

Ocean-Going Vessel Technology to Reduce Main Engine Emissions at the Port of Long Beach and the Port of Los Angeles

REQUEST FOR INFORMATION



Port of
LONG BEACH
The Green Port

DATE: May 20, 2013

SUBJECT: Request for Information for Ocean-Going Vessel Technology to Reduce Main Engine Emissions for use at the Port of Los Angeles and the Port of Long Beach

The Port of Long Beach and the Port of Los Angeles (Ports) seek the submittal of information packages by vendors for technologies that are effective in substantially reducing exhaust gas emissions from marine engines. This Request for Information (RFI) specifically seeks information on technologies that can be used to reduce ocean-going vessel (OGV) main engine as well as potentially auxiliary engine and boiler exhaust emissions, while the vessel is transiting to and from the Ports.

The Ports seek technologies that meet or exceed the International Maritime Organization (IMO) Tier 3 engine standard for oxides of nitrogen (NOx), which is 3.4 grams NOx per kilowatt-hour for slow-speed engines. The Ports' Clean Air Action Plan (CAAP) established a target of significantly reducing air pollutant emissions from all port sources, including OGVs, to help meet the goals outlined in the San Pedro Bay Standards. These emission reduction targets are consistent with the goals established by the California Air Resources Board (CARB) in its Goods Movement Action Plan.

This is not a formal solicitation for proposals. The Ports will use this information to better understand the technologies, infrastructure requirements, and unique characteristics of proposed emissions control strategies primarily for main engines. The information provided will allow the Ports to determine potential cost and schedule requirements for a future port-sponsored demonstration of one or more OGV emission reduction technologies. As such, the Ports will not make a vendor selection from this RFI. The Ports, however, may elect to issue a formal Request for Proposals at a later date if there are several vendors with similar technologies and/or ask some vendors to submit formal proposals to the Ports Technology Advancement Program (TAP). The TAP is a Ports' program that provides funding for technology demonstration projects (more details on the TAP are provided in the RFI, or go to <http://www.cleanairactionplan.org/programs/tap/default.asp>).

Information package preparation guidelines and submittal instructions are included in this RFI, along with port staff contacts, should you have questions or need additional clarification.

On behalf of the Ports, thank you in advance for your participation in the "first step" of an important, innovative clean air strategy.

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1 Background

In 2006, the Port of Long Beach and Port of Los Angeles (Ports) adopted the San Pedro Bay Ports Clean Air Action Plan (CAAP). The CAAP provides the overall strategy for dramatically reducing air pollution emissions from port-related cargo movement. This far reaching and unprecedented plan was developed with the cooperation and assistance of the U.S. Environmental Protection Agency (EPA), California Air Resources Board (CARB), and the South Coast Air Quality Management District. Creation of the CAAP was a proactive commitment by the two Ports to reduce port-related air pollution. The CAAP's primary goal was to dramatically reduce emissions and associated health risk for the Southern California region while allowing port development to continue.

The CAAP focuses on development and implementation of near-term strategies. The Ports agreed that the CAAP would be a "living" document that would undergo periodic reviews and updates to reflect the most recent implementation status, incorporate new and revised measures, identify changes that have resulted from recent regulatory activities, and include long-term targets for reduction of cancer risk and air pollution from cargo movement at the Ports. The 2010 CAAP Update identifies planning goals through the end of 2014, a health risk reduction goal for 2020, and emissions reduction goals for the years 2014 and 2023.

One measure revised in the CAAP Update (CAAP Measure OGV6) specifically targets emission reductions from ocean-going vessels (OGV) transiting to and from San Pedro Bay, and highlights the need for technologies to control oxides of nitrogen (NOx) and diesel particulate matter (DPM) emissions from the main engines of in-use vessels.

The amended International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) Annex VI, requires a progressive reduction in sulfur oxides (SOx) emissions associated with ship fuels, as well as a reduction in NOx emissions from ship engines. Tier 3 engines, which will be required on all new-built ships servicing Emission Control Areas (ECAs) in 2016, sets the NOx standard at 3.4 grams NOx per kilowatt-hour (g NOx/kW-hr) for slow-speed engines.

