FOREWORD

To effectively integrate common goals for air quality in the South Coast Air Basin, the Port of Los Angeles (POLA) and the Port of Long Beach (POLB) worked together in close coordination with the staff of the United States Environmental Protection Agency Region 9 (USEPA Region 9), the California Air Resources Board (CARB), and the South Coast Air Quality Management District (SCAQMD) to develop the 2006 San Pedro Bay Ports Clean Air Action Plan (CAAP). This plan was the first of its kind in the country, linking the emission reduction efforts and visions of the two largest ports in the United States with similar efforts and goals of the regulatory agencies responsible for ensuring compliance with air quality standards. The collaborative effort continues with this update of the CAAP.

The air agencies have extensively reviewed and commented on this draft CAAP Update and continue to support the collaborative process that has been established. By participating in the development and update of this CAAP, these regulatory agencies do not waive or forfeit their rights or obligations to continue to regulate emissions sources under their control. Participation in this process is voluntary by all parties and does not in any way inhibit or preclude the agencies from any legal authorities and responsibilities to meet federal, state, and local air quality standards. Participation does not mean that the agencies necessarily endorse each of the measures and concepts proposed in the CAAP Update.
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EXECUTIVE SUMMARY

In March 2006, a groundbreaking meeting occurred at the highest level between the Port of Long Beach (POLB), Port of Los Angeles (POLA), and the South Coast Air Quality Management District (SCAQMD) where all parties expressed the need to work jointly toward solutions to reduce emissions from port related operations. Shortly thereafter, the ports also engaged the California Air Resources Board (CARB) and the United States Environmental Protection Agency (USEPA) Region 9 in the spirit of cooperation to help the ports develop the original 2006 San Pedro Bay Ports Clean Air Action Plan (CAAP).

Since the release and implementation of the CAAP, the concepts presented in the plan and the actions taken by the ports have had a profound effect on the dialogue regarding a port’s role in addressing port-related air quality issues on the local, national, and international levels. The CAAP has significantly redefined what port authorities can do to ensure that surrounding communities are not adversely impacted by port-related operations. Since its release, there are now published air quality plans in the Pacific Northwest, there are plans being developed in the Northeast and Gulf coasts of North America, and plans being discussed and prepared in Asia and Europe. Inquires about the CAAP have come from ports around the world. In recognition of the groundbreaking work and commitment by both ports, several awards and recognitions have been received, including in 2007, the ports received the 8th Annual National USEPA Clean Air Excellence Award for the CAAP.

Port’s Commitment to CAAP

The ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. The CAAP was designed to develop and implement strategies and programs necessary to reduce air emissions and health risks while allowing port development to continue. This remains the primary goal of the CAAP Update.

At this time, the ports have two planned terminal redevelopment projects, in addition to a number of infrastructure improvement projects that could be approved and implemented in the next five years. As with the terminal redevelopment projects that have been already approved since the CAAP was adopted, these upcoming projects present significant opportunities to implement the measures defined by the CAAP and satisfy the ports’ twin goals of clean air and economic growth. The ports also anticipate lease amendments in the next five years, and through these opportunities, the ports will continue to implement the strategies defined in the CAAP. In short, the ports have already started to serve as a catalyst for rapid change towards reducing air pollution, proactively addressing the impacts to communities affected by port operations.
The CAAP is the ports’ long-term commitment to reduce emissions associated with port activities. In November 2006, the first version of the CAAP was adopted at a historic joint meeting of each port’s Board of Harbor Commissioners. The 2006 CAAP was a five-year action plan that highlighted the near-term goals, emissions reductions, and budgetary needs for fiscal years 2006 through 2011. Consistent with each port’s air quality program goals, the 2006 CAAP focused primarily on reducing health risks to the local communities and reducing emissions of DPM, NOx and SOx.

As stated when the original CAAP was developed, the ports believe it is important to continuously update and improve upon the CAAP, where necessary, in order to monitor progress, plan for the future, and maximize success. Staffs from both ports meet regularly to evaluate progress towards meeting the CAAP goals, review status of existing control measures, evaluate new measures, and jointly develop updates to the CAAP as needed.

It should be emphasized that the air quality regulatory agencies, USEPA, CARB and SCAQMD, continue to fulfill their commitment to work with the staff of the two ports on their efforts associated with the implementation of the CAAP.

Enhancements to the CAAP
There are three categories of major enhancements in the updated version of the CAAP: Measure Changes, San Pedro Bay Standards, and CAAP Progress Tracking. Highlights of these enhancements are as follows:

- **Measure Changes** – Several of the measures have been updated to include information on the implementation details and measurable results for programs that have been developed or improved since the original CAAP was adopted. Further, some measures have been updated to reflect regulatory changes that have occurred over the past several years. The most significant changes to the measures are associated with ocean-going vessel (OGV) main engines and line haul rail locomotives.

  - A new measure has been introduced as OGV5 which seeks to maximize the early introduction and preferential deployment of vessels to the San Pedro Bay ports with cleaner/newer engines meeting the new International Maritime Organization (IMO) oxides of nitrogen (NOx) standard for Emission Control Areas. The previous OGV5, Main & Auxiliary Engine Emissions Improvements, has been re-classified as OGV6, with the focus of reducing diesel particulate matter (DPM) and NOx emissions from the existing fleet of vessels through the identification of new effective technologies. Numerous emission reduction technologies are being evaluated for integration into vessel new builds and use of these technologies as a retrofit for existing vessels will be explored. The ports intend to work cooperatively with vessel owners and engine and technology manufacturers to advance these efforts. This strategy will be coupled with the Technology Advancement Program and will include a systematic outreach, evaluation and demonstration effort.
Measure RL3, New and Redeveloped Near-Dock Rail Yards, has been revised to reflect the new locomotive engine standards promulgated by USEPA and supports achievement of CARB’s stated goal of a state-wide fleet of 95% Tier 4 locomotive engines by 2020, contained in CARB’s “Staff Recommendations to Provide Further Locomotive and Railyard Emission Reductions” adopted in September 2009.

San Pedro Bay Standards – The San Pedro Bay Standards are perhaps the most significant addition to the CAAP and are a statement of the ports’ commitments to significantly reduce the air quality impacts from port operations. Achievement of the Standards listed below will require diligent implementation of all of the known CAAP measures and aggressive action to seek out further emissions and health risk reductions from port-related sources from strategies that will emerge over time.

Health Risk Reduction Standard. To complement the CARB’s Emission Reduction Plan, the ports of Long Beach and Los Angeles have developed the following standard for reducing overall port-related health risk impacts, relative to 2005 conditions:

- By 2020, reduce the population-weighted cancer risk of ports-related DPM emissions by 85%, in highly-impacted communities located proximate to port sources and throughout the residential areas in the port region.

Emissions Reduction Standard. Consistent with the ports’ commitment to meet their fair-share of mass emission reductions of air pollutants, the ports of Long Beach and Los Angeles have developed the following standards for reducing air pollutant emissions of ports-related activities, relative to 2005 levels:

- By 2014, reduce emissions by 22% for NOx, 93% for sulfur oxides (SOx), and 72% for DPM to support attainment of the federal fine particulate matter (PM2.5) standards.
- By 2023, reduce emissions by 59% for NOx to support attainment of the federal 8-hour ozone standard. The corresponding SOx and DPM reductions in 2023 are 92% and 77%, respectively.

The ports will strive to exceed the 2014 NOx standard of 22% reduction, potentially exceeding 40% reduction, given the forecasted cargo volumes and efforts to implement new technologies.
CAAP Progress Tracking - The original CAAP was published in November of 2006, prior to the establishment of the San Pedro Bay Standards. In the absence of San Pedro Bay Standards, the progress and effectiveness of the plan were forecasted through 2011 by estimating the growth in emissions due to anticipated cargo activity increases and then applying the effectiveness of the various control measures. The resulting controlled emission forecasts were compared with the same year's uncontrolled forecasted emissions grown from the CAAP 2005 emission estimates. Now that the San Pedro Bay Standards have been established, on-going CAAP progress and effectiveness will be measured against the Standards which consist of reductions as compared to 2005 published inventories.

Measures & Strategies Recap
Since the original CAAP was adopted in late-2006, staff of both ports have been diligently working together to develop, implement and operate the various ground breaking measures and initiatives of the CAAP. The initiatives that the ports of Long Beach and Los Angeles have been working on together since the adoption of the 2006 CAAP and will continue to implement over the next five years include:

- **Heavy-Duty Vehicle Control Measures** – The Clean Trucks Program (CTP) will produce 80% emission reductions by 2012 from all port trucks serving both ports. This will be accomplished through a port tariff that will gradually limit access to all but the cleanest on-road trucks meeting the USEPA’s 2007+ on-road truck emissions standards. Older trucks will be banned according to the following schedule:
  
  - Phase 1: By October 1, 2008, all pre-1989 MY engines are banned from operation in the ports.
  - Phase 2: By January 1, 2010, all 1989 to 1993 MY engines are banned from operation in the ports. Further, all 1994-2003 MY engines will be required to achieve an 85 percent DPM reduction and a 25 percent NOx reduction through the use of a CARB approved level 3 plus NOx VDECS.
  - Phase 3: By January 1, 2012, all drayage truck engines that do not meet 2007 federal on-road standards will be banned from the ports.

  Milestones reached in the CTP include:

  - In 2007, both ports worked together to develop the Clean Trucks Program. Each port’s Board of Harbor Commissioners approved the Clean Trucks Program Tariff in November 2007.
  - In October 2008, the first ban date for the oldest trucks (pre-1989) was successfully implemented.
  - In February 2009, the Truck Environmental Fee was initiated for all non-exempt trucks and all trucks operating in the ports were required to be registered in the Drayage Truck Registry.
As of September 2009, the first anniversary of the Clean Truck Program, over half of all truck trips were made by clean trucks which meet the 2007 USEPA on-road standards.

Participation rates for the Clean Truck Program have exceeded the goals set forth in the original plan. Since February 2010, the Port of Los Angeles (POLA) reported that 84% of container cargo moves at its terminals were made by clean trucks. Similarly, the Port of Long Beach (POLB) reported that 77% of all container cargo moves were made by clean trucks.

**Ocean-Going Vessels Control Measures** – These measures include: vessel speed reduction; shore-power/alternative maritime power; fuel improvements for main engines, auxiliary engines, and auxiliary boilers; cleaner OGV engines; and technology improvements for OGV engines.

Milestones reached in the OGV measures include:

- The POLB Green Flag Program has been in place since late 2005. POLA approved a Vessel Speed Reduction Incentive Program in June 2008. In 2009, the POLB Green Flag Program compliance rate to 20 nautical miles (nm) from the port was 95%; POLA’s compliance to 20 nm was 90%. Starting in 2009, POLB expanded its Green Flag Program to 40 nm from the port, and throughout 2009, the compliance rate to 40 nm was up to 72% of all vessels. POLA expanded their incentive program to 40 nm starting late-September 2009.

- In March 2008, the ports approved the Vessel Main Engine Fuel Inventive Program to provide a monetary incentive for the use of low-sulfur marine fuel in vessel main engines, for the period from July 1, 2008 through June 30, 2009. During the program, approximately 15% of all calls at the two ports used low sulfur fuel in the main engines for arrivals and departures. The CARB vessel fuel regulation, requiring low sulfur fuel in main and auxiliary engines and boilers, went into effect on July 1, 2009, at which time the ports’ fuel incentive program ended.

- Both ports are continuing to move forward with design, construction and commissioning of shore power infrastructure at their container, cruise and one tanker terminals. As of 4th Quarter 2009, Alternative Maritime Power (AMP) infrastructure is operational at two terminals in POLA with another two terminals anticipated to be active by 2nd Quarter 2010. Shore power infrastructure is currently operational at three terminals in POLB and is currently in construction at a fourth terminal. Remaining port cruise and container terminals at both ports will be outfitted with shore power infrastructure by 2014.
Cargo Handling Equipment (CHE) Control Measures - Performance standards for CHE which call for progressive replacement with equipment meeting cleaner engine standards as implemented through lease conditions, and port assistance for securing grant funding for equipment replacements, repowers and retrofits, in conjunction with CARB regulations, continue to be effective strategies for reducing emissions from this source category.

Harbor Craft (HC) Control Measures - Performance standards for HC which establish goals for early replacement of harbor craft engines with engines meeting cleaner standards, and port assistance for securing grant funding for engine repowers, in conjunction with CARB regulations, continue to be effective strategies for reducing emissions from this source category.

Railroad Locomotive Control Measures – Engine modernization for the rail switch operations in the port complex has been successfully completed, upgrading 16 locomotives to Tier 2 engine standards. Six additional gen-set locomotives that meet the more stringent Tier 3 standards have also been added to the ports’ switching fleet. By 2010, all Class 1 locomotives operating in the ports will meet the emissions equivalent of Tier 2 standards in accordance with the CARB’s South Coast Air Basin (SoCAB) MOU. Additional requirements will be implemented through any new or redeveloped railyard projects.

Construction Activity – The ports have developed key Best Management Practices which are focused on reducing emissions associated with construction activities. Compliance with these practices is required in all project bid specifications.

Technology Advancement Program (TAP) – The ports’ Technology Advancement Program is focused on the development and implementation of near-term emission reduction technologies. The ports have made over $9 million available to the TAP since 2007.

Emissions Inventory Improvements - The emissions inventories are the ports’ measurement tool for evaluating and reporting on progress toward meeting the San Pedro Bay Standards. The ports continue to identify opportunities to improve the accuracy of key monitoring and tracking elements used in development of the ports’ emissions inventories. Several improvements have been made to the methods, data and understanding of the sources types since 2006 and the ports inventories are considered “state-of-art.”

Zero Emission Container Movement - Over the past several years, the ports have been evaluating various Zero Emission Container Movement Systems (ZECMS) for potential application at the ports. The short-term goal is to determine if ZECMS are feasible for the ports and if so, demonstrate innovative technologies that can be utilized for more efficient and greener movement of cargo. The ultimate goal is to handle the anticipated cargo throughput growth with pollution-free technologies and strategies.
Operational Efficiency Improvement Initiatives - This initiative identifies projects at the San Pedro Bay ports that improve infrastructure and operational efficiencies, as well as have an air quality benefit. The types of projects that are included in this element of the CAAP are generally initiated primarily as transportation or operational improvements; however, an air quality benefit does result from completing these projects.

Progress to Date & Future Benefits

Progress to date and future benefits are measured against the San Pedro Bay Emissions and Health Risk Reduction Standards. To be consistent with the methods used in the emissions forecasting for the Standards, the progress to date for this CAAP Update is based on the 2005 inventory methods and assumptions. Accordingly, actual annual activity data for 2006 through 2008 from both ports were modeled using the 2005 methodology and assumptions to develop comparative emissions for these years. In order to determine the projected benefits from the CAAP measures and applicable regulations, emissions are forecasted from 2009 through 2013 based on the 2005 methodology and assumptions and the 2007 San Pedro Bay cargo forecast, consistent with the forecasting that was used in the establishing the San Pedro Bay Standards.

It should be noted that cargo forecasts vary along with changes in the financial markets. The 2007 San Pedro Bay cargo forecast used to establish the San Pedro Bay Standards was developed and published before the market collapse and ensuing recession and was based on previous year’s cargo throughput changes. However, the forecasted cargo volumes for 2007 through 2009 have not occurred at the ports. In fact, all the ports on the U.S. West Coast have experienced significant cargo reductions in the last two years due to the massive reductions in international trade volumes. The 2007 cargo forecast utilized for development of the Standards projected that the ports would continue to experience steady growth and reach cargo capacity (42+ million twenty-foot equivalents (TEUs)) by 2023. However, in actuality, the TEUs at the San Pedro Bay ports were flat in 2007 and declined in 2008 and 2009. Therefore, the forecasted emissions presented in CAAP Update are conservative (i.e. high growth) estimates, and should not be considered definitive as they are subject to change to reflect updated cargo forecasts. These forecasts may be updated with each CAAP Update to reflect new forecast information.

Figures ES.1 through ES.4 present the 2005 baseline and the year-to-year percent change in the magnitude of both ports’ emissions, with respect to 2005 and the Emissions Reduction and Health Risk Standards.
As presented above, with the additional CAAP measures coming on line, including the Clean Trucks Program, and CARB’s OGV fuel switch regulation implemented in mid-2009, it is anticipated that the reduction trend experienced through 2008 will continue and sharpen slightly. By 2013, the ports are anticipated to be close to achieving their 2014 DPM Emissions Reduction Standard. Though significant progress has been made, significant challenges remain with actually reaching the goals.
As presented above, it is anticipated that with implementation of the CAAP measures, including the vessel speed reduction (VSR) program, shore-power, and the Clean Trucks Program, the ports are on target with meeting the 2014 NOx Standard. Increased participation in VSR out to 40 nm, increased use of shore power (or equivalent technologies) at berth and introduction of new control technologies on existing and new build OGVs will significantly help in meeting the 2023 NOx Emissions Reduction Standard. Additionally, continued fleet turnover in other source categories will contribute to future NOx reductions. The increase in emission levels in 2009 is a manifestation of the cargo forecast compared to the actual cargo throughputs in the preceding years. The decrease in NOx emissions in 2009 is less than 2007 and 2008 because uncontrolled emissions for that year are based on the higher estimated growth from the 2007 cargo forecast, whereas controlled emissions in 2007 and 2008 reflect the actual decline in growth that occurred during those years.
As presented above, with the implementation of additional CAAP measures and CARB’s OGV fuel regulation implemented in mid-2009, it is anticipated that the high rate of SO\textsubscript{x} reductions will continue in the coming years. The slight erosion of SO\textsubscript{x} reductions from 2007 and 2008 was due to the injunction of the previous CARB OGV fuel rule in 2008. The plateau in 2009 is a manifestation of the cargo forecast. The ports are anticipated to be close to achieving their 2014 and 2023 SO\textsubscript{x} Emissions Reduction Standards by 2012. Significant challenges, however, remain with closing the final gap and sustaining these reductions.
DPM emission reductions closely track with DPM-related health risk reduction. Therefore, evaluating the DPM emission reduction trend is a good surrogate for estimating the health risk reduction trend. As presented above, with additional CAAP measures coming on line, CARB’s OGV fuel switch regulation implemented in mid-2009, and the Clean Trucks Program, it is anticipated that the reduction trend seen since 2006 will continue. The slight bump in 2009 is a manifestation of the cargo forecast. Although it appears that the ports will be close to meeting the Health Risk Reduction Standard by 2013, closing the remaining gap to meet the Standard will be a significant challenge as the remaining sources from which to gain reductions are anticipated to be the hardest to control.

**Looking Ahead**

The CAAP is a planning tool to assist the ports, the port operators, and the air quality regulatory agencies to move forward with strategies that will achieve the ports’ commitment to reduce emissions associated with port activities. The CAAP was designed to provide direction for developing and implementing strategies and programs necessary to progressively achieve real and measurable air quality and public health improvements, while allowing port development to continue. This remains the primary goal of the CAAP Update and, as shown above, real and measurable benefits are being achieved and are forecasted. The most significant addition to the CAAP Update is the development of the San Pedro Bay Standards which establish long-term goals for emissions and health risk reductions for the overall two port complex. Achievement of the Standards will require diligent implementation of all of the known CAAP measures and aggressive action to seek out further emissions and health risk reductions from port-related sources from strategies that will emerge over time. In looking ahead over the next five years, the preeminent goal of the ports is to demonstrate
progress in achievement of the Standards and to annually report performance and effectiveness in meeting this challenge with consistently improved, accurate and state-of-the-art emission inventories.

An impressive array of enhanced measures is contained in the CAAP Update and the key areas of focus over next five years are highlighted below:

- Continue to implement the Clean Trucks Programs at each port, with full implementation of trucks meeting the 2007 USEPA on-road standard by January 2012
- Achieve 90% or greater VSR participation to 40nm
- Continue implementation of shore-power infrastructure to meet the ports’ lease schedules and to support CARB’s requirement of 50% compliant calls for regulated vessels by 2014
- Implement use of marine fuel for OGVs with reduced sulfur content of 0.1% in 2012 through CARB’s regulation
- Support implementation of a North America and Canada Emission Control Area
- Encourage demonstration and deployment of OGV control technologies for existing vessels calling at the San Pedro Bay ports
- Encourage vessels meeting the cleanest new engine standards to preferentially call at the ports of Long Beach and Los Angeles
- Continue aggressive implementation of the Technology Advancement Program to demonstrate, verify and commercialize new, cleaner engine technologies
- Evaluate progress toward achieving the San Pedro Bay Standards in 2012, and update as needed.

Lastly, in looking ahead, the ports will continue the collaborative and cooperative partnership with our agency partners and industry stakeholders to implement these strategies and to develop new technologies and control strategies to further accelerate progress toward meeting the ports’ goals. Federal, state and local air quality agencies will play an essential role by identifying and pursuing future regulatory measures targeting specific source categories to further reduce emissions to order to achieve the San Pedro Bay Standards. As stated in CARB’s 2006 Emission Reduction Plan for Ports and Goods Movement in California - "Successful implementation of the CARB emission reduction plan will depend upon actions at all levels of government and partnership with the private sector. No single entity can solve this problem in isolation."1 This is also true for the CAAP.

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1 Emission Reduction Plan for Ports and Goods Movement in California, Executive Summary, ES-1, CARB, 2006
SECTION 1: INTRODUCTION

In March 2006, a groundbreaking meeting occurred at the highest level between the Port of Long Beach (POLB), Port of Los Angeles (POLA), and the South Coast Air Quality Management District (SCAQMD) where all parties expressed the need to work jointly toward sustainable solutions to improve air quality from port-related sources. Shortly thereafter, the ports also engaged the California Air Resources Board (CARB) and the United States Environmental Protection Agency (USEPA) Region 9 in the spirit of cooperation to help the ports develop the original 2006 San Pedro Bay Ports Clean Air Action Plan (CAAP).

The CAAP is the ports’ long-term commitment to reduce emissions associated with port activities. In November 2006, the first version of the CAAP was adopted at an historic joint meeting of each port’s Board of Harbor Commissioners. The 2006 CAAP was a five-year action plan that highlighted the near-term goals, emissions reductions, and budgetary needs for fiscal years (FY) 2006/2007 through 2010/2011. Consistent with each port’s air quality program goals, the 2006 CAAP focused primarily on reducing health risks to the local communities and reducing emissions of diesel particulate matter (DPM), oxides of nitrogen (NOx) and oxides of sulfur (SOx).

As stated when the original CAAP was developed, the ports believe it is important to continuously update and improve upon the CAAP, where necessary, in order to monitor progress, plan for the future, and maximize success. Staff from both ports meet regularly to evaluate progress towards meeting the CAAP goals, review status of existing control measures, evaluate new measures, and jointly develop updates to the CAAP as needed.

This document is the first update to the 2006 CAAP. This joint update to the CAAP describes the measures that the ports of Los Angeles and Long Beach are implementing or will be implementing over the next five-year period to continue to reduce emissions related to port operations.

It should be emphasized that the air quality regulatory agencies, USEPA, CARB and SCAQMD, continue to fulfill their commitment to work with the staff of the two ports on their efforts associated with the implementation of the CAAP.

Throughout this document, this update to the CAAP will hereinafter be referred to as the CAAP Update.
1.1 The Ports’ Mandate

In the early 1900s, the State conveyed the port tidelands to Los Angeles and Long Beach, as trustees for the people of the State of California, to accommodate and promote harbor commerce, navigation and fisheries. The ports are landlord ports; they build terminal facilities and lease them to shipping lines and stevedoring companies. The ports do not own or operate the terminals, ships, yard equipment, trucks or trains that move the cargo. However, the ports are determined to accelerate the efforts to reduce air pollution from “goods movement” activities using all the powers available to them.

The two ports comprise a huge regional and national economic engine. The Los Angeles Customs District accounts for approximately $300 billion in annual trade. More than 30% of all containerized trade in the nation flows through the two ports. Although recent economic conditions have caused a near-term reduction in imports and exports, the latest economic forecasts still indicate that the demand for containerized cargo moving through the San Pedro Bay region will increase significantly by the year 2020.

The economic benefits of the ports are felt throughout the nation; however, the environmental impacts of trade are more locally concentrated. In order to address these local impacts, both ports have adopted and are implementing a wide range of aggressive environmental initiatives. These efforts include better documentation of environmental impacts and more detailed evaluation and implementation of effective mitigation measures. The ports are cognizant of the view held by environmental groups, local residents, and regulatory agencies that not enough has been done to address port-related air quality issues. The ports are also aware of the views held by port users and operators that inconsistent or conflicting environmental measures could have unintended and even counterproductive effects.

The ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. The CAAP was designed to develop and implement strategies and programs necessary to reduce air emissions and health risks while allowing port development to continue. This remains the primary goal of the CAAP Update.

At this time, the ports have two planned terminal redevelopment projects, in addition to a number of infrastructure improvement projects that could be approved and implemented in the next five years. As with the terminal redevelopment projects that have been approved since the CAAP was adopted, these projects present significant opportunities to implement the measures defined by the CAAP and satisfy the ports’ twin goals of clean air and economic growth. The ports also anticipate lease amendments in the next five years, and through these opportunities, the ports will continue to implement the strategies defined in the CAAP. In short, the ports have already started to serve as a catalyst for rapid change, recognizing the rights of all involved in, and affected by, port operations.
1.2 San Pedro Bay Ports Clean Air Action Plan Achievements To Date

It is important to recognize that while there is still much effort needed for the ports to achieve their clean air goals, significant progress has already been made to reduce the air quality impacts of port operations. The following major CAAP milestones have been achieved:

**Clean Air Action Plan (CAAP)**

- Jointly adopted by the Boards of Harbor Commissioners from the ports of Long Beach and Los Angeles in November 2006. The CAAP includes control measures to reduce air emissions by 45% or more within five years.

- The CAAP website (www.cleanairactionplan.org) was developed to provide the public the status of implementation progress, port emissions and reductions, and updates in the Technology Advancement Program.

- An annual program, the CAAP Air Quality Awards, was developed to recognize industry efforts to reduce port-related air pollution consistent with the CAAP goals. Since development, two awards ceremonies have been held, in 2008 and 2009, and a total of 13 companies were recognized.

**CAAP Implementation Stakeholder Task Force**

- The CAAP Implementation Stakeholder Task Force was formed in 2007 by each City’s Mayor’s office, and consists of representatives from federal, state as well as local air quality agencies, industry, environmental organizations, labor groups and academia to provide input for CAAP implementation plans. The Task Force meets on an as needed basis, typically a few times per year.

**Air Emissions Inventory**

- The ports committed to updating their air emissions inventories annually to track progress for reducing air emissions from port operations. POLB and POLA each released their respective 2005 Air Emissions Inventories in September 2007; 2006 air emissions inventories in the summer of 2008; 2007 air emissions inventories in January 2009; and the 2008 air emissions inventories in December 2009. Complete emissions inventory reports can be found at:
  
  POLA - [http://www.portoflosangeles.org/environment/studies_reports.asp](http://www.portoflosangeles.org/environment/studies_reports.asp)
Air Monitoring Network

- The Port of Long Beach’s real-time air monitoring data website was launched in October 2006. The website was expanded in February 11, 2008 to provide real-time monitoring of actual air pollution concentrations in and around the San Pedro Bay from all six POLB and POLA air monitoring stations (http://caap.airsis.com/). The Port of Los Angeles initiated filter-based air monitoring for particulates and elemental carbon at four stations starting in 2005, and that program continues today. This data is accessible at http://www.portoflosangeles.org/environment/air_quality.asp.

Clean Truck Program

- In 2007, both ports worked together to develop the Clean Truck Program. Each port’s Board of Harbor Commissioners approved the Clean Truck Program Tariff in November 2007 and the Truck Environmental Fee in December 2007. In March 2008, each port adopted their concession program requirements.

- In October 2008, the first ban date for the oldest trucks (pre-1989 model year) was successfully implemented.

- In February 2009, the Truck Environmental Fee was initiated for all non-exempt trucks and all trucks operating in the ports were required to be registered in the Drayage Truck Registry (DTR).

- As of September 2009, the first anniversary of the Clean Truck Program, over half of all truck trips were made by clean trucks which meet the 2007 USEPA on-road standards.

- Participation rates for the Clean Truck Program have exceeded the goals set forth in the original plan. In February 2010, POLA reported that 84% of the all container cargo moves at its terminals were made by clean trucks. Similarly, POLB reported that 77% of all container cargo moves were made by clean trucks.

- Clean Energy constructed a liquefied natural gas (LNG) fueling facility in the port area for on-road trucks. Fueling operations began during the second quarter of 2009. A little over five percent of the truck fleet currently is powered by natural gas.

- In 2008, POLA completed a successful prototype test of a zero-emission Class 8 all-electric truck. Through 2009 to 2010, POLA will receive delivery of 25 electric trucks operating with advanced lithium-ion battery systems for use between marine terminals and near-dock rail facilities and within terminals.

- For more information, refer to:
  POLB - http://www.polb.com/cleantrucks
  POLA - http://www.portoflosangeles.org/ctp/idx_ctp.asp
Technology Advancement Program

➢ The Technology Advancement Program (TAP) was established in first quarter 2007, and program guidelines were published. The mission of the TAP is to accelerate the verification and commercial availability of new, clean technologies, through evaluation and demonstration.

➢ The TAP Advisory Committee was formed consisting of agency partners from the POLB, POLA, USEPA Region 9, CARB and SCAQMD. The Advisory Committee provides input on the proposal and technologies submitted to the TAP for consideration.

➢ As of early-2010, the POLB and POLA funded $5.4 million towards TAP related projects, targeting cargo handling equipment, vessels, harbor craft and on-road trucks.

Ocean-Going Vessels

➢ The Port of Long Beach Green Flag Program has been in place since late 2005. POLA approved a Vessel Speed Reduction Incentive Program in June 2008. In 2009, the Port of Long Beach Green Flag Program compliance rate to 20 nautical miles (nm) from the port was 95%; POLA’s compliance to 20 nm was 90%. Starting at the beginning of 2009, POLB expanded its Green Flag Program to 40 nm from the port. The 2009 annual average compliance rate to 40 nm was 72% of all vessels calling at POLB. POLA expanded their incentive program to 40 nm starting on September 29, 2009.

➢ In March 2008, the ports approved the Vessel Main Engine Fuel Inventive Program to provide monetary incentive for the use of low-sulfur marine gas oil (MGO) in vessel main engines, for the period from July 1, 2008 through June 30, 2009. During the program, approximately 15% of all calls at the two ports used low sulfur fuel in the main engines for arrivals and departures. The CARB vessel fuel regulation, requiring low sulfur fuel in main and auxiliary engines and boilers, went into effect on July 1, 2009 when the ports’ fuel incentive portion of the program ended.

➢ Both ports are continuing to move forward with design, construction, and commissioning of shore power infrastructure at their container and cruise terminals and one tanker terminal. As of 4th Quarter 2009, Alternative Maritime Power (AMP) infrastructure is operational at two terminals in POLA with another two terminals anticipated to be active by 2nd Quarter 2010. Shore power infrastructure is currently operational at three terminals in the POLB and is currently in construction at a fourth terminal. Remaining port cruise and container terminals at both ports will be outfitted with shore power infrastructure by 2014.
An evaluation of the Alternative Maritime Emissions Control System (AMECS) was conducted during the summer of 2008. Testing indicated that emissions were reduced by over 95 percent.

**Railroad Locomotives**

- Pacific Harbor Line (PHL) has replaced their entire fleet with sixteen USEPA Tier 2 locomotives. In addition, PHL has also begun operating six Tier 3-equivalent non-road engine-equipped “genset” locomotives. In addition, a one-year demonstration of a LNG locomotive was conducted from early-2008 through early-2009.

**Harbor Craft**

- The Foss Maritime Green Assist™ Hybrid Tug completed its first year of operation in the San Pedro Bay ports. Emissions testing is underway; a 44% reduction in emissions and fuel consumption is anticipated.
- POLA’s Air Quality Mitigation Incentive Program approved over $11.8 million in grant funding to repower 69 main and auxiliary marine engines, resulting in over 16 and 456 tons per year of DPM and NOx, respectively.
- SCAQMD’s Carl Moyer Program provided over $14.6 million in grant funding to repower 92 main and auxiliary engines, resulting in approximately 8 and 228 tons per year of DPM and NOx, respectively.
- POLB received $471,000 in USEPA Diesel Emission Reduction Act (DERA) stimulus grant funding to repower eight engines onboard two crew boats and one tugboat.

**Cargo Handling Equipment (CHE)**

- In 2008, 30% of all CHE at the ports of Long Beach and Los Angeles were equipped with on-road engines which emit significantly less pollution compared to similar off-road engines. In addition, two of the cranes at the port of Long Beach and three cranes at the port of Los Angeles are equipped with Vycon REGEN Flywheel System which is one of the few emissions control technologies available for crane operations to reduce NOx and DPM emissions.
- POLB received over $3.5 million and POLA received over $1.6 million in USEPA DERA stimulus grant funding to be used for a combined total of 59 retrofits, 20 engine repowers and 63 equipment replacements for cargo handling equipment.
POLA’s Air Quality Mitigation Incentive Program approved approximately $3.8 million in grant funding to replace or repower 334 vehicles or engines, resulting in 5 and 107 tons per year of DPM and NOx, respectively.

In 2009, POLA provided $1.2 million in funding and assisted in the implementation of an electric rubber-tired gantry crane demonstration project at its China Shipping terminal. This represents another promising retrofit technology for crane operations.

1.3 South Coast Air Basin

The two ports are located in the South Coast Air Basin (SoCAB). The SoCAB includes all or part of four counties in southern California (Los Angeles, Orange, San Bernardino and Riverside) covering an area of 6,745 square miles with a population of over 16.5 million people. The SoCAB has some of the worst air quality in the nation, which represents a major health concern for its residents. Much of this air quality problem is attributable to the fact that the SoCAB is the second largest urban area in the nation (with all its associated emissions sources) and to the existence of topographical and meteorological conditions that enhance the formation of air pollution. Currently, the SoCAB is designated by the USEPA as being in nonattainment of the National Ambient Air Quality Standards (NAAQS) for ozone and for particulate matter less than 2.5 microns (PM$_{2.5}$). Ozone is formed when sunlight reacts with available oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the atmosphere, making NOx a primary pollutant of concern in the SoCAB, particularly from mobile sources of emissions. Similarly, oxides of sulfur (SOx) are precursors to secondary PM$_{2.5}$ formation in the atmosphere, making SOx a critical pollutant to control in light of the large contribution of SOx in the SoCAB from maritime sources. In addition, NOx and directly-emitted PM$_{2.5}$ also contribute to the PM$_{2.5}$ air quality. The federal 8-hour ozone attainment deadline for the SoCAB is 2023. The federal annual PM$_{2.5}$ attainment deadline is 2014.

In addition, CARB designated the exhaust from diesel-fueled engines as a toxic air contaminant, with diesel particulate matter (DPM) as a surrogate for total emissions. The USEPA also lists diesel exhaust as a mobile source air toxic. According to CARB, about 70% of the potential cancer risk from toxic air contaminants in California can be attributed to DPM. Therefore, the concentration of DPM in communities has become a major public health concern and the focus of CARB and SCAQMD regulations.

In 2000, the SCAQMD released results from its second Multiple Air Toxics Exposure Study (MATES II), which raised concerns about the impact of emissions from ships, trucks and trains in the vicinity of the ports and major transportation corridors. Since then, both ports have had terminal development plans challenged and delayed due to concerns about the adequacy of environmental mitigation. In 2008, the SCAQMD released their MATES III report, which continued to raise concerns over emissions from port operations. The MATES III modeling analysis showed the highest carcinogenic health risks from air toxics at areas surrounding the ports, ranging from 1,100 to

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2 Multiple Air Toxics Exposure Study in the South Coast Air Basin, Final Report, September 2008, South Coast Air Quality Management District. [MATES III]
In addition, compared to the MATES II period (i.e., 1998-1999), the areas near the ports (as well as inland areas in the eastern and northern portions of SCAQMD) also showed an increase in estimated air toxics risk primarily due to the additional cargo container throughputs that occurred between the MATES II and MATES III time periods.\(^3\)

In order for the SoCAB to attain the NAAQS, and to protect public health, immediate action is necessary to significantly reduce emissions from all sectors, including “goods movement”, which is why the ports have worked aggressively to implement the emission reduction programs outlined in the CAAP. In addition, CARB recently undertook several major actions targeted at reducing emissions from goods movement activities. These actions are described later in detail in Section 1.5. The implementation of the CAAP measures and CARB’s regulations is expected to substantially reduce emissions and air toxics risks associated with port operations.

### 1.4 The Global Picture – Climate Change

Climate Change is a global concern. During the 20th century, global average temperatures increased about one degree centigrade. Over the next 100 years, temperatures are likely to increase another two to ten degrees centigrade.

Greenhouse gases (GHGs) are the gases present in the earth’s atmosphere that reduce the loss of heat into space. GHGs primarily include water vapor, carbon dioxide (CO\(_2\)), methane (CH\(_4\)), and nitrous oxide (N\(_2\)O). GHGs affect climate as they concentrate in the Earth’s atmosphere and trap heat by blocking some of the long-wave energy normally radiated back to space.

While some GHGs occur naturally, there is widespread agreement among climate scientists worldwide that human activity is increasing the GHGs in the Earth’s atmosphere and accelerating global warming. Activities causing this warming include those that occur in and around a port setting, such as the burning of fossil fuels for industrial operations, transportation, heating, and electricity.

In addition to the focus on DPM, NO\(_x\), and SO\(_x\), both ports recognize that GHGs are also an important consideration when evaluating emissions from mobile sources, due to their potential global effect. It should be noted that the immediate purpose of this CAAP is to address emissions that affect public health risk on a local basis and prevent the attainment of health-based NAAQS. Both ports are addressing GHG emissions under separate programs, however, implementation of the some of the CAAP measures will result in GHG co-benefits, or reductions, which have been identified in this document. Further, state-wide GHG emission reductions are expected to be achieved through Assembly Bill (AB) 32, which was signed into law in September 2006. AB 32 requires CARB to develop regulations and market mechanisms to implement a cap on GHG emissions from mobile and stationary sources that will reduce California’s GHG emissions to 1990 levels by 2020. To mitigate climate change in California, the Governor’s Climate Action Team has proposed a series of early action measures relevant to port operations to be in place by 2010 or shortly thereafter. These state measures are in parallel with those presented in the CAAP. In December 2008, CARB adopted the

\(^3\) MATES III, Section 6.4, pg. 6-3, 2008
Climate Change Scoping Plan to achieve the GHG reductions mandated by AB 32 including several measures targeting goods movement and ports.

In May 2007, Los Angeles Mayor Villaraigosa unveiled GREEN LA – An Action Plan to Lead the Nation in Fighting Global Warming, which set a goal to reduce the City of Los Angeles’ GHGs by 35% below 1990 levels, by 2030. This plan included the POLA, which published its GREEN LA component, City of Los Angeles Harbor Department Climate Action Plan, in December 2007. This Action Plan focused on meeting the GREEN LA targets with the ports’ own municipally-controlled operations and buildings. In September 2008, the POLB Board adopted a policy resolution, establishing a framework for reducing emissions of GHGs in a cooperative effort with the other departments of the City of Long Beach. In addition, both ports, through their respective cities, are members of the California Climate Action Registry. Both ports began annually reporting GHG emissions for their Harbor Department operations in 2007. Further, to gain a better understanding of the GHG impacts from port tenant operations, both ports also began reporting on GHG emissions in their annual air emissions inventories, starting with the 2006 Emissions Inventory. This will be standard practice for all future Emission Inventories. Finally, for each of the control measures in this CAAP Update, the impact on GHG emissions is quantified. Since both cities have different approaches and goals relating to GHGs, each port is developing a comprehensive GHG or Climate Action Plan outside of the CAAP to meet their respective Board of Harbor Commissioners’ and City Administration GHG emission reduction goals. These GHG or Climate Action Plans will include strategies for all port operations, including tenant operations.

1.5 Regulatory Measures Addressing Port-Related Activities

Almost all of the emissions associated with port related activities are attributable to five diesel-fueled source categories. These source categories include ocean-going vessels (OGVs), On-Road Heavy-Duty Vehicles (HDVs), Cargo Handling Equipment (CHE), Harbor Craft (HC) and Railroad Locomotives (RL). The responsibility for the control of emissions from the majority of these sources falls under the jurisdiction of federal (USEPA) and state (CARB) air regulatory agencies. In addition to a summary of key regulations already affecting port operations, a list of the recently adopted and proposed regulatory measures that may impact the ports over the next five calendar years is presented below. When evaluating the future year benefits from the CAAP, the impacts of the adopted measures were estimated and considered in order to avoid duplication and to ensure both the effectiveness and cost efficiency of the ports’ proposed measures. Regulatory measures that have been announced in concept but for which no detailed information on approach has been released, have not been included in the following discussion. Once developed, these regulations will be included in future revisions to the CAAP.
1.5.1 On-Road Heavy-Duty Vehicles

Emission Standards for New 2007+ On-Road Heavy-Duty Vehicles

In 2001, CARB adopted USEPA’s stringent emission standards for 2007+ On-Road Heavy-Duty Vehicles (HDV), which will ultimately result in a 90% reduction in NOx and particulate matter (PM) emissions. This regulation requires HDV engine manufacturers to meet a 0.01 g/bhp-hr PM standard starting in 2007, which is 90% lower than the 2004 PM standard of 0.1 g/bhp-hr. The regulation further requires a phase-in of a 0.2 g/bhp-hr NOx standard between 2007 and 2010. By 2010, all engines will be required to meet the 0.2 g/bhp-hr NOx standard, which represents a greater than 90% reduction compared to the 2004 NOx standard of 2.4 g/bhp-hr. Between 2007 and 2010, on average, manufacturers have produced HDV engines meeting a PM standard of 0.01 g/bhp-hr and a NOx standard of 1.2 g/bhp-hr. This latter was referred to as the 2007 interim standard.

Ultra-Low Sulfur Diesel (ULSD) Fuel Requirement

In 2003, CARB adopted a regulation requiring that diesel fuel produced or offered for sale in California for use in any on-road or non-road vehicular diesel engine (with the exception of locomotive and marine diesel engines) contain no more than 15 parts per million (ppm) of sulfur (S) by weight, beginning June of 2006. This ULSD fuel is needed in order for retrofit technologies, such as diesel particulate filters, to operate effectively.

Heavy-Duty Vehicle On-Board Diagnostics (OBD) Requirement

In 2005, CARB adopted a comprehensive HDV On-Board Diagnostics (OBD) regulation, which ensures that the increasingly stringent HDV emissions standards being phased in are maintained throughout the vehicle’s useful life. The OBD regulation requires manufacturers to install a system in HDVs to monitor virtually every emissions-related component on the vehicle. The OBD regulation will be phased in beginning with the 2010 model years with full implementation required by 2016.

Requirements for In-Use On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at Ports and Intermodal Rail Yard Facilities

As a part of CARB’s emissions reduction plan for ports and goods movement in California, in December of 2007, CARB adopted a regulation designed to modernize the drayage truck fleet in use at California’s ports. This objective is to be achieved in two phases:

1. By December 31, 2009, all pre-1994 model year (MY) engines are to be retired or replaced with 1994 and newer MY engines. Furthermore, all drayage trucks with 1994 to 2003 MY engines will be required to achieve an 85% PM emission reduction through the use of a CARB Level 3 verified diesel emission control strategy (VDECS).

2. By December 31, 2013, all trucks operating at California ports must comply with the 2007+ on-road heavy-duty truck engine standards.
Statewide Truck and Bus Regulation
In December 2008, CARB adopted a regulation that places requirements on in-use HDVs operating throughout the state. Under the regulation, existing HDVs are required to be replaced with HDVs meeting the latest NOx and PM Best Available Control Technology (BACT). By January 1, 2021, all MY 2007 trucks are required to meet NOx and PM BACT (i.e., 2010+ USEPA Engine Standards). MY 2008 and MY 2009 must be replaced with 2010+ engines by January 1, 2022 and January 1, 2023, respectively.

