



# NORTHWEST PORTS CLEAN AIR STRATEGY

## 2011 Implementation Report

July 25, 2012



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## List of Acronyms

<b>ABC</b>	At-Berth Clean Fuels Vessel Incentive Program
<b>BC Ferries</b>	British Columbia Ferries
<b>BNSF</b>	Burlington Northern Santa Fe Railway
<b>CHE</b>	Cargo-Handling Equipment
<b>Clean Air Agency</b>	Puget Sound Clean Air Agency
<b>DERA</b>	Diesel Emission Reduction Act
<b>DOC</b>	Diesel Oxidation Catalyst
<b>Ecology</b>	Washington State Department of Ecology
<b>EPA</b>	United States Environmental Protection Agency
<b>IMO</b>	International Maritime Organization
<b>NO<sub>x</sub></b>	Nitrogen Oxides
<b>OGV</b>	Ocean-Going Vessel
<b>PM</b>	Particulate Matter
<b>RFID</b>	Radio Frequency Identification
<b>RTG</b>	Rubber-tired Gantry
<b>ScRAPs</b>	Scrappage and Retrofits for Air in Puget Sound
<b>Seaspan</b>	Seaspan Marine Corporation
<b>SO<sub>x</sub></b>	Sulfur Oxides
<b>TLS</b>	Truck Licensing System
<b>ULSD</b>	Ultra-Low Sulfur Diesel (15 ppm or 0.0015% Sulfur)
<b>U.S.</b>	United States
<b>WSF</b>	Washington State Ferries

## Executive Summary

Recognizing that port operations contribute air emissions in local and regional airsheds, Port Metro Vancouver, the Port of Seattle, and the Port of Tacoma ('the Ports') have partnered with regulatory agencies to identify ways to reduce air emissions from all aspects of port operations. The Northwest Ports Clean Air Strategy ("the Strategy") was developed in 2007 as a collaboration between the Ports and regulatory agencies including Environment Canada, the Puget Sound Clean Air Agency, the Washington State Department of Ecology, and the United States Environmental Protection Agency. Reporting on implementation of the Strategy occurs on an annual basis with previous implementation reports published in 2009, 2010 and 2011.

**Table i – Summary of Status and Implementation Efforts in 2011 for Each Sector**

Sector	Implementation Efforts in 2011	2010 Performance Measure Status	2015 Performance Measure Status
Ocean-Going Vessels	<ul style="list-style-type: none"> <li>Incentives for using cleaner fuels at berth.</li> <li>Providing shore power connections.</li> <li>Award programs.</li> </ul>	44% met or surpassed	No data available
Cargo-Handling Equipment	<ul style="list-style-type: none"> <li>Use of ULSD and/or biofuel.</li> <li>Exhaust retrofit or equipment replacement.</li> </ul>	60% met or surpassed	6% met or surpassed
Trucks	<ul style="list-style-type: none"> <li>Scrappage and replacement programs.</li> <li>Limit access to container terminals through truck registries.</li> </ul>	100% met or surpassed	19% met or surpassed
Rail	<ul style="list-style-type: none"> <li>Support EPA SmartWay commitments.</li> <li>Pursue grant opportunities.</li> <li>Install idle reduction devices.</li> <li>Replace old engines.</li> <li>Collaborative supply-chain agreement to improve operational efficiency.</li> </ul>	√*	No data available
Harbor Craft	<ul style="list-style-type: none"> <li>Engine replacement or installation of upgrade kits.</li> <li>Use of ULSD, low-sulfur, and/or biodiesel.</li> <li>Participation in the Green Marine program.</li> <li>Investigation of alternative fuels.</li> </ul>	√	Continue emission reduction initiatives
Port Administration	<ul style="list-style-type: none"> <li>Corporate emission inventory &amp; reporting.</li> <li>Energy audits.</li> <li>Sustainable procurement.</li> <li>Vehicle fleet fuel efficiency upgrades, scrappage, and/or replacement.</li> <li>Energy and/or carbon offsets purchased.</li> <li>Reduced commutes and promote sustainable transportation.</li> <li>Collaborate with Western Washington Clean Cities Coalition.</li> <li>Composting and/or recycling.</li> <li>Energy conservation measures.</li> </ul>	√	Continue emission reduction initiatives

\* a "√" indicates efforts have been made towards reducing emissions in sectors that do not have specific performance measures.

The Strategy defines specific targets, or ‘performance measures’ for the reduction of port-related air quality impacts on human health, the environment, climate change, and the economy. The focus of the Strategy is on emission reductions in six sectors of port operations. Performance measures are quantitative or qualitative, depending on the sector of port operations. The Strategy includes two milestones: a set of near-term performance measures to be met by 2010, and a set of longer-term performance measures for 2015.

The successful implementation of the Strategy has been facilitated by:

- Collaboration between the Ports and regulatory agencies,
- Investments by the owners and operators of the emission sources,
- Recognition of independent efforts through award programs, and
- Access to governmental funding programs and grants for certain emission source sectors.

Challenges have been encountered in implementing the strategy and, in some cases, the 2010 performance measures were not achieved. Common factors that challenged the successful implementation of some elements of the Strategy include:

- new emission reduction technologies not performing as anticipated,
- limitations of data collection and management systems,
- some 2015 performance measures were based on federal rules that were not final when the 2007 Strategy was developed,
- limited direct influence or functional control of the majority of emission sources,
- lack of funding for certain emission source sectors to fully implement the Strategy, and
- reprioritization of budgets by terminal operators due to economic conditions.

