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E-Mailed: December 9, 2011 December 9, 2011
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Mr. Richard Cameron
Director Environmental Affairs
Port of Long Beach
925 Harbor Plaza
Long Beach, CA 90802

**Review of the Draft Environmental Impact Report (Draft EIR)
for the Proposed Pier S Project**

The South Coast Air Quality Management District (AQMD) staff appreciates the opportunity to comment on the above-captioned document and appreciates that the Port of Long Beach accommodated our request to extend the comment period through December 9. The AQMD staff has some concerns with the analysis in the Draft EIR for the Pier S Marine Terminal & Back Channel Improvements project, and hopes that our agencies will work together to resolve these issues.

The proposed project involves the development of 160 acres of vacant land in the Port on Terminal Island into a new marine terminal and associated infrastructure. As discussed in the Draft EIR, the proposed project, referred to as the Three-Berth Alternative, would, at maximum capacity, handle approximately one million containers per year that would be transported by 312 vessel calls, 1,728 annual train trips, and 1.3 million annual truck trips or 7,168 truck trips per day at full operation. Not surprisingly, the massive scope of this Project will result in significant impacts to air quality and greenhouse gases, among others. For this reason, it is important that all feasible mitigation measures including zero emission technologies, as described below, be incorporated as enforceable project requirements. The AQMD staff also questions the Draft EIR's analysis of growth inducing impacts, which does not fully consider the role of this project in substantially increasing the flow of goods in the region, and the rejection of a potentially feasible Rail Yard Alternative prior to full evaluation.

Also, this Project is one of several major port projects that have either recently been approved or are currently going through the approval process that will more than double the current number of containers flowing through the ports. It is important that these projects are developed in a complementary and coordinated manner to achieve the long-term goal of reducing the significant air quality impacts the Ports of Los Angeles and Long Beach create in the South Coast Air Basin.

This project site is unique in that it offers the rare opportunity to develop vacant land in the port. As such, the AQMD staff strongly encourages the lead agency to develop the property in a manner that improves the goods movement system at the ports to decrease its impact in the region. Specifically, this includes maximizing the amount of rail yard capacity on this site and implementing zero emission technologies. Both approaches will further reduce diesel emissions from truck travel throughout the region. These options should be fully evaluated in the EIR.

In addition, this proposed Three-Berth Alternative will expose the surrounding community to significant cancer risks, contrary to a project standard in the Clean Air Action Plan, and will exceed state and federal standards for PM and NOx. These impacts may also be substantially underestimated due to the incorrect calculation of truck emissions. Therefore the lead agency should commit to implement additional zero emission technologies at project startup and in the near future to reduce these impacts to less than significant levels.

Pursuant to Public Resources Code Section 21092.5, please provide the AQMD staff with written responses to all comments contained herein prior to the adoption of the Final EIR. Further, staff is available to work with the lead agency to address these issues and any other questions that may arise. Please contact Ian MacMillan, Program Supervisor CEQA Intergovernmental Review, at (909) 396-3244, if you have any questions regarding the enclosed comments.

Sincerely,

Susan Nakamura
Planning Manager

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Attachments

LAC110922-02
Control Number

ATTACHMENT A

Zero Emission Goods Movement

- The proposed on-dock rail yard will not be large enough to handle all the containers imported at this terminal, and more than three train loads of containers per day will need to be trucked to near or off-dock rail yards. Because of the significant NO2 and PM impacts from trucking activities identified in the Draft EIR, CEQA requires the lead agency to implement all feasible mitigation (CEQA Guidelines 15126.4). Zero emission technologies (e.g. electric trucks) to move containers over the relatively short distances between the ports and near-dock railyards will be feasible in the 2017 to 2020 timeframe — early in the life of this project (see attachment B). To mitigate significant air quality impacts of the project as required by CEQA, the lead agency must commit to requiring 100% transition to zero emission technologies for containers traveling from this terminal to near dock rail yards by 2020 with implementation beginning in 2017. The lead agency must also commit to implementing zero and near zero technologies as soon as feasible for other container destinations.