1.5.2 Ocean-Going Vessels
International Emission Standards for Marine Propulsion Engines
The International Maritime Organization (IMO) adopted limits for NOx in Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL) in 1997. These NOx limits apply to marine engines over 130 kilowatts (kW) installed on vessels built on or after 2000 and are summarized below. The required number of countries ratified Annex VI in May 2004 and it went into force for the ratifying countries in May of 2005. Engine manufacturers have been certifying engines to the Annex VI NOx limits since 2000 as the standards are retroactive in other countries, once Annex VI is ratified. In April 2008, the Marine Environment Protection Committee of the IMO approved a recommendation for new MARPOL Annex VI sulfur limits for fuel and further NOx limits for engines. In October 2008, the IMO adopted these amendments to the international requirements under MARPOL Annex VI, which place a global limit on marine fuel sulfur content of 3.5% by 2012, reduced from the current 4.5%, which will be further reduced to 0.5% sulfur by 2020, or 2025 at the latest, pending a technical review in 2018.4 In Emissions Control Areas (ECAs), sulfur content will be limited to 1.0% in 2010, and further reduced to 0.1% sulfur in 2015 from the current 1.5% limit. In addition, new engine emission rate limits for NOx for marine diesel engines installed on newly built ships are based on rated engine speed (n) and the year the ship is built. The NOx standards are summarized as follow:

- **NOx - Tier 1; For ships built between January 1, 2000 and December 31, 2010:**
  - 17.0 g/kW-hr if n is less than 130 rpm
  - 45* n \(^{(0.2)}\) g/kW-hr if n is equal to 130 rpm or less than 2000 rpm
  - 9.8 g/kW-hr if n is equal to or greater than 2000 rpm

- **NOx - Tier 2; For ships built starting in January 1, 2011:**
  - 14.4 g/kW-hr if n is less than 130 rpm
  - 44* n \(^{(-0.23)}\) g/kW-hr if n is equal to 130 rpm or less than 2000 rpm
  - 7.7 g/kW-hr if n is equal to or greater than 2000 rpm

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NOx - Tier 3; For ships built starting in January 1, 2016 and operate in ECA area:
- 3.4 g/kW-hr if n is less than 130 rpm
- 9* n (-0.2) g/kW-hr if n is equal to 130 rpm or less than 2000 rpm
- 2.0 g/kW-hr if n is equal to or greater than 2000 rpm
- Tier 3 NOx standards are based on the use of advanced catalytic after-treatment systems.

The United States ratified Annex VI in October 2008, and the requirements became enforceable through the Act to Prevent Pollution from Ships (APPS) in January 2009. In March 2009, the United States and Canada submitted a proposal to the IMO for the designation of an ECA in which the stringent international emission controls described above would apply to ocean-going vessels in waters extending to 200 nm from the Pacific coast, Atlantic/Gulf coast, and the eight main Hawaiian Islands. On March 26, 2010, IMO approved the North American ECA, which will enter into force on August 1, 2011, and allow for 1.0% sulfur fuel limits to take effect on August 1, 2012.

USEPA's Emission Standards for Marine Diesel Engines Above 30 Liters per Cylinder (Category 3 Engines)
Under the Clean Air Act, on December 22, 2009, USEPA announced final emission standards for new marine diesel engines with per-cylinder displacement at or above 30 liters or Category 3 marine diesel engines installed on U.S.-flagged vessels. The final engine standards are equivalent to IMO's latest MARPOL standards as described above. The emission standards apply in two stages: near-term standards for newly-built engines will apply beginning in 2011, and long-term standards requiring an 80 percent reduction in nitrogen dioxides (NOx) will begin in 2016. USEPA has also adopted MARPOL Annex VI standards for existing engines built between 1990 and 2000. The USEPA also applied to IMO to designate U.S. coasts as an Emissions Control Area (ECA), and forbid the production and sale of fuel with greater than 0.1% sulfur for use in waters within a U.S. ECA.

USEPA's Final Regulation for the Control of Air Pollution from Locomotive and Marine Compression Ignited Engines Less than 30 Liters Per Cylinder
On March 14, 2008⁵, the USEPA finalized a program designed to dramatically reduce emissions from marine diesel engines below 30 liters per cylinder displacement. These include marine propulsion engines used on vessels and marine auxiliary engines. When fully implemented, this rule will cut PM emissions from these engines by as much as 90% and NOx emissions by as much as 80%.

⁵ http://www.epa.gov/otaq/regs/nonroad/420f08004.htm#xhaust
The regulations introduce two tiers of standards – Tier 3 and Tier 4 – which apply to both new and remanufactured marine diesel engines, as follows:

- **Newly-built engines**: Tier 3 standards apply to engines used in commercial, recreational and auxiliary power applications (including those below 37 kW that were previously covered by non-road engine standards). The emissions standards for newly-built engines will phase in beginning in 2009. Tier 4 standards apply to engines above 600 kW on commercial vessels based on the application of high-efficiency catalytic after-treatment technology, phasing in beginning in 2014.

- **Remanufactured engines**: The standards apply to commercial marine diesel engines above 600 kW when these engines were remanufactured and will take effect as soon as certified systems are available, as early as 2008.

**CARB’s Regulation to Reduce Emissions from Diesel Auxiliary Engines on Ocean-Going Vessels While at Berth at a California Port**

On December 6, 2007, CARB adopted a regulation to reduce emissions from diesel auxiliary engines on ocean-going vessels (OGVs) while at berth for container, cruise and refrigerated cargo vessels. The regulation requires that auxiliary diesel engines on OGVs be shut down (i.e., use shore power) for specified percentages of the fleet’s visits and that the fleet’s at-berth auxiliary engine power generation be reduced by the same percentages. As an alternative, vessel operators may employ any combination of clean emissions control technologies to achieve equivalent reductions. Specifically, by 2014, vessel operators relying on shore power are required to shut down their auxiliary engines at-berth for 50% of the fleet’s vessel visits and reduce their onboard auxiliary engine power generation by 50 percent. The specified percentages increase to 70% in 2017 and 80% in 2020. For vessel operators choosing the emission reduction equivalency alternative, the regulation requires a 10% reduction in OGV hotelling emissions starting in 2010, increasing in stringency to an 80% reduction by 2020.

**CARB’s Regulation for Low Sulfur Fuel for Marine Engines and Auxiliary Boilers**

On July 24, 2008, CARB adopted low sulfur fuel requirements for marine main engines, auxiliary engines and auxiliary boilers within 24 nautical miles (nm) of the California coastline. As of July 1, 2009, the regulation required the use of marine gas oil (MGO) with a sulfur content less than 1.5% by weight or marine diesel oil (MDO) with a sulfur content of equal to or less than 0.5% by weight. The use of MGO or MDO with a sulfur content of equal to or less than 0.1 % will be required in all engines and boilers by January 1, 2012. The use of low sulfur fuel will reduce emissions of DPM, NOx and SOx.

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CARB’s Regulation Related to Ocean-Going Ship On-board Incineration
Starting in November of 2007, all cruise ships and ocean-going vessels of 300 gross registered 
tons or more are prohibited from conducting on-board incineration within 3 nm of the 
California coast. Enactment of this regulation reduced emissions of toxic air contaminants 
such as dioxins and public exposure to toxic metals. The regulation will reduce PM and 
hydrocarbon emissions generated during incineration.

Vessel Speed Reduction (VSR) Program
In May of 2001, a Memorandum of Understanding (MOU) between the POLA, POLB, 
USEPA Region 9, CARB, SCAQMD, the Pacific Merchant Shipping Association (PMSA), 
and the Marine Exchange of Southern California was signed. This MOU called for OGVs to 
voluntarily reduce speed to 12 knots at a distance of 20 nautical miles (nm) from Point 
Fermin. Although the terms of this MOU expired in 2004, a significant number of vessels 
visiting the ports continue to abide by the VSR and participate in the ports’ incentive 
programs described in CAAP measure OGV1.

1.5.3 Cargo Handling Equipment
Emissions Standards for Non-Road Diesel Powered Equipment
USEPA’s and CARB’s Tier 1, Tier 2, Tier 3, and Tier 4 (interim Tier 4 and final) emissions 
standards for non-road diesel engines require compliance with progressively more stringent 
standards for DPM, NOx, hydrocarbon and carbon monoxide (CO). Tier 4 standards for 
non-road diesel powered equipment complement the 2007+ on-road heavy-duty engine 
standards which require 90% reductions in DPM and NOx compared to current levels. In 
order to meet these standards, engine manufacturers must produce new engines with advanced 
emissions control technologies similar to those already in place for on-road heavy-duty diesel 
vehicles. These standards for new engines will be phased in starting with smaller engines in 
2008 until all but the very largest diesel engines meet NOx and PM standards in 2015. 
Currently, the interim Tier 4 standards include a 90% reduction in PM and a 60% reduction 
in NOx.

CARB’s Cargo Handling Equipment Regulation
In December of 2005, CARB adopted a regulation designed to reduce emissions from cargo 
handling equipment (CHE) such as yard tractors and forklifts starting in 2007. The 
regulation calls for the replacement or retrofit of existing engines with engines that use BACT. 
Beginning January 1, 2007 the regulation requires newly purchased, leased, or rented yard 
tractors to be equipped with a 2007 or later on-road engine, or a Final Tier 4 off-road engine. 
Newly purchased, leased, or rented non-yard tractors must be equipped with a certified on-
road or off-road engine meeting the current model year standards in effect at the time the 
engine is added to the fleet. If the engine is pre-Tier 4, then the highest level available 
VDECS must be installed within one year. In-use yard tractors are required to meet either 
2007 or later certified on-road engine standards, Final Tier 4 off-road engine standards, or 
install verified controls that will result in equivalent or fewer DPM and NOx emissions than a 
Final Tier 4 off-road engine. In-use non-yard tractors must either install the highest level
available VDECS and/or replace to an on-road or off-road engine meeting the current model year standards. For all CHE, compliance dates are being phased in beginning December 31, 2007, based on the age of the engine and number of equipment in each model year group.

1.5.4 Harbor Craft

Emission Standards for Harbor Craft Engines

On March 14, 2008, USEPA finalized the latest regulation establishing new emission standards for new Category 1 and 2 diesel engines rated over 50 horsepower (hp) used for propulsion in most harbor craft. The new Tier 3 engine standards phased in beginning in 2009. The more stringent Tier 4 engine standards (based on the application of high-efficiency catalytic aftertreatment technologies) will phase in beginning in 2014 and apply only to commercial marine diesel engines greater than 800 hp. The regulation also includes requirements for remanufacturing commercial marine diesel engines greater than 800 hp.

CARB’s Low Sulfur Fuel Requirement for Harbor Craft

In 2004, CARB adopted a low sulfur fuel requirement for harbor craft. Starting January 1, 2006 (in SoCAB) harbor craft are required to use on-road diesel fuel (e.g., ULSD), which has a sulfur content limit of 15 ppm and a lower aromatic hydrocarbon content. The use of lower sulfur and aromatic fuel has resulted in DPM and NOx reductions. In addition, the use of low sulfur fuel will facilitate retrofitting harbor craft with emissions control devices such as diesel particulate filters (DPFs) that have the potential to reduce PM by an additional 85%.

CARB’s Regulation to Reduce Emissions from Diesel Engines on Commercial Harbor Craft

As a part of both the Diesel Risk Reduction Plan and Goods Movement Plan, CARB adopted a regulation in November 2007 that will reduce DPM and NOx emissions from new and in-use commercial harbor craft operating in regulated California waters (i.e., internal waters, ports, and coastal waters within 24 nm of California coastline). Under CARB’s definition, commercial harbor craft include tug boats, tow boats, ferries, excursion vessels, work boats, crew boats, and fishing vessels. This regulation requires stringent emission limits for auxiliary and propulsion engines installed in commercial harbor craft. All in-use, newly purchased, or replacement engines must meet USEPA’s most stringent emission standards per a compliance schedule set by CARB. In addition, the propulsion engines on all new ferries, with the capacity of more than 75 passengers, acquired after January 1, 2009, will be required to install control technology that represents BACT, in addition to an engine that meets the Tier 2 or Tier 3 USEPA marine engine standard, as applicable, in effect at the time of vessel acquisition. For harbor craft that home port in the SoCAB, the compliance schedule is accelerated by two years (compared to statewide requirements) in order to achieve earlier emission benefits required in SoCAB. The in-use emission limits only apply to ferries, excursion vessels, tug boats and tow boats. The compliance schedule for in-use engine replacement began in 2009.

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1.5.5 Railroad Locomotives

Emissions Standards for New and Remanufactured Locomotives and Locomotive Engines

In 1998, USEPA adopted Tier 0 (1973-2001), Tier 1 (2002-2004), and Tier 2 (2005+) emissions standards applicable to newly manufactured and remanufactured railroad locomotives and locomotive engines. These standards require compliance with progressively more stringent limits on allowable emissions of hydrocarbon, CO, NOx, and DPM. Although the most stringent standard, Tier 2, results in over 60% reduction in DPM and 40% reduction in NOx compared to Tier 0, the full potential of these reductions will not be realized in the next five years because of the long life of diesel locomotive engines. In March of 2008, the USEPA finalized a regulation which established new standards for new and remanufactured locomotives. When fully implemented, this rule will cut DPM emissions from these engines by as much as 90% and NOx emissions by as much as 80%.

The regulation introduces two tiers of standards – Tier 3 and Tier 4 – which apply to new locomotives as well as standards for remanufactured locomotives, as follows:

- **Newly-Manufactured Locomotives:** The new Tier 3 emission standards will achieve 50% reduction in DPM beyond the Tier 2 standard and will become effective in 2012. The longer term Tier 4 emission standards which are based on the application of high efficiency catalytic after-treatment technologies for NOx and DPM will become effective in 2015 and will achieve about 80% reduction in NOx and DPM compared to Tier 2 standards.
- **Remanufactured Locomotives:** The regulation also establishes emission standards for remanufactured Tier 0, 1, and 2 locomotives which would achieve 50 to 60% reduction in DPM and 0 to 20% reduction in NOx.

CARB’s Low Sulfur Fuel Requirement for Intrastate Locomotives

In 2004, CARB adopted a low sulfur fuel requirement for intrastate locomotives. Intrastate locomotives are defined as those locomotives that operate at least 90% of the time within the borders of the state, based on hours of operation, miles traveled, or fuel consumption. Primarily applicable to switchers, starting January 1, 2006 statewide, intrastate locomotives are required to use CARB off-road diesel fuel which has a sulfur content limit of 15 ppm and a lower aromatic content. The use of fuel with lower sulfur and aromatics results in DPM and NOx reductions. In addition, use of low sulfur fuel facilitates retrofitting locomotives with emissions control devices such as DPFs that have potential to reduce DPM by 85%.

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8 [http://www.epa.gov/otaq/regs/nonroad/420f08004.htm](http://www.epa.gov/otaq/regs/nonroad/420f08004.htm)
Statewide 1998 and 2005 Memoranda of Understanding (MOU)
In order to accelerate the implementation of Tier 2 engines in the SoCAB, the CARB and USEPA Region 9 entered into an enforceable MOU in 1998 with two major Class 1 freight railroads [Union Pacific (UP) and Burlington Northern Santa Fe (BNSF)] in California. This MOU requires UP and BNSF to concentrate the introduction of the Tier 2 locomotives in the SoCAB which will achieve a 65% reduction in NOx by 2010. In 2005, CARB entered into another MOU with UP and BNSF whereby the two railroads agreed to phase out non-essential idling and install idling reduction devices, identify and expeditiously repair locomotives that smoke excessively, and maximize the use of 15 ppm sulfur fuel.

1.5.6 AB 32 – The California Global Warming Solutions Act
Assembly Bill 32 (AB32), the California Global Warming Solutions Act of 2006, establishes a first-in-the-world comprehensive program requiring CARB to develop regulatory and market mechanisms that will ultimately reduce GHG emissions to 1990 levels by the year 2020, and reduce emissions to 80% below 1990 levels by 2050. Mandatory caps will begin in 2012 for significant sources and ratchet down to meet the 2020 goals. In the interim, CARB will begin to measure the GHG emissions of industries determined to be significant sources of GHG emissions.

On October 25, 2007, CARB approved several emission reduction strategies to reduce GHG emissions as “early action measures.” Early action measures pertaining to goods movement activities for ships, port drayage trucks, cargo handling equipment and transport refrigeration units include:

- Green Ports (Ship Electrification)
- SmartWay Truck Efficiency
- Tire Inflation Program
- Anti-idling Enforcement
- Refrigerant Tracking, Reporting, and Recovery Program
- Low Carbon Fuel Standard

In December 2008, CARB adopted their Climate Change Scoping Plan, which was designed to achieve the reductions in GHG emissions mandated in AB 32. The AB 32 Scoping Plan contains the main strategies California will use to reduce the GHGs that cause climate change. Several of these measures are targeted at goods movement, including ports, and are expected to achieve a combined 3.7 million metric tons of carbon dioxide equivalent (CO2E) reduction. Measures in the Scoping Plan that affect port operations include:

- T-5: Ship electrification at ports (previously adopted as regulation in December 2007)
- T-6: Goods movement efficiency measures
1.5.7 Grant Funding Programs

Non-regulatory grant funding programs are also helping to significantly reduce emissions from sources including those associated with port operations. An example of these types of programs is the Carl Moyer Program. This program is a CARB administered grant program implemented in partnership with local air districts to fund the replacement of older, higher emitting engines or to cover the incremental cost of purchasing cleaner-than-required engines and vehicles. Under this program, owners/operators of mobile emissions sources can apply for incremental funding to reduce emissions. The program also includes a fleet modernization component. It is important to note that only emission reductions that are surplus to regulatory requirements are eligible for Carl Moyer Program funding.

In addition to the Carl Moyer Program, Proposition 1B (Prop 1B), the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 passed by voters in November 2006, authorized $1 billion in bond funding over four years for incentives to reduce diesel emissions associated with goods movement. Under this program, the CARB will work in partnerships with local public agencies (i.e., air quality management districts and ports) to identify and fund qualified projects. CARB awards funding to local agencies, which in turn provide financial incentives to owners of equipment used in goods movement to upgrade to cleaner technologies. In June 2008, CARB and the ports of Long Beach and Los Angeles entered into an agreement for a $98 million award of Prop 1B grant funds to replace older diesel drayage trucks operating at the ports. In August 2008, the ports began moving forward with the Prop 1B grant program, however, on December 23, 2008 CARB issued a letter to all local air districts and seaports asking them to cease making any awards on Prop 1B applications due to California’s fiscal budget crisis. Several months later, CARB was able to tap into the bond market, and in June 2009 reinstated the original $98 million under the Prop 1B grant program.

In 2006, the SCAQMD committed $36 million to support the implementation of the HDV component of the CAAP, described in HDV-1, however, this funding to help the ports has been held up by administrative restrictions associated with the funding sources. In addition, the USEPA, through the Diesel Emission Reduction Act (DERA), has provided grant funding to local governments for diesel emissions reduction projects. In 2009, both ports were successful in receiving grant awards through DERA, funded by the American Reinvestment and Recovery Act. The combined total of nearly $6 million was used for the replacement, repower or retrofit of cargo handling equipment and harbor craft projects.
1.5.8 CAAP Coordination with Regulatory Requirements

It is important to highlight that the CAAP works in conjunction with, and relies upon existing and anticipated federal, state, and local regulations. The CAAP will continue to incorporate new regulations in future updates. Working together, both regulatory and port efforts can produce combined emissions reductions that are greater than those that are likely to be achieved on an individual basis. In order to meet the immediate needs of our local communities in southern California, the ports’ efforts can also expedite emissions reductions to be achieved by existing or proposed regulations and can provide greater assurance that emissions reductions which may be achieved by future regulations or standards (e.g., potential USEPA and IMO vessel standards) will actually occur. The ports believe however that broader scale regulations are necessary to help meet our air quality improvement goals while not putting our local port operators at a competitive disadvantage, and that eventually, the ports’ efforts should be overtaken by regulatory actions at the state, national and international level.

1.6 Clean Air Action Plan Vision

The ports recognize that their ability to accommodate the projected growth in trade will depend upon their ability to address adverse environmental impacts (and, in particular, air quality impacts) that result from such trade. The ports are determined to accelerate efforts to reduce air pollution from all modes of goods movement through the San Pedro Bay area. The CAAP builds upon the ports’ previous air quality mitigation efforts, as well as the efforts of regulatory agencies, business stakeholders, and concerned residents. The CAAP is designed to develop mitigation measures and incentive programs necessary to reduce air emissions and health risks while allowing port development to continue. The CAAP Update provides progress report on milestones completed to date and identifies strategies and programs to be implemented over the next five years to reduce air emissions and health risks while allowing port development to continue.

The ports share the goal of reducing air pollution from existing and future port operations to acceptable levels. The ports take full responsibility for implementation of the measures in this CAAP, and will continue to work in close coordination with the regulatory agencies to ensure that the CAAP Update goals are achieved.
This CAAP Update, like the 2006 CAAP, is based on the following principles:

1. The ports will work cooperatively to implement these strategies.

2. The Clean Air Action Plan will continue to build upon past efforts, and will be continually updated and improved.

3. The ports will remain open to and supportive of new technologies and other advancements to accelerate meeting the ports’ emissions reduction goals.

4. The ports will achieve an appropriate “fair share” of necessary pollutant emission reductions in order to reduce health risks to the local communities.

The CAAP includes multiple strategies that will achieve real emissions reductions. Several of these strategies also provide co-benefits by reducing GHG emissions as well. These strategies include a nested set of standards; multiple implementation mechanisms; investment in the development and integration of new/cleaner technologies into port operations; and a comprehensive monitoring and tracking program that will document progress on all of these elements.

Finally, the CAAP Update provides near-term planning, with a view toward the future. The primary focus of this update to the CAAP is for implementation activities that will occur over the next five years. However, the ports recognize that to meet the long-term goals of emissions and health risk reductions, activities beyond the next five years will be necessary. Therefore, the ports will continue to support programs that will help to meet our long-term goals, such as development of new, clean technologies through our Technology Advancement Program. In addition, the ports will continue to update the CAAP, planning and forecasting for the five years following each update.

1.7 Air Quality Background

The CAAP Update targets the same port-related emissions sources identified in the emissions inventories prepared by the ports of Long Beach and Los Angeles. The geographical boundaries of the emissions inventories include the SoCAB and its associated over-water boundary (consistent with the boundaries established for the SCAQMD’s Air Quality Management Plan [AQMP]). The landside boundary is presented in Figure 1.1 and the over-water boundary is presented in Figure 1.2. As in the emissions inventory, HDV operations are considered to be port-related only within the SoCAB boundary (which includes trips between the ports), the last point of rest prior to arriving at the ports and the first time the cargo is off-loaded after departing the ports (such as at a distribution center). Locomotive emissions are considered to be port-related between the port terminals and the edge of the SoCAB landside boundary.
Figure 1.1: Emissions Inventory Landside Boundary
The emission inventory over-water area is bounded in the north by the Ventura County line and to the south by the San Diego County line and extends perpendicularly out over water to the California Coastal Water designated coordinates.

**Figure 1.2: Emissions Inventory Over-Water Boundary**

Both ports finalized their 2008 Emissions Inventories in December of 2009. Using the emissions estimates from these inventories, the combined contribution of emissions by the five port-related source categories and their percentage share are presented in Figures 1.3 through 1.6 below. GHGs are presented as CO$_2$E.

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http://www.polb.com/environment/air/emissions.asp
http://www.portoflosangeles.org/environment/studies_reports.asp
**Figure 1.3: 2008 Port DPM Emissions Contributions by Source Category**

- **Heavy-Duty Vehicles**: 33%
- **Ocean-Going Vessels**: 51%
- **Rail Locomotives**: 5%
- **Cargo Handling Equipment**: 4%
- **Harbor Craft**: 7%

**Figure 1.4: 2008 Port NOx Emissions Contributions by Source Category**

- **Heavy-Duty Vehicles**: 39%
- **Ocean-Going Vessels**: 36%
- **Rail Locomotives**: 9%
- **Cargo Handling Equipment**: 7%
- **Harbor Craft**: 9%
Figure 1.5: 2008 Port SOx Emissions Contributions by Source Category

Ocean-Going Vessels >99%

Other Categories <1%

Figure 1.6: 2008 Port GHG Emissions Contributions by Source Category

Heavy-Duty Vehicles 43%

Ocean-Going Vessels 32%

Rail Locomotives 7%

Cargo Handling Equipment 13%

Harbor Craft 5%
Figures 1.7 through 1.9 shown below compare the San Pedro Bay ports percentage contributions with the contributions from all the emissions sources in the SoCAB for 2008. As existing and new regulations continue to take effect on stationary, area, and domestic mobile sources, the port-related percentage contribution to the total SoCAB emissions for DPM, NOx, and SOx is expected to increase significantly if these sources are not reduced. Further details are presented on the anticipated future percent contributions by port-related sources in Section 1.8.

Figure 1.7: Relative Contributions of Ports DPM Emissions to SoCAB in 2008

Figure 1.8: Relative Contributions of Ports NOx Emissions to SoCAB in 2008

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10 Final 2007 AQMP, Appendix III, Base and Future Year Emissions Inventory, SCAQMD, February 2007
1.8 The Greater Challenge

The ports acknowledge that if port-related sources are not controlled to their “fair share” with respect to the other sources in the SoCAB by the CAAP’s continued implementation and further state regulation, port-related contributions to the basin’s total emissions (particularly with respect to OGVs) will increase significantly beyond the levels presented in Figures 1.7 through 1.9 above.

Figures 1.10 through 1.12 below show the forecasts for 2023 of the port-related sources compared to all other emission sources in the basin. The port-related forecasted emissions shown include ports assumed cargo growth in future and federal/state/local regulations that were adopted until October of 2005. It is important to note that some significant regulatory requirements that will reduce emissions from port-related sources were promulgated since this forecasting was completed. Even though these new requirements contribute to reducing port emission contributions, diligent effort is still required to ensure that the ports’ fair share of regional emissions are reduced. Therefore, continued action must be taken in order to help the basin meet its air quality goals.
Figure 1.10: Contributions of Ports DPM Emissions to SoCAB in 2023

Figure 1.11: Contributions of Ports NOx Emissions to SoCAB in 2023

Figure 1.12: Contributions of Ports SOx Emissions to SoCAB in 2023
This CAAP Update focuses on control strategies, measures, and costs to achieve CAAP goals over the next five years. It is important to understand that a significant amount of work will still be needed beyond the next five years to ensure that plan goals are met and maintained. These challenges drive the need for continued re-evaluation, adjustment, and updates of the CAAP.

For the continued reduction of public health risk associated with port-related sources, the regulatory agencies will need to continue to apply tighter emissions reduction requirements in the future to ensure that growth does not reverse the desired trend of continual emissions reductions.

As stated previously, both ports are supportive of greater participation, action, and regulation by our agency partners as this creates a fair and level playing field for both industry and ports. As the two ports continue to implement the CAAP, it could put them at a competitive disadvantage with (in regard to cargo that is destined outside of the SoCAB) other California, west coast, and international ports. The ports have worked closely with CARB to make the strategies in the CAAP a standard that all California ports must meet, and further the ports continue to encourage USEPA to make the CAAP a standard that all ports in United States must meet. The CAAP should be considered a near-term strategy for meeting the immediate needs for local communities in the SoCAB, however ultimately, the CAAP should be surpassed by consistent and comprehensive regulation at the state, national, and international level.

Further, groundwork must be put in place today in order to secure emission reductions for the future. For example, the ports must continue to pursue development, demonstration, and integration of cleaner technologies and if feasible, “zero emission container mover systems” to ultimately replace the current systems. These “zero emission” transport systems should be near pollution-free and be powered by “green energy” sources and renewable fuels – contributing to both air quality improvement and GHG reduction goals. Perfecting the technology for a truly clean tomorrow is a critical element for achieving long-term goals. Early demonstration and implementation of these technologies today, will lead to benefits of a better and cleaner tomorrow.

Due to the enormity of the challenges ahead, specifically in the case of the Clean Trucks Program described in CAAP Measure HDV1 and infrastructure and operational efficiency programs, the ports simply cannot afford to fund these initiatives through their current operating budgets. Substantial additional funding must be secured. As mentioned earlier however, some of the funding assistance promised by the agencies has been curtailed due to administrative restrictions or the state budget crisis. Consequently, the majority of the funding for these programs must currently be borne by the port industry. In 2008, the estimated funding from POLA and POLB for Clean Air Action Plan programs was over $80 million. Estimated funding by the port industry for the Clean Trucks Program alone is over $600 million.
1.9 Clean Air Action Plan Update Report Organization

After this Introduction, the CAAP Update is organized into the following sections:

- Section 2: “San Pedro Bay Ports Clean Air Action Plan Goals” presents the goals associated with the CAAP Update over the next five fiscal years.

- Section 3: “Implementation Strategies” presents an update to the various strategies/options available to the ports for implementation of the CAAP Update.

- Section 4: “Clean Air Action Plan Initiatives” presents details and estimated emissions reductions of each of the initiatives proposed in the CAAP that will need to be completed in order to realize successful implementation.

- Section 5: “Progress To Date and Future Emissions Projections” presents reductions to date and the affect of growth on the emissions reductions that are estimated to result from the implementation of the measures discussed in the previous section.

- Section 6: “Budget Summary” presents and discusses the estimated capital and incentive costs associated with implementing the measures described in Section 4. Costs are presented in terms of annual funding over the five-year CAAP Update period.
SECTION 2: SAN PEDRO BAY PORTS CLEAN AIR ACTION PLAN GOALS

The Clean Air Action Plan establishes the path by which the targeted control measures will be implemented in the short-term and provides for budget planning over a five year period. In addition, these measures implemented in the near-term will establish the pathway for achieving emissions reductions over the long-term. The Clean Air Action Plan will be reviewed on a regular basis in light of progress that has been made and implementation strategies will be adjusted to ensure that the goals for the Clean Air Action Plan are achieved. Additional measures may be specified in future Clean Air Action Plan updates to maintain progress towards a complete and timely achievement of the goals. Goals will be reviewed as part of the update cycle and new goals may be added as needed.

2.1 Foundations

The following foundations support the San Pedro Bay Ports Clean Air Action Plan.

- The San Pedro Bay ports are committed to expeditiously and constantly reduce the public health risk associated with port-related mobile sources, and implement programs in the near-term that will achieve this goal.
- The San Pedro Bay ports are committed to facilitate growth in trade while reducing air emissions.
- The San Pedro Bay ports will focus on lease amendments/renewals and California Environmental Quality Act (CEQA) evaluations as mechanisms to establish provisions and requirements in leases consistent with meeting the Clean Air Action Plan goals.
- The San Pedro Bay ports will implement tariff changes as needed to affect activity changes that will result in emissions reductions.
- The San Pedro Bay ports will work with the international, national, state and regional regulatory agencies to influence changes in regulations that will implement uniform requirements to reduce emissions from port operations.
- The San Pedro Bay ports are committed to monitor, document, and report on performance of their efforts under the Clean Air Action Plan and will update the plan on a regular basis.

2.2 Standards

The San Pedro Bay ports established Standards to act as a guide for decision making. These Standards have been established at three levels (e.g. San Pedro Bay-wide for the two port complex, Project Specific for individual projects, and Source Specific for individual pieces of equipment), in order to provide direction for achieving overall long-term goals, but also to provide specificity on the emission reduction needs.
2.2.1 San Pedro Bay Standards
Since finalization of the 2006 CAAP, the ports of Long Beach and Los Angeles, along with the agency Technical Working Group (TWG), comprised of USEPA, CARB and SCAQMD staff, have been working to establish appropriate San Pedro Bay Standards. There are two components to the San Pedro Bay Standards: 1) reduction in health risk from port-related DPM emissions in residential areas surrounding the ports, and 2) “fair share” reduction of port-related mass emissions of pollutants. These components address the ports’ primary air quality goals of reducing health risks to local communities from port operations and reducing emissions to assist the region in reaching attainment with health-based ambient air quality standards.

The San Pedro Bay Standards represent the health risk and emissions reduction goals for the ports through the year 2023. The Standards apply to the emissions and health risk associated with the operation of both ports and the transport of goods that flow to or from the ports. The Standards are tools for long-term air quality planning, which will help the ports and the agencies better understand and evaluate the long-term cumulative effects of future port projects in conjunction with implementation of CAAP measures and existing regulations. It is anticipated that compliance of port operations with the Standards would, over time, effectuate substantial reductions in emissions and health risk from port-related sources, relative to 2005 levels.

Similar to a statement made in CARB’s 2006 Emission Reduction Plan for Ports and Goods Movement in California, achievement of these San Pedro Bay Standards will require concerted and cooperative effort – “Successful implementation of the CARB emission reduction plan will depend upon actions at all levels of government and partnership with the private sector. No single entity can solve this problem in isolation.”\(^\text{11}\) The ports and partner air agencies are dedicated to aggressively pursue multiple mechanisms to achieve the Standards, including regulations, tariffs, leases, fees, incentives, and other means. The ports will use their mitigation authority, funds, and influence to support achievement of the Standards.

The ports’ implementation of existing CAAP measures, and CARB’s implementation of existing statewide regulations, will significantly reduce emissions and health risk from port operations. But existing measures alone are not sufficient to achieve reductions consistent with state and local air quality goals. Therefore, the ports, in adopting the Standards, commit to cooperatively work toward achieving even greater emissions reduction in the future, beyond currently known CAAP measures, by requiring implementation of additional forms of CAAP mitigation and stricter requirements when they become feasible and available, and to work with the agencies to implement aggressive emission reductions strategies within their regulatory authority.

San Pedro Bay Standards
The San Pedro Bay Standards are a statement of the ports’ commitments to significantly reduce the air quality impacts from port operations. Achievement of the Standards listed below will require diligent implementation of all of the known CAAP measures and aggressive action to seek out further emissions and health risk reductions from port-related sources from strategies that will emerge over time.

Health Risk Reduction Standard. To compliment the CARB’s Goods Movement Emission Reduction Plan, the ports of Long Beach and Los Angeles have developed the following standard for reducing overall port-related health risk impacts, relative to 2005 conditions:

- By 2020, reduce the population-weighted residential cancer risk of port-related DPM emissions by 85%, in highly-impacted communities located proximate to port sources and throughout the residential areas in the port region.

Similar to CARB’s Emission Reduction Plan, the Health Risk Reduction Standard does not contain an interim year target. However, diesel particulate matter (DPM) reductions are highly correlated with health risk reductions and, as presented in the Emission Reduction Standard below, a significant reduction in DPM emissions, and therefore health risk, is targeted for 2014

Emissions Reduction Standard. Consistent with the ports’ commitment to meet their fair share of mass emissions reductions, the ports of Long Beach and Los Angeles developed the following standards, for reducing air pollutant emissions of port-related activities, relative to 2005 levels:

- By 2014, reduce emissions by 72% for DPM, 22% for NOx, and 93% for SOx, and to support attainment of the federal fine particulate matter (PM$_{2.5}$) standards.

- By 2023, reduce emissions by 59% for NOx to support attainment of the federal 8-hour ozone standard. The corresponding DPM and SOx reductions in 2023 are 77% and 92%, respectively.

The ports will strive to exceed the 2014 NOx standard of 22% reduction, potentially exceeding 40% reduction, given the forecasted cargo volumes and efforts to implement new technologies.
Development of the San Pedro Bay Standards

The forecast years of 2014 and 2023 were selected for the ports’ Emission Reduction Standards in order to coordinate with the federal ambient air quality standards attainment years for the SoCAB, which are achievement of the federal PM$_{2.5}$ standard by 2014 and attainment of the federal 8-hour ozone standard by 2023. PM$_{2.5}$ air quality is related to DPM emissions as well as NOx and SOx emissions. While the ports’ Health Risk and Emission Reduction Standards are focused on reducing DPM emissions, progress in reducing DPM emissions will also provide reductions in PM$_{2.5}$ emissions, thus assisting with attainment of the federal PM$_{2.5}$ standard.

In addition, the forecast year of 2020 for health risk reduction generally aligns with CARB’s statewide goal of reducing DPM health risk from the goods movement industry by 85% below 2000 levels by 2020. The ports closely evaluated the methodology used to establish this statewide goal, and reviewed the specific emissions and health risk reductions estimated by CARB. The ports have thoroughly discussed the establishment of the Health Risk Reduction Standard with the agency TWG. Establishment of an appropriate Health Risk Reduction Standard has been especially challenging, as such a standard has never before been promulgated for a goods movement complex as extensive and with as many facilities and mobile sources as the San Pedro Bay ports. Further, none of the agencies have identified a “safe” or “acceptable” level of exposure to DPM. The ports are committed to do their fair share to support achievement of the statewide risk reduction goal, in addition to the reductions that will be achieved for communities in the vicinity of the ports.

Further, the ports recognize that the communities located closest (i.e., within two kilometers) to the port boundaries and the major transportation corridors utilized by port-related trucks and locomotives are more highly impacted by port-related emissions. Therefore, the commitment of the Health Risk Reduction Standard is to reduce the health risk in these residential communities, in addition to reducing the health risk in the residential areas throughout the entire modeled ports region$^{12}$, by 85% by 2020.

Finally, similar to CARB’s Emission Reduction Plan, the Health Risk Reduction Standard does not contain an interim year target. However, diesel particulate matter (DPM) reductions are highly correlated with health risk reductions and, as presented in the Emission Reduction Standard below, a significant reduction in DPM emissions, and therefore health risk, is targeted for 2014.

$^{12}$ A 20 mile by 20 mile area, as defined by the BWHRA Tool modeling domain, consistent with the CARB’s exposure assessment of the Ports (CARB, 2006a).
Assessment of Current Progress Toward Achieving the Standards

To understand the ports’ current progress toward meeting the Emission Reduction Standards, the ports developed emissions forecasting that assumed implementation of the CAAP and all existing regulations as of the end of July 2008, and compared existing conditions in the CAAP baseline year (2005) with forecasted conditions in 2014 and 2023, assuming a conservative estimate of projected growth in the ports’ operations (i.e. 2007 Cargo Forecast). Based on this analysis, it was estimated that the ports will achieve emissions reductions of 72% DPM, 19% NOx and 93% SOx by 2014, compared to 2005, and a reduction of 75% DPM, 18% NOx and 92% SOx by 2023, compared to 2005\(^\text{13}\). A comparison of the Emissions Reduction Standards with the Emission Forecast is shown in Table 2.1.

Table 2.1. Comparison of Emissions Reductions Standards with Emissions Forecast

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<th>Emissions Reduction Standards</th>
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In order to better understand the ports’ current progress toward meeting the Health Risk Reduction Standard, the ports developed the Bay Wide Health Risk Assessment (BWHRA) Tool, a health risk assessment modeling tool. An estimate of health risk reductions in 2020 was developed by comparing health risk assessment modeling results based upon the 2005 baseline year port-related DPM emissions with health risk assessment modeling results based on an estimate of port-related DPM emissions using forecasted conditions in 2020, assuming implementation of all CAAP measures and existing regulations and a conservative estimate of projected growth in port operations.

Figure 2.1 shows the significant reduction in residential population-weighted cancer risk in the larger ports region of 74% by 2020 with implementation of presently feasible and available CAAP measures and existing emissions control regulations. Figure 2.2 shows the reduction in residential population-weighted cancer risk of 72% by 2020 in the areas within two kilometers of the port and transportation corridors serving the port with implementation of presently feasible and available CAAP measures and existing emissions control regulations\(^\text{14}\).

Both the emissions forecast and the BWHRA Tool were extensively reviewed by the agency TWG.

\(^{13}\) San Pedro Bay Ports Emissions Forecasting Methodology and Results, Starcrest, 2008; provided as Appendix A

\(^{14}\) Bay Wide Health Risk Assessment, 2008, Environ; provided as Appendix B
Figure 2.1: Percent Reduction in DPM-Related Health Risk Between 2005 and 2020 for Ports Region
Implementation of presently feasible and available measures and regulations would not be sufficient to achieve the Health Risk Reduction Standard of an 85% reduction in that risk or the Emission Reduction Standards for NOx and DPM. Nevertheless, it is expected that technological improvements and regulatory actions will make feasible and available, within the timeframes of the Health Risk Reduction and Emission Reduction Standards, additional CAAP measures whose implementation along with emission control regulations would achieve the Standards’ goals. Such additional CAAP measures can only emerge if there are concerted efforts by the ports, regulatory agencies, and industry stakeholders to develop them. It must be emphasized that federal, state, and local air quality agencies will also play an essential role by identifying and pursuing future regulatory measures that will reduce emissions above and beyond currently allowable levels. As these technological improvements and regulatory measures emerge, future editions of the CAAP will be revised to incorporate the new measures, and these new measures will be required in the ports’ future leases and project approvals.
Although sufficient means for full achievement of the Health Risk Reduction Standard and all of the Emission Reduction Standards have not been identified at this time, the ports must move forward with port improvement projects in the near-term. These projects will significantly reduce emissions by incorporating all feasible and available technologies, as identified in the current version of the CAAP, and will ensure that the ports can at least achieve the currently forecasted emissions reductions and health risk reductions. At this time, a project will be determined consistent with the Health Risk Reduction Standard if it meets the Source Specific Performance Standards and Project Specific Standards contained in the then current version of the CAAP, which are defined in more detail later in this section. In addition, an evaluation must be conducted to identify new, available and feasible measures that can be added to the project to achieve emissions reductions beyond the existing Source Specific Performance Measures, and if so, the new measures will be included in the project. As the CAAP is revised in the future to include additional feasible and available emissions control technologies and regulatory measures, future projects will be determined consistent with the Health Risk Reduction Standard if they meet the revised CAAP requirements. The additional emission reductions from yet-to-be-developed CAAP measures on future ports’ projects are expected to be sufficient to ensure that the ports ultimately achieve the Health Risk Reduction Standard’s cumulative 85% DPM population-weighted average risk reduction goal by 2020 and the Emission Reduction Standards by the 2014 and 2023 timelines. A more complete discussion on the process through which discretionary actions, such as facility leases or CEQA actions, will be evaluated to determine project consistency with the Health Risk Reduction Standard, is presented later in this section.

Relationship of the Emissions Reduction Standards and the 2007 SIP
With regard to criteria pollutants, the 2007 SIP establishes emission reductions from all source categories which are necessary to attain the Federal PM$_{2.5}$ and 8-hour ozone standards in the SoCAB. The SIP proposes different and generally greater reductions from port-related sources, specifically for NOx, because port-related sources are generally less well-controlled than other sources. It is important to note that the SIP targets were developed prior to development of the San Pedro Bay Standard, and therefore were not informed by the extensive analysis conducted for the ports emissions forecast, the BWHRA Tool, the ports’ most recent emissions inventories, and new developments following the adoption of the 2007 SIP. In the adopting resolution for the 2007 AQMP, the SCAQMD committed to continue working with the ports on port-related AQMP emissions targets.

The Emission Reduction Standards reflect the ports commitment to their fair share of reductions from port-related sources to support regional attainment. Again, it is critically important to note that achievement of these reductions -- particularly with regard to emissions from marine vessels and locomotives -- will require significant technological improvements and pursuit of regulatory strategies to control DPM and NOx emissions.
The Emission Reduction Standards reflect adjusted reduction targets from those originally contained in the 2007 SIP for port-related sources. The adjustments were made by the ports to reflect new information not available at the time the 2007 SIP was prepared, and have been extensively discussed with the agencies. It is important to note that, with the exception of 2014 NOx, the targets in the Emission Reduction Standards substantially meet the ports reductions for the SoCAB identified in the 2007 State Implementation Plan (SIP). However, 2014 NOx reductions from port-related sources called for in the 2007 SIP are approximately twice the target shown in the Emission Reduction Standards. There are though two significant factors that are anticipated to occur through which the ports may move towards meeting the expectations under the SIP and potentially exceed the target identified in the 2014 Emissions Reduction Standard listed above.

1. **In-Use Vessel Retrofits.** As discussed below, the 2014 targets were largely established based on presently feasible and available CAAP measures and existing emissions control regulations. OGV main engines contribute 24% of uncontrolled NOx emissions in 2014 and proven control strategies for existing vessels (beyond speed reduction and low sulfur fuel) are currently very limited or in development only. Control Measure OGV6 in Section 4 is intended, in cooperation with our regulatory agency partners, to start systematically addressing this challenging issue. For the next CAAP Update, the effectiveness and feasibility of promising OGV main engine control technologies are expected to be evaluated and demonstrated, requirements for in-use vessel retrofits using these technologies progressively incorporated into new and re-negotiated leases, and an estimate of additional 2014 NOx reductions should be more well known.