The Ports also recognize the need to review and adjust the Strategy on a regular basis in light of new standards, technology, air emissions data, and evolving climate change policy frameworks. A five-year review and update of the Strategy is currently underway, incorporating these external changes and integrating lessons learned.





## Introduction

Motivated by a commitment to protect the environment and public health in the Puget Sound region and elsewhere, the Ports of Seattle, Tacoma, and Vancouver (B.C.) voluntarily collaborated to adopt the Northwest Ports Clean Air Strategy in 2007. The objective of this effort was to reduce maritime and port-related emissions that affect air quality and climate change in the Pacific Northwest. Developed in close collaboration with the Puget Sound Clean Air Agency, Washington Department of Ecology, US Environmental Protection Agency, and Environment Canada with input from stakeholders, customers, and citizens; the Strategy will result in emission reductions to further improve air quality throughout the region. The Strategy, which builds on significant efforts that the Ports of Seattle and Tacoma and Port Metro Vancouver have invested in emission reductions, establishes common short-term (2010) and long-term (2015) performance measures to further reduce emissions from Port-related operations. The Ports are again collaborating in 2012 to update the strategy and establish longer-term performance measures.

The Northwest Ports Clean Air Strategy has three primary emissions reduction objectives:

- 1) reduce maritime and port-related air quality impacts on human health, the environment, and the economy,
- 2) reduce contribution to climate change through co-benefits associated with reducing air quality impacts, and
- 3) help the Georgia Basin – Puget Sound airshed continue to meet air quality standards and objectives.

To meet the primary objectives listed above, the Strategy defines specific performance measures (discussed below) and focuses on the reduction of diesel particulate matter (DPM), with benefits that reduce greenhouse gases (GHG).

The Strategy targets emission sources from the following six sectors: ocean going vessels, cargo-handling equipment, trucks, rail, harbor craft, and port administration.

Progress has been made towards achieving the 2010 performance measures. However, not all performance measures have been met. The Ports are continuing to work to achieve 2010 performance measures while also pursuing progress towards 2015 performance measures. As such, this report describes progress towards both the 2010 and 2015 performance measures.

A review of the Strategy is currently underway, and the relevancy of specific 2015 performance measures will be assessed and updated as necessary. In addition, a new set of performance measures will be established for future milestone years.

## Ocean-Going Vessels

Ocean-going vessels (OGV) (e.g., container ships, cruise ships, tanker ships, bulk cargo ships) represent a significant source of maritime emissions. The Strategy has primarily focused on reducing emission from frequent- calling vessels during hotelling and transiting.<sup>1</sup>

To reduce OGV emissions, the Ports established the following performance measures in the Strategy.

**Table 1 – OGV Performance Measures**

<b>2010</b>	<ul style="list-style-type: none"><li>• Reach the equivalent PM reduction of using distillate fuels with a maximum sulfur content of 0.5% for all hotelling auxiliary engine operations.</li><li>• Use of fuels with a maximum sulfur content of 1.5%, or use of equivalent PM reduction measures, for all hotelling main or diesel electric engine operations (except during active docking and departure, during which non-hotelling engine operations are running).</li></ul>
<b>2015</b>	<ul style="list-style-type: none"><li>• For all ships, compliance with performance measures that the International Maritime Organization (IMO) adopts and in accordance with the IMO schedule.<sup>2</sup></li></ul>

On March 26, 2010, the IMO officially designated the North American Emission Control Area<sup>3</sup>. For this area, all vessels within 200 nautical miles of the coast must burn low-sulfur fuel or achieve an equivalent emission reduction with exhaust gas after-treatment or other methods as follows:

- Starting August 2012, the maximum fuel sulfur limit is 1%.
- In January 2015, the maximum sulfur limit is lowered to 0.1%.
- Beginning in 2016, NO<sub>x</sub> after-treatment requirements become applicable for newly manufactured engines.

Since the intent of the Strategy is to achieve reductions in advance of, and complementary to, applicable regulations, and the IMO standards are now final, the Ports and their Strategy partners are currently reviewing this performance measure. The Ports are committed to assisting OGVs in meeting the IMO standards, particularly for hotelling operations.

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<sup>1</sup> Frequent callers are defined as vessels in regularly scheduled service or strings making five or more calls to one of the three ports in twelve consecutive months.

<sup>2</sup> When the Strategy was developed in 2007, the United States had submitted a proposal to the IMO calling for the equivalent emissions reduction that would result from use of 0.1% sulfur fuel and calls for a circa 80% reduction in NO<sub>x</sub> emissions in defined coastal areas. The Ports supported a flexible approach similar to the US EPA proposal to the IMO that would allow use of technology or a combination of technology and cleaner fuels to reach the proposed standards. If new IMO performance measures substantially similar to the US IMO proposal were not in force by 2015, the Ports agreed to continue to work towards meeting these goals, recognizing that technology and fuel availability could impact shipping lines ability to achieve this goal."

<sup>3</sup> Available online at: <http://www.epa.gov/oms/oceanvessels.htm>.



