



SAN PEDRO BAY PORTS
CLEAN AIR ACTION PLAN 2017

Draft Final
Clean Air Action Plan Update

JULY 2017

San Pedro Bay Ports
Clean Air Action Plan 2017
DRAFT Final

July 2017



To send written comments on the Clean Air Action Plan 2017 Draft Final, please email:

caap@cleanairactionplan.org

The comment period extends through September 18, 2017.

If you would like to request a meeting with CAAP staff or to schedule a presentation on CAAP 2017 for your organization, please email caap@cleanairactionplan.org.

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Preface

The Port of Long Beach and Port of Los Angeles (together, the “Ports”) hereby introduce the draft final Clean Air Action Plan (CAAP) 2017 Update, which will serve as high-level policy guidance for continued emission reduction activities in collaboration with industry stakeholders, local communities, environmental groups, and regulatory agencies for the next 20 years.

This Draft Final CAAP is the result of extensive public outreach that has taken place over the past two years and recent regulatory and statutory changes. Some of the strategies contained here may look different from the concepts proposed in the CAAP 2017 Update Discussion Document (Discussion Document) released on November 17, 2016. All strategies continue to support our aggressive march toward clean air for the community.

To refine or revise the specific strategies contained within the Discussion Document, the Ports engaged in stakeholder outreach that has included multiple small focused meetings as well as a large interactive public workshop that took place on October 14, 2015. Since the release of the Discussion Document, the Ports have held over 50 stakeholder meetings, conducted an interactive community workshop on January 24, 2017, drawing roughly 100 people, and received nearly 40 comment letters from industry, environmental, neighborhood, and regulatory organizations. A summary of comments received during the comment period are posted on the CAAP website at www.cleanairactionplan.org.

Additionally, these strategies have been guided by recent planning efforts, chief among them the California Sustainable Freight Action Plan, which also provides the framework for State and regional control strategies under the Clean Air Act; the South Coast Air Quality Management District (SCAQMD) 2016 Air Quality Management Plan (AQMP), approved by the SCAQMD Governing Board on March 3, 2017 and the California Air Resources Board (CARB) Governing Board on March 23, 2017; as well as regulatory and statutory changes that occurred following the release of the initial Discussion Document. These changes, which will be described later in more detail, have had a profound impact on some of the new proposed CAAP strategies, in some cases offering opportunities for more aggressive and focused actions, and in other cases, imposing greater constraints.

On June 12, 2017, Mayor Eric Garcetti of the City of Los Angeles and Mayor Robert Garcia of the City of Long Beach approved a joint declaration for creating a zero-emissions goods movement future – with ultimate goals of zero emissions for cargo handling equipment by 2030, and zero emissions for on-road drayage trucks serving the ports by 2035. In the declaration, the mayors made a commitment to continue focusing on advancing clean technologies to reduce emissions and combat climate change. They identified that the CAAP Update should include expansion of at-berth emission reductions, a pilot project to test zero-emission drayage trucks, establishment of a CAAP Implementation Stakeholder Advisory Group that would discuss and report on CAAP implementation progress as well as related energy projects, development of a

Green Ports Collaborative to advance similar goals with other climate mayors along the West Coast and throughout the nation, and finally a joint effort to secure funding to support necessary equipment purchases and infrastructure development. These goals have been captured in this Draft Final CAAP.

The Discussion Document provided a platform to develop the next steps and strategies that are outlined in this Draft Final CAAP. In order to finalize the CAAP, the Ports will seek additional input on the updated strategies to continue to work toward a shared vision of an economically competitive, efficient, and environmentally sustainable port complex.

Further, following finalization of CAAP 2017 Update, the Ports will continue to work with stakeholders throughout the development of specific programs and implementation of the strategies. It is vital that all stakeholders continue to work together if we are going to be successful in meeting these challenges.

Public Outreach

The strategies contained in this Draft Final CAAP have been shaped by more than two years of outreach and engagement with the goods movement industry, environmental groups, regulatory agencies, and the local communities. Unlike the outreach conducted for previous iterations of the CAAP, the Ports this time directly engaged and encouraged input from a broader set of stakeholders, including regulators, port operators and business users, community and non-governmental organizations (NGOs), energy suppliers, and technology developers.

Additionally, the Ports used a wide array of outreach strategies to encourage input. These strategies included small focus groups, presentations to business organizations and neighborhood groups, calls for formal comment letters, multiple meetings with two member subcommittees of the Board of Harbor Commissioners for each port, and several presentations to each Port's Board of Harbor Commissioners during which members of the public could make comments. Updates on CAAP progress and opportunities for community interaction were advertised through press releases, each Port's website, the CAAP website, Facebook, and Twitter. Also, the Ports held two public workshops – one on October 14, 2015, prior to the release of the Discussion Document, and the other on January 24, 2017 – that together drew nearly 200 people. During these workshops, which included Spanish translation, the Ports used small breakout sessions to drive more focused and detailed discussions on the proposed CAAP concepts, thus providing valuable focused input.

To date, the Ports have held nearly 50 meetings with more than 30 groups representing thousands of stakeholders. Following the release of the CAAP 2017 Update Discussion Document in November 2016, the Ports received more than 40 letters totaling hundreds of pages of comments from business groups, regulatory agencies, neighborhood and community organizations, and technology providers.

Based on this input, the Ports have refined – and in some cases, modified – the CAAP strategies originally presented in the Discussion Document. These changes are highlighted in the appendix.

Recurring Themes

The Ports received numerous comments on the concepts contained in the Discussion Document; these comments, including the actual letters received, are posted on the CAAP Web site. Several overarching themes emerged:

- Praise for the inclusion of zero-emissions deadlines for trucks and cargo-handling equipment.
- The timelines to transition to zero-emissions and cleaner equipment are too aggressive and do not give the industry enough time to plan or to recoup the useful value of its existing equipment.
- The Ports should consider additional interim targets for near-zero emissions vehicles and equipment and whether near-zero emissions constitutes an adequate end goal.
- The Ports need to highlight their community impacts and prioritize public health.
- The industry and the Ports will incur significant costs to implement the CAAP strategies.
- The strategies could adversely impact the San Pedro Bay port complex’s economic competitiveness and jobs.
- The infrastructure, such as charging stations or hydrogen fueling, is not in place to support zero-emissions vehicles or equipment.
- The Ports call for “feasibility assessments” to evaluate technological readiness, economic impacts, and operational considerations for zero-emissions equipment but do not provide detail on how these assessments will be conducted nor what constitutes “feasible.”
- Development of the CAAP must be transparent and inclusive of various stakeholders.

Response to Comments

The Ports have taken these comments seriously, and the strategies contained in this Draft 2017 CAAP Update – many of them revised or refined – reflect this input. Additionally, the Ports have responded to these comments by:

- Including more information in the Draft CAAP 2017 Update about public health and the community impacts associated with port operations
- Conducting new analyses and providing additional background to support the proposed CAAP strategies, as noted in each strategy section
- Developing new supporting documents in the accompanying “CAAP 2017 Update Supporting Documentation,” available on the CAAP Web site:
 - “Framework for Feasibility Assessments:” A description of the process to be used, components to be analyzed, and proposed methodologies to be employed

- in developing the feasibility assessments for trucks and cargo-handling equipment.
- “Preliminary Cost Estimates for Select 2017 Clean Air Action Plan (CAAP) Strategies:” An analysis of the potential costs associated with the CAAP as a plan, with more detailed cost analyses to come during implementation of specific strategies
 - “CAAP Strategies: Economic and Jobs Effects Discussion Paper:” A discussion of the potential economic and jobs impacts associated with the CAAP strategies
 - “Bay-Wide Ocean-Going Vessel International Maritime Organization Tier Forecast 2015-2050:” A forecast of the penetration of Tier 3 ships for various vessel types.
 - “Potential Emission Reduction Projections for Select CAAP Strategies:” A range of forecasted emission reductions for CAAP strategies related to trucks, cargo-handling equipment, and at-berth emissions where sufficient information exists to support such forecasts.

More details about how the Ports responded to comments for specific strategies can be found within the description of the respective strategy.

Recent Regulatory and Statutory Actions: Challenges and Opportunities

Since the release of the CAAP Discussion Document in late 2016, several state and regional actions have prompted the Ports to re-evaluate the original concepts for several source categories.

In some cases, these recent actions have aligned with the proposed CAAP strategies by identifying a process for developing statewide emission-reduction mandates for mobile sources. Those actions have allowed the Ports to focus our efforts on implementation and acceleration of these upcoming CARB regulations to support successful implementation and generate near-term reductions. In other cases, however, the actions imposed new constraints on the ability to control certain port-related sources. In those cases, the Ports modified the proposed CAAP strategy to reflect new realities while still pursuing emission reductions to the maximum extent possible.

The following actions have influenced the strategies in this CAAP Update document.

California Air Resources Board, 2016 State Strategy for the State Implementation Plan, Resolution No. 17-7. During the adoption of the State Implementation Plan in March 2017, the CARB Board directed its staff to take the following actions for Los Angeles Ports and Ports that

are in or adjacent to disadvantaged communities in the top 10% of those defined as most impacted by CalEnviroScreen:¹

- Within 18 months, develop At-Berth Regulation amendments that achieve up to 100% compliance by 2030
- Within 24 months, develop cargo-handling equipment regulations to achieve up to 100% compliance with zero-emissions vehicles by 2030

With the State moving ahead on more stringent regulations for at-berth emissions and zero-emissions cargo-handling equipment, it is appropriate for the Ports to defer to, and participate in, the rulemaking process in order to ensure we remain consistent with their approach. For that reason, the Ports are now proposing to focus our efforts on implementation and where possible acceleration of these regulations to facilitate compliance and generate emission reductions in the early years. This is entirely consistent with the approach used for the original 2006 and 2010 CAAP strategies, which relied on impending newly developed State regulations (Drayage Truck Rule, Shore Power Rule) and accelerated the compliance dates at the Ports, in an “early action” demonstration that promoted such regulations’ implementation to great success.

State of California Senate Bill 1 (SB 1), signed into law April 28, 2017. SB1 develops a funding mechanism for transportation infrastructure in California. Within the statute, however, is a prohibition on new requirements to replace, retire, repower, or retrofit heavy-duty trucks before the truck has reached the earlier of either 800,000 vehicle miles traveled or 18 years from the engine model year. The language does not prohibit voluntary incentive and grant programs, including, but not limited to, those that give preferential access to a facility to a particular vehicle or class of vehicles. SB1 also requires CARB by January 1, 2025, to evaluate the impact of the provisions of SB1 on efforts to meet state and local clean air goals.

The original CAAP Clean Truck Program (CTP) relied upon the power of the State of California CARB Drayage Truck Rule requiring all truck fleets at all ports and railyards throughout the state to turn over to 2007 US EPA compliant engines effective January 1, 2014. To motivate early voluntary truck industry action, the CTP offered millions in grants and incentives to help the trucking industry achieve early compliance by an advanced date of January 1, 2012. This strategy, together with a “dirty truck fee” disincentive for non-2007-compliant trucks, achieved a voluntary early fleet replacement by the industry several years in advance of state law.

As a result of SB1, CARB is prohibited from adopting regulations to require state truck fleet replacement sooner than the Truck and Bus Rule (which replaced the Drayage Truck Rule) that requires 2010 US EPA Truck standard by January 1, 2023, or to implement new requirements for replacement of trucks with engines that are 2010 model year or newer prior to the earlier of

¹ CalEnviroScreen is a science-based screening tool developed by the California Office of Environmental Health Hazard Assessment. It helps to identify California communities that are disproportionately burdened by many sources of pollution.

2028 or 800,000 miles. Therefore, unless and until CARB is able to adopt a new state truck standard required for port drayage trucks, the Ports are unable to follow our previous strategy of advancing a deadline of a new State truck regulation. Instead, in compliance with our jurisdiction and authority, the Ports are proposing a suite of actions to encourage acceleration of new trucks entering the fleet to meet the cleanest standards, including near-zero emissions and zero-emissions. The Ports also have bolstered the incentive-based strategies to promote voluntary turnover to cleaner technologies.

Indirect Source Rule or Alternatives, 2016 State Strategy for the State Implementation Plan, Resolution No. 17-7 and South Coast Air Quality Management District 2016 Air Quality Management Plan. As defined under the Clean Air Act, an indirect source is "...a facility, building, structure, installation, real property, road, or highway which attracts, or may attract, mobile sources of pollution..."²

During the adoption of the State Implementation Plan in March 2017, the CARB Board directed its staff to take the following action:

- Return to the Board with concepts for an Indirect Source Rule to control pollution from large freight facilities, including ports, railyards, warehouses, and distribution centers, as well as any identified alternatives capable of achieving similar levels of emission reductions.

The CARB Board direction appears to be similar to the Indirect Source Rule concept in SCAQMD's 2016 AQMP Measure MOB-01 Emission Reductions at Commercial Marine Ports which calls for a process to evaluate facility-based emission-reduction options for various freight-related operations, including indirect source rules. In the AQMP, the SCAQMD describes a collaborative working group process through March of 2018 that would determine what feasible actions could be taken to reduce pollution from freight facilities, including ports. This process could include an exploration of mechanisms other than rules to ensure emission reductions. If, however, the SCAQMD Board does not believe that adequate progress has been made under the voluntary program, it may pivot to rulemaking.

The agencies may attempt to apply an Indirect Source Rule to cap maximum emissions or activity at a freight facility, according to the "Facility Based Approach" described in CARB's April 2015 Sustainable Freight Pathways to Zero and Near-Zero Emissions Discussion Document.³

The Ports will be collaborating with CARB staff to provide input for their report to the CARB Board on this subject, just as the Ports have been collaborating with SCAQMD staff on their approach to the concept in working group meetings since the adoption of the 2016 AQMP.

² 42 U.S.C. § 7410(a)(5)(C)

³ <https://www.arb.ca.gov/gmp/sfti/sustainable-freight-pathways-to-zero-and-near-zero-emissions-discussion-document.pdf>, at pp 44-46.

Mindful of these efforts, the draft CAAP 2017 Update includes strategies that are feasible and within the purview of our legal and jurisdictional authority while meeting the objectives of the Ports' Boards of Harbor Commissioners, each City's Mayor, the regulatory agencies, and other stakeholders, to reduce emissions.

Next Steps

This Draft Final CAAP 2017 Update provides refinement to strategy concepts initially laid out in the Discussion Document. In some cases, stakeholder feedback, regulatory changes and new laws have resulted in modifications to the strategies.

The public has the opportunity to provide comments on the Draft Final CAAP 2017 Update until September 18, 2017. Written comments can be submitted to caap@cleanairactionplan.org.

In addition, the Ports will hold a public workshop on August 30, 2017 to provide additional opportunities for public comment.

Meetings will be announced through the CAAP website: www.cleanairactionplan.org. All interested stakeholders are encouraged to register on the CAAP website to receive the latest information and meeting notices. The Ports anticipate that the final CAAP will be considered for adoption by each Port's Board of Harbor Commissioners in November 2017.

Introduction

When the Port of Long Beach and Port of Los Angeles (Ports) first adopted the Clean Air Action Plan (CAAP) in 2006, we became world-wide leaders in efforts to reduce emissions associated with maritime goods movement. At the time, no other seaport complex in the world had attempted such a progressive and comprehensive program to reduce emissions from maritime goods-movement-related mobile sources, and even today, the CAAP remains the most successful seaport emission-reduction effort ever implemented.

Since 2005, San Pedro Bay port-related diesel particulate matter (DPM) has dropped 84%, nitrogen oxides (NO_x) are down 50%, and sulfur oxides (SO_x) have nearly been eliminated. The 2014 emission reduction and health risk goals that were voluntarily set in 2010 were met and exceeded. These reductions are a testament to the CAAP's cutting-edge strategies and the collaborative approach taken with the regulatory agencies and our industry partners to meet shared goals.

The unprecedented success of the CAAP would not have been achieved without the support of the maritime industry and the other stakeholders. Investments in new equipment by the maritime industry since the CAAP was adopted have been significant with nearly \$2 billion estimated to have been spent on cleaner trucks and cargo-handling equipment and strategies such as shore power for ships. The Ports do not own, operate, or contract for dispatch, any of the vehicles or equipment used in maritime goods movement-related activities and thus must work cooperatively with private operators to bring about environmental change. The emission reductions achieved over the past decade would not have occurred if not for their efforts.

Much has changed since the Ports adopted the original CAAP more than 10 years ago and even since the Ports updated the plan in 2010. The strategies outlined in the original CAAPs have been fully implemented or are well underway. Zero-emission technologies that once existed only in concept are increasingly becoming a reality. The Ports have engaged in Supply Chain Optimization efforts with a goal to improve efficiency in the freight system. Cleaner and more reliable sources of energy through energy planning activities by the Ports are also being pursued.

More importantly, through a multi-agency coordinated approach, the State of California (State) for the first time has defined a comprehensive multi-agency vision for cleaner goods movement through its Sustainable Freight Action Plan, which was finalized in July 2016. The Sustainable Freight Action Plan provides a long-term vision for the freight system and new targets to help the State meet its environmental, efficiency, and economic competitiveness goals over the next decade.

Although much progress has been made, the Ports recognize that additional work needs to be done to reduce the freight industry's impacts on local communities and to help the State and region meet their goals for air quality improvements and sustainable freight movement. As

stated in the Sustainable Freight Action Plan, “success will require government, industry, labor, and environmental and community leaders to stand together on this vision.”

The CAAP supports this vision by introducing specific emission reduction and efficiency improvement strategies that can be implemented locally to support the overarching goals and objectives outlined in the Sustainable Freight Action Plan. The CAAP also identifies the areas where significant investments will be needed, and the timelines for those investments, to inform upcoming funding allocation plans to be developed at the state and federal level.

About the CAAP

The CAAP is a plan that provides policy guidance to help the region achieve its clean air goals and to support the statewide vision for more sustainable freight movement. The proposed strategies in this iteration of the CAAP are some of our boldest yet, and they will require continued cooperation from the goods movement industry and our regulatory agency partners.