Project Alternatives

- The proposed near dock rail yard projects (proposed SCIG and ICTF expansion) will bring significant new goods movement activity in close proximity to residents. The Draft EIR for the proposed SCIG project is currently undergoing public review, and concludes that there will be significant air quality impacts that cannot be mitigated (e.g., NO2). Because the Pier S project is located on a relatively large, vacant piece of land in the port, there must be a more thorough explanation why a rail yard cannot be placed at Pier S instead of expanding rail yard capacity nearer to residents and schools — as is the case with the proposed SCIG and ICTF. The Draft EIR does not contain a clear description about why this alternative was rejected. This information must include:
    - A description of any site constraints (engineering obstacles and policy limitations) and what would be required to overcome those constraints. The studies referred to in the Draft EIR do not contain this information. Further, studies relied upon to make a determination in the EIR should be summarized within the EIR itself for clarity to the public and decision makers.
    - A description of the largest rail yard that could feasibly be built on this site (regardless of whether the site would be used as a marine terminal too). While a rail yard equivalent in size to the proposed SCIG or an expanded ICTF may not be possible at Pier S, the maximum size rail yard that could be placed here is information that the public and decision makers should have before approving the proposed Pier S project. In assessing the maximum capacity railyard feasible at Pier S, the port should include evaluation of potential in-port rail system modifications that could support greater rail capacity at Pier S, such as creating rail line extensions beyond the boundaries of Pier S to facilitate creation of trains at that Pier.
    - A description (with figures) of the improvements needed to the rail system on Terminal Island and in between Terminal Island and the Alameda Corridor to

serve a larger rail yard than currently proposed at Pier S. A determination of whether the largest feasible rail yard at Pier S plus lesser expansion than currently proposed for near dock rail yards will be able to handle the projected needed capacity for rail yard growth at and near the ports. As seen in the table below, there appears to be significant overbuilt capacity planned for near dock rail yards that will serve the San Pedro Bay ports. Specifically, total the near-dock railyard capacity proposed for SCIG and ICTF exceeds the total near-dock capacity which the ports have stated will be necessary through 2035. The Pier S EIR must specifically evaluate whether the amount of near-dock railyard capacity actually needed could be built at Pier S and other sites within the ports that are farther from residents and schools than SCIG and ICTF.

Rail Yard Capacity	**Million TEU's**
Projected intermodal need at SPB ports[1]	17.01
Projected on-dock capacity	12.94
Current ICTF operations	1.4
Remaining need	2.67
Proposed near dock increase	4.2
Potential overbuilt capacity	1.53

Growth Inducing Impacts

- In Section 5.3 of the Draft EIR, the lead agency states that the project will not have any growth inducing impacts. However, as stated in the most recent port growth forecast[2], throughput at the ports will grow from approximately 14 million containers in 2010 to more than 36 million containers by 2030. This 2.5-fold increase in throughput is at least partially accommodated by the Pier S project. Other goods movement infrastructure is required to handle this increased growth including near dock rail yards (proposed SCIG and ICTF expansion), improvements to local freeways (e.g., the I-710 project and the east-west corridor along SR-60), growth in warehouse space in the region, and additional rail line improvements.[3] While the expected growth of goods movement at the ports has been well documented, it is not clear if this significant increase in activity has ever undergone CEQA review or discretionary action by a public body. If this growth is not subject to an overarching discretionary action, then individual projects (such as Pier S) need to account for the growth inducement individually. The discussion of growth inducing impacts should therefore be expanded for the Pier S project.

- The EIR should clarify whether the growth in domestic goods movement (including transloaded goods from the proposed Pier S project) would need to be accommodated elsewhere beyond the Commerce rail yards if near dock rail yard capacity is not increased. The EIR should include a description of other possible rail yard expansions (e.g., Hobart expansion, San Bernardino expansion, new Victorville rail yard) that would be needed due to the induced growth from this project.

[1] San Pedro Bar Ports Rail Study Update (Parsons, 2006) Table 3-5
[2] San Pedro Bay Container Forecast Update, Ports of Long Beach and Los Angeles, 2009.
[3] Draft 2012 Regional Transportation Plan , Southern California Association of Governments, December, 2011.