2. **Emissions Growth.** Also discussed below, the emissions that ports estimated would need to be controlled in 2014 were projected from the 2005 baseline using the pre-economic crisis 2007 growth forecast. The reduction targets (which are percent reductions compared to 2005) contained in the Standards therefore assume a significantly higher level of cargo throughput and associated emissions than is now considered probable. For example, throughput in 2015 is now estimated to be 38.5% lower than forecasted in 2007\(^\text{15}\). However, to be conservative in developing long-term air quality goals, the ports have retained the higher emissions growth assumptions for this CAAP Update. As it relates to meeting SIP expectations, based on current lower growth forecasts, uncontrolled NOx emissions in 2014 are expected to decline by approximately 20% compared to 2005 as opposed to the over 30% growth that was previously assumed. Consequently, with implementation of the strategies identified to achieve the 22% reduction for the NOx Emission Reduction Standard, coupled with the emissions decline due to currently anticipated lower growth, NOx emissions reductions could be 40% by 2014 which is in line with SIP expectations. Lower growth will have a similar positive effect on achievement of emission reduction targets.

\(^{15}\) *San Pedro Bay Container Forecast Update, The Tioga Group, Inc., p. 20, July 2009.*
for other pollutants, potentially resulting in the ports achieving the targeted emissions reductions earlier than anticipated.

It should be emphasized that CARB and USEPA, having direct regulatory authority over mobile sources, are identified as the main entities in the 2007 SIP responsible for achieving mobile source reductions, including port-related reductions, through regulations, programs, or incentive funding. The USEPA’s approval of the 2007 SIP is contingent upon such enforceable strategies and reduction commitments. Therefore, for port-related sources, CARB has committed to an aggressive schedule of rule making and strategy development in the 2007 SIP including measures for ocean-going vessels, harbor craft, rail locomotives, and on-road diesel vehicles, including port trucks, some of which have recently been adopted by CARB. The reductions associated with regulations adopted as of July 2008 have already been incorporated in this CAAP Update and included in the emissions forecasting. In addition to the actions that have been undertaken already, CARB has also committed to pursue a strategy with Class 1 railroads to achieve further reductions from locomotives, a strategy to reduce emissions from vessel main engines, as well as identifying additional incentive funding for port-related sources. The 2007 SIP also includes reductions attributed to the USEPA for reducing emissions from locomotives through federal funding.

Therefore, achieving the 2007 SIP reductions identified for port-related sources is predicated on a number of key assumptions, the fulfillment of which is outside the ports control or jurisdiction. These important assumptions are briefly specified below:

1. CARB’s adoption of regulations and enforceable agreements
   - Since 2007, CARB adopted four regulations affecting port-related sources. These include regulations for: a) auxiliary diesel engines on three classes of ocean-going vessels while at berth (container vessels, reefers, and cruise ships); b) low sulfur fuel for ocean-going vessels’ main and auxiliary engines and auxiliary boilers; c) new and in-use harbor craft; and d) on-road diesel vehicles, including port drayage trucks.
   - In addition to these adopted strategies, CARB also proposed in the 2007 SIP four additional strategies or programs for port-related sources in the 2008-2009 timeframe including: a) OGV auxiliary engines for non-regulated classes of ocean-going vessels while at berth, b) OGV main engine controls, c) a statewide OGV vessel speed reduction program, and d) a commitment by CARB to pursue renegotiation of the existing MOU with Class 1 railroads in order to accelerate the introduction of cleaner locomotives in the SoCAB, pending USEPA’s adoption of Tier 4 locomotive standards (Tier 4 standards are about 70% cleaner than existing Tier 2 standards). It should be noted that in December 2009, CARB withdrew from its regulatory development calendar a measure to control OGV auxiliary engines for non-regulated classes of OGVs while at-berth. It should also be noted that the reductions assigned to the cleaner locomotive strategy were based on the assumption that the new federal regulation for locomotives (under development at the time of SIP process) would establish Tier 4 locomotive standards which would
become effective beginning in 2012. However, the final federal regulation adopted in March 2008 by the USEPA established a 2015 date for introduction of Tier 4 locomotives in order to allow for adequate time for development and integration of advanced after-treatment technologies into these new locomotives. Therefore, with the deferral of a regulatory strategy to further control at-berth emissions and with no regulatory mechanism in place that would mandate the introduction of Tier 4 locomotives prior to 2015, reductions assigned under these SIP strategies will need to be re-examined and alternative strategies identified.

2. CARB’s incentive funding programs
   - The 2007 SIP includes a strategy based on additional incentive funds to achieve an additional two tons per day of NOx reductions from harbor craft in 2014, above and beyond the anticipated reductions from the CARB’s recently adopted regulation. These reductions are based on the assumption that joint funding from CARB and SCAQMD would be available and committed to the San Pedro Bay ports, with CARB being primarily responsible for achieving the targeted emission reductions.

3. USEPA’s federal funding to mitigate locomotive emissions
   - The 2007 SIP also calls on the federal government to do its fair share of emission reductions by further mitigating locomotive emissions since locomotives are under the USEPA’s direct authority and responsibility. Specifically, the 2007 SIP relies on federal funding to achieve 10 tons per day of NOx reductions from locomotives operating in SoCAB by 2014. This strategy in combination with CARB’s proposed renegotiated MOU with Class 1 railroads, or other equivalent strategy, would achieve reductions that would be equivalent to converting all locomotives operating in SoCAB to Tier 4 by 2014. However, the USEPA has not accepted this reduction responsibility and has indicated that inclusion of this strategy in the 2007 SIP could result in disapproval of the 2014 PM_{2.5} attainment demonstration in the SIP.

It is clear that meeting the 2007 SIP targets for port-related sources depends heavily on CARB and USEPA’s rulemaking activities, availability of state and federal incentive funding and development of enforceable strategies with the Class 1 railroads. It is also clear that some of the assumptions made in the 2007 SIP which were the basis for port-related emission reduction targets may have changed. To that end, the ports will work with our agency partners to help ensure their success on the regulatory front because as stated previously, “no single entity can solve this problem in isolation.”
Thus, the ports have developed an aggressive Emission Reduction Standard in this CAAP Update derived from a combined understanding of the strategies that can be pursued in the near-term, and that development of state and federal regulations or programs is essential in order for these goals to be achievable. The ports are fully committed to do their fair share to help support these state and federal efforts and strive to achieve even greater reductions through existing and future CAAP strategies, limited only by the availability and feasibility of new technologies as well as ports’ level of jurisdiction over its tenants and operators. Through the Technology Advancement Program, the ports are also fully committed to current and future evaluation, demonstration and integration of advanced control technologies which are anticipated to provide further reductions from port-related sources beyond existing regulations.

Given developments following the adoption of the 2007 SIP (e.g., final USEPA locomotive regulation, USEPA’s rejection of funding/reduction assignment for locomotives, deferral of regulations to further control at-berth emissions), as well as uncertainty about CARB’s specific control strategies for potential regulation of OGV main engines, the Emission Reduction Standard in the CAAP Update reflects the level of reductions from the 2007 SIP strategies which the ports currently anticipate will occur within the 2014 and 2023 timeframes.

For 2014, the Emission Reduction Standard reflects existing regulations (as of July 2008), CAAP strategies and assumed reductions from CARB’s proposed strategy for OGV auxiliary engines at-berth for non-regulated vessel classes (i.e., 50% reduction in at-berth emissions by 2014). In the absence of CARB regulations to further control at-berth emissions, other reduction opportunities will be sought, but the ports cannot be held responsible for addressing this shortfall in the 2014 Emission Reduction Standard. As a partial offset, the 2014 Emission Reduction Standard does incorporate anticipated reductions associated with implementation of the most recent IMO standards which were not included in the 2007 SIP.

The ports have not incorporated the 2007 SIP reduction targets for locomotives, OGV main engines, or reductions associated with funding for harbor craft, in the 2014 Emission Reduction Standard. The reductions for locomotives associated with port operations weren’t included since there is no regulatory mechanism which would mandate the development of Tier 4 locomotives by 2014 (i.e., earlier than required under USEPA final locomotive regulation) or accelerate the introduction of these locomotives such that an approximate 95% of locomotives operating at the ports will be Tier 4 by 2014, as discussed above. Therefore, the SIP reductions associated with Tier 4 locomotives used in port-operations do not appear achievable from this source as defined within the 2014 timeframe and are not included in the 2014 Emission Reduction Standard. However, because of the availability of Tier 3 locomotives within this timeframe (based on USEPA’s final locomotive regulation), it is assumed that all off-port switchers will be emitting at the Tier 3 level. In addition, SIP reductions associated with CARB’s strategy for OGV main engine controls have not been included since CARB has not committed to pursuing such a strategy, especially in view of the...
recent IMO standards. Finally, for harbor craft, the additional SIP reductions associated with incentive funding are also not considered because of uncertainties regarding CARB or AQMD funding commitments and any potential additional feasible reductions beyond CARB’s existing in-use harbor craft regulation which might be achievable by 2014. The ports’ are supportive of CARB’s overall statewide efforts to achieve the SIP targets. While technologies and strategies have not materialized for the port-sector as was expected during the development of the 2007 SIP, CARB does have flexibility in making up for any shortfall by taking advantage of cost-effective opportunities that have developed in other sectors.

As identified previously, implementation of presently feasible and available CAAP measures and existing emission control regulations thus far would achieve a 19% reduction in NOx emissions, 93% reduction in SOx emissions, and 72% reduction in DPM emissions by 2014 compared to 2005 emissions. When comparing this forecast with the 2014 Emissions Reduction Targets, the forecasted DPM and SOx reductions will achieve the goals, while the NOx reductions fall short of the Standard by a small margin of 3% in 2014. This reduction shortfall is expected to be addressed with use of Tier 3 off-port switcher locomotives, CARB’s adoption of alternative control measures to make up for the reductions initially anticipated for OGV at-berth auxiliary engines for non-regulated vessel classes, and implementation of the IMO NOx standards for vessels.

For 2023, the Emission Reduction Standard is based on the assumption that 2007 SIP reduction targets for port-related sources in 2023 are achievable within that timeframe. For instance, the introduction of Tier 4 locomotives in 2015 could allow for fleet turnover prior to 2023, and therefore achievement of the SIP reductions, predicated on the assumption that regulatory mechanisms by CARB or USEPA will be developed and implemented to achieve these reductions. It is also conceivable that CARB or USEPA may pursue additional control measures for OGVs, strengthening and/or accelerating IMO regulations that would achieve the SIP targets by 2023. In addition, the reductions in 2023 also assume a strengthening of auxiliary engine controls at berth for all vessel classes to achieve an 80% control, and implementation of the statewide on-road diesel vehicles rule adopted by CARB in December 2008. The ports are fully committed to work with USEPA, CARB and AQMD to accelerate the implementation of all feasible strategies in the 2007 SIP and strive to exceed SIP reductions where possible through cooperative efforts with the port industry and aggressive development and commercialization of new technologies.
In 2023, implementation of presently feasible and available CAAP measures and existing emissions control regulations would achieve 18% reduction in NOx emissions, 92% reduction in SOx emissions, and 75% reduction in DPM emissions compared to 2005 conditions. Although the currently achievable SOx reductions are consistent with the 2023 Emission Reduction Standard, the NOx and DPM reductions fall short of the Standard primarily because the anticipated reductions associated with future CARB and USEPA control strategies and programs have not yet been achieved. However, the ports are fully committed to work closely with agencies to identify and pursue new CAAP strategies and state and federal measures to meet the Emission Reduction Standard and close the reduction gap.

It should also be noted that over the last several years, the ports have fully participated and supported the development and implementation of port-related CARB and USEPA regulations, and actions by the IMO, as they provide a “level playing field” throughout California, the nation, and internationally. Several of these regulations were based on initiatives that the ports were already implementing as part of the 2006 CAAP (e.g., Clean Trucks Program, shore power for ships, low sulfur fuel for ships, and cargo handling equipment requirements). The ports will continue to support future regulatory efforts and strive to accelerate or exceed the reductions associated with these regulations through lease requirements or other mechanisms specified in the CAAP.

**Inconsistencies in Emissions Estimations between the Ports and 2007 SIP**

It should be noted that a number of fundamental differences remain in emissions baseline and forecasting methodologies between the 2007 SIP and the ports’ emissions estimates. Whereas these differences have not been addressed in establishing the Emission Reduction Standard, the ports have worked very closely with agency staff to understand the differences and are confident that these enhancements will be incorporated into the 2010 SIP, resulting in better alignment of the SIP reduction targets with the Emission Reduction Standard. Specifically, these enhancements include:

1. **2005 Emissions Baseline** - Over the last several years, the ports have spent a significant amount of resources to develop a comprehensive and detailed annual inventory of the port-wide emissions in consultation with the agency TWG consisting of USEPA, CARB, and SCAQMD. The ports’ 2005 emissions inventory represents the actual operating data for all five port-related mobile source categories (ocean-going vessels, harbor craft, cargo handling equipment, heavy-duty trucks, and rail locomotives) and emission calculation methodologies that have been agreed upon with TWG. In contrast, the 2005 port-specific inventory in the 2007 SIP is generally derived from the statewide inventory, and assumptions made to the SoCAB regional inventory (where a portion of the regional inventory is assigned to the ports), or interpolation of inventory data is conducted between various years.
2. Emissions Forecasting Methodologies – Different emissions forecasting methodologies were used in the 2007 SIP and the ports’ emission forecast. While the ports’ emissions forecast reflects the conservative 2007 cargo growth projections and methodologies approved by the TWG, the 2007 SIP relies on regional growth factors and differing methodologies to estimate future emissions.

As stated above, in order to accurately compare the Emission Reduction Standard to the SIP reduction targets, it is imperative that the inconsistencies in the emissions baseline and forecasting methodologies be reconciled. Work is already underway to resolve these discrepancies to properly identify the ports’ contribution to regional attainment goals and to use the more detailed port-wide inventory in the next SIP update.

*Implementation of Existing Mechanisms to Achieve the Goals of the San Pedro Bay Standards*

The ports commit to design and implement emission control strategies under the CAAP, and future amendments to this plan that will help to achieve the goals set in the Standards. Such strategies include:

- Port-wide tariffs to reduce emissions by accelerating stringent emissions standards;
- Infrastructure modifications to be implemented by the ports;
- Enforceable conditions in ports’ leases or agreements concerning terminal or other operations;
- Incentive programs, as appropriate, to produce quantifiable emission reductions;
- Other strategies to be implemented by the ports to achieve quantifiable emission reductions; and
- Redevelopment of existing ports facilities and new port projects anticipated in the CAAP, which will incorporate existing and later-revised CAAP emission reduction strategies.

Achieving the Standards will also require adopted enforceable regulations, funded incentive programs, and funded infrastructure modifications be implemented by government agencies other than the ports.

*Future Implementation of Newly Feasible and Available Mechanisms to Achieve the Goals of the San Pedro Bay Standards*

It is expected that ultimate achievement of the Standards will require some of the future emissions and health risk reductions to be achieved through new measures and identification of new technologies that would be required in future port tariffs or leases. However, as has been emphasized, federal, state, and local air quality agencies will also play an important role in identifying and implementing future regulatory measures that will further reduce emissions. The ports commit to work with air agencies to pursue significant additional emission reductions from port-related sources by facilitating or implementing new strategies. The ports and agencies will evaluate and support programs to:
Implement an increasingly more efficient and cleaner transportation system to move cargo both within the ports and to/from the ports to reduce diesel emissions and exposure and reduce criteria pollutants.

Further reduce emissions from new and existing ships through the use of cost-effective techniques.

Further reduce emissions from port-related locomotives and rail operations, including at on-port facilities, and at the near-dock rail yard (e.g., ICTF).

Further reduce emissions from future port projects incorporating yet-to-be-developed CAAP measures or regulations.

**Methods to Evaluate Project-Specific Consistency with the Standards**

As noted earlier, the ports need to move forward with near-term projects that address demand for modern marine terminals, subject to the existing requirements of the CAAP. Implementation of existing CAAP measures will dramatically reduce emissions in the near-term based upon the current suite of available emissions reduction strategies. As discussed above, the emissions forecast indicates that the ports will at a minimum achieve emissions reductions of 19% NOx, 93% SOx, 72% DPM by 2014, at least a 74% reduction in overall DPM-related health risk by 2020, and emissions reductions of 18% NOx, 92% SOx and 75% DPM by 2023, based upon implementation of CAAP measures, anticipated regulatory programs and strategies that are known today. Additionally, by adopting the Standards, the ports commit to revise the CAAP to require implementation of additional emissions control measures as soon as they are determined feasible and available, with the intention of achieving the 85% risk reduction goal of the Health Risk Reduction Standard by 2020 and the 2014 and 2023 emission reduction goals of the Emission Reduction Standards. Environmental analysis of each proposed port project will include a review of newly feasible and available project-related emission control technologies, if any, that if imposed on the proposed project, would contribute to achievement of the 85% risk reduction goal of the Health Risk Reduction Standard and the various emission reduction goals of the Emission Reduction Standards.

As discretionary actions such as CEQA project approvals, leases, or infrastructure programs come before the ports’ respective Boards of Harbor Commissioners, each of these discretionary actions will need to be evaluated for consistency with the San Pedro Bay Standards. The evaluation process is represented in Figure 2.3. As shown, a proposed project will be deemed to be consistent with the risk and emission reductions required by the Standards if:

- The project complies with all then-applicable air quality-related laws and regulations,
- The project will implement all applicable Project-Specific and Source Specific Standards in the then-existing version of the CAAP, and
The supporting environmental analysis assesses any relevant potentially practicable new emission reduction technologies beyond those required under the then-existing version of the CAAP, and imposes a requirement that the project use any such technologies found to be feasible, available, and effective at reducing emissions as needed to achieve the Standards.

Figure 2.3: Evaluation of Project Consistency with the San Pedro Bay Standards
In addition, the 2008 BWHRA Tool, which was developed to help establish and to monitor progress toward compliance with the Standards, provides vital information to enable more detailed characterization of the health-risk impacts of the ports’ operations in environmental review documents. The BWHRA Tool includes an exposure assessment for the baseline year 2005, and compares estimated cancer risks from that year with those estimated in 2020, assuming the ports’ growth projections, implementation of adopted regulations, and implementation of additional control measures identified in the original CAAP. The BWHRA Tool assesses the cancer-risk impacts of DPM emissions from existing and anticipated mobile sources within the ports’ boundaries, as well as nearby port-related truck, locomotive and vessel emissions outside those boundaries. It focuses solely on cancer risk impacts from port-related DPM emissions, as past studies indicate that those sources may be the most significant single contributors of toxic air contaminant (TACs) to regional cancer risk. To facilitate comparisons with CARB’s exposure assessment of the ports’, the BWHRA Tool assesses sub-regional, rather than local, impacts of DPM on a population-weighted risk basis, and uses the same geographic area (domain) of air dispersion modeling for estimation of DPM exposure point concentrations as that used by CARB (discussed further below).

However, the 2008 BWHRA Tool was not intended to, and cannot fully, describe cumulative health-risk impacts for purposes of CEQA or National Environmental Policy Act (NEPA) review of individual port projects, for several reasons. First, the BWHRA Tool includes only DPM emissions, and includes only emissions from on-port operations and port-related activity along transportation corridors. Therefore, the BWHRA Tool cannot supply certain other information that must be included when evaluating cumulative health-risk impacts under CEQA and NEPA, such as TAC emissions from cumulative non-port sources, or TAC emissions from cumulative non-diesel sources. Second, because the BWHRA Tool was used to evaluate the effect of CAAP implementation over a broad sub-regional area, the BWHRA Tool employed certain inputs that are different than those used to model localized project-specific health-risk impacts under CEQA and NEPA. These different inputs include a more generalized representation of emission source locations, agglomerated spatial allocation of emissions sources, fleet-average versus project-specific modeling source parameters, coarser Cartesian grids to represent off-site receptors, and certain model inputs based on information available today that is likely to change in the future as scientific understanding progresses and/or new data become available. The result is that the BWHRA Tool does not provide the highly detailed information about incremental, project-specific changes at individual points of maximum health risk impact that is used to assess health-risk impacts under CEQA and NEPA. Third, because the BWHRA Tool focuses on emissions in only two milestone years (the baseline year 2005, and the target year 2020), it does not provide accurate information regarding cumulative emissions or cancer-risks in interim years, and so will not accurately describe baseline cumulative conditions surrounding port projects proposed in those interim years. Finally, the 2008 BWHRA Tool evaluates risk based on discrete DPM emissions rates established for 2005 and 2020, and held constant over the subsequent respective 70-year

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16 Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach, CARB, April 2006.
averaging times. In contrast, project analyses utilize emissions rates calculated for each year of a project’s life. These distinct methodological differences do not support direct comparisons between the two approaches.

For these reasons, CEQA and NEPA documents prepared for port projects will determine consistency of individual proposed projects with the Standards, and will disclose information from the BWHRA Tool as part of their description of cumulative impacts, but will not rely solely on the BWHRA Tool to describe those cumulative impacts. In addition, although consistency of individual port projects with the Standards will advance achievement of the substantial cancer-risk reductions identified by the BWHRA Tool, environmental review of ports projects will not treat consistency with the Standards as determinative of whether a proposed project would make a cumulatively considerable contribution to cumulative health risk impacts, as defined by CEQA or NEPA.

Methods to Assess Progress Against Health Risk and Emission Reduction Standards

The ports will periodically evaluate progress towards achieving the Health Risk and Emission Reduction Standards, as part of the CAAP updates, and will report the results to the public and to the Harbor Commissions of each port. These updates will reflect changes to emissions attributable to new projects, adoption of new regulations, implementation of newly feasible and available emission control technologies, plus other benefits that result from the ports’ actions to reduce emissions/exposure and efficiency improvements. At the time of each CAAP update, the necessity of these updates will be determined based upon continuing dialogue between the ports and their regulatory partners. Because the rate of development of regulations, technology, and other factors cannot be predicted, and because the quantitative assessment of progress towards the Standards requires significant resources, assessment updates will be conducted when one or more of the following elements are identified, and whose implementation could significantly enhance reductions in emissions and in risk:

- Significant new feasible technologies become available
- Important new regulations are adopted
- A major new project is approved which has substantial changes in the operations of a tenant from the operations evaluated in the emissions forecast and BWHRA Tool, with respect to the type, number, or distribution of sources, and these changes will have a significant effect on the overall ports-wide emissions forecasting and health risk assessment results

Achievement of the Health Risk Reduction Standard will be affected by the overall reduction in port-related DPM emissions and the relative location of emissions sources and off-port residences. In contrast, criteria pollutant standards can only be met by reducing overall port-related emissions. It is essential that local municipalities make informed land use planning decisions in the areas surrounding the ports in order to avoid aggravating potential health risk impacts. In addition, the ports will evaluate the affect of proposed project locations on community health risk impacts when considering new projects.
When conducting periodic evaluations to assess the status of the ports’ efforts to reduce health risks, the ports will first evaluate emissions forecasting results, using DPM reductions as a surrogate for health risk reductions, since they are highly correlated. If significant changes in DPM reductions are expected to occur as a result of greater effectiveness of strategies or implementation of new, advanced technologies, the ports anticipate using the assessment methodology followed in the BWHRA Tool. This approach has the benefit of relying on methodologies that were developed collaboratively between the ports and their regulatory partners. Further, it provides the ports with ability (albeit limited by methodological constraints) to quantify percentage of reduction in overall port-related risk attained by implementation of the emission reduction strategies outlined in this statement. As such, it provides the ports and regulatory agencies the most direct assessment methodology for characterizing emission and risk reduction achievements. Risk reductions calculated in these periodic updates will be determined by comparison to the 2005 baseline year, and will address DPM emissions from ports’ sources within the boundaries identified in the BWHRA Tool. Risk reductions will be calculated as population-weighted average risk over that same geographic domain, and will utilize 2000 census data. Updates will rely on the air dispersion model AERMOD and the health risk assessment methodologies used in the BWHRA Tool. Specific parameters used in the BWHRA Tool that may also be utilized in the periodic updates include, but are not limited to, the 2005 baseline year emissions factors, ports growth rate, meteorological data sets, and source spatial distributions.

In addition, through implementation of the Standards for port-related sources, the ports will contribute to achievement of state and federal ambient air quality standards demonstrated at air quality monitoring stations at both ports. Evaluation of port-related compliance with the state and federal ambient air quality standards will be based-upon monitoring data from the ports’ six air monitoring stations. It is ultimately the goal of the ports to be able to demonstrate a downward trend in ambient air pollutants, consistent with the reductions in emissions from port-related sources and to prevent port-related violations, allowing timely achievement of the NAAQS and California Ambient Air Quality Standards (CAAQS) in advance of, or on schedule with, the attainment schedule for the SoCAB. The air quality results will be published in the ports’ annual air quality monitoring reports. It is important to note, however, that concentrations at monitoring stations will include not only the ports’ sources but all emissions sources in the vicinity of the monitors. Therefore, part of the evaluation to identify port-related violations of the NAAQS and CAAQS will include comparison of the concentrations observed at the ports’ stations with the regional air quality trends. Further, when scientifically-proven and accepted methods for apportioning pollutants to specific port-related sources become available, the ports will use this information in their evaluations.
Summary and Conclusion

In summary, the primary purpose of the San Pedro Bay Standards is to provide a valuable tool for long-term air quality planning, aiding the ports and the agencies in their effort to achieve substantial reductions in the long-term cumulative air quality impacts of emissions from ongoing and future port operations over time. The forecasting used to develop the Health Risk Reduction and Emission Reduction Standards was based upon implementation of the CAAP through the specified implementation mechanisms and implementation of existing regulations. As long as the project proposed for approval by one of the ports meets assumptions used to develop the San Pedro Bay Standards, including all then-applicable CAAP measures and regulatory requirements, as well as any new emissions control measures determined to be feasible, available and effective at reducing emissions covered under the Standards, then the project can be deemed consistent with the San Pedro Bay Standards.

The San Pedro Bay Standards will also provide a mechanism for the ports to better communicate with the public on the long-term benefits of implementing the CAAP, and the resulting reduction in the ports’ overall health risk impacts and criteria pollutant emissions over time. This communication will be further supported by the annual emissions inventory reports, the availability of the ports’ air monitoring data on the CAAP publicly accessible website and release of summary information in the ports’ annual air monitoring reports.

It is important to emphasize that the ports are making a commitment to achieve the San Pedro Bay Standards as described above. In addition, the ports will strive in the future to achieve greater emissions reductions and health risk reductions than are currently feasible. The San Pedro Bay Standards will push the ports to continue seeking additional emission reduction strategies until health risks to the local communities have been adequately minimized. This has already been evidenced by the ports’ decisions to adopt a more stringent Clean Truck Program than originally anticipated in the 2006 CAAP; to implement the Vessel Main Engine Fuel Incentive Program to accelerate and expand CAAP measures; and to pursue the Technology Advancement Program, which will lead to greater emission reduction options in the future. That said, however, it is important to note that the San Pedro Bay Standards are not regulatory thresholds and do not place a cap on the ports’ growth. Further, the San Pedro Bay Standards do not provide long-term goals beyond 2023. The ports will need to review the San Pedro Bay Standards over time and update them as necessary to incorporate the latest information on significant newly feasible and available emission reduction strategies or regulations, and also to include the latest information on the ports’ cargo growth forecasts.
2.2.2 Project Specific Standards

Project Specific Standards lay out the particular requirements for individual port development projects. The ports regularly develop new facilities and redevelop existing facilities to support the changes in the market and increased demand for imports. The ports will evaluate each project against the following standards:

- Projects must meet the 10 in 1,000,000 excess residential cancer risk threshold, as determined by health risk assessments conducted subject to CEQA statute, regulations and guidelines, and implemented through required CEQA mitigations associated with lease negotiations.
- Projects that exceed the SCAQMD CEQA significance threshold for criteria pollutants must implement the maximum available controls and feasible mitigations for any emissions increases.
- The contribution of emissions from a particular project to the cumulative effects, in conjunction with CAAP and other adopted/implemented control measures, will allow for the timely achievement of the San Pedro Bay Standards.

As stated above, Project Specific Standards require all new projects to meet or be below acceptable health risk standards (10 in 1,000,000 excess residential cancer risk threshold). Projects that exceed the SCAQMD CEQA significance thresholds for criteria pollutants must implement the maximum available controls and feasible mitigations for any emission increases. The Project Specific Standards do not limit the types of impacts that will be considered or mitigated pursuant to CEQA. For example, while the 10 in a million project standard for cancer risks applies to residential risks, the ports will continue to evaluate and, if required by CEQA, mitigate all impacts. Additionally, the ports will evaluate and mitigate, where required, non-cancer health impacts.

The emissions from an individual project will be analyzed based upon its contribution to cumulative effects. The project contribution will be evaluated in conjunction with the CAAP and other federal, state and local adopted and/or implemented control measures to ensure that the contribution to cumulative effects will allow for the timely achievement of the San Pedro Bay Standards. As stated above, when evaluating projects, a consistency analysis with the assumptions used to develop the health risk and criteria pollutant San Pedro Bay Standards will be performed in order to ensure that the proposed project is contributing to attainment of the San Pedro Bay Standards.
2.2.3 Source Specific Performance Standards

Source Specific Performance Standards lay out particular strategies for individual port emission sources to attain the ultimate goals of the CAAP. These Source Specific Standards are considered generally feasible/achievable in most port-related applications, and therefore should be considered in all decisions related to equipment purchase or operational changes. These standards will be used by the ports in environmental reviews on both new development and substantial redevelopment projects. The ports encourage innovation and will accept equivalent strategies, once proven. The Source Specific Performance Standards are:

**Heavy-Duty Vehicles/Trucks**
- By January 1, 2012, all trucks calling at the ports will meet or be cleaner than the USEPA 2007 on-road engine standard.
- The ports will support development of alternative fuel infrastructure in the port-complex.

**Ocean-Going Vessels**
- Compliance with the Vessel Speed Reduction Program out to a distance of 40 nm from Point Fermin
- The use of ≤0.2% sulfur MGO or MDO fuel in vessel auxiliary and main engines, and auxiliary boilers, at berth and during transit out to a distance of 40 nm from Point Fermin. By 2012, sulfur content in MGO or MDO fuel used in auxiliary and main engines and auxiliary boilers within 24 nm of the coast will not exceed ≤0.1%, in compliance with the CARB regulation.
- The use of shore power (or equivalent) for hotelling emissions implemented at all major container and cruise terminals and one liquid bulk terminal in POLA, and at all container terminals, one crude oil terminal, and one bulk terminal in POLB by 2014.

**Cargo Handling Equipment**
- Beginning 2007, all CHE purchases will meet one of the following performance standards:
  - Cleanest available NOx alternative-fueled engine, meeting 0.01 g/bhp-hr PM, available at time of purchase, or
  - Cleanest available NOx diesel-fueled engine, meeting 0.01 g/bhp-hr PM, available at time of purchase.
  - If there are no engines available that meet 0.01 g/bhp-hr PM, then must purchase cleanest available engine (either fuel type) and install cleanest Verified Diesel Emissions Control Strategy (VDECS) available.
- By the end of 2010, all yard tractors operating at the San Pedro Bay Ports will meet, at a minimum, the USEPA 2007 on-road or Tier 4 off-road engine standards.
- By the end of 2012, all pre-2007 on-road or pre-Tier 4 top picks, forklifts, reach stackers, rubber tired gantry (RTG) cranes, and straddle carriers <750 hp will meet, at a minimum, the USEPA 2007 on-road engine standards or Tier 4 off-road engine standards.
By end of 2014, all CHE with engines >750 hp will meet, at a minimum, the USEPA Tier 4 off-road engine standards. Starting 2007 (until equipment is replaced with Tier 4), all CHE with engines >750 hp will be equipped with the cleanest available VDECS.

**Harbor Craft**

- By 2008, Harbor Craft home-based at San Pedro Bay Ports will meet USEPA Tier 2 for harbor craft or equivalent reductions.
- After Tier 3 engines become available between 2009 and 2014, within five years HC home-based at San Pedro Bay Ports will be repowered with the new engines.
- All tugs will use shore power while at their home fleeting location.

**Railroad Locomotives**

- By 2008, all existing Pacific Harbor Line switch engines in the ports will be replaced with Tier 2 engines equipped with 15-minute idling limit devices, retrofitted with either DOCs or DPFs, and shall use emulsified or other equivalently clean alternative diesel fuels available.
- Any new switch engine acquired after the initial Pacific Harbor Line replacement must meet USEPA Tier 3 standards or equivalent to 3 g/bhp-hr NOx and 0.0225 g/bhp-hr PM.
- By 2007, all Class 1 switchers and by 2008, all Class 1 long-haul locomotives, use ULSD.
- By 2010, all use 15-minute idle restrictors on all Class 1 switchers and line-haul locomotives.
- By 2010, the fleet average for Class 1 line-haul locomotives entering the ports will meet Tier 2 Line Haul Locomotive Standards.
- By the end of 2015, all Class 1 switcher and helper locomotives entering the ports will meet the final Tier 4 off-road engine standards.
- By 2020, goal for 95% of Class 1 line-haul locomotives entering the ports to meet Tier 4 locomotive standards.
Relationships of the Standards
The three levels of CAAP Standards are inter-related. Compliance with the Project Specific Standards may require that an individual terminal go beyond the Source Specific Performance Standards or advance the date of compliance with those performance standards. In addition, projects that meet the Project Specific Standard associated with health risk, must also meet the criteria pollutant emissions reductions identified in the Source Specific Performance Standards, which may require them to implement greater levels of control than would be necessary to meet the health risk standard alone. Projects must include compliance with the Source Specific Performance Standards in order to achieve the ports “fair share” of regional emissions reductions, and health risk reductions, as stated in the San Pedro Bay Standard. The relationships between these three standards are illustrated below.

Figure 2.4: Relationships of the Standards

Greenhouse Gases
The ports do not include greenhouse gas emission reduction standards in the CAAP since reductions in greenhouse gas emissions from all harbor department, tenant, and shipping line activities are being addressed separately in each port’s comprehensive greenhouse gas programs currently being developed in partnership with their respective cities. As the CAAP is focused on a sub-set of the greenhouse gas emissions sources, it does not address the entire array of strategies that will be deployed to address these emissions reductions, and therefore only represents a portion of the overall picture. Through each port’s efforts with their cities, the ports will endeavor to establish comprehensive goals and strategies for achievement of greenhouse gas emissions reduction in accordance with, or exceedance of, AB 32 requirements.
SECTION 3: IMPLEMENTATION STRATEGIES

To implement the CAAP, several strategies are being utilized to maximize the reduction of public health risk and criteria pollutant mass emission reductions, and to meet CAAP goals. The implementation approach continues to evolve so that strategies may be added, changed, or superseded based on the accumulated experience as the CAAP moves forward.

This chapter provides a general overview of these implementation strategies. Specific implementation strategies by control measure are detailed in the measure narratives provided in Section 4.

3.1 Overview of Implementation Strategies

Since adoption of the CAAP, the ports evaluated numerous implementation strategies and options. The strategies that have proven to be most effective include:

- Lease Requirements
- Tariff Changes
- Port Funded Incentives
- Grants
- Voluntary Measures and Recognition Programs
- Requirements Imposed by Regulatory Agencies

Each of the above strategies requires sound monitoring, recordkeeping, and reporting. Procedures and recordkeeping requirements are developed to monitor and review participation levels at a frequent interval to determine the effectiveness of the implemented strategy.

3.1.1 Lease Requirements

Facilities Required by Lease to Meet Emissions Reduction Requirements

This strategy offers the opportunity for control measures to be negotiated and required in a terminal’s lease that would reduce emissions, increase performance on voluntary or incentive-based measures, or require customers to implement specific emission reduction measures. This opportunity exists for renegotiated, amended, and new leases.

All new significant development projects or modifications to existing facilities require a detailed CEQA and/or NEPA review prior to project approval. Along with these reviews comes an affirmative duty to mitigate significant environmental impacts.

Through the Environmental Impact Review (EIR) process, air emissions and health risk levels are assessed and applicable mitigations included in a project (on a project by project basis). These mitigations are then incorporated as provisions in any lease or permit for the project.
One benefit of the lease strategy is that placing a requirement in a lease provides a legally binding mechanism for ensuring that the desired action is achieved and provides remedies for noncompliance (because noncompliance would constitute a breach of the lease terms). Another benefit is that, since leases are negotiated on a terminal-by-terminal basis, the mix of requirements can be tailored to terminal-specific considerations. For example, break bulk terminals might be less able to employ shore power (cold ironing) than a container terminal having vessels that call repeatedly throughout the year, so a break bulk terminal’s lease may contain an alternative emission reduction requirement. A limitation of this strategy is that all leases have different renewal dates and terms, so the implementation is phased over time as leases come due or are renegotiated. However, all terminals will indeed be considered for renewal so this is a strategy that will reach far beyond the initial five-year CAAP.

Most facility leases are issued for long periods (e.g., 20 years). It is expected that new emission reduction technologies will emerge over the course of a lease and it is important to incorporate these new technologies into tenant operations in order to meet the San Pedro Bay-wide Standards. To achieve this objective, both ports are requiring in new leases a protocol of periodic review of new technologies. At prescribed intervals (e.g., five years for POLB and seven years for POLA), the tenant and responsible port will conduct a comprehensive feasibility review of emission-reduction technologies, assessing cost, technical and operational feasibility. New air quality technological advances that are identified shall be implemented by the tenant, subject to mutual agreement on operational feasibility and cost sharing. If a tenant requests future project changes that would require environmental clearance and a lease amendment, all control technologies deemed by the ports to be feasible, available, and effective at reducing emissions would be incorporated into the new lease terms.

3.1.2 Tariff Changes

Tariffs Changed to Influence Activity

A port tariff is the published set of rates, charges, rules and regulations for those doing business with a port. Each port publishes its own tariffs. A tariff is generally applicable to all tenants. However, individual operating leases may set requirements to a specific version of the tariff (i.e., later changes don’t apply). All potential tariff changes undergo legal evaluation prior to being enacted.

This strategy could be used to implement uniform rules affecting most or all port users. A potential scenario for this strategy could be a tariff item that sets discounted rates to activities that provide an air quality benefit (like discounted dockage for vessel speed reduction). Alternatively, a tariff item might prohibit certain kinds of activities (such as a prohibition from dumping into harbor waters). In general, a tariff could allow more uniform application of resources to customers of a port. However, application of the tariff approach to implementation can only be used in selected instances and, as ordinances, must be developed following specific procedures.
Some of the measures pursued under the CAAP may be under-funded. As a result, the ports are continuously exploring various mechanisms to achieve the goals outlined in the CAAP. One mechanism that could alleviate potential funding shortfalls is the application of impact fees associated with the movement of cargo or sources (i.e., trucks, locomotives, vessels, etc.), which would be applied through a port tariff. Staff is committed to continue to evaluate the use of fees to accelerate emission reductions from all source categories. However, for fees to achieve the desired results, they must be structured appropriately. Outlined below are principles that the ports will consider when crafting any fee with the goal of reducing pollution.

1. The fee should target the source of pollution, not cargo in general, and the fee must be higher for those individual sources that cause the greatest impact, while bypassing those sources that meet clearly defined goals/standards. For instance, a truck that does not meet the tariff requirements of the Clean Truck Program could be assessed a fee based on how old and/or “dirty” that truck was; while a clean truck meeting the requirements could be assessed no fee or a small administrative fee necessary to cover the costs of monitoring compliance. Fees collected should be used to clean up the source that generated the fee (i.e., fees assessed against a “dirty” truck should fund a retrofit or replacement truck). Under the current CTP, starting in the fourth quarter of 2008, the Port of Los Angeles and the Port of Long Beach began collecting a cargo fee of $35 for each loaded 20-foot container ($70 for each 40-foot container). The two ports use different criteria to collect the fees. The criteria used are such that they encourage early introduction of cleaner trucks and private investments to replace older trucks with cleaner trucks. No fee is assessed if the cleaner trucks are privately funded.

2. Costs should ultimately be borne by those who benefit from goods movement. To the extent possible, fees should be shifted to the beneficial cargo owners (BCO). Under the CTP, the truck fee is collected from the BCO. Programs similar to the successful PierPass and CTP provide examples of how this can be done.

3. When a specific program achieves its goal, the fee must end. Broad-based fees that have no defined “conclusion” may fail to garner sufficient support to be successful. In addition, they undermine the goals of the program by not rewarding those who achieve the goals. Under the CTP the fees end in 2012 when all trucks meet the USEPA’s 2007+ emissions standards.

These principles establish a framework for the successful use of fees. They ensure success in two ways. First, the program generates the funding necessary to achieve the emission reduction goals. Second, it holds the BCO accountable for their shipping decisions, assessing the externalized costs for more polluting modes of shipping and financially encouraging them to make more environmentally sound shipping decisions. While these principles are not absolute, adherence to them will more likely result in reduced emissions and increase the chances of broad-based support.
3.1.3 Port Funded Incentives

Incentive Funding Targeted Toward Specific Sources to Accelerate Emissions Reductions

Incentive-based measures provide a business incentive for the participant to reduce emissions beyond what is currently required by regulation or lease requirements. Incentive funding is targeted at “buying” emission reductions ahead of regulation milestones or lease renewals. Incentive funding can come from several sources including the ports, local and state regulatory programs, federal agency programs and grants, or an additional use fee that generates money to be used to incentivize emissions reductions. An incentive-based approach makes the adoption of the various strategies cost-neutral for the participant, or provides just enough incentive for a participant to enter the program.

Several of the emission reduction measures implemented by the ports to date have been incentive-based and have utilized port and local/state funds. The advantages of this strategy are that it can accelerate implementation of control measures that will become lease requirements or proposed regulations, and it avoids regulatory authority control issues. The disadvantage is that there is not adequate funding to support all measures, either in the ports’ operating budgets or in regional, state, or federal grant programs.

Examples of successfully implemented incentive-based programs at the ports include: POLB’s Green Flag Program and POLA’s companion incentive program to encourage increasing levels of VSR compliance, and the Vessel Main Engine Fuel Incentive Program to encourage use of low-sulfur fuel in main engines.

3.1.4 Grants

National Clean Diesel Funding Assistance Program, Carl Moyer Program and Air Quality Mitigation Improvement Program

Grant programs can offer significant encouragement and can be used to spur early action by port operators to move forward with replacement, repower or retrofit projects in advance of regulatory or port requirements. The USEPA, through their National Clean Diesel Funding Assistance Program, has offered funding to local governments, including the ports, for diesel emissions reduction projects. Both ports have been successful in receiving funding from this program on behalf of their port operators for cargo handling equipment and harbor craft projects. The state Carl Moyer Program, dispersed by local air agencies like the SCAQMD, has been available since 1998, to provide grants for early emission reductions from diesel sources. Over the years, Carl Moyer Program funding has been used by port operators to replace, retrofit or repower cargo handling equipment, harbor craft and rail switcher locomotives.
In accordance with the 2004 Amended Stipulated Judgment between the Natural Resources Defense Council et al. and the City of Los Angeles, the POLA established the Air Quality Mitigation Incentive Program (AQMIP) and committed $20 million over five years to pay for air quality mitigation projects that would: (1) reduce DPM and NOx emissions from port operations in the communities of San Pedro and Wilmington; or (2) develop emission reduction technologies that may be applied in the San Pedro Bay. Additional funding of approximately $8 million was deposited into the AQMIP account as a result of container throughput overages at the China Shipping Terminal. To qualify for funding under the AQMIP, projects and/or programs were voluntary and not mandated by law. Since adoption of the CAAP in 2006, over $14.5 million has been awarded for repower and retrofit of CHE and HC, resulting in an estimated reduction in 610 tons per year of NOx and PM combined. Over $10 million has been awarded for new technology research and development.

3.1.5 Voluntary Measures and Recognition Programs

Voluntary Emission Reduction Actions Encouraged

Voluntary measures are non-compensated actions agreed to and undertaken by operators, and are used or implemented by the participants without legal obligation. There are already many examples of voluntary actions taken by operators that have resulted in a decrease in emissions, including procedural efficiency increases, purchase of new lower-emitting equipment, and use of alternative fuels in equipment. This strategy is generally specific to measures that provide win-win situations for participants, which could include positive public relations press about the programs, regulatory agency or port recognition, environmental awards, etc. A notable example was the decision of Maersk Line to use low sulfur fuel in the engines of its vessels within 24 nm of California ports and while docked, thus paving the way for widespread use of cleaner fuels in vessel main and auxiliary engines and boilers, a highly significant emission reduction measure.