## 2011 Progress Toward the 2010 Performance Measure

In 2011, 44% of frequent callers to the Ports met the 2010 performance measure. The level of achievement of the 2010 performance measure by the Ports is summarized below. Significant additional progress on this performance measure will be achieved after the IMO standard goes into effect in August 2012.

**Table 2 – OGV 2010 Performance Measure Progress Summary**

Port	2008		2009		2010		2011	
	% of Calls	# of Calls	% of Calls	# of Calls	% of Calls	# of Calls	% of Calls	# of Calls
Port Metro Vancouver	7%	79	1.6%	12	25%	199	18%	180
Port of Seattle	29%	219	64%	454	72%	601	73%	579
Port of Tacoma	57%	433	50%	336	35%	188	50%	261
Overall Weighted Percentage/Total	28%	731	38%	802	46%	988	44%	1,020

In 2011, there was a 2% decrease from 2010 in overall percentage of eligible calls meeting the performance measure. This decrease can be attributed to interruptions to the electrical service at shore power connections and a significantly different context for counting eligible frequent calling vessels at Port Metro Vancouver. Note that even with a slightly decreased percentage of calls meeting the performance measure, the total number of overall calls that met the measure continued to increase yearly and improved performance was seen at the Port of Seattle and Port of Tacoma. The Ports continued to incentivize the use of low sulfur fuels and added shore power connections to make progress in this sector.

## 2011 Progress Toward the 2015 Performance Measure

Because the Emission Control Area standards are not yet in effect, OGV carriers are not yet reporting data that could be used to determine the percentage of applicable OGVs that already meet the August 2012 IMO standard of 1% sulfur fuel or the January 2015 IMO standard of 0.1% sulfur fuel. In addition, the Ports have collected data on fuels used at berth, and not during all operations within 200 nautical miles of the coast as specified under the IMO. While at berth, however, the hotelling auxiliary engines that met the 2010 performance measure of 0.5% sulfur fuel also met the August 2012 IMO standard of 1% sulfur fuel. The Ports will continue to assist OGVs in meeting the sulfur standards both in accordance with, and in advance of, the IMO schedule.

## Summary of Implementation Efforts in 2011

### Port of Seattle

- The At-Berth Clean Fuels Vessel Incentive Program (ABC Fuels), administered by the Clean Air Agency, continues to provide a financial incentive to frequently-calling vessels that burn 0.5% (or less) sulfur fuels in auxiliary engines while at berth. One new container line joined the ABC Fuels program in 2011, which accounted for 27 vessel visits during the year. The incentive was modified in 2011 to offer a tiered incentive payout, depending on the volume of fuel burned while at berth.
- 69% of the vessels participating in the ABC Fuels program (a total of 262 vessels) burned fuel at berth that was less than or equal to 0.1% sulfur in 2011.
- The majority of cruise ships that call at the Port of Seattle plug into shore power. If not using shore power, cruise ships are required through Port tariffs to burn a maximum 1.5% sulfur fuel while at berth. Several cruise lines continue to participate in the ABC Fuels program and burn fuel with 0.5% or lower sulfur content at berth.
- For a second year, Green Gateway Partners Awards were given to selected cruise and container lines. In order to be eligible for an award, applicants must either participate in the ABC Fuels Program or plug into shore power, and demonstrate environmental stewardship initiatives above and beyond existing regulations.
- Working towards the 2015 OGV performance measure, in 2011 the Port of Seattle continued to seek funding to provide shore power at Pier 66.

### Port of Tacoma

- The drop in performance between 2009 and 2010 was attributed to consolidated routes for two shipping lines, which reduced the number of calls by the frequent calling vessels taking part in the vessel sharing agreement.
- Shore power was installed at the Totem Ocean Trailer Express terminal in late 2010. The improvement in 2011 is attributed to the full year of shore power availability as an alternative to burning fuel.

### Port Metro Vancouver

- The EcoAction Program continues to provide reduced harbor dues for vessels going beyond requirements to reduce emissions through options such as use of  $\leq 0.5\%$  sulfur fuel and shore power connections. The highest achievers within the program are recognized with the Blue Circle Award. The 2011 Blue Circle Award recipients included APL (Canada), Disney Cruise Line, Grieg Star Shipping (Canada) Ltd., Holland America Line, "K" Line, Maersk Line, Princess Cruises, and Westwood Shipping Lines.
- Shore power is available at both the east and west berths of Port Metro Vancouver's Canada Place Cruise Terminal.

## Cargo-Handling Equipment

The CHE sector addressed in this report includes the following diesel-powered engines operated on marine terminals: straddle carriers, rubber-tired gantry cranes (RTGs), reach stackers, top and side picks, forklifts, skid loaders, yard tractors/trucks, wharf cranes, and conveyor belts. The Strategy encourages engine retrofit, electrification, hybridization, or replacement with newer engines during capital renewal projects by setting a port-wide fleet emissions goal.

The Strategy outlined the following performance measures.

