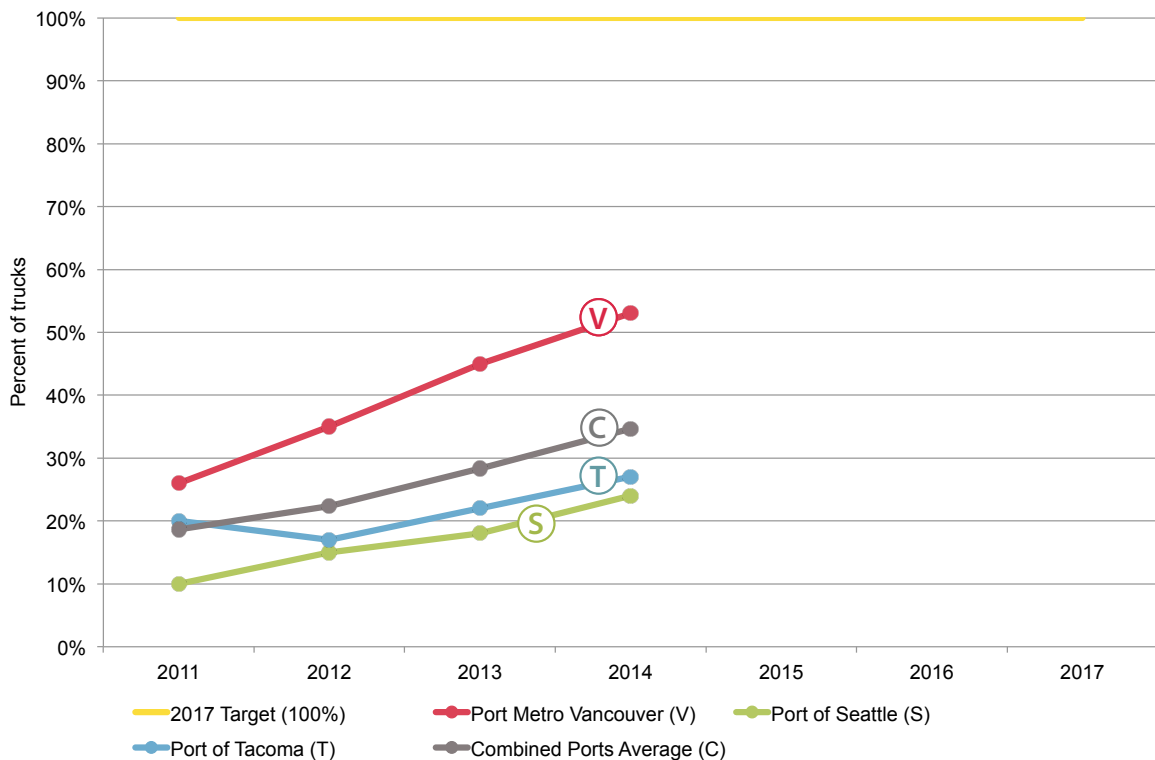
Port	Number of container terminals	Number of truck companies	Number of trucks
PMV	4	1,008	2,200
POS	4	350	4,000
POT	5	277	4,000

## Performance Targets

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

<b>2017 Target</b>	By 2017, 100% of trucks meet or surpass 2007 EPA emission standards
<b>What is being measured?</b>	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.
<b>Why is this important?</b>	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 newer, low-emission engines. It also recognizes emission reductions achieved through retrofits or engine replacements.
<b>How did we do?</b>	The combined Ports' weighted average in 2014 is 35% (see chart below).
<b>Definition of terms</b>	<i>2007 emission requirements:</i> The US 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 <sup>th</sup> of the 1994 to 2006 standard for PM emissions.