Truck Emissions

- The operational truck emissions in the Draft EIR are substantially underestimated. As stated in Section 3.1.2 of Appendix A-2, “The modeling analysis included all roads that would contain at least five percent of the daily trucks generated by any project alternative.” While this rationale described the modeling analysis for this project, it was also inappropriately used for consideration of regional emission impacts. Section 3.0 of Appendix A-1 states that “Truck emissions [include] (1) on-terminal driving and idling, and (2) off-terminal driving between the terminal and the average distance to the boundary of the South Coast Air Basin.” However this is not what was performed in the actual calculation spreadsheets, or presented in Table 3.2-11 of the Draft EIR.

  For example, on-road truck NOx emissions in 2020 are 2,404 lbs/day based on Table 3.2-11. This value appears to come from Table A.1.2-Alt1-26 showing 438.7 tons/yr for the year 2020 based on the equation below.
  438.7 tons/yr × 2000 lbs/ton ÷ 365 days/yr = 2,404 lbs/day

  The calculations that support the 438.7 tons/yr in Table A.1.2-Alt1-26 are not presented in the spreadsheets provided in electronic files. However, if all of the emissions are summed from all of the modeled roadway links in Table A.2.1-Alt1-3, the total is 1,271 tons/yr, or 6,964 pounds on an average day (not a peak day). It is important to note that this 6,964 pounds per average day is only on modeled roadways that are south of Pacific Coast Highway. This value is considerably higher than the 2,404 pounds per day presented in the Draft EIR *and* does not include the substantial emissions occurring outside of the port area as trucks transport goods to the Inland Empire.

  If correct, this indicates that the lead agency may have underestimated truck emissions by several tons per day. The peak daily and average daily emissions should be corrected for regional impacts, localized impacts, and health risk impacts. In addition, given the severity of these impacts, the lead agency must apply more substantial mitigation to reduce these impacts to the maximum extent feasible.

- The Draft EIR does not consider the impact of emissions from transloaded goods movement. Transloaded goods travel via truck from the ports to a distribution center (often in the Inland Empire), and back to an intermodal rail yard for final transport to destinations outside of the AQMD. Approximately 36% of all containers at the San Pedro Bay ports were transloaded in 2008[4] and this percentage may be increasing[5]. Emissions from the longer truck haul lengths from this activity must be included to present a full picture of the air quality impacts from emissions directly related to this project.

- The emission factors used to calculate truck emissions in the spreadsheets provided in electronic format are different than those found in EMFAC 2007 and lower than emission factors released by CARB from EMFAC 2011. If the emission factors in the

[4] Final Report – Port and Modal Elasticity Study, Phase II (SCAG, 2010)
[5] Up to 45% of all containers imported to the San Pedro Bay ports were transloaded in 2009. Tirschwell, P., 2011, *Surging Transload*, Journal of Commerce

Draft EIR were calculated to include LNG trucks, these calculations should be presented prior to approving the project. If the lead agency determines that emission factors will be lower than those specified in EMFAC 2011, then an explanation with supporting calculations should be provided prior to approving the project. In addition, if these lower emission factors are used to determine impacts in the EIR, a commitment must be made to only use trucks that meet these emission factors.

- The geographic distribution of truck traffic is unclear in the Draft EIR. A flowchart and/or map showing where trucks travel would be helpful. The flowchart should show the amount and proportion of trucks that are projected to travel from the terminal to near dock rail yards, off-dock rail yards both directly from the terminal and indirectly from transloading, and destinations in LA County, the Inland Empire, and beyond. As truck travel significantly impacts air quality, it is crucial to understand where the trucks are expected to travel.

Rail

- As this project will place a new terminal on undeveloped and vacant land, and given the significant air quality impacts identified, the lead agency must maximize the use of on-dock rail to minimize impacts associated with trucking. The Draft EIR states that the proposed project will transport approximately 15% of its containers off the terminal via its on-dock railyard. However, Pier S has previously been projected to transport up to 35% of its goods via on-dock rail and terminals in the San Pedro Bay transport 30% of their containers via on-dock rail on average.[6] The lead agency must provide additional rationale demonstrating why such a low proportion of intermodal container traffic is the maximum feasible from only this terminal. Increasing on-dock rail yard capacity to 35% would reduce the number of trucks visiting the terminal by several hundred every day.
- The off terminal rail emissions presented in the Draft EIR includes approximately 1.5 trains per day directly serving Pier S, and 3.2 trains per day serving ICTF. The emissions from off terminal rail activity are underestimated in the Draft EIR as they use average trains per day rather than peak trains per day. As AQMD CEQA thresholds are peak daily thresholds, the EIR should present the peak daily rail emissions assuming that maximum number of trains that would serve Pier S either on-dock or off-dock.
- It is not clear how peak daily locomotive emissions are estimated for this proposed project and what fleet mix was used. It is also not clear if the lead agency took into consideration the 2008 EPA rulemaking on locomotive emissions in Table A.1.2-15. The EIR should provide clarification on these updated emission standards, fleet mix and how they were used in the emission calculations.