**Table 3 – CHE Performance Measures**

<b>2010</b>	<ul style="list-style-type: none"> <li>Reach the port-wide equivalent PM reduction of Tier 2 or Tier 3 engines (0.15 g/hp-hr for most CHE) operating with ultra-low sulfur diesel (ULSD) or a biodiesel blend of an equivalent sulfur level (15 ppm sulfur), and promote early implementation of the requirements between now and 2010.</li> <li>All new terminals will be equipped with new CHE equipment meeting the highest standards that is practicable for the anticipated use at the time of purchase.</li> </ul>
<b>2015</b>	<ul style="list-style-type: none"> <li>Reach a port-wide equivalent of Tier 4 engines, for 80% of equipment.</li> <li>Retrofit the remainder of equipment with best available verified retrofit technologies.</li> <li>Purchase the cleanest available CHE equipment that is practicable for the anticipated use at the time of scheduled capital upgrades.</li> </ul>

The performance measure is for a port-wide equivalent emissions value, which is most clearly represented as the average emission rate across all equipment (fleet-wide average). With this calculation, CHE that surpass the Tier 2, 3, or 4 standards are shown to offset emissions from equipment that do not meet the Tier 2, 3, or 4 standards, particularly if averaging electric CHE with an emission rate of 0 g/hp-hr. However, the Ports are still working to develop a methodology to determine a fleet-wide average, and progress toward these performance measures is still reported on the basis of individual pieces of equipment. Results below indicate the percent of individual CHE equipment that met or surpassed the performance measure standard.

### 2011 Progress Toward the 2010 Performance Measure

In 2011, 60% of CHE met or surpassed Tier 2 or Tier 3 engine standards. All CHE have used ULSD fuels or biofuel with equivalent sulfur levels since 2008 at the Port of Seattle and Port of Tacoma, and since 2010 at Port Metro Vancouver<sup>4</sup>.

<sup>4</sup> Note ULSD was a regulatory requirement for off-road engines in 2010 for both Canada and the U.S. At Port Metro Vancouver, 55% of CHE used ULSD and/or biodiesel blends in advance of the regulatory requirement (as reported in the 2009 Implementation Report).

Table 4 shows the percent of CHE that met or surpassed the Tier 2 or 3 engine standard by year.

**Table 4 – CHE 2010 Performance Measure Progress Summary**

Port	2008	2009	2010	2011
Port Metro Vancouver	29%	32%	53%	54%
Port of Seattle	9%	68%	55%	58%
Port of Tacoma	47%	70%	77%	68%

Progress was achieved through retrofits and replacement of engines. In the U.S., funding was provided through the EPA Diesel Emission Reduction Act (DERA), the Clean Air Agency, and Ecology's Clean Diesel Grant program.

The Ports had several challenges meeting the performance measure due to economic and technological factors. Many pieces of older CHE are still in use because the replacement costs are high. Grant programs focused on retrofitting equipment were delayed due to technical issues discovered with one new retrofit technology.

The Ports continue to aggressively pursue grants, partnerships, and all available opportunities for funding to meet 2010 performance measures, while staying focused on fleet modernization as the ultimate goal.

### 2011 Progress Toward the 2015 Performance Measure

In 2011, 6% of CHE met or surpassed Tier 4 engine standards. Progress toward the 2015 performance measure is modest due to the challenges mentioned above. Table 5 shows the percent of CHE that met or surpassed the Tier 4 engine standard.

**Table 5 – CHE 2015 Performance Measure Progress Summary**

Port	2011
Port Metro Vancouver	7%
Port of Seattle	3%
Port of Tacoma	8%

## Summary of Implementation Efforts in 2011

### Port of Seattle

- In 2011, the Port of Seattle gained back a little ground lost in the prior year towards meeting the 2010 performance measure for CHE. The lost ground was caused by the failure of Diesel Multi-stage Filters (DMFs) from one manufacturer. With funding provided by Ecology, the DMFs were installed on 81 pieces of CHE at the Port of Seattle and were projected to decrease PM emissions from that equipment by 50%. By the fall of 2010, some of the DMFs were plugging with soot due to low exhaust temperatures. DMF removal was initiated in 2010 and completed in early 2011 at the recommendation of the manufacturer. The refunded cost of the DMFs was used in 2011 and 2012 to install Diesel Particulate Filters (DPFs) from another manufacturer on some of the CHE at port terminals.
- Under an EPA DERA grant, with Clean Air Agency and Port of Seattle matching funds, 13 CHE were retrofitted with DPFs.
- Under the same EPA DERA grant, with Clean Air Agency and Port matching funds, ten Tier 1 yard trucks with Tier 1 engines were replaced with newer yard trucks, reducing PM from engines by an estimated 98%.

### Port of Tacoma

- During data collection efforts related to the 2011 Puget Sound Air Emission Inventory work, rarely used or previously unrecorded equipment was discovered through terminal operator interviews. In addition, a new port tenant began operation of a log export facility in late 2010 and their equipment was added to the CHE inventory in 2011. For both cases, the newly listed equipment is a mixture of emission certification levels (from non-certified to Tier 4), which affected 2011 performance against the 2010 performance measures.
- Using a combination of Ecology, EPA, Clean Air Agency, and Port of Tacoma funds, 50 CHE were retrofitted with DPFs.
- All newly purchased CHE by existing tenants (23 total) met the highest standards practicable for the equipment type.

### Port Metro Vancouver

- Port Metro Vancouver's results for 2011 are now based on its entire jurisdiction, including the Fraser River, Burrard Inlet, and Roberts Bank.
- 3 Tier 1 and Tier 2 RTGs were retrofitted with variable speed generators.
- 3 Tier 3 RTGs were retrofitted with an electric hybrid system.
- 2 yard trucks were retrofitted with DPFs.



