Port of LONG BEACH
The Green Port

THE PORT OF LOS ANGELES

SAN PEDRO BAY PORTS

CLEAN AIR ACTION PLAN 2017

DRAFT Discussion Document

NOVEMBER 2016

San Pedro Bay Ports
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Released November 2016

The Port of LONG BEACH
The Green Port

THE PORT OF LOS ANGELES

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

caap@cleanairactionplan.org

The comment period extends through February 17, 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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INTRODUCTION

The Port of Long Beach and Port of Los Angeles (together, the "Ports") hereby introduce a draft of the proposed Clean Air Action Plan 2017 Update (CAAP) programs that will serve as a roadmap for continued emission reduction activities in collaboration with industry stakeholders, local communities, environmental groups, and regulatory agencies (collectively, "stakeholders") for the next 20 years. This Draft Discussion Document is the result of several planning and discussion meetings with stakeholders that have taken place over the past 18 months.

Further stakeholder discussions are planned for a 90-day period after the Ports release this Discussion Document at a joint meeting on November 17, 2016. These next stakeholder meetings will include a community workshop at Banning's Landing in January 2017, as well as numerous individual meetings by staff of the Ports with stakeholder groups. Please reach out to the Ports' CAAP planning staff at caap@cleanairactionplan.org to assure meeting with any groups that are interested can be scheduled.

When the Ports first adopted the 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 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 more than a billion dollars spent on cleaner trucks and cargo-handling equipment and strategies such as shore power for ships. 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 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 our 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 roadmap to help the region achieve its clean air goals and to support the statewide vision for more sustainable freight movement. The proposed strategies 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 near-zero and 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 engine technologies and operational changes through incentives and new requirements. In

parallel, the Ports are evaluating long-term strategies 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 Discussion Document have been shaped by extensive outreach and engagement with the goods movement industry, environmental groups, regulatory agencies, and the local communities. To refine the specific strategies contained within this Discussion Document, the Ports developed and 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. Comments received during that public workshop are posted on the Ports' CAAP website at www.cleanairactionplan.org.

Additionally, these strategies have been guided by recent planning efforts, chief among them the Sustainable Freight Action Plan, which also provides the framework for State and regional control strategies under the Clean Air Act. Lastly, these strategies are informed by numerous technical documents, including the Ports' Zero Emissions Roadmap,[1] separate efforts by each of the Ports, and a series of technology assessments developed by the California Air Resources Board.[2]

Our intent is for this Discussion Document to provide a platform to develop the next steps and strategies to be undertaken. In order to finalize the CAAP, the Ports will seek input on the proposed strategies to work toward a shared vision of an economically competitive, efficient, and environmentally sustainable port complex.

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.

[1] http://www.cleanairactionplan.org/documents/zero-emissions-roadmap-technical-report.pdf
[2] https://www.arb.ca.gov/msprog/tech/report.htm

The Technology Advancement Program (TAP), a CAAP initiative, is a collaborative partnership among the Ports, regulatory agencies, and industry partners, including shipping lines and terminal operators. Through the TAP, the Ports fund the development and demonstration of promising emission-reduction technologies. Since its inception nearly 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 CAAP will be the third version of the CAAP.

This Discussion Document provides high-level strategy concepts for consideration by industry, community, environmental groups, and other stakeholders. Input received on these concepts will be used to inform the final CAAP document, anticipated for consideration by the Boards of each Port in spring 2017.

Additionally, the CAAP is a plan, and acceptance of the plan does not constitute approval of the individual strategies. Each Port's Board of Harbor Commissioners would need to approve these strategies in separate actions, which would provide additional time for study, outreach, and refinement.

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.

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.

To that end, the CAAP incorporates a new emission reduction target:

- 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 85%, NO_x by 51%, 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 the 2020 Bay-wide health risk goal. As part of the public dialogue regarding this Draft CAAP Discussion Document, the Ports are working with State, regional and local regulators and stakeholders to determine how 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 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 a 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 2050 GHG reduction goal help us achieve our 2023 NO_x, DPM, and SO_x emission reduction targets and maintain them. More importantly, the 2050 GHG reduction goal aligns with local, regional, and State mandates and commits 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 target of 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 state and federal air 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

Appendix A includes the detailed list of Sustainable Freight Action Plan strategies supported by the CAAP.