The approach outlined in the CAAP is different from previous CAAP efforts because the challenge is different. As articulated in the Sustainable Freight Action Plan, to become greener – and to support the ultimate goal of zero-emissions goods movement – the Ports must develop strategies that include the introduction of clean vehicles and equipment, infrastructure, freight efficiency and energy planning.

The CAAP supports this transformational shift in the way we think about sustainable port planning while preserving our longstanding commitment to improve air quality for our communities.

The Ports have identified near-term actions to produce air quality improvements within the next 3 to 5 years. These actions rely on accelerating the adoption of commercially available cleaner engine technologies and operational changes through incentives and new requirements. In parallel, the Ports are evaluating long-term strategies to be implemented over the next two decades and have defined a series of interim steps to lay the foundation for our ultimate goal – zero emissions. Strategies with specific actions and timelines for technology development, infrastructure planning, and fleet turnover help to lay the groundwork for our long-term vision of a clean maritime goods movement freight transport system.

The strategies contained in this Draft Final CAAP have been shaped by extensive outreach and engagement with the goods movement industry, environmental groups, regulatory agencies, and the local communities. Additionally, these strategies have been guided by recent planning efforts, chief among them the California Sustainable Freight Action Plan, which also provides the framework for State and regional control strategies under the Clean Air Act, the South Coast Air Quality Management District (SCAQMD) 2016 Air Quality Management Plan (AQMP), approved by the SCAQMD Governing Board on February 3, 2017, and the CARB Governing Board on March 23, 2017, as well as new regulations and statutes coming into play over the last year. Lastly, these strategies are informed by numerous technical documents, including the Ports' Zero Emissions Roadmap,⁴ separate efforts by each of the Ports, including the Port of Los Angeles Zero Emission White Paper⁵, and a series of technology assessments developed by the California Air Resources Board.⁶

⁴ <http://www.cleanairactionplan.org/documents/zero-emissions-roadmap-technical-report.pdf>

⁵ https://www.portoflosangeles.org/pdf/Zero_Emission_White_Paper_DRAFT.pdf

⁶ <https://www.arb.ca.gov/msprog/tech/report.htm>

In order to finalize the CAAP, the Ports will seek additional input on the updated strategies to continue to work toward a shared vision of an economically competitive, efficient, and environmentally sustainable port complex.

It is also important to note that the Ports' approach to achieving emissions reductions has always been, and will remain, to establish goals and provide flexibility to the operators on how they can best achieve those goals. The Ports are not mandating a particular technology pathway or a certain type of operation – we are technology-neutral, fuel-neutral, and operations-neutral. Through the Ports' Technology Advancement Program, we will continue to support and demonstrate a variety of technology options so there can be more tools in the toolbox. We understand that there are no "one-size-fits-all" solutions. The industry are the experts on their business operations and they are in the best position to identify the solutions that meet the goals, and at the same time, work best for their needs.

Background

On November 20, 2006, the Ports took an unprecedented joint action to improve air quality in the South Coast Air Basin by adopting the CAAP, a sweeping plan aimed at significantly reducing the health risks posed by air pollution from port-related mobile sources, specifically ships, trains, trucks, terminal equipment and harbor craft, such as tugboats.

The CAAP was a landmark air quality plan that established the most comprehensive, far-reaching approach to improve air quality in the Ports region and to reduce health risks from maritime goods-movement-related activities. The CAAP's success allowed the Ports to continue development, job creation, and economic activity while ushering in a suite of air emission-reduction strategies including the ports' Clean Trucks Program and a series of vessel programs.

The Technology Advancement Program (TAP), a CAAP initiative, is a collaborative partnership among the Ports, regulatory agencies, and industry partners, including shipping lines, terminal operators and the trucking industry. Through the TAP, the Ports fund the development and demonstration of promising emission-reduction technologies. Since its inception more than 10 years ago, TAP has become a catalyst for identifying, evaluating, and demonstrating new emissions reduction technologies for potential commercialization and deployment throughout the port complex to help achieve the CAAP goals. TAP has advanced cutting-edge technology in use today, such as pollution capture systems for ships at berth and hybrid-electric rubber-tired gantry cranes.

The Ports believe it is important to continuously update and improve upon the CAAP 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 2017 CAAP Update will be the third version of the CAAP.

Additionally, the CAAP is a plan that provides high-level policy guidance, and acceptance of the plan does not constitute approval to implement the individual strategies. Each Port's Board of Harbor Commissioners retains their respective jurisdiction and authority to approve these strategies to be implemented at each Port in future separate actions⁷, which would provide additional time for study, public participation and outreach, and refinement and consideration of the then-applicable facts and circumstances at the time of adoption.

Public Health – A Call to Action

Freight operations at the Ports generate toxic air emissions from ships, trucks, trains, tugboats, and terminal equipment, thus contributing to regional air quality issues and local health risk.

⁷ Future separate actions by the Boards include but are not limited to adoption of programs, budgets, incentives, grants, tariffs, contracts, leases, and CEQA mitigation in port project environmental impact reports (EIRs).

According to the Environmental Protection Agency, port-related air pollution can negatively impact public health by:⁸

- Aggravating respiratory and cardiovascular disease
- Reducing lung function
- Increasing the severity and frequency of respiratory symptoms such as coughing and difficult breathing
- Increasing susceptibility to respiratory infections
- Impacting the nervous system, including the brain
- Increasing the risk of cancer
- Contributing to premature death

Certain sensitive populations are especially susceptible to the effects of air pollution, such as children, senior citizens, people with chronic illnesses, and pregnant women. Children are particularly vulnerable to air pollution due to the fact that children's bodies, including their lungs, are still developing and their exposure is greater due to quicker breathing speeds and more active hours spent outdoors.⁹

Such health impacts drove the development of the original CAAP more than 10 years ago. Today, as a result of the CAAP and various state regulations that have since come into effect, the communities around the Ports have seen dramatic reductions in health risk and air pollution. Since 2005, port-related NO_x and SO_x have dropped by 50% and 97% respectively, according to the Ports emissions inventories. Even more, port-related DPM – which is linked to cancer risk and other adverse health effects – has plunged 84% during that time, significantly reducing the public health risk associated with port-related emissions faced by neighboring communities. Figure 1 approximates the reduction in port-related health risk since 2005.¹⁰

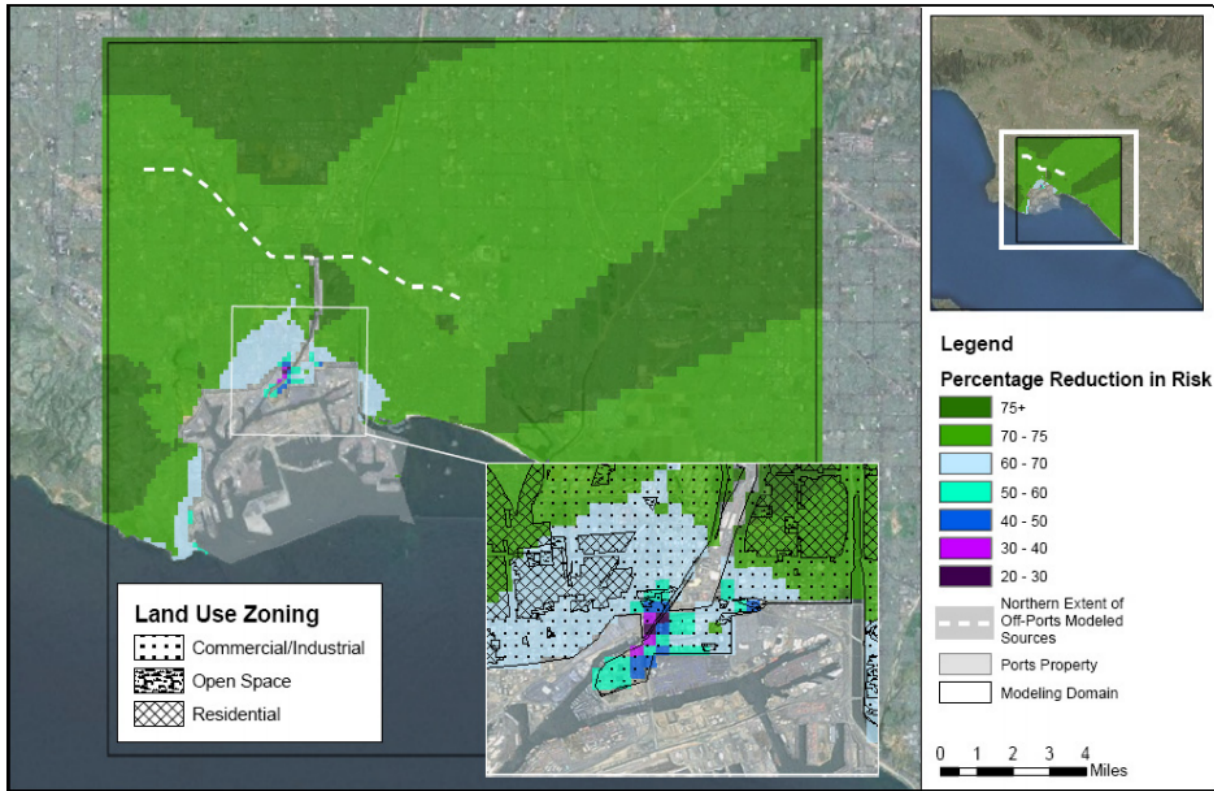
In fact, the area around the Ports has seen a greater decline in air-related cancer risk than Southern California as a whole. According to the South Coast Air Quality Management District's MATES-IV (Multiple Air Toxics Exposure Study), between 2005 and 2012, cancer risk near the Ports dropped 66% compared to a 56% reduction for the rest of the region, demonstrating the accelerated rate of progress and the success of our CAAP and other goods movement-related initiatives.

⁸ "Draft A Ports Primer for Communities." 2016. United States Environmental Protection Agency. <https://www.epa.gov/sites/production/files/2016-07/documents/420p16001.pdf>

⁹ "The Children's Health Study," 2015. California Air Resources Board. <https://www.arb.ca.gov/research/chs/chs.htm>

¹⁰ In 2009, the Ports conducted a Bay-wide health risk assessment tool (BWHRA Tool) to project health risk reductions as a result of CAAP strategies. The BWHRA Tool used DPM emissions for the baseline year of 2005, forecasted DPM emissions for 2020, and determined health risk reductions that would result from an 85% reduction in Ports-related DPM by 2020. The Ports have achieved an 84% reduction in DPM as confirmed by the 2015 Annual Emissions Inventories for each Port. Thus, it is appropriate to use the 2020 forecasted health risk results to characterize the current impact of Port-related activity on the neighboring community.

Figure 1: Percent Reduction in Diesel Particulate Matter-Related Health Risk Since 2005 for Ports Region Based on 85% Reduction in Emissions¹¹



Yet despite the improvements in air quality and health, more work needs to be done. Although health risk reductions have been significant, residents nearest the Ports still face higher pollution-related health risks than the rest of the Southern California population,¹² and most of the neighboring areas are classified as “disadvantaged” communities in the State of California’s CalEnviroScreen model.

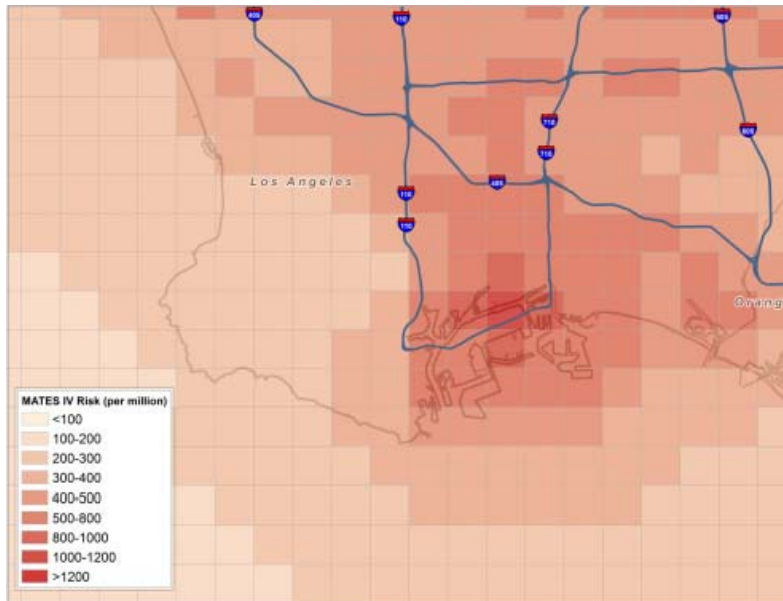
Health risk increases with proximity to the source of pollution, and as a result, communities closest to the Ports face greater public health impacts than those farther away. Figure 2 displays the high cancer risk near the Ports, according to MATES-IV.¹³

¹¹ San Pedro Bay Ports Final 2010 Clean Air Action Plan Update, <http://www.cleanairactionplan.org/documents/2010-final-clean-air-action-plan-update.pdf>

¹² “Multiple Air Toxics Exposure Study in the South Coast Air Basin, MATES IV.” 2012. South Coast Air Quality Management District. <http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7>

¹³ MATES-IV

Figure 2: Ports Area Simulated Air Toxic Cancer Risk, MATES IV, 2012



In addition to cancer risk, port-related air pollution contributes to other acute and chronic health effects. About 15% of children in Long Beach suffer from asthma compared to 9% of children in the United States.¹⁴ The City of Long Beach Community Health Assessment (July 2013) further reflects the health burden on communities surrounding the Ports. According to the assessment, in 2011, about 55,000 Long Beach residents suffered from asthma. In 2007, about 1,200 hospitalizations in Long Beach were due to asthma and Chronic Obstructive Pulmonary Disease (COPD), which is also linked to poor air quality. Asthma hospitalization rates are greater in West Long Beach near the Ports and the 710 freeway than in East Long Beach.

In communities near the Port of Los Angeles, including San Pedro, Wilmington, and the Harbor Gateway, asthma-related emergency department visit rates exceed the city average in half of the zip codes. The Los Angeles rate of asthma-related hospital visits is 39 per 10,000 residents; in at least one zip code in the Harbor Gateway, that rate rose to 72 visits per 10,000 residents.¹⁵ Hospitalizations result in significant direct costs such as medications and services, and indirect

¹⁴ "Health Statistics 2010." 2013. City of Long Beach Department of Health and Human Services. <http://www.longbeach.gov/health/media-library/documents/planning-and-research/reports/2010-health-statistics/2010-health-statistics/>

¹⁵ "Health Profiles – Harbor Gateway." Plan for a Healthy Los Angeles. <http://healthyplan.la/interactive/neighborhoods/#id=11>

costs including missed school and work. The average cost of an asthma-related hospitalization in 2010 according to the California Public Health Department was \$33,749.¹⁶

The South Coast Air Basin continues to be out of compliance with federal ambient air quality standards for ozone and particulate matter, pollutants correlated with breathing problems, exacerbation of asthma and other respiratory symptoms, and in the case of particulate matter, increased mortality due to cardiovascular or respiratory diseases.¹⁷ Goods movement-related sources generate roughly 40% of the NO_x emissions in the South Coast Air Basin, and although not all of these sources are tied directly to the San Pedro Bay port complex, the Ports recognize we have a responsibility to minimize our environmental and public health impacts.

With our community's health and quality of life at the forefront, the Ports offer our most aggressive CAAP yet.

¹⁶ "Strategic Plan for Asthma in California 2015-2018." 2015. The California Department of Public Health. https://www.californiabreathing.org/images/SPAC2014_7-28-15APR.PDF

¹⁷ "Final 2016 Air Quality Management Plan," South Coast Air Quality Management District. <http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp>

CAAP Goals

The State of California has established aggressive goals for more sustainable movement of goods to meet air quality and greenhouse gas reduction goals.

The Sustainable Freight Action Plan set the following targets for the goods movement sector:

- *For system efficiency:* Improve freight system efficiency 25 percent by increasing the value of goods and services produced from the freight sector, relative to the amount of carbon that it produces by 2030.
- *To transition to zero-emissions technologies:* Deploy over 100,000 freight vehicles and equipment capable of zero-emission operation and maximize near-zero-emission freight vehicles and equipment powered by renewable energy by 2030.
- *To address economic competitiveness:* Establish a target or targets for increased State competitiveness and future economic growth within the freight and goods movement industry.

Additionally, the State has set targets for reducing greenhouse gas emissions (GHGs) through Assembly Bill 32, subsequent executive orders and Senate Bill 32 as follows:

- By 2020, reduce GHGs to 1990 levels;
- By 2030, reduce GHGs to 40% below 1990 levels (Governor's Executive Order B-30-15 and Senate Bill 32);
- By 2050, reduce GHGs to 80% below 1990 levels (Governor's Executive Order S-3-05)

The cities of Los Angeles and Long Beach also have greenhouse gas reduction and sustainability goals. In 2015, the City of Los Angeles adopted the Sustainable City pLAN, which called for reducing GHGs to 45% below 1990 levels by 2025 and to 60% below 1990 levels by 2035 in addition to the governor's 2050 target. Additionally, the plan seeks to increase the percentage of Port-related goods movement trips that use zero-emissions technology to at least 15% by 2025 and 25% by 2035. The Mayor of Long Beach has signed on to the "Compact of Mayors," which requires cities to set greenhouse gas reduction targets and to address the impacts of climate change. These targets and actions are under development.

On June 12, 2017, the Mayors of the cities of Los Angeles and Long Beach publicly signed a joint declaration affirming the commitment to move toward zero emissions at the Ports, including setting goals of zero-emission cargo-handling equipment by 2030 and zero-emission drayage trucks by 2035. The Mayors committed to a CAAP that includes new investments in clean technology, expanded use of at-berth emission reduction technologies, and a zero-emissions drayage truck pilot program. The declaration also puts in place a CAAP Implementation Stakeholder Advisory Group to bring together key public and private industry stakeholders to advise the Ports on details of CAAP implementation and further ongoing operational efficiency programs to move towards zero emissions goods movement. The group will also report on

progress with CAAP implementation and related issues such as energy efficiency improvements, onsite renewable energy generation and energy storage. The declaration also called for the establishment of a Green Ports Collaborative to advance progress toward meeting shared goals for reducing emissions and protecting public health with other Climate Mayors along the West Coast and the nation. A core initiative of the collaborative will be to aggregate, demonstrate and create markets that grow the demand for zero emissions goods movement vehicles and equipment to encourage investments in vehicle development by manufacturers. Finally, the declaration emphasizes the need to work together to secure public and private funding to support the purchase of cleaner equipment and development of the infrastructure needed to meet the goals of the CAAP.