**Figure 3. Truck-1: Percent of trucks that meet or surpass US EPA emission standards or equivalent for model year 2007**



## Truck-2: Ports, terminals, and truck companies have fuel-efficiency plans in place that promote continuous improvement<sup>8</sup>

<b>2015 Target</b>	By 2015, Ports have fuel-efficiency plans
<b>2020 Target</b>	By 2020, Ports, terminals, and 50% of truck companies have fuel-efficiency plans
<b>What is being measured?</b>	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. This measure reports on whether each of the Ports has adopted fuel-efficiency plans.
<b>Why is this important?</b>	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.
<b>How did we do?</b>	In 2014, none of the three Ports had fuel-efficiency plans in place. However, all three facilitated fuel efficiency in trucks through the following initiatives: the Truck Licensing System and Smart Fleet Initiative at PMV, the ScRAPs 2 truck replacement program at POS, and the FRATIS project at POT.
<b>Definition of Terms</b>	<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.

<sup>8</sup> 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 2014 by Port: Trucks

Port:	Port Metro Vancouver
<b>How is PMV doing?</b>	<p>At the end of 2014, 53% of the entire drayage truck fleet was 2007 or newer.</p> <p>As PMV does not have operational control over container trucks, PMV's approach is to address fuel efficiency in trucks by continuing to implement a truck program that requires replacement of old engines, opacity limits and idling limits (see "Program for Trucks" below).</p>
<b>Program for Trucks:</b>	<p><i>Truck Licensing System (TLS)</i></p> <p>PMV continued to implement increasingly stringent environmental requirements on drayage trucks accessing the port through the TLS program. Requirements in 2014 included:</p> <ul style="list-style-type: none"> <li>• 2004 model year trucks already in the TLS had to have an eligible emission reduction measure (e.g. diesel oxidation catalyst) installed,</li> <li>• Trucks new to the TLS had to be 2007 or newer,</li> <li>• Trucks 2004 and older had to be tested and pass a 20% opacity limit, and</li> <li>• All trucks were not to exceed a maximum of three minutes consecutive idling in any 60-minute period.</li> </ul>
<b>Retrofits or Replacements:</b>	The TLS program required retrofits or replacements, as outlined above.
<b>Alternative fuels:</b>	None to report for 2014.
<b>Other initiatives:</b>	<p>In 2014, a review of PMV's TLS was undertaken through the Smart Fleet Initiative. PMV's Smart Fleet Initiative contains important tools and policy reforms that will improve operational efficiency of drayage trucks and reduce emissions, including:</p> <ul style="list-style-type: none"> <li>• Development of a drayage model to optimize truck movements,</li> <li>• GPS tracking of all drayage trucks in real-time,</li> <li>• Development of a common reservation system to improve data and scheduling, and</li> <li>• New TLS requirements including transition toward a 10-year rolling truck age.</li> </ul>

<b>Port:</b>	Port of Seattle
<b>How is POS doing?</b>	In 2014, 24% of trucks, representing 18% of trips, had 2007 or newer engines or equivalent. POS did not have a fuel-efficiency plan in place for trucks in 2014; however, POS continued efforts to reduce emissions through its <i>Clean Truck Program</i> (see below).
<b>Program for Trucks:</b>	<p><i>Clean Truck Program</i></p> <p>Since January 1, 2011, POS has not allowed drayage trucks with pre-1994 engines to access its international container terminals. The Port has had a drayage truck registry in place since 2009, and a RFID (radio frequency identification) program in place since 2013.</p>
<b>Retrofits or Replacements:</b>	<p>In May 2014, POS launched its second drayage truck scrappage/replacement program titled ScRAPS 2 (Seaport Scrappage and Replacements for Air in Puget Sound). The Program was 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 (\$638,000).</p> <p>This program provides financial incentives of \$20,000 to \$30,000 per truck to approximately 240 eligible owners who scrap old trucks. In 2014, 70 trucks were scrapped and replaced under this project. Prior to program launch, POS conducted meetings with trucking companies, truck owners, and financial lenders; and held a large trucker outreach meeting attended by about 300 people.</p> <p>The Clean Air Agency received a CMAQ grant for a joint POS and POT drayage truck replacement program; this program (ScRAPs 3) will begin in 2016.</p>
<b>Alternative fuels:</b>	POS continued to provide funding to the Clean Air Agency in 2014 to carry out a multi-year pilot project to convert diesel-powered drayage trucks to run entirely on compressed natural gas. The project is expected to be complete by the end of 2015. Compressed natural gas (CNG) drayage truck emissions are cleaner than the 2007 engine PM emission standard of 0.01 grams/brake horsepower-hour.
<b>Other initiatives:</b>	In 2014, 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%. 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. 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.