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

In the near-term, 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 run. Where cleaner engine technologies already exist, 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 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 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 and 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 target. 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 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 South Coast Air Quality Management District has petitioned the federal government for a national low-NO_x 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 advocate for the following regulations:

- Ultra-low NO_x 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 on cargo handling equipment

Funding Advocacy

In the short term, capital costs are likely to remain very high for both manufacturers and operators of the advanced technologies envisioned in the CAAP. Federal, state and regional government incentives will be needed to 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. Also, additional research, development, and demonstration projects will be needed. The Ports will advocate for incentive funding from federal, state, and regional sources to assist with these efforts.

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 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 help them with the application process.

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 and reinforce our continued push to reduce port-related air quality impacts. With a combination of requirements and incentives, the Ports aim to advance 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 and harbor craft, the Ports are proposing strategies with longer timeframes and incremental near-term milestones to get us to our ultimate outcome.

1.1. Advance the Clean Trucks Program to phase out older trucks and transition to zero-emission trucks by 2035.

The Clean Trucks Program adopted in 2007 and implemented beginning in 2009 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. In just two years, the trucking fleet, which at the time consisted of about 16,000 regular callers, was transformed and truck-related DPM emissions were reduced 97% between 2005 and 2015.

While this progress is remarkable, more needs to be done. The State's Truck and Bus Rule bans pre-2010 trucks in 2023, but as described below, the Ports seek to accelerate this ban, and, furthermore, to ensure the fleet stays newer by imposing fees on trucks with engines that are 10 years or older.

According to the 2015 port emissions inventories, trucks remain a significant source of our emissions. Port trucks contribute more than 20% of our 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 greenhouse gas emissions, representing 37% of total port-wide GHG emissions.

Notably, today about 40% of the truck fleet is equipped with MY2010 or newer engines that are significantly cleaner than their predecessors. The balance of the truck fleet, however, is nearly 10 years old, and their engines are deteriorating, which results in rising emissions. These rising emissions are problematic because the older trucks – those with pre-MY2010 engines – conducted 59% of the port truck trips in 2015.

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.

Discouraging or banning operation of older trucks makes sense for a variety of environmental and operational reasons. For one, truck emissions peak at 12 years, according to the State's emissions factor model (EMFAC). Thus, our proposed strategy could discourage the use of 10-year-old trucks before they reach peak emissions. Second, industry data show that fleets generally replace heavy-duty trucks about every 7 years,[3] after the asset has been fully depreciated and the warranties have expired. The effective useful life on trucks included in the updated Clean Trucks Program minimizes financial impacts on the trucking sector by leveraging natural replacement cycles.

In the long term, the Ports must continue to ratchet down truck-related pollution with cleaner technologies. 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

SCAQMD and other partners are working with Cummins Westport Inc. (CWI) to develop and demonstrate a 11.9L low-NO_x engine as a follow-on effort to CWI's recent certification and commercialization of its smaller 8.9L ISL G NZ near-zero-

[3] http://atri-online.org/wp-content/uploads/2015/09/ATRI-Operational-Costs-of-Trucking-2015-FINAL-09-2015.pdf

emission engine. The schedule anticipates the larger low-NO_x engine to be available in early 2018.

This near-zero engine is projected to meet drayage truck operational needs, and when paired with renewable natural gas, would provide significant GHG reductions. CARB has also projected[4] that diesel-fueled near-zero engines are likely to become available by 2020.

Moreover, CARB's draft 2016 State Strategy for the State Implementation Plan[5] proposes to require a manufacturing standard for all new heavy-duty engines to meet the low-NO_x standard starting in 2023.

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.

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.

There is still significant effort needed to commercialize these zero- and near-zero-emission technologies. 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.