Although the specific actions and numeric targets vary, all of these goals strive to advance zero-emissions and low-carbon goods movement. The strategies in the CAAP support these larger goals by accelerating the development and deployment of zero-emissions technologies and cleaner equipment, improving freight efficiency, and undertaking long-term planning efforts to help our cities and State meet their sustainability goals.

For freight efficiency, the Ports have proposed to study concepts to speed the flow of cargo through the terminals, such as staging yards and off-dock chassis facilities; to explore systemwide efficiencies, such as intelligent transportation systems; and to reduce truck visit times with a universal portwide appointment system. Such strategies are expected to have positive benefits for air quality. The State has set a metric to measure freight efficiency that considers GHG emissions in relation to the value of the goods movement industry. To support that effort, the Ports will continue to report emissions per container moved in our annual emissions inventories and to measure the progress over time in reducing the amount of freight industry emissions generated while moving cargo.

Keeping the Ports economically competitive amidst this transition to more sustainable goods movement will be challenging. The Ports have raised various economic considerations in an accompanying document, "Economic and Workforce Considerations for the Clean Air Action Plan (CAAP) 2017 Update,"¹⁸ and these considerations must be taken into account as we move forward on implementing the CAAP 2017 Update strategies. The Ports intend to conduct more detailed analyses when setting rates and incentives for various strategies in an effort to ensure emission reductions while minimizing adverse economic impacts.

The bulk of the CAAP 2017 Update strategies, however, are designed to significantly advance the push toward zero emissions in support of the GHG reduction goals from the State and the Mayors of Long Beach and Los Angeles.

¹⁸ www.cleanairactionplan.org

To that end, the CAAP incorporates two new emission reduction targets:

- Reduce GHGs from port-related sources to 40% below 1990 levels by 2030
- Reduce GHGs from port-related sources to 80% below 1990 levels by 2050

In addition, the 2010 CAAP set emission reduction targets for 2014 and 2023 for diesel particulate matter, nitrogen oxides, and sulfur oxides, as compared to 2005 conditions:

- By 2014, reduce port-related emissions by 22 percent for NO_x, 93 percent for SO_x and 72 percent for DPM.
- By 2023, reduce port-related emissions by 59 percent for NO_x, 93 percent for SO_x and 77 percent for DPM.

The Ports have achieved the 2014 targets. The Ports' 2015 Emission Inventories report DPM reduced by 84%, NO_x by 50%, and SO_x by 97%. We are well on our way to achieving the 2023 targets.

The 2010 CAAP further established the following San Pedro Bay-wide health risk reduction goal, consistent with CARB's Goods Movement Reduction Plan goal, as compared to 2005 conditions:

- By 2020, reduce residential cancer risk from port-related DPM emissions by 85%

The initial CAAP also made reducing health risk from individual port development projects an important objective by setting an increment threshold of 10 in a million excess residential cancer risk for new projects. The Ports remain committed to management of health risk from individual port development projects as well as achieving the 2020 Bay-wide health risk reduction goal. The Ports are working with State, regional and local regulators and stakeholders to determine how continued reductions in emissions and an ever-improving baseline, and recent changes made by the State Office of Environmental Health Hazard Assessment to procedures for calculation of health risk, could affect the way these goals are evaluated by the Ports in the future. The Ports will continue to evaluate whether this health risk threshold should be modified on a case-by-case basis for future redevelopment projects.

The Ports also remain committed to the 2023 emission reduction targets set by the initial CAAP. The CAAP includes strategies designed to achieve the necessary emission reductions and maintain the progress we have achieved over the past 10 years. Continued progress in reducing DPM, NO_x and SO_x remains an ongoing priority for the Ports.

Finally, strategies to reduce GHGs often help to reduce criteria pollutants, an approach that has been embraced by state and regional air agencies; thus, the strategies put in place to achieve the 2030 and 2050 GHG reduction goals help us achieve our 2023 NO_x, DPM, and SO_x emission reduction targets and continue to make further progress. More importantly, the GHG reduction goals aligns with local, regional, and State mandates and commit the Ports to a long-term path toward sustainability and improved air quality.

Looking toward 2050, there are several unknowns that will affect future GHG emission levels. These unknowns include grid power portfolios; maritime industry preferences of power sources for ships, harbor craft, terminal equipment, locomotives, and trucks; advances in cargo movement efficiencies; the locations of manufacturing centers for products and commodities moved; and consumer concern about the carbon footprint of goods to be purchased. The key factors that have led to operational efficiency improvements to date are the cost of energy, current and upcoming regulatory programs, and the competitive nature of the goods movement industry. We anticipate these factors will continue to have an effect on GHG emissions in the foreseeable future.

In order to reach the targets of 40% reduction in GHG emissions in 2030 and 80% reduction in GHG emissions in 2050, compared to 1990 levels, the Ports will need to overcome tremendous challenges and will need to be prepared to address those challenges in new ways. The Ports will need a long-term vision and a coordinated, collaborative effort with both the industry and the regulatory agencies to realize the needed emission reductions from these sources.

Strategies

The CAAP strategies are aligned to the broad actions identified in the Sustainable Freight Action Plan:

1. Clean Vehicles and Equipment Technology and Fuels
2. Freight Infrastructure Investment and Planning
3. Freight Efficiency

Energy resource planning, which is a critical part of the path to zero-emissions, falls under “freight infrastructure investment and planning” in the Sustainable Freight Action Plan. Due to the importance of energy infrastructure and supply for implementing the CAAP actions, the Ports are identifying energy planning as its own action:

4. Energy Resource Planning

With a health risk reduction goal for 2020 and emission reduction goals for 2023, 2030, and 2050, the Ports will require near- and long-term approaches to achieve our goals.

In the next few years, there is still a need to develop and demonstrate the zero- and near-zero-emissions technologies that will be critical to helping us reduce emissions in the long term. Where cleaner engine technologies are already certified and feasible, the Ports will use a combination of incentives and requirements to support more widespread deployment.

In the long-term, as cleaner technologies are developed and become feasible and commercialized, the Ports will look to drive the pace of deployment of such equipment to produce the cleanest fleet possible. By necessity, some strategies, particularly those for ships, will have long timeframes to accommodate the limited availability of cleaner equipment and to ensure adequate notice and planning timelines for fleet turnover.

In addition to the specific strategies listed throughout this section, the Ports are committed to two overarching goals that cut across the categories of clean vehicles and equipment technology, freight infrastructure, freight efficiency, and energy resource planning:

- Technology Advancement
- Regulatory Advocacy
- Funding Advocacy

Technology Advancement

Since 2007, the Ports have led the way in advancing emission reduction technologies for the port sector through our Technology Advancement Program, or TAP. Through the TAP, the Ports

have committed almost \$15 million for nearly 35 projects, many of which have resulted in commercialized technologies now deployed throughout the port complex.

The CAAP reaffirms this commitment to technology development and demonstration. The TAP, which has focused mainly on technologies with criteria pollutant reductions, will evolve to include technologies and approaches with the potential to reduce GHGs in order to help us meet our new GHG reduction targets. TAP Guidelines will be modified to reflect a prioritization on focused solicitations for targeted source categories and emission goals, including GHG reduction. This will allow the Ports to direct our resources to supporting development of technologies where there is the greatest need.

Over the next few years, the Ports envision specifically targeting TAP investments toward technologies for harbor craft, ships, and zero-emissions cargo-handling equipment and trucks, as well as for technologies or operational approaches that improve freight efficiency in order to reduce fuel consumption, and thus, GHGs.

Regulatory Advocacy

The Sustainable Freight Action Plan highlighted the State's intention to advocate for new engine tier levels for locomotives and ships, and SCAQMD has petitioned the federal government for a national near-zero emissions engine standard for trucks. The Ports have supported these efforts and will continue to do so. Additionally, the Ports will continue to advocate for making source specific strategies developed at the local Port level into state or federal mandates, in order to minimize impacts to economic competitiveness for our customers.

In support of the CAAP, the Ports propose to participate in, advocate for, and support regional, State, and federal efforts to move forward on the following regulations:

- Near-zero emissions engine standard for on-road trucks
- Tier 5 engine standard for locomotives
- Limit federal preemption on locomotive engines to the initial useful life
- Tier 4/particulate matter engine standard for vessels
- Statewide vessel speed reduction
- At-berth emission controls from non-regulated vessels
- New fleet turnover requirements for harbor craft
- Idling restrictions and fleet turnover requirements for cargo handling equipment

Funding Advocacy

In the short term, early adoption of cleaner technologies will require financial support to offset higher incremental costs. Capital costs are likely to remain very high for both manufacturers and operators of the advanced technologies envisioned in the CAAP. Expanding on-dock rail infrastructure and installing emission-control technologies to reduce ship emissions at berth

will require significant investments. Furthermore, it is anticipated that a substantial amount of electrical infrastructure must be installed at terminals, including major utility upgrades to bring additional power to the ports, in support of electrified zero-emissions cargo-handling equipment.

The Ports have estimated incremental costs of \$8.5 billion to as high as nearly \$14 billion for new technologies, infrastructure investments, and incentive programs to support the CAAP strategies.¹⁹ This is in addition to Port investments in on-dock rail infrastructure. Outside of any state and federal funding that can be secured to support these efforts, these costs will be borne by the Ports themselves and private industry. Moreover, a large portion of these costs must occur within the next 5 to 7 years to ensure the necessary infrastructure is in place to support the equipment transition; fleets cannot begin to convert to zero emissions without adequate charging and fueling capabilities.

By far, this CAAP 2017 Update represents the largest environmental investment ever undertaken by a port complex, and these strategies will place an enormous financial burden on the Ports and goods movement industry. The CAAP cannot be successful, and the industry cannot remain economically competitive, without the significant financial support of the state and federal government.

Federal, state and regional government incentives must help offset costs where production of this equipment is low due to the presence of less expensive alternatives and the resulting lack of widespread demand. Government subsidies are also needed in the near-term to install the critical infrastructure and to support additional research, development, and demonstration projects. The Ports have already begun to advocate for incentive funding from federal, state, and regional sources to assist with these efforts, and will remain actively involved in these discussions throughout the implementation of this CAAP.

The Ports will also serve in an advocacy role, between port operators and funding agencies, to help reduce barriers for applicants and ensure funding awards will be targeted for priority projects in support of the CAAP goals. This includes advocating for streamlined application processes and flexibility on eligible costs, maximum funding levels, and timelines for implementation.

In addition, many small operators and tenants require assistance to apply for grant opportunities. The Ports will expand current efforts to make our tenants aware of upcoming grants and support them with the application process and reporting requirements. In some cases, as has already occurred, the Ports will take on the role of project partner and grant administrator.

¹⁹ For information on these cost estimates, please see the “Preliminary Cost Estimates for Select 2017 Clean Air Action Plan Strategies” at www.cleanairactionplan.org.

1. Clean Vehicles and Equipment Technology and Fuels

Cleaner engine technologies are the cornerstone of more sustainable goods movement. The Ports are committed to advancing technologies that move our industry toward zero emissions and to ensuring that our fleets are among the cleanest in the world. The strategies below support the State's goal of deploying 100,000 zero-emission vehicles by 2030, the goals of the Mayors, and reinforce our continued push to reduce port-related air quality impacts. With a combination of requirements and incentives, the Ports aim to advance feasible, cutting-edge technologies and support deployment as expeditiously as possible and to encourage operational changes that generate significant emission reductions for our communities.

Where cleaner technologies and certified engines already exist, the Ports are proposing near-term strategies to accelerate deployment. Where technologies do not exist, or where there is expected to be longer lead times required for adoption, particularly for ships, the Ports are proposing strategies with longer timeframes and incremental near-term milestones to get us to our ultimate outcome.

1.1. Clean Trucks Program

The Clean Trucks Program (CTP), adopted in 2007 and launched in October 2008, was a groundbreaking initiative to phase out the oldest, dirtiest trucks serving Port terminals by banning trucks older than 2007 engine model year (MY) in advance of state regulation. The benefits of this program cannot be overstated. By 2010, just over two years from initiation of the program, more than 90% of the fleet was transformed to 2007 EPA compliant trucks, which have significantly lower emissions than their predecessors. By January 1, 2012, 100% of the fleet consisted of 2007 EPA-compliant trucks or newer, two full years before the State's drayage truck rule requirements went into effect in 2014.

Numerous challenges arose with implementing the original CTP. The Ports had never undertaken a program that was so transformational to a sector of the port industry. There were many concerns with the ability of the trucking sector to take on the costs of upgrading their equipment and whether or not there would be enough trucks to meet the operational needs of the Ports. Many of the trucks used in drayage were older, in some cases many decades old. Drayage is a low-margin industry and many of the truck owners were not well positioned to invest in newer, more expensive trucks. At the same time, there were other factors at play that helped to inform and support the Ports' timeline and approach. Most importantly, CARB was in the regulatory development process, establishing requirements for trucks servicing ports and rail yards in California. This regulation served as a basis for the Ports requirements that worked to accelerate the timeline locally by two years. Finally, the EPA had already promulgated emissions standards for new heavy-duty on-road truck engines manufactured in 2007 and 2010, providing assurances that trucks meeting the emissions requirements would be available.

Through the combined efforts of the Ports, availability of grant funding to purchase new trucks, and the impending requirements of the state Drayage Truck Rule, the transition of the older trucks serving the Ports was dramatic and very effective. Our latest emissions inventories show that truck-related DPM emissions have decreased 97% since 2005.²⁰

While this progress is remarkable and should be celebrated, there is still a need for further emission reductions, and more needs to be done. According to the 2015 port emissions inventories, trucks remain a significant source of emissions. Port trucks contribute more than 20% of the total NO_x emissions, making them the second largest source of NO_x emissions at the Ports. Further, Port trucks are the largest contributor of port-related GHG emissions, representing 37% of total port-wide GHG emissions.

In order to continue reducing NO_x and GHGs, through strategies described below, the Ports plan to assist in transitioning the current drayage truck fleet to a near-zero and ultimately zero-emissions drayage trucking fleet by 2035. Currently, about 55% of the Ports drayage fleet meets the 2007 EPA standard and 45% meets the 2010 standard.

Importantly, zero- and near-zero-emissions trucks are not yet commercially available; however, several recent demonstration projects, described in more detail below, have shown great promise for these technologies.

Near-Zero Emissions

A truck with an ultra low-NO_x engine, also known as a near-zero-emissions truck, is 90% cleaner than a 2010 EPA-compliant truck. When paired with renewable fuels, the near-zero-emissions engine truck will also provide significant GHG reductions.

SCAQMD and other partners are working with Cummins Westport Inc. (CWI) to develop and demonstrate a natural gas-fueled 11.9L near-zero-emissions engine as a follow-on effort to CWI's recent certification and commercialization of its smaller 8.9L ISL G NZ near-zero-emissions engine. The schedule anticipates the larger near-zero-emissions engine to be available in 2018. Currently, the only near-zero-emissions engines available are fueled by natural gas; however, CARB has projected²¹ that diesel-fueled near-zero engines are likely to become available in the 2020 timeframe.

Moreover, CARB's 2016 State Strategy for the State Implementation Plan²² proposes to require a manufacturing standard for all new heavy-duty engines to meet the near-zero-emissions standard starting in 2023. At this point, it is unknown what NO_x emissions rate will be selected for the final engine standard; however, it is anticipated to be between 0.05 g NO_x/bhp-hr and 0.02 g NO_x/bhp-hr.

²⁰ 2015 Emissions inventories

²¹ https://www.arb.ca.gov/msprog/tech/techreport/ta_overview_v_4_3_2015_final_pdf.pdf

²² <https://www.arb.ca.gov/planning/sip/2016sip/2016sip.htm>

Zero Emissions

There are ongoing demonstrations of zero-emission truck technologies as part of the Zero Emission Cargo Transport programs (I and II) being led by the SCAQMD and supported by the Ports TAP. These projects include battery-electric, fuel cell, and plug-in hybrid (both natural gas and diesel) electric trucks from more than half a dozen manufacturers with several trucks already in service. Additionally, SCAQMD has received Greenhouse Gas Reduction Funds to develop and demonstrate 44 zero-emissions trucks, which are expected to enter service in late 2018.

Also, the SCAQMD is piloting an overhead catenary system to provide wayside power to electric trucks when connected to the system. The Ports are providing financial support for the project. The 1-mile demonstration test track is located near the Ports. The project includes retrofitting zero-emission trucks with devices to allow them to attach to the overhead electric lines to draw power from the grid while in motion. This demonstration is expected to begin in 2017.

By the end of 2018, there should be nearly 70 zero-emissions trucks in demonstration at the Ports and throughout the region.

There is still significant effort needed for these zero- and near-zero-emission technologies to become feasible and commercialized. Some near-zero emission technologies are expected to be available in the next few years, with zero-emission technologies to follow. The aim of this strategy is to identify a long-term schedule so that the trucking industry can know the expectations and can plan ahead for new equipment purchases. For that reason, the Ports propose a Clean Trucks Program that maximizes near-term benefits with existing engine technologies while defining a clear path with concrete steps and a schedule toward achieving the ultimate goal of zero emissions.

Stakeholder Input

Since the release of the CAAP Discussion Document, the Ports have met with numerous community, environmental and industry groups and received many comments related to the strategy for trucks. These comments, in addition to the legislative changes previously discussed and various modeling and forecasting analyses, have led to changes in the truck strategy as originally proposed in the Discussion Document.

The proposed strategy included in the Discussion Document called for a continuous fee to take effect immediately on 10-year or older trucks with exemptions for near-zero and zero-emissions trucks. The strategy also proposed that all trucks meet 2010 standards by 2020, three years in advance of the State's requirement. In addition, any new trucks entering port service would be required to meet near-zero starting in 2023, and all trucks would be required to meet zero emissions by 2035.