Both ports believe it’s important to recognize efforts that go beyond existing federal, state, and local regulations and that meet both ports’ definition of a “green” terminal or operation. To that end, the annual Clean Air Action Plan Air Quality Awards was developed to recognize industry efforts to reduce port-related air pollution consistent with CAAP goals. Since development, two awards ceremonies have been held, in 2008 and 2009, and a total of 13 companies received recognition.
3.1.6 Requirements Imposed by Regulatory Agencies

*International Treaties, Federal and State Rules and Regulations*

As stated previously, the CAAP was developed by the ports to achieve the near-term emission reductions needed for the local communities and the region. Eventually, these local requirements should be overtaken by regulations from state, federal or international regulatory agencies, in order to level the playing field and minimize any competitive disadvantage experienced by operators doing business in the San Pedro Bay. Since the CAAP was adopted, several regulations have been promulgated that support the CAAP measures, including CARB’s cargo handling equipment and vessel low sulfur fuel regulations. The ports work very closely with the regulatory agencies and will continue to provide comments and input into the regulatory process to ensure that regulatory requirements will be effective at reducing emissions and appropriate for port operations.

3.2 Implementation

All control measures and implementation strategies are subject to ongoing legal analysis by the City Attorneys of the two ports. Encouragement of voluntary efforts and the recognition program strategy will be implemented as part of the CAAP independent of which additional strategies are used to implement the various measures.

As stated above, the ports have found that the most effective combination of implementation strategies includes a mix of lease requirements, tariff changes, incentives, grants, and voluntary efforts with an ultimate backstop of regulatory requirements. This combination provides redundancy in implementing the Source Specific Performance Standards should any one of the other specific strategies fail to be applied.

Tariff changes offer an opportunity to affect a broader range of tenants but have potential implementation issues. Lease requirements may be able to go further than tariffs, but requirements can generally only be negotiated when the lease is reopened, such as when:

- A redevelopment of an existing terminal results in the opening of a lease and a CEQA review
- A new lease is sought
- An existing lease comes up for renewal

Therefore, renegotiation of leases continues to be a key component in forecasting opportunities for implementation of CAAP control measures.

Table 3.1 presents the Port of Los Angeles’ currently anticipated upcoming Board action dates related to Environmental Impact Reports and/or lease actions.
<table>
<thead>
<tr>
<th>Land Use</th>
<th>Grantee</th>
<th>Anticipated Board Action</th>
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<tr>
<td>Container</td>
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<tr>
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<td>Container</td>
<td>APM Terminals Pacific, Ltd</td>
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<td>Container</td>
<td>China Shipping Holding Company, Ltd.</td>
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<td>Container</td>
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<td>Container</td>
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<td>Passengers</td>
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<td>Automobile</td>
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Table 3.2 presents the Port of Long Beach’s currently anticipated upcoming Board action dates related to Environmental Impact Reports and/or lease actions.
Table 3.2: POLB Leases Status

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<td>Container</td>
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<tr>
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<td>Chemoil</td>
<td>1st Quarter 2010</td>
</tr>
<tr>
<td>Liquid Bulk</td>
<td>Tosoro</td>
<td>1st Quarter of 2010</td>
</tr>
<tr>
<td>Liquid Bulk</td>
<td>Petro-Diamond</td>
<td>4th Quarter 2022</td>
</tr>
</tbody>
</table>
3.3 Tracking and Monitoring

To track, monitor, and demonstrate the progress of the CAAP, both ports enhanced their monitoring programs to encompass the breadth of actions encompassed in the CAAP. These include:

- A comprehensive expansion of the port-wide real-time air monitoring network to improve continued monitoring of actual air pollution concentrations in and around the two-port area.
- Updating port-wide air emissions inventories annually to track control measure compliance and emission reductions from the 2005 baseline year.
- The development and tracking of the San Pedro Bay Standard, which establishes long term goals for health risk and emission reductions, including development of a comprehensive emissions forecast and a port-wide health risk assessment in coordination with USEPA, CARB and SCAQMD, using the latest health risk assessment estimates.
- Tracking CAAP progress on implementation of programs and associated expenditures for each port.
- Reporting on overall progress of the CAAP to each port’s Board annually and additionally as required.
- Posting progress reports prepared for each port’s Board on the CAAP website.

Progress related to each of the source specific standards is tracked and monitored to determine CAAP implementation progress. Regular updates to each port’s Board are made on the various elements of the program. Upgrades to the emissions inventory and implementation databases were completed in order to facilitate regular monitoring and updating of the Boards and public. The CAAP website provides the public the status of the implementation progress, links to the ports’ Annual Emissions Inventories, and other key elements including what is happening in the Technology Advancement Program. This website is also a clearinghouse for CAAP related documents, fact sheets, schedules, and provides links to Board meeting schedules and agendas.

For further specific details on monitoring and tracking on a per measure basis, are presented in Section 5.

17 www.cleanairactionplan.org
3.4 Integration of New Technologies into Existing Operations

New emission reduction technologies are constantly emerging. The Technology Advancement Program (see Section 4.7) seeks to support development of these new technologies in the port environment. Technologies available today can be incorporated into terminal leases as they are renegotiated or amended and at technology review milestones in recently approved leases. However, there may be opportunities to require or incentivize tenants to adopt these technologies through tariffs (i.e., requirements and/or fees), incentives or other mechanisms.

The ports will continue to work to identify and implement mechanisms to ensure implementation of needed control technologies that are identified through the Technology Advancement Program after execution of long-term leases. The technology review condition in new leases will allow the ports and the terminal operators an opportunity to identify how to incorporate these new technologies into existing operations prior to the end of the lease term. The ports will also consider fee mechanisms under the framework identified in Section 3.1 above. Under this structure, operations which have already adopted the new technologies would be exempt from the fee.

Through the Technology Advancement Program, staff will develop technical information detailing the status of various emissions control technologies, and make that information available on the CAAP website. This information will contain details such as links for verification status of various emissions control devices and results of demonstration of alternatively fueled equipment or other new technologies aimed at reducing emissions.

New technologies identified through this process would be evaluated for integration into existing operations based on the mechanisms identified by the ports described above.
SECTION 4: CLEAN AIR ACTION PLAN INITIATIVES

Since the original CAAP was adopted in late-2006, staff of both ports have been diligently working together to develop, implement and operate the various ground breaking measures and initiatives of the CAAP. This section presents the revisions to, and details the progress of, the CAAP initiatives that the Port of Los Angeles and the Port of Long Beach have been working on together since the adoption of the 2006 CAAP. In addition, this section details the control measures that the ports will continue to endeavor to implement over the next five years. This section organizes these initiatives in the following subsections:

4.1 Heavy-Duty Vehicles Control Measures
4.2 Ocean-Going Vessels Control Measures
4.3 Cargo Handling Equipment Control Measures
4.4 Harbor Craft Control Measures
4.5 Railroad Locomotive Control Measures
4.6 Construction Activity
4.7 Technology Advancement Program
4.8 Emissions Inventory Improvements
4.9 Zero Emission Container Movement
4.10 Infrastructure and Operational Efficiency Improvement Initiatives
4.11 The Port of Los Angeles’ China Shipping Settlement

Specific source category control measures and programs were proposed in the original 2006 CAAP report and have been updated through 2009. Emission benefits to date and future emission benefits have been updated and incorporated into the measure descriptions listed throughout this section, as well as the summary emission reduction information presented in Section 5.

4.1 Heavy-Duty Vehicle Control Measures

In the 2006 CAAP, significant emphasis was placed on heavy-duty vehicle (HDV, or truck) emission reductions. This was due to their significant contribution of pollutant emissions, their proximity to, and health risk impact on surrounding communities. One particular challenge to addressing this source is the diffuse nature of ownership of the trucks (many, if not most, trucks are owned and operated by individuals rather than by a centralized company).

After the adoption of the 2006 CAAP by the Boards of Harbor Commissioners of the two ports, the Clean Truck Program was the first major control element of the CAAP to be developed and implemented by the two ports. Some modifications were made to the implementation approach for HDV1, as originally outlined in the 2006 CAAP, which focused on requirements for frequent and semi-frequent callers and assumed the final fleet would be a mix of trucks meeting the USEPA 2007 on-road standards and trucks installed with Level 3 retrofit devices. The Clean Truck Program ultimately adopted goes further than originally planned by placing requirements on all trucks,
including infrequent callers, and requires all trucks to meet the 2007 on-road standards by 2012. As a result, the Clean Truck Program exceeds the emissions reduction goals outlined in the 2006 CAAP.

In the 2006 CAAP, the ports had originally considered implementing measure HDV2 by constructing the alternative fuel infrastructure as a port project, and selecting the operator and fuel supplier through a request for proposals (RFP). It was later determined that the best mechanism for expediting the availability of the fueling facility would be to issue an RFP for a lease on port property, where the fuel provider would construct and operate the facility. As a result, the fueling station has been operational since 2nd quarter 2009.

The HDV source category is addressed through a combination of measures that include truck replacements, control device retrofits for the interim period, and a research and development initiative to help identify and demonstrate cleaner engines types and modes of transportation that can be used in the movement of containerized cargo.
4.1.1 Control Measure Number HDV1

Measure Title: Performance Standards for On-Road Heavy-Duty Vehicles

This measure requires that all trucks servicing both ports comply with 2007 USEPA heavy-duty on-road emissions standards, in addition to safety and security requirements, by January 1, 2012. Incentives, grants and financing were provided to support the required fleet turnover. This comprehensive program will maximize the associated emissions reductions and greatly reduce health risk concerns associated with trucks. The measure is being implemented through port tariffs and lease agreements.

Initiation Year: 2008

Key Milestone Dates: October 1, 2008, ban oldest trucks from port terminals; January 1, 2010, second ban on older, more polluting trucks; January 1, 2012, require all trucks to meet 2007 or newer truck standards; see details below

Criteria Pollutant Reduction: By 2012, the average drayage truck servicing the ports will emit at least 90% less DPM and 70% less NOx emissions than before implementation of bans

GHG Impact: Due to the uncertainty of the impact of 2007+ truck technology on fuel economy, CO2E reduction or increase cannot be quantified

Implementation Strategies: Tariffs and Lease Agreements

Background

On-road heavy-duty trucks are used to move containers from the ports to other locations in the SoCAB and beyond. Almost all of these trucks have a gross vehicle weight of greater than 33,000 pounds. For 2007, over 4,000,000 license plate records were received from the terminals, which yielded about 218,000 unique license plate numbers. Registration information was requested from the California Department of Motor Vehicles and 54,493 unique truck records accounting for more than 3,000,000 trips (75% of total trips) were returned with model year information. The average age of the drayage truck fleet servicing the ports in 2007 was determined to be 12.2 years. This is in reasonable agreement with CARB’s estimate of 11.6 years for heavy-duty diesel trucks in operation within the SoCAB. CARB’s estimate is based on its on-road emissions inventory model, known as EMFAC. While the average age is similar, the EMFAC distribution included a greater proportion of trucks in the newest age range (up to six years old) and correspondingly fewer trucks in the eight to 13-year age range. A similar license plate analysis performed for 2008 suggested that the average age of the port-related fleet was 12.1 years which is similar to the 2007 fleet and the 2008 EMFAC fleet average age of 11.6 years for the trucks operating within SCAB region. For 2009 however, the average age for trucks used at the ports is anticipated to be significantly reduced due to the effect of the Clean Air Action Plan HDV1 requirements on drayage trucks. The 2009 data will be analyzed and published as part of the 2009 Annual Emissions Inventory for each port.
According to the 2008 Emissions Inventories prepared for the ports of Los Angeles and Long Beach, on-road heavy-duty vehicles operating at both ports contributed 33% of DPM and 39% of NOx when compared to emissions from all five port related sources.

**Measure Description**

The 2006 CAAP outlined several potential implementation scenarios for reducing emissions from frequent and semi-frequent caller trucks, based upon varying levels of replacements with either diesel- or LNG-fueled trucks, or retrofits with exhaust after-treatment devices. These various scenarios were presented as preliminary concepts for comparison purposes, with the actual implementation measure specifics to be developed for decision by each port’s Board of Harbor Commissioners.

Since adoption of the CAAP in November 2006, the ports have developed the program details and implementation mechanisms for this measure. During 2007 and 2008, the ports developed the following key components: (1) fleet modernization through a progressive truck ban; (2) Clean Truck Fees collected on older trucks and used to fund new truck replacements, (3) incentives, grants and financing programs for funding replacement trucks; and (4) port agreements with licensed motor carriers regarding conditions of drayage truck entry to port terminals. The first staff proposal for the program was finalized with input from each port’s Executive Director in late March 2007, consistent with the original CAAP commitment date, and released on April 12, 2007, at a CAAP stakeholder meeting. After the release of the draft program elements, the ports held two additional stakeholder meetings to discuss the proposal, and hosted Licensed Motor Carrier (LMC) workshops and two driver workshops. Over 15,000 letters, e-mails, and public comments were received on the proposed program. Based upon the significant level of concerns raised regarding several of the proposed program elements, two studies were commissioned in order to gain a better understanding of the potential economic impacts to the drayage industry and the potential for container diversion based upon increased drayage costs. The results of these analyses were finalized and released in September 2007, during an additional CAAP stakeholder meeting. Following the release, the Port of Long Beach and Port of Los Angeles Boards held a joint meeting to solicit input in October 2007. The proposed program details were updated, and in November of 2007 each port’s Board of Harbor Commissioners approved the first step in the groundbreaking “Clean Trucks Program” (CTP). Additionally, POLA commissioned a further study to analyze different models of CTP motor carrier agreements, which was presented at the public POLA Board of Harbor Commissioners meetings on March 6 and March 20, 2008 prior to the POLA Board’s adoption of the Concession model. The CTP has following elements:
Port Truck Fleet Modernization

The CTP targets 80% emission reductions by 2012 from all drayage truck fleets serving both ports. This will be accomplished through a port tariff that gradually limits port terminal access to all but the cleanest on-road trucks meeting the USEPA’s 2007+ on-road truck emissions standards. Older trucks will be banned according to the following schedule:

- **Phase 1:** Effective October 1, 2008, all pre-1989 MY engines were banned from operation in the ports.
- **Phase 2:** Effective January 1, 2010, all 1989 to 1993 MY engines were banned from operation in the ports. Furthermore, all 1994-2003 MY engines will be required to achieve an 85% DPM reduction and a 25% NOx reduction through the use of a CARB approved Level 3 plus NOx VDECS.
- **Phase 3:** By January 1, 2012, all drayage truck engines that do not meet 2007 federal on-road standards will be banned from the ports.

In the 2006 CAAP version of measure HDV1, it was assumed that only trucks that made 3.5 or more trips per week would be required to be replaced or retrofitted. The final version of measure HDV1 eliminated the distinctions between levels of frequency of truck visits and applied the fleet modernization requirement to all trucks entering the port terminals, based upon engine model years. The CTP as implemented will achieve emission reductions beyond the original goal by banning all trucks with pre-2007 engines from port service by January 1, 2012. As a result, the adopted CTP will achieve significantly greater emission reductions than estimated by the original version of HDV1.

The clean truck requirements of the ports tariffs (i.e. 2007 USEPA on-road heavy-duty truck emission standard) are fuel neutral. Any truck that can meet the emissions standard is eligible to participate in the program. In order to encourage the introduction of alternative-fueled vehicles into the port drayage fleet however, the ports adopted a 50% liquefied natural gas (LNG) truck goal for their funding awards. In the future, as new technologies become available that will meet or exceed the CTP emissions requirements (e.g. hybrid or electric trucks), they will also be eligible for use in the ports’ program.

All trucks operating at the ports of Long Beach and Los Angeles must be registered with the Ports’ Drayage Truck Registry (DTR). This registry is a database containing information about the truck such as make, model, engine year, truck owner and LMC permit under which the truck is driven. The CTP ban is administered by the marine terminal operators using information from the DTR and their preferred identification technology. For container terminal operators, an electronic identification system such as Radio Frequency Identifications (RFID) tags on trucks are being used to identify trucks while preventing congestion at marine terminal gates. RFID tag readers are installed at the terminal gates to ensure access only for
trucks that comply with the CTP. Other terminals, such as break bulk facilities are using other strategies including a ports-approved sticker system.

The ban schedule for the ports’ CTP is consistent with the CARB’s drayage truck regulation adopted in December 2007; however the ports’ schedule is more aggressive. In 2008, CARB adopted a regulation for in-use on-road diesel vehicles that goes beyond both the CTP bans and CARB’s drayage truck regulation requiring all trucks operating in California to meet USEPA’s 2010+ emissions standards starting January 1, 2021.  

Clean Truck Fee  
The ambitious schedule for truck replacements and retrofits required by the CTP results in significant costs. Initial estimates showed that this program could cost over $2 billion dollars. In order to generate the necessary additional funding, the ports of Los Angeles and Long Beach amended their CTP tariffs in December 2007 to include a cargo fee.

Starting in the February of 2009, the Port of Los Angeles and the Port of Long Beach began collecting a Clean Truck Fee of $35 for each loaded 20-foot (or less) container ($70 for each container longer than 20 feet). This fee does not apply to containerized cargo entering or leaving the port terminals via train, or containerized cargo that is simply moved from one terminal to another. The fee is charged to cargo owners and collected by marine terminal operators. The fee has generated funds to help finance the replacement of eligible trucks with trucks meeting the CTP requirements, which include diesel, LNG, or other approved alternative–powered vehicles that meet the 2007 USEPA on-road truck standards.

The ports of Los Angeles and Long Beach established additional exemptions to the cargo fee, for among other reasons, to encourage early action to modernize the port-related truck fleets. There are minor differences in the cargo fee exemptions for the ports of Los Angeles and Long Beach. More information about cargo fee exemptions can be obtained from the “Clean Truck Program” tariffs posted at:
http://www.polb.com/cleantrucks

Truck Grants, Incentives and Financing Programs  
Grants. The Ports of Los Angeles and Long Beach, CARB, and the AQMD jointly administered a $98 million California Proposition 1B grant program that provided $50,000 grants to applicants toward the purchase of 2007 compliant trucks. In addition, the Port of Long Beach provided a one-time grant of one million dollars towards the purchase of retrofit equipment for model year 1994 – 2003 trucks in 2009.
Incentives. The Port of Los Angeles provided $44 million in separate $20,000 incentives to stimulate the deployment of privately funded 2007 (or newer) USEPA compliant drayage trucks in the San Pedro Bay ports. The Ports of Long Beach and Los Angeles and AQMD jointly administered a $25 million program to incentivize the purchase of 500 LNG trucks. The trucks had to qualify for a Prop 1B award, and then once they qualified for that, they became eligible for an additional $50,000 incentive to purchase an LNG truck.

Financing. The Port of Long Beach provided $37.5 million in lease-to-own financing for 2007 (or newer) USEPA compliant drayage trucks in the San Pedro Bay ports. Under the lease to own program, applicants were provided 7-year lease agreements with a financial institution selected by the ports.

It is important to note that the drayage industry has made a major, direct investment in the success of the CTP. As a result of this investment, the majority of clean trucks that have been deployed recently to serve the ports have been privately funded. It is estimated that the cost to industry for this upgrade was over $600 million.

Additional details of the ports’ financing programs can be found at:
   http://www.polb.com/cleantrucks
   http://www.portoflosangeles.org/environment/ctp.asp

Motor Carrier Agreements
Each of the ports has established contractual agreements with the licensed motor carriers accessing the ports through a Concession Agreement (POLA) and Registration Agreement (POLB).

The purpose of the motor carrier agreements is to establish a relationship between the ports and the trucking companies or LMCs and to hold them responsible for ensuring that the trucks calling at the ports meet the ports’ terminal access requirements, including safety and security compliance. The agreements include requirements that drayage trucking firms:

- Maintain a motor carrier license
- Register their trucks and drivers in the port drayage truck registry and equip their trucks with compliance tags specified by the marine terminal operators,
- Ensure that trucks comply with motor vehicle safety requirements
- Ensure that drivers have federal Transportation Worker Identification Credentials (TWIC) and comply with all security requirements,
- Ensure that LMCs meet insurance requirements

The ports have also developed a Temporary Access Pass in lieu of a motor carrier agreement for infrequent visitors.
For more details on the agreement and temporary access pass requirements for the Ports of Los Angeles and Long Beach, refer to:

http://www.portoflosangeles.org/environment/ctp.asp
http://www.polb.com/cleantrucks

Air Quality Benefits
Benefits to Date
Starting in October of 2008, the first compliance date for the ports Clean Trucks Programs came into effect, whereby all trucks 1988 and older were banned from the ports. Analysis of the actual 2008 license plate data collected indicates that trucks meeting the 2007+ standards had started entering port service, representing a little over 4% of the drayage truck fleet operating at the ports. The emission benefits from these changes to the fleet are included in the 2008 emissions inventories.

Future Benefits
The implementation of the CTP has accelerated the turnover of older, higher polluting trucks to newer, cleaner trucks. As of February 2010, more than 75% of the trips are made with trucks meeting 2007+ standards. In 2012, when the last phase of the CTP will be implemented and all trucks meet at least the 2007 USEPA on-road standard, the average age of trucks in the fleet is expected to be six years or less resulting in a fleet that on average emits more than 90% less DPM emissions and 70% less NOx emissions compared to a twelve-year old truck fleet. CO₂E emissions benefits are unknown at this time due to uncertainty in new truck technologies.
Financial Costs

Costs to Date:
The financial costs of HDV1 from November 2006 through end of 2008 consist of program development, implementation planning, and initial startup costs. These costs are presented in Table 4.1 below.

Table 4.1: Costs-to-Date for HDV1

<table>
<thead>
<tr>
<th>HDV1</th>
<th>Funding Source</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Total</th>
</tr>
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<tr>
<td></td>
<td>POLA</td>
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<td>$23,317,485</td>
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<td></td>
<td>POLB</td>
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<td></td>
<td>SCAQMD</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>CARB</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>Measure Totals</td>
<td>$0</td>
<td>$0</td>
<td>$38,902,792</td>
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</tr>
</tbody>
</table>

Future Costs:
The financial costs for the program detailed in Table 4.2 include all currently known funding sources, from the ports, regulatory agencies, and bond funding. Additional potential costs to be borne by the industry were not estimated.

Table 4.2: Estimated Future Costs for HDV1

<table>
<thead>
<tr>
<th>HDV1</th>
<th>Funding Source</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
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<td>POLA</td>
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<td></td>
<td>POLB</td>
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<td>$0</td>
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<td>CARB Bond</td>
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<td>$100,000</td>
<td>$246,086,350</td>
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**Completed Milestones**

The following list identifies major milestones for implementation of CAAP measure HDV1:

1. Staff will develop program details and an implementation plan to achieve the ambitious fleet turnover and retrofit goals proposed in the Clean Air Action Plan. The plan will be approved by each port’s Board of Harbor Commissioners.

   **Schedule:** Completed.

2. Staff will meet with the regulatory agencies to discuss implementation of the ports’ program, with the goal of ensuring that the ports’ measure will not conflict with any current or proposed agency regulations.

   **Schedule:** Completed.

3. Award CTP agreements to trucking companies that provide drayage services at the ports.

   **Schedule:** Applications were made available in July 2008.

4. Launch Drayage Truck Registry for enrollment of drayage trucks servicing the ports.

   **Schedule:** Completed.

5. Develop truck financing options and launch program for awarding grants and leasing options for truck replacements and retrofits.

   **Schedule:** Completed.

6. Begin collecting cargo fee to provide a funding source for the Clean Truck Program.

   **Schedule:** Completed. Fee was initiated in February 2009.

7. All drayage trucks with pre-1989 MY engines are to be banned from operation in the ports.

   **Schedule:** Completed. Pre-1989 ban implemented as of October 1, 2008.
8. All drayage trucks with 1989 to 1993 MY engines are banned from operation in the ports. Furthermore, all trucks with 1994-2003 MY engines will be required to achieve an 85% DPM reduction and a 25% NOx reduction through the use of a CARB approved level 3 plus NOx VDECS.

**Schedule:** Completed. Ban initiated on January 1, 2010.

**Upcoming Milestones**

1. All drayage trucks with engines that do not meet 2007 federal on-road standards will be banned from the ports.

**Schedule:** By January 1, 2012.

**Elements to be Tracked**

The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for the CTP, the ports will provide regular updates on the number of enrollments in the Drayage Truck Registry, number of agreements executed, number of grants and leases awarded through the ports’ financing programs, amount of funding collected through the cargo fee, amount of funding received from other sources, including Proposition 1B bond funding, emission reductions, as part of the ports’ annual emissions inventories, and any other significant updates, as needed.

**Looking Forward**

The ports’ Clean Trucks Programs provide near term emissions reductions, in advance of state regulations. Once the state drayage truck requirements come into full effect in 2014, the ports programs will essentially be overtaken by the state rule. Further, the state on-road truck and bus rule will place further requirements on the trucks operating at the ports, requiring 2010+ standards by 2021.

The ports’ ultimate goal is to achieve near zero emissions from all port operations. As new advanced technologies such as hybrid diesel or alternative fueled (electric and hydrogen) drayage trucks become commercially viable options, the two ports will seek to integrate those technologies into the fleet of trucks serving the ports. In addition, starting with calendar year 2009, more accurate emission estimates can be made for port-related truck operations because, under the CTP, all trucks operating at the ports are required to be registered in the DTR and equipped with RFID tags which will provide more accurate and up to date population and mileage information.
4.1.2 Control Measure Number HDV2

Measure Title: Alternative Fuel Infrastructure for Heavy-Duty Natural Gas Vehicles

In order to encourage use of alternative fueled trucks, the ports will support development of alternative-fuel infrastructure in the port complex.

Initiation Year: 2007

Key Milestone Dates: LNG fueling facility is operational starting in March 2009

Criteria Pollutant Reduction: Not applicable; supports reductions in HDV1

GHG Impact: Not applicable; supports reductions in HDV1

Implementation Strategies: Lease Requirements

Background

While the clean truck standards for CAAP measure HDV1 applies to all fuel types, each port’s Board adopted a 50% LNG truck goal for their funding awards, in order to maximize potential health risk reductions from on-road trucks.

LNG fueling and maintenance facilities in the port area are limited. In order to make LNG trucks a viable option for port drayage, the ports began working with fuel providers in 2007 to make a public facility available in the port area. The original commitment of HDV2 was completed with the construction of the LNG refueling facility at the ports.

In February 2007, the Port of Long Beach solicited proposals to enter into a lease to provide LNG fueling infrastructure. The ports jointly selected a fuel provider, Clean Energy, to lease the parcel near the Anaheim Street Grade Separation, in the City of Los Angeles owned by the Port of Long Beach. A small portion of the property is also owned by the Port of Los Angeles. At no cost to the ports, Clean Energy has constructed the station on the leased property, with LNG storage tanks and four fueling dispensers. The station is open 24-hours per day, seven days per week. It was agreed through the selection process that currently existing maintenance facilities would be utilized until a LNG truck fleet exists within the ports and the market develops for a new maintenance facility. Construction of the station began in October 2008 and the station has been operational since March 2009. It is noteworthy that the facility constructed by Clean Energy on port property offers CNG fuel, in addition to LNG fuel.
Since the ports’ Board adopted a goal that 50% of all port-funded trucks be LNG, two truck vendors have also begun offering commercial drayage trucks that operate on compressed natural gas (CNG) in addition to LNG. With the potential increased use of CNG drayage trucks, HDV2 is proposed to be enhanced to support development of CNG fueling at the ports and to lay the foundation for the development of infrastructure for other alternative fuels such as hydrogen.

**Measure Description**

Next to the differential in purchase and maintenance costs, the decision to convert from conventional diesel-powered trucks to cleaner alternative-fueled trucks is also impacted by the availability of fueling infrastructure. The ports have been working with fuel providers and other stakeholders to identify key locations throughout the South Coast Air Basin to expand the natural gas refueling infrastructure to facilitate the deployment of natural gas trucks. Key locations include trucking facilities and the destinations where containers are drayed such as rail yards and warehouse distribution centers. Fuel providers should focus their efforts in expanding the natural gas refueling infrastructure at these locations while the ports focus on addressing the need for refueling infrastructure on port property. Currently, there are LNG and CNG refueling facilities in the City of Commerce and Ontario with plans to construct stations in key transportation corridors such as Interstate 5, 10 and 15. In addition, several LMC are proposing to develop on-site refueling capabilities for their own trucks.

The objective of this measure is to provide continued support in the development of an alternative fuel infrastructure in the port area. To maximize the utilization of fueling facilities, they should be available for public use.

In 2008, one of the LMCs operating at the ports ordered a small number of CNG powered trucks for their operations. It is anticipated that additional LMCs will choose the CNG option. CNG fuel can be provided in two ways. One approach is to augment current LNG facilities to dispense CNG through a L/CNG process. The LNG stored at the facility for dispensing is vaporized into CNG directly into the truck’s tank. Such systems are utilized at several locations in the SoCAB; most notably, at the San Bernardino Omnitrans facility. Alternatively, a second site could be identified where a full CNG station would be constructed. The station could have storage for CNG that is delivered from the pipeline. One of the potential tasks of this measure could be to solicit proposals for the most cost-effective approach. Currently, the facility constructed by Clean Energy on port property offers CNG fuel, in addition to LNG fuel.
In order to further expand the availability of LNG fuel in the port area, the ports have worked with the SCAQMD to provide incentive funding for the construction of two additional publicly available LNG fueling stations. Both facilities will be located at California Cartage Company sites: one in Wilmington and one in North Long Beach. These stations are expected to become operational by June 2010. Finally, plans are being considered for the development of an LNG fueling station on Terminal Island within the port complex. All together, this represents a significant expansion of LNG fueling capacity in port area. Figure 4.1 shows the locations of operational and planned LNG fueling stations in the vicinity of the ports.

Figure 4.1: Locations of Operational and Planned LNG Fueling Stations in the Vicinity of the Ports of Long Beach and Los Angeles
Air Quality Benefits
There are no emission reductions directly related to the performance of this control measure; however this measure is critical to the successful implementation of HDV1, which itself results in significant emission reductions.

Financial Costs
Costs to Date:
In order to support development of the fueling infrastructure, the Port of Long Beach negotiated a reduced rate with the fuel provider for the first five years of the lease. There are no port capital costs to date associated with this measure.

Future Costs:
The future funding commitments related to additional alternative fuel structures at the ports are detailed in Table 4.3.

Table 4.3: Estimated Future Costs for HDV2 by Funding Source

<table>
<thead>
<tr>
<th>HDV2 Funding Source</th>
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<th>2010</th>
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Completed Milestones
The following list identifies major milestones for implementation of CAAP measure HDV2:

1. Staff will develop specifications and an RFP for the lease to provide LNG infrastructure.
   
   Schedule: Completed.

2. The ports will select a lessee from the RFP process.
   
   Schedule: Completed.

3. The lessee will begin construction of the fueling facility.
   

4. Fueling station will be completed and operational.
   
   Schedule: Completed and operational in March 2009.
Upcoming Milestones

1. LNG truck maintenance facility will be constructed.

   Schedule: When justified, due to market demand in the port area.

2. Additional alternative fuel infrastructure needs will be evaluated and the ports will support further development of additional alternative fuel dispensing stations as needed. This could include enhancing the existing LNG fueling station to dispense CNG fuel.

   Schedule: As needed.

Elements to be Tracked

The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures. Specifically for measure HDV2, the ports will provide updates on the construction of additional alternative fueling facilities and the beginning of operations.

Looking Forward

As future CAAP updates are made, this measure would seek to continue to enhance the port’s refueling facility capabilities to provide dispensing for other cleaner fuels such as hydrogen or hydrogen blends. Several natural gas engine manufacturers are evaluating the blending of hydrogen with natural gas as a transportation fuel. Such blending would further reduce emissions from natural gas trucks in the future and would be the bridge to a future hydrogen economy where trucks and other equipment such as yard tractors would utilize hydrogen fuel. Other fuels that may have substantial air toxics and greenhouse gas benefits over conventional diesel fuel may also be identified and evaluated.
4.2 Ocean-Going Vessels Control Measures

Ocean-going vessels (OGVs) represent the second major source category where emissions reduction efforts were focused in the 2006 CAAP. This is because of their significant contribution to overall port emissions and their proximity and health risk impact to surrounding communities while at berth.

The ports are moving forward with implementation of the OGV measures as identified in the original 2006 CAAP. Each port is implementing their incentive programs to encourage greater participation in the vessel speed reduction program, as described under OGV1. Each port is also constructing shore power infrastructure to meet the implementation schedule outlined in OGV2. For measures OGV3 and OGV4, the ports developed and implemented a one-year incentive program, which hadn’t been anticipated during development of the 2006 CAAP, to encourage greater use of low sulfur fuel in vessel main engines. In addition, since the 2006 CAAP was adopted, CARB adopted two regulations which support the CAAP measures for shore power and low sulfur vessel fuels. These regulations are described in more detail in Section 1.

The OGV source category is addressed through a combination of measures that include operational controls, shore power, cleaner fuels, preferential deployment of cleaner vessels, and a research and development initiative to help identify and demonstrate new technologies to reduce emissions. This final component is being implemented with support of the Technology Advancement Program.
4.2.1 Control Measure Number OGV1

Measure Title: OGV Vessel Speed Reduction (VSR)

This measure reduces emissions from OGVs during their approach and departure from the ports, by slowing vessel speed to 12 knots at a distance of 20 nm and 40 nm from Point Fermin.

Initiation Year: 2001

Key Milestone Dates: Voluntary program initially established in 2001; POLB Green Flag Program adopted in 2005 and amended to include 40 nm compliance starting in January 2009; POLA VSR incentive program adopted in 2008 and amended to include 40 nm compliance starting in September 2009; requirements implemented as leases are negotiated.

Criteria Pollutant Reduction: On an average per OGV call basis, 100% compliance with VSR will achieve 19% reduction of DPM, NOx and SOx within the 20 nm zone, and 48% of DPM, NOx and SOx reduction within the 40 nm zone.

GHG Impact: On an average per OGV call basis, 100% compliance with VSR will achieve 5% reduction of CO2E within the 20 nm zone and 10% reduction of CO2E within the 40 nm zone.

Implementation Strategies: Lease Requirements, Incentive Tariffs, & Voluntary Participation

Measure Description

Under the Vessel Speed Reduction (VSR) program, participant vessels are requested to slow down to 12 knots as they approach or depart the ports. The primary objective of the VSR program is to reduce emissions from OGVs during vessel transit near the ports. When ships slow down, the load on the main engines decreases considerably compared to the engine load when transiting at higher speeds, leading to a decrease in the total energy required to move the ship through the water. This energy reduction in turn reduces emissions for this segment of the transit. Since the load on the main engines affects power demand and fuel consumption, this strategy significantly reduces all pollutants including DPM, NOx, SOx, and GHG emissions.
There are several ongoing and proposed VSR efforts/initiatives affecting vessel transit operations at the ports of Los Angeles and Long Beach.

1. A voluntary VSR program has been in place since 2001 under which vessels slow to 12 knots when they are within 20 nm of Point Fermin.

2. Under the Port of Long Beach Green Flag Program, adopted in 2005, Green Flags are awarded to vessel operators that are 100% compliant with the program for the previous year. Carriers with at least 90% compliance by their vessels receive a 15% dockage fee reduction. Starting on January 1, 2009, this program has been extended to include an additional compliance level to 40 nm. Carriers with at least a 90% compliance rate for all of their vessels within 40 nm qualify for the green-plus rate, which is a 25% dockage fee reduction. In early 2010, POLB adopted the G-40 Plan, which increased the dockage fee reduction to 50%, from April 1, 2010 through March 31, 2011, for carriers with 90% compliance for their vessels within 40 nm.

3. In 2008, the Port of Los Angeles adopted a VSR Incentive Program in the 20 nm zone to provide a financial incentive equivalent to 15% of first day dockage to vessel operators who reduce their speed on approach or departure. On September 29, 2009, this program was expanded to provide an increased incentive equal to 30 of first day dockage to carriers for compliance to 40 nm.

4. In order to meet the mandates of AB 32, the California Global Warming Solution Act, implementation of VSR has been identified as one of the early action plan measures. CARB staff is currently developing a program to implement this measure.

Compliance with the voluntary VSR program has steadily increased over the years since it was originally adopted. Compliance is tracked by individual ship call and reported monthly to the shipping lines. Overall compliance for all calls at the ports during the CAAP baseline year of 2005 was 67%. In 2007, the overall VSR compliance rate had increased to 84%. In 2008, the compliance rate for all vessels calling at POLB was 92% and the compliance rate for vessels calling at POLA was 89%. In 2009, the compliance rate for all vessels calling at POLB was 95% to 20 nm and 72% to 40 nm; the compliance rate for vessels calling at POLA was 90% to 20 nm and, for the period of September 29, 2009 through December 31, 2009, 53% to 40 nm.

In late-2007, a survey on the VSR Program was administered to vessel companies that call at the Port of Long Beach and the Port of Los Angeles. The purpose of the survey was to obtain feedback from vessel companies on the voluntary VSR program and on the proposed extension of the VSR zone to 30 nm or 40 nm. The VSR survey was administered to vessel companies representing tankers, bulk, cruise and container ships. All of the respondents were participating in the VSR program and 52% felt the current program was beneficial. When asked about extending the VSR zone to 30 or 40 nm from Point Fermin, 76% of the respondents felt the program would pose a negative impact on their business. Most felt the increase would result in scheduling conflicts and would increase costs associated with fuel and
labor. In addition, 86% felt they would have to increase their vessel speed at other legs of the voyage to make up for the extra time spent in the VSR zone. If this were to occur, the unintended consequence would be higher emissions and higher fuel consumption outside of the 40 nm zone, potentially along the California coast. However, though most of the respondents felt expanding the VSR zone would have negative effects, 76% said they would comply with the new program.

Feedback from the surveys also provided insight on a number of challenges that could result with extending the VSR zone such as possible wear and tear on the engine; ability to order longshoreman labor properly; and potential increase in emissions due to increased speeds outside of the port VSR zone. Survey responses also suggested alternative incentives to promote VSR compliance, for example, reducing port fees or offering incentives to offset additional fuel costs. The results from this survey helped to inform the ports decision to expand the VSR programs to 40 nm.

Shipping lines that can demonstrate alternative compliance plans (using controls surplus to the Clean Air Action Plan) that meet or exceed the emissions reductions from VSR at 12 knots are able to petition to the ports for changes for specified vessels. This could include requesting approval of an alternative speed for a particular vessel if supporting information can be provided that the alternative speed will result in greater emissions reductions than traveling at 12 knots. The alternative compliance plans will be reviewed by port staff for validation and recommendations will be presented to the applicable Executive Director for action.

The ports receive complete vessel speed data to 40 nm from Point Fermin from the Marine Exchange of Southern California. Marine Exchange has expanded their vessel tracking hardware, and with the support of the ports, the software has been upgraded to collect and transmit the data in a format that can be used to determine compliance with the ports’ programs. The expanded datasets started to be transmitted to the ports for activity in June 2008 and for each month thereafter. Additional upgrades to the system were implemented through the end of 2008 to provide complete data coverage.

**Implementation Approach**

There are five key elements to implementing this control measure:

1. Require participation in the VSR program to 40 nm from Point Fermin through conditions negotiated into new or renegotiated leases.

2. Increase emissions reduction benefits through implementation of a two-tiered incentive for voluntary compliance with the speed reduction to 20 nm or 40 nm from Point Fermin.

3. As needed, work with the shipping lines to address any ongoing issues associated with participation to 40 nm from Point Fermin.
4. Coordinate with CARB on the development of a statewide VSR program.

5. The benefits of the VSR program are quantified and reflected in the annual updates to the ports’ emissions inventories and reported annually to the Executive Director and the Board of Harbor Commissioners for each port.

There are three primary implementation approaches for this measure: 1) continuation of the voluntary program, 2) incorporation of VSR requirements in new leases, and 3) CARB’s VSR strategy. Parallel to the voluntary, incentive based strategies, compliance with the VSR program to 40 nm from Point Fermin will be negotiated into new and re-negotiated lease requirements. In addition, the ports will also work closely with CARB to facilitate a statewide VSR program and ensure that the programs are aligned.

To facilitate the transition to the lease requirements for compliance with the VSR program to 40 nm from Point Fermin, or the upcoming statewide VSR program along the California coastline, the ports have expanded their VSR programs to include incentives for compliance to 20 nm or 40 nm from the Point Fermin. The extended VSR program has been in place since January 2009 for Port of Long Beach and September 2009 for Port of Los Angeles. The extended incentive program is tiered to offer greater incentives to the carriers whose vessels participate over the longer distance and therefore produce the greatest emissions benefits.

**Air Quality Benefits**

The net reduction of all pollutants from slowing ship speeds has been recognized by CARB as an effective control strategy, and hence an early action measure under the State’s GHG reduction plans. The VSR program has been generating significant emissions reductions since starting in 2001.

**Benefits to Date**

The voluntary VSR program started in late 2001 and has been increasing in participation ever since. The estimated reductions in DPM, NOx, SOx, and GHGs in terms of CO2E associated with this measure, since the CAAP baseline year of 2005, are reflected in both ports’ annual EI reports.

**Future Benefits**

If an average individual OGV complies with the VSR speed of 12 knots or less during arrival and departure from the ports, emissions of DPM, NOx and SOx will be reduced by 19%, within the 20 nm zone, and by 48% within the 40 nm zone. Additionally, CO2E emissions will be reduced by 5% in the 20 nm zone and by 10% in the 40 nm zone. Overall emissions reduction from all vessels will depend on the compliance rate.
Financial Costs
The costs to date and projected funding costs for the measure are associated with ports’ tariff incentive funding, data acquisition, compliance tracking and reporting, and administrative costs associated with the control measure.

Costs to Date
Table 4.4 provides the financial costs to date for each port in support of this measure.

Table 4.4: Costs-To-Date for OGV1 by Funding Source

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<tr>
<th>OGV1</th>
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Future Costs
Table 4.5 provides the expected budgetary requirements needed to continue the program as described in this measure.

Table 4.5: Estimated Future Costs for OGV1 by Funding Source

<table>
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<tr>
<th>OGV1</th>
<th>Funding Source</th>
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Completed Milestones
1. Staff from both ports will meet and confer with the Marine Exchange, the USEPA Region 9, CARB, SCAQMD and PMSA to revise and renew the VSR Memorandum of Understanding (unless replaced or superseded by regulation).

  Schedule: Completed. It was determined by the agencies that a renewed MOU is not necessary to continue to monitor the benefits of the VSR programs.

2. Staff from the ports of Los Angeles and Long Beach will work with the Marine Exchange to update equipment and software needed to track vessel speeds out to 40nm from Point Fermin.

3. Staff will prepare a presentation and/or fact sheet outlining the air quality benefits of the VSR program. The final fact sheet will be posted on the CAAP website.

   **Schedule:** Completed.\(^{19}\)

4. Amend the existing tariff incentive programs to implement a two-tiered approach, offering incentives for compliance to 20 nm and/or 40 nm from Point Fermin.

   **Schedule:** Completed in late 2008 for POLB and September 2009 for POLA.

**Upcoming Milestones**

1. Staff from the ports of Long Beach and Los Angeles will continue to work with the carriers to any address barriers to participation in the VSR programs to 40 nm from Point Fermin.

   **Schedule:** Ongoing.

2. As leases are opened through the EIR process or for renegotiation, or as new leases are negotiated, the ports will include provisions for compliance with the VSR program to 40 nm from Point Fermin.

   **Schedule:** As leases are opened.

3. The benefits of the VSR program will be quantified and reflected in the periodic updates to the ports’ emissions inventories and reported annually to the Executive Director and the Board of Harbor Commissioners for each port.

   **Schedule:** Ongoing.

**Elements to be Tracked**

The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for the OGV1 measure, the ports track compliance with the VSR programs on a monthly basis. In addition, the emissions benefits of OGV1 will be compiled each year in the annual emissions inventories.

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\(^{19}\) [http://www.cleanairactionplan.org/strategies/vessels/vsr.asp](http://www.cleanairactionplan.org/strategies/vessels/vsr.asp)
**Looking Forward**

The ports will continue to work with carriers to increase participation in the VSR programs to 40 nm from Point Fermin. Currently, as part of their Diesel Risk Reduction Plan, Goods Movement Emissions Reduction Plan and Assembly Bill 32 (Global Warming Solutions Act of 2006), CARB is evaluating a strategy for ships to observe VSR speeds within 24 nm or 40 nm from the California coastline along major shipping channels. The ports will work closely with CARB to facilitate the development of a statewide VSR program.
4.2.2 Control Measure Number OGV2
Measure Title: Reduction of At-Berth OGV Emissions

The use of shore power to reduce hotelling emissions implemented at all container and cruise terminals and one liquid bulk terminal at the Port of Los Angeles and all container, one crude, and one bulk terminal at the Port of Long Beach by 2014. Through the Technology Advancement Program, demonstration and application of alternative emissions reduction technologies will be evaluated and implemented for ships that are not good candidates for shore power.