## Trucks

Drayage (or container) trucks are primarily diesel-fueled, heavy-duty trucks that transport containers and bulk cargo to and from ports and rail yards. The Strategy calls for all trucks operating at the Ports to meet specific PM emissions levels.

The Strategy outlined the following performance measures.

**Table 6 – Trucks Performance Measures**

<b>2010</b>	<ul style="list-style-type: none"><li>Reach the equivalent PM emissions level of 1994 or newer heavy-duty truck engine model year through vehicle purchase or by using approved retrofit packages.</li></ul>
<b>2015</b>	<ul style="list-style-type: none"><li>Eighty percent of heavy-duty drayage trucks will reach the equivalent PM emissions level of 2007 or newer engine model year through vehicle purchase or by using approved retrofit packages. This is an interim objective on the way to the goal of 100% of heavy-duty drayage trucks by 2017.</li><li>All gates will have an automated system using best available technology to reduce truck waiting times.</li></ul>

The performance measures for trucks state that progress should be measured by truck engine model year. However, this information is not available in many cases; thus, the Ports are reporting progress based on truck model year if engine model year is not available.

### 2011 Progress Toward the 2010 Performance Measure

The 2010 performance measure for emissions from drayage trucks was achieved by the Port Metro Vancouver in 2009 and by the Port of Seattle in 2010. The Port of Tacoma increased performance by 5% to nearly 100% in 2011. Table 7 shows the percentage of trucks that reached the equivalent PM emissions level of a 1994 or newer model year heavy-duty truck engine.

**Table 7 – Truck 2010 Performance Measure Progress Summary**

Port	2008	2009	2010	2011
Port Metro Vancouver	95%	100%	100%	100%
Port of Seattle	76%	77%	100%	100%
Port of Tacoma	86%	90%	94%	99%

Operators are meeting the performance measure primarily through truck scrappage and replacement. Retrofits meeting the 1994 or 2007 equivalent emission rate have not been found to be cost effective. However, as noted below, Port Metro Vancouver began requiring 1998 and older model year trucks already registered in the Truck Licensing System (TLS) to install retrofits.



## 2011 Progress Toward the 2015 Performance Measure

In 2011, 19% of all drayage trucks visiting one of the three ports have a 2007 or newer model year engine or equivalent PM emission level (see Table 8).

Scrappage and replacement programs have allowed some truck operators to upgrade to a newer model year engine than required to meet the 2010 performance measure (1994 model year engine). In some cases, trucks were upgraded to model year 2007 or newer, which meets the 2015 performance measure. The scrappage program has concluded at the Port of Seattle and is just beginning at the Port of Tacoma.

**Table 8 – Truck 2015 Performance Measure Progress Summary**

Port	2011
Port Metro Vancouver	26%
Port of Seattle	10%
Port of Tacoma	20%

These percentages are estimates using the best methods and technology currently available to the Ports for determining truck engine age. It is not uncommon for trucks to have engines from a prior manufacturing year, and some trucks may have replacement engines newer or older than originally equipped. Port Metro Vancouver and the Port of Tacoma developed their estimates based on truck model year data from their truck registries (generally truck model year 2007 or newer, except for cases in which a truck owner has declared an engine replacement in an older truck). The Port of Seattle percentage is extrapolated from limited truck call data on model year 2008 and newer trucks.

## Summary of Implementation Efforts in 2011

### Port of Seattle

- Through its Drayage Truck Registry, the Port of Seattle restricts access to container terminals to trucks with 1994 and newer model year engines or equivalent PM emission levels.
- The Scrappage and Retrofits for Air in Puget Sound (ScRAPs) program to buy-back, scrap, and replace pre-1994 engine model year trucks concluded in early 2011. Between 2009 and 2011, a total of 280 trucks were removed from service and scrapped. Eleven of these were scrapped in early 2011, as the program drew to a close.
- The Port of Seattle initiated plans to place RFID tags on drayage trucks. This will allow Port of Seattle to better track the engine model year and number of drayage truck visits and will enable terminals to speed up truck check-in at terminal gates, thereby reducing idling.



#### Port of Tacoma

- Port of Tacoma installed Optical Character Recognition of truck license plates at two gates in 2011.
- The Tacoma ScRAPs program launched by the City of Tacoma in collaboration with the Port of Tacoma, the Clean Air Agency, and Ecology will replace pre-1997 trucks with low-emission trucks through funding from the US Department of Transportation Congestion Mitigation and Air Quality Grant, Ecology's Clean Diesel Grant program, and truck owners. A total of eight trucks were scrapped and replaced in 2011, which resulted in a total annual emission reduction of 0.66 tons of particulate matter.

#### Port Metro Vancouver

- Starting in 2011, as part of Port Metro Vancouver's Truck Licensing System (TLS), trucks already in the TLS with model year 1998 and older engines had to install an eligible emission reduction retrofit or replace the engine.
- Also starting in 2011, trucks new to the TLS had to be model year 2007 or newer.

## Rail

Within the Ports, emissions from rail yard activities occur from both line-haul and switch locomotives. Line-haul locomotives typically move across the country whereas switch locomotives are used for building and breaking apart trains on-site and moving rail cars or built trains from the marine terminals to rail yards for long distance transportation. Due to the limited ability of the Ports to influence this sector, the performance measures promote both supporting and working with railways and with regulatory agencies to implement emission reduction techniques.