Many stakeholders lauded the inclusion of a deadline for zero-emissions trucks; however, they expressed the need for interim milestones for near-zero-emissions trucks in order to ensure introduction of cleaner trucks to the fleet earlier than 2035.

The trucking industry had significant concerns about the immediacy of the model year 2010 ban. Trucking companies develop their fleet replacement plans years in advance and have purchased trucks to be compliant with the State's Truck and Bus Rule, which bans pre-2010 MY trucks in 2023; any acceleration of this timeline, according to commenters, would not give these companies enough time to recoup their nearly \$1 billion investment to comply with the current requirements, or to plan and budget for replacements. Additionally, the industry had concerns about the continuous fee on 10-year-old and older trucks, asserting that properly serviced trucks can maintain low emission levels for many years and that a fee would arbitrarily diminish the value of these trucks without warrant. Lastly, industry stakeholders expressed concern over the availability and viability of near-zero and zero-emissions technologies, especially within the aggressive timeline proposed.

In addition, as mentioned previously, the recently approved Senate Bill 1 (SB-1) prohibits new regulatory requirements to replace, retire, repower, or retrofit heavy-duty trucks before the truck has reached the earlier of either 800,000 vehicle miles traveled or 18 years from the engine model year. As a result, it is not anticipated that CARB will develop any new regulations that establish near-term requirements for trucks. Therefore, the Ports are unable to follow our previous strategy of advancing deadlines contained within a State truck regulation.

The Ports have considered all of these factors thoughtfully, taking into account the need to reduce emissions for community health and meet our greenhouse gas reduction goals, while minimizing economic impacts on the industry, and utilizing the Ports' authority within our jurisdiction. It is our intent to identify a long-term schedule so that the trucking industry can know the expectations and can plan ahead for new equipment purchases coupled with near-term actions for immediate public health benefits. To that end, key highlights related to the proposed new truck strategy are outlined below:

- immediately requires any new trucks entering the port drayage registries to meet the cleanest engine standard
- establishes an approach to accelerate the introduction of near-zero emissions trucks in the early years, and zero-emission trucks in the later years
- provides more time for fleet owners to budget and plan for the eventual transition to zero emissions,
- introduces an early action pilot of a State heavy-duty truck emission inspection program (e.g. Heavy-Duty Smog Check) to improve drayage truck repair rates and emissions performance and retire non-complaint trucks with excessive emissions,
- defines a stepwise transition to zero emissions, including incentives and pilot programs to introduce these trucks to the fleet prior to 2035, and

- includes more frequent feasibility assessments to identify the state of near-zero and zero-emissions technologies, potential challenges, and potential opportunities for earlier penetration of the cleanest trucks.

The proposed Clean Trucks Program update is as follows:

- Beginning in early 2018, new trucks entering the Port's Drayage Truck Registry must have a 2014 engine model year (MY) or newer.
- Beginning in 2023, or when the State's near-zero-emission heavy-duty engine standard takes effect, new trucks entering the Ports Drayage Truck Registry must meet this near-zero standard or better.
- Starting in 2023, or when the State's near-zero-emission heavy-duty engine standard takes effect, all heavy-duty trucks will be charged a rate to enter the ports' terminals, with exemptions for trucks that meet this near-zero standard or better
- Beginning in 2035, only trucks that meet zero-emissions or the equivalent will be exempt from the rate

Immediate Requirements for 2014 Model Year Trucks

In the near term, phasing out older trucks and replacing them with engines that meet the 2010 federal emission standard of 0.2 g/bhp-hr NO_x will accelerate reductions from most port truck trips. The State's Truck and Bus Rule bans pre-2010 trucks in 2023; however, the Ports seek to assist the State in accelerating the turnover to 2010-compliant trucks before 2023. To that end, the Ports will only allow trucks with 2014 MY engines and newer to be added into the Ports Drayage Truck Registry (PDTR) starting in early 2018. All pre-2010 trucks entered into the PDTR before the change takes effect will be allowed to continue providing drayage services until the State requires replacement in 2023.

The Ports chose to make the requirement for trucks with 2014 MY engines for two reasons. First, a portion of the 2010 to 2014 model year trucks are not 2010 EPA emissions compliant due to credits that engine manufacturers received to build the engines. Second, the 2014 MY trucks are equipped with On-Board Diagnostics that will assist with engine testing and maintenance compliance going forward. Therefore, trucks with 2014 MY engines provide the current cleanest engine emissions rate.

With this requirement in place, and assuming the current rate of truck turnover, the Ports project that by 2020, nearly 70% of the fleet will be comprised of 2010 MY or newer trucks compared to 50% absent this requirement. The difference is driven by the introduction of the 2014 MY trucks.

Requirements for Near-Zero Trucks

CARB's State Strategy for the State Implementation Plan²³ proposes to require a manufacturing standard for all new heavy-duty engines to meet a near-zero emissions standard starting in 2023. It is anticipated that this standard will be established somewhere between of 0.02 g/bhp-hr of NO_x and 0.05 g/bhp-hr of NO_x. The Ports intend to hasten the penetration of these near-zero-emission trucks into the drayage fleet with financial inducements and near-term requirements for new trucks in 2023.

After January 1, 2023, the Ports will only allow near-zero-emission trucks or cleaner to be entered into the PDTR. In addition, the Ports plan to assess a rate on any truck that does not at least meet the near-zero standard. The amount of the truck rate will be established after the Ports conduct a comprehensive economic analysis prior to implementation. The rate will be assessed to the owner of the cargo that is being transported by the truck that does not meet the cleaner engine standard. All funds collected through the assessment of the rate will be used for trucking initiatives, for example, to defray the administrative costs of the program and for incentives to the trucking industry for purchase of zero-emission trucks.

Under the previous Clean Trucks Program, which imposed a fee on older trucks, roughly 90% of the trucks were replaced within three years with cleaner models while 10% chose to pay the fee in the short term. Thus, this strategy could result in a significant turnover to near-zero-emissions trucks while giving fleet owners flexibility and ample time to plan for new purchases. The Ports project that by 2024, as a result of the 2023 requirement for new trucks and the fee in 2023, near-zero emission trucks will comprise up to 85% of the drayage truck fleet.

Financial incentives will be critical to meet this rate of turnover. The Ports intend to work closely with the federal, state, and local governments to secure incentive funding for near-zero emissions trucks in the near-term.

Transition to Zero-Emissions

The initial effort to transition the Ports' drayage trucking fleet to near-zero emissions is not intended to slow down the parallel ongoing effort to transition the entire truck fleet to zero emissions by 2035. However, zero-emissions trucks are still in the testing and demonstration phase. While near-zero-emission technologies are expected to be commercially available and mass produced in the next few years, the zero-emission trucks may not be available for some time. Significant effort to manufacture a sizeable fleet of commercialized zero-emission trucks that are capable of meeting the duty-cycle operational requirements, reliable, durable and affordable is going to take some time. Providing fueling or charging infrastructure to support the use of zero-emission trucks will take major planning and funding as well. Similar to the challenges of transitioning to near-zero-emission trucks, financial incentives will be critical to make the

²³ <https://www.arb.ca.gov/planning/sip/2016sip/2016sip.htm>

switch to zero-emission trucks. The Ports plan to work with federal, state, and local agencies to secure funding for the effort to turn over the fleet to zero emissions.

Table 1 shows the projected distribution of the fleet in 2020, 2024, 2031, and 2036 under two scenarios: (1) No action (i.e., business as usual) and (2) the proposed new Clean Trucks Program. In 2024, 2031, and 2036, the Ports have provided a range of near-zero and zero-emissions truck penetration based on a variety of assumptions regarding the effectiveness of the rate’s impact. On the low end, the Ports assumed that 25% of trucks would turn over to near-zero and then zero-emissions, and on the high end, the Ports assumed that 100% of trucks would turn over. Additionally, the Ports varied the assumed penetration rate of zero-emissions vehicles based upon the assumed availability of vehicles and financial incentives. These scenarios present a bounding analysis to understand what levels of fleet turnover will be needed, on what timeframe, in order to achieve various levels of near-zero and zero emissions trucks. The complete methodology is described in the document “Potential Emission Reductions from Select CAAP 2017 Strategies.”²⁴

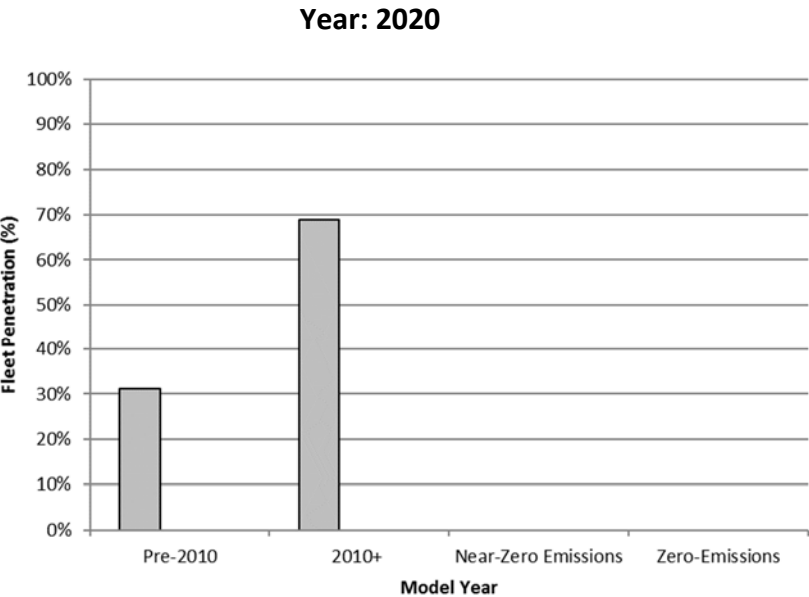
Table 1: Projected Fleet Distributions in Selected Years (% of Trucks)

	No Action				Proposed Clean Trucks Program			
	2020	2024	2031	2036	2020	2024	2031	2036
Pre-2010	50%	0%	0%	0%	31%	0%	0%	0%
2010+	50%	100%	100%	100%	69%	13-38%	1-5%	0-1%
Near-Zero Emissions	0%	0%	0%	0%	0%	59-85%	53-92%	0-44%
Zero-Emissions	0%	0%	0%	0%	0%	1-17%	7-45%	55-100%

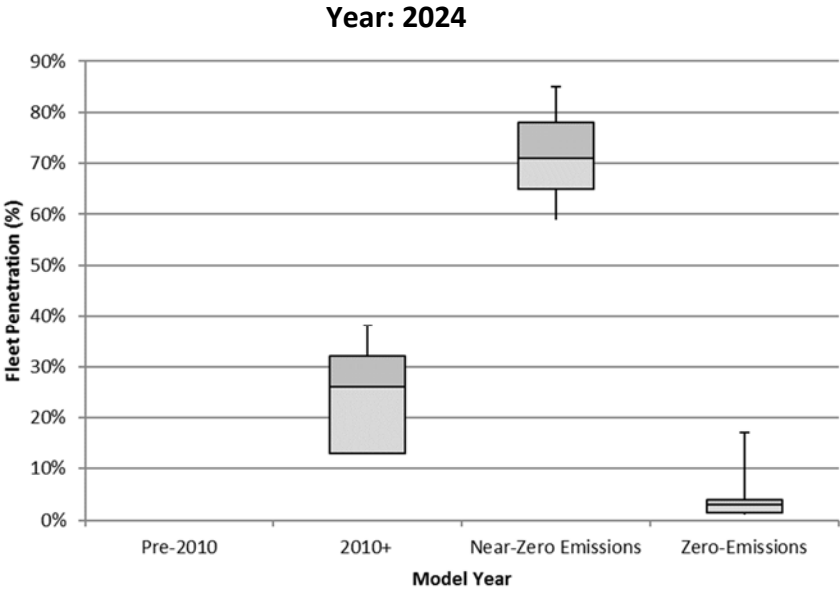
Figure 3 graphically represents the projected fleet distributions.

²⁴ Available at www.cleanairactionplan.org

Figure 3: Projected Fleet Distributions, with Proposed Clean Trucks Program

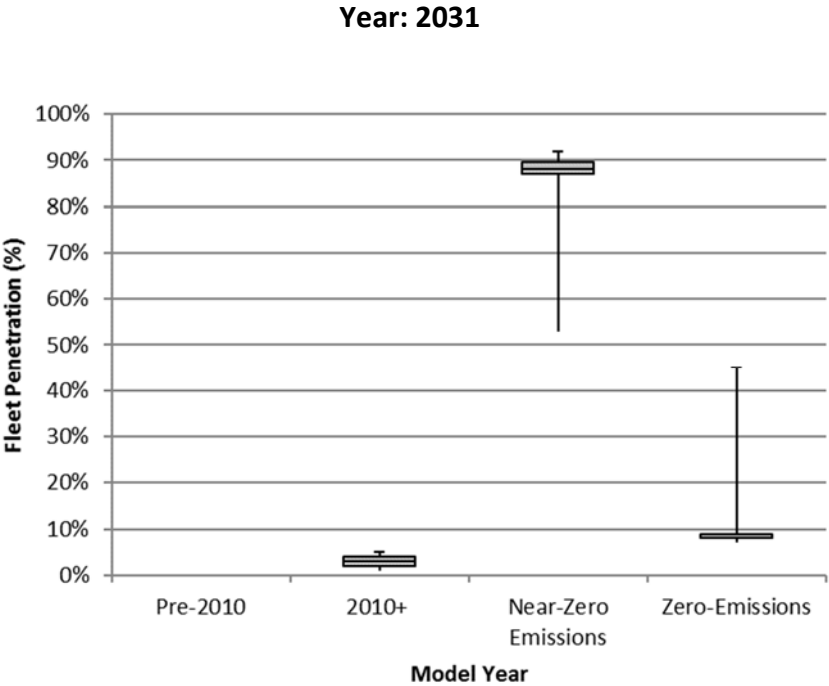


Note: In 2020, without the Ports' proposed Clean Trucks Program, the truck mix is expected to be 50% pre-MY2010 trucks and 50% MY2010+

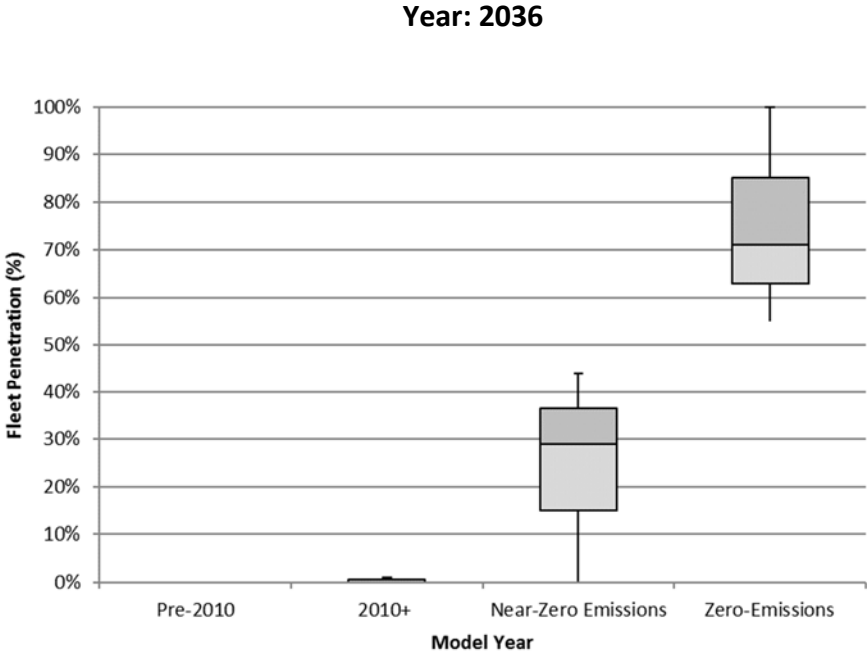


Note: In 2024, without the Ports' proposed Clean Trucks Program, the truck mix is expected to be 100% MY2010+

Figure 3 (continued): Projected Fleet Distributions, with Proposed Clean Trucks Program



Note: In 2031, without the Ports' proposed Clean Trucks Program, the truck mix is expected to be 100% MY2010+



Note: In 2020, without the Ports' proposed Clean Trucks Program, the truck mix is expected to be 100% MY2010+

These fleet penetration scenarios are based upon a set of assumptions related to the potential effectiveness of the specific details of the proposed Clean Trucks Program, including the most aggressive assumptions to get to a 100% zero-emissions drayage fleet by 2035. Other efforts, chiefly the aggressive funding advocacy campaign that will be conducted by both Ports, are expected to result in accelerated turnover of trucks to near-zero trucks through 2023, and zero-emissions trucks through 2035. Substantial funding support by state and federal agencies will be critical to build upon the efforts of the Ports' CTP strategies, to meet the ultimate goal of 100% zero-emissions trucks by 2035.

In support of the transition to cleaner trucks, the Ports would take additional actions, including:

- conducting feasibility assessments to evaluate the state of the technology development, infrastructure availability, and economic factors for deployment of zero-emissions trucks by 2035 and to provide interim progress reports on deployment of near-zero and zero-emission trucks,
- facilitating, supporting, and expanding upon the State's comprehensive heavy-duty vehicle maintenance, repair and inspection program currently under development by serving as the pilot location for implementation,
- waiving the Clean Truck Program annual registration fee for near-zero and zero-emission vehicles, effective upon adoption of the tariff, and
- conducting a larger-scale pilot deployment of zero-emission trucks to demonstrate the technology in targeted duty cycles.

These supporting efforts are described in more detail below.