Ultimately, the Ports aim to identify technologies that could reduce main engine emissions to Tier 3 NOx limits of 3.4 g/kW-hr for slow-speed engines. Technologies that meet or exceed Tier 2 NOx limits (14.5 g/kW-hr) are also of interest.

2 Introduction

The purpose of this Request for Information (RFI) is to obtain technical and programmatic information on emission reduction technologies that can be used to reduce NOx emissions, and to a lesser extent, particulate matter (PM)/diesel particulate matter (DPM), emissions from main engines on the existing fleet of OGVs while transiting to and from the Ports. These emission reduction technologies can include but are not limited to: engine technologies, engine support technologies, after-treatment technologies, alternative fuels, alternative supplemental power systems, and ship-related efficiencies. For the purpose of this RFI,

main engines are defined as an engine on an OGV designed primarily to provide propulsion power.

The CAAP Update Measure OGV6 seeks to encourage the demonstration and deployment of cleaner OGV engine technologies that are validated through the Technology Advancement Program (TAP) or by the regulatory agencies (i.e. EPA and CARB). The goal of this measure is to reduce NOx and DPM emissions from transiting OGVs. Respondents to this RFI should focus on their technology's capabilities in reducing main engine exhaust emissions from any type of OGV that calls at the Ports.

While main engine exhaust emission reductions are a required element under this RFI, respondents are also encouraged to discuss their technology's capabilities in treating OGV auxiliary engine emissions and boiler emissions, if applicable. Any emission reductions achieved from OGV boilers are considered surplus to those targeted under the 2010 CAAP Update. Respondents to this RFI are asked to present their technology's capabilities for reducing OGV boiler emission reductions in terms of incremental requirements for their proposed technology solution, including impacts on system design, size, power requirements, effluent discharge, system capital cost, operations costs, etc. This will be discussed further in Section 3 of this RFI.

Who Should Respond to this Request for Information?

Vendors of emission reduction technologies that could be used in main engine OGV applications are encouraged to review the RFI materials included herein and submit an information package. Vendors include, but are not limited to, developers and manufacturers of industrial exhaust gas scrubbing systems, marine exhaust gas scrubbing systems, diesel emission control devices, selective catalytic reduction systems, distributed generation equipment, alternative fuels, etc.

Is the Proposed Technology Required to be Commercially Available?

No. The Ports understand that many of the technologies submitted in response to this RFI will be based upon emission reduction technologies used in other industrial applications but not necessarily currently available for maritime use. Respondents will be asked, however, to address the degree of "technical maturity" of their proposed main engine emission reduction technology.

What will be the Result of this Request for Information?

Depending on the responses received, the following are potential outcomes of this RFI:

- The Ports may ask some respondents to submit a formal proposal to the TAP for the development and demonstration of one or more main engine emission reduction technologies.
- The Ports may determine there are several vendors with similar viable technologies and issue a competitive RFP to select one of these vendors for a TAP-funded demonstration project.

- The Ports may determine that it is premature to embark on the development and demonstration of a main engine emissions reduction technology demonstration project at this time.

How does the Technology Advancement Program (TAP) work?

The TAP is a joint Ports program that aims to accelerate the commercialization and deployment of clean technologies by funding port-related demonstration projects. Projects are evaluated by an Advisory Committee consisting of the Ports and air quality regulatory agencies for their potential emission reductions, cost, feasibility, technology operational performance, and technical approach.

Generally, the TAP requires the following commitments from awardees:

- A project partner from the port industry (in this case, a shipping line or ship owner) that has agreed to install, use, and test the technology for the contract duration
- 50% match funding from the vendor and/or project partner (in-kind support can count toward the match)
- The demonstration must take place within San Pedro Bay waters and/or in a vessel that calls within the San Pedro Bay

More details can be found on the TAP website:

<http://www.cleanairactionplan.org/programs/tap/default.asp>

Technology vendors are encouraged to review the TAP guidelines.

3 Technical Overview

The following sections discuss the Ports' goals as they pertain to reducing transiting emissions from OGV main engines.