Vessels

- The two-berth and three-berth alternatives include modifications to the back channel that include both widening and deepening of the channel. These modifications will allow larger vessels, such as post-Panamax vessels, to access terminals in the Cerritos Channel. However the Draft EIR concludes that these vessels will not access Pier S based on container yard limits. As these vessels likely have higher emissions, if the

[6] San Pedro Bay Ports Rail Study Update (Parsons, 2006) Tables 4-2 and 2b

EIR assumes that they won't visit Pier S, then this should be made into an enforceable measure.

In addition, if these channel modifications allow post-Panamax vessels to visit other terminals such as Pier A, the impacts from these emissions must be included in the EIR. While there may currently be container yard constraints limiting the type of vessel that can call on this terminal, future modification to terminal operations may allow these vessels in the future, without further CEQA review. Therefore, AQMD staff recommends that potential emissions from these larger vessels be included in the EIR, including the cumulative impact of vessels visiting other terminals.

- Because the project will have significant regional and localized air quality impacts, the lead agency must implement additional feasible mitigation measures for all sources, including vessels. Additional vessel measures that must be adopted unless the port establishes that they are infeasible include: (1) incentives or requirements to preferentially route International Maritime Organization Tier 3 vessels to this terminal, and (2) requirements that operators contact vessel manufacturers to determine additional feasible retrofit control strategies for individual vessels, including emulsified fuel to reduce NOx emissions, and implement such feasible strategies.
- Mitigation Measure AQ-3 requires all ocean-going vessels to utilize 0.2 percent sulfur fuel within 40 nautical miles of Point Fermin. However Table A.1.2-12 uses emission factors assuming 0.1% sulfur fuel. This discrepancy should be explained or corrected in the EIR.

Cargo Handling Equipment

- All three proposed alternatives require the use of diesel cargo handling equipment (side-picks, top-picks, and hostlers) on-dock to move containers. The lead agency has not provided an analysis of the potential for zero emission technologies to transport containers onsite. The regular movement of containers on a single parcel presents a good opportunity to implement a zero emission technology from project startup. Zero-emission yard hostlers, for example, are being demonstrated in port applications and, like the zero-emission trucks described in the attachment to this letter (and for the same reasons), are feasible for implementation early in the life of the project. In addition, as this would be a brand new terminal with significant air quality impacts, the lead agency must take the opportunity now to build the necessary infrastructure (e.g., electric charging for electric yard hostlers) that will enable the least use of diesel technologies possible. Waiting to install on-dock zero emission technology at some future unspecified date will impact air quality in the interim, and it may make implementing this technology even more difficult as new infrastructure may interrupt operations at a working terminal.
- The three-berth alternative will utilize electric rail mounted gantry cranes, while the two-berth alternative will utilize diesel rubber tired gantry cranes. Given the significant air quality impacts, the lead agency must commit to using electric gantry cranes for all alternatives since they are feasible.

Cumulative Impacts

- This project, along with other foreseeable projects such as the proposed Southern California Intermodal Gateway (SCIG) and the Intermodal Container Transfer Facility (ICTF) expansion, will substantially contribute to the increased flow of goods in the region, and locally. The cumulative impact of these projects has not been presented in the Draft EIR. The EIR must include a cumulative impact assessment showing the combined impact from all three projects, including air quality, greenhouse gas, and health risk impacts. Maps showing the geographic extent of the criteria pollutant and health risk impacts should also be provided.

- The baseline analysis used to assess cumulative impacts should not be the baseline used in the SCIG Draft EIR. That baseline is 2005, six years ago and prior to implementation of the Clean Air Action Plan and regulatory agency rules for trucks and locomotives which have and will substantially change the air quality setting. That baseline does not therefore present the impacts of construction of the proposed SCIG. The baseline used for the cumulative analysis should be emissions that will occur in the future considering the impacts of adopted regulatory agency and port programs.