[4] https://www.arb.ca.gov/msprog/tech/techreport/ta_overview_v_4_3_2015_final_pdf.pdf
[5] https://www.arb.ca.gov/planning/sip/2016sip/2016sip.htm

The Clean Trucks Program update is as follows:

- 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-NO_x (near-zero-emission) heavy-duty engine standard takes effect, new trucks registered in the Ports Drayage Truck Registry must meet this low NO_x 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)

Additionally, the Ports would:

- 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. 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 study may identify if there is a long-term need for near-zero-emission trucks in certain duty cycles.
- Facilitate and support the State's comprehensive heavy-duty vehicle maintenance and repair program currently under development
- Waive the Clean Truck Program registration fee for near-zero and zero-emission vehicles, effective upon adoption of the tariff

The fee on older trucks will be implemented similar to the Clean Truck Program fee that was implemented to support the original program between 2009 and 2012. The fee will be assessed to the owner of the cargo that is being transported by the older truck. Similar to our original effort, the Ports intend to update the economic study that was conducted to identify the appropriate amount of the fee. All proceeds from the fee will be used to defray the administrative costs of the program and for incentives to the trucking industry to accelerate the transition to near-zero and zero-emission trucks.

To support the transition to the near-zero and zero-emission trucks, significant allocations of federal, state and local grant funding will be necessary. The Ports will play an active role in advocating for this funding support, focusing on accelerating the transition to near-zero and zero-emissions trucks.

To assist the trucking industry with the transition, both Ports will work with local workforce development programs to assist with necessary training programs to support implementation of the new technologies and retraining programs for drivers, as needed.

1.2. Transition to zero-emissions terminal equipment by 2030.

Within the marine terminals, equipment is used to move the cargo within 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 CAAP and the 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 to near-zero and zero-emission technologies.

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, shore-to-ship 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 Long Beach Container Terminal, and several terminals have begun demonstrating electric yard tractors in regular operations.

Terminal operators have made considerable capital investments in clean diesel-fueled equipment to comply with 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 performance equivalent to traditional, diesel-powered equipment.

To accelerate emission reductions, the terminal equipment requirement is as follows:

- All terminal equipment must be zero-emissions by 2030. This requirement will be placed into leases.

Working toward this requirement, the Ports will conduct feasibility assessments and provide interim progress reports in 2020 and 2025 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. 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. In addition, the feasibility study may identify if there is a long-term need for near-zero-emission equipment in certain duty cycles. Finally, 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.

To support the transition to zero-emission equipment, the Ports will advocate for early allocations of federal, state and local grant funding. The Ports will also provide assistance to terminal operators in identifying and applying for grant funding.

1.3. Modify the Vessel Speed Reduction Program to expand compliance out to 40 nautical miles (nm) and to maximize emission reductions with differential speeds.

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

The voluntary Vessel Speed Reduction (VSR) Program initially started under a multi-party Memorandum of Understanding in 2001. Since 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 nearly 95%, and participation within the 40 nm zone is nearly 90%.

Owing to the significant emission reductions associated with vessel speed reduction, especially reductions in NO_x emissions, the Ports are seeking to increase compliance at the 40 nm boundary.

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

- Eliminate the 20 nm incentive but maintain an increased 40 nm incentive.

Importantly, the structure of the programs at each Port, which includes a combination of financial incentives and recognition, has been very successful and will not change. This revised VSR program would emphasize compliance out to 40 nm from the Ports. Currently, some operators only participate to 20 nm because of operational issues, such as scheduling for the vessels for other destinations on the service string.

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. Thus, the Ports would also pursue the strategy that follows:

- 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.

1.4. Provide incentives and require in some cases through terminal leases the use of at-berth emission reduction technologies for vessels not covered by the state's shore power regulation.

Emissions from ships 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 gases were emitted by ship auxiliary engines at berth.

CARB requires at-berth emission reductions from container, cruise and reefer vessels, 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.

Although this regulation will continue to significantly reduce at-berth emissions from vessels subject to the regulation, it excludes certain vessel types. At-berth emissions from bulk, break bulk, tankers and auto carriers are not regulated primarily because shore power has not been a good operational fit for these vessel types. These vessels, however, contributed one-third of our total at-berth emissions in 2015.