Feasibility Assessments

In support of this strategy, the Ports will conduct a feasibility assessment by end of 2018 with updates every 3 years or as new information becomes available. These feasibility studies will inform the 2035 timeline for implementation and will identify potential challenges that need to be addressed in the intervening years to ensure the timeline is achieved. In addition, the feasibility studies may identify if there is a long-term need for near-zero-emission trucks in certain duty cycles. The scope and process for developing these assessments is described in the accompanying document, "A Framework for Developing Feasibility Assessments."²⁵

Heavy-Duty Vehicle Inspection Pilot Program

CARB's Periodic Smoke Inspection Program (PSIP) and Heavy-Duty Vehicle Inspection Program (HDVIP), are designed to ensure that heavy duty trucks are well maintained and are working properly in order to achieve expected emission reductions. These programs are more than 20

²⁵ Available at www.cleanairactionplan.org

years old and are being updated to address the newer modern engine technologies and after-treatment systems.

For the PSIP, ARB is proposing to revise the current opacity threshold to assist in identifying heavy-duty trucks in need of repair due to malfunctioning diesel particulate filters. Proposed amendments to the PSIP are scheduled for Fall of 2017.

For the HDVIP, CARB is developing a more comprehensive program that would be similar to the smog check program for passenger automobiles. Ongoing efforts to develop a comprehensive heavy-duty vehicle inspection and maintenance program are expected to be finalized by 2020.

The Ports intend to facilitate and support CARB with these efforts to amend and implement these updated programs. With over 17,000 heavy duty trucks signed up in the Ports' Clean Truck Program Drayage Truck Registry, the Ports are in a unique position to carry out effective pilot programs. In initial discussions with CARB staff, the Ports have offered to facilitate pilot programs at agreed upon locations throughout the Port complex.

It is currently estimated that a small portion (< 5%) of the drayage fleet that services the ports has issues with their after-treatment devices resulting in additional emissions. The Ports account for those increased emissions through the application of the State's emission modeling tools used in our annual emissions inventories. The Ports' efforts to facilitate and support CARB will assist in identifying higher polluting trucks and ensuring they are repaired for improved performance or eliminating them from the fleet and thus lowering those emissions. Additionally, the program will be able to provide better data on the actual emission levels of the trucks in operating in port drayage. Finally, support for CARB's maintenance and repair programs will ensure that the drayage trucking fleet at our Ports remains clean over time.

Annual Registration Fee Waiver

Each port charges an annual fee of \$100 per truck registered in the Ports Drayage Truck Registry (PDTR). Assuming a truck stays 10 years in the PDTR, the owner would spend \$2,000 on fees per truck to operate at both ports. There are more than 40 trucking companies serving the Ports that have at least 100 trucks in their fleets, and the largest fleet has 1,250 trucks. Waiving the fees would equate to \$20,000 in savings for fleets of 100 near-zero or zero-emissions trucks over a 10-year span; the largest operator would save \$2.5 million in that time. Although seemingly insignificant on a per-truck basis, the aggregate savings could be substantial, particularly for larger fleets. By waiving these fees, the Ports could help incentivize and accelerate the transition to cleaner trucks.

Pilot Deployment

Zero-emissions on-road drayage trucks, whether battery- or fuel-cell powered, face range limitations in the near term when compared to their diesel counterparts. They are also very dependent upon access to electric-charging infrastructure or hydrogen fueling. The

infrastructure requirements are a key challenge in Southern California due to the long distances trucks must often travel to conduct business. Therefore, zero-emission on-road vehicles are likely to be focused on short-haul duty for the near term, often limited to trips to and from the near dock railyards, or other nearby warehouses or yards.

These short-distance runs are a prime candidate for early introduction of zero-emissions trucks. To that end, the Ports will seek to demonstrate 50 to 100 zero-emissions trucks in targeted duty cycles, using the results to assess whether additional incentives or programs may accelerate the penetration of zero-emissions trucks before 2035 in short-haul applications.

The Clean Trucks Program strategy is expected to greatly increase the penetration of cleaner trucks into the fleet, particularly near-zero emissions trucks in the near term and zero-emission trucks in the long term, and lead to significant emission reductions. Table 2 shows the forecasted reductions of truck-related pollutants as a result of this strategy. These reductions are based on anticipated emissions in the selected years compared to the emissions that would have occurred in those years absent this strategy. A complete description of the projected reductions can be found in “Potential Emission Reductions from Select CAAP 2017 Strategies.”

Table 2: Forecasted Reductions of Truck-Related Pollutants from the Proposed Strategy

	2020	2024	2031	2036
NO _x	36%	74% -91%	83% - 96%	90% - 100%
CO ₂	7%	9% - 24%	10% - 47%	56% - 100%

* Range depends on the impact of the 2023 fee, zero-emissions trucks penetration, and the emissions standard (i.e., the Ports forecasted 0.02 gm/NO_x and 0.05 gm/NO_x)

To support the transition to the near-zero and zero-emission trucks, significant allocations of federal, state and local grant funding will be necessary, and workforce development programs will be needed to assist truck drivers and mechanics with the transition to new technologies. The Ports will help support these efforts as further described in the Implementation section.

1.2. Terminal Equipment

Within the marine terminals, equipment is used to move the cargo in the yard, to and from ships, rail cars, and trucks. Containerized cargo is handled by yard tractors, top handlers, side handlers, gantry cranes, reach stackers, and forklifts. Dozers, excavators, and loaders are typically used to handle bulk material. More than 3,200 pieces of terminal cargo-handling equipment (CHE) operate at the Ports, comprising 6% of the Ports’ overall DPM emissions, 7% of NO_x emissions, and 17% of GHG emissions.

As a result of the original CAAP and the 2009 CARB cargo-handling equipment regulation, which requires phased-in replacement of older equipment, emissions from terminal equipment have dropped significantly since 2005 with DPM and NO_x emissions down 84% and 60% respectively. The state regulation and CAAP strategies have primarily focused on reducing criteria pollutants,

which is evident in the drastic reductions in DPM and NO_x emissions. Further reductions of criteria pollutant and greenhouse gas emissions into the future will require a shift from the use of conventional diesel-powered equipment.

Some near-zero and zero-emission technologies that can be used in marine terminals are either commercially available or currently being utilized or demonstrated in port operations. For example, ship-to-shore gantry cranes have been electrically-powered in the Ports for decades. Electric-powered rail-mounted gantry cranes have also operated in various locations for several years in addition to low-emission hybrid-electric rubber-tired gantry cranes. Finally, the use of electric cargo-handling equipment was introduced with the opening of the Port of Long Beach Middle Harbor Terminal operated by Long Beach Container Terminal, and various terminals at both Ports have begun demonstrating electric yard tractors in regular operations.

Terminal operators have made considerable capital investments in clean diesel-fueled equipment over the past decade to comply with Port lease requirements and the state regulation and have achieved significant emission reductions. To get to zero emissions, it will be necessary to identify, demonstrate, and deploy technologies in port operations that will provide cost-effective options with durability and operational performance equivalent to traditional, diesel-powered equipment.

The Ports received significant comments from stakeholders related to the strategy for cargo handling equipment. Many stakeholders supported the aggressive timeline to get to zero-emissions operations to meet the needs for emissions reductions close to the local communities, in protection of public health. Other stakeholders had significant concerns about the feasibility of the timeline given the shortage of proven zero emission equipment designed for use in terminal operations, and the lack of available infrastructure to support the use of those technologies. In addition, commenters identified that the aggressive timeline will not allow terminal operators to capture the full useful life for the equipment that they have recently invested in, resulting in stranded assets. Lastly, commenters suggested that the cost to achieve zero emissions is not cost effective when near-zero emissions equipment, which will result in significant emissions reductions (e.g. near-zero emissions equipment is 90% cleaner than the cleanest equipment available today) and can be implemented for significantly less cost. These concerns must continue to be taken into consideration as we move forward with implementation of this strategy.

In March 2017, the CARB Board directed its staff to develop amendments to the cargo handling equipment regulation to achieve up to 100% compliance with zero emissions by 2030 in San Pedro Bay and other ports near environmental justice communities.

With the State moving forward with new zero emission CHE requirements, the Ports plan to participate in this effort and, where possible, ease barriers to implementation and accelerate these emission reductions through securing state and federal funding to allow our operators to remain economically competitive while at the same time meeting the Mayors' goals. In addition, the Ports will continue to invest in demonstration of new, cleaner technologies to understand

their operational effectiveness, provide a forum for technology developers to test their equipment and refine the design to meet the duty cycle requirements, and to accelerate commercial availability. In addition, the ports will implement lease-based measures that support the state's requirements. Thus, the strategy for terminal equipment is as follows:

- Participate in the State's regulatory development efforts to achieve up to 100% zero-emissions cargo-handling equipment by 2030, and support implementation by demonstrating new technologies, accelerating deployment through a concerted funding strategy, and accelerating requirements through leases where possible.

CARB anticipates amending the Cargo Handling Equipment Regulation by March 2019. The Ports will take the immediate actions described in more detail below to support and to accelerate this timeline where possible. In addition, the Ports commit to conducting technology feasibility assessments in 2018 with updates every 3 years or as new information becomes available to guide implementation. The terminal equipment strategy is described in more detail below.

Approaching the Transition to Zero Emission CHE

Achieving a zero-emissions cargo-handling fleet by 2030 is an ambitious goal, one that is complicated by the current lack of commercially available technology and inadequate infrastructure to support widespread charging or fueling. Transitioning the fleet to zero emissions is not simply a matter of swapping equipment; there must be years of design, engineering, and construction to install the necessary electric and alternative fuel terminal infrastructure. This infrastructure will be costly – as much as \$2 billion according to our estimates – and must be in place before the fleets can transition. Moreover, the longer it takes to install the infrastructure, the less time the operators have to purchase new equipment, which concentrates their costs into a few years and increases their financial burden.

One approach for making the transition may be to require specific types of new equipment purchases to be zero emissions beginning in a given year, for example, requiring that new yard tractor purchases be zero emissions once they have been proven to be feasible and the infrastructure is available. The useful life of the equipment, by which replacement is required, could be defined in the regulation, similar to how the state's cargo-handling equipment requirements were originally implemented. This approach would allow time for the technologies to develop, for the infrastructure to be installed, and for the terminal operators to avoid stranded assets and to recoup the value of their existing equipment, which is relatively new.

Another consideration is whether or not zero-emission equipment will be made available for all port terminal equipment types. For example, some of the more specialized equipment used in bulk terminals may not be developed commercially as a zero-emission product because the manufacturers may not see enough of a potential market. In addition, the hours of use of that equipment may be low, resulting in a very high cost for replacement without a commensurate emission benefit.

With these considerations in mind, the Ports plan to take the following actions to support transition of the terminal equipment fleet as expeditiously as possible:

Feasibility Assessments. In support of the CARB Board’s direction, the Ports will conduct feasibility assessments and provide interim progress reports, the first to be completed by end of 2018, to evaluate the status of zero-emission cargo-handling equipment technologies and infrastructure as well as the operational and financial challenges associated with this transition. Updates to the feasibility assessments will be performed at least once every 3 years. Similar to the feasibility studies that will be developed to support the Clean Trucks Program, these feasibility studies will inform the 2030 timeline for implementation and will identify potential challenges that need to be addressed in the intervening years to ensure the timeline is achieved or if adjustments need to be made. In addition, the feasibility studies may identify if there is a long-term need for near-zero-emission equipment in certain duty cycles. Feasibility assessments are expected to be conducted for specific equipment (e.g., RTGs, top/side picks, yard trucks, etc.). The scope and process for developing these assessments is described in the accompanying document, “A Framework for Developing Feasibility Assessments.”²⁶

Infrastructure Planning and Construction. The Ports will separately prepare site-specific infrastructure plans and budgets that will allow for timely construction of needed infrastructure to support a fleet of zero-emission CHE. The timing for the construction will need to be balanced with the ports other significant near-term capital improvements commitments. The ports will also seek state and federal incentive funds to reduce costs and accelerate the timeline for implementation.

Procurement Planning. Beginning in 2020, the Ports will work with the terminal operators to review procurement plans identifying equipment replacement through 2030 in an effort to avoid equipment becoming obsolete before the end of its useful life. The Ports may identify opportunities for operators to invest in zero-emissions equipment for new purchases, particularly if there are state or federal incentive funds available to support the transition.

Technology Demonstrations

Through the Ports TAP and various grant-funded programs, the Ports have several technology demonstrations underway. The Ports have begun aggressively pursuing and have successfully received multi-million dollar grant awards being offered by federal, state and local government agencies to build, test, and deploy near-zero and zero-emissions cargo handling equipment.

To date, the Port of Los Angeles has received about \$25 million to test and demonstrate near-zero and zero-emissions equipment at two of its cargo terminals. The first cargo terminal, Pasha, received about \$15 million from CARB to fund nine pre-commercial zero-emissions electric vehicles (four yard tractors, two Class 8 on-road trucks, two hi-tonnage forklift retrofits, and one top handler retrofit) in addition to other emission-reduction and energy-related technologies.

²⁶ www.cleanairactionplan.org

The second cargo terminal, Everport, has received about \$10 million from the California Energy Commission (CEC) to fund 20 near-zero-emissions yard tractors, eight zero-emission yard tractors, and two zero-emission top handlers. These projects are underway and deployment of the various equipment is scheduled to begin over the next couple of years.

The Port of Long Beach has received more than \$9.7 million from CEC to repower nine rubber-tired gantry cranes (RTGs) to full electric power, making it the largest deployment of fully electric RTGs in the nation, and to demonstrate 12 battery-electric yard tractors at two container terminals. These projects are expected to be complete by the latter part of 2020.

Accelerated Deployment of Cargo-Handling Equipment

As referenced above, there is some zero- and near-zero emission equipment currently servicing the San Pedro Bay Ports complex. Other equipment is under development; however, with the impending CARB requirements, the Ports anticipate needing more operationally proven and commercially available zero-emission terminal equipment to meet anticipated demand for this equipment in a very short amount of time. Thus, in addition to supporting technology development for new terminal equipment, the Ports also must support deployment of commercially available equipment.

There are several sources of funding available to accelerate early deployment of these technologies and the infrastructure needed to support them, including Proposition 1B, Carl Moyer, SB-1 Transportation Funds, Diesel Emission Reduction Act (DERA) funds, and various incentive programs funded by the Greenhouse Gas Reduction Fund. Lastly, there are Volkswagen Settlement funds in the amount of \$800 million that will be made available for zero-emission projects in California. The Ports will continue to work together to advocate and apply for a sizable portion of any and all relevant funding opportunities that arise in the future.

A key approach to accelerating deployment will be the pursuit of grant funds. The Ports estimate it may cost upwards of \$1.8 billion to replace the existing fleet with zero-emissions equipment, plus up to an additional \$2 billion for supporting infrastructure. The Ports will work with the terminals and technology manufacturers to seek grant funds and incentives for additional deployment of near-zero and zero-emission cargo-handling equipment. The Ports will assist terminals in applying for these funds and will advocate at the local, state, and federal level for more funding for this equipment.

Zero-emissions equipment already operates at the ports, and more pieces are expected to come online in the next few years through our existing commitments. Table 3 shows the current penetration of zero- and near-zero emissions terminal equipment at the Ports as well as projections for 2020 and 2025, based upon commitments that have been made by terminal operators and funding that has already been secured from state and federal sources.

Table 3: Baseline Projections for Cleaner Terminal Equipment

	2017 (actual)	2020	2025
Near-Zero Emissions Equipment	0	20	20
Zero-Emissions Equipment	333	519	573
Total Equipment	3,766	3,972	4,026
% Near-Zero Emissions	0%	<1%	<1%
% Zero-Emissions	9%	13%	14%

With the strategies outlined above, the Ports expect to surpass these baseline percentages. The Ports will also work closely with CARB on developing and implementing the amendments to the cargo-handling equipment regulation for up to 100% compliance with zero emissions equipment by 2030 to meet the Mayors’ goals. Throughout the rulemaking process, if any inconsistencies arise between the Mayors’ goals and CARB’s approach, that information will be presented to the Ports’ Boards for their consideration and discussion on how to proceed in relation to meeting the Mayors’ goals. In addition, the Ports will aggressively advocate for funding support to accelerate turnover of equipment to zero-emissions as quickly as feasible. Similar to other strategies contained in the 2017 CAAP Update, this funding support by state and federal agencies will be critical for success of this program, to meet the ultimate goal of 100% zero-emissions cargo handling equipment by 2030.

1.3. Terminal Equipment Idling Reduction Program

Idling is defined as an engine running for non-operational purposes. The emission rate during idling is higher than when the engine is running while in motion or moving cargo. Extended idling can also cause a build-up of soot in engines, resulting in black smoke. Diesel exhaust from idling engines can accumulate in and around the emission source and pose a human health exposure risk.

The purpose of a port-wide Terminal Equipment Idling Reduction Program is to ensure that unnecessary idling of vehicles and equipment does not occur on port terminals. Limiting idling contributes to a healthier work environment, reduces air and noise pollution, fuel consumption, and engine deterioration and wear. Currently, there is no regulation to limit idling for cargo-handling equipment.

Additional information will be necessary to understand when idling is occurring and where opportunities exist for reducing that idling without compromising safety or reducing operational efficiency. A study developing an inventory of equipment with idling limit devices and analyzing equipment data loggers will be necessary to develop recommendations.

The Ports envision that through this program, terminal operators would be required to develop plans to reduce or eliminate unnecessary idling of cargo-handling equipment. These plans would need to identify specific strategies and implementation actions to that end. Terminals would:

- Ensure that idle limiting technologies are installed on diesel-powered vehicle engines. An idling limiting device or software enables the engine to shut down automatically if it idles longer than the programmed time.
- Develop training and education programs for equipment operators to identify opportunities for idle reduction
- Make operational changes to reduce idling

The Ports would review these plans and provide suggestions to ensure the maximum use of idle reduction strategies.

1.4. Vessel Speed Reduction Program

When ships slow down, the load on the main engines decreases considerably as compared to operation at higher speeds. Operation at a slower speed typically decreases the total energy required to move the ship through water. This energy reduction translates to less fuel burned and fewer emissions.