- It is not clear if the existing ICTF rail yard can handle the additional containers that will arrive in this new marine terminal. If near dock rail yard capacity is not increased, trucks may need to haul goods to rail yards farther inland such as the Commerce rail yards. Since the approval of the proposed near dock rail yard projects (proposed SCIG and ICTF expansion) is outside of the control of the lead agency, CEQA impacts for the Pier S project should assume that those projects will not be built and that the majority of trucks will travel the existing route up the I-710 freeway.

Health Risk Assessment and Modeling Analysis

- The HRA concludes that the proposed three berth alternative will present significant health risks with a cancer burden of 1.21 and a residential cancer risk of 13 per million. AQMD staff notes that it is very rare for any single project to exceed a cancer burden of 1.0. A cancer burden exceeding 1.0 indicates that a large population will be exposed to significant levels of carcinogenic emissions. In addition, the 13 in a million residential risk is above the standards set in the San Pedro Bay Clean Air Action Plan (CAAP) which states that no project will be approved with a residential cancer risk increase above 10 per million. The lead agency should not disregard this CAAP provision. In addition, the lead agency must under CEQA apply feasible mitigations for this impact, such as zero emission transport and other measures described in this letter.

- The lead agency determines that there will be no significant PM mortality or morbidity impacts because "incremental PM2.5 concentrations associated with POLB projects are typically orders of magnitude lower than the levels observed in the studies that established the C/R functions." The lead agency then goes on to determine that because no sensitive receptors would experience an incremental increase above 2.5 $\mu g/m^3$ of PM2.5, that impacts would be less than significant. AQMD staff does not recommend this non-standard methodology as it may substantially underestimate potential impacts. This less than conservative methodology also was not used by the lead agency in other CEQA documents such as the Middle Harbor EIR. As the baseline PM2.5 concentrations in the surrounding community already exceed federal and state standards, AQMD staff recommends that PM mortality and morbidity impacts be calculated and presented without using a high threshold of 2.5 $\mu g/m^3$. In addition, because the cancer burden from diesel particulate matter was found to significantly impact a large population, and diesel particulate matter makes up the vast majority of PM2.5 from this project, the mortality impacts should be calculated at least out to the one per million cancer risk isopleths.

- AQMD staff was not able to correlate emission rates from the modeling files with those found in the technical appendix spreadsheets. The EIR should contain clarifying information that explains how the emission rates from the technical appendices were input into the model files.
- The lead agency concludes that air quality impacts generally do not have significant impacts on environmental justice area (with the exception of cancer risk). These impacts should be re-evaluated after emission calculations are reconsidered based on comments in the 'Trucks' comments and 'Vessels' comments above.

NO2 Impacts

- The Draft EIR does not contain an adequate presentation of modeled NO2 impacts. Neither the Draft EIR nor its technical appendices contain maps showing the geographic extent of modeled NO2 impacts. Therefore it is difficult to determine which populations will be exposed to air quality that exceeds federal and state standards. These maps must be provided in the EIR to provide the public and decision makers a complete understanding of potential project impacts. These maps must also be used in the environmental justice impact determinations. In addition, given the significance of these impacts, additional feasible mitigation measures must taken to reduce these impacts, such as zero emission technologies listed above.

Construction Activities

- Footnote C in Table 3.2-9 states that AQMD staff recommends that tugboat/barge emissions should not be included in a localized construction analysis as they are considered off-site emissions. This is generally true if the tugboat/barge emissions are strictly one-time delivery activities used to haul materials to/from a site. However, as this project includes considerable water based construction activities (e.g. wharf construction, channel dredging), any tugboat/barge emissions associated with this on-site water activity should be included in the localized analysis.
- AQMD staff recommends that dredging activity be conducted by electrical equipment to the maximum extent feasible.

Permitting

- AQMD permits may be required for several activities associated with this project. The lead agency should explicitly specify all equipment that will need AQMD and/or ARB permits for this project. Based on a review of the EIR, this includes but may not be limited to:
    - Dredging equipment and concrete crushing onsite during construction.
    - Standby emergency generators.
    - Control equipment used for vessels that are not capable of cold ironing.