Initiation Year: 2004

Key Milestone Dates: First shore-powered berth at POLA in June 2004; first shore-powered berth at POLB in 2007; CARB regulation adopted in December 2007; design, construction and operation of other berths at both ports to be phased-in through 2013; CARB regulation requires 50% of all container, cruise and reefer vessels to use shore power by 2014; port requirements implemented as leases are negotiated

Criteria Pollutants Reduction: Use of shore power at-berth will reduce OGV hotelling emissions of DPM, NOx and SOx by 95% per vessel call

GHG Impact: Use of shore power at-berth will reduce hotelling emissions of CO$_2$E by 95% per vessel call. Estimate does not account for power plant emissions

Initial Implementation Strategies: Lease Requirements, Regulatory Requirements, & Incentives

Measure Description

This measure focuses on reducing hotelling emissions from OGVs while at berth. The measure focuses on two primary approaches for reducing at-berth emissions: (1) shore power (transferring the electrical generation needs for OGVs while at berth from onboard diesel-electric generators to the cleaner shore-side power grid, which generates power through regulated/controlled stationary sources) and (2) hotelling emissions reduction requirements through alternative technologies, for ships that do not fit the shore power model. The shore power approach is generally best suited for vessels that make multiple calls per year, require a significant power demand while at berth (a function of hotel load and time at berth), and vessels that will continue to call at the same terminal for multiple years. The most common ship types that are good candidates for shore power are large string-service containerships, cruise ships, reefer ships, and specially designed crude tankers that have diesel-electric engines.
Shore power requires extensive infrastructure improvements on-board vessels that would use the system, as well as on the terminal side for supplying the appropriate level of conditioned electrical power. The on-board infrastructure costs are dependent upon the candidate vessel’s current configuration, conduit space, and electrical panel space.

Alternative hotelling emissions reduction technologies are in various stages of development and verification. These technologies may be applied to vessels that do not fit the shore power model and include but are not limited to:

- Exhaust gas scrubbing technologies that capture vessel stack emissions while at berth and “scrubs” exhaust streams either on-shore or on a barge.
- Shore-powered dockside electrical pumps for tankers, which reduce onboard pumping loads (typically these pumps are driven by steam power).
- Dockside portable distributed generation systems, which utilize LNG generators to supply power.

Emerging OGV emissions reduction technologies are being evaluated, demonstrated, and implemented through the Technology Advancement Program or other demonstration programs. Some of these technologies have demonstrated the potential to achieve equivalent emissions reductions of shore power while others have the potential for significant reductions (though not at the same level of shore power) of hotelling emissions. As an example, a short-term pilot test of the Advanced Maritime Emission Control System (AMECS) was successfully completed under the TAP in May and July of 2008. Results indicate at least a 95% DPM, SOx, and NOx emissions at-berth were captured from use of the system. AMECS is an emission control system that uses a mechanical articulating arm along with a soft-sealing exhaust intake bonnet to capture stack emissions from an OGV while at berth. Exhaust from the vessels is then transported to a multi-stage emission control system (consisting of a scrubber and selective catalytic reduction reactor) to reduce SOx, DPM, and NOx emissions. As a result of the successful pilot tests, POLB is planning to conduct a more extensive, longer-term demonstration in 2010. The longer-term demonstration testing is intended to evaluate the operational feasibility of the technology on an ongoing basis and establish the operational costs of the system.
Both ports have separate and distinct shore power programs; however, they share the common ultimate goal of transitioning all frequent visitors such as container and cruise ship operations calling at the ports to shore power, and to transition other vessel types toward alternative hotelling emissions reduction technologies. The Port of Long Beach’s program is referred to as shore-side power or cold ironing, while the Port of Los Angeles’ program is called Alternative Maritime Power (AMP™). With regard to shore power, the ports are in significantly different positions from an infrastructure standpoint. Generally, the Port of Los Angeles has the main electrical trunk lines in place from which to “step-down” and condition power for use by ships. The Port of Long Beach, on the other hand, needs to bring new electrical service lines from Interstate 405 into the Harbor District in order to supply the appropriate power, which will require significant infrastructure improvements and thus somewhat delay implementation timelines, and significantly increase the costs, compared with the Port of Los Angeles. One other difference between the two ports is the relationship with the cruise terminals. The Port of Los Angeles has a leasing relationship with their cruise terminal operators. The cruise terminal at the Port of Long Beach is leased by another department at the City of Long Beach and therefore is not directly under the control of the Port.

The CARB adopted a regulation in December 2007 to reduce emissions from diesel auxiliary engines on OGVs while at-berth for container, cruise and reefer vessels. The regulation requires that auxiliary diesel engines be shut down (i.e., use shore power) for specified percentages of fleet visits. In addition the fleet’s at-berth auxiliary engine power generation (kW-hrs) must be reduced by the same percentages. As an alternative, vessel operators may employ any combination of technologies to achieve equivalent reductions. Specifically, by 2014, vessel operators relying on shore power are required to shut down their auxiliary engines at-berth for 50% of the fleet’s vessel visits and also reduce their onboard auxiliary engine power generation by 50%. The specified percentages will increase to 70% in 2017 and 80% in 2020. For vessel operators choosing the emission reduction equivalency alternative, the regulation requires a 10% reduction in OGV hotelling emissions starting in 2010 increasing in stringency to an 80% reduction by 2020. The timelines presented in this measure will allow for compliance with the CARB regulation, but will accelerate the schedule and the level of use of shore power where possible.

In addition, CARB has proposed developing a second phase of the at-berth regulation, for vessels that are not captured by the first regulation. It was anticipated that this regulation would rely on the use of alternative technologies, and would result in 50% reduction of emissions from these additional vessels by 2014 and an 80% reduction by 2020. In December 2009 however, CARB stated that they would not be pursuing the second phase of the regulation. If cost-effective and commercially-available technologies did emerge in the future, CARB would revisit the issue.

Implementation Plan
The ports' implementation of this measure consists of two paths: use of shore power and alternative hotelling emissions reduction technologies for non-shore power candidate vessels/terminals. Shore power implementation will be different for each port due to the existing infrastructure differences cited above. In addition to making the terminal infrastructure available, it is imperative that requirements be placed on individual terminals to ensure that vessels use the shore power facilities. Lease requirements include specific performance requirements for maximum feasible utilization of the available shore power infrastructure. The phase-in schedule for those use requirements is dependent upon several factors, including how many berths at the terminal are equipped with shore power, retrofit and assignment of vessel strings to use the available infrastructure, and the phase-out of vessels that are not candidates for shore power (e.g. steamships). As soon as a berth is equipped with shore power infrastructure, that berth will be used to the maximum extent feasible. Ultimately, after all berths at a terminal are electrified, the goal is 100% utilization of shore power by candidate vessel calls at that terminal.

Port of Los Angeles AMP™ Implementation
The Port of Los Angeles has eight major container terminals and one cruise terminal (with three berths that can accommodate two large cruise ships). Over the next five years, the Port of Los Angeles will implement a massive infrastructure improvement program to make AMP™ available at a number of berths at container, one liquid bulk terminal, cruise terminals, and dredge plug-in locations. The implementation strategy focuses on terminal infrastructure improvements based on upcoming lease negotiations or EIR dates and will be implemented primarily by lease requirements to use AMP™ once the infrastructure is in place and operational. The schedules presented within the measure are preliminary and were developed with the port's Engineering Department based on assumptions regarding when projects will be cleared through the CEQA process.

Table 4.6 presents the berths at the Port of Los Angeles that are planned to be improved and operational within the next five years.
Table 4.6: POLA AMP™ Infrastructure by Berth Over Next Five Calendar Years

<table>
<thead>
<tr>
<th>Berths (Terminal)</th>
<th>Number of Berths</th>
<th>Date Operational</th>
</tr>
</thead>
</table>
| B90-93 (Cruise Terminal)| 3 Berths         | Two berths in 2nd Quarter 2010  
|                         |                  | One berth by 1st Quarter 2011 |
| B100-102 (China Shipping)| 2 Berths        | One berth completed in 2004  
|                         |                  | One berth by 2nd Quarter 2011 |
| B121-131 (WBCT)         | 2 Berths         | 3rd Quarter 2013           |
| B136-147 (TraPac)       | 3 Berths         | 2nd Quarter 2010           |
| B175-181 (Pasha)        | 2 Berths         | 1st Quarter 2011           |
| B206-209 (LTT)          | 1 Berth          | 1st Quarter 2011           |
| B212-218 (YTI)          | 2 Berths         | One completed in 2006       
|                         |                  | One berth by 4th Quarter 2013 |
| B224-236 (Evergreen)    | 2 Berth          | One berth in 3rd Quarter 2009  
|                         |                  | One berth by 4th Quarter 2013 |
| Pier 300 (APL)         | 5 Berths         | Five berths in 3rd Quarter 2012 |
| Pier 400 (APM)         | 3 Berth          | Two berths in 1st Quarter 2011  
|                         |                  | One berth by 3rd Quarter 2013 |
| Pier 400 Liquid Bulk    | 1 Berth          | 1st Quarter 2012           |
| **Total**              | **26 AMP Berths**|                           |

A preliminary aggressive lease requirement-based rollout scenario was developed in conjunction with POLA Engineering for the AMP™ program. Under this scenario, the POLA would have AMP™ capabilities at 26 berths (3 cruise and 22 container and one liquid bulk) at a cost of $81 million before the end of 2013. The resulting scenario would translate into the following number of AMP™ ship calls, presented below in Table 4.7.
### Table 4.7: POLA Estimated AMP™ Ship Calls by Calendar Year

<table>
<thead>
<tr>
<th>Berths (Terminals)</th>
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<th>2012</th>
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<td>0</td>
<td>110</td>
<td>114</td>
<td>119</td>
</tr>
<tr>
<td>B206-209 (LTT)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B212-218 (YTI)</td>
<td>6</td>
<td>52</td>
<td>108</td>
<td>111</td>
<td>115</td>
</tr>
<tr>
<td>B224-236 (Evergreen)</td>
<td>0</td>
<td>138</td>
<td>140</td>
<td>142</td>
<td>144</td>
</tr>
<tr>
<td>Pier 300 (APL)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>148</td>
<td>291</td>
</tr>
<tr>
<td>Pier 400 (APM)</td>
<td>0</td>
<td>0</td>
<td>108</td>
<td>110</td>
<td>116</td>
</tr>
<tr>
<td>Pier 400 Liquid Bulk</td>
<td>0</td>
<td>0</td>
<td>119</td>
<td>123</td>
<td>126</td>
</tr>
<tr>
<td><strong>Total AMP’d Calls</strong></td>
<td>80</td>
<td>665</td>
<td>1,245</td>
<td>1,435</td>
<td>1,841</td>
</tr>
<tr>
<td>AMP Container Calls versus Total Container Calls</td>
<td>4%</td>
<td>31%</td>
<td>53%</td>
<td>60%</td>
<td>67%</td>
</tr>
<tr>
<td>AMP Cruise Calls versus Total Cruise Calls</td>
<td>0%</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
<td>100%</td>
</tr>
<tr>
<td>AMP Tanker Calls versus Total Tanker Calls</td>
<td>0%</td>
<td>0%</td>
<td>24%</td>
<td>24%</td>
<td>24%</td>
</tr>
</tbody>
</table>

One berth at the China Shipping terminal and one berth at the YTI terminal are currently AMP™ equipped. At those terminals there were 40 AMP™ vessel calls in 2005, 63 AMP™ vessel calls in 2006, 59 AMP™ vessel calls in 2007, and 50 AMP™ vessel calls in 2008. The rollout of AMP™ as shown above will require significant terminal infrastructure improvements for both container and cruise terminals. The pre-construction activities include developing engineering plans and specifications, bid packages, contracting, etc. The shore side infrastructure improvements include installation of 34.5 kV to 6.6 kV transformers, connections ~200' apart along the berth, terminal trenching, etc. In the case of the cruise terminal, shore infrastructure improvements will include a shore based cable management system. The extremely aggressive AMP™ rollout program presented above is based on the following key assumptions/limitations:

- All EIRs/EISs remain on schedule.
- Customer vessels will be ready to use AMP™ shortly after berth infrastructure is completed and operational.
- With the exception of Evergreen, no other temporary AMP™ installations will be constructed. Evergreen is the exception because they already have AMP™ capable vessels.
- The port can complete AMP™ installations as assumed in the schedule.
- Weekly services call at each berth using AMP™.
➢ There will be enough AMP™ equipped vessels to reach 100% of all vessel calls at an AMP™-ready berth.
➢ Initially 30% (Princess Cruise Line) of all cruise vessels will utilize AMP™. By 2013, 100% of all cruise vessel calls will be AMP™-ready.

Port of Long Beach Shore Power Implementation
During the next five years, the port will be undergoing a massive electrical infrastructure improvement program to construct an additional 6.6 kV sub-transmission line to serve the POLB Harbor District, and complete infrastructure improvements for the remaining container terminals, electric dredge plug-ins, and additional infrastructure for electrification of certain types of yard equipment.

Background: The Port of Long Beach Harbor Commission adopted a Green Port Policy in January 2005 that guides all port operations and future development to achieve significant air quality improvements. Key elements of the Green Port Policy that are being enacted over time are the port’s commitment to implement shore power; the encouragement of terminal operators to electrify yard equipment; and the conversion to electric dredging for all port deepening projects. To undertake the large-scale improvements to the electrical system required to support these goals, the port has established an Electrical Infrastructure Program with primary responsibility to manage the strategic planning, development and improvement of the port’s electrical infrastructure. In addition to air quality improvements, the program also has a goal of reducing the cost of electrical power for port tenants by simplifying the existing electrical distribution system and by upgrading the source voltage.

Priorities: Manage the strategic planning, development, and improvement of the port’s electrical infrastructure.

Goals:
➢ Satisfy future electrical demand due to shore power, yard electrification and terminal development
➢ Preserve competitiveness
➢ Position the port to take advantage of future electrical service opportunities
POLB is actively implementing its shore power program. In 2006, the port began improvements on the shore power infrastructure at the BP terminal at berth T121. Construction is completed and since mid-2009, the shore power infrastructure has been operational and is being used. In 2006, shore power requirements were included in the terminal leases for the container terminals at Piers G and C. Since adoption of those leases, design and development of the infrastructure has proceeded, and in November of 2008, the shore power infrastructure at berth G232 became operational. Construction of shore power infrastructure at Pier C is underway. In 2007, almost 80% of the calls at the Berth F208 Mitsubishi Cement (MCC-Dry Bulk) facility utilized shore power when visiting the Port of Long Beach. Over 25 berths at container terminals at the Port of Long Beach are scheduled to be shore power ready by the end of 2013. These projects are discussed in greater detail below.

Table 4.8 presents the berths that are expected to be improved and operational with shore power within five years including the expected initial operational date. Table 4.9 summarizes the number of annual vessel calls.

**Table 4.8: POLB Shore Power Infrastructure by Berth Over Next Five Calendar Years**

<table>
<thead>
<tr>
<th>Site</th>
<th>Number of Berths</th>
<th>Date Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCT - Pier J South</td>
<td>4 Berths</td>
<td>2012 - 2013</td>
</tr>
<tr>
<td>SSAT - Pier C</td>
<td>2 Berths</td>
<td>2010</td>
</tr>
<tr>
<td>SSAT Long Beach - Pier A</td>
<td>3 Berths</td>
<td>2013</td>
</tr>
<tr>
<td>TTI - Pier T</td>
<td>4 to 5 Berths</td>
<td>2012</td>
</tr>
<tr>
<td>CUT &amp; LCBT - Pier E</td>
<td>2 Berths</td>
<td>2012 &amp; 2013</td>
</tr>
<tr>
<td>ITS - Pier G</td>
<td>4 Berths</td>
<td>One berth 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others 2011 - 2013</td>
</tr>
<tr>
<td>Pier S</td>
<td>2 to 3 Berths</td>
<td>2013</td>
</tr>
<tr>
<td>BP/ARCO - Berth T121</td>
<td>1 Berth</td>
<td>2009</td>
</tr>
<tr>
<td>Mitsubishi Cement (MCC) - Berth F 208</td>
<td>1 Berth</td>
<td>2007</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23 to 25 Berths</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table 4.9: POLB Estimated Shore Power Ship Calls by Calendar Year

<table>
<thead>
<tr>
<th>Site</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCT - Pier J South</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SSAT - Pier C</td>
<td>0</td>
<td>54</td>
<td>63</td>
<td>77</td>
<td>125</td>
</tr>
<tr>
<td>SSAT Long Beach - Pier A</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TTI - Pier T</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CUT &amp; LCBT - Pier E</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>ITS - Pier G</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>Pier S</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>235</td>
</tr>
<tr>
<td>BP/ARCO - Berth T121</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Mitsubishi Cement (MCC) - Berth F 208</td>
<td>34</td>
<td>34</td>
<td>35</td>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td><strong>Total Shore Power Calls</strong></td>
<td><strong>96</strong></td>
<td><strong>150</strong></td>
<td><strong>210</strong></td>
<td><strong>325</strong></td>
<td><strong>709</strong></td>
</tr>
</tbody>
</table>

AMP Container Calls versus Total Contain 3% 6% 9% 15% 33%
AMP Cruise Calls versus Total Cruise Calls 2% 1% 1% 1% 1%
AMP Tanker Calls versus Total Tanker Cal 7% 7% 7% 7% 7%

The estimated calls are based upon the assumption that, for terminals with weekly services, at least 50 calls per year will be required through lease requirements, at each shore power berth. Once all berths at the terminal are equipped with shore power infrastructure and there is reasonable assurance that shore power ready vessels are available, all calls will be shore powered. As shown in Table 4.8, there will be shore power ready berths available for terminals PCT, J South, SSAT Long Beach, and TTI. However, there is no mechanism available to require ships calling at these shore power ready berths to utilize shore power until 2014. In 2014, CARB’s at-berth regulation requires 50% of the container, cruise, and reefer vessel calls to utilize shore power. The port will work with these operators to encourage their use of the shore power facilities on a voluntary basis in excess of and in advance of the regulatory requirement.

The following list outlines the shore power capital improvement plan at the Port of Long Beach over the next five years. In preparation for this program, the Port of Long Beach developed a draft Electrical Master Plan to evaluate electrical needs for shore power and yard equipment electrification.

- Pier G/J Container Terminals 66 kV Power Transmission Infrastructure. Installation of approximately 3.5 miles of 66 kilo-volt power lines, over 50 high-mast 100 foot-plus power poles, and related power distribution facilities from Pico and Seabright SCE Substations to Piers G and J.
➢ Pier G Container Terminal Power Infrastructure. Provide container terminal 66kV/12kV substations, conduit, cables, and related distribution facilities.

➢ Pier G Container Terminal. Retrofit three existing berths for shore power to reduce diesel emission from ships while at berth.

➢ Pier J Container Terminal. Retrofit four existing berths for shore power at 6.6 kV to reduce diesel emission from ships while at berth by shutting down auxiliary diesel ship generators.

➢ Pier T Container Terminal. Retrofit four existing berths for shore power at 6.6 kV to reduce diesel emission from ships while at berth by shutting down auxiliary diesel ship generators.

➢ Pier A Container Terminal. Retrofit three existing berths for shore power at 6.6 kV to reduce diesel emission from ships while at berth by shutting down auxiliary diesel ship generators, plus power transmission infrastructure.

➢ Pier E Container Terminal. Build shore power for new berths at 6.6 kV to reduce diesel emission from ships while at berth by shutting down auxiliary diesel ship generators.

➢ Pier E Container Terminal Power Infrastructure. Provide container terminal 66kV/12kV substations, conduit, cables, and related distribution facilities.

➢ Pier S Container Terminal. Build shore power for new berths at 6.6 kV to reduce diesel emission from ships while at berth by shutting down auxiliary diesel ship generators.

➢ Pier S Container Terminal Power Infrastructure. Provide container terminal 66kV/12kV substations, conduit, cables, and related distribution facilities.

➢ Pier C Container Terminal. Retrofit two existing berths for shore power to reduce diesel emission of ships while at berth.
Standardization of AMP/Shore Power Systems

The International Organization of Standards (ISO) Technical Committee (TC) 8 and Sub-Committee 3 provided an environment and work platform that allowed the ports to take a leadership role in developing a shore power standard. The development of an international standard involved close cooperation between industry, industry associations, and the ports. The Port of Los Angeles, Port of Long Beach, and the Port of Rotterdam agreed to lead in this effort. Five draft committees were formed according to vessel/berth type: tankers/LNG, bulkers, containerships and roll-on/roll-off (ro/ro), cruise ships, and ferries.

Draft guidelines, which include the ports input, have been finalized by the ISO and are being reviewed by the International Electrotechnical Commission (IEC). The draft report is now publicly available from ISO.

Alternative Hotelling Emissions Reduction Technologies Implementation

This path focuses on alternative emissions reduction technology strategies for hotelling emissions from vessels that are not good candidates for shore power. Currently there are no verified, commercially-available emissions reductions technologies for direct use on ship auxiliary emissions other than shore power. However, as mentioned earlier, the Technology Advancement Program (described in Section 4.7) has successfully demonstrated the Advanced Maritime Emissions Control System (AMECS) in short-term testing on two bulk vessels. The testing of the system has confirmed that emission reductions equivalent to those of shore power could potentially be achieved through the use of this alternative technology.

In addition to the AMECS system, there are other measures that can be implemented to reduce the loads required during hotelling for some ships, such as traditional bulk liquid tankers. One such option is the use of shore side electrical pumps for discharging the vessel. Under certain operational parameters, shore-side pumps can assist in reducing the load required by the ship’s steam driven pumps. The ship’s steam pumps would only be required to run at a load that moves the liquid over the “rail” or side of the ship; the rest of the liquid pipeline transport is powered by electrically powered on-shore pumps.

Testing of the Clean Air Logix DFMV Cold Ironing™ (DFMV) system was conducted in July 2007 on a container vessel at the Port of Oakland. The DFMV system was also demonstrated on a container vessel at the TraPac terminal at the Port of Los Angeles in October 2008. The results of these tests indicate that the system has the potential to reduce 90% or greater of at-berth DPM, NOx and SOx emissions. Clean Air Logix has developed a newer generation technology, called Flex-Grid, which utilizes dockside portable LNG generators to supply power directly to AMP-ready ships. It is designed to be used as a “bridge technology” until grid-based power is installed or as backup if grid-based power is temporarily unavailable. The Port of Los Angeles recently received a $1.2 million from USEPA to demonstrate Flex-Grid at one of its container terminals.
While these alternative technologies are potentially promising, additional information is needed to understand the operating costs of operation and to determine how they could be integrated into port operations.

**Air Quality Benefits**
This measure will result in significant reductions of DPM, NOx and SOx emissions. Greenhouse gas emissions will also be significantly reduced due to the use of shore power and the associated reduced fuel consumption in auxiliary diesel engines. The emission benefits from this measure will be achieved earlier than those anticipated under CARB’s regulation.

**Benefits to Date**
There were 59 AMP™ container vessel calls in 2007 and 50 AMP™ container vessel calls in 2008 at the Port of Los Angeles. There were 19 shore power dry bulk ship calls in 2007 and 9 shore power dry bulk ship calls in 2008 at the Port of Long Beach. In addition, the two United States Maritime Administration’s Ready Reserve Fleet vessels use shored-power while domiciled at the Port of Long Beach. The emissions benefits for all of these calls are included in 2007 and 2008 emissions inventories.

**Future Benefits**
A 95% reduction in DPM, NOx, SOx, and CO2E will occur as a result of each OGV call utilizing shore power while at berth. Overall emissions reductions will depend upon the number of calls that utilize shore power, and will be documented in each port’s Emissions Inventory.

**Financial Costs**
The financial costs associated with this measure include engineering designs, planning/coordination, electrical hardware procurement, contracting, construction, and testing of the shore power systems for each berth. Research and development costs associated with alternative at-berth emissions control systems are funding through the TAP. The financial costs to date and the anticipated future costs associated with this measure are presented below for each port.
Costs to Date
The costs to date for each port on shore power infrastructure are presented in Table 4.10 below.

Table 4.10: Costs-To-Date for OGV2 by Funding Source

<table>
<thead>
<tr>
<th>OGV2</th>
<th>Funding Source</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POLA</td>
<td>$0</td>
<td>$5,395,900</td>
<td>$17,072,800</td>
<td>$22,468,700</td>
</tr>
<tr>
<td></td>
<td>POLB</td>
<td>$5,533,900</td>
<td>$6,313,100</td>
<td>$8,078,900</td>
<td>$19,925,900</td>
</tr>
<tr>
<td></td>
<td>SCAQMD</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>CARB</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>Measure Totals</td>
<td>$5,533,900</td>
<td>$11,709,000</td>
<td>$25,151,700</td>
<td>$42,394,600</td>
</tr>
</tbody>
</table>

Future Costs
The costs associated with the POLA AMP™ and POLB shore power programs are:

- Capital costs associated with the terminal infrastructure improvements.
- Engineering planning/evaluation of bringing required trunk lines down to the terminals.
- Permitting and construction management.
- Coordination with the Port’s electrical service provider.

Port of Los Angeles AMP™ Order of Magnitude Costs
The majority of the costs to implement AMP™ at Evergreen, China Shipping and YTI were spent prior to the current CAAP planning cycle. The costs in Table 4.11 represent budget planning for the period of 2009 through 2013.

Port of Long Beach Shore Power Order of Magnitude Costs
The costs associated with the shore power program are:

- Capital costs associated with the terminal infrastructure improvements.
- Engineering planning/evaluation of bringing required trunk lines down to the terminals.
- Permitting and construction management.
- Coordination with the port’s electrical service provider.

The majority of the costs for the BP Terminal Improvements at T121 and ITS Berth G232 were expended prior to the current CAAP planning cycle. The costs in Table 4.11 represent budget planning for the period of 2009 through 2013.
The estimated costs of the measure, by port, are presented in the following table. It should be noted that it is the intention of the ports to largely recapture the infrastructure costs over time through the financial terms in the lease. In addition, the ports will seek grant funding as available to offset the shore-side costs.

Table 4.11: Estimated Future Costs for OGV2 by Funding Source

<table>
<thead>
<tr>
<th>OGV2</th>
<th>Funding Source</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLA</td>
<td></td>
<td>$3,196,787</td>
<td>$20,500,000</td>
<td>$15,400,000</td>
<td>$23,518,000</td>
<td>$18,500,000</td>
<td>$81,114,787</td>
</tr>
<tr>
<td>POLB</td>
<td></td>
<td>$3,749,500</td>
<td>$36,495,400</td>
<td>$38,250,000</td>
<td>$56,933,500</td>
<td>$43,802,300</td>
<td>$179,230,700</td>
</tr>
<tr>
<td>SCAQMD</td>
<td></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>CARB</td>
<td></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

Measure Totals  $6,946,287  $56,995,400  $53,650,000  $80,451,500  $62,302,300  $260,345,487

Upcoming Milestones

1. Conduct pilot test of Alternative Maritime Emissions Control System (AMECS) including emissions reduction evaluation at Port of Long Beach.

   Schedule: Short-term emissions testing of AMECS was successfully completed through a joint port TAP funded demonstration on May 26, 2008 and July 16, 2008. The final report was completed in the 3rd quarter of 2008. Further demonstration of the AMECS will be necessary to evaluate operational considerations, cost, and durability of the system.

2. Ports to participate in the effort to standardize cold ironing infrastructure and connection equipment through the ISO committees and IEC.


3. As leases are opened through the EIR process or for renegotiation, or as new leases are negotiated, the ports will include provisions for use of shore power infrastructure.

   Schedule: As leases are opened.

4. Shore-side infrastructure in place and operational as presented above.

   Schedule: As shown above in Tables 4.6 and 4.8

5. The benefits of this program will be quantified and reflected in the periodic updates to the port’s emissions inventories.

   Schedule: Ongoing.
Elements to be Tracked
The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for the OGV2 measure, the ports will track the status of shore side infrastructure being developed to facilitate use of shore power by ships calling at those berths. The current schedule is shown in tables 4.6 and 4.8. In addition, the emissions benefits of OGV2 will be compiled each year in the annual emissions inventory. In order to reflect the emissions benefits, ports will track the number of ship calls that utilized shore power and their hotelling duration.

Looking Forward
In conjunction with CARB’s at-berth emissions reduction regulation and the CAAP requirement, the ports are committed to provide shore power infrastructure to all container terminals, cruise terminal (POLA only) and selected liquid bulk terminals. The goal is for 100% of container calls to utilize shore power while at berth instead of operating auxiliary engines on diesel fuel. In addition, the ports are actively pursuing alternative emissions reduction technology strategies for hotelling emissions from vessels that are not good candidates for shore power. Any port funded demonstrations of alternative technologies would be conducted through the TAP, in coordination with the agency TWG.
4.2.3 Control Measure Number OGV3

Measure Title: OGV Low Sulfur Fuel for Auxiliary Engines and Auxiliary Boilers

This measure reduces emissions from the auxiliary engines and auxiliary boilers of OGVs during their approach and departure from the ports, by switching to \( \leq 0.2\% \) sulfur distillate fuel (MGO or MDO) within 40 nm from Point Fermin. Compliance with the CARB rule limit of \( \leq 0.1\% \) sulfur distillate fuel (MGO or MDO) starts on January 1, 2012.

Initiation Year: 2007

Key Milestone Dates: CARB rule mandating \( \leq 0.5\% \) sulfur MDO or \( \leq 1.5\% \) sulfur MGO fuel for auxiliary engines and boilers used in California waters took effect initially on January 1, 2007 and was reinstated on July 1, 2009; CARB requirement for \( \leq 0.1\% \) sulfur MGO or MDO fuel will be effective January 1, 2012; ports’ requirements per CAAP implemented as leases are renewed

Criteria Pollutant Reduction: On a per OGV call basis, reduction of 83% DPM, 6% NOx, and 96% SOx will be achieved in 2013 due to switching fuel from IFO to MGO or MDO with 0.1% sulfur content over the distance the fuel is used.

GHG Impact: Approximately 5% reduction in \( CO_2 \) and possible reduction in \( CH_4 \) associated with fuel switch from IFO to distillate fuels (MGO or MDO). However, there may be an increase in \( CO_2 \) emissions due to additional processing of fuel to produce MGO or MDO. Therefore, no \( CO_2 \) emissions benefits are assumed for this measure.

Implementation Strategies: Lease Requirements & CARB Regulation

Measure Description

This measure is designed to require all vessels to use lower sulfur distillate fuels in the auxiliary engines and auxiliary boilers of OGVs, within 40 nm of Point Fermin and while at berth. Traditionally, OGVs calling on the ports have burned heavy fuel oil (HFO), most commonly Intermediate Fuel Oil (IFO) 380 that has a sulfur content ranging from 1.0 to 4.5\%. Substantial reductions in DPM and SOx can be achieved if these vessels use distillate fuels that have a lower sulfur content of \( \leq 0.2\% \). There are also modest NOx reductions associated with the use of lower-sulfur fuels. This measure, as well as OGV4 (OGV Low Sulfur Fuel for Main Engines), targets vessel fuel quality with the goal of synchronizing the auxiliary and main engines, as well as auxiliary boilers to use distillate fuel of \( \leq 0.2\% \) sulfur in near-shore waters.

21 Appendix D, http://www.arb.ca.gov/regact/2008/fuelogv08/fuelogv08.htm
This synchronization of fuel requirements is expected to reduce logistical and operational hurdles for the carriers. It should be noted that Maersk, the world’s largest shipping line, has been voluntarily using ≤0.2% low-sulfur marine distillate fuel since 2006 in their vessel auxiliary and main engines on approach to California ports. Starting in 2007, all carriers used low sulfur distillate fuels in their auxiliary engines near the California coast under a statewide regulation adopted by CARB.

The ports have made assertive efforts to work with ports around the Pacific Rim, fuel suppliers, shipping lines, and others to emphasize the need for available supplies of ≤0.2% sulfur distillate fuels. It is critical to both this measure and OGV4 that cleaner fuels become more widely available as soon as possible. In an effort to better understand the current availability of ≤0.2% MGO at bunkering ports frequented by vessels that call on the ports of Long Beach and Los Angeles, the two ports jointly conducted a study, which was finalized in April 2008. This study concluded that the low sulfur MGO fuel supply at the major bunkering ports is likely to be sufficient to meet the demand in 2008 and 2009 if measures OGV3 and OGV4 are implemented through lease conditions. If the vessel main and auxiliary engine requirements were implemented immediately for all vessels operating up to 40 nautical miles from Point Fermin however, obtaining low-sulfur fuel at the time the study was completed could have been a problem in China, Japan, Korea, Central and South America, and North America-West Coast in 2008 and 2009.22 It is expected that as demand for low sulfur marine fuel increases through the ports’ programs and state and international regulations, fuel supplies will increase. The ports intend to update the low sulfur marine fuel availability study as necessary to support continued implementation of these measures.

CARB adopted a low sulfur marine fuel regulation for auxiliary engines in December 2005, which required the use of ≤1.5% sulfur MGO or ≤0.5% sulfur MDO beginning January 1, 2007. This regulation was legally challenged by the Pacific Merchant Shipping Association (PMSA). As a result, the U.S. District Court issued an injunction preventing CARB from enforcing the regulation. Through the appeal process, the regulation was enforced off and on throughout 2007 and 2008; however enforcement of the regulation was finally discontinued in May 2008. It is important to note that although CARB was enjoined from enforcing the requirements of the regulation, an informal survey conducted by PMSA indicated that all of those surveyed continued to voluntarily use low-sulfur distillate fuel in their auxiliary engines.

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In July of 2008, CARB adopted a new regulation for fuel sulfur requirements for OGVs within 24 nm of the California coastline which affects auxiliary and main engines and boilers. Phase 1 of the regulation, which became effective on July 1, 2009, requires the use of ≤1.5% sulfur MGO or ≤0.5% sulfur MDO in auxiliary and main engines, and auxiliary boilers. Under Phase 2, the fuel sulfur limit for use in auxiliary and main engines and boilers will be 0.1% for MGO or MDO beginning January 1, 2012.

For those vessel calls that are subject to this measure due to new lease agreements or renewal, taken in combination with OGV4, the benefits of measure OGV3 will initially surpasses the benefits of CARB’s regulation in the region near the ports by requiring ≤0.2% sulfur MGO or MDO within 40 nm of Point Fermin. However, by January 1, 2012, CARB’s regulation will surpass the CAAP measures, requiring the use of MGO or MDO with a sulfur content limit of 0.1% by weight in the main and auxiliary engines and boilers of all OGVs within 24 nm of the California coastline.

As a further backstop to the ports programs and the CARB regulation, the IMO adopted international requirements under MARPOL Annex VI in October 2008. These place a global limit on marine fuel sulfur content of 3.5% by 2012, down from 4.5% currently, which will be further reduced to 0.5% sulfur by 2020, or 2025 at the latest, pending a technical review in 2018. In Emissions Control Areas (ECAs), sulfur content will be limited to 1.0% in 2010, and further reduced to 0.1% sulfur in 2015.

Under OGV3, vessels that are subject to a lease requirement, that operate within 40 nm from Point Fermin are required to use ≤0.2% sulfur MGO or MDO fuels in auxiliary engines and auxiliary boilers (until superseded by the CARB regulation in 2012). The ports are trying to minimize the requirements for the use of multiple fuels due to on-board tankage limitations in some vessels. Therefore, the auxiliary engine and auxiliary boiler fuel requirement is the same as the main engine requirement in OGV4.

The fundamental elements of this control measure are:

1. The ports are securing near-term benefits over and above the existing CARB regulation, for vessel calls that are subject to this measure due new lease agreements, by requiring the accelerated introduction of ≤0.2% sulfur MGO or MDO fuels used in auxiliary engines and auxiliary boilers between 2006 and 2012.

2. The ports will continue to work with the regulatory agencies to support development of a west coast ECA which would limit sulfur content of fuels to 1.0% by March 2010, further dropping to 0.1% sulfur by January 2015.

3. The ports will continue to monitor implementation of this measure and will quantify the emissions benefits in their annual emissions inventories.
Implementation Plan
The Clean Air Action Plan provides for the active engagement by both ports to accelerate the availability of the ≤0.2% sulfur MGO or MDO fuels at key ports throughout the Pacific Rim. Through implementation of OGV3 and OGV4, in combination with upcoming regulatory requirements, the ports believe low sulfur marine fuel supplies will increase to meet the demand.

Currently, this measure is being implemented through lease requirements. The fuel requirement applies to vessel transits within 40 nm from Point Fermin and during hotelling. In addition, under the ports’ Vessel Low Sulfur Fuel Incentive Program, implemented between July 2008 and June 2009, as described in OGV4, use of low sulfur (≤0.2% S MGO/MDO) fuel in vessel auxiliary engines while at berth was required in order to receive an incentive for use of the fuel in the vessel main engines.23

Air Quality Benefits
As OGV operators start using low sulfur MGO or MDO instead of IFO when arriving and departing from ports, there will be significant reductions of DPM and SOx emissions, with additional NOx benefits.

Benefits to Date
In 2007, 100% of OGV calls at both ports used low sulfur fuel in their auxiliary engines to comply with CARB’s regulation adopted in 2005. In 2008, between January 1 and April 30, 100% OGV calls at both ports used low sulfur fuel in their auxiliary engines to comply with CARB’s regulation, however after April 30th enforcement of the regulation was suspended and accurate voluntary compliance rates are unknown. Later in 2008, between July 1 and December 31, 14% of all OGV calls at the Port of Los Angeles and 6% of all OGV calls at the Port of Long Beach voluntarily switched to low sulfur fuel in their auxiliary engines under the port funded Fuel Incentive Program. The emissions benefits for all of the calls that switched fuel is included in 2007 and 2008 emissions inventories.

Future Benefits
Currently, under the CARB regulation, all OGVs are required to use maximum 0.5% sulfur MDO or 1.5% sulfur MGO in their auxiliary engines and boilers when operating within 24 nm of the coast. OGVs subject to lease requirements will use maximum 0.2% sulfur MGO or MDO within 40 nm of Point Fermin. By 2012, maximum emissions benefits will be achieved when all OGV auxiliary engines and auxiliary boilers will be required to use MDO or MGO with a sulfur content limit of 0.1% by weight. On a vessel call basis, switching from high sulfur fuels (with an average sulfur content of 2.6%) to a low sulfur fuel at 0.1% sulfur will achieve an 83% reduction in DPM emissions, a 6% reduction in NOx emissions and a 96% reduction in SOx emissions.

23 http://www.cleanairactionplan.org_STRATEGIES_VESSELS_FUEL.ASP

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April 2010
Overall emission reductions will depend on the number of vessel calls, geographical boundaries of fuel switching (e.g., within 24 or 40 nm) and the sulfur content of fuel used prior to switch. CO2 emissions benefits are uncertain at this time.

Financial Costs
Costs to Date
There are no port related costs to date for this measure.

Future Costs
There are no anticipated port costs for this measure in the future.

Upcoming Milestones
1. Staff will survey fuel suppliers, shipping lines, and refineries to assess low sulfur fuel availability at major bunkering ports used by vessels calling at the ports of Long Beach and Los Angeles.

   Schedule: In early 2008, staff released a “Fuel Availability Study” which looked into the estimate of fuel demand from ships calling the ports of Long Beach and Los Angeles and assessed the availability of adequate quantities of ≤0.2% sulfur MGO necessary to supply those vessels through 2009. This study to be updated as needed.

2. Staff will monitor concerns raised by carriers and vessel operators regarding technical and safety issues associated with fuel switching in auxiliary engines and auxiliary boilers.

   Schedule: Ongoing.

3. Port staff will meet and work with other U.S. and international port authorities, including the Pacific Ports Air Quality Collaborative, in an effort to harmonize ship fuel requirements among the various ports.

   Schedule: Ongoing.

4. Port staff will work with the regulatory agencies to provide support for development of a west coast ECA which would limit sulfur content of fuels to 1.0% by March 2010, further dropping to 0.1% sulfur by January 2015.

   Schedule: Ongoing.
5. As leases are opened through the EIR process, or as new leases are negotiated, the ports are including provisions for use of low sulfur fuel in vessel auxiliary engines and auxiliary boilers.

   **Schedule:** As leases are opened.

6. The benefits of this program will be quantified and reflected in the periodic updates to each port’s emissions inventories.

   **Schedule:** Ongoing.

**Elements to be Tracked**

The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for the OGV3 measure, the ports will provide updates to the low sulfur fuel availability study as needed. In addition, as part of the annual emissions inventories, the ports will provide updates on the number of vessels using low sulfur fuel in their auxiliary engines, auxiliary boilers, and the annual emissions from those sources.

**Looking Forward**

Recently, the IMO adopted stringent fuel sulfur content limitations which is a first major step towards controlling exhaust emissions from both U.S. flagged and ships of foreign origin. The USEPA along with Coast Guard, Navy, National Oceanic and Atmospheric Administration, Maritime Administration and the State Department were closely involved during the negotiation process for the final IMO standards. In order to accelerate and achieve the full benefits of the most stringent fuel sulfur standards, the USEPA is seeking Emissions Control Area (ECA) designation for the U.S. coastline. The ports will continue to work cooperatively with the USEPA and other stakeholders to support this ECA designation.

Starting on July 1, 2009, CARB implemented fuel quality and sulfur content limits (13 CCR Section 2299.2) for use in auxiliary and main engines, and boilers, for all vessels operating within 24-nautical miles from the coast of California. Under this regulation, use of 0.1% S MGO or 0.1% S MDO will be required starting in January, 1 2012.
4.2.4 Control Measure Number OGV4

Measure Title: OGV Low Sulfur Fuel for Main Engines

This measure reduces emissions from main engines of OGVs during their approach and departure from the ports, by switching to ≤0.2% sulfur distillate (MGO or MDO) fuel within 40 nm from Point Fermin; Compliance with the CARB rule limit of ≤0.1% sulfur distillate fuel (MGO or MDO) starts on January 1, 2012

Initiation Year: 2007

Key Milestone Dates: Ports’ voluntary fuel incentive in effect between July 1, 2008 and June 30, 2009; CARB’s rule mandating low sulfur fuel use in main engines of vessel operating in California waters took effect on July 1, 2009; CARB requirement for ≤0.1% sulfur MGO or MDO fuel effective January 1, 2012; ports’ requirements per CAAP implemented as leases are renewed

Criteria Pollutant Reduction: On a per OGV call basis, reduction of 83% DPM, 6% NOx, and 96% SOx from main engine operation will be achieved in 2013 due to switching fuel from IFO to MGO or MDO with 0.1% sulfur content over the distance the fuel is used.

GHG Impact Approximately 5% reduction in CO₂ and possible reduction in CH₄ associated with fuel switch from IFO to distillate fuels (MGO or MDO). However, there may be an increase in CO₂ emissions due to additional processing of fuel to produce MGO or MDO. Therefore, no CO₂ emissions benefits are assumed for this measure.

Implementation Strategies: Lease Requirements, Incentive Tariffs, & CARB Regulation

Measure Description

As implemented through leases, this program is designed to require all vessels to use lower sulfur fuels (≤0.2% sulfur MGO or MDO) in the main propulsion engines of OGVs within 40 nm of Point Fermin. During July 2008 through June 2009, the ports encouraged early use of the low sulfur fuel through a voluntary incentive program. Since July 1, 2009, use of low sulfur fuel has been required statewide under a CARB regulation.

24 Appendix D, http://www.arb.ca.gov/regact/2008/fuelogv08/fuelogv08.htm
Typically vessels use bunker fuels in their main engines, such as IFO380, that have substantially higher sulfur content (i.e., 2.5% sulfur by weight). Substantial reductions in DPM and SOx can be achieved when these vessels use distillate fuels that have a lower sulfur content of ≤0.2%. There are also modest NOx reductions associated with the use of lower sulfur fuels. This measure is harmonized with measure OGV3 to minimize the need for vessels to carry multiple fuels (due to the limited tankage available on board OGVs). It should be noted that Maersk began voluntarily using low-sulfur marine distillate fuel in 2006 in both their auxiliary and main engines on approach to California ports. Several other carriers also began using the low sulfur fuel in July 2008, under the ports’ incentive program. Since July 1, 2009, all vessels operating within 24 nm of the California coastline have been using maximum 1.5% S MGO or 0.5% S MDO fuel as required under the CARB regulation.