<b>Port:</b>	Port of Tacoma
<b>How is POT doing?</b>	In 2014, 27% of trucks, representing 18% of trips, had 2007 or newer engines or equivalent. POT did not have a fuel-efficiency plan in place for trucks in 2014; however, POT facilitated the FRATIS pilot study to improve truck efficiency (see below).
<b>Program for Trucks:</b>	In 2014, POT began work with EPA, Department of Transportation, Washington State Department of Transportation, 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.
<b>Retrofits or Replacements:</b>	The Clean Air Agency received a CMAQ grant for a joint POT and POS drayage truck replacement program; this program (ScRAPs 3) will begin in 2016.
<b>Alternative fuels:</b>	None to report for 2014.
<b>Other initiatives:</b>	<p>POT conducted two NWPCAS Truck Program Steering committee meetings in 2014 to discuss truck age goals and truck terminal efficiency issues.</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.</p> <p>POT published roadway conditions, terminal gate information and rail information to improve truck terminal efficiencies and reduce idling time. POT also provided clean truck program and registration information on their website.</p>



## 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 three 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 2014**

Port	Number of switcher locomotive operators	Number of switcher locomotives
PMV	13	17* (CN and Canadian Pacific data not available)
POS	3	13* (Union Pacific data not available)
POT	4	19* (Union Pacific and BNSF data not available)

\* Indicates incomplete data available. Locomotive operators provide data voluntarily to the Ports and partners.

## Performance Targets

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

<b>2015 Target</b>	By 2015, 100% of owners/operators participate in a fuel-efficiency program
<b>2020 Target</b>	<i>By 2020, 100% of owners/operators achieve performance measures of chosen program</i>
<b>What is being measured?</b>	As stated in the 2013 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.
<b>Why is this important?</b>	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.
<b>How did we do?</b>	In 2014, 60% of owners/operators participated in a fuel-efficiency program (2014 data includes operators in POS and POT only). Operators with a fuel-efficiency program include BNSF, Tacoma Rail, and Union Pacific.
<b>Definition of Terms</b>	<p><i>Automatic Engine Stop Start (AESS) technology:</i> This technology enables the engines to be safely shut down when not in use by ensuring engines do not freeze, charging batteries, and maintaining air pressure at 90 psi or greater.</p> <p><i>Fuel-efficiency program:</i> A fuel-efficiency program sets goals or objectives for improving fuel-efficiency, undertakes actions that achieve those, and reports progress. Examples of fuel-efficiency actions include: idle-reduction policies, equipping locomotives with AESS technology, installing Eco-Tip fuel injectors, engaging or training employees on fuel-efficiency practices, and improving maintenance practices.</p>

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

<b>2015 Target</b>	By 2015, 10% of unregulated locomotive engines are replaced with Tier 2 or better engines
<b>2020 Target</b>	<i>By 2020, 20% of unregulated locomotive engines are replaced with Tier 2 or better engines</i>
<b>What is being measured?</b>	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.
<b>Why is this important?</b>	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.
<b>How did we do?</b>	Incomplete data available for 2014. Of data collected to date, 31 unregulated engines were in use as of December 31, 2013 across PMV, POS, and POT.
<b>Definition of Terms</b>	<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>