ATTACHMENT B

ZERO-EMISSION CONTAINER TRANSPORT: MITIGATION MEASURE OR PROJECT ALTERNATIVE

Overview

This mitigation measure or alternative would include a commitment by the lead agency to require deployment of zero-emission technologies to move containers between Pier S and near dock rail yards. The specific technology or technologies used to implement this option will be determined by the lead agency. Under this option, container movement between Pier S and near dock rail yards would be by zero-emission technologies early in the life of the Pier S project.

Any of several types of zero-emission container movement systems could be used to implement this option. As is described below, these include, but are not limited to, on-road technologies such as battery-electric trucks, fuel cell trucks, hybrid-electric trucks with all-electric range (AER) and zero-emission hybrid or battery-electric trucks with "wayside" power (such as electricity from overhead wires).

Such systems are not currently in use for full-scale port operations and, depending on the technology, may require different levels of additional development and optimization. But, as is described below, a variety of these technologies are being demonstrated, and there is substantial evidence that they can be made commercially available within a few years after commencement of Pier S project operation, especially if the Ports send a strong market signal by requiring the use of zero-emission technologies. In addition, many of these zero-emission technologies are expected to be operationally feasible to serve Pier S. For example, electric trucks with adequate range, power and reliability -- such as are being developed and demonstrated at the Ports -- could fit into current operating procedures as a replacement for fossil fuel-powered trucks, and their implementation could be required and co-funded through mechanisms similar to those employed to implement the ports' Clean Truck Program. Drayage service to near dock rail yards is particularly conducive to implementation of zero-emission trucking technologies because of the short distance involved and because near dock rail yards could be served by a relatively limited number of trucks compared to the total number serving the ports.

Description of Mitigation Measure/Alternative

1. Commitment. Under this mitigation measure/alternative, the lead agency will commit as part of the Pier S project approval to implement zero-emission container transport for all transport between Pier S and near-dock rail yard(s). Zero emission transport will be implemented as soon as possible but, at a minimum, operationally commence by 2017, and be implemented for all transport between Pier S and near-dock railyards by 2020. The lead agency may implement zero-emission transport through its own actions, through actions by the project applicant required by project conditions, or through other mechanisms. In addition, the lead agency will commit to implement zero or near zero emissions transport to destinations beyond near-dock railyards, to be implemented as soon as feasible.

2. Technologies. Zero-emission transport may be by any technology that does not create tailpipe emissions from the transport vehicle or system. The determination of which technology to utilize will be made by the lead agency, either in connection with Pier S project approval, or subsequently in a public meeting.

3. Cooperative Actions by Project Operator. The lead agency will adopt Pier S project approval conditions requiring the tenant to cooperate in any technology demonstrations that take place on Pier S property, and take any other actions, including co-funding, the lead agency determines necessary to implement this mitigation measure/alternative, subject to reasonable limits established by the lead agency in the project approval.

Reasons for Zero-Emission Transport

Deployment of zero-emission technologies for transport between Pier S and near-dock railyards will mitigate significant project impacts, as required by CEQA.

In addition, zero emission transport is important for the following reasons:

- In the 2010 Update to the San Pedro Bay Ports Clean Air Action Plan, the ports underscored their commitment to air quality improvement by adopting San Pedro Bay Standards. These targets for port air quality programs are comprised of two components: 1) reduction in health risk from port-related diesel particulate matter (DPM) emissions in residential areas surrounding the ports, and 2) "fair share" reduction of port-related air emission to assist the region in achieving federal air quality standards. These components reflect the ports' stated goals of reducing health risks to local communities from port-related sources, and reducing emissions to support the attainment of health-based ambient air quality standards on a regional level.

  Specifically, the ports' Health Risk Reduction Standard is to reduce the population-weighted cancer risk of ports-related DPM emissions by 85% by 2020, relative to 2005 conditions, in highly impacted communities located near port sources and throughout the residential areas in the port region. The San Pedro Bay Emission Reduction Standards are to, by 2014, reduce emissions by 22% for nitrogen oxides, 93% for sulfur oxides, and 72% for DPM; and to, by 2023, reduce emissions by 59% for nitrogen oxides, 93% for sulfur oxides and 77% for DPM.