3.1 Goal

The Ports' goal is to reduce NOx and DPM emissions from vessel main engines. The Ports envision that technologies demonstrated through the TAP might be used to reduce OGV engine emissions upon determination and verification of their emissions control efficiencies.

Some examples of potential ways to reduce emissions from large marine diesel engines include:

- Engine Technologies
- Engine Support Technologies
- After-Treatment Technologies
- Alternative Fuels
- Alternative Supplemental Power Systems
- Ship-Related Efficiencies

For more information on emission reduction technologies please see the San Pedro Bay Ports Emission Reduction Strategy Guide:

<http://www.cleanairactionplan.org/civica/filebank/blobdload.asp?BlobID=2540>.

The goal of OGV6 is to demonstrate technologies and accelerate commercialization of main engines that achieve an 80% reduction in NO_x emissions from Tier I main engines. Please note that the emission reduction goal is above and beyond emission reductions achieved through the use of low sulfur marine fuels.

3.1.1 Eligible Engine Types

Eligible OGV engine types are diesel two-stroke slow-speed and four-stroke medium-speed engines used for propulsion.

3.2 Targeted Pollutants

The emission reductions sought through the use of OGV Main Engine Emissions Reduction technologies applies to the following criteria air pollutants:

- Nitrogen Oxide (NO_x)
- Diesel Particulate Matter (DPM)

Emission reductions are also sought from additional criteria air pollutants, including SO_x, carbon monoxide (CO) and volatile organic compounds (VOC). Reductions in these criteria pollutants, while beneficial and desired by the Ports, are less critical as compared to the focus criteria pollutants DPM and NO_x. In addition, greenhouse gases (GHG), including carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) are not included within the OGV Main Engine Emissions Reduction goal. However, reductions in GHG are highly sought by the Ports because of potential emission reduction co-benefits; thus, ***respondents to this RFI should highlight their technology's capabilities as they pertain to the reduction of CO, VOC, and GHG.***

3.3 San Pedro Bay Operating Conditions

Proposers should be aware of the following specific conditions for San Pedro Bay, which go beyond international regulations.

3.3.1 Fuel Specifications

Ships are required under CARB's Ocean-Going Vessel Fuel Rule to use low-sulfur content marine distillate fuels along the California coast and when at berth. The allowable sulfur content, currently 0.5% for marine diesel oil, will be further reduced to 0.1% for both marine diesel oil and marine gas oil on January 1, 2014.

Under the revised MARPOL Annex VI, the global sulfur cap applicable in the North American Emission Control Area (ECA) for SO_x and PM will be reduced to 0.1%, effective January 1, 2015.

For purposes of the RFI, emission reduction benefits should be based on using CARB-compliant fuel with sulfur not exceeding the applicable CARB standard.

3.3.2 Vessel Speed Reduction

The Ports have a high percentage of vessels that participate in the Vessel Speed Reduction Program; roughly 90% of vessel calls in San Pedro Bay arrive and depart the harbor at 12 knots or less. For purposes of this RFI, proposers should characterize their technology's ability to operate effectively and generate reductions at such lower engine loads.

3.4 Additional Considerations

Respondents to this RFI should be cognizant of additional factors that may influence their technology design and operation. Additional factors that may or may not be applicable to a specific technology solution include wastewater discharge and ammonia slip. ***Please note that technology solutions must be compatible with all current regulatory requirements and Port of Los Angeles and Port of Long Beach environmental practices.***

3.4.1 Wastewater Discharge Quality

Proposers should include a characterization of the discharge effluent in their RFI response. Effluent limits must meet California discharge standards, which can be found here:

<http://www.epa.gov/fedrgstr/EPA-WATER/2000/May/Day-18/w11106.pdf>

Additionally, please review and consider the EPA's Vessel General Permit for vessel discharge limits and regulations, as well as California State Water Resources Control Board's 401 Certification of the Vessel General Permit. Specifically, refer to the discharge requirements for Exhaust Gas Scrubber Washwater Discharge (section 2.2.26 of the 2008 and Draft 2013 Vessel General Permit). The Vessel General Permit can be found here:

<http://cfpub.epa.gov/npdes/vessels/vgpermit.cfm>.