The Strategy outlined the following performance measures.

**Table 9 – Rail Performance Measures**

<b>2010</b>	<ul style="list-style-type: none"> <li>At the Ports of Tacoma and Seattle, expedite the implementation of the SmartWay Partner commitments at intermodal facilities where BNSF, Union Pacific, and Tacoma Rail have operations in the Puget Sound region.</li> <li>At Vancouver Port Authority, work with the industry and regulatory agencies to develop a British Columbia Locomotive and Rail Air Quality Work Group in 2008, through which collaborative efforts to reduce emissions from the rail sector will be developed.</li> </ul>
<b>2015</b>	<ul style="list-style-type: none"> <li>Compliance with the EPA Proposed 2007 Locomotive and Marine Diesel Engine Rule which, if adopted, will reduce PM emissions from all new locomotives engines by 90%.</li> </ul>

EPA finalized the *Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder Rule* (hereafter referred to as “Locomotive and Marine Rule”) on May 6, 2008 (re-published on June 30, 2008). The three-part program applies:

1. Requirements for existing locomotives and marine engines to meet lower emission standards when they are re-manufactured, as early as 2008.
2. New emission standards, Tier 3, for newly-built locomotive and marine engines, and phased in starting 2009, new idle reduction requirements for new and remanufactured locomotives, and a new generation of clean switch locomotives.
3. New emission standards, Tier 4, for newly-built locomotives and diesel marine engines, phased in starting 2015 for locomotives.

Since the purpose of the Strategy is to achieve reductions in advance of, and complementary to, applicable regulations and the US EPA’s Locomotive and Marine Rule is now final, the Ports and their Strategy partners are currently reviewing this performance measure. The Ports are committed to assisting railways in meeting the Locomotive and Marine Rule.



## 2011 Progress Toward the 2010 Performance Measure

The 2010 performance measure was achieved in 2008. At the Port of Tacoma and Port of Seattle, Burlington Northern Santa Fe Railway (BNSF), Union Pacific, and Tacoma Rail became partners in the EPA SmartWay program in 2008. Likewise, Port Metro Vancouver took part in the creation of the British Columbia Locomotive and Rail Air Quality Work Group in 2008.

## 2011 Progress Toward the 2015 Performance Measure

So far, data are not available to the Ports to determine the railways' progress towards meeting the Locomotive and Marine Rule. Reporting the progress on this performance measure is deferred until this performance measure is updated and data becomes available.

## Summary of Implementation Efforts in 2011

### Port of Seattle

- The Port of Seattle and the Clean Air Agency continued to support the EPA SmartWay commitments by BNSF and Union Pacific.
- The Port of Seattle and the Clean Air Agency continued to pursue grant opportunities with the railways to secure additional investments to further reduce emissions.

### Port of Tacoma

- The Port of Tacoma and the Clean Air Agency continued to support the EPA SmartWay commitments by Tacoma Rail.
- Switching locomotives at the Port of Tacoma's TEMCO Grain Terminal were equipped with automatic engine startup-shutdown (AESS) devices to reduce idling. Funding for the AESS project came from TEMCO, DERA, and Ecology's Clean Diesel Grant Program. Based on typical results from a similar AESS project, it is anticipated that this project will reduce emissions of PM by 0.4 tons per year, NO<sub>x</sub> by 11.8 tons per year, and CO<sub>2</sub> by 675 tons per year.
- Tacoma Rail partnered with the EPA and the Clean Air Agency to retire three circa 1950's locomotives and replace them with re-manufactured locomotives. Two were equipped with EPA Tier 2 diesel engines and one was equipped with an EPA Tier 3 diesel engine. These replacements are expected to reduce emissions of NO<sub>x</sub> by 36 tons per year, CO by 27 tons per year, PM by over 2 tons per year, and total hydrocarbons by over 7 tons per year.
- From 2007 through 2011, Tacoma Rail has saved 440,000 gallons of ULSD and reduced GHGs by 209 tons through the use of ant-idling equipment.



Port Metro Vancouver

- In 2011, Port Metro Vancouver worked with rail service providers on a collaborative supply-chain agreement to improve operational efficiency. As a result, dwell times were reduced by 30%, to consistently fewer than 3 days. Port Metro Vancouver will continue to work with rail service providers by collaborative means to improve operational and equipment efficiency to manage impacts of projected growth.

## Harbor Craft

The harbor craft sector includes non-ocean-going vessels such as ferries, fishing vessels, commercial vessels, tugs, tour boats, U.S. Coast Guard vessels, work boats, barges, and pleasure craft. The Strategy does not identify specific performance measures for harbor craft. However, introduction of performance measures may be included as part of the current effort to review and update of the Strategy.