While the ports have made significant progress toward meeting these goals, as reflected in each port's annual emission inventories, emissions forecasts indicate that CAAP measures and existing emissions control regulations will not be adequate to achieve and maintain the San Pedro Bay Standards. Implementation of zero-emission technology options would provide significant benefits to the ports, bringing them closer to achieving the San Pedro Bay Standards, and assist the region in meeting National Ambient Air Quality Standards. The South Coast Air Quality Management District and the California Air Resources Board have determined that, in order to attain currently-adopted federal ozone standards, zero-emission technologies will need to be broadly deployed in transportation sources.

- Deployment of zero-emission technologies for the transport corridor between Pier S and near-dock railyards is particularly important for the following reasons:

    - Emissions in this transport corridor occur relatively close to locations where people live, work and go to school.

    - These areas are also impacted by cumulative emissions from other port-related sources: ships, harbor craft, cargo handling equipment, locomotives and trucks.

    - Achieving emission reductions beyond current regulations and CAAP measures, as needed to attain the San Pedro Bay Standards, will be relatively challenging in the case of some Pier S-related sources (e.g. marine vessel main engines) compared to further reducing emissions from other sources such as trucks.

    - The transport corridor to near dock rail yards is in an area where existing regulations and CAAP measures are projected to achieve a lower percentage level of risk reduction than other areas. *See* 2010 CAAP Update, Figure 2.2: Percent Reduction in DPM-Related Health Risk Between 2005 and 2020 for Areas Located Closest to the Ports (p.35).

    - The transport corridor to near dock rail yards--as a high volume, relatively short (approximately five mile)--route, is particularly suited to deployment of new technologies such as electric trucks, which ultimately could be deployed by the ports, and then in broader areas as technologies evolve.

- In addition to air quality benefits, utilization of zero-emission technologies could be a significant strategy for reducing greenhouse gas (GHG) emissions. Each port, in cooperation with their respective cities, has initiated a process to quantify, evaluate and implement strategies to reduce GHG emissions from their administrative operations a well as from port-related activities of their tenants and customers.

- Finally, energy security (i.e. reducing dependence on foreign oil) is also a significant consideration as the ports transition into the future. Uncertainty about potential future supplies of oil and rising costs provide another reason for moving away from technologies that rely on fossil fuels to technologies that are powered by electricity, ideally produced using renewable energy sources.

Zero-Emission Container Transport Technologies

A variety of zero-emission technologies will be feasible for deployment early in the life of the Pier S project, if the lead agency requires them. The following is a discussion of key technology options.

Zero-Emission Trucks

Zero-emission trucks are powered by grid electricity stored in a battery or by electricity produced onboard the vehicle through a fuel cell. They also can be powered by “wayside” electricity from outside sources such as overhead catenary wires, as is currently used for transit buses and heavy mining trucks (discussed below). All technologies eliminate fuel combustion and utilize electric drive systems as the means to achieve zero emissions and higher system efficiency compared to conventional fossil fuel combustion technology.

Vehicles employing electrified drive trains have seen dramatic growth in the passenger vehicle market in recent years, evidenced by the commercialization of various hybrid-electric cars, and culminating in the sale of all-electric and range extended electric vehicles in 2011. The medium- and heavy-duty markets have also shown recent trends toward electric drive technologies in both on-road and off-road applications, leveraging the light-duty market technologies and component supply base. Indeed, the California-funded Hybrid Truck and Bus Voucher Incentive Project (HVIP) website' currently lists more than 75 hybrid-electric on-road trucks and buses available for order from eight manufacturers.

Battery-Electric Trucks

Battery-electric vehicles operate continuously in zero-emissions mode by utilizing electricity from the grid stored on the vehicle in battery packs. Battery-electric technology has been tested, and even commercially deployed, for years in other types of heavy-duty vehicles (e.g., shuttle buses). Technologically mature prototypes are being demonstrated in drayage truck applications. (*Technology Status Report - Zero Emission Drayage Trucks*, TIAX, June 2011, at 1, http://www.cleanairactionplan.org/programs/tap/techdemos.asp ["TIAX"]).