The voluntary Vessel Speed Reduction (VSR) Program initially started under a multi-party Memorandum of Understanding in 2001. Starting in 2005, the Ports have provided financial incentives to shipping lines that reduce their speeds to 12 knots within 20 nautical miles (nm) of Point Fermin. In 2009, the Ports expanded this program to provide additional incentives for ships slowing down within 40 nm of the Ports. This voluntary program has been extremely successful. Participation within the 20 nm zone is above 90%, and participation within the 40 nm zone is above 80%.

Owing to the significant emission reductions associated with vessel speed reduction, especially reductions in NO_x emissions, the Ports are seeking to build upon the already very high participation rate and maximize compliance at the 40 nm boundary.

A revised VSR incentive program to drive improved compliance and emission benefits is as follows:

- Maximize participation in VSR for all vessels transiting within 40 nm of Point Fermin

This revised VSR program would emphasize compliance out to 40 nm from the Ports. Program changes to be considered include eliminating the 20 nm incentive to encourage all vessels to participate within 40 nm. The Ports will also consider increasing the incentive amount at the 40 nm distance.

In addition, some operators only participate within 20 nm because of operational issues, such as scheduling of the vessels for other destinations on the service string. In order to preserve the high participation levels, the Ports will continue to evaluate specific operational hurdles on a shipping line by shipping line basis.

The Ports will also evaluate changes to the program's payment structure. Currently, in order to qualify for the dockage rebate incentive, 90% of a fleet's calls for the year must slow down at the prescribed boundary; once a fleet has met this 90% mark, all of the fleet's calls receive a dockage rebate in the ensuing calendar year. The Ports may modify this structure to a per-call incentive, so each qualifying call may earn the incentive on its own. Such an approach could encourage participation on an individual call basis for shipping lines that would not otherwise participate in the 40 nm program today, because they are unable to meet the annual minimum to qualify.

The Ports also continue to require vessel speed reduction within 40 nm, where possible, through new or renewed leases, which provide another mechanism for ensuring compliance.

Additionally, for some vessel classes, a 12-knot vessel speed may not be the optimal speed from an emissions perspective. Some vessels are equipped with an emissions reduction technology that requires higher speeds for optimum performance. For example, some vessels have large 'house' electrical loads like cruise ships, which have higher optimum emission reduction speeds. Thus, the Ports would continue to pursue the following strategy:

- Implement alternative compliance plans allowing vessel operators to maximize emission reductions for their fleet.

Under this strategy, the Ports will accept requests from shipping lines that propose alternative compliance plans where a different speed would result in fewer emissions compared to the current speed limit. These alternative compliance options may enable a ship to travel faster than 12 knots without an associated emissions penalty, thus increasing the likelihood of compliance and operational efficiency.

1.5. Vessel At-Berth Emission Reductions

Emissions from ship auxiliary engines while loading and unloading cargo at berth are a significant contributor to total ship pollution. In 2015, 34% of DPM, 26% of NO_x and 20% of greenhouse gas emissions from ships in San Pedro Bay were emitted while the ships were at berth.

CARB's current regulation requires at-berth emission reductions from container, cruise and refrigerated cargo vessels ("reefers"), generally by plugging the ship into the electrical grid and turning off the auxiliary engines, which is known as "shore power." The Ports have implemented significant capital improvements to our electrical infrastructure to ensure shore power capabilities at all necessary berths. The CARB regulation, which has been in place since 2014, ramps up the required shore power usage until 2020, when fleets must demonstrate an 80% reduction in at-berth emissions.

In March 2017 the CARB Board directed its staff to amend the At-Berth Regulation in order to achieve up to 100% compliance by 2030 in San Pedro Bay and other ports near environmental justice communities. This action would require at-berth emission reductions from vessels not currently subject to the regulation, such as bulk, break bulk, tankers and auto carriers. These vessels contributed one-third of our total at-berth emissions in 2015.

With the State moving forward on additional at-berth controls by 2030, the strategy for at-berth emission reductions is as follows:

- Participate in the State's efforts to achieve up to 100% compliance with the At-Berth Regulation by 2030 and assist with implementation by demonstrating new at-berth emission reduction technologies, accelerating availability and utilization of technologies through a concerted funding strategy, and accelerating use requirements through leases where possible.

CARB anticipates amending the At-Berth Regulation by September 2018.

Implementing At-Berth Emission Control Systems and Shore Power

Expanding the use of at-berth emission reduction technologies for non-regulated vessels is challenging as there are no CARB-approved technologies currently available. These technologies will need to be designed, developed, tested, certified, and implemented in a very short time frame to meet the schedule directed by the CARB Board. The Ports will take the immediate actions described in more detail below to support and to accelerate this timeline where possible.

Technology Demonstrations

CARB has approved two alternative technologies (AMECS and METS-I) for container vessels that can be used to comply with the at-berth regulation. Both of these technologies are barge-based systems that affix to the vessel's exhaust stack(s) to filter pollutants from auxiliary engines while the vessel is at berth. Currently, these technologies are approved only for container vessels meeting certain configurations; however, operators of both of these systems are working with CARB to expand approval to include other sizes and types of vessels. At least one additional technology manufacturer is developing a barge-based control system and likely will seek CARB approval as an alternative to shore power.

Additionally, the Ports see a need for land-based capture-and-control systems. Some vessel types – tankers, for example – are not good candidates for barge-based technologies due to at-berth operational constraints and safety considerations. Furthermore, the Ports have limited wharf space and may be unable to provide berths for a substantial fleet of barges. Lastly, barges may impede waterway access and impose constraints on the safe passage of other vessel types depending on the quantity of barges. For these reasons, the Ports see a need for a mix of water-

and land-based strategies. The Port of Los Angeles is currently funding the development and demonstration of a land-based system at a non-container terminal for bulk ships.

To augment the existing technologies and to stimulate the development of new technologies, the Ports commit to funding up to \$2 million for the development and demonstration of at-berth emission control systems for non-container ships. The Ports, through the TAP, will issue a competitive solicitation for capture-and-control technologies within the next 12 months in order to start development and/or demonstration by January 1, 2019.

Additionally, the Ports already provide financial incentives for shipping lines that participate in technology demonstrations; the Ports will explore whether we need to expand these incentives to increase participation in such demonstrations.

Accelerated Deployment of At-Berth Emission Control Devices

At present, there are two commercialized capture-and-control systems servicing the entire San Pedro Bay Ports complex. Other systems are under development; however, with the impending increase in demand for such systems, the Ports anticipate needing more at-berth control units. Thus, in addition to supporting technology development for new at-berth control systems, the Ports will support deployment of additional commercialized units by (1) conducting operational assessments, and (2) pursuing grant funds.

Deploying enough emission-control systems to handle the entire fleet will not be easy. Limitations on berth space could limit the number of barge-based systems as there is little available space for these units to tie up when not in use. Conversely, limits on wharf area could impede land-based systems. Each terminal may require its own unique solution. Thus, the Ports will work with terminal operators and shipping lines, and conduct studies to determine how many emission-control devices may be needed for widespread deployment and to evaluate possible barriers to implementation, such as berth space, waterway access, piloting hazards, conflicts with bunkering, and backlands constraints. The assessment also will propose recommendations for addressing these impacts in order to maximize deployment.

A key approach to accelerating deployment will be the pursuit of grant funds to assist with the development and availability of the equipment. The Ports estimate it may cost upwards of \$144 million to provide enough emission-control systems for all of the non-container terminals.²⁷ The Ports will work with the terminals, shipping lines, and technology manufacturers to seek grant funds and incentives for additional deployment of these control systems. There are incentive programs available, including the Proposition 1B Goods Movement Emission Reduction Program. The Ports will assist terminals and shipping lines in applying for these funds and will advocate at

²⁷ "Preliminary Cost Estimates For Select 2017 Clean Air Action Plan Strategies" available at www.cleanairactionplan.org

the local, state, and federal level for more funding for capture-and-control systems. Ongoing expenses associated with the use of the equipment have not been estimated.

The Ports will also consider development of an incentive program to accelerate early use and adoption of the at-berth emission control technologies at non-container terminals, in advance of CARB’s requirements. In addition, the Ports will continue to put requirements into leases, as feasible, for implementation and use of these technologies at container and non-container terminals.

The Ports anticipate an increase over the next 10 years in the number of vessel calls using alternative emission-control systems. As stated earlier, there are two systems in operation today. An additional land-based unit at Port of Los Angeles is expected to become operational at a non-container terminal in 2018, and Wan Hai Lines, a container line that is not currently subject to the State At-Berth Regulation due to below-minimum annual ship calls, has commissioned the development of a third barge-based system to service its vessels. This system is expected to debut in late 2017. With this additional capacity, the Ports expect to see increased use of alternative emission-control systems by 2025.

At the same time, more ships will use grid-based shore power as the State regulation ramps up to 80% fleet usage requirements in 2020. The shore power regulation applies only to container ships, cruise ships, and refrigerated cargo ships. Table 4 shows the percentage of the fleet currently controlling at-berth emissions and the percentage anticipated to control at-berth emissions in future years.

Table 4: Baseline Use of Alternative Emission Control Systems in Select Years

	2017	2020	2025
Vessel Calls Using an Alternative Emissions Control Device ¹	4%	5%	5%
Vessel Calls Using Grid-Based Shorepower	43%	49%	49%
All Vessel Calls Using At-Berth Emissions Controls	47%	55%	55%
Vessel Calls Using No At-Berth Emissions Controls	53%	45%	45%
Total Vessel Calls (include all vessel types)	3,970	4,241	4,526
¹ Mostly container calls because currently the two State-approved alternative emission control devices are certified only for container vessels.			

The Ports anticipate that in 2020 and 2025, roughly 2,000 calls will not use at-berth emission controls. These calls are largely from non-container ships not subject to the State At-Berth regulation, and as such, they are the primary target for this strategy. The Ports intend to work with our industry and technology partners to develop and deploy alternative systems for these 45% of projected ship calls. The Ports will also work closely with CARB on developing and implementing the amendments to the at-berth regulation for up to 100% compliance by 2030.

1.6. Green Ship Incentives

Ships are the largest source of maritime goods-movement-related NO_x emissions, comprising 53% of the NO_x emissions, according to the 2015 emissions inventories. Of those ship emissions, more than half are associated with ships transiting or maneuvering within approximately 100 nm of the Ports. The International Maritime Organization (IMO)²⁸ has established engine standards for ships that ratchet down the allowable NO_x emissions over time, which has a tremendous environmental benefit for ship emissions, including those incurred while in transit. Tier 2 engines, which were required to be installed on new ships beginning in 2011, are 15% cleaner than the previous generation of engines, and Tier 3 engines, which became available beginning in 2016, are 75% cleaner than Tier 2 vessels.

Although the IMO requires manufacturing standards for newly built ships (post-2015) to have Tier 3 engines for ships serving the North American and Caribbean Emission Control Area (ECA), there are no requirements for shipping lines to purchase new ships with Tier 3 engines nor are there requirements on when to deploy these ships on services calling San Pedro Bay terminals.

The Ports have adopted incentive programs, namely the Environmental Ship Index in Los Angeles and the Green Ship Incentive Program in Long Beach, to encourage the deployment of cleaner ships to San Pedro Bay. These incentive programs, however, do not fully recognize all the methods available for a vessel operator to reduce its vessel's emissions rate. Two key approaches to reducing ship-related emissions are through improvements in operational efficiencies and the introduction of emission reduction technologies.

Operational efficiencies are either energy efficiency improvements or operational improvements on board a ship that otherwise reduce energy consumption and potentially reduce a wide range of pollutant and GHG emissions. Several lines have initiated efficiency improvement programs to reduce fuel costs, and these efforts also ultimately reduce emissions. Examples of energy efficiency improvements might be focused on propulsion system modifications of the bulbous bows, installation of improved propellers, de-rating of the main engines, and/or focused on reducing electrical loads such as higher efficiency reefer containers and upgrading the ship's lighting system to light-emitting diodes (LEDs), which reduces the related emissions from the generation of electricity. The Ports TAP is funding the testing of energy efficiency upgrades to several Maersk ships in order to quantify the emission reductions associated with these improvements.

²⁸ The governance of international ship deployment is preempted by the international shipping law, MARPOL, the International Convention for the Prevention of the Pollution from Ships, developed through the International Maritime Organization (IMO), a United Nations agency that deals with maritime safety, security, and pollution from ships. Annex VI of MARPOL addresses air pollution from ocean going vessels. The international air pollution requirements of Annex VI establish limits on nitrogen oxides (NO_x) emissions and require the use of fuel with lower sulfur content. The requirements apply to vessels operating in U.S. waters as well as ships operating within 200 nautical miles of the coast of North America, also known as the North American Emissions Control Area (ECA). MARPOL violations are addressed by the U.S. EPA and U.S. Coast Guard.

Additionally, some shipping lines are beginning to install emission reduction technologies on their older ships, specifically cruise ships equipped with onboard scrubbers that reduce DPM and SO_x emissions. These emission reduction technologies are typically used as an alternative compliance approach for the low sulfur fuel requirements under the ECA, which permits use of higher sulfur fuel in conjunction with a scrubber because the overall emissions are the same or lower. Although California law continues to require low-sulfur marine distillate fuel usage regardless of the use of a scrubber, the ECA has motivated more shipping lines to consider scrubbers for their global fleets, and the Ports could take advantage of this natural opportunity for additional reductions.

In order to encourage these energy efficiency upgrades and emission reduction technologies to reduce ship emissions in the near term, the Ports would work to further incentivize these approaches, especially those that reduce NO_x and GHG emissions.

The Ports also plan to launch an outreach campaign to raise the shipping industry's awareness of these incentive programs and potentially to coordinate with regulatory agencies and/or other ports on the same vessel service strings. If a shipping line can earn incentives from multiple ports along its route, it could provide a greater return on investment for these technology upgrades and make participation more attractive.

Additionally, the Ports will look to minimize the burden associated with applying and submitting requisite data for participating in the programs. Options might include a joint online registration web portal such that lines would only need to register and update data once, which could be developed within San Pedro Bay or even with other ports in order to streamline the process and thus enhance participation globally.

1.7. Clean Ship Program

Ship diesel engines are classified by the IMO from Tier 0, the oldest pre-regulated engines, to Tier 3, the newest – and cleanest – engines. Currently, Tier 3 engines are only required for ships that have a keel laid date post-2015 and for those that travel in the ECA. Operators are not required to upgrade their existing pre-2016 'grandfathered' fleets to the newest cleanest vessels nor are they required to deploy them to San Pedro Bay.

In 2015, roughly 85% of vessel calls to San Pedro Bay were made by Tier 0 or Tier 1 ships and 15% were made by Tier 2 ships, mostly larger container vessels. To date, no Tier 3 ships have called at San Pedro Bay terminals.

Several factors are affecting the order and deployment of Tier 3 vessels to San Pedro Bay. First, Tier 3 engines are significantly more expensive than their predecessors in both price and operation, in part due to more complex emission control equipment, which could be contributing to fewer orders. Although Tier 3 engines are required for ships calling the ECA with keels laid starting on January 1, 2016, there were a significant number of ship keels laid prior to 2016 and yet to be constructed, essentially creating a large pool of grandfathered or Tier 3-exempt new ships. Looking at the number of keels laid but not constructed (as of August 2016) between 2005

and 2015, there are more than 1,400 grandfathered keels that are available for new ships with more than 1,200 of those laid in 2015.²⁹

For these reasons, the Ports do not expect to see significant numbers of Tier 3 ships in San Pedro Bay Ports any time in the next 10 years. The Ports conservatively project the first Tier 3 ship could arrive no earlier than 2026, with significant numbers not arriving until the mid-2030s to late-2040s depending on the vessel type.

Absent natural turnover to bring the ships with the cleanest engines into the San Pedro Bay service, to meet our emission reduction goals, the Ports will attempt to encourage earlier deployment of Tier 2 and Tier 3 vessels and discourage calls by Tier 0 and Tier 1 ships. Importantly, the Ports do not own or operate the vessels and thus have few tools to compel the introduction of newer vessels. Additionally, terminal operators do not control the deployment of specific vessels to their terminals. The Ports, however, do have control over rates charged to operators through the tariff.

In order to help accelerate the transition to a cleaner fleet, the Ports propose the following strategy:

- Implement a differentiated rate structure on ships according to engine tier level to encourage calls by cleaner ships and to discourage older ships. A higher rate would be applied initially to Tier 0 ships, later adding Tier 1 ships, and would begin no earlier than 2025.

There are examples of charging different rates for ships based on environmental characteristics. The Swedish Maritime Administration assesses lower fees on ships that generate fewer NO_x emissions, setting limits below which a ship's engine must emit to earn the discount. The government of Norway imposes a tax on NO_x emissions from ships, then uses the revenue to fund technologies that reduce NO_x emissions. Shipping lines that commit to reducing their NO_x emissions are exempted from the fee. This tax has spurred heavy investment in liquefied natural gas (LNG) ships in Norway. Seven years ago, there were only 3 LNG-fueled ships serving the country; there are expected to be nearly 100 such vessels within the next few years. An important distinction, however, is that these programs were enacted by countries as a tax on all international ships, not by individual seaports through a tariff.

In 2016, about 14% of the roughly 3,900 calls to San Pedro Bay were made by ships with Tier 0 engines, primarily cruise vessels, which comprised nearly 6% of those calls. About 64% of the calls were made by Tier 1 vessels. Roughly 19% of the calls were made by Tier 2 vessels, and there were no Tier 3 visits. Table 5 provides a snapshot of the 2016 engine tier levels by vessel type:

²⁹ Starcrest Consulting Group. "San Pedro Bay Ocean-Going Vessel International Maritime Organization EngineTier Forecasts, 2015-2050." June 2017.