## Implementation Efforts in 2014 by Port: Rail

Port:	Port Metro Vancouver
<b>Rail initiatives:</b>	<p>In 2014, PMV finalized a two-year consultative process to design an emissions reduction program applicable to terminal operated locomotives for the NRDE Program. Effective 2015, all terminal operators will be required to conform to the NRDE Program, which includes reporting, fees, labelling, opacity, auditing and maintaining a fuel-efficiency plan applicable to switcher locomotives.</p> <p>PMV continued to invest in infrastructure to improve rail flow, with construction now complete for the South Shore Corridor Project, Low Level Road Project, and the Deltaport Causeway overpass as part of the Deltaport Terminal Road and Rail Improvement Project. These Infrastructure improvements within the South Shore Trade Area, North Shore Trade Area, and Roberts Bank Trade Area allow for further rail improvements by eliminating at-grade rail crossings and reducing switching-related noise and emissions within local communities. These projects will lead to continued rail efficiency at PMV and enable continued sustainable growth for the gateway.</p> <p>2014 information on Canadian National (CN) Railway or Canadian Pacific (CP) Railway locomotives was not collected, however, the collaborative supply chain agreement between PMV and CN and CP in 2010 continued to result in improved operational performance.</p>
Port:	Port of Seattle
<b>Rail initiatives:</b>	None to report for 2014.
Port:	Port of Tacoma
<b>Rail initiatives:</b>	<p>In 2014, POT, in partnership with Tacoma Rail, was awarded a 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. Also in 2014, Ecology independently awarded Tacoma Rail a diesel emissions reduction grant to be applied towards the replacement / repower project. Upon completion, all Tacoma Rail switchers will be equipped with AESS technology.</p>



## 8. Port Administration

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

### Context

The proportion of DPM and GHG emissions associated with port administration have not been fully quantified independently of the other sectors, however, they are a very small portion of total port-related emissions (e.g. fleet vehicles accounted for 0.004% 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

<b>2015 Target</b>	By 2015, Ports report cleaner vehicles and equipment and other relevant information
<b>2020 Target</b>	By 2020, Ports increase use of cleaner vehicles and equipment
<b>What is being measured?</b>	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.
<b>Why is this important?</b>	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.
<b>How did we do?</b>	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.
<b>Definition of Terms</b>	<p><i>Port-owned and operated vehicles and equipment:</i> The scope of equipment reported includes all equipment (on and off-road) that is owned, rented or leased and operated by the Ports. PMV has included non-mobile equipment in the non-road category, while POT and POS have only included mobile equipment in the non-road category.</p> <p><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.</p>

**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
PMV	5	2	4	14	0	6	0	2	3	0	8	0
POS	0	1	35	192	3	23	2	0	0	0	1	0
POT	0	1	0	103	0	8	0	0	0	0	0	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) <sup>[A]</sup>	Biodiesel 20 (gal)	Gasoline (gal) <sup>[B]</sup>	Propane (gal)	CNG or LNG (gal)	Electricity
PMV	827	0	6,414	118	0	0
POS	29,780	22,009	54,061	2,259	456	0
POT	0	0	55,268	0	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

<b>2015 Target</b>	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
<b>2020 Target</b>	<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>
<b>What is being measured?</b>	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.
<b>Why is this important?</b>	Ports can directly support the Strategy goals through appropriate clean construction practices and requirements.
<b>How did we do?</b>	In 2014, all three Ports adopted 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.
<b>Definition of Terms</b>	<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

<b>2015 Target</b>	By 2015, each port conducts 3 energy studies
<b>2020 Target</b>	<i>By 2020, each port completes 3 energy conservation projects</i>
<b>What is being measured?</b>	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.
<b>Why is this important?</b>	Reducing energy use in facilities can contribute to reducing GHG emissions.
<b>How did we do?</b>	Collectively, nine energy studies and six energy conservation projects were completed for Port or tenant facilities. Two of the three ports conducted at least three studies.
<b>Definition of Terms</b>	<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 2014 by Port: Port Administration