As mentioned in OGV3, the ports have made assertive efforts to work with other ports around the Pacific Rim, fuel suppliers, shipping lines, and others to emphasize the need for available supplies of ≤0.2% sulfur distillate fuels. It is critical to both this measure and OGV3 that cleaner fuels become available as soon as possible. As stated in OGV3, the two ports jointly conducted a study, finalized in April 2008, on the availability of low sulfur MGO fuels at the major bunkering ports frequented by the vessels that call on the ports of Long Beach and Los Angeles. This study concluded that the low sulfur MGO fuel supply at the major bunkering ports is likely to be sufficient to meet the demand in 2008 and 2009 if measures OGV3 and OGV4 are implemented through lease conditions. If the vessel main and auxiliary engine requirements were implemented immediately for all vessels operating up to 40 nautical miles from Point Fermin however, at the time the study was completed, it was identified that obtaining low sulfur fuel could be a problem in China, Japan, Korea, Central and South America, and North America-West Coast in 2008 and 2009. It is expected that as demand for low sulfur marine fuel increases through the ports’ programs and state and international regulations, fuel supplies will increase. The ports intend to update the low sulfur marine fuel availability study as necessary to support continued implementation of these measures.

In July of 2008, CARB adopted a regulation for fuel sulfur requirements for OGV auxiliary and main engines and auxiliary boilers within 24 nm from the California coastline. Phase 1 of the regulation, which went into effect on July 1, 2009, requires the use of ≤1.5% sulfur MGO or ≤0.5% sulfur MDO for auxiliary and main engines and boilers. Under Phase 2, the fuel sulfur limit will drop to 0.1% for MGO or MDO beginning January 1, 2012.

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http://www.cleanairactionplan.org/strategies/vessels/fuel.asp
For those vessel calls that are subject to this measure due to new lease agreements or renewal, or those that participated in the fuel incentive program, taken in combination with OGV3, the benefits of this measure will initially surpass those of CARB’s regulation by requiring the use of ≤0.2% sulfur MGO or MDO within 40 nm of Point Fermin. However, by January 1, 2012, CARB’s regulation will surpass those of the CAAP requiring the use of MGO or MDO with a maximum sulfur content of 0.1% by weight in the main and auxiliary engines and boilers of OGVs within 24 nm of the California coastline.

As a further backstop to the ports’ programs and the CARB regulation, the IMO adopted international requirements under MARPOL Annex VI in October 2008. These place a global limit on marine fuel sulfur content of 3.5% by 2012, down from 4.5% currently, which will be further reduced to 0.5% sulfur by 2020, or 2025 at the latest, pending a technical review in 2018. In ECAs, sulfur content will be limited to 1.0% in 2010, and further reduced to 0.1% sulfur in 2015.

Vessel operators and carriers have raised concerns over the use of very low sulfur fuel in vessel main engines. While switching to low sulfur distillate fuel in vessel main engines is standard practice when vessels are serviced, concerns have been raised that operating the engines on the low sulfur fuel for extended periods of time may cause engine damage. The major vessel engine manufacturers, MAN B&W and Wärtsilä, have both stated that vessel main engines can be operated on the low sulfur distillate fuel with no differences in engine performance and without damaging the engines, as long as proper precautions are taken. Both engine manufacturers have published operating procedures for fuel switching. In addition, MAN B&W is also commercializing an automated fuel switching procedure for their engines. When operating the main engines on distillate fuel for extended periods of time, minor modifications are necessary, such as changing to a more compatible cylinder lube oil, however, over the distances required by the ports programs, this is likely not an issue.

The fundamental elements of this control measure are:

1. The ports will encourage early adoption of the use of low sulfur MGO or MDO fuel in vessel main engines through a port incentive program.

2. The ports are securing near-term benefits over and above the existing CARB regulation for vessel calls that are subjected to this measure via new lease agreements or renewal, or participation in the fuel incentive program, by requiring the accelerated introduction of ≤0.2% sulfur MGO or MDO fuel use in main engines between 2006 and 2012.

3. The ports will work with carriers, vessel operators, and engine manufacturers to facilitate discussions on the proper procedures for performing fuel switching in order to ease the transition to the low sulfur fuel requirements.
4. The ports will continue to work with the regulatory agencies to support development of a west coast ECA which would limit sulfur content of fuels to 1.0% by March 2010, further dropping to 0.1% sulfur by January 2015.

5. The ports will continue to monitor implementation of this measure and will quantify the emissions benefits in their annual emissions inventories.

Implementation Plan
The Clean Air Action Plan provides for the active engagement by both ports to accelerate the availability of the ≤0.2% sulfur MGO or MDO fuels at key ports throughout the Pacific Rim. Through implementation of OGV3 and OGV4, in combination with upcoming regulatory requirements, the ports believe that low sulfur marine fuel supplies will increase to meet the demand.

Currently, this measure is being implemented through lease requirements and incentive tariffs. For leases, the use of low sulfur distillate fuel (≤0.2% sulfur MGO or MDO), will be required in main engines between 40 nm of Point Fermin and berth. In addition, in March 2008, at a joint Board of Harbor Commissioners meeting for the ports of Long Beach and Los Angeles, the ports adopted a tariff establishing the Vessel Low Sulfur Fuel Incentive Program. Under the program, which was in effect from July 2008 through June 2009, operators were reimbursed for the additional cost of using ≤0.2% sulfur MGO or MDO instead of IFO380 in their main vessel engines while within 20 or 40 nm of the ports. Also operators were required to comply with the vessel speed reduction speed limit of 12 knots, over the same distance that they used the low sulfur fuel, and use the low sulfur fuel in their auxiliary engines while at berth. This Program encourages the early use of low sulfur fuel, prior to the statewide requirement under the CARB regulation26. This program also offered an opportunity for the vessel operators to refine their procedures for switching fuels, prior to implementation of the CARB regulation, without having to pay for the added cost of the low sulfur fuel. A map of the various vessel requirement zones (i.e., 24 nm from the California coastline, and 20 or 40 nm from Point Fermin) is shown in Figure 4.2.

26 http://www.cleanairactionplan.org/strategies/vessels/fuel.asp
Air Quality Benefits
As OGV operators start using low sulfur MGO or MDO instead of IFO when arriving and departing from ports, there will be significant reductions of DPM and SOx emissions.

Benefits to Date
In 2007, 26% of all OGV calls at the Port of Los Angeles and 6% of all OGV calls at the Port of Long Beach used low sulfur fuel in their main engines. In 2008, between July 1 and December 31, 14% of all OGV calls at the Port of Los Angeles and 6% of all OGV calls at the Port of Long Beach voluntarily switched to low sulfur fuel in their main engines under ports Fuel Incentive program. The emissions benefits for all of these calls that switched fuel is included in 2007 and 2008 emissions inventories.
Future Benefits
Currently, under the CARB regulation, all OGVs are required to use maximum 0.5% MDO or 1.5% sulfur MGO in their main engines when operating within 24 nm of the coast. OGVs subject to lease requirements will use maximum 0.2% sulfur MGO or MDO within 40 nm of Point Fermin. By 2012, maximum emissions benefits will be achieved when all OGV main engines will be required to use MDO or MGO with a sulfur content limit of 0.1% by weight. On a vessel call basis, switching from high sulfur fuels (with an average sulfur content of 2.6%) to a low sulfur fuel at 0.1% sulfur will achieve an 83% reduction in DPM emissions, a 6% reduction in NOx emissions and a 96% reduction in SOx emissions. Overall emission reductions will depend on the number of vessel calls, geographical boundaries of fuel switching (e.g., within 24 or 40 nm) and the sulfur content of fuel used prior to switch. CO2 emissions benefits are uncertain at this time.

Financial Costs
Costs to Date
Port costs to date associated with this measure are presented in Table 4.12, below. These costs are associated with the development and operation of the fuel switch incentive program.

Table 4.12: Costs-to-Date for OGV4 by Funding Source

<table>
<thead>
<tr>
<th>OGV4</th>
<th>Clean Fuels Main Engine</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLA</td>
<td>$0</td>
<td>$0</td>
<td>$354,000</td>
<td>$354,000</td>
<td></td>
</tr>
<tr>
<td>POLB</td>
<td>$0</td>
<td>$0</td>
<td>$120,800</td>
<td>$120,800</td>
<td></td>
</tr>
<tr>
<td>SCAQMD</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>CARB</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>Measure Totals</td>
<td>$0</td>
<td>$0</td>
<td>$474,800</td>
<td>$474,800</td>
<td></td>
</tr>
</tbody>
</table>

Future Costs
The estimated future financial costs of this measure are presented in Table 4.13. The ports' costs for the fuel switch incentive program ended in July 2009 when the new CARB fuel switch regulation becomes effective; there are no port costs after 2009.

Table 4.13: Estimated Future Costs for OGV4 by Funding Source

<table>
<thead>
<tr>
<th>OGV4</th>
<th>Funding Source</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLA</td>
<td>$204,000</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$204,000</td>
</tr>
<tr>
<td>POLB</td>
<td>$90,000</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$90,000</td>
</tr>
<tr>
<td>SCAQMD</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>CARB</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Measure Totals</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$294,000</td>
</tr>
</tbody>
</table>
**Completed Milestones**

1. In order to monitor vessel speeds for the Vessel Main Engine Fuel Incentive Program to 40 nm from Point Fermin, the ports will coordinate with Marine Exchange to upgrade the necessary vessel tracking hardware and software.

   **Schedule:** Complete. Vessel tracking by Marine Exchange was upgraded in 2008.

2. The ports will implement an incentive program to encourage early use of low sulfur fuel within 20 nm or 40 nm of Point Fermin.

   **Schedule:** The Program was adopted during a joint port Board of Harbor Commissioner’s meeting in March 2008. The Program was available for one year, starting July 1, 2008 and ending June 30, 2009, after which the statewide requirement came into effect.

**Upcoming Milestones**

1. Staff will survey fuel suppliers, shipping lines, and refineries to assess low sulfur fuel availability at major bunkering ports used by vessels calling at the ports of Long Beach and Los Angeles.

   **Schedule:** In early 2008, staff released a “Fuel Availability Study” which looked into the estimate of fuel demand from ships calling the ports of Long Beach and Los Angeles and assessed the availability of adequate quantities of ≤0.2% sulfur MGO necessary to supply those vessels through 2009. This study to be updated as needed.

2. Staff will meet and work with carriers, vessel operators and engine manufacturers to facilitate discussions on the proper procedures for performing fuel switching in order to address the technical and safety concerns and to ease the transition into the low sulfur fuel requirements.

   **Schedule:** The ports held a workshop for carriers and vessel operators in early 2008 which included presentations by MAN B&W, Wärtsilä, and Maersk. The ports will continue to facilitate discussions, as needed.

3. Staff will meet and work with other U.S. and international port authorities, including the Pacific Ports Air Quality Collaborative, in an effort to harmonize ship fuel requirements among the various ports.

   **Schedule:** Ongoing.
4. Port staff will work with the regulatory agencies to provide support for development of a west coast ECA which would limit sulfur content of fuels to 1.0% by March 2010, further dropping to 0.1% sulfur by January 2015.

**Schedule:** Ongoing.

5. As leases are opened through the EIR process, or as new leases are negotiated, the ports are including provisions for compliance with the Main Engine Fuel Standard.

**Schedule:** As leases are opened.

6. The benefits of this program will be quantified and reflected in the periodic updates to the port’s emissions inventories.

**Schedule:** Ongoing.

**Elements to be Tracked**
The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for the OGV4 measure, the ports will provide updates to the low sulfur fuel availability study as needed. In addition, as part of the annual emissions inventories, the ports will provide updates on the number of vessels using low sulfur fuel in their main engines, and the annual emissions from those engines.

**Looking Forward**
Recently, the IMO adopted more stringent fuel sulfur content limitations which are a first major step towards controlling exhaust emissions from ocean going vessels from both U.S. and foreign ships. The USEPA along with Coast Guard, Navy, National Oceanic and Atmospheric Administration, Maritime Administration and the State Department were closely involved in the negotiation process for the final IMO standards. In order to accelerate and achieve full benefits of these standards, the USEPA is seeking ECA designation for U.S. coastlines. The ports will continue to work cooperatively with the USEPA and other stakeholders to support an ECA designation.

Starting on July 1, 2009, CARB implemented fuel quality and sulfur content limits (13 CCR Section 2299.2) for use in auxiliary and main engines, and boilers, for all vessels operating within 24-nautical miles from the coast of California. Under this regulation, use of 0.1% S MGO or 0.1% S MDO will be required starting in January, 1 2012.
4.2.5 Control Measure Number OGV5
Measure Title: Cleaner OGV Engines
Measure seeks to maximize the number of vessels meeting the IMO NOx limit of 3.4 g/kW-hr that visit the ports.

Initiation Year: 2008
Key Milestone Dates: IMO’s NOx engine standards for OGVs adopted in October 2008; IMO Tier 2 NOx standards come into effect January 1, 2011 for new vessels; IMO Tier 3 NOx standards come into effect January 1, 2016 for new vessels operating in Emission Control Areas
Criteria Pollutants Reduced: On an individual OGV basis, 15% reduction in NOx emissions will result from compliance with the IMO Tier 2 standard compared to Tier 1 standard and 80% reduction in NOx emissions will result from compliance with the IMO Tier 3 standard compared to Tier 1 standard
GHG Impact: Dependent upon the technology used by IMO compliant vessels that frequent the ports; cannot be quantified at this time

Initial Implementation Strategies: Regulatory Strategies, Lease Requirements, & Tariff Incentives

Measure Description
This measure focuses on the early introduction and preferential deployment of vessels that comply with the Annex VI NOx and SOx standards for ECAs into the fleet that calls at the ports of Long Beach and Los Angeles. OGVs are the greatest single contributors of emissions from port of Long Beach and Los Angeles operations. Securing emission reductions from these sources remains a priority and presents a significant challenge due, not in small part, to the fact that the stringency of OGV main engine emission standards has not kept pace with other source categories such as HDVs and CHE.
Annex VI of MARPOL 73/78, the Regulations for the Prevention of Air Pollution from Ships, requires that all ships of 400 gross rated tonnage or above obtain an International Air Pollution Prevention (IAPP) certificate. The Annex became effective May 19, 2005 and applies to all ships constructed (keel laid) on or after that date. Ships constructed before May 19, 2005 are required to comply with Annex VI on the first scheduled dry-docking after the date of entry into force, but in no case later than May 19, 2008. Finally, starting in 2010, existing ships built between 1990 and 2000, will be required to retrofit their engines to meet the Tier 1 NOx standard upon first engine rebuild (See Section 1 of this report for a detailed description of the Annex VI requirements).

In October 2008, the IMO approved amendments to the NOx Technical Code of Annex VI which resulted in additional NOx limits for new engines, additional sulfur content limits for marine fuel, methods to reduce PM emissions, and NOx limits for existing engines.

The Annex VI amendments follow a three-tier structure for new engines which would set progressively tighter NOx emission standards for new Category 3 engines (the large engines used for vessel propulsion, with per-cylinder displacement at or above 30 liters) depending upon their date of installation (See Table 4.14). Annex VI will require vessels operating within an ECA that were constructed on or after January 1, 2016 to achieve an 80% reduction in NOx emissions compared to those vessels constructed prior to 2011. The United States was the 53rd country to ratify Annex VI of the International Convention for the Prevention of Pollution from Ships, with the deposition of an instrument of ratification with IMO in October of 2008.27

<table>
<thead>
<tr>
<th>Ship Construction Date</th>
<th>NOx g/kW-hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>On or After January 1, 1990 and prior to January 1, 2000*</td>
<td>17.0</td>
</tr>
<tr>
<td>On or After January 1, 2000 and prior to January 1, 2011</td>
<td>17.0</td>
</tr>
<tr>
<td>On or After January 1, 2011 and prior to January 1, 2016</td>
<td>14.4</td>
</tr>
<tr>
<td>On or After January 1, 2016 for Emissions Control Area</td>
<td>3.4</td>
</tr>
</tbody>
</table>

*If not built to this standard originally, must meet this standard upon first rebuild.

In addition to NO\textsubscript{x} controls for Category 3 engines, the IMO Annex VI amendments place a global limit on marine fuel sulfur content of 3.5% (35,000 ppm) by 2012, from the current level of 4.5%, which will be further reduced to 0.5% (5,000 ppm) by 2020, or 2025 at the latest, pending a technical review in 2018\textsuperscript{28}. In ECAs, the sulfur content will be limited to 1.0% (10,000 ppm) in 2010, and further reduced to 0.1% [1,000 ppm (a 90% reduction)] in 2015 from the current limit of 1.5%. In California, CARB’s Vessel Fuel Rule, which requires the use of MDO or MGO with the sulfur content limit of 0.1% beginning January 1, 2012, will accelerate the benefits of the Annex VI lower sulfur fuel requirement in ECAs.

Under the Clean Air Act, on December 22, 2009, USEPA announced final emission standards for new marine diesel engines with per-cylinder displacement at or above 30 liters or Category 3 marine diesel engines installed on U.S.-flagged vessels. The final engine standards are equivalent to IMO’s latest MARPOL standards as described above. The emission standards apply in two stages: near-term standards for newly-built engines will apply beginning in 2011, and long-term standards requiring an 80 percent reduction in nitrogen dioxides (NO\textsubscript{x}) beginning in 2016. USEPA has also adopted MARPOL Annex VI standards for existing engines built between 1990 and 2000. The USEPA also applied to IMO to designate U.S. coasts as an Emissions Control Area (ECA), and forbid the production and sale of fuel with greater than 0.1% sulfur for use in waters within a U.S. ECA. The application to designate a North American ECA was approved by IMO on March 26, 2010.

It is estimated that measures previously implemented by the USEPA, CARB, and the CAAP, including the additional benefits of the latest Annex VI standards, and establishment of an ECA for North America, will result in significant reductions in NO\textsubscript{x}, SO\textsubscript{x}, and DPM compared to 2005 levels. However introduction of new and rebuilt vessels compliant with the Annex VI NO\textsubscript{x} requirements into the fleet is not expected to be fast enough to meet the CAAP goals. Therefore, the ports seek to encourage early introduction of these vessels with cleaner engines, at a rate that is faster than would occur naturally due to fleet turnover.

**Implementation Plan**

The ports shall require through lease requirements and CEQA mitigations that vessels built on or after the effective date of January 1, 2016 show evidence of compliance with the MARPOL Annex VI standards. In addition, as described in measures OGV3 and OGV4, the ports will implement lease requirements for vessels to use \(\leq 0.2\)% sulfur marine distillate fuel within 40nm of Point Fermin, which will step down to \(\leq 0.1\)% sulfur fuel in 2012, upon implementation of the second phase of the CARB regulation. Further, the ports shall also consider developing a targeted outreach program and/or establishing of an incentive program geared toward facilitating the early introduction of lower emitting OGVs and their preferential deployment to the ports of Long Beach and Los Angeles. In support of this effort, port staff will work with vessel builders and shipping lines to determine the best combination.

\textsuperscript{28} [http://www.epa.gov/otaq/regs/nonroad/marine/ci/mepc58-5noxsecretariat.pdf]
of mechanisms, including incentives, to accelerate turnover of the vessel fleet to Annex VI compliant ships.

The ports have strongly encouraged the USEPA to adopt NOx emission standards for Category 3 engines on OGVs that are at the least equivalent to the Annex VI standards. In addition, the ports have recommended that DPM standards be included in promulgated rules and that USEPA work with IMO to incorporate DPM standards as amendment to Annex VI, so that these standards will apply to all vessels (U.S. and foreign). Finally, the ports have been strong supporters of the USEPA in its application to the IMO to establish a North American ECA. Now that the application has been approved by IMO, the ports will continue to support implementation of the requirements that the most stringent engine NOx emissions standards and lowest sulfur content fuels be met by vessels calling on the ports on or prior to the established schedule.

**Air Quality Benefits**

**Benefits to Date**
The air quality benefits associated with this measure do not begin until 2011, when the IMO Tier 2 NOx limit is implemented. There are no benefits to date.

**Future Benefits**
OGVs complying with the IMO Tier 2 standard (i.e., built after January 1, 2011) will achieve about a 15% reduction in NOx emissions compared to an OGV meeting the IMO Tier 1 standard. Similarly, OGVs complying with the IMO Tier 3 standard (built after January 1, 2016 and operating in an ECA) will achieve an 80% NOx reduction compared to those vessels complying with a Tier 1 standard. Overall emissions reductions will depend on the number and types of IMO compliant vessels visiting the ports in 2013.

**Financial Costs**
The port costs for this measure are currently limited to the study of the most effective methods of promoting the early introduction and deployment of Annex VI compliant vessels to the ports. No specific cost estimates are available at this time.

**Upcoming Milestones**
1. To facilitate the near-term deployment of cleaner vessels, the ports will bring the issues of expedited production and preferential deployment forward in international venues such as the International Association of Port and Harbors, International Maritime Organization and the Pacific Ports Air Quality Collaborative.

   **Schedule:** The ports will continue to discuss the need for accelerated introduction of cleaner OGV engine technologies during discussions with various international port and regulatory organizations.
2. The ports will communicate with shipping lines and ship builders regarding the need for new ship builds to be, at a minimum, compliant with MARPOL Annex VI NOx standards for vessels operating in ECAs. In addition, the ports will meet with representatives of the shipping industry and vessel engine manufacturers to better understand issues underlying existing vessel deployment strategies in order to identify opportunities for preferential deployment of vessels that comply with the 2016 MARPOL Annex VI emissions standards.

**Schedule:** Meetings initiated in 2010.

3. The ports shall determine through communication with shipping line operators and through analysis of historic vessel call information, the past and projected age distribution of ships calling on the ports. By concentrating efforts on those vessel classes and lines which most frequently call on the ports, the benefits of this strategy may be optimized.

**Schedule:** Vessel call tracking is an ongoing element of the periodic updates to the ports’ emissions inventories. It is from these data that call frequency by terminal, vessel class and age will be tracked.

4. The ports will work with the regulatory agencies to provide support for implementation of a North American ECA, which will require that the most stringent engine emissions standards and lowest sulfur content requirement in fuel be met by vessels calling on the ports.

**Schedule:** Ongoing.

5. As leases are opened through the EIR process or for renegotiation, or as new leases are negotiated, the ports will include provisions for the compliance with Annex VI NOx standards for vessels operating in ECAs.

**Schedule:** As new leases are opened or existing leases are renewed.

6. Staff will evaluate the development of a program to encourage accelerated deployment of vessels compliant with Annex VI NOx standards for ECAs to the ports (e.g. targeted outreach campaign, incentive program, etc.) and will bring appropriate recommendations for consideration to each port’s Board.

**Schedule:** Board consideration anticipated in 2011.

7. The benefits of this program will be quantified and reflected in the periodic updates to each port’s emissions inventories.

**Schedule:** Ongoing.
Elements to be Tracked
The ports commit to providing regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically, for vessel main engine emissions improvements, the ports will provide updates on the new leases that are adopted that include provisions for compliance with Annex VI standards. If an incentive program is deemed an effective and appropriate tool for encouraging early introduction of Annex VI compliant vessels and preferential deployment to the ports, ports’ staff will provide updates on the participation rates within the incentive program. Finally, emission reductions from vessels complying with the MARPOL Annex VI standards will be tracked in the ports’ annual emissions inventories.

Looking Forward
The ports will continue to support USEPA on their implementation of an ECA for North America. Since the ECA was approved in March 2010, vessels calling at ports in the United States, including the ports of Long Beach and Los Angeles, will be required to meet the cleanest NOx engine standards and use ≤0.1% sulfur fuel. In addition, the ports will encourage the early introduction of Annex VI compliant vessels and will seek opportunities to have these lower emitting vessels selectively deployed to the San Pedro Bay.
4.2.5 Control Measure Number OGV6

**Measure Title: OGV Engine Emissions Reduction Technology Improvements**

This measure seeks to encourage demonstration and deployment of cleaner OGV engine technologies that are validated through the Technology Advancement Program (TAP) or by the regulatory agencies. The goal of this measure is to reduce DPM and NOx emissions of in-use vessels.

**Initiation Year:** 2006

**Key Milestone Dates:** Port’s TAP Program initiated in 2007

**Criteria Pollutant Reduction:** Slide valve technology implemented for MAN B&W engines may reduce 25% DPM and 30% NOx; technology reductions due to other technologies cannot be quantified at this time

**GHG Impact:** Dependent on the effectiveness of the demonstrated technology; cannot be quantified at this time

**Initial Implementation Strategies:** Technology Advancement Program, Lease Requirements, Tariff Changes, & Incentives

**Measure Description**

This measure focuses on reducing DPM and NOx emissions from the existing fleet of vessels. This measure is coupled with the Technology Advancement Program (TAP) in that the technologies vetted through the TAP might be utilized to reduce OGV engine emissions upon determination and verification of their emissions control efficiencies.

Some examples of potential methods of reducing emissions from large marine diesel engines include:

- Direct Water Injection (DWI)
- Fuel Water Emulsion (FWE)
- Humid Air Motor (HAM)
- Exhaust Gas Recirculation (EGR)
- Selective Catalytic Reduction (SCR)
- Continuous Water Injection (CWI)
- Slide Valves
Many of these technologies are being evaluated for integration into vessel new builds to meet the upcoming regulatory standards, however use of these technologies as a retrofit for existing vessels should also be explored. In addition, the list of technologies mentioned above is not all-inclusive. Although limited tests of the emission reduction potential of each of the technologies has been performed, these strategies must still be verified through the TAP process in order to assess their applicability as retrofits for OGV engines. The ports will continue to seek to demonstrate additional emerging technologies through the TAP, which would then be included as options for further reductions upon verification.

The ports, along with several other funding partners, including the USEPA and CARB, have been participating in a demonstration of the use of slide valve retrofit and fuel water emulsion on a vessel calling at the ports. The emissions tests were completed in 2008. Preliminary results from the demonstration indicate that the use of slide valves as a retrofit technology may not provide the same emission reductions as originally anticipated. The manufacturer, MAN B&W, has indicated that slide valves have produced reductions of 30% NOx emissions and 25% DPM emissions when the technology is optimized in new engines, however this level of reduction may not be universal. The results from the slide valve retrofit demonstration are inconclusive. More information is needed to understand the potential benefits of slide valves as a retrofit and as installed in new builds. For example, the earlier testing was completed using bunker fuel, not distillate fuel, which is currently being used in vessels complying with the CARB Vessel Fuel Rule within 24 nm of the California coast. In addition, the effect of engine optimization following installation of the retrofit should be evaluated. The ports may seek to conduct an additional evaluation of this technology as appropriate.

**Implementation Plan**

The ports will actively engage the shipping industry to identify and evaluate technologies that may have the potential to reduce emissions from the in-use fleet of vessels. These demonstrations will be conducted under the ports’ TAP. In addition, the ports will monitor demonstrations and verification of technologies outside of the TAP, that undergo evaluation and verification by the regulatory agencies. The ports will work with the shipping industry to deploy proven technologies as soon as possible, following validation of emission reduction benefits.

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29 Emission Control Technologies for Ocean Going Vessels (OGVs) presented by H.R. Rahai, PhD. and H. Hefazi, Ph.D. Center for Energy and Environmental Research and Services (CEERS), California State University, Long Beach.
**Air Quality Benefits**
The estimated reductions in DPM and NO\textsubscript{x} associated with this measure are discussed below.

**Benefits to Date**
15% of the total port calls in 2007 were made by vessels equipped with slide valves. In 2008, 21% of the total calls at the Port of Los Angeles and 34% of the total calls at the Port of Long Beach were made by vessels equipped with slide valves. The benefits of the use of this technology are included in annual inventory updates.

**Future Benefits**
Slide valves installed in OGV main engines can potentially achieve a 25% reduction in DPM and 30% reduction in NO\textsubscript{x} emissions. However, the potential benefits for new engines and retrofits should be further evaluated.

**Financial Costs**

**Costs to Date**
To date the cost of this measure has been limited to participation in the demonstration project to evaluate slide valves and emulsified fuel. Costs to date are included in the TAP budget.

**Future Costs**
The projected costs to the ports for this measure are associated with those of the TAP to evaluate and verify technologies and are included in the costs shown in Section 4.7. Additional costs could be incurred if financial incentives for early introduction and deployment of slide valve and other technologies are considered. These additional costs cannot be quantified at this time.

**Completed Milestones**
1. The Ports will publish fact sheets or other information that describe the emission reduction technologies available and those emerging through the TAP and the ports’ needs (in terms of reductions from the current fleet) in order to achieve CAAP goals.

   **Schedule:** Fact sheets were initially completed in 1st quarter 2008. These fact sheets or any other relevant information will be updated periodically, as needed.
Upcoming Milestones

1. Further explore the potential DPM and NOx emission reduction benefits from slide valves installed as a retrofit or on a new build, using distillate fuel, with and without engine optimization.

   Schedule: The testing of the slide valve retrofit was completed in August 2008, however the results were inconclusive and additional testing is needed to quantify the emission reduction benefits when the engines are optimized and the vessels are using distillate fuel. The port will further investigate the benefits of using slide valves, and if necessary, will seek to perform further testing of the technology

2. The ports will convene detailed technical meetings with stakeholders (including vessel operators, engine manufacturers, regulatory agencies) with the goal of developing a strategic plan for reducing emissions from in-use vessels. The strategic plan will prioritize the technology options using cost, feasibility, operational integration and will identify the performance standard(s) that may be achievable. In addition, the plan will identify technology gaps. The ports and the stakeholders will also commit to collaborative demonstration projects to evaluate the effectiveness of new or emerging technology options. The ports will incorporate technologies that have been identified, through demonstrations or verification testing, as feasible and cost effective into lease requirements and/or incentive programs. In addition, the ports will work with USEPA to seek to amend the Category 3 rule to include performance standards for in-use vessels.

   Schedule: The ports will initiate meetings with the stakeholders in 2010.

3. Staff will meet and work with international venues such as International Association of Port Authorities, International Maritime Organization and the Pacific Ports Air Quality Collaborative in an effort to provide/share information on vessel technologies and to advance engine emissions improvements.

   Schedule: Ongoing.

4. For retrofit technologies that prove to be cost effective and feasible for reducing emissions from vessel engines, require the use of that technology through port leases, as appropriate.

   Schedule: Ongoing.

5. The benefits of this program will be quantified and reflected in the periodic updates to the ports' emissions inventories.

   Schedule: Ongoing.
Elements to be Tracked
The ports commit to providing regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically the ports will track the status of emerging emission reduction technologies through the TAP and through discussions with engine manufacturers and vessel operators. Finally, emissions reductions from vessels employing these technologies will be tracked and the reductions reflected within the ports’ emissions inventory updates.

Looking Forward
The ports will work to streamline the evaluation process under TAP and verification process through CARB in order to ensure that time between concept and application is shortened to the greatest extent practicable in order to achieve the greatest level of emission reduction from ocean going vessels as quickly as possible.

4.3 Cargo Handling Equipment Control Measure
Cargo handling equipment (CHE) is another of the five port-related emissions source categories that contribute toward the adverse impact on air quality. The operation of this equipment is confined within the ports’ boundaries. Despite growth, the emissions contribution from this category is projected to decline largely due to the in-use emissions control regulations adopted by the CARB and CAAP measure CHE1, which further encourages the implementation of new technologies and standards into the ports’ fleets, when they become feasible and available. Implementation of this measure demonstrates the ports’ determination to accelerate ongoing efforts to reduce air pollution from all modes of goods movement.
4.3.1 Control Measure Number: CHE1  
Measure Title: Performance Standards for CHE  
This measure calls for the following CHE improvements:

- Beginning 2007, all CHE purchases will meet one of the following performance standards:
  - Cleanest available NOx alternative-fueled engine, meeting 0.01 g/bhp-hr DPM, available at time of purchase, or
  - Cleanest available NOx diesel-fueled engine, meeting 0.01 g/bhp-hr DPM, available at time of purchase.
  - If there are no engines available that meet 0.01 g/bhp-hr DPM, then must purchase cleanest available engine (either fuel type) and install cleanest verified diesel emission control strategy (VDECS) available.

- By the end of 2010, all yard tractors will meet, at a minimum, the USEPA 2007 on-road or Tier 4 off-road engine standards.

- By the end of 2012, all pre-2007 on-road or pre Tier 4 off-road top picks, forklifts, reach stackers, RTGs, and straddle carriers ≤750 hp will meet, at a minimum, the USEPA 2007 on-road engine standards or Tier 4 off-road engine standards.

- By end of 2014, all CHE with engines >750 hp will meet at a minimum the USEPA Tier 4 off-road engine standards. Starting 2007 (until equipment is replaced with Tier 4), all CHE with engines >750 hp will be equipped with the cleanest available VDECS.

Initiation Year: 2006  
Key Milestone Dates: Implementation through leases with requirements phased-in between 2007 and 2014  
Criteria Pollutant Reductions: The average CHE meeting CHE1 requirements will emit at least 80% less DPM and at least 50% less NOx  
GHG Impact: Reduction in GHGs depends upon the technology used to meet future emissions standards; cannot be quantified at this time
Implementation Strategies: CARB Regulation & Lease Requirements

Measure Description

This measure is designed to achieve the maximum possible emission reductions from cargo handling equipment operating at the port over the next several years by accelerating CARB’s CHE regulation requirements. The standards include requirements for the purchase of new CHE and timetables for the replacement of all pre-2007 engines. Through conditions negotiated into new and revised leases, this measure requires that any new yard tractors (which in 2006 made up ~46% of total DPM plus NOx CHE emissions) meet the 0.01 g/bhp-hr DPM and the cleanest available NOx engines (for either alternative or diesel fueled engines), with all yard tractors meeting the standard by the end of 2010. This measure also requires that all other pre-2007 or pre-Tier 4 CHE with engines <750 hp (which makes up ~48% of total 2006 DPM plus NOx CHE emissions) will, at a minimum, meet the 2007 on-road or Tier 4 engine standards by the end of 2012. Finally, this measure requires all other CHE (which made up ~6% of total 2006 DPM plus NOx CHE emissions) to, at a minimum, meet the Tier 4 off-road engine standards by the end of 2014. In addition, through conditions negotiated into new and revised leases, until all CHE with engines >750 hp are replaced with Tier 4 engines, they must be equipped with the cleanest available verified diesel emissions control system (VDECS).

Figure 4.3 provides a summary of the CAAP requirements on a lease requirement basis.
CAAP Requirements

New Purchases
All new purchases must meet 2007 on-road PM engine standards and cleanest available NOx. If 2007 on-road engine model not available, then purchase newest off-road engine and install cleanest VDECS.

Fleet Turnover
By end of 2011, all pre-2007 yard tractors will be replaced with Yard tractors meeting the 2007 on-road engine standards. By end of 2012, all pre-2007 top pick, forklifts, reach stackers, RTGs, and straddle carriers with <750 hp will be replaced with engines meeting 2010 on-road Tier 4 off-road engine standards. By end of 2014, all remaining CHE >750 hp will be replaced with engines meeting Tier 4 engine standards. These CHE will be equipped with cleanest VDECS possible.
The CARB CHE regulation adopted in December 2005 requires the replacement or retrofit of existing engines with the cleanest available VDECS and requires, beginning January 1, 2007, that newly purchased, leased or rented CHE meet low DPM and NOx limits. The requirements in CARB’s regulation are phased-in, and are focused on 2002 and older engines in the 2007–2013 timeframe and 2003–2006 engines and equipment in the 2010-2016 timeframe. The CAAP control measure further accelerates the CHE modernization schedule, by requiring replacement of all engines on a faster timeline.

**Implementation Plan**

The performance standards will be phased in through lease requirements. Terminals would be required to meet the standards listed above as part of conditions negotiated into new or amended leases or when leases are reviewed through the EIR process.

**Air Quality Benefits**

This measure will result in additional reductions of DPM, NOx and GHG (depending upon the technology) beyond those achieved by CARB’s CHE regulation since the requirements of this measure are more stringent than CARB’s regulation. Depending upon the technology installed on the future CHE used by terminal operators, there is potential for GHG reductions.

**Benefits to Date**

Emission reduction benefits for this measure began in 2007 through lease agreements with the requirement for all new CHE purchases to employ the cleanest available NOx alternative- or diesel-fueled engines, meeting 0.01 g/bhp-hr DPM, or install best available VDECS on cleanest engines available. The emission reductions due to fleet turnover and implementation of CHE emission control technologies employed by various terminal operators have reduced CHE emissions. The reductions are included in 2007 and 2008 emissions inventories.

**Future Benefits**

Full implementation of CHE1 will result in replacement of diesel yard tractors with yard tractors that are conforming to the USEPA’s 2007 on-road standards or Tier 4 off-road diesel engine standards. CHE1 will also result in replacement of non-yard tractor diesel equipment with units meeting the interim Tier 4 off-road diesel engine standards. Full implementation of this measure will result in an average CHE emitting at least 80% less DPM emissions and at least 50% less NOx emissions compared to the CHE fleet without CHE1 and CARB’s regulation. Overall emission reductions will depend upon the lease renewal schedule of terminals at both ports and the phase-in compliance schedule of CARB’s regulation.

**Financial Costs**

Since this measure will be implemented as a lease requirement, there will be no direct costs to either port.
Completed Milestones

1. Develop a technical fact sheet detailing the CAAP requirements and the status of various emissions control technologies or alternative fueled CHE. This fact sheet will contain information on CARB verified emission control devices and results of technology demonstrations conducted under the ports’ Technology Advancement Program.

Schedule: Completed and posted on the Clean Air Action Plan website. To be updated as needed.

2. Staff to conduct an outreach meeting for terminal operators to present the requirements for CHE, funding incentives, federal tax credits, compliance schedule, and status of technology as outlined in the fact sheet mentioned above. This will also be an opportunity for staff to gather questions and concerns from customers so they can be addressed prior to lease negotiations.

Schedule: Completed. Workshop for all tenants in the ports of Long Beach and Los Angeles held in 2007. Additional support on requirements provided one-on-one to tenants, as requested. Information on grant funding opportunities sent to tenants, as available.

Upcoming Milestones

1. Staff will collect information from each of the tenants on the number of pieces of equipment in operation by each tenant and the emission reduction strategies being used, such as on-road engines, retrofit devices, alternative fuels, etc. Emissions from cargo handling equipment operations will be compared to 2005 emissions (CAAP baseline) in order to quantify the effectiveness of the emissions reduction strategies being used.

Schedule: Ongoing, as part of each port’s annual emissions inventory. In addition, CARB also collects data on CHE as a part of their CHE regulation adopted in 2005.

2. As leases are opened through the EIR process or for re-negotiation, or as new leases are negotiated, the ports will include requirements for CHE fleet modernization.

Schedule: As leases are opened.

http://cleanairactionplan.org/tech/factsheets/default.asp
Elements to be Tracked
The ports commit to providing regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for the CHE1 measure, the ports will provide updates on the approvals of any new leases where the cargo handling equipment requirements apply. The ports will also provide regular updates, as part of the annual emissions inventories, on the number of pieces of equipment in operation, the control strategies employed, and the annual emissions. In addition, as new control strategies are demonstrated through the ports Technology Advancement Program, information will be made available on the Clean Air Action Plan website.

Looking Forward
In addition to complying with the CHE standards listed in this measure, tenants will be encouraged to purchase and use lower emitting equipment where feasible. In some instances, where necessary to meet the Project Specific Standards as described in Section 2 for newly proposed projects, cleaner equipment may be required. Examples include equipment that utilizes electric, hybrid, or other alternative fuel technologies. Through the Technology Advancement Program, the ports are committed to provide support for the demonstration of new technologies needed to further reduce emissions beyond currently available technologies. As new technologies are developed and demonstrated, they will be incorporated into the future updates of the CHE1 measure, as appropriate.

4.4 Harbor Craft Control Measure
Since the adoption of the 2006 CAAP, CARB and USEPA have adopted regulations for the control of emissions from existing and new harbor craft engines. The implementation of these recently adopted CARB and USEPA regulations will significantly reduce DPM and NOx emissions from commercial harbor craft. In addition, the ports are encouraging all tugs to utilize shore power while at berth.
4.4.1 Control Measure Number HC1

Measure Title: Performance Standards for Harbor Craft

All harbor craft operating in the ports of Long Beach and Los Angeles are required to comply with the CARB harbor craft (HC) regulation. This measure seeks to further reduce emissions by encouraging compliance with the following goals:

- By 2008, all HC home-ported in the San Pedro Bay will meet USEPA Tier 2 standards for harbor craft, or equivalent reductions.
- After Tier 3 engines become available between 2009 and 2014, within five years all HC home-based in the San Pedro Bay will be repowered with the new engines.
- All tugs will use shore power while at their home port location.

Initiation Year: 2001

Key Milestone Dates: Implementation of CARB’s In-Use HC regulation starts in 2009 through 2020

Criteria Pollutant Reduction: Depending upon the horsepower of the engine and replacement of Tier 0 or Tier 1 engines to Tier 2 or Tier 3 engines, the NOx emissions reduction will vary from 25% to 62% and DPM emissions reduction will vary from 44% to 78%.

GHG Impact: GHG reduction depends upon the technology used to meet future emissions standards; cannot be quantified at this time

Implementation Strategies: CARB Regulation, Voluntary, & Incentives

Measure Description

According to data collected by the ports in 2008, over 35% of all harbor craft engines have been repowered. Over 80% of these were repowered with the help of various incentive programs, including the SCAQMD (under the Carl Moyer Program) and the Port of Los Angeles Air Quality Mitigation Incentive Program. There are approximately 120 fishing related vessels that have not been repowered although their numbers are expected to stay flat or decline due to the cyclical nature of the fishing industry. This control measure focuses on harbor craft that are home-ported at either port and could potentially be repowered with cleaner engines or retrofitted with verified emissions control devices. This would occur through compliance with the CARB Commercial Harbor Craft regulation, or where eligible, through the assistance of the Carl Moyer Program, USEPA’s Diesel Emission Reduction Act funding, the Proposition 1B Funding program, or other similar incentive program.
As part of its Diesel Risk Reduction Plan and Goods Movement Plan, CARB adopted a regulation in November 2007 that will reduce DPM and NOx emissions from new and in-use commercial harbor craft operating in Regulated California Waters (i.e., internal waters, ports, and coastal waters within 24 nm of California coastline). Under CARB’s definition, commercial harbor craft include tug boats, tow boats, ferries, excursion vessels, work boats, crew boats, and fishing vessels; however, work boats, crew boats and fishing vessels are only subject to the regulation’s reporting requirements at this time. This regulation requires that auxiliary and propulsion engines installed in commercial harbor craft meet stringent emission limits. All in-use, newly purchased, or replacement engines must meet USEPA’s most stringent emission standards per a compliance schedule set by CARB for in-use engines and from new engines at the time of purchase. In addition, the propulsion engines on all new ferries, with the capacity of more than 75 passengers, acquired after January 1, 2009, will be required to install control technology that represents the best available control technology in addition to an engine that meets the Tier 2 or Tier 3 USEPA marine engine standards in effect at the time of vessel acquisition. For harbor craft that home port in SoCAB, the compliance schedule is accelerated by two years (compared to statewide requirements) in order to achieve earlier emission reductions required in the SoCAB. The in-use emission limits apply to ferries, excursion vessels, tug boats and tow boats only. The compliance schedule for in-use engine replacement began in 2009. At a minimum, harbor craft subject to CARB’s regulation and operating in the ports will be required to modernize their vessels in accordance with the state regulation.

In addition, USEPA recently adopted more stringent Tier 3 and Tier 4 emission standards for new Category 1 and 2 marine diesel engines rated over 37kW used for propulsion and auxiliary engines in harbor craft. Tier 3 engine standards begin to phase in starting in 2009 with engines >75kW between 2012 and 2014. The more stringent Tier 4 engine standards (based on the application of high-efficiency catalytic after-treatment technologies) would phase in beginning in 2014 and apply only to commercial marine diesel engines greater than 597kW.