Table 5: 2016 Vessel Arrivals to San Pedro Bay by Engine Tier and Vessel Type

Vessel Type	Count of Arrivals					Percent of Total Arrivals				
	Tier 0	Tier I	Tier II	Tier III	Steam	Tier 0	Tier I	Tier II	Tier III	Steam
Auto Carrier	59	190	17	0	0	1.5%	4.7%	0.4%	0.0%	0.0%
Bulk	12	177	108	0	0	0.3%	4.4%	2.7%	0.0%	0.0%
Container	178	1,550	430	0	94	4.4%	38.4%	10.7%	0.0%	2.3%
Cruise	226	150	0	0	0	5.6%	3.7%	0.0%	0.0%	0.0%
General Cargo	23	46	20	0	0	0.6%	1.1%	0.5%	0.0%	0.0%
Integrated Tug Barge	7	10	1	0	0	0.2%	0.2%	0.0%	0.0%	0.0%
Miscellaneous	11	0	0	0	0	0.3%	0.0%	0.0%	0.0%	0.0%
Reefer	16	4	0	0	0	0.4%	0.1%	0.0%	0.0%	0.0%
RoRo	2	0	24	0	0	0.0%	0.0%	0.6%	0.0%	0.0%
Tanker	39	465	174	0	0	1.0%	11.5%	4.3%	0.0%	0.0%
TOTAL	573	2,592	774	0	94	14.2%	64.3%	19.2%	0.0%	2.3%

In 2025, due to forecasted fleet turnover, calls from Tier 0 ships are expected to comprise less than 1% of the total, and calls from Tier 1 ships are expected to comprise roughly 35% of the total. Meanwhile, the percentage of calls by Tier 2 vessels is expected to more than triple to nearly 65% by 2025, as shown in Table 6.

Table 6: Forecasted Vessel Arrivals to San Pedro Bay in 2025 by Engine Tier and Vessel Type

Vessel Type	Count of Arrivals					Percent of Total Arrivals				
	Tier 0	Tier I	Tier II	Tier III	Steam	Tier 0	Tier I	Tier II	Tier III	Steam
Auto Carrier	0	157	226	0	0	0.0%	4.3%	6.2%	0.0%	0.0%
Bulk	0	73	196	0	0	0.0%	2.0%	5.4%	0.0%	0.0%
Container	0	445	1,069	0	0	0.0%	12.3%	29.5%	0.0%	0.0%
Cruise	12	136	379	0	0	0.3%	3.8%	10.5%	0.0%	0.0%
General Cargo	0	40	98	0	0	0.0%	1.1%	2.7%	0.0%	0.0%
Integrated Tug Barge	0	9	0	0	0	0.0%	0.2%	0.0%	0.0%	0.0%
Miscellaneous	0	11	0	0	0	0.0%	0.3%	0.0%	0.0%	0.0%
Reefer	0	5	15	0	0	0.0%	0.1%	0.4%	0.0%	0.0%
RoRo	0	16	23	0	0	0.0%	0.4%	0.6%	0.0%	0.0%
Tanker	17	363	328	0	0	0.5%	10.0%	9.1%	0.0%	0.0%
TOTAL	29	1,255	2,334	0	0	0.8%	34.7%	64.5%	0.0%	0.0%

By imposing a higher rate on Tier 0 vessels in 2025, the Ports would affect less than 1 percent of the calls. The rate, however, would most likely solely impact tankers and cruise ships as they are expected to be the primary Tier 0 vessels calling the Ports at that time. A differentiated rate on Tier 1 vessels, which could follow shortly after 2025, is expected to affect more than one-third of vessel calls, particularly auto carriers, smaller container ships, cruise vessels, and tankers. The larger container ships (i.e., greater than 10,000 TEU capacity) are expected to be largely Tier 2 by that time.

This differentiated rate strategy requires a long timeline in order to accommodate the projected dearth of Tier 3 ships and to give shipping lines ample time to modify deployment schedules and potentially to upgrade their fleets. Ships have long life spans, and operators will need time to project future availability. Further complicating fleet turnover are the investments already made

on existing ships to meet CARB's at-berth regulations, which is taken into account by the shipping lines when analyzing the business cases for global fleet deployments.

The Ports are keenly aware that today's shipping industry is facing unprecedented financial hardship and consolidation. In 2016, one of the world's largest shipping lines, Hanjin Shipping, filed for bankruptcy. According to some experts, the shipping industry has overinvested in large ships, resulting in a glut of capacity that has driven shipping freight rates down to unsustainable levels and further hampering the pace of Tier 3 deployment.

The Ports must balance these economic realities with the need to reduce air pollution impacts on our communities. Because it is impossible to predict what the shipping industry will look like in 2025 and how this strategy would affect it, the Ports propose to conduct an assessment in 2020 that would update the projections for Tier 3 deployment. In addition, the Ports will conduct an economic assessment to evaluate the appropriate rate structure and implementation timeline to be adopted by both Ports through a tariff, also taking into account current costs of shipping through the San Pedro Bay complex, potential cargo diversion to other ports, and market competitiveness. One year before the proposed implementation start date, the Ports will update the assessment to identify any new considerations that may warrant changes to the implementation plan.

1.8. Harbor Craft

Harbor craft that operate at the Ports – tugboats, crewboats, and workboats – are among the cleanest in the world, thanks largely to the federal phase-in of more stringent marine engine emissions standards between 2014 and 2018 and state regulations that require accelerated turnover of all Tier 1 and older engines by 2023. Over the past few years, incentive funding from the Ports and state and federal programs have assisted to offset the incremental cost to accelerate the deployment of cleaner harbor craft by repowering or retrofitting marine engines operating in the San Pedro Bay. In addition, the Ports have funded the construction of electrical infrastructure improvements for tugboats to use shore power when they are tied-up at berth.

Today, harbor craft are our second largest source of particulate matter, comprising 18% of the port-related PM emissions. Harbor craft also contribute 10% of our NO_x emissions and 6% of our GHG emissions. While emissions from port-related harbor craft have decreased over the last several years as a result of the implementation of the state's commercial harbor craft regulation, the relative contribution of emissions from harbor craft compared to emissions from other port-related sources has increased, and is projected to remain at this higher level in the future as a result of the long useful lives of marine engines. As the engines age and accumulate operating hours, they will continue to deteriorate absent new mandates for turnover.

Given the variety and individual characteristics of harbor craft, differences in work activities, engine horsepower, and usage, there is no 'one size fits all' emissions reduction technology applicable to harbor craft. A challenge associated with developing and deploying emissions reduction technologies for harbor craft, include the numerous possible engine combinations and

configurations, as well as weight and space limitations on vessels. Given these challenges, it is not uncommon for design, modification, and installation costs to exceed the costs for new engines or emission reduction technologies. As a result, funding opportunities for harbor craft have been limited.

The Ports will continue to encourage and invest in technology development projects for harbor craft through the joint Technology Advancement Program. To stimulate the identification, demonstration, and validation of technologies that can achieve emissions reductions from harbor craft beyond current state and federal regulation, the Ports will seek proposals for harbor craft technologies that have the potential to achieve NO_x and DPM emission levels cleaner than Tier 4 standards, or technologies that can be retrofitted to existing harbor craft to achieve Tier 3 or Tier 4 emission levels through the following action:

- Issue a Request for Proposals for harbor craft emission-reduction technologies by December 2017 with demonstrations to begin no later than mid-2018.

The Ports will also conduct periodic assessments of the status of harbor craft technology in order to identify ways of accelerating adoption.

Additionally, the Ports propose the following strategies to reduce harbor craft emissions and fuel consumption:

- Provide incentives for harbor craft operators to upgrade to the cleanest available (i.e. Tier 4) engines or low-emission hybrid systems in the short term, and to upgrade with advanced technologies (e.g. fuel cells and alternative fuels) in the long term. Incentives could be given through securing grants from federal, state or local agencies, a formal incentive program with financial rewards, or through more favorable lease terms, where applicable, for harbor craft operators that have cleaner fleets.
- Identify operational changes that could reduce emissions, for example, by reducing the wait time or slow speed movements of assist tugboats while they are waiting to assist a vessel or by optimizing tugboat berth locations to minimize unnecessary travel.
- As leases with harbor craft operators are opened or renegotiated, the Ports will assess whether it is possible to include requirements for harbor craft modernization, subject to the requisite negotiation process. Many harbor craft companies operate on private land and do not have leases with the Ports; however, the Ports will seek opportunities as they arise.

2. Freight Infrastructure Planning and Investments

Deploying the latest, cleanest technology will require significant investments in electrification and fueling infrastructure. Additionally, reductions in emissions can be achieved by shifting the way cargo is handled, for example, by maximizing on-dock rail where possible. The strategies defined below describe the planning and investment actions needed to transform the Ports' infrastructure over the next 10 years to support zero emissions and supply chain efficiencies.

2.1. Expand use of Rail Arriving to and Departing from the Port Complex.

In some cases, moving cargo by rail can be economically and environmentally superior to moving cargo by truck. The Ports estimate that one double-stacked train can eliminate roughly 750 truck trips, which makes rail transport an efficient and sustainable approach to goods movement, particularly if that cargo can be loaded onto rail within the marine terminal. Maximizing the use of rail infrastructure at the terminal – on-dock rail – eliminates intermodal cargo moving by truck along roadways to inland rail yards.

Any cargo that is moved by train from the port complex benefits the overall transportation system by reducing truck mileage and the associated congestion and diesel emissions. In addition, loading cargo onto rail in a terminal can avoid the time and cost associated with an additional lift and drayage to an off-site facility. The CAAP reaffirms the Ports' commitment to investment in on-dock rail infrastructure and in programs that shift cargo to rail.

The Ports have made significant investments over the years, and will continue to make investments, to build rail infrastructure in the terminals and throughout the port complex, with the goal of accommodating 35% of all cargo leaving the port complex by rail. In 2015, 26% of all containerized cargo moving through the Ports went by rail. The Ports will also aim to push further. Over the long term, the Ports will seek to handle 50% of all cargo leaving the port complex by rail. To achieve this goal, operational changes are needed related to what cargo is moved by rail. For example, the Ports will explore the potential of short-haul rail to inland sorting facilities about 60 to 80 miles away from the Port area, which is described in more detail under Strategy 3.3.

Currently, on-dock rail infrastructure is available at nearly all container terminals at the Ports. Many non-container terminals are also served by rail in both Ports. Some existing on-dock rail facilities have physical limitations due to, for instance, the capacity of storage tracks. Additional tracks may be needed to optimize building blocks of rail cars to make destination trains.

In order to maximize the amount of cargo loaded onto rail in the terminals, the Ports also recognize the need to reduce constraints within the port-wide network that can affect utilization. To do this, the Ports need to invest in port-wide infrastructure improvements and on-dock rail support facilities, which can serve multiple terminals, such as the Port of Long Beach's proposed Pier B On-Dock Rail Support Facility.

Finally, in order to maximize emission reduction benefits, the Ports will continue to work with the rail operators and the state and federal regulatory agencies to seek utilization of the cleanest locomotives. Both Ports are currently participating in the development and demonstration of a near-zero emission locomotive for use in switching operations within the Port complex. In the future, the Ports will continue to seek opportunities to work with rail operators and technology developers to demonstrate and deploy locomotive technologies that can achieve zero-emission track miles.

2.2. Charging Standards for Electric Terminal Equipment.

Successful deployment of commercially available electric terminal equipment will depend on compatible and accessible electrical charging infrastructure. Currently, manufacturers of electric terminal equipment are using different methods and equipment design specifications to charge the vehicles, resulting in different infrastructure requirements depending upon the equipment selected. This incompatibility will lead to potentially significant challenges in the long run. In order to deploy electric equipment on a large scale, the Ports must adopt charging standards so uniform infrastructure can be built throughout the port complex and so that a variety of equipment built by multiple manufacturers can be successfully deployed.

The design, siting, and construction of support infrastructure are very complex. Since 2015, the Ports have been working with regulatory agencies, technology developers and equipment operators to establish charging standards for yard tractors. These standards include technical specifications that consider design, cost and the complexity of charging a large fleet of equipment simultaneously. These standards are under development. We anticipate similar standards will need to be developed for electric top picks and other terminal equipment. The Ports will continue these efforts to facilitate deployment of commercially available zero-emission or near-zero emission equipment in the terminals on the schedule identified in Strategy 1.2.

3. Freight Efficiency

The Ports recognize the value of moving goods efficiently in order to accommodate cargo growth without increasing emissions, and in fact, with potentially reducing emissions. Operational efficiencies may also result in significant cost savings for the operators and cargo owners from reduced fuel costs and reduced time to move the cargo. In 2014, the Ports established the Supply Chain Optimization (SCO) strategy, bringing together representatives from across the goods movement industry to explore ways of enhancing freight efficiency. This ongoing effort will continue to support the State's goal of increasing freight efficiency by 25% as measured by trade value compared to greenhouse gas emissions.

While SCO discussions are still underway, there are several strategies that have risen to the top or that the Ports can explore expeditiously to accelerate potential benefits.

3.1. Green Terminal Program

The Ports would develop a voluntary recognition program to recognize the achievements of terminals working to enhance productivity while minimizing air quality impacts. There are several programs that could serve as models for the how such a program could be structured, described below:

Leadership in Energy and Environmental Design (LEED) certification program. Under this program, buildings are rated Silver, Gold, or Platinum depending on the level of environmental sustainability. Terminals could voluntarily apply to be "certified" as a Green Terminal, with more efficient and sustainable terminals receiving higher levels of certification.

EPA SmartWay Program. The EPA's SmartWay Program is a voluntary program that provides supply-chain partners with tools, methodologies, and resources to operate more efficiently and to reduce emissions. SmartWay partners report information on their cargo movements and activities, which are then calculated into emissions. The program helps supply-chain partners identify more environmentally friendly approaches to moving goods. Such a program, perhaps with modifications, could provide tools or metrics for evaluating a terminal's efficiency.

Container Terminal Quality Index. This system encourages container terminals to benchmark their performance against 80 key performance indicators that take into account a terminal's unique configuration and operational profile. Such metrics include ship time at berth and crane productivity. The system provides tools by which terminals can audit their performance, report these metrics, and obtain third-party certification for their efforts. The program is administered by the Global Institute of Logistics.

Green Marine. Under this program, terminals conduct a detailed self-assessment on a variety of environmental markers. The results determine the terminal's ranking, from mere compliance to leadership and excellence. This program also monitors a terminal's year-over-year improvements

in the various performance indicators. Although Green Marine is focused exclusively on environmental achievements, this program could be a model for evaluating efficiency.

To develop a voluntary terminal recognition program for San Pedro Bay, the Ports would evaluate the programs described above as well as others and work with terminals to identify appropriate metrics. The discussions under the SCO effort have identified some of these metrics, which may include berth productivity, terminal dwell time, truck turn times, use of on-dock rail, and ship at-berth times.

The Ports may also structure the program to recognize improvements over time – that is, relative progress toward greater efficiency – rather than absolute standards. An example of such a metric could be emissions produced per TEU moved, which the ports currently track and report on a port-wide basis as a part of the annual emissions inventory. Terminals wishing to participate in this program would be required to report on their efficiency achievements to maintain or improve their certification level. The Ports also could adopt incentives to encourage terminal participation and to recognize their achievements.

3.2. Universal Port Truck Appointment System

Of the 13 container terminals in San Pedro Bay, eight terminals use appointment systems, and two more terminals are in the planning stages of such systems. Truckers who arrive at the gate with an appointment are expected to receive prompt service during that time window.

Currently, individual terminals and trucking companies use their own software systems to manage appointments. There is no consistent platform nor are there consequences for a trucker missing an appointment or a terminal failing to serve a truck on time. In addition, the appointments only provide times for gate arrivals to pick up loaded containers; however empty returns and chassis are not currently scheduled. If there were a uniform portal for securing all aspects of a truck transaction, it could improve the functionality of the system, help to alleviate congestion issues, and promote dual transactions (e.g. empty return coupled with a loaded pick-up). Further, efficiency improvements at the gate and throughout the terminal can reduce truck idling time.

Together, these improvements could improve traffic flow, and reduce truck turn times, vehicle miles travelled, and associated truck emissions. In order to improve overall efficiencies and achieve these goals, the Ports propose the adoption of a universal appointment system for San Pedro Bay to be implemented by January 1, 2019.

The Ports support an appointment system that can be paired with financial penalties for terminals and trucking companies that fail to uphold their end of the appointment. Other ports around the world have adopted similar programs. For example, Port Botany, Australia's second largest container port, has instituted financial penalties for terminals that do not honor a trucker's appointment and for truckers who do not arrive during their scheduled appointment time.

The Ports could also explore a program that establishes maximum turn times for trucks within the terminal (i.e. from in-gate to out-gate). The goal would be to achieve a maximum visit time of 1 hour for a dual transaction. Port Metro Vancouver has implemented a system that imposes fees on terminals that exceed a specified truck turn-time threshold; such an approach could be a model here for terminals that exceed a certain turn-time standard. Further evaluation would be needed to determine whether or not these approaches could work in the San Pedro Bay Ports, where the truck fleet is four to 10 times larger than these other ports.

In addition, appointment systems should be able to provide predictive appointments, in anticipation of when a container will be ready for pick up. Currently, in most cases, appointments for containers cannot be scheduled until the container has already been cleared for pick-up, which can be days after the container arrived in the terminal. With predictive appointments that anticipate when the container will be ready, there could be more opportunity for advanced planning and more efficient scheduling for dual transactions.

In May, PierPass – a nonprofit company created by terminal operators to address issues of congestion, air quality, and security – announced plans to evaluate a port-wide appointment system with an associated fee structure. The Port will continue to coordinate with PierPass to understand if the proposed program can be structured in a way to achieve our goals.

Thus, the strategy for the Universal Truck Appointment System is as follows:

- Adopt a universal appointment system for San Pedro Bay by January 1, 2019, to be used as a mechanism for improving overall efficiency for truck transactions in the port complex.

The Ports would propose to conduct a pilot program prior to broader implementation in order to gauge the potential effectiveness and to ensure implementation can be optimized to meet the Ports' goals.

3.3. Systemwide Efficiencies

In order to improve the overall efficiency of freight movement, the Ports are looking beyond the terminals and the port complex. Transitioning to cleaner equipment is critical; however, further emission reductions can be achieved by changing the very way we do business. For example, moving cargo by rail as opposed to truck or handling containers at off-terminal yards, which was identified in the Sustainable Freight Action Plan, show promise in improving air quality.