Thus, the Ports seek further reductions by encouraging at-berth emission reduction technologies for vessel types not covered by the CARB shore power regulation.

Recently, CARB approved two alternative technologies (AMECS and METS-I) 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; however, operators of both of these systems are working with CARB to expand approval to include other sizes and types of vessels.

CARB has announced plans to amend the at-berth regulation by 2018 to include other vessel types. In the draft SIP strategy, CARB assumed 10% fleet compliance by other vessel types in 2022 increasing to 50% fleet compliance by 2032. The Ports seek to accelerate this timeline and expand utilization with the following strategy:

- 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.

1.5. Provide incentives for energy efficiency upgrades and emission reduction technologies on ships.

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 inventory. Of those ship emissions, more than half are associated with ships transiting or maneuvering. The International Maritime Organization (IMO) has established engine standards for ships that ratchet down the allowable NO_x emissions over time, which has a tremendous environmental benefit for ship transit emissions. Tier 2 engines, which were available beginning in 2011, are 15% cleaner than the previous generation of engines, and Tier 3 engines, which were available beginning in 2016, are 75% cleaner than Tier 2 vessels.

Although the IMO requires manufacturers to produce these engines for ships serving the North American Emission Control Area (ECA), there are no requirements for shipping lines to purchase ships with these new engine types or to deploy them on services calling at 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 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 that otherwise reduce energy consumption. 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 modifications of the bulbous bows, installation of improved propellers, de-rating of the main engines, and upgrading the ship's lighting system to light-emitting diodes (LEDs), which reduces the lighting-related electrical load and 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.

Additionally, 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 a 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 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.

1.6. Develop a Clean Ship Program to transition the oldest, most polluting ships out of the San Pedro Bay fleet.

Engines are classified by the IMO from Tier 0, the oldest engines, to Tier 3, the newest – and cleanest – engines. Operators, however, are not required to upgrade their fleets with these newer vessels or 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. Second, very few ships with Tier 3 engines have been constructed so far. Although Tier 3 engines are required on ships calling North America with keels laid after January 1, 2016, shipping lines can lay a keel and then delay construction of the ship for many years or indefinitely.

For these reasons, the Ports do not expect to see Tier 3 ships in San Pedro Bay Ports any time in the next 10 years. The Ports project the first Tier 3 ship to arrive no earlier than 2026 with most arriving after 2028.

Absent natural turnover to bring these ships with the cleanest engines into the San Pedro Bay service, to meet our emission reduction goals the Ports will attempt to encourage deployment of Tier 2 and Tier 3 vessels and discourage calls by Tier 0 and Tier 1 ships.

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

- Impose a higher rate on Tier 0 ships to start, later adding Tier 1 ships, to begin no earlier than 2025.

This 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.

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 and evaluate this strategy's potential economic impacts on the shipping industry. This assessment will be used to set the implementation timeline and fee structure. 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.

1.7. Adopt a "Green Truck Priority" program at terminals to accelerate the deployment of zero- and near-zero-emission trucks.

In order to jumpstart an industry-wide move toward cleaner drayage, the Ports propose to work with terminal operators to give preferential access to zero- and near-zero-emission trucks. Priority access would enable drivers with the cleanest trucks to get access to a terminal more quickly, thus allowing them to make more daily moves – called "turns" – and earn more revenue. Faster moves and higher earning potential could entice drivers and trucking companies to accelerate the investment in zero- and near-zero-emission trucks.

Preferential access could involve giving drivers of clean trucks the first choice of coveted appointment/reservation slots, dedicating a gate for cleaner trucks, or a combination of several such strategies.

Due to the physical constraints of access roads into marine terminals, the Ports would propose to conduct a pilot program prior to broader implementation in order to gauge the potential effectiveness and to ensure implementation does not result in even longer waits for other trucks at the gates, resulting in greater emissions overall.