There are three fundamental elements to this control measure:

1. All harbor craft operating in the ports will modernize their vessels in accordance with the CARB’s Commercial Harbor Craft regulation.
2. To achieve early emission reductions, the ports will encourage harbor craft operators to modernize their equipment in advance of state regulation. Through the emissions inventory update process, the ports will identify propulsion and auxiliary harbor craft engines that are good candidates for accelerated repower or retrofit and qualify under the Carl Moyer or other similar grant programs (i.e., reductions would exceed the requirements of the existing regulations). In addition, the ports will identify and provide information on available funding programs, such as USEPA Diesel Emission Reduction Act, SCAQMD, Carl Moyer Program, Proposition 1B and other available funds and criteria, and will assist harbor craft owners in applying for grant funding, as needed.

3. The ports will work with tug boat operators to facilitate development of shore power infrastructure and encourage the use shore power while at their home port locations.

**Implementation Approach**

In order to successfully identify candidate harbor craft for potential incentive program funding, the harbor craft emissions inventory will continue to be updated by each port on an annual basis. Emission inventories track the population of harbor craft engines by model year, type of engines (mechanical versus electronically controlled) and their emissions contribution compared to total harbor craft emissions. Since some of the assist tugboats are common to both ports, it is important that staff work together to identify the candidate vessel projects that will provide the greatest benefits.

Every year, SCAQMD receives a share of the state’s Carl Moyer Program funds to reduce emissions from mobile source engines faster than required by state regulations. In addition, funding may be made available locally through the Proposition 1B funding program with a total allocation of $1 billion in state bond funds over four years for reducing emissions from goods movement categories (i.e., heavy-duty trucks, ocean-going vessels, locomotives, and commercial harbor craft). Further, through the American Recovery and Reinvestment Act, National Clean Diesel Funding Assistance Program, USEPA has provided funding to both ports in 2009 for diesel emissions reductions from harbor craft, for projects to be implemented prior to September 2010. Both ports will continue to coordinate with agency staff to solicit these funds to clean harbor craft engines. Staff will provide assistance as needed to identify candidate vessel owner/operators in applying for grant funding.
In addition, the ports support the development of new, emission reduction technologies for harbor craft through their joint Technology Advancement Program. In 2008, the ports provided funding assistance for the demonstration of a hybrid tug boat and a tug boat that utilizes a modified engine design which is expected to be more efficient than the traditional tug boat designs. The ports are hopeful that these demonstrations will prove to be effective at meeting the anticipated emissions reductions and that, following demonstration; these technologies will be commercialized and implemented throughout the harbor. In addition, once these technologies have been demonstrated and proven to be effective, the goal is that these technologies would also be eligible for funding awards from the various grant programs. Finally, the ports remain committed to evaluating additional harbor craft technologies through their Technology Advancement Program, which may provide even greater benefits and offer additional options for harbor craft operators.

Finally, the ports will encourage tug operators to use shore power when berthed at their home-port locations. Tug boats at the Crowley terminal at the Port of Los Angeles currently use shore power, rather than idling their engines, when tied up. In 2009, the Port of Long Beach began construction of electrical infrastructure improvements at the Foss terminal to allow tug boats to use shore power. The shore power had the added benefit of providing battery recharge for the hybrid tugboat, which will decrease the need to recharge the batteries using the tug’s on-board diesel engines.

Air Quality Benefits
Implementation of the recent CARB and USEPA regulations will significantly reduce DPM and NOx emissions from commercial harbor craft. GHG reductions are also expected to be achieved due to implementation of more fuel efficient engines. The emission reduction benefits associated with implementation of this measure, primarily associated with repowers thus far are reflected in the annual emissions inventory updates.

Benefits to Date
Harbor craft engine repowering and replacements are tracked as part of the annual inventories and the emission benefits are included in the results.

Future Benefits
Per CARB’s harbor craft engine replacement schedule, by 2013 most of the Tier 0 and Tier 1 engines will be replaced with Tier 2 or Tier 3 engines. On an average replacement of Tier 0 engine to Tier 2 will reduce NOx emissions by 49% and DPM emissions by 44%; replacement of Tier 0 engine to Tier 3 will reduce NOx emissions by 62% and DPM emissions by 78%. On an average replacement of Tier 1 engine to Tier 2 will reduce NOx emissions by 25% and DPM emissions by 44%; replacement of Tier 1 engine to Tier 3 will reduce NOx emissions by 44% and DPM emissions by 78%. Overall emission reductions will depend on CARB’s replacement schedule and the types of harbor craft that are subjected to the CARB regulation.
Financial Costs
The Port of Long Beach incurred a cost of $92,000 in 2009 as shown below in Table 4.15. At this time there are no anticipated costs associated with this measure.

Table 4.15: Estimated Future Costs for HC1

<table>
<thead>
<tr>
<th>HC1</th>
<th>Funding Source</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
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<td></td>
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<td>$0</td>
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<td></td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td></td>
<td>CARB</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$92,200</td>
</tr>
</tbody>
</table>

Completed Milestones
1. The ports will provide information on various funding programs available to assist harbor craft operators to modernize their equipment in advance of regulatory requirements.

   Schedule: Completed. A grants page was added to the Clean Air Action Plan website to provide links to the relevant federal, state and local funding sources. The page can be accessed at: http://cleanairactionplan.org/tech/grants.asp. In addition, the ports provide information on available grant programs to harbor craft operators, as available.

2. Develop a technical fact sheet detailing CAAP goals; regulatory requirements and the status of various emissions control technologies, engine standards, and engines available (including alternative fuels). This fact sheet will contain details on agency verification of various emissions control devices and availability of low emitting engines. In addition, the fact sheet will include results of demonstrations conducted under the ports’ Technology Advancement Program.

   Schedule: Completed. The fact sheet is available on the Clean Air Action Plan website (http://cleanairactionplan.org/tech/factsheets/hc.asp) and will be updated as needed.

3. Staff to conduct an outreach meeting for the harbor craft operators to present information on the various grant funding processes and funding levels, program flexibility and status of technology as outlined in the technical/fiscal fact sheets mentioned above. This will provide an opportunity for staff to gather questions and concerns from the operators so that these can be addressed prior to lease negotiations. In addition, staff will provide information to harbor craft operators on the availability of grant funding opportunities.
Schedule: Completed. Funding workshops targeted at harbor craft operators have been held concurrent with available funding opportunities, such as Carl Moyer and POLA’s Air Quality Mitigation Incentive Program (AQMIP). Since 2006, the Port of Los Angeles has awarded over $11 million in AQMIP funding to repower or retrofit harbor craft. Additional workshops will be held as new funding opportunities become available.

**Upcoming Milestones**

1. The ports will provide assistance to harbor craft operators in applying for various funding programs to modernize their equipment in advance of regulatory requirements.

   **Schedule:** As needed. In 2009, POLB was awarded grant funding for harbor craft operated by tenants, through the USEPA Diesel Emission Reduction Act funding program. Harbor craft operating in each port have been awarded funding through the Carl Moyer Program. The ports and the vessel operators will continue to seek funding through such opportunities in the future.

2. The ports will provide assistance to tug boat operators, as appropriate, to install shore power infrastructure to reduce emissions from tugboats when tied up at home-port.

   **Schedule:** Ongoing. Port of Long Beach began construction on shore power infrastructure for the Foss terminal in 2009.

3. The benefits of this program will be quantified and reflected in the periodic updates to the ports’ emissions inventories.

   **Schedule:** Ongoing.

**Elements to be Tracked**

The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for the HC1 measure, the ports will provide updates on the installation and utilization of shore power for tug boats. In addition, the ports will provide regular updates, as part of the annual emission inventories, on the number of vessels in operation, the types of engines, control strategies employed, and the annual emissions. In addition, as any new control strategies are demonstrated through the ports Technology Advancement Program, information will be made available on the Clean Air Action Plan website.
Looking Forward

Besides the implementation of CARB’s In-Use Harbor Craft regulation and the USEPA’s recently adopted Tier 3 and 4 standards, the ports are working to accelerate harbor craft emission reductions through emerging technologies such as the hybrid tug, new more-efficient engine configurations, alternative fuels and shore power for tugs at-berth and at the staging areas, through incentives or voluntary measures.

4.5 Railroad Locomotive Control Measures

The railroad locomotive control measures are designed such that each measure focuses on individual rail operation related to port activities. RL1 focuses on port switching operations, operated under an agreement with the ports by Pacific Harbor Line (PHL). Most of the goals set forth under RL1 when the 2006 CAAP was adopted have already been achieved.

RL2 focuses on Class 1 locomotive operations related to the ports and requires the implementation of clean technologies as required by USEPA regulation and an agreement with CARB.

RL3 focuses on setting standards through new or redeveloped near-dock rail yard facility projects that require the most stringent achievable emissions control operations for rail, CHE and HDVs.

Since the 2006 CAAP, measures RL2 and RL3 have been updated to reflect new information available on the timeline for implementation of new clean engine standards, as adopted by USEPA since the original CAAP was completed. In addition, the scope and the implementation measures have been clarified and updated.
4.5.1 Measure Number RL1

Measure Title: **PHL Rail Switch Engine Modernization**

This measure will be implemented through the second amendment to the operating agreement between the Port of Los Angeles, Port of Long Beach, and Pacific Harbor Line (PHL), which calls for the following:

- By 2008, all existing switch engines in the ports will be replaced with Tier 2 engines and will use emulsified fuels as available or other equivalently clean alternative diesel fuels.
- Any new switch engine acquired after the initial replacement must meet USEPA Tier 3 standards or a NOx standard of 3 g/bhp-hr and a DPM standard of 0.0225 g/bhp-hr.
- All switch engines will have 15-minute idling limit devices installed and operational.
- PHL will conduct a series of feasibility tests including: DOC or DPF retrofits, LNG locomotive and hybrid locomotive. Based on successful demonstration of a locomotive DOC or DPF, all of the Tier 2 engines will be retrofitted preferentially with the DPF, or with the DOC retrofit as a fallback if the DPF trial is not successful.

Initiation Year: 2005

Implementation Schedule: All existing switcher locomotives replaced with Tier 2 engines equipped with idle-limit devices as of 2nd Quarter 2008; Hybrid locomotive demonstration completed in 2007; LNG demonstration completed in 2nd quarter 2009; DPF/DOC demonstration to be completed by end of 2009; all new locomotive purchases to meet Tier 3 equivalent or better.

Tonnage Reduced: Replacement of existing switcher locomotives with locomotives meeting Tier 2 standard (or better) results in 54% reduction in DPM emissions and 62% reduction in NOx emissions for the PHL fleet compared to 2005. Replacement of Tier 2 switcher locomotives with Tier 3 locomotives will achieve 50% reduction in DPM emissions.

GHG Impact: GHG reductions possible due to increased fuel efficiency of new locomotives and reduced idling; cannot be quantified at this time due to lack of data.
Initial Implementation Strategies: Operating Agreements

Measure Description
This measure implements the switch locomotive engine modernization requirements included in the operating agreement between the ports and PHL. All sixteen of PHL’s switch engine fleet was replaced with newer and significantly cleaner Tier 2 compliant railroad locomotives equipped with idling controls. In addition, all new locomotive purchases by PHL meet the Tier 3 off-road standard. The fundamental elements associated with this control measure are:

1. In accordance with the terms of the second amendment of the operation agreement between PHL, Port of Los Angeles and Port of Long Beach, PHL has procured replacements for their sixteen older technology locomotives. As of mid-2008, the sixteen older locomotives previously in operation have been replaced with Tier 2 diesel switcher locomotives equipped with 15-minute idle control devices. PHL no longer operates the older locomotives and is in the process of disposing of them in accordance with the agreement.

2. In addition to the required locomotive replacements, PHL committed to test a locomotive DOC or DPF, and conduct demonstrations of LNG and hybrid locomotives. In addition, PHL has voluntarily conducted a demonstration of a multiple engine generator set (gen-set) switching locomotive.

3. If the DOC or DPF testing is successful, DOCs or DPFs will be installed on all of the Tier 2 locomotives.

4. Any additional locomotives added to the PHL fleet will, at a minimum, meet Tier 3 emission standards. Since the operating agreement has been in effect, PHL has purchased six gen-set switching locomotives that are equipped with Tier 3 certified non-road engines.

5. Emulsified diesel fuel or other clean alternative diesel fuel will be used in all diesel fueled switchers when it is available. Emulsified fuels have not been available for PHL’s use since January 2007.

Implementation Approach
This program called for sixteen of PHL’s fleet of locomotives to be replaced by new switcher locomotives meeting Tier 2 emission levels. PHL replaced all of the older switchers with new units meeting or exceeding Tier 2 switcher locomotive emission standards.
As part of the agreement with the ports of Los Angeles and Long Beach, PHL conducted a one-year demonstration of a hybrid-electric locomotive in 2007 and a demonstration of an LNG locomotive, which was completed in 2nd quarter 2007. In addition, PHL is required to demonstrate the use of a DOC on one of the new Tier 2 locomotives. PHL is working with the ports and the SCAQMD to demonstrate the use of a DPF, which will provide a greater level of emissions control. If the DPF test is successful, DPFs will be installed on the remaining Tier 2 locomotives. If the DPF test is unsuccessful, a DOC test will be conducted and upon successful demonstration DOCs will be installed on the remaining Tier 2 locomotives. In addition, if PHL purchases additional locomotives, they will meet Tier 3 standards or better. Finally, PHL is also required to use emulsified fuels or an equivalently clean alternative diesel fuel in their locomotives. Unfortunately, the company that supplied emulsified diesel fuel made a business decision to discontinue the fuel product, and since January 2007, emulsified diesel fuel is no longer available. The ports and PHL are currently exploring options for other alternative diesel fuels.

From May 31, 2006 to September 30, 2006, PHL conducted its own independent demonstration project of a multiple engine generator set locomotive. The four month demonstration project was considered successful and PHL leveraged Carl Moyer Program funding to purchase six locomotives with multiple engine generator set locomotives. In accordance with the second amendment of the operational agreement, these multiple engine generator set locomotives achieve USEPA Tier 3 standards, or a NOx standard of 3 g/bhp-hr and a DPM standard of 0.0225 g/bhp-hr, the these levels. These locomotives have been in service since April 2008.

The ports provided $10 million to support the modernization program for replacement with locomotives that meet the Tier 2 standards. All of these funds have been expended. Carl Moyer grant funds have also been awarded by SCAQMD to PHL for a portion of the fleet modernization costs. In addition, the ports are working to secure additional funding, through the ports’ Technology Advancement Program, SCAQMD and others, to assist PHL with the costs associated with the DPF demonstration test. Should the DPF prove successful, additional units to retrofit the Tier 2 locomotive fleet may be co-funded by PHL and other grant funds. Should the DPF prove unsuccessful and the subsequent demonstration of the DOC prove successful, additional units to retrofit the Tier 2 locomotive fleet will be paid for by PHL.
Air Quality Benefits

This measure will produce significant reductions of DPM and NOx emissions, and the concurrent use of ULSD will reduce emissions of SOx by over 95%. Greenhouse gas emissions will be reduced due to increased fuel efficiency of the new locomotives compared with the old locomotives as well as idling controls on new locomotives. However due to lack of data the GHG reductions cannot be quantified.

Benefits to Date

Emission reduction benefits began accruing in 2007 as the new Tier 2 switcher locomotives were placed into service over the course of the year and the old locomotives were phased out. All sixteen of the new switcher locomotives were placed into service in mid-2008. Switch locomotive repowering is tracked as part of the annual inventories and the emission benefits are included therein.

Future Benefits

Replacement of switcher engines with Tier 2 or better engines along with idling restriction will result in at least a 54% reduction in DPM emissions and a 62% reduction in NOx emissions for the PHL fleet. Replacement of Tier 2 switcher locomotives with locomotives meeting Tier 3 standards will result in 50% reduction in DPM emissions. GHG emissions benefits associated with Tier 2 switcher locomotives are not certain at this time.

Financial Costs

The funding for this measure was committed when the amendment to the operating agreement was negotiated.

Costs to Date

To date, the funding shown in Table 4.16 for replacement locomotives has been expended on RL1 (exclusive of any funding provided by PHL). The funding for the DPF demonstration project has not been spent due to delays in initiating this project.

Table 4.16: Costs-To-Date for RL1 by Funding Source

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<tr>
<th>RL1</th>
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<th>2007</th>
<th>2008</th>
<th>Total</th>
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<td>$2,500,000</td>
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<td>$0</td>
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<td>$13,200,000</td>
</tr>
</tbody>
</table>

Future Costs

Future funding for this measure associated with co-funding of the DPF demonstration project (through TAP) is not yet determined.
**Completed Milestones**

1. Multiple Engine Generator Set locomotive demonstration.
   
   **Schedule:** Completed.

2. Hybrid locomotive demonstration.
   
   **Schedule:** Completed.

3. LNG locomotive demonstration.
   
   **Schedule:** Completed.

4. All Tier 2 locomotive engines operational.
   
   **Schedule:** Completed. All sixteen Tier 2 locomotives in operation as of 2nd Quarter 2008.

5. Any new locomotives purchased by PHL will meet a Tier 3 equivalent standard or better.
   
   **Schedule:** PHL has purchased six gen-set locomotives that meet Tier 3 off-road standards.

**Upcoming Milestones**

1. DPF/DOC demonstration.
   
   **Schedule:** One year DPF demonstration on a Tier 2 locomotive anticipated to begin in 2010, pending successful negotiations among the ports, SCAQMD, PHL, and the equipment manufacturers. If the demonstration is successful then the Tier 2 locomotive retrofits will follow.

2. The benefits of this program will be quantified and reflected in the periodic updates to the port’s emissions inventories.
   
   **Schedule:** Ongoing.

3. The ports will continue to work with PHL to explore opportunities to demonstrate new, clean technologies.
   
   **Schedule:** Ongoing.
Elements to be Tracked
The ports commit to provide regular updates on the progress of implementing this measure. These updates will be provided in quarterly progress reports, which detail significant progress for implementation of all CAAP measures.

Specifically for measure RL1, the ports will provide updates on the implementation of the technology demonstrations and installation of DOC or DPF units on the Tier 2 locomotives. The ports will also provide regular updates, as part of the annual emissions inventories, on the operation of the switcher locomotives and the annual emissions.

Looking Forward
All of the original commitments of this measure are fulfilled, with the sole exception of the technology demonstration and installation of DOC or DPF units on Tier 2 locomotives. The ports will also continue to work with PHL to explore future opportunities to integrate cleaner locomotive technologies into their operations, as they become available.
4.5.2 Measure Number RL2
Measure Title: Class 1 Line-haul and Switcher Fleet Modernization

This is a long term measure affecting all Class 1 line-haul and switcher operations used for the goods movement in and out of the ports. The focus of this measure is to identify the emission reductions associated with the CARB Class 1 railroads MOU and the 2008 USEPA locomotive engine standards. The key requirements from these two regulatory efforts are:

- By 2007, phase-out all non-essential idling and maximize use of ULSD fuel
- By 2010, all Class 1 locomotives entering the ports will meet emissions equivalent to Tier 2 locomotive standards
- By 2023, all Class 1 locomotives entering the ports will meet emissions equivalent to Tier 3 locomotive standards

Initiation Year: 2007

Key Milestone Dates: By 2010, the locomotive operators must meet a Tier 2 equivalent fleet average under the CARB MOU. By no later than 2013 and thereafter, at the time of major service, Tier 2 locomotives must be rebuilt to Tier 3 standards, under the USEPA rule.

Criteria Pollutant Reduction: Replacement of an average 2005 on-port and off-port line haul locomotives and off-port switcher locomotives with Tier 2 locomotives using ULSD will result in reductions of 38% DPM, 41% NOx, and 99% SOx.

GHG Impact: Cannot be quantified

Initial Implementation Strategies: CARB MOU & USEPA Rule

Background

In the 1998 Memorandum of Mutual Understandings and Agreements (MOU), CARB and the Class 1 railroads (BNSF and UP) entered into an agreement that would set the fleet average for locomotives operating in the South Coast nonattainment area at 5.5 g/hp-hr (equivalent to the Tier 2 locomotive NOx standard included in the Final USEPA National Locomotive Rule). The Tier 2 engine standards require approximately 58% NOx control for new locomotives. Under a subsequent 2005 MOU the Class 1 railroads agreed to:

1. Phase-out all “non-essential” idling (by January 1, 2007 for all California-based locomotives)
2. Install idling reduction devices (limiting idling to 15 minutes) on California-based locomotives within three years (June 30, 2008)

3. Maximize the use of ULSD (15 ppm) after January 1, 2007

The 1998 MOU focuses on fleet averaging for locomotives operating in the South Coast nonattainment area. Fleet averaging means that not all locomotives will meet the 5.5 g NOx/hp-hr target, however taking the fleet as a whole, the fleet average must meet the target. In addition, for early action to implement cleaner technologies, the Class 1 rail operators receive “credit” toward implementing the Tier 2 fleet average. Therefore, the Class 1 operators can meet the requirements through a combination of replacements with locomotives that meet Tier 2, plus early action “credits”.

On March 27, 2008, USEPA adopted and published their long awaited locomotive and marine diesel engine standards. This rulemaking tightened DPM and NOx standards for remanufactured locomotives, defined Tier 3 standards for newly-built locomotives, and defined longer-term Tier 4 standards. These standards cover line-haul locomotives >2,300 hp, switcher locomotives >2,300 hp, and all passenger locomotives. A summary of the locomotive standards that affect port operations is provided in Table 4.17 (for switch locomotives) and Table 4.18 (for line-haul locomotives), below:

Table 4.17: 2008 USEPA Switch Locomotive Standards

<table>
<thead>
<tr>
<th>Locomotive Group</th>
<th>Date</th>
<th>DPM (g/hp-hr)</th>
<th>NOx (g/hp-hr)</th>
<th>HC (g/hp-hr)</th>
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</thead>
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<td>Remanufactured Tier 0</td>
<td>2008 as available; 2010 required</td>
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</tr>
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<td>Remanufactured Tier 1</td>
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<td>11.00</td>
<td>1.20</td>
</tr>
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<td>2008 as available; 2013 required</td>
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<td>0.10</td>
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<td>New Build Tier 4</td>
<td>2015</td>
<td>0.03</td>
<td>1.30</td>
<td>0.14</td>
</tr>
</tbody>
</table>

31 http://www.epa.gov/OMS/locomotv.htm#2008final
In addition to engine standards, starting in 2008, idle controls are to be phased in on all locomotives (covering all tiers).

While significant, these adopted engine standards were not as aggressive as the ports had been informed that they would be at the time of the original CAAP development. Therefore, implementation schedules in measures RL2 and RL3 have changed in this update to the CAAP.

**Measure Description**

Through implementation of regulatory and contractual mechanisms already in place, this measure ensures introduction of cleaner switchers and long haul locomotives for port operation. Under the CARB MOU, the Class 1 rail operators are moving forward aggressively with engine and locomotive replacements to meet the required Tier 2 fleet average by 2010. As required under the USEPA rule, at the time of major engine servicing, Tier 2 locomotives must be rebuilt to meet the Tier 3 standards. This requirement will become effective as soon as a Tier 3 kit is available, but no later than 2013. Given the typical time between major servicing for locomotives, it is assumed that the entire fleet of Tier 2 locomotives will be rebuilt to Tier 3 standards by 2023.
The ports will seek more stringent standards for Class 1 rail operations in the future (e.g. Tier 4 fleet average) through providing comments on any potential revisions to the MOU between CARB and the rail operators. In addition, the ports will work with the Class 1 rail operators as needed through the Technology Advancement Program to help fund and demonstrate the use of new cleaner locomotive technologies, such as early development of a retrofit kit to allow Tier 2 locomotive engines to meet Tier 3 standards.

**Implementation Plan**

Implementation of this measure will be through the requirements of the MOU between CARB and the Class 1 rail operators, and implementation of the USEPA rule establishing engine standards for locomotives.

**Air Quality Benefits**

**Benefits to Date**

The air quality benefits associated with this measure to date result from the use of ULSD, idle reduction, and phase-in of new, cleaner, locomotives in preparation for the 2010 Tier 2 fleet average deadline, as required by the CARB MOU. The emissions reductions are reflected in ports’ emissions.

**Future Benefits**

By 2013, fleet wide reductions of 38% DPM, 41% NOx, and 99% SOx will be achieved from on-port and off-port line haul operation and off-port switching operations. Replacement of an average off-port line haul operations from 2005 levels to Tier 2 levels will result in a 35% reduction in DPM and a 38% reduction in NOx. Replacement of an average on-port line haul operations from 2005 levels to Tier 2 levels along with idle restriction will result in a 41% reduction in DPM and a 43% reduction in NOx. A 99% reduction of SOx emissions for line haul locomotives is due to switching from high sulfur fuel with average sulfur content of 1,915 ppm in 2005 to ULSD with sulfur content of 15 ppm.

**Financial Costs**

At this time there are no anticipated port-related costs associated with the control measure other than administrative costs and demonstration projects which will be covered by the TAP budget.
Upcoming Milestones

1. Meet and work with representatives of the Class 1 rail companies to identify opportunities to accelerate emissions reductions from the locomotives that operate at the ports.

   Schedule: Meetings with the Class 1 railroads began in late 2007 and are still ongoing.

2. Provide input on any federal, state or local action to regulate, or any reach agreement with the Class 1 rail companies on a new MOU, to seek to accelerate emissions reductions from rail operations.

   Schedule: Ongoing.

3. The benefits of this program will be quantified and reflected in the annual updates to the ports’ emissions inventories.

   Schedule: Ongoing.

Elements to be Tracked

Specifically for progress on the RL2 measure, fleet information will be tracked through annual emissions inventory updates and the demonstration projects will be tracked through the TAP. In addition, CARB tracks compliance with the MOU.

Looking Forward

Requiring compliance with the new, more stringent USEPA’s Tier 3 and 4 locomotive emission standards should prove to be an effective strategy for reducing locomotive emissions. The ports will encourage the early introduction of these locomotives at the earliest opportunity. The ports will seek more aggressive requirements that will expedite the deployment of these new, lower emitting locomotives into port service through any potential update to the Class 1 railroad MOU with CARB or any future regulatory actions.
4.5.3 Measure Number RL3
Measure Title: New and Redeveloped Near-Dock Rail Yards
This measure focuses on new and redeveloped near-dock rail facilities located on port properties. These facilities are intended to be utilized for intermodal operations. The goal of this measure is to incorporate the cleanest locomotive, CHE, and HDV technologies into near-dock rail operations. This measure will be implemented as an element of near-dock rail projects, in support of CARB’s goals for emission reductions from locomotives statewide. The performance standards for these rail yards include:

- By 2020, with the assistance of the ports’ regulatory agency partners and in concert with CARB’s stated goals, the ports will support achievement of the goal of accelerating the natural turnover of the line-haul locomotive fleet resulting in a state-wide fleet comprised of at least 95% Tier 4 locomotive engines.
- Idling restrictions
- Use of ULSD or alternative fuels
- Clean CHE and HDVs
- Evaluation of new cleaner technologies

Initiation Year: Dependant on schedule for any new or redeveloped rail yard projects.

Key Milestone Dates: To be determined through any new or redeveloped near-dock rail yard projects.

Criteria Pollutant Reduction: Not quantifiable at this time.

GHG Impact: Minor GHG reductions possible due to increased fuel efficiency of new locomotives, and reduced idling. Not quantifiable at this time.

Initial Implementation Strategy: Regulatory Agency Strategies, Incentive Funding, Lease Requirements, & CEQA

Background
As described in Measure RL2, Class 1 rail operations in the California are subject to the requirements of the 1998 and 2005 MOUs between the Class 1 rail operators and CARB. In addition, locomotives nationwide are also subject to the requirements of the USEPA locomotive engine standards adopted in 2008. While these requirements will help to reduce the emissions from rail operations, additional emissions reductions are necessary to meet state and regional attainments needs.
In September 2009, CARB adopted their “Staff Recommendations to Provide Further Locomotive and Railyard Emission Reductions”\(^\text{32}\), which identified several high priority near-term strategies for reducing emissions from locomotive operations in California, as well as long-term strategies, including providing support for the ports “to accelerate the turnover of cleaner Tier 4 line-haul locomotives serving port properties as expeditiously as possible following their introduction in 2015, with the goal of 95% Tier 4 line-haul locomotives serving the ports by 2020.”

Emissions from rail operations are a significant contributor to localized health risk. The ports' future estimates of the health risk in specific areas near rail facilities indicate that locomotive emissions could be a dominant factor driving health risk in those locations. Therefore, aggressive action is needed to reduce those impacts, achieve the ports’ San Pedro Bay Standards, and meet the CARB statewide goals. Emissions from Tier 4 line-haul locomotives are over 70% lower than Tier 2 line-haul locomotives. Therefore, a transition to a Tier 4 fleet will provide significant emissions reduction benefits.

Meeting the goal of a 95% Tier 4 fleet by 2020 will be a significant challenge. The rail companies operate a national line-haul locomotive fleet. Dedicating a smaller population of cleaner locomotives to a specific geographic region presents logistical challenges, however the Class 1 rail companies have been able to demonstrate that some prioritization of specific locomotives to a certain area is possible through their compliance with the 1998 MOU conditions.

For the rail lines to dedicate a fleet of cleaner locomotives to service the ports, it is estimated by CARB and SCAQMD that approximately 750 locomotives would be required to be directed to the ports from the national fleet. Since Tier 4 locomotive engines aren’t required by USEPA to be manufactured until 2015, this will require that the rail companies make a significant investment in Tier 4 locomotives after 2015 and dedicate the majority of those purchases to port service.

The cost to purchase a dedicated port locomotive fleet is significant, at approximately $3 million per locomotive (50% higher than the cost of Tier 2 locomotives) or $2.25 billion. A portion of these locomotive upgrades are likely to occur as part of the normal fleet turnover, however additional costs are anticipated above normal turnover for the rail companies to provide a port fleet and still meet the equipment needs for other regions.

If the rail lines must dedicate Tier 4 locomotives to statewide service in California, according to CARB Staff Recommendations document, the rail companies would need approximately 4,800 Tier 4 locomotives as a subset of the national fleet at an estimated cost of $15 billion.

\(^{32}\) http://www.arb.ca.gov/railyard/ted/drftrec090909.pdf
**Measure Description**

The goal of this measure is to achieve significant reductions in locomotive emissions through the accelerated turnover of the existing locomotive fleet to newer, lower emitting models. The ports will work with regulatory agencies: USEPA, CARB and SCAQMD toward the goal of achieving a line-haul and switcher locomotive fleet with an emissions equivalent of 95% Tier 4 compliant engines operating within the ports, and state-wide, as expeditiously as possible.

Achieving this goal will require a significant investment by the rail companies and will likely require significant funding assistance from the regulatory agencies. This goal cannot likely be achieved without a coordinated effort by all parties, including regulatory strategies by the agencies, cooperation by the rail companies, and assistance at the local level on individual rail yard projects.

While the goal is for a 95% Tier 4 fleet by 2020, the ports, in any environmental documents for upcoming rail yard projects, will use a minimum performance standard of an emissions equivalent of at least 50% Tier 4 line-haul locomotives and 40% Tier 3 line-haul locomotives to be operating on port properties by 2023 for the purposes of the environmental analysis. This minimum performance standard will be incorporated into the project analysis and will therefore establish a minimum threshold to be achieved, which may be above what would be required strictly based upon identified impacts in the environmental analysis.

Following approval of the environmental analysis for any new or modified near-dock rail yard, the ports or the joint powers authority (JPA) will enter into lease negotiations with the proposed rail operator. Through this process, the ports will make every feasible effort to implement requirements that will achieve the 95% Tier 4 line-haul locomotive goal by 2020.

Rail facilities include many emission-producing activities for switcher and long-haul locomotives, including switching, idling, loading/unloading of railcars by CHE, and drayage of containers to and from the rail yard. Under this measure, new rail facilities, or modifications to existing rail facilities, will incorporate clean, low emitting equipment for all operations. A list of such technologies will be provided for project proponents to consider in developing new facilities, and choices will be formalized in project approvals and lease requirements. The initial expectations for cleanest rail yard technologies include the following:

- By 2007, all Class 1 switcher locomotives, and by 2008, all line-haul locomotives, will maximize the use of ULSD fuels by refueling with only ULSD fuel in California.
- By 2010, all Class 1 switching and line-haul locomotives will restrict idling to no more than 15-minutes, through the use of idling shut-off devices, or equivalent.
- By 2010, the fleet average for Class 1 switching and line-haul locomotives will be an emissions equivalent of the USEPA Tier 2 emissions standards.
- By 2011, with co-funding through the ports’ Technology Advancement Program (TAP), demonstrate the use of a technology with the goal of reducing emissions from
a Tier 2 line-haul locomotive to achieve an emissions equivalent of at least a Tier 3 line-haul locomotive standard.

- By end of 2015 all Class 1 switcher locomotives operating on port property will meet USEPA Tier 4 off-road standards.
- Class 1 helper locomotives will be turned off while on port properties. If, for safety reasons, helper locomotives need to be on then they will meet similar controls as line-haul locomotives.
- By 2020, goal for 95% of Class 1 line-haul locomotives entering the ports to meet Tier 4 standards. For environmental analysis purposes, analyze that at a minimum, by 2023, Class 1 line-haul locomotives entering the ports will meet an emissions equivalent of 40% USEPA Tier 3 line haul locomotive standards and 50% Tier 4 line haul locomotive standards.
- New and modified rail facilities will, at a minimum, be subject to the conditions of CHE measure CHE1, and will have provisions requiring service by clean trucks as defined by measure HDV1.

Commercial availability of Tier 4 locomotive engines in 2015 that fully meet USEPA emission standards (1.3 g/bhp-hr NOx and .03 g/bhp-hr PM) is essential to achieving both the minimum performance standard and advancing toward the goal of 95% Tier 4 by 2020. To that end, the ports will conduct a Tier 4 technology development status review in 2012 and 2014, or participate in technology status evaluations by USEPA and/or CARB, to benchmark research and development, prototype testing, product compliance with standards, manufacturer production plans and procurement forecasts by the Class 1 railroads. Participants in the status review will include, at minimum, the ports, rail companies, agency partners and engine manufacturers. All review findings and recommendations will be documented and presented to each port’s Board. Participation in a technology review and agreement to meet to negotiate on terms that could strengthen or augment the minimum performance standard would be required as a commitment into any near dock rail yard lease subject to RL3.
Further, the ports’ plan is to maximize the use of on-dock rail as an effective way to limit emissions associated with operation of on-road trucks and rail yards near residential areas. Several factors affect use of on-dock rail, such as: shipper and steamship line logistics (transloading, transportation costs, etc.), railroad operations (equipment availability, train schedules, and steamship line contracts/arrangements), terminal operations/congestion, and on-dock rail yard capacity. To accommodate projected increases in intermodal traffic and maximize rail movement of cargo, greater efficiencies in on-dock rail operations, and additional rail infrastructure will need to be planned by the ports. Consistent with such goals, the ports have plans to increase the on-dock rail capacity in the ports, and also to construct additional rail infrastructure and trackage outside the marine terminals to better connect the on-dock rail yards with the Alameda Corridor. This additional rail capacity is important to maximize the use of the Alameda Corridor, and consequently reduce truck trips. The ports have maximized the size of planned/proposed on-dock railyards and support rail infrastructure via detailed master planning (which includes detail container terminal and rail system computer modeling/simulation), preliminary engineering, and final design for some of the infrastructure.

Some of the rail infrastructure improvements can be constructed within the existing land area to increase capacity. Capacity of the existing on-dock rail yards can also be increased through expanded hours of operations and improved efficiency in operational procedures. However, these physical improvements and operational changes may not be sufficient to accommodate the long-term growth forecasts of both ports. Existing rail yards will need to be made more efficient and expanded, and new yards will need to be evaluated and planned to minimize their impacts on communities. The existing rail yards cannot be expanded without additional land area and it is important to note that although rail yard expansions are needed in the face of projected cargo volumes, there is also a practical limit to the total size of on-dock rail facilities.

The ports will take all opportunities to maximize on-dock rail, and explore any other alternatives, in order to (1) reduce the need for truck drayage and (2) minimize the need for rail yard operations outside of the ports that are in relatively close proximity to residential and other receptors. However, near/off-dock infrastructure is needed, in addition to on-dock rail, to accommodate intermodal containers. As on-dock rail becomes maximized, near-dock rail facilities could further increase the capacity of moving cargo out of the port-area by rail and limit the distance of truck drayage. The community impacts around these facilities require the cleanest technologies and operational controls. This is why the ports are proposing strict performance standards in this measure. In addition, the ports are also evaluating long term options. One of the major technology advancements being evaluated by the ports is development of a new zero emission container mover system, as discussed later in Section 4 of the CAAP, to move containers to near-dock rail yards in a manner that reduces the impacts on communities, fuel consumption, and the environment, while assuring that the lowest feasible percentage of discretionary cargo is drayed inland by trucks.
**Implementation Plan**

The ports’ mechanism for implementing these strategies with Class 1 rail operations is through the CEQA process and the discretionary project approval for new near-dock rail facilities or modifications to existing near-dock rail facilities. The requirements identified for those near-dock rail projects will apply at the project site, as well as on all port tracks. The ports will also continue to work closely with regulatory agencies and rail companies to support achievement of the overall goals to maximize Tier 4 locomotives statewide, through the technology development status review process outlined above, implementation of regulatory strategies, securing incentive funding, and through cooperative agreements.

**Air Quality Benefits**

The air quality benefits of this measure will accelerate the improvements to be gained from locomotive and CHE regulations and from the MOU between the Class 1 railroads and CARB.

**Benefits to date**

Because no new rail facilities have been developed, there have been no air emission benefits to date from this measure.

**Future Benefits**

Since the measure will affect new or modified rail facilities that have not yet been designed, estimating the level of emission reductions is not possible at this time. However, the measure will result in reduction of emissions of DPM, NOx, other criteria pollutants, and other diesel-related pollutants beyond what will be achieved by upcoming regulations and the railroad/CARB MOU. More efficient use of on-dock rail versus truck drayage, and other improvements that reduce fuel consumption, will also likely result in a decrease in greenhouse gas emissions.

**Financial Costs**

At this time there are no anticipated costs to the ports associated with this control measure.

**Costs to Date**

There have been no costs incurred to date in association with this measure.

**Future Costs**

At this time there are no anticipated future costs associated with this measure, but there may be TAP-related costs in the future associated with technology advancements sought under the measure.
Upcoming Milestones

1. The elements of this measure will be included in any new or modified rail facilities,

   **Schedule:** To be completed through EIR development; ongoing.

2. The benefits of this program will be quantified and reflected in the periodic updates to the ports’ emissions inventories.

   **Schedule:** Ongoing.

**Elements to be Tracked**

Specifically for progress on the RL3 measure, any new or redeveloped rail yard projects will be evaluated under CEQA and all project information will undergo public review. Tier 4 product availability in 2015 meeting USEPA emission standards will be tracked and documented through the structured technology review process described above, all locomotive fleet information will be tracked through annual emissions inventory updates, and demonstration projects will be tracked and reported through the TAP. In addition, CARB tracks compliance with the MOU.

**Looking Forward**

The ports will also continue to work with their agency partners, USEPA, CARB and SCAQMD, and will continue discussions with the Class 1 rail operators, to explore future opportunities to integrate cleaner locomotive into their operations as soon as they become available.

4.6 Construction Activity

In the 2006 CAAP, the ports committed to develop Best Management Practices (BMPs) for port-related construction activity. To meet this commitment, the Port of Los Angeles adopted its “Sustainable Construction Guidelines for Reducing Air Emissions” and the Port of Long Beach developed guidelines for reducing air emissions from construction operations. These BMPs will be evaluated on a project-specific basis and applicable practices will be incorporated into construction project contracts.

Below is a list of key BMPs common to both ports.

- All dredging equipment shall be electric powered.
- All ships and barges used primarily to deliver construction related materials to a construction site shall comply with the expanded VSR Program (12 knots from 40 nm).
- All category 1 and 2 engines in harbor craft used for construction projects must meet U.S. USEPA Tier 2 off-road marine engine standards.
- All on-road heavy-duty trucks must meet the requirements of the Clean Truck Program.
Off-road construction equipment must meet Tier 2 standards in the period prior to 12/31/2011, Tier 3 standards in the period between 1/1/2012 to 12/31/2014, and shall meet Tier 4 standards after 1/1/2015.

As applicable, off-road construction equipment shall be equipped with a CARB-verified Level 3 diesel emission control system.

Construction equipment idling is limited to five minutes when not in use.

Full compliance with SCAQMD Rule 403, Fugitive Dust, including an approved Control Plan is required.

It should be noted that there are provisions for certain exemptions, which are considered on a case-by-case basis.

Additional emissions control strategies are being explored. For example, the Port of Los Angeles is developing a concept that would include emission limits and controls in their bid packages. Bidders would receive a “calculator,” which they would fill out and submit with their bids. “Emissions calculators” may be developed prior to the bid solicitation package going public and would incorporate that project’s emissions limitations, control strategies applicable to construction equipment, and other limitations/specifications developed under the CEQA analysis. The calculator would be simplified to the extent that dredge/construction companies would not need to hire air quality expertise to fill out the calculator to determine whether their bid meets the specific project requirements. In addition, contract specification language would be developed and incorporated into the construction contracts stating the reporting, recordkeeping requirements, and penalties (should any requirement not be met).

4.7 Technology Advancement Program

Introduction

To ensure effective air pollution reduction strategies are commercially available to facilitate implementation of CAAP measures, the ports developed and are currently implementing the Technology Advancement Program (TAP). The purpose of the TAP is to identify and demonstrate new technologies or new applications for existing technologies that have significant potential to reduce air pollution emissions from the CAAP source categories and meet CAAP goals.

The TAP implementation process adopted by the ports is thoroughly outlined in the TAP Guidelines. TAP offers financial support for the demonstration of advanced technologies that: a) have a high probability of achieving significant reductions in criteria pollutants and CARB classified air toxic pollutants, specifically, DPM, NOx and SOx, and; b) are seeking verified technology status from CARB; and c) present a strong business case for future successful technology commercialization. In the simplest terms, the purpose of TAP is to add additional, effective air pollution reduction strategies to the CAAP “toolbox”.

The TAP’s primary focus is on the demonstration, verification, and commercialization of technologies that reduce criteria air pollutants from the major source categories identified in the CAAP. While TAP primarily focuses on technology demonstrations with a high potential to reduce DPM, NOx and SOx, the technologies demonstrated under TAP often reduce greenhouse gases (GHG) and fine particulate matter (i.e., particle sizes on the order of 2.5 micron in diameter or smaller). As a matter of practice, the reduction potential of GHG is considered in the evaluation for each technology proposed for TAP demonstration.

TAP Funding

Costs to Date

Table 4.19 summarizes TAP funding to date.

Table 4.19: Technology Advancement Program Funding to Date

<table>
<thead>
<tr>
<th>TAP</th>
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<th>2007</th>
<th>2008</th>
<th>Total</th>
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Future Costs

TAP is funded on an annual basis by both ports. The annual minimum contribution from each port is $1.5M. Port financial support of TAP is shown below in Table 4.20.

Table 4.20: Technology Advancement Program Future Funding

<table>
<thead>
<tr>
<th>TAP</th>
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As discussed in the TAP Guidelines, the ports maximize the effectiveness of TAP by leveraging the ports’ investment. As a policy, TAP funds a maximum of 50% of a project’s total cost. As noted in Table 4.20, TAP leverages the ports’ funding commitments with contributions from stakeholder agencies, including the USEPA Region 9, CARB, and SCAQMD. Co-funding contributions are also offered by the project proponents.
The original CAAP identified a funding commitment by each port over the five year CAAP planning period. The ports remain committed to the TAP and anticipate continued funding allocations in each port’s budget, which is adopted each year by the Boards of Harbor Commissioners, over the CAAP Update five year planning horizon.

**Advisory Committee**

TAP implementation is guided by the management and staff of the ports of Long Beach and Los Angeles, as well as by an Advisory Committee comprised of recognized experts from the CAAP agency partners, the USEPA Region 9, CARB, and SCAQMD. The Advisory Committee was established by invitation from the ports during the first quarter of 2007; a list of current Advisory Committee members is included in the TAP Annual Reports.

The Advisory Committee serves in an advisory capacity to the ports for screening, evaluating, and recommending meritorious projects. The Advisory Committee members also provide information related to co-funding from their agencies that could potentially be used to move projects toward implementation. In addition, the Advisory Committee members receive regular updates on the Technology Advancement projects being conducted in the ports. The Advisory Committee process also serves as the mechanism for member agencies and the ports to reach consensus on the level of emission reductions achieved by the candidate technologies undergoing evaluation.