Such efforts require study, and as such, the Ports propose to examine the feasibility of systemwide efficiency programs in order to identify potential emission reductions and to accelerate deployment. Several of these efforts, including emerging technology demonstrations for intelligent transportation systems and other pilot projects to enhance efficiency, have already begun and can be expanded upon:

Port of Los Angeles Information Portal: The Port of Los Angeles and GE Transportation are partnering to pilot a first-of-its-kind port information portal, a unique approach to demonstrate the benefits of digitizing maritime shipping data and making it available to cargo owners and supply chain operators through secure, channeled access. The digital platform will provide stakeholders with greater line-of-sight and planning capabilities to more effectively service ultra-large container vessels. Cargo data used in the two-month pilot project will include filtered information from the U.S. Customs and Border Protection’s Automated Commercial Environment (ACE) system. The pilot project is a critical first step toward enabling next-level collaboration and coordination among the many stakeholders involved in the conveyance of waterborne cargo containers. It will enhance supply chain performance by delivering fast, data-driven insights through a single portal to partners across the supply chain. Ultimately, the goal of the port information portal is to improve data-flow between cargo owners, shipping lines and other stakeholders so that port and terminal operators have an extended window of time to track inbound cargo to more effectively service vessels, optimize cargo movement and improve the predictability and reliability of the supply chain.

Freight Advanced Traveler Information System (FRATIS) Demonstration: The Port of Los Angeles is using a nearly \$1 million grant from the California Energy Commission to support the ongoing large-scale testing of this technology. FRATIS is an intelligent transportation system that analyzes data from multiple sources to come up with the most efficient schedule, route and container information for drivers, dispatchers and cargo owners. Specific technologies that are being tested include: real-time traffic information being obtained from the California Department of Transportation and the Los Angeles County Metropolitan Transportation Authority (Metro); automated estimated-time-of-arrival messaging to the terminals one day in advance of truck arrival; and deployment of an algorithm which will optimize drayage throughout the day and region. The system is designed to reduce travel times inside and outside the terminals, which in turn reduces congestion, emissions and fuel consumption. The demonstration phase of the existing project involves 200 trucks and several trucking companies. The project is also testing Geostamp, a Harbor Trucking Association/InfoMagnus application, which tracks real-time truck travel and terminal turn times via an automated mobile smart device app, and ECO-Drive, University of California, Riverside’s Center for Environmental Research and Technology app, which uses traffic signal timing information to optimize acceleration/deceleration of trucks. The Eco-FRATIS demonstration will commence in late 2017.

Concept for the Harbor Performance Efficiency Center (HPEC) “Peel Off Yard:” The conceptual HPEC is a proposed “peel off yard” located in the Port of Los Angeles that could provide an outlet to relieve congestion in San Pedro Bay. The concept is expected to increase efficiency, reduce costs, and lower emissions. Efforts will be made to ensure that zero- and near-zero-emission technologies are demonstrated and used to the greatest extent feasible at this facility, which will also be used to facilitate learning, collaboration, and new innovative ideas for the supply chain. This concept is currently in the environmental review process.

Short-Haul Rail Study: The Ports have begun researching the potential of inland ports, which involve shuttling cargo by rail between the port complex and warehousing and distribution centers within 100 miles of the Ports. Initial discussions with beneficial cargo owners along with distribution center and warehouse operators indicate significant interest in an inland port served by short-haul rail to serve the Inland Empire region, providing costs are comparable to a truck move. The Ports will be pursuing a more detailed review of the concept. Potential benefits could include reduced congestion at marine terminal gates, reduced congestion on local freeways, and reduced net emissions. Further study is necessary, however, to ensure that potential impacts are not just being shifted to a new location.

Advanced Transportation Management and Information System (ATMIS): The Ports began using this intelligent transportation system (ITS) technology for managing traffic conditions in the San Pedro Port Complex in 2012 and recently began exploring an upgrade of the system. ATMIS is composed of computer software communicating with various field devices including closed-circuit cameras, vehicle detectors, and changeable message signs connected to a central computer software to improve traffic flow and to enable management of roadway conditions. The initial phase of the upgrade includes integrating current traffic management functions with Virtual Port, a geographic information system (GIS)-based operations monitoring tool developed by the Port of Long Beach Security Services Division. Subsequent phases include potential enhancements to Virtual Port and Web Portal (the viewer-only version of the tool) to specifically aid traffic management functions, improved coverage of ATMIS field devices, coordination with the Freight Advanced Traveler Information System (FRATIS), and continued data sharing with regional ITS managed by the Los Angeles County Metropolitan Transportation Authority (Metro) and the California Department of Transportation (Caltrans).

There is a need for these efforts to be expanded. The Ports will coordinate with their industry and regulatory partners to identify and expand upon the areas of study, which may include:

- Short-haul rail (i.e., shuttle trains)
- Off-dock chassis facilities
- Staging yards (i.e., peel-off yards)
- Truck appointment times and off-terminal queuing
- Intelligent transportation systems

4. Energy Resource Planning

Transitioning to zero emissions at the scale needed to support the two largest container seaports in the country will place a significant burden on the Ports' energy system. Adding electric and alternative-fueled equipment will require additional infrastructure, and the Ports will be challenged to ensure reliable, predictable, and cost-effective power to maintain our operations. For these reasons, the Ports must think strategically about energy generation, storage, controls, and systems integration to ensure resiliency for our operations and to meet the 2050 GHG goal.

Since each Port receives its power from different utility providers (Southern California Edison for the Port of Long Beach and Los Angeles Department of Water and Power for Port of Los Angeles), each Port has embarked on its own detailed energy resources planning efforts. The goals of both Ports remain aligned and focused on the following key concepts:

- *Resiliency*: Ability of the Ports to maintain business continuity during power outages and resume operations after a catastrophic event.
- *Availability*: Access to sources of electricity necessary for present and future power demands of Port operations through generation, transmission, and distribution and access to alternative fuels such as hydrogen to support fuel cell powered equipment.
- *Reliability*: Availability of high-quality, consistent electricity that meets predicted peaks in demand.
- *Cost Stability*: Ensure that costs for energy are predictable into the future and cost effective.
- *Efficiency*: Adoption of, and incentives for, management practices and technologies that reduce energy demand.
- *Sustainability*: Integration of energy management practices and renewable power generation to minimize the depletion of natural resources and provide economic, social, and environmental benefits.

Through the respective energy planning efforts, the Ports are poised to become industry leaders in the management of integrated energy systems that will provide safe, reliable, sustainable power and fuels for seaport operations.

4.1. Energy Infrastructure

The Ports understand that technology-driven design improvements and significant infrastructure planning are required to support the deployment of zero and near-zero-emission equipment. Collaboration between the Ports, manufacturers and regulators is required to evaluate and standardize infrastructure needed for emerging technologies. For example, as mentioned previously, the Ports have convened a working group to establish a charging standard for heavy-duty equipment and are evaluating various charging systems. Initial estimates indicate that supporting infrastructure could cost upwards of \$2 billion, so a thorough evaluation of

alternatives is required. This research will be used to develop infrastructure plans, design criteria and specifications, and more refined cost estimates to support equipment electrification.

In addition, the ports will evaluate the need for additional alternative fuel infrastructure to support near-zero and zero-emission equipment and will work with port operators, fuel providers, and regional stakeholders to support necessary deployments.

In addition, both Ports are developing energy programs and are working to refine, demonstrate and implement various energy management strategies. Port efforts can be found at the following websites:

- Port of Long Beach: <http://www.polb.com/environment/energyisland.asp>
- Port of Los Angeles: [https://www.portoflosangeles.org/DOC/DRAFT%20POLA%20E-MAP July%202014.pdf](https://www.portoflosangeles.org/DOC/DRAFT%20POLA%20E-MAP%20July%202014.pdf)

Supportive Efforts

For the CAAP to be successful, the Ports must engage in efforts that support the CAAP strategies even if those efforts are not tied directly to the strategies themselves. Specifically, the Ports commit to augmenting workforce development initiatives that bolster the transition to zero emissions and to cultivating innovation and supporting businesses, including entrepreneurs, that can assist in the development of new emission-reduction technologies.

Workforce Development

The CAAP 2017 Update hinges on new emission-reduction technologies, particularly near-zero emissions and zero emissions for on-road and off-road vehicles. To support this transition, the Ports need a workforce that can operate and maintain natural gas, battery-electric, and fuel cell equipment; build the necessary infrastructure; and develop innovative approaches to improving efficiency. All this can be done while maintaining the vital jobs here in the port complex, but preparing for these changes must start now.

The Ports already actively engage in workforce development efforts, and in support of the CAAP, we commit to building upon them:

- **Zero-Emissions Workforce Development Working Group:** The Port of Long Beach has partnered with Long Beach City College to evaluate the workforce needs for a zero-emissions future and to develop recommendations for new training programs and curricula that address any gaps. The effort launched this year and the first phase – assessments and recommendations – is expected to wrap up in early 2019. Future phases will involve curriculum development and implementation of new programs. This work group builds upon the Port’s longstanding partnership with Long Beach City College, which includes an award-winning training program for technicians servicing natural gas trucks.
- **Harbor Driver Training Program:** Since 2013, both Ports have partnered with the Harbor Trucking Association and Long Beach City College to train drayage truck drivers through the Harbor Driver Training Program. To date, this program has graduated more than 140 drivers with 70% of them placed into port truck driving jobs. As truck technologies evolve to near-zero emissions and zero-emissions, the Ports will continue to support driver training programs.
- **International Trade Education Programs™ (ITEP):** ITEP is a Southern California 501(c)(3) non-profit organization that prepares high school students for diverse career opportunities in ports, transportation, logistics, and related industries. ITEP develops programs that integrate internships and career mentoring with the curriculum of area high schools. ITEP serves more than 5,100 students in 21 academies across 15 high schools, many of them near the Ports.

- **Academy of Global Logistics (AGL) at Cabrillo High School:** The Port of Long Beach sponsors the AGL at Cabrillo High School in Long Beach, which combines academic curriculum with industry relevant training and information to support academic and career development. The Academy introduces high school students to career opportunities in global trade and logistics and shows them how to prepare for those careers through a wide range of training and education programs including certificates, certifications, and degrees offered by Long Beach City College and California State University, Long Beach.

Business Support

- **Technology Events and Entrepreneur Development:** As described earlier, the Ports support emerging technology manufacturers and developers through the TAP. The primary purpose of the TAP is to demonstrate promising emission-reduction technologies; however, in support of this ultimate goal, the Ports work closely with organizations that support entrepreneurs whose technologies may be applicable to port operations. In the past, the Ports have attended conferences and events that give entrepreneurs opportunities to pitch new ideas for emission-reduction technologies, and we have participated in “hack-a-thons” to stimulate innovations for supply chain efficiencies. The Ports plan to augment these efforts going forward.

Implementation

The CAAP 2017 Update is a high-level policy and planning document. Following its adoption by the Boards of Harbor Commissioners, the Ports will begin implementing the individual strategies through separate actions considered by each Port's Board of Harbor Commissioners. All of the strategies will require further Board approval, such as grant and incentive programs, contracts, tariff amendments and budget authorizations before they can be implemented. As these strategies come to each Port's respective Board for adoption through a public process, the staffs will share more implementation details, including specific timelines, cost estimates, and programmatic procedures, and stakeholders will have the opportunity to provide comments along the way.

Following adoption by the Ports' Boards, the Ports will take the following actions toward CAAP implementation:

- Develop technology feasibility assessments to evaluate technological readiness, economic considerations, and infrastructure availability for trucks and cargo-handling equipment by the end of 2018;
- Modify the vessel incentive programs, including the vessel speed reduction program, by the end of 2018;
- Begin a study to determine the appropriate fee level for the Clean Trucks Program with completion in the first half of 2019;
- Identify specific demonstration projects for zero-emissions trucks and terminal equipment, harbor craft, and at-berth emission-reduction technologies;
- Begin development of a terminal equipment idling reduction program;
- Begin detailed infrastructure planning for near-zero-emissions and zero-emissions terminal equipment.

The Ports commit to regularly communicating the results of our CAAP efforts to our Boards and all of our stakeholders. To that end, the Ports plan to post regular updates about CAAP initiatives and all related CAAP documents, including assessments and technology reports, on the CAAP Web site and on social media. The Ports also will keep their Boards apprised of progress through regular briefings at public Board meetings.

Additionally, the Ports plan to convene a CAAP Implementation Advisory Workgroup comprised of various stakeholders to provide input on the implementation of the CAAP strategies. This workgroup will meet on a regular basis to hear updates on the Ports' progress, which will be provided in regular reports to Mayors of Long Beach and Los Angeles, and to provide feedback on the path forward.

Appendix: Changes in CAAP Strategies from Discussion Document

	Original Discussion Document Strategy	NEW Proposed Strategy
CLEAN VEHICLES AND EQUIPMENT TECHNOLOGY AND FUELS		
1.1. Clean Trucks Program	<ul style="list-style-type: none"> Beginning in early 2018, cargo carried by all trucks with engines 10 years or older would be subject to a fee with the exception of cargo carried by near-zero and zero-emissions trucks Beginning in 2020, all trucks registered in the Ports Drayage Truck Registry must meet the federal 2010 engine emission standard Beginning in 2023, or when the State's low-NOx (near-zero-emission) heavy-duty engine standard takes effect, new trucks registered in the Ports Drayage Truck Registry must meet this low NOx standard or better Beginning in 2035, all trucks registered in the Ports Drayage Truck Registry must be zero emissions (no tailpipe emissions or the equivalent) 	<ul style="list-style-type: none"> Beginning in early 2018, new trucks entering the Port's Drayage Truck Registry must have an engine model year (MY) 2014 or newer. In 2023, or when the State's near-zero-emission heavy-duty engine standard takes effect: <ul style="list-style-type: none"> New trucks registered in the Ports Drayage Truck Registry must meet the near-zero standard or better All trucks registered in the Ports Drayage Truck Registry must pay a truck rate with exceptions for near-zero and zero-emissions trucks In 2035, only trucks that meet zero-emissions or the equivalent will be exempt from the rate

	Original Discussion Document Strategy	NEW Proposed Strategy
Clean Trucks: Feasibility Assessments	In 2020, 2025, and 2030, conduct feasibility assessments to evaluate the state of the technology development, infrastructure availability, and economic factors for deployment of zero-emissions trucks by 2035 and to provide interim progress reports on deployment of near-zero and zero-emission trucks.	Conduct feasibility assessments every 3 years with the first one by end of 2018.
Clean Trucks: Maintenance Program	Facilitate and support the State’s comprehensive heavy-duty vehicle maintenance and repair program currently under development	By 2020, in partnership with the State and trucking industry, launch a pilot smog check program for heavy-duty trucks in San Pedro Bay.
Clean Trucks: Fee Waiver for Clean Trucks	Waive the Clean Truck Program registration fee for near-zero and zero-emission vehicles, effective upon adoption of the tariff	No change.
1.2. Clean Terminal Equipment	All terminal equipment must be zero-emissions by 2030. This requirement will be placed into leases.	Participate in the State’s efforts to achieve up to 100% zero-emissions cargo-handling equipment by 2030, and support implementation by demonstrating new technologies, accelerating deployment through a concerted funding strategy, and accelerating requirements through leases where possible.

	Original Discussion Document Strategy	NEW Proposed Strategy
1.3. Terminal Equipment Idling Reduction Program	Terminal operators would be required to develop plans to reduce or eliminate unnecessary idling of cargo-handling equipment.	No change.
1.4. Vessel Speed Reduction Program	<ul style="list-style-type: none"> • Maximize participation in program to 40 nm by eliminating the 20 nm incentive and potentially increasing the 40 nm incentive. • Implement alternative compliance plans allowing vessel operators to maximize emission reductions for their fleet. 	No change.
1.5. At-Berth Emissions	<ul style="list-style-type: none"> • Develop programs to control at-berth emissions from non-regulated vessels in advance of state regulation and at utilization rates higher than those proposed by CARB. 	Participate in the State’s efforts to achieve up to 100% compliance with the At-Berth Regulation by 2030 and assist with implementation by demonstrating new at-berth emission reduction technologies, accelerating availability and utilization of technologies through a concerted funding strategy, and accelerating use requirements through leases where possible.
1.6. Green Ship Incentives	Modify the Port of Long Beach Green Ship Incentive Program and the Port of Los Angeles’s Environmental Ship Index Program to reward operational efficiencies and emission reduction technologies	No change.

	Original Discussion Document Strategy	NEW Proposed Strategy
1.8. Harbor Craft	<ul style="list-style-type: none"> • Provide incentives for harbor craft operators to upgrade to the cleanest available (i.e. Tier 4) engines or low-emission hybrid systems in the short term, and to upgrade with advanced technologies (e.g. fuel cells and alternative fuels) in the long term. • Identify operational changes that could reduce emissions. 	No change.
FREIGHT INFRASTRUCTURE PLANNING AND INVESTMENTS		
2.1. On-Dock Rail	Build rail infrastructure with the goal of accommodating 35% of all cargo leaving the port complex by rail.	Added long term goal of 50% of cargo leaving the port complex by rail.
2.2. Charging Standards	Work with technology developers, regulatory agencies and industry to develop uniform charging standards for cargo-handling equipment.	No change.
FREIGHT EFFICIENCY		
3.1. Green Terminal Program	Develop a voluntary recognition program to celebrate the achievements of terminals working to enhance productivity while minimizing air quality impacts.	No change.

	Original Discussion Document Strategy	NEW Proposed Strategy
3.2. Green Truck Priority Program/ Universal Truck Appointment System	Work with terminal operators to give preferential access to zero- and near-zero-emission trucks.	By 2020, adopt a universal truck appointment system for San Pedro Bay to be used as a mechanism for minimizing truck turn times and improving overall efficiency for truck transactions in the port complex.
3.3. Systemwide Efficiencies	Examine the feasibility of systemwide efficiency programs in order to identify potential emission reductions and to accelerate deployment.	No change.
ENERGY RESOURCE PLANNING		
4.1. Energy Infrastructure	Develop plans for infrastructure to support zero-emissions goals.	No change.
4.2. Energy Strategies	Implement various energy strategies through each Port's respective energy plan.	Combined with Strategy 4.1