1.8. Accelerate the deployment of cleaner harbor craft engines and operational strategies to reduce harbor craft emissions.

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 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, several harbor craft have been repowered with cleaner engines using incentive funding from the Ports and other state and federal incentive programs.

Despite all of these emissions reduction efforts, the relative contribution of emissions from harbor craft compared to emissions from all port-related sources has increased and is projected to remain at this higher level in the future because the engines will continue to deteriorate absent new mandates for turnover. 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.

The Ports will continue to invest in technology development projects for harbor craft and periodically will conduct 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 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.

1.9. Establish a Terminal Equipment Idling Reduction Program to reduce or eliminate extended idling of diesel-powered cargo-handling equipment.

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 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.

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.

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 on-dock rail.

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 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' investment in on-dock rail infrastructure and in programs that shift cargo to rail.

The Ports have made significant investments over the years to build rail infrastructure 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. Over the long term, the Ports are seeking to handle 50% of all cargo leaving the port complex by rail. To achieve this goal, 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 3.2.

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 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.

2.2. Develop charging standards for electric cargo-handling equipment.

Successful deployment of commercially available electric cargo-handling equipment will depend on compatible and accessible electrical charging infrastructure. Currently, manufacturers of electric cargo-handling 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.

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. 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 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 is expected to generate strategies 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. Develop a voluntary Green Terminal Program to recognize terminal operators achieving high levels of freight movement efficiency.

The Ports would develop a voluntary recognition program to celebrate the achievements of terminals working to enhance productivity while minimizing air quality impacts. This program could be modeled after the Leadership in Energy and Environmental Design (LEED) certification program, in which 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. An additional model could be a modification to the EPA SmartWay Program. Ideally, this type of a program would be implemented more broadly than San Pedro Bay, establishing a standard for good practices on a nationwide basis.

In cooperation with the terminal operators, the Ports would develop metrics by which terminals could be evaluated. 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. Terminals wishing to participate in this program would be required to report on their efficiency achievements to maintain or improve their certification level.

3.2. Study the feasibility of various strategies to enhance systemwide efficiencies.

In order to improve freight efficiency, the Ports are beginning to think 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.

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.

Additionally, the Ports are supporting emerging technology demonstrations for intelligent transportation systems, such as the Freight Advanced Traveler Information System (FRATIS), which integrates real-time data on gate wait times and traffic conditions to reduce truck queues.

These efforts need to be expanded. The Ports will coordinate with their industry and regulatory partners to identify areas of study, which may include:

- Short-haul rail (i.e., shuttle trains)
- Staging 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. Develop design criteria and terminal infrastructure plans to support equipment electrification, alternative fuels, and other energy resource goals.

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 hundreds of millions of dollars, so a thorough evaluation of alternatives is required. This research will be used to develop specifications and cost estimates to support equipment electrification.

4.2. Develop and implement energy strategies.

Both Ports have developed 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

NEXT STEPS

This Discussion Document provides a first look at proposed strategies aimed at continuing our progress in reducing emissions from sources that operate in the San Pedro Bay Ports.

The purpose of this Discussion Document is to provide stakeholders with the opportunity to review and comment on initial CAAP concepts.

The public review and comment process extends through February 17, 2017. During this period, written comments can be submitted to caap@cleanairactionplan.org.

The Ports will continue to hold focused meetings with stakeholder groups to refine these strategies over the coming months. In addition, the Ports will hold a workshop in early January 2017 to provide additional updates and continue the conversation. 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 by each Port's Board of Harbor Commissioners in early 2017.