Key initiatives by government agencies and local operators in 2011 included:

- An engine upgrade kit was demonstrated in 2009 on the Seattle-based fishing vessel, *Fierce Allegiance*, to reduce PM emissions by 25% in a partnership between the Clean Air Agency and the Caterpillar Corporation. EPA certified this upgrade kit and it has become mandatory for this engine model under the EPA's Locomotive and Marine Rule for all U.S. ports. The Locomotive and Marine Rule applies to commercial harbor craft vessels that meet the following criteria for their diesel engines: manufactured after 1973, rated above 800 horsepower, and displacement of less than 30 liters per cylinder (referred to as Category 1 and 2 engines). A summary of the requirements of the Locomotive and Marine Rule is provided in the Rail section above.
- Funding was received in 2011 to repower the tug boat *Eagle*, owned and operated by Harley Marine in Puget Sound (approximately 30% of the time in Port of Tacoma and 70% of the time in Port of Seattle). Funds for the project come from Harley Marine, DERA, and Ecology's Clean Diesel Grant program.
- Washington State Ferries (WSF) continued using ULSD or low-sulfur fuel in all vessels along with more than 200,000 gallons of biodiesel in 17 ferries.
- WSF completed engine upgrades with ultra-low-lube oil packs for nine engines on four vessels, partially funded by the Congestion Mitigation and Air Quality grant.
- WSF installed a basic fuel monitoring system on the *MV Walla Walla*. WSF estimates the close monitoring of fuel consumption could save 2% of the annual total fuel use for vessels with meters.



- WSF commissioned a study looking at the feasibility of converting its 144-car ferry design to liquefied natural gas (LNG) fuel. The study, which investigated design, economic, regulatory, and environmental issues, concluded that the conversion is both technically feasible and cost effective, although technical and regulatory challenges remain. WSF also investigated the feasibility of converting the *Issaquah* class ferries to LNG fuel and submitted its design to regulators for review and comment. WSF is working with legislators to find opportunities to continue funding its investigation of fueling vessels with LNG. The use of LNG in the fleet could potentially reduce operating costs while also reducing PM and SO<sub>x</sub> by close to 100%. LNG would also significantly reduce NO<sub>x</sub> emissions.
- Seaspan Marine Corporation (Seaspan) operates a wide variety of vessels in and around Port Metro Vancouver. Seaspan became the first major West Coast vessel owner to join the Green Marine environmental program<sup>5</sup>. SMIT Canada Inc., as well as Island Tug and Barge, are also Green Marine participants. As participants, environmental performance is reported on six impacts, including air emissions of criteria pollutants (SO<sub>x</sub> and NO<sub>x</sub>) and greenhouse gases.
- British Columbia Ferries (BC Ferries) is investigating the feasibility of using of LNG in its fleet for both new vessels and the conversion of existing vessels.
- BC Ferries is committed to using cleaner fuels than legislation required. In 2011, fuel quality met 2016 North American Emissions Control Area standards and, where available, incorporated a 5% alternative fuel component.
- All BC Ferries, vessels, and terminals where the vessels berth at night are equipped with shore power capabilities.
- BC Ferries continually investigates opportunities for fuel consumption reduction. These opportunities include but are not limited to standardization of vessel operations, use of new hull coatings and interoperability of vessels to suit demand, and promoting anti-idling at all terminals and on all of its vessels.
- BC Ferries purchased electric vehicles to replace gasoline-powered vehicles at major terminals.

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<sup>5</sup> Green Marine is a voluntary environmental program for the Canadian and U.S. marine industry. A program summary is provided on their website: <http://www.green-marine.org/home>, last visited 5/2/2012.

## Port Administration

Emissions from port administration are mainly associated with vehicle, vessel, and other equipment use, handling of waste, as well as with electricity and gas consumption in port buildings. There is currently no performance measure for the port administration sector; however, implementation initiatives include best management practices related to electrical or hybrid vehicle use, energy use, and handling waste. The ongoing and new initiatives are highlighted in Table 10.

**Table 10 – Port Administration Initiatives**

Environmental Program	Port Metro Vancouver	Port of Seattle	Port of Tacoma
Corporate emissions inventory & reporting	√	√	
Energy audits		√	√
Sustainable procurement	√	√	
Vehicle fleet fuel efficiency upgrades	√	√	√
Energy and/or carbon offsets purchased	√		√
Recycle construction waste	√		√
Reduced commutes with alternate office locations and flex time schedules. Promoted sustainable forms of transportation commuting and/or business travel	√	√	√
Collaborate with Western Washington Clean Cities Coalition on clean vehicle fleet initiatives	Not applicable	√	√
Composting and/or recycling	√	√	√
Energy conservation measures, such as yard lighting retrofits, upgrades to heating systems, ventilation, and/or air conditioning controls, and employee awareness programs	√	√	√

## Summary of Implementation Efforts in 2011

### Port of Seattle

- Through membership in the Western Washington Clean Cities Coalition and its Evergreen Fleets program, the Port of Seattle is promoting cleaner air, minimizing greenhouse gas emissions, and reducing fuel consumption through smart and efficient fleet management practices. A member of the Port's Marine Maintenance staff is on the steering committee of the Western Washington Clean Cities Coalition.
- Removed one pickup truck from the fleet and did not replace it.
- Replaced a 1996 PCS Dump Truck with one that meets 2010 emission standards.
- Replaced a 1977 heavy capacity forklift with one that meets 2010 emission standards.
- Replaced standard paint spray guns with high-velocity, low-pressure guns.
- Opened the Marine Maintenance North Office for trip reductions to job sites and shorter commutes.

*Port of Tacoma*

- The Port of Tacoma recycled over 8,000 tons of material from demolition and deconstruction projects, representing a recycling rate of 98%.
- Worked with Tacoma Power to implement lighting retrofits under the Bright Rebates Program that will conserve energy. A total of 389 fixtures presently rated 1,000-watt lamps have been replaced with 775-watt lamps that provide comparable light.
- Added telecommuting and flexible work schedule to the Port's existing Commuter Trip Reduction program that saved more than 7,300 gallons of fuel in 2011.