The State's 401 Certification can be found here:

http://www.waterboards.ca.gov/water_issues/programs/beaches/vssl_prmt.shtml.

The data provided by respondents to this RFI will assist the Ports in understanding potential disposal and infrastructure requirements, should this technology be pursued under a future port-funded demonstration project. All discharges shall comply with Federal, state, and local regulations. Refer to the Ports' Vessel Discharge Rules and Regulations guidance manual for more information: <http://www.polb.com/civica/filebank/blobload.asp?BlobID=7587>

Additionally, proposers should be aware that if selected for a demonstration, they may be required to conduct effluent sampling to ensure the technology will meet all current and future water quality standards in the Los Angeles region.

3.4.2 Ship Testing Protocol

Respondents should be aware that CARB has developed Recommended Emissions Testing Guidelines for Ocean-Going Vessels to provide testing guidance in support of control equipment manufacturers, port programs, and regulatory requirements. Demonstration projects with emissions testing performed under the TAP must conform to the specifications outlined in this document. The document can be found here:

<http://www.arb.ca.gov/ports/marinevess/ogv/ogvreports.htm>.

4 Information Package Preparation Guidelines

The Ports request that information packages submitted in response to this RFI be prepared in accordance with the following guidelines.

4.1 Page Limit

Information packages submitted in response to this RFI should be limited to a maximum of 20 pages, double-sided, including all narrative, diagrams, brochures, etc. It is recommended that the response be written concisely and include information as appropriate (i.e., company experience, background information, etc.).

4.2 Contact Information

Provide the information indicated below:

Business Name	
Division of	
Subsidiary of	
Website Address	

Address			
City/Town			
State		Zip	
Phone	() - Ext	Fax	() -
Contact		Title	
E-mail Address			

4.3 Technology Description

Provide a technical description of the proposed OGV emissions reduction technology, including the following elements to the extent possible.

4.3.1 Proposed Technology

Provide the following information regarding the proposed technology:

1. Description of the proposed technology, including scientific principle(s) of operation for the emissions reduction system. Please provide any modeling data, if available.
2. Description of operational consumables (as applicable) and consumption rates.

3. Technology development status and whether the emission reduction technology has been demonstrated in an OGV-marine environment.
4. Description of any prototype units that have been demonstrated or placed into operation.
5. Description of known limitations of the technology, such as whether it can only work on a certain kind of vessel and/or engine.
6. Any other data that may support the Ports' technology evaluation including engine size/type limitations, duty-cycle limitations, anticipated engine back pressure effects, engine warranty issues, maintenance requirements, etc.

4.3.2 Emission Reduction Technology and Main Engine Interface

Provide an accurate description of the interface between the emissions reduction technology and the OGV main engine or other applicable design changes to the OGV. Include drawings, diagrams, placement location, etc.

4.3.3 Vessel/Infrastructure Requirements

Provide a basic description of any infrastructure requirements needed to accommodate the proposed emissions reduction technology. This would include but is not limited to:

- Utility Requirements (power, water, etc.)
- Installation Requirements (i.e. the approximate number of dedicated square feet required)
- Vessel Requirements (Is the technology a retrofit? Only for new-builds? Both?)

4.3.4 Waste Generation and Disposal

Provide a description and anticipated quantities of the waste, both solid and liquid, generated by the proposed emission reduction technology, as well as the proposed method(s) of disposing of solid and liquid waste, if applicable. Consider all relevant discharge regulations pertaining to vessel discharge in your description.

4.4 Emission Reduction Potential

4.4.1 Emission Reductions

The information package submitted in response to this RFI should include a concise discussion of the proposed OGV emissions reduction technology's capabilities to reduce air pollutant emissions from OGV main engines. Provide estimates/ranges of the proposed emissions reduction technology's potential to reduce NO_x, DPM/PM, and SO_x emissions. If applicable, please include information relative to the proposed technology's capabilities to obtain emission reductions for current vessels to meet or exceed Tier 3 NO_x standards, as well as CO, VOC, and GHG, as applicable. Also, please address, to the extent feasible, the proposed technology's capability to reduce emissions from OGV auxiliary engines and boilers.