Appendix A

The Ports relied heavily on the vision of sustainable freight articulated in the State's Sustainable Freight Action Plan. The Sustainable Freight Action Plan identified numerous specific strategies needed in order to achieve the larger vision, and the CAAP supports these strategies, specifically those listed below:

Clean Vehicles and Equipment Technology and Fuels

- Action 3.C: Research Efforts to Support Sustainable Freight Transport System Development
  Overview: Support research efforts to improve freight transportation system including demonstrations
- Action 4.A: Investments in Advanced Vehicles and Equipment Technology Demonstrations and Deployment, Renewable Fuel Production, and Other Freight Technology
  Overview: Investments in the above listed categories by ARB including on-road and off-road equipment
- Action 4.B.1: Lower In-Use Emission Performance Level for Heavy-Duty Vehicles
  Overview: Adoption of comprehensive heavy-duty vehicle inspection and maintenance program
- Action 4.B.2: Innovative Technology Certification Flexibility
  Overview: Develop a modification to test procedures that are intended to enable key technology-advancing heavy-duty vehicle regulations and incentive programs
- Action 4.B.3: Medium- and Heavy-Duty Greenhouse Gas Emissions Standards Phase 2
  Overview: California Phase 2 proposal may include some more stringent, California-only provisions to U.S. EPA Phase 2
- Action 4.B.4: Low-Nitrogen Oxides Engine Standard
  Overview: Establish low NOx engine standards for new on-road heavy-duty engines used in medium- and heavy-duty trucks
- Action 4.C.2: Zero Emission Vehicle Market Forums
  Overview: Forums for various stakeholder groups as appropriate: zero emission vehicle owners, facility owners, utilities, electricity ratepayers, and others
- Action 4.D.1: Renewable Electricity Resources
  Overview: Utilization of additional renewable electricity generation and daytime over-generation for the fueling of zero emission vehicles and equipment in the freight sector
- Action 4.D.2: Natural Gas Vehicle Research Roadmap
  Overview: Roadmap for where natural gas vehicle research, fuel production, and infrastructure planning efforts should be initiated
- Action 4.D.5: Low-Emission Diesel Requirement
  Overview: ARB proposed measure that would require low-emission diesel fuel comprises a steadily increasing percentage of the ARB diesel supply
- Action 4.E.1: Advanced Transportation Electrification Technologies
  Overview: Integration of advanced energy storage technology with transportation electrification advancement
- Action 4.F.1: Heavy-Duty Zero Emission Vehicle Fueling Infrastructure Research, Development, and Demonstration
  Overview: Funding for R&D and demonstrations focused on improving fueling infrastructure for medium- and heavy-duty zero emission vehicles through technology advancement, equipment optimization, cost reduction, and ease of scaling

- Action 4.F.2: Standardize Medium- and Heavy-Duty Vehicle and Equipment Charging Standards and Protocols
  Overview: Develop standardized medium- and heavy-duty vehicle and equipment charging protocols
- Action 4.G.1: Tier 4 Vessel Standards
  Overview: Advocacy with international partners for the IMO to establish new Tier 4 NOx and PM standards, efficiency targets for existing vessels, and new vessel categories not covered by IMO efficiency standards
- Action 4.G.3: At-Berth Regulation Amendments
  Overview: ARB would evaluate how the current At-Berth Regulation can be amended to achieve further emissions reductions by including smaller fleets and/or additional vessel types if control systems are feasible and cost effective
- Action 4.H.2: Zero Emission Off-Road Forklift Regulation Phase 1
  Overview: Deployment of zero emission technology in heavier equipment fleets that remain at a particular location for extended periods of time and ban on non-zero emission forklifts with lifting capacities less than or equal to 8,000 lbs.
- Action 4.I: More Stringent National Locomotive Emission Standards
  Overview: Petition U.S. EPA to promulgate by 2020 new Tier 5 national locomotive emission standards and more stringent national emissions requirements for remanufactured locomotives
- Action 4.J.1-3: Further Deployment of Cleaner Technologies Through Regulations, Partnerships, and Incentives
  Overview: Regulatory mechanisms and incentives to support the development of zero emission and near zero emission technology for on-road/off-road equipment, rail, harbor craft, and international sources
- Action 4.L.1: Outreach and Advocacy to Increase Awareness of Advanced Vehicle and Equipment Technologies and Clean Energy Generation Options for Freight – Freight Fleets
  Overview: Increase freight fleet awareness of advanced vehicle technology options through outreach and education campaigns
- Action 4.L.2: Outreach and Advocacy to Increase Awareness of Advanced Vehicle and Equipment Technologies and Clean Energy Generation Options for Freight – International Partners
  Overview: Expanding and enhancing existing incentive and innovative funding programs to increase the emphasis on and support for deployment of cleaner technologies in oceangoing vessels, locomotives, and aircraft
- Action 7.A.1: Truck Platooning
  Overview: R&D and demonstration of automated (vehicle-to-vehicle) truck platooning technology