Port:	Port Metro Vancouver
<b>How is PMV doing?</b>	<p>Since 2010, PMV 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 was tracked on a monthly basis, reported to all staff, and integrated into individual incentive plans.</p> <p>PMV's procurement process was informed by a Sustainable Procurement Policy, which encourages sustainability practices and clean equipment such as Tier 2 minimum engines. PMV used the Institute for Sustainable Infrastructure Envision rating system for the Low Level Road Project and is expanding this practice for other major infrastructure projects.</p> <p>In 2014, five energy studies were conducted and three energy conservation measures were implemented under PMV's Energy Action Initiative, established in 2012 in partnership with BC Hydro.</p>
<b>Other initiatives:</b>	<p>PMV 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 2014, 52% of employees took part in a Commuter Challenge to encourage sustainable commuting.</p> <p>Since 2009, PMV has completed an annual corporate emission inventory, and since 2010 has purchased carbon offsets to render its operations carbon neutral. PMV's 2014 GHG Inventory and carbon neutral assertion were assured by Ernst &amp; Young and disclosed in PMV's 2014 Sustainability Report.</p> <p>PMV continued its SortSmart waste management program in 2014, which includes organic waste composting and recycling of paper, glass, metal, plastics, cardboard, film, and foil plastics. In 2014, PMV achieved a 77% waste diversion rate.</p>
Port:	Port of Seattle
<b>How is POS doing?</b>	<p>POS used the West Coast Ports Sustainable Design checklist as a tool to implement principles of sustainable development for select projects.</p> <p>POS conducted one energy study in 2014 and one energy audit focused on cruise parking and pier outdoor lighting in 2014.</p>
<b>Other initiatives:</b>	<p>In 2014, POS continued its membership in the Green Marine Program as a port authority. POS participated in the Green Marine West Coast Advisory Committee.</p> <p>POS was represented on the steering committee of the Western Washington Clean Cities Coalition. POS was also 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> <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.</p>

Port:	Port of Tacoma
<b>How is POT doing?</b>	<p>Late 2014, POT created a vehicle purchasing policy that emphasizes fuel economy and low-emission vehicles (e.g. the purchase of low or zero emission vehicles).</p> <p>POT used standard contract language, and required a minimum emission standard of Tier 2 equipment for Port construction contracts.</p> <p>POT conducted three energy studies and three energy conservation projects in 2014.</p>
<b>Other initiatives:</b>	<p>POT's Corporate Social Responsibility Team developed goals for CO<sub>2</sub>e emissions related to fuel use in Port owned and operated equipment in 2014. Quarterly reporting will begin in 2015.</p> <p>POT reduced CO<sub>2</sub>e 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.</p> <p>POT's external affairs created a handout highlighting POT environmental improvement for 2014.</p> <p>POT formed a sustainability committee (Green Team) in 2014 to improve resource conservation at Port-owned and operated facilities. Their first task was to educate Port staff on recycling options and resource conservation through the Port news network and newsletters.</p>

## 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 2014 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, six pilot studies and demonstration projects were undertaken at the ports in 2014. One pilot study or project for each port is profiled below.

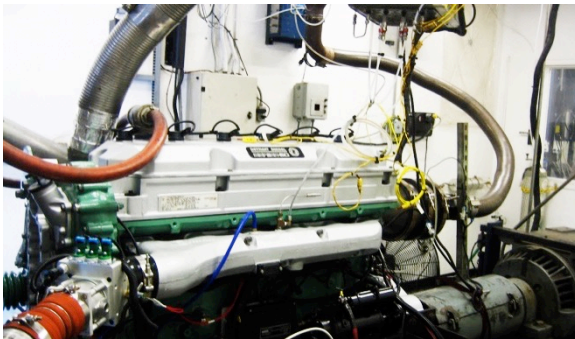
### PMV: Feasibility of Converting RTG Cranes to CNG and LNG