Table 1 is included as an example of how the projected technology performance data should be presented; respondents to this RFI are welcome to use an alternative data presentation format

at their discretion. Proposers should be sure to estimate the emission reductions given the unique San Pedro Bay conditions listed in Section 3.3.

Table 1: Anticipated Emission Reductions

Vessel Type: [INSERT VESSEL TYPE]	Main Engine (% Reduction)	Auxiliary Engines PLUS Boiler Emissions (% Reduction) if applicable
Nitrogen Oxides (NO _x)		
Particulate Matter (PM)/ Diesel Particulate Matter (DPM)		
Sulfur Oxides (SO _x)		
Carbon Monoxide (CO)		
Volatile Organic Compounds (VOC)		
Greenhouse Gases (CO ₂ E)*		

* CO₂E is a greenhouse gas equivalency based on global warming potential of different greenhouse gases (CO₂, CH₄ and N₂O).

The table below provides the engine emission factors used by the Ports in calculating their annual emissions; this chart may be useful in estimating the technology’s potential reductions.

Table 2: Estimated Average Emission Factors for Main Engines (g/kW-hr)

NOx Standards	Engine Speed	Fuel Type	NOx g/kW-hr	SOx g/kW-hr	PM g/kW-hr
Tier 0	Medium	HFO (>2.5%)	14	11.5	1.5
Tier 0	Slow	HFO (>2.5%)	18.1	10.5	1.5
Tier 1*	Medium	HFO (>2.5%)	13	11.5	1.5
Tier 1	Slow	HFO (>2.5%)	17	10.5	1.5
Tier 2*	Medium	HFO (>2.5%)	11.2	11.5	1.5
Tier 2	Slow	HFO (>2.5%)	15.3	10.5	1.5

*NO_x Emission Factor based on engine speed of 500 rpm

4.4.2 CARB/EPA Certification or Verification

Discuss whether the proposed OGV main engine emissions reduction technology is currently certified or verified by CARB or EPA for any application. If the proposed technology has a CARB Executive Order Number, please provide it in your response along with a copy of the letter provided by CARB. Also, if your technology is currently identified in the CARB/EPA certification or verification protocol, please discuss the status of earning CARB/EPA certification/verification.

4.5 Technical Maturity

Please indicate the degree of technological readiness for a demonstration of the proposed technology on an OGV that calls at the Port of Los Angeles or the Port of Long Beach. If the technology is in a conceptual phase, please describe to the extent possible the technology development milestones that must be met prior to a demonstration.

4.6 Cost Estimate

To the extent feasible, provide an estimate of the proposed emissions reduction technology cost. The Ports understand that these estimates are preliminary and subject to change. The Ports require this information to facilitate development of a potential future demonstration project(s):

1. If possible, include an estimate of the following cost elements at scale:
 - Installation
 - Materials
 - Emissions testing
 - Other

2. Estimated costs for the proposed emissions reduction when fully commercialized. To the extent possible, include costs for the following:
 - Estimated capital acquisition cost for the fully commercialized system
 - Estimated operations cost
 - Estimated life cycle cost for the fully commercialized system – please state the assumptions used in estimating life cycle cost
 - Business plan strategy

5 Submittal Instructions

All information packages should be submitted electronically in PDF format to:

Carter Atkins
Port of Los Angeles
catkins@portla.org

Renee Moilanen
Port of Long Beach
renee.moilanen@polb.com

6 Assistance

If you need additional assistance or clarification with regard to this RFI, please feel free to contact:

Carter Atkins
Environmental Specialist

Renee Moilanen
Environmental Specialist Associate

Phone: (310) 732-7649

FAX: (310) 547-4643

E-mail: catkins@portla.org

Phone: (562) 283-7100

FAX: (562) 283-7148

E-mail: renee.moilanen@polb.com

7 Public Information Disclosure

Please note that any information and materials submitted in response to this Request for Information becomes public information and may be released under a Public Records Act request without further notification. Therefore, it is recommended that company proprietary and trade secret information not be included in any response submitted under this solicitation. All information packages submitted become the property of the Ports.