Freight Infrastructure Planning and Investments

- Action 3.A.1: Electric Charging Infrastructure for Parked Trucks
  Overview: Feasibility assessment and coordination of installation of electric charging infrastructure at truck parking areas
- Action 3.A.2: Transportation Electrification Planning
  Overview: Planning on how to move closer to zero emission vehicle deployment and electrification of transportation sector.
- Action 3.A.4: Hydrogen Fueling Infrastructure
  Overview: Feasibility assessment of hydrogen fueling station network for medium- and heavy-duty applications

- Action 3.A.5: Electric Charging Infrastructure Incentives
  Overview: CEC assessment of opportunities/incentives for expanding electric fueling network for medium and heavy-duty applications
- Action 3.B.4: Regional Medium- and Heavy-Duty Zero Emission Vehicle Infrastructure
  Overview: Develop and adopt regional zero emission vehicle and equipment infrastructure plans that will support the adoption of infrastructure for medium- and heavy-duty vehicles that could refuel along major freight corridors.
- Action 3.G: Inland Facility, Short-haul Rail Shuttle, and Inland Seaports Utilization with Less Impact on Nearby Communities
  Overview: Increase opportunity for use of short-haul rail shuttles and waterways that lead to inland seaports and freight distribution hubs that will have less impact on nearby communities
- Action 3.H.1: Short Line Rail Improvements Through Infrastructure Upgrades and Advanced Technologies
  Overview: Identify locations where increased use of current and/or abandoned short line rail, and develop short line rail improvement plan

Freight Efficiency

- Action 3.E.4: Bottleneck Relief
  Overview: Congestion relief along critical highway freight facilities; improve on-dock rail, marine transportation infrastructure, and services; and construct grade separations at high-volume railroad and roadway crossings
- Action 3.F: Feasibility Assessment of Developing Dedicated Freight Lanes Along High Capacity Corridors
  Overview: Dedicated freight lanes with a demonstration pilot project on a freight corridor
- Action 3.H.2: Freight Rail Efficiencies
  Overview: Supporting the handling of transloaded international containers at on-dock/near-dock rail facilities and developing on-dock/near-dock rail intermodal terminals to reduce truck trips to off-dock terminals
- Action 4.G.2: Incentivize Low Emission Efficient Ship Visits
  Overview: ARB work with California seaports, ocean carriers, and other stakeholders to develop the criteria and to identify the best way to incentivize the introduction of Low Emission Efficient Ships into the existing fleet of vessels that visit California seaports
- Action 7.A.4: Truck Parking
  Overview: Inclusion of refueling and/or charging stations for alternative fuel vehicles and implementation of parking space availability/reservation systems technology
- Action 7.B: Freight Intelligent Transportation Systems Enhancements
  Overview: Integrate intelligent transportation systems into State roadside facilities and border ports of entry for monitoring traveler info, smart truck parking, and freight mobility systems
- Action 7.C: Off-Hour Delivery/Pick-Up Strategy Development
  Overview: Shifting cargo pick-up and delivery to off-peak hours

Energy Resource Planning

- Action 4.E.2: Vehicle-to-Grid Incentive and Funding Programs

Overview: CEC funding programs will support innovative concepts for deploying vehicle-to-grid tech in major fleets. The projects will look to develop sustainable business cases for the use of plug-in electric vehicle/plug-in hybrid electric vehicles as distributed energy providers, which will add stability to the grid while assessing the impacts of increased charging and discharging rates on battery packs

- Action 4.K.1: Seaport Electrification Demonstration Projects
  Overview: Develop demonstration projects that will promote electrification of service equipment and increase shore power applications