**TAP Accomplishments**

TAP has met all milestones and exceeded goals originally established by the CAAP. These include: a) the development and publication of guidelines describing how the program will be implemented; b) formation of the TAP Advisory Committee; and c) evaluation, selection, and award of projects received under both the port-sponsored and unsolicited proposal elements of the TAP Guidelines. A description of TAP funded projects is included in the TAP annual reports.

**Additional Technology Pursuits**

In addition to the TAP, the ports are also supportive of other technology development and implementation efforts. The TAP’s primary focus is identifying, verifying, and preparing technologies for commercialization. Products that have already been proven technically feasible and commercially viable increase the ports’ options and allow the ports to be more aggressive in pursuing CAAP measure implementation. In certain cases, technologies have been pursued under separate and distinct technology implementation programs. Examples include the Port of Los Angeles’ electric Class 8 drayage truck program and the electrified rubber tired gantry crane projects at each port.

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34 http://www.cleanairactionplan.org/tech/default.asp
Additionally, other initiatives have been created to compliment the TAP, such as the Port Technology Development Center (PTDC). The PTDC assists companies, providing an “incubator” for their developing products that are in the concept or research and development stage and are not yet ready for the TAP. In addition, the PTDC provides support for companies that have moved beyond the TAP stage, but still need business assistance.

**Completed Milestones**

1. Develop guidelines for the TAP, which identify the program goals, and procedures for evaluating proposals.

   **Schedule:** Completed.

2. Establish an Advisory Committee comprised of representatives of the ports agency partners, USEPA, CARB and SCAQMD.

   **Schedule:** Completed.

**Upcoming Milestones**

1. Publish TAP Annual Report, including a budget review, ongoing project status and any program revisions or updates.

   **Schedule:** End of first quarter of 2009, annually thereafter.

2. Upon completion of a TAP project, post information on the results of the project to the CAAP website.

   **Schedule:** Upon completion of TAP projects.

3. Update the TAP Guidelines as needed to continually improve program implementation.

   **Schedule:** Updates to occur as needed.
Looking Forward
While the Technology Advancement Program will continue to seek emission reductions from all source categories identified in the CAAP, the current programmatic and technical TAP priorities are as follows:

- Expand outreach to port tenants, industry groups, and equipment operators regarding the TAP opportunity as well as other available grant funding opportunities, including but not limited to those offered by the SCAQMD and USEPA;
- Increase coordination and the level of communication with other domestic and world ports regarding to air quality improvement technologies and the potential for inclusion in the Clean Air Action Plan;
- Streamline TAP implementation and identify strategies to improve the efficiency of reviewing candidate technologies and processing proposals;
- Partner with TAP Advisory Committee member agencies, other agency stakeholders, and project proponents in an effort to leverage TAP funding and maximize program effectiveness.

4.8 Emissions Inventory Improvements

The ports will continue to identify opportunities to improve the accuracy of key monitoring and tracking elements used in development of the ports’ emissions inventories. The emissions inventories are the ports measurement tool for evaluating and reporting on progress toward meeting the San Pedro Bay Standards. Therefore, it is important that this measurement tool be as accurate as possible.

Emissions inventory improvements potentially include:

- Scrutinizing emissions factors and conducting source testing to improve the accuracy of emissions loading for port-related sources;
- Evaluating duty-cycles/load factors through increased use of data logging to improve their accuracy;
- Determining OGV actual speeds from 20 to 40 nautical miles from Point Fermin using the enhanced radar system identified in OGV-1;
- Evaluating the use of Automatic Identification System (AIS) data into the emissions estimates for OGVs;
- Inclusion of ultrafines in the emissions inventories when emissions estimating methodologies are approved;
- Evaluating direct data uploads to the emissions inventory database to facilitate data gathering;
- Evaluating critical highway speed data to better improve the accuracy of HDV emissions estimates;
- Updating the origin destination study used to estimate truck routing; and
Discussions with OGV engine manufacturers to evaluate their test data and understanding of the emissions profiles of their engines at different loads and determine if improvements can be made to better represent what the engines are producing (emissions) at various loads encountered during transit and maneuvering.

4.9 Zero Emission Container Movement Systems

The ports’ Technology Advancement Program is focused on the development and implementation of near-term emission reduction technologies. In a separate effort, the ports are also exploring longer-term solutions for cleaner movement of cargo.

Activities Near the Port Complex

Over the past several years, the ports have been evaluating various Zero Emission Container Movement Systems (ZECMS) for potential application at the ports. The short term goal is to determine if ZECMS are feasible for the ports and if so, demonstrate innovative technologies that can be utilized for more efficient and greener movement of cargo. The ultimate goal is to handle the anticipated cargo throughput growth with pollution-free technologies and strategies.

In June 2007, the ports of Long Beach and Los Angeles embarked upon an evaluation of ZECMS from the port complex to near-dock rail facilities. The evaluation included a preliminary assessment and a technical review of various alternatives. Fourteen alternative container movement systems were evaluated including linear induction motor systems, magnetic levitation container conveyor systems, electric freight shuttle systems, elevated monorail systems based upon people-mover technology, and wheeled shuttle cars operating on guideways. The results of the evaluation were published in May 2008.

On June 3, 2009, the Port of Long Beach, in collaboration with Port of Los Angles and the Alameda Corridor Transportation Authority (ACTA), issued a Request for Concepts and Solutions (RFCS) to potential vendors, system integrators, and investors, which outlined the goals and requirements of a ZECMS Project to move containers between docks and the International Container Transfer Facility near West Long Beach, potentially eliminating thousands of daily short-haul diesel truck trips and reducing air pollution. The following conditions apply to the Project:

1. The proposed Project is intended to support the necessary movement of containers between the port terminals and existing and proposed near-dock rail facilities. The Project is not intended to diminish or replace on-dock rail loading at the marine terminals.

2. The system will compete with trucking to the near-dock rail facilities; it is assumed that the ports would not ban trucks from transporting cargo to the near-dock rail facilities.

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3. The respondents were required to assume that the Project would be a stand-alone project that would be financed without contribution or subsidy from the ports or ACTA.

The purpose of the RFCS was to (a) determine the technical and financial viability of available ZECMS technologies submitted by each respondent and the feasibility of employing that technology for completion of the Project; (b) evaluate the capabilities of each respondent’s management teams to provide and present detailed design criteria and construction capability for a possible future RFQ/RFP for the Design, Build, Finance, Operate, and Maintenance (DBFOM) of a ZECMS Project; and (c) assess the respondent’s current financial plan for funding the Project at no net cost to the ports, including operating costs for a proposed long-term leasehold initiative for the ZECMS Project and respondent management teams.

The submission deadline for the ZECMS RFCS was October 23, 2009; seven responses were received. It is estimated that the RFCS submittal evaluation could be completed in early 2010. This RFCS is the first step in a potential multi-step program for project development, which could possibly include a future Request for Qualifications and a Request for Proposals to be issued by ACTA.

The RFCS for the ZECMS sets in motion a process leading to achieving air quality, safety and congestion goals in the communities surrounding the ports, and may eventually result in a more expansive regional system in the future. This project is a logical first step that not only has the potential for stand-alone benefits, but also can be used as a proving ground for the new technology.

Other Related Planning Activities in the Region
The ports continue to coordinate with the efforts by other regional organizations with interest in this area, including ACTA, the Gateway Cities Council of Governments (COG), the Southern California Association of Governments (SCAG), Caltrans and Los Angeles Metro. For instance, to support the preparation of the I-710 Corridor EIR/EIS, studies of market, technology assessment, system requirements, and engineering feasibility were completed in early and mid-2009. The ports and ACTA participated in these efforts, and provided input accordingly.

For the I-710 EIR/EIS, the various technologies evaluated in the ports’ ZECMS study were narrowed down to two families of alternative technologies: automated fixed-track/guideway systems (e.g., maglev) and electric/battery (zero emission) trucks. In light of the property requirements and cost for deployment of an automated fixed-guideway technology on the ports and intermodal rail facilities, a concept which entails the propulsion of electric/battery trucks was developed. This technology would interface with ports and rail terminals as conventional trucks do today, but would operate on a dedicated guideway subject to controls that safely optimize capacity. Such a technology does not exist as a commercial product today, but would incorporate characteristics of a range of existing freight and passenger technologies. Trucks powered by electric motors could draw wayside electric power on the line-haul segment and operate on battery power at the ports and intermodal rail facilities. Individually-

operated electric trucks would interface with existing container handling systems and would not otherwise consume limited capacity at either the ports or intermodal rail facilities.

The alternative technology (or ZECMS) and project alternatives screening analyses for the I-710 corridor yielded an alternative (to be carried forward for further detailed analyses) that consist of an exclusive freight movement corridor (truck lanes) that can accommodate conventional trucks as well as the aforementioned electric/battery-powered trucks. This alternative will assume design and usage of the freight movement corridor by zero emission trucks. This technology would include, but not be limited to, battery powered trucks as well as trucks powered by overhead electrical lines, linear induction motor or linear synchronous motor systems (or other concepts), or future zero emission technologies to be developed designed as part of the Freight Movement corridor. The design of the freight corridor will also assume possible future conversion, or initial construction, as feasible, (which may require additional environmental analysis and approval) of a fixed track guideway family of alternative technologies (e.g. Maglev).

The I-710 EIR/EIS funding partners (which includes the ports) will continue to encourage the goods movement industry to explore different options for Advanced Technology for ZECMS that can serve the minimum required future container volumes to be moved in the Freight Movement lanes using a fixed track guideway family of alternative technology systems as an initial element of the project, or as a future option with zero emission trucks (or zero emission transportation methods to move trucks) assumed at this time. New ZECMS concepts or methods that are adequately developed or demonstrated by other agencies or others in the future may be considered for subsequent analysis as part of a supplemental environmental report (including other alignments) to be prepared in the future for application and effects for the I-710 Corridor Project.

In addition, the SCAG will soon commence a study titled “Comprehensive Regional Goods Movement Plan and Implementation Strategy”. This study will include a conceptual plan for ZECMS between the north end of the I-710 Corridor and the eastern boundary of the SCAG region.

Finally, in January 2008, the City of Los Angeles created a “High Speed Transit” Joint Powers Agreement (JPA) with the cities of Ontario and West Covina to implement a 54-mile high-speed initial operating segment (IOS), initially for passengers, between West Los Angeles, Union Station, West Covina, and the Ontario Airport. The IOS is envisioned to be part of a larger regional system that would connect to: LAX, the Burbank Airport, San Bernardino County, and the ports of Los Angeles and Long Beach. This larger system is contained in the SCAG 2008 RTP. The assumed connection to the ports of Los Angeles and Long Beach is via the I-710 Corridor. The JPA effort would rely upon the I-710 Corridor EIR/EIS and SCAG study to identify any connection to the POLB/POLA.
4.10 Infrastructure and Operational Efficiency Improvement Initiatives

This initiative identifies projects at the San Pedro Bay ports that improve infrastructure and operational efficiencies that also have an air quality benefit. The types of projects that are included in this element of the Clean Air Action Plan are generally initiated primarily as transportation or operational improvements; however, an air quality benefit does result from completing these projects. Projects examples include, but are not limited to:

- Grade separations
- OCR/RFID gates at terminals
- Terminal cargo handling/configuration efficiency improvements
- Evaluation of other potential operational efficiencies approaches that would reduce emissions associated with the port-related source categories

The emissions reduced from these projects would be quantified and reported under this measure. This initiative will most likely be undertaken by the same group and structure as the Technology Advancement Program.

4.11 The Port of Los Angeles’ China Shipping Settlement

The City of Los Angeles Harbor Department (Harbor Department) joined environmental and Harbor-area community groups in a settlement agreement in 2003 and amended in 2004 that included a series of environmental programs designed to improve the area’s air quality and quality of life. As part of this Amended Stipulated Judgment, the Harbor Department has committed $29 million over five years to pay for air quality mitigation projects that reduce diesel particulate and oxides of nitrogen (NOx) emissions from port operations in the communities of Wilmington and San Pedro. This program is known as the Air Quality Mitigation Incentive Program (AQMIP). The primary purpose of this program is to provide financial incentives to assist in the implementation of projects that will accomplish two objectives: (1) reduction of diesel particulate and NOx emissions associated with port operations in the communities of San Pedro and Wilmington, and (2) research and development of specific technologies that can be applied in the San Pedro Bay Port area to achieve the first objective.

The final round of AQMIP funding was awarded in 2009 and there will be no additional monies deposited into the fund.
A wide range of projects were awarded on a variety of port equipment for this program, including repowers, retrofits, after-market technologies and new engine purchases for the following categories:

- On-road heavy-duty vehicles
- Off-road heavy-duty equipment and engines
  - Specialty port equipment (i.e., top-pick, side-pick, yard hostlers, etc.)
  - Construction equipment
  - Marine engines and equipment on ships (ocean-going vessels and line-haul tugs) that regularly call at the Port
  - Marine engines and equipment on tugs and harbor craft
- Research and development (R&D), including technology demonstrations.

To date, the implemented projects have resulted in the reduction of over 21 tons per year of particulate matter emissions and over 588 tons per year of NOx emissions.
SECTION 5: CAAP EFFECTIVENESS TRACKING

Background
The original CAAP was published in November of 2006, prior to the establishment of the San Pedro Bay Standards detailed in Section 2 of this CAAP update. At the time of adoption, the effectiveness of the plan was estimated based on forecasted growth of uncontrolled emissions as compared with forecasted growth of controlled emissions after implementing CAAP measures and applicable regulations. In Section 3.3 of the original CAAP, the ports identified several methods for tracking and measuring CAAP progress which included the annual emissions inventory updates.

In the original CAAP, the 2005 emissions were based on the 2001 POLA and 2002 POLB OGV and HDV emissions grown to 2005, and the draft 2005 CHE emissions from both ports. It is important to note that the CAAP was released prior to publishing of the 2005 emissions inventories, and only the draft 2005 CHE emission estimates were available at that time. Rail and harbor craft emissions were not included because of uncertainties in both fleet characteristics and control strategy implementation. Estimated controlled and uncontrolled emissions were forecasted for the years 2007, the first year of CAAP measure implementation, through 2011. Controlled emissions in the original CAAP were estimated with the application of CAAP measures and regulations adopted through May 2005. Uncontrolled emissions were forecasted with adopted regulations through May 2005, but without the effects of CAAP measures. The original comparisons of controlled and uncontrolled emissions have been widely publicized in the media, and it is commonly quoted that the CAAP will reduce 2011 DPM emissions by 47%, NOx emissions by 45%, and SOx emissions by 52%.

Since the publication of CAAP, there have been a number of developments in regulatory programs and inventory updates. Specifically, CARB has adopted several aggressive regulations controlling port-related sources. Also, the 2005 emissions inventories for both ports have been published along with updates in 2006, 2007, and 2008. Finally, with this CAAP Update, the San Pedro Bay Standards are established based on out-year emissions changes compared to the 2005 baseline of actual emissions from both ports.

Therefore, the original comparisons of controlled to uncontrolled emissions within each outer year, based on preliminary baseline information and adopted regulations through May 2005, are no longer applicable. However, for completeness, a detailed evaluation of the CAAP’s progress against the original comparisons is provided in Appendix C.
2009 CAAP Update Effectiveness
Now that the San Pedro Bay Standards have been established, ongoing CAAP progress and effectiveness will be measured against these Standards which consist of the following reductions as compared to the 2005 published inventories:

- Health Risk Reduction Standard: 85% reduction by 2020
- Emissions Reduction Standard:
  - By 2014, reduce emissions by 72% for DPM, 22% for NOx, and 93% for SOx
  - By 2023, reduce emissions by 77% for DPM, 59% for NOx, and 92% for SOx

Both of these Standards are represented as a percentage reduction from the total published 2005 Emissions Inventories, based on grown activity and control measures that includes all five source categories, not just the original three source categories used in the original CAAP. The San Pedro Bay Standards are developed based on the published 2005 emissions, grown to 2014 and 2023 using the 2007 San Pedro Bay cargo forecast, and controlled with CAAP measures and applicable regulations.

The following sections present the CAAP’s effectiveness with respect to the San Pedro Bay Standards based on the 2005 published inventory methods and 2007 San Pedro Bay cargo forecast. Reductions in future year emissions are compared to the 2005 CAAP baseline.

5.1 Emissions Reduction Standard Progress

As stated above, one of the primary goals of the CAAP is to reduce mass emissions associated with port-related operations. For this CAAP Update, progress is determined by applying the 2005 published inventory methods to applicable years. It is, however, the intention of the ports moving forward to track the CAAP’s effectiveness and progress through annual updates to both ports’ published emissions inventories using the latest emissions estimating methodologies, activity data, and assumptions, which are reviewed by the Technical Working Group. With each new inventory publication, there is a detailed discussion on what improvements have been made to the emissions estimation methodology from the previous year. Port activity from previous years is then re-modeled using the latest methods and assumptions.

It is important to note that when updating emission estimating and forecasting methodologies and assumptions, the absolute values of the mass emissions numbers may change when the previous activity data is run using the new method. However, as long as all years are modeled in the same manner, it is the difference in emissions between the modeled and baseline year that is important since the Standards are stated as percent reductions over the baseline. Modeling all years with the same methods and assumptions allows for apples-to-apples comparison of annual emissions and the effectiveness of the CAAP, while incorporating the latest methodologies and data.
In the annual inventory updates completed since the 2005 published inventory, the 2005 baseline emissions have changed due to improved methodologies and assumptions across all five source categories. However, these changes have been modest.

The following two subsections present the progress to-date and the projected future benefits from the implementation of the CAAP and applicable regulations.

5.1.1 Progress to Date
To be consistent with the methods used in the emissions forecasting for the Standards, the progress to date for this CAAP update is shown based on the 2005 inventory methods and assumptions. Accordingly, for determining progress to date for this CAAP update, actual annual activity data for 2006 through 2008 from both ports were modeled using the 2005 methodology and assumptions to develop comparable emissions for these years. Tables 5.1 to 5.3 show the normalized estimates of emissions by source category for calendar years 2005 through 2008. Figures 5.1 through 5.3 present the 2005 baseline emissions and the year to year percent change in emissions with respect to the 2005 baseline emissions. This is different from those in the published annual inventories where previous years’ activities are modeled with the latest methods to update the emission estimates.
Table 5.1: Emissions by Calendar Year and Source Category Using the 2005 EI Methodology (DPM in tons/year)

<table>
<thead>
<tr>
<th>Category</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>1,206</td>
<td>1,283</td>
<td>811</td>
<td>870</td>
</tr>
<tr>
<td>HC</td>
<td>68</td>
<td>60</td>
<td>60</td>
<td>59</td>
</tr>
<tr>
<td>CHE</td>
<td>114</td>
<td>115</td>
<td>109</td>
<td>90</td>
</tr>
<tr>
<td>Rail</td>
<td>100</td>
<td>119</td>
<td>108</td>
<td>75</td>
</tr>
<tr>
<td>HDV</td>
<td>567</td>
<td>647</td>
<td>607</td>
<td>505</td>
</tr>
<tr>
<td>Total</td>
<td>2,054</td>
<td>2,224</td>
<td>1,696</td>
<td>1,599</td>
</tr>
</tbody>
</table>

% Cumulative Reduction: -8% 17% 22%

Figure 5.1: DPM Reductions - Progress to Date

As presented above, by 2008 the ports were nearly a third of the way to meeting the 2014 DPM Emission Reduction Standards.
### Table 5.2: Emissions by Calendar Year and Source Category Using the 2005 EI Methodology (NOx in tons/year)

<table>
<thead>
<tr>
<th>Category</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>13,094</td>
<td>13,949</td>
<td>12,664</td>
<td>10,985</td>
</tr>
<tr>
<td>HC</td>
<td>2,263</td>
<td>2,146</td>
<td>2,187</td>
<td>2,095</td>
</tr>
<tr>
<td>CHE</td>
<td>3,727</td>
<td>4,250</td>
<td>3,926</td>
<td>3,104</td>
</tr>
<tr>
<td>Rail</td>
<td>2,985</td>
<td>3,428</td>
<td>3,011</td>
<td>2,469</td>
</tr>
<tr>
<td>HDV</td>
<td>12,327</td>
<td>13,743</td>
<td>12,121</td>
<td>11,206</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34,396</strong></td>
<td><strong>37,515</strong></td>
<td><strong>33,909</strong></td>
<td><strong>29,859</strong></td>
</tr>
<tr>
<td><strong>% Cumulative Reduction</strong></td>
<td>-9%</td>
<td>1%</td>
<td>13%</td>
<td></td>
</tr>
</tbody>
</table>

### Figure 5.2: NOx Reductions - Progress to Date

As presented above, the ports were nearly two-thirds on the way to meeting the 2014 NOx Emission Reduction Standard in 2008 and nearly a third of the way to meeting the 2023 Emission Reduction Standard.
Table 5.3: 2005 Emissions by Calendar Year and Source Category Using the 2005 EI Methodology
(SOx in tons/year)

<table>
<thead>
<tr>
<th>Category</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>12,940</td>
<td>13,677</td>
<td>9,123</td>
<td>9,767</td>
</tr>
<tr>
<td>HC</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CHE</td>
<td>31</td>
<td>46</td>
<td>42</td>
<td>41</td>
</tr>
<tr>
<td>Rail</td>
<td>173</td>
<td>218</td>
<td>101</td>
<td>17</td>
</tr>
<tr>
<td>HDV</td>
<td>87</td>
<td>71</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>13,243</td>
<td>14,013</td>
<td>9,279</td>
<td>9,836</td>
</tr>
</tbody>
</table>

% Cumulative Reduction

-6% 30% 26%

Figure 5.3: SOx Reductions - Progress to Date

As presented above, by 2008 the ports were over a quarter of the way to meeting the SOx Emission Reduction Standards.
As stated above, each year the ports update their annual emissions inventories utilizing the latest emission estimating methods, data, and assumptions, and compare the resulting emissions estimates to the 2005 CAAP baseline (this is the primary method for tracking CAAP progress). The approach and findings are reviewed by the TWG. In Section 9 of the POLA Emissions Inventory reports, the comparison includes the current year, the previous year and the 2005 baseline, using the activities from each year, modeled with the current year’s methodology and assumptions. POLB provides a similar comparison in Section 8 of their Emissions Inventories. POLB’s inventory compares the current year’s emissions with the 2005 baseline emissions, based upon the activity data for each year and using the current year’s methodology and assumptions.

5.1.2 Projected Future Benefits

In order to determine the projected benefits from the CAAP and applicable regulations, emissions are forecasted through 2013 based on the 2005 emissions inventory assumptions and the 2007 San Pedro Bay cargo forecast, consistent with the forecasting that was used to establish the San Pedro Bay Standards. Comparing the forecasted out-years to the 2005 baseline provides the projected benefits from 2009 through 2013. Benefits for 2005 through 2008 are based on the actual annual activity and the 2005 inventory methodology.

It should be noted that cargo forecasts vary along with changes in the financial markets. The 2007 San Pedro Bay cargo forecast used to establish the San Pedro Bay Standards was developed and published before the market collapse and ensuing recession and was based on previous year’s cargo throughput changes. However, the forecasted volumes for 2007 through 2009 have not been realized at the ports. In fact, all the ports on the U.S. west coast have experienced significant cargo reductions during those two years due to the massive reductions in international trade volumes. The 2007 cargo forecast utilized for development of the Standards projected that the ports would continue to experience steady growth and reach cargo capacity (over 42 million twenty-foot equivalents (TEUs)) by 2023. In actuality however, the TEUs at the San Pedro Bay ports were flat in 2007 and reduced in 2008 and 2009. Therefore, the forecasted emissions presented in this section should not be considered definitive as they are subject to change to reflect updated cargo forecasts. These forecasts will be updated with each CAAP Update to reflect new forecast information.

Tables 5.4 through 5.6 present the projected benefits of the CAAP measures and applicable regulations. Figures 5.4 through 5.6 present the 2005 baseline and the year to year percent change in the magnitude of emissions with respect to 2005 for the San Pedro Bay ports.
Table 5.4: Actual and Forecasted DPM Emissions & Benefits Using the 2005 EI Methodology

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DPM, tons</strong></td>
<td>SAAD</td>
<td>FAD</td>
<td></td>
<td></td>
<td>FAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OGV</td>
<td>1,206</td>
<td>1,283</td>
<td>811</td>
<td>870</td>
<td>847</td>
<td>457</td>
<td>448</td>
<td>342</td>
<td>348</td>
</tr>
<tr>
<td>HC</td>
<td>68</td>
<td>60</td>
<td>60</td>
<td>59</td>
<td>70</td>
<td>71</td>
<td>72</td>
<td>71</td>
<td>60</td>
</tr>
<tr>
<td>CHE</td>
<td>114</td>
<td>115</td>
<td>109</td>
<td>90</td>
<td>88</td>
<td>77</td>
<td>73</td>
<td>63</td>
<td>50</td>
</tr>
<tr>
<td>Rail</td>
<td>100</td>
<td>119</td>
<td>108</td>
<td>75</td>
<td>107</td>
<td>105</td>
<td>114</td>
<td>123</td>
<td>132</td>
</tr>
<tr>
<td>HDV</td>
<td>567</td>
<td>647</td>
<td>607</td>
<td>505</td>
<td>428</td>
<td>114</td>
<td>123</td>
<td>62</td>
<td>70</td>
</tr>
<tr>
<td>Total</td>
<td>2,054</td>
<td>2,224</td>
<td>1,696</td>
<td>1,599</td>
<td>1,540</td>
<td>825</td>
<td>829</td>
<td>660</td>
<td>659</td>
</tr>
<tr>
<td><strong>DPM Reductions Compared to 2005, ton</strong></td>
<td>SAAD</td>
<td>FAD</td>
<td></td>
<td></td>
<td>FAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OGV</td>
<td>0</td>
<td>-77</td>
<td>394</td>
<td>335</td>
<td>359</td>
<td>748</td>
<td>757</td>
<td>864</td>
<td>858</td>
</tr>
<tr>
<td>HC</td>
<td>0</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>-3</td>
<td>-3</td>
<td>-4</td>
<td>-3</td>
<td>8</td>
</tr>
<tr>
<td>CHE</td>
<td>0</td>
<td>-1</td>
<td>5</td>
<td>24</td>
<td>26</td>
<td>37</td>
<td>41</td>
<td>51</td>
<td>64</td>
</tr>
<tr>
<td>Rail</td>
<td>0</td>
<td>-20</td>
<td>-9</td>
<td>24</td>
<td>-7</td>
<td>-5</td>
<td>-14</td>
<td>-23</td>
<td>-32</td>
</tr>
<tr>
<td>HDV</td>
<td>0</td>
<td>-80</td>
<td>-40</td>
<td>62</td>
<td>139</td>
<td>453</td>
<td>444</td>
<td>505</td>
<td>497</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>-170</td>
<td>358</td>
<td>455</td>
<td>514</td>
<td>1,229</td>
<td>1,225</td>
<td>1,394</td>
<td>1,395</td>
</tr>
</tbody>
</table>

Based on Actual Activity Data
Based on Forecasted Activity Data

Figure 5.4: DPM Baseline & Forecasted Benefits
As presented on the previous page, with additional CAAP measures coming on line, the ports' 2008/2009 OGV fuel switch incentive program, CARB's OGV fuel switch regulation implemented in mid-2009, and the Clean Truck Program, it is anticipated that the reduction trend through 2008 will continue and sharpen slightly. By 2012, the ports are anticipated to be close to achieving their 2014 DPM emissions reduction Standard. Though significant progress has been made, significant challenges remain to achieve the goals.

Table 5.5: Actual and Forecasted NOx Emissions & Benefits Using the 2005 EI Methodology

<table>
<thead>
<tr>
<th>NOx, tons</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>13,094</td>
<td>13,949</td>
<td>12,664</td>
<td>10,985</td>
<td>14,386</td>
<td>14,086</td>
<td>13,939</td>
<td>13,903</td>
<td>14,125</td>
</tr>
<tr>
<td>HC</td>
<td>2,263</td>
<td>2,146</td>
<td>2,187</td>
<td>2,095</td>
<td>2,114</td>
<td>2,130</td>
<td>2,054</td>
<td>1,912</td>
<td>1,695</td>
</tr>
<tr>
<td>CHE</td>
<td>3,727</td>
<td>4,250</td>
<td>3,926</td>
<td>3,104</td>
<td>3,736</td>
<td>3,219</td>
<td>3,159</td>
<td>2,791</td>
<td>2,298</td>
</tr>
<tr>
<td>Rail</td>
<td>2,985</td>
<td>3,428</td>
<td>3,011</td>
<td>2,469</td>
<td>2,986</td>
<td>2,903</td>
<td>3,149</td>
<td>3,395</td>
<td>3,642</td>
</tr>
<tr>
<td>HDV</td>
<td>12,327</td>
<td>13,743</td>
<td>12,121</td>
<td>11,206</td>
<td>14,108</td>
<td>10,339</td>
<td>10,766</td>
<td>4,189</td>
<td>4,511</td>
</tr>
<tr>
<td>Total</td>
<td>34,396</td>
<td>37,515</td>
<td>33,909</td>
<td>29,859</td>
<td>37,331</td>
<td>32,676</td>
<td>33,068</td>
<td>26,191</td>
<td>26,270</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOx Reductions Compared to 2005, tons</th>
<th>Based on Actual Activity Data</th>
<th>Based on Forecasted Activity Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>0 -855</td>
<td>430</td>
</tr>
<tr>
<td>HC</td>
<td>0 118</td>
<td>77</td>
</tr>
<tr>
<td>CHE</td>
<td>0 -523</td>
<td>-199</td>
</tr>
<tr>
<td>Rail</td>
<td>0 -443</td>
<td>-26</td>
</tr>
<tr>
<td>HDV</td>
<td>0 -1,416</td>
<td>206</td>
</tr>
<tr>
<td>Total</td>
<td>0 -3,120</td>
<td>487</td>
</tr>
</tbody>
</table>

Table 5.5 (continued)

<table>
<thead>
<tr>
<th>NOx Reductions Compared to 2005</th>
<th>Based on Actual Activity Data</th>
<th>Based on Forecasted Activity Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>0% -7%</td>
<td>3%</td>
</tr>
<tr>
<td>HC</td>
<td>0% 5%</td>
<td>3%</td>
</tr>
<tr>
<td>CHE</td>
<td>0% -14%</td>
<td>-5%</td>
</tr>
<tr>
<td>Rail</td>
<td>0% -15%</td>
<td>-1%</td>
</tr>
<tr>
<td>HDV</td>
<td>0% -11%</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>0% -9%</td>
<td>1%</td>
</tr>
</tbody>
</table>

April 2010
As presented above, it is anticipated with implementation of the CAAP measures, including the vessel speed reduction (VSR) program, shore-power, and the Clean Truck Program (CTP), the ports are on target with meeting the 2014 NOx standard. Increased participation in VSR out to 40 nm, increased use of shore power (or equivalent technologies) at berth and introduction of new control technologies on existing and new build OGVs will significantly help in meeting the 2023 NOx emissions reduction standard. Additionally, continued fleet turnover in other source categories will also contribute to NOx reductions. The increase in emission levels in 2009 is a manifestation of the cargo forecast compared to the actual cargo throughputs in the preceding years. Finally, the decrease in NOx emissions in 2009 is less than 2007 and 2008 because uncontrolled emissions for that year are based on the higher estimated growth from the 2007 cargo forecast, whereas controlled emissions in 2007 and 2008 reflect the actual decline in growth that occurred during those years.
### Table 5.6: Actual and Forecasted SOx Emissions & Benefits Using the 2005 EI Methodology

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOx, tons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OGV</td>
<td>12,940</td>
<td>13,677</td>
<td>9,123</td>
<td>9,767</td>
<td>9,210</td>
<td>4,469</td>
<td>4,492</td>
<td>1,711</td>
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<tr>
<td>HC</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>CHE</td>
<td>31</td>
<td>46</td>
<td>42</td>
<td>41</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Rail</td>
<td>173</td>
<td>218</td>
<td>101</td>
<td>17</td>
<td>26</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>HDV</td>
<td>87</td>
<td>71</td>
<td>11</td>
<td>9</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>13,243</td>
<td>14,013</td>
<td>9,279</td>
<td>9,836</td>
<td>9,254</td>
<td>4,491</td>
<td>4,515</td>
<td>1,736</td>
<td>1,800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOx Reductions Compared to 2005, tons</th>
<th>Based on Actual Activity Data</th>
<th>Based on Forecasted Activity Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>0 -737</td>
<td>3,817 3,173</td>
</tr>
<tr>
<td>HC</td>
<td>0 11</td>
<td>11 11</td>
</tr>
<tr>
<td>CHE</td>
<td>0 -14 -11 -9</td>
<td>25 25 25 24</td>
</tr>
<tr>
<td>Rail</td>
<td>0 -45 71 156</td>
<td>147 170 169 169</td>
</tr>
<tr>
<td>HDV</td>
<td>0 16 76 78</td>
<td>76 75 75 74</td>
</tr>
<tr>
<td>Total</td>
<td>0 -770 3,965 3,408</td>
<td>3,989 8,752 8,728 11,508 11,444</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOx Reductions Compared to 2005</th>
<th>Based on Actual Activity Data</th>
<th>Based on Forecasted Activity Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGV</td>
<td>0% -6% 29% 25%</td>
<td>29% 65% 65% 87% 86%</td>
</tr>
<tr>
<td>HC</td>
<td>0% 88% 88% 88%</td>
<td>87% 87% 87% 87% 87%</td>
</tr>
<tr>
<td>CHE</td>
<td>0% -46% -35% -30%</td>
<td>82% 81% 80% 79% 77%</td>
</tr>
<tr>
<td>Rail</td>
<td>0% -26% 41% 90%</td>
<td>85% 98% 98% 98% 98%</td>
</tr>
<tr>
<td>HDV</td>
<td>0% 18% 88% 89%</td>
<td>87% 86% 86% 85% 85%</td>
</tr>
<tr>
<td>Total</td>
<td>0% -6% 30% 26%</td>
<td>30% 66% 66% 87% 86%</td>
</tr>
</tbody>
</table>

### Figure 5.6: SOx Baseline & Forecasted Benefits

![SOx Baseline & Forecasted Benefits](image-url)
As presented on the previous page, with the implementation of additional CAAP measures, the ports’ 2008/2009 OGV fuel switch incentive program and CARB’s OGV fuel regulation implemented in mid-2009, it is anticipated that the high rate of SO\textsubscript{x} reductions will continue in the coming years. The slight erosion of SO\textsubscript{x} reductions from 2007 and 2008 was due to the injunction of the previous CARB OGV fuel rule in 2008. The plateau in 2009 is a manifestation of the cargo forecast. The ports are anticipated to be close to achieving their 2014 and 2023 SO\textsubscript{x} emissions reduction standards by 2012. Significant challenges however remain with closing the final gap and sustaining these reductions.

5.2 Health-Risk Reduction Standard Progress

As discussed in Section 2, the effectiveness of the CAAP’s control measures and applicable regulations with respect to the population-weighted Health Risk Reduction Standard can be correlated to mass emission reductions in DPM from the 2005 baseline, as DPM emissions reductions track closely with reductions in DPM health risk. Since the Standard was based on geographically allocated forecasted DPM emissions, reductions in DPM mass emissions associated with CAAP measures and applicable regulations are therefore a representative surrogate for health risk reductions.

Progress to date and projected future benefits are determined by comparing the change in DPM mass emissions to the 2005 baseline. Figure 5.7 presents the progress to date and Figure 5.8 presents the projected future benefits anticipated from the CAAP and applicable regulations.

**Figure 5.7: Health Risk Reduction Benefits - Progress To Date Using the 2005 EI Methodology**

As presented above, by 2008 the ports were a quarter of the way to meeting the health risk standard, based upon the reduction in DPM emissions.
As presented above, with additional CAAP measures coming on line, the ports’ 2008/2009 OGV fuel switch incentive program, CARB’s OGV fuel switch regulation implemented in mid-2009, and the Clean Truck Program, it is anticipated that the reduction trend seen since 2006 will continue. Although it appears that the ports will be close to meeting the health risk reduction standard by 2013, closing the gap to achieve the Standard will be a significant challenge, since the remaining emission sources will be the hardest to mitigate.
SECTION 6: BUDGET SUMMARY

There are several funding sources associated with the implementation of the CAAP, including:

- Costs borne by the ports in developing required infrastructure improvements, funding incentives, implementation of control measures, and demonstrating new emission reduction strategies, and
- Costs borne by the industries/terminals affected by CAAP requirements, and
- Costs borne by regulatory agencies to fund grants and demonstration projects.

The CAAP is a tool developed expressly for the ports to implement comprehensive strategies that will reduce both health-risk and mass emissions associated with port operations. This budget section is a guide for the ports’ financial planning. Costs that need to be borne by the ports must be identified to ensure that the programs to be funded by the ports can be properly budgeted. Potential available funding from regulatory agencies is also included for planning purposes. Health care costs and industry costs are not the focus of this section.

Port funding to date is broken down by measure and presented in Table 6.1 for POLA and Table 6.2 for POLB.
Table 6.1: POLA Funding To Date

<table>
<thead>
<tr>
<th>Initiative</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>TOTAL</th>
</tr>
</thead>
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<td>$23,317,485</td>
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<tr>
<td>HDV2</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>OGV1</td>
<td>$0</td>
<td>$0</td>
<td>$1,400,000</td>
<td>$1,400,000</td>
</tr>
<tr>
<td>OGV2</td>
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<td>$17,072,800</td>
<td>$22,468,700</td>
</tr>
<tr>
<td>OGV3</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>OGV4</td>
<td>$0</td>
<td>$0</td>
<td>$354,000</td>
<td>$354,000</td>
</tr>
<tr>
<td>OGV5</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>OGV6</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>CHE1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>HC1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>RL1</td>
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<td>$2,500,000</td>
<td>$5,000,000</td>
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<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>RL3</td>
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<tr>
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<td>$0</td>
<td>$1,500,000</td>
<td>$1,500,000</td>
<td>$3,000,000</td>
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<tr>
<td>Recognition</td>
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<td>$5,000</td>
<td>$10,000</td>
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<tr>
<td>Eff. Imprv.</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$0</td>
<td>$9,400,900</td>
<td>$46,149,285</td>
<td>$55,550,185</td>
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Table 6.2: POLB Funding To Date

<table>
<thead>
<tr>
<th>Initiative</th>
<th>FY2006</th>
<th>FY2007</th>
<th>FY2008</th>
<th>TOTAL</th>
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</thead>
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<td>$15,585,307</td>
<td>$15,585,307</td>
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<td>HDV2</td>
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<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>OGV1</td>
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<td>$1,727,500</td>
<td>$1,834,600</td>
<td>$5,177,100</td>
</tr>
<tr>
<td>OGV2</td>
<td>$5,533,900</td>
<td>$6,313,100</td>
<td>$8,078,900</td>
<td>$19,925,900</td>
</tr>
<tr>
<td>OGV3</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>OGV4</td>
<td>$0</td>
<td>$0</td>
<td>$120,800</td>
<td>$120,800</td>
</tr>
<tr>
<td>OGV5</td>
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<td>$0</td>
</tr>
<tr>
<td>OGV6</td>
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<td>$0</td>
</tr>
<tr>
<td>HC1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>RL1</td>
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<td>$0</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>RL2</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>RL3</td>
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<tr>
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<td>$0</td>
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<td>$1,500,000</td>
<td>$3,000,000</td>
</tr>
<tr>
<td>Recognition</td>
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<td>$0</td>
<td>$5,400</td>
<td>$5,400</td>
</tr>
<tr>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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<td><strong>$12,040,600</strong></td>
<td><strong>$27,125,007</strong></td>
<td><strong>$48,814,507</strong></td>
</tr>
</tbody>
</table>

Significantly less port funding was needed by the CTP than originally estimated in the original CAAP since private industry funded a significant portion of the truck fleet turnover. It is estimated that private industry invested over $600 million for truck modernization.

In addition to the funding from the ports identified above, additional funding was provided by the agencies, mostly through the grant awards, or through co-funding of Technology Advancement Program projects. AQMD provided over $1.8 million in co-funding for four TAP projects and awarded a $3.2 million Carl Moyer grant for the PHL fleet replacement project. CARB provided $98 million through Prop 1B and awarded a Carl Moyer grant for a multi-district TAP project. USEPA awarded over $6 million through several DERA grants to the ports to upgrade terminal equipment and harbor craft and to support a TAP project to develop a hybrid yard hostler.
Through 2009, the financial contribution to the CAAP progress by each partnering agency was as follows:

- SCAQMD/Carl Moyer $5,028,625
- CARB/Carl Moyer $783,628
- USEPA TAP/DERA $375,000

Anticipated port funding for support of the CAAP from 2009 through 2013 is presented in Table 6.3 for POLA and Table 6.4 for POLB.

**Table 6.3: 2009 - 2013 POLA Future Budget Estimates**

<table>
<thead>
<tr>
<th>Initiative</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>HDV1</td>
<td>$59,457,232</td>
<td>$24,683,088</td>
<td>$2,398,030</td>
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<td>$0</td>
<td>$91,538,350</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$266,250</td>
</tr>
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<td>OGV1</td>
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<td>$3,000,000</td>
<td>$3,000,000</td>
<td>$3,000,000</td>
<td>$3,000,000</td>
<td>$13,900,000</td>
</tr>
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<td>$23,518,000</td>
<td>$18,500,000</td>
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<td>$0</td>
</tr>
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<td>$0</td>
<td>$0</td>
<td>$204,000</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>OGV6</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>CHE1</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
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</tr>
<tr>
<td>HC1</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>RL1</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<td>RL2</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>RL3</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>TAP</td>
<td>$1,500,000</td>
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<td>$1,500,000</td>
<td>$1,500,000</td>
<td>$1,500,000</td>
<td>$7,500,000</td>
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<td>$5,000</td>
<td>$5,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>Eff. Imprv.</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$66,263,019</td>
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<td>$33,023,000</td>
<td>$23,005,000</td>
<td>$194,548,387</td>
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</table>

186 \hspace{1cm} April 2010
### Table 6.4: 2009 - 2013 POLB Future Budget Estimates

<table>
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<tr>
<th>Initiative</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>HDV1</td>
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</tr>
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<td>$0</td>
<td>$0</td>
<td>$266,250</td>
</tr>
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<td>OGV1</td>
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<td>$3,950,000</td>
<td>$3,950,000</td>
<td>$3,950,000</td>
<td>$3,950,000</td>
<td>$19,750,000</td>
</tr>
<tr>
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<td>$0</td>
<td>$0</td>
</tr>
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<td>$0</td>
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<td>$90,000</td>
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<tr>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
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<td>$0</td>
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<td>$0</td>
</tr>
<tr>
<td>CHE1</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
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<td>$1,500,000</td>
<td>$1,500,000</td>
<td>$1,500,000</td>
<td>$7,500,000</td>
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<tr>
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<td>$25,000</td>
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<td>$0</td>
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<td>$62,488,500</td>
<td>$49,357,300</td>
<td>$256,002,150</td>
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</tbody>
</table>

As presented in the tables above, both ports have made strong financial commitments to ensure the success of the CAAP. The budget estimates are reviewed and updated each year to ensure the proper level of funding for the CAAP.

In addition to port funding, the regulatory agencies have also made commitments to provide funding contributions for ongoing implementation of the CAAP. AQMD provided co-funding for a TAP project. CARB awarded the ports $98,000,000 in Prop 1B bond funding for the implementation of the Clean Truck Program. USEPA awarded the Port of Long Beach $4,008,250 through a DERA grant award for tenant cargo handling equipment and harbor craft projects, and awarded a DERA grant to Port of Los Angeles in the amount of $1,639,250 for port tenant cargo handling equipment projects.
The commitments made to date are presented in Table 6.5.

Table 6.5: 2009 – 2013 Planned Contributions by Regulatory Agencies

<table>
<thead>
<tr>
<th>Agency</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
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<td>ND</td>
<td>ND</td>
<td>$8,508,750</td>
</tr>
<tr>
<td>CARB</td>
<td>$49,000,000</td>
<td>$49,000,000</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>$98,000,000</td>
</tr>
<tr>
<td>USEPA</td>
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<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>$5,647,500</td>
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<tr>
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<td>$0</td>
<td>$0</td>
<td>$112,156,250</td>
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</table>

Note: ND - Not Determined at this time

The ports will continue to seek additional funding from the agencies, as well as from other sources, into the future to assist the ports and the port industry with achieving the clean air goals of the CAAP.