In 2014, PMV led studies related to emissions reductions including advancement of shore power for container vessels, development of an integrated energy management system incentive for terminal operators, and opportunities for electric drayage truck infrastructure. In collaboration with DP World, a major container terminal operator, PMV supported the feasibility analysis of converting rubber tire gantry cranes to natural gas. The study considered opportunities for CNG and LNG. The findings suggested that LNG technology could be adapted for RTGs but with significant barriers, including the accommodation of fuel tanks, refueling facilities and operations, and the current price of diesel. DP World is further investigating RTG fuel tank and refueling options.



## POS: Conversion of Diesel Trucks to CNG

POS has funded a multi-year demonstration project to convert diesel-powered drayage trucks to run completely on compressed natural gas, since 2013. The project is 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). The project is expected to be complete by the end of 2015.



## POT: FRATIS Concept of Operations

In 2014, the Federal Highways Administration (FHWA) awarded a contract to Flatirons Two Inc. to develop a pilot study demonstrating the use of Freight Advanced Traveler Information System technology to improve drayage truck efficiency at POT. POT facilitated the participation of two terminal operators and two trucking companies to implement two-way communication systems using Discrete Short-Range Communication devices (DSRC) that can broadcast the truck's location and other specific information about the truck, cargo, and company. DSRC can accept information provided by the terminal, regional traffic information centers, emergency services, or truck dispatch center to provide the driver with the latest routing information. DSRC has the potential to reduce wait times and improve air quality. In late 2014, the project scope and concept of operations was developed. Unfortunately port labor negotiations caused a significant delay and cancellation of the project by FHWA. However, POT obtained a well-developed project scope, established regional private and public agency partnerships, and opened opportunities for future funding to implement the project in part or in whole.



## 10. Key Initiatives for 2015

The key air initiatives that are planned by the partner ports for 2015 include:

- **PMV** will implement the Non-Road Diesel Emissions Program, implement updates to the EcoAction Program, ensuring the program continues to recognize vessels going beyond requirement to reduce air emissions as the more stringent Emission Control Area fuel quality limits come into effect, initiate the PMV 2015 Emission Inventory and Greenhouse Gas Reduction Strategy Analysis, with an expanded scope to include additional land-side sources as well as marine, and engage tenants in Climate Smart training to help them manage and reduce their greenhouse gas emissions.
- In August 2015, the ports of Tacoma and Seattle formed the Northwest Seaport Alliance (**NWSA**) to jointly manage their marine cargo facilities and business. The Port of Seattle's cruise line of business will remain with POS, but most of the two ports' cargo business will fall under the NWSA. Going forward, the NWSA will be a port partner in implementing the Northwest Ports Clean Air Strategy.
- **POS** plans to complete the current drayage truck scrap and replacement program (ScRAPs 2), complete the CNG conversion pilot project for trucks, update the Green Gateway Partner Awards for OGVs, and develop and implement fuel-efficiency plans and other port administration improvements.
- **POT** plans to focus on port administration fuel efficiency improvements to reduce GHG emissions.
- The **NWSA** plans to implement a pilot study of commercially available vehicle wait time awareness system(s) in collaboration with Ecology, FHWA and the Washington State Department of Transportation, repower a locomotive with clean engine technology, install high efficiency yard lighting at port terminals, and prepare for a new multi-port drayage truck replacement program to be implemented by the Clean Air Agency (ScRAPs 3).
- **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. 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 seven years of collaboration on reducing port-related air emissions in the Northwest, PMV, 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

Port Metro Vancouver, 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 seven years. Significant investment is required to undertake each of the initiatives identified in the Strategy. Funding made available by various agencies in 2014 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 2013 Strategy in 2015 and beyond.

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