*Port Metro Vancouver*

- Port Metro Vancouver implemented energy conservation measures including changes to HVAC, lighting equipment and controls, and behavioral practices. These measures reduced electricity consumption at its maintenance facility by 26% (86 MWhs or 310 GJ) and reduced 2.16 tonnes of GHG.
- 49% of employees took part in the annual Commuter Challenge and the port was recognized as one of the leading participants in the 2011 Insurance Corporation of British Columbia Commuter Challenge
- A group of sustainable commuters known as ECOmmuters was developed. The ECOmmuters group held information and brainstorming sessions on active transportation opportunities as well as contests to recognize leading participants.
- Six hybrid vehicles were replaced with five hybrids with higher fuel efficiency.
- The successful Sort Smart waste management program at the main office was expanded to the maintenance facility.
- Carbon offsets based in British Columbia were purchased for corporate emissions of GHGs.

## Conclusion

Since the implementation of the Strategy in 2008, the Ports, stakeholders, and partners have achieved considerable progress toward the performance measures in the OGV, CHE, and truck sectors, and have completed several emission reduction actions in the rail, harbor craft, and port administration sectors. The majority of the emissions sources are outside the Ports' direct functional control. Most of the diesel-powered equipment is owned or operated by other parties such as port tenants, trucking companies, and shipping lines, and some, but not all, of their activities are regulated by air agencies. Nonetheless, the Ports have made consistent progress considering their boundaries of influence. Table 11 illustrates this progress.

**Table 11 – Summary of Status and Implementation Efforts in 2011 for Each Sector**

Sector	Implementation Efforts in 2011	2010 Performance Measure Status	2015 Performance Measure Status
Ocean-Going Vessels	<ul style="list-style-type: none"> <li>Incentives for using cleaner fuels at berth.</li> <li>Providing shore power connections.</li> <li>Award programs.</li> </ul>	44% met or surpassed	No data available
Cargo-Handling Equipment	<ul style="list-style-type: none"> <li>Use of ULSD and/or biofuel.</li> <li>Exhaust retrofit or equipment replacement.</li> </ul>	60% met or surpassed	6% met or surpassed
Trucks	<ul style="list-style-type: none"> <li>Scrappage and replacement programs.</li> <li>Limit access to container terminals through truck registries.</li> </ul>	100% met or surpassed	19% met or surpassed
Rail	<ul style="list-style-type: none"> <li>Support EPA SmartWay commitments.</li> <li>Pursue grant opportunities.</li> <li>Install idle reduction devices.</li> <li>Replace old engines.</li> <li>Collaborative supply-chain agreement to improve operational efficiency.</li> </ul>	√	No data available
Harbor Craft	<ul style="list-style-type: none"> <li>Engine replacement or installation of upgrade kits.</li> <li>Use of ULSD, low-sulfur, and/or biodiesel.</li> <li>Participation in the Green Marine program.</li> <li>Investigation of alternative fuels.</li> </ul>	√	Continue emission reduction initiatives
Port Administration	<ul style="list-style-type: none"> <li>Corporate emission inventory &amp; reporting.</li> <li>Energy audits.</li> <li>Sustainable procurement.</li> <li>Vehicle fleet fuel efficiency upgrades, scrappage, and/or replacement.</li> <li>Energy and/or carbon offsets purchased.</li> <li>Reduced commutes and promote sustainable transportation.</li> <li>Collaborate with Western Washington Clean Cities Coalition.</li> <li>Composting and/or recycling.</li> <li>Energy conservation measures.</li> </ul>	√	Continue emission reduction initiatives

The Ports recognize the need to adjust the Strategy periodically to reflect new regulatory standards, technological advancements, air emissions inventory data, and evolving climate change policy. The Ports and partner agencies are currently undertaking a review and update of the Strategy in light of the developments listed below.



- **Updated Emissions Inventory** - The results of the most recent Port Metro Vancouver Land-Side Emission Inventory were published in the Spring of 2012, and a 2011 Puget Sound Emission Inventory update is expected in to be completed in fall of 2012. The emission inventories offer an objective benchmark in measuring progress and refining the Strategy. This updated information is expected to help identify where the Ports should focus their emission reduction efforts and justify further investment in emission reduction programs.
- **New Regulations** - Two important regulations that affect port-related sources were adopted since the Strategy was developed in 2007: the IMO North American Emissions Control Area fuel standards, applicable to OGVs within 200 nautical miles of shore; and EPA's Locomotive and Marine Rule, applicable to U.S. locomotives and small marine engines (harbor craft). It is likely that the performance measures and potential emission reduction actions will be adjusted to complement and/or supplement these new rules.
- **Milestone Elapsed** - The Strategy's near-term milestone year (i.e. 2010) has elapsed.

The Strategy update may incorporate revisions to the overall objectives and 2015 performance measures where appropriate. Any new long-term emission reduction goals will leverage maturing technologies and likely pursue energy efficiency enhancements.

The Ports will continue to encourage the spirit of collaboration and cooperation among the Ports and their partners, to promote the proactive engagement of stakeholders, to try innovative approaches for reducing emissions, and to pursue federal and state/provincial funding programs and grants.