Tests of the Balqon XE-30 battery-electric truck prototype began in 2008 by the Port of Los Angeles, using a lead-acid battery pack. In subsequent manufacturer tests the truck was equipped with a larger and more advanced lithium-ion battery pack. Manufacturer's tests of the upgraded vehicle have shown a maximum range of between 125 – 150 miles loaded, and dynamometer results indicate ability to climb a 15% grade while fully loaded for two hours. (TIAX, 3). Port demonstrations will test performance in actual operations against these and other metrics.

The performance metrics being targeted by the manufacturer would be sufficient to meet the needs of service between near dock rail yards and the ports, specifically if the range is only 10 miles round trip.

Number of Trucks. Regarding number of trucks needed, TIAX assumed that a Balqon truck would make 12 round trips per day, assuming three shifts per day (TIAX, 14). This would total 120 miles per day per truck (within the loaded range estimated by the manufacturer for a single charge). TIAX estimates a need for 520 trucks in 2016, growing to 720 in 2023 to serve the port to near-dock corridor (TIAX at 9). The number of trucks needed to serve just Pier S would likely be substantially less. Balqon has estimated that it could produce as many as three trucks per day due to modular truck design, which would enable it to deliver more than 750 trucks per year. This would, in one year and for one manufacturer, be well in excess of the fleet size needed to serve near dock rail yards.

Charging Time. Regarding charging time, Balqon offers a 60kW charger that would require 4.5 hours for a full charge. Balqon is working on a 100kW charger that would reduce charging time, as well as the number of required chargers and peak electrical demand. (TIAX, 14). In addition, quick charge technologies are now being manufactured, e.g. by AeroVironment which are in use by Foothill Transit electric buses to allow continuous service for a set route. Such technologies could be adapted to allow charging of trucks in much less than one hour. In addition, various charging strategies are available that could further reduce time dedicated to charging. These include battery swapping and "opportunity charging." (TIAX at 14-15). Even assuming a 4.5 hour charging time every day, however, would allow 12 round trips to near dock rail yards per day (TIAX at 14).

Implementation Time. TIAX recommends 6 to 12 months of tests in real world drayage operations, followed by an assessment and an additional larger scale demonstration of 12 to 18 months duration. (TIAX, 20-21).

To the extent that in-use performance testing indicates a need for improvements such as greater range or gradability for a battery-electric truck such as Balqon, resolving such technical issues is, in general, a matter of appropriately sizing and engineering key components—notably the battery. A variety of battery sizes are feasible, although there are trade-offs such as weight and cost. The limited range requirements of service to near dock rail yards will, however, minimize the impact of any such trade-offs.

Given these factors, SCAQMD Technology Advancement Office staff concludes that battery-electric trucks can be developed and manufactured in sufficient time and quantities to fully serve near dock rail yards by 2017-2020, even if modifications in response to demonstration tests are required.

Costs. As with most new technologies, capital costs are higher for electric-drive trucks compared to conventional diesel trucks. However, operating and maintenance (O&M) costs of electric-drive trucks can be significantly lower, due to higher vehicle fuel economy (reduced fuel costs per energy used) and lower maintenance costs. TIAX calculated a ten-year cost for the Balqon truck, including capital cost of truck, operation and maintenance, of about $30,000 - $60,000 more than the cost for a diesel truck. This differential cost is, however, within the amount of government incentive funding for relatively clean technologies that has been provided in the past for vehicles such as LNG trucks, and which is currently available (see below). Cost of charging infrastructure would vary greatly based on conventional or quick charging, and charging strategy (e.g. whether battery swapping and opportunity charging occur). TIAX estimated costs of one approach at between $26.4 and 30.4 million for a fleet of 720 trucks, which is certainly more than would be required just to serve Pier S. Again, various government funding programs have been and continue to be available for installation of charging infrastructure.

Since the electric drayage truck is still in its early commercialization phase, the costs are expected to come down as the technology matures, unit volumes increase and economies of scaled production and supply take effect. Balqon estimates that with large scale purchase commitments and its partnership with Winston Battery Limited, the largest heavy-duty lithium battery manufacturer in China, battery costs will come down to half their current costs.

Operational Issues. The ports have devoted substantial resources to developing and demonstrating electric trucks in part because they would fit well into current operating modes, with minimal or no need for new transportation infrastructure such as roads or new fixed guideway systems. Operational issues thus are expected to be manageable.

It should also be noted that the successful deployment of nearly 900 natural gas drayage trucks since 2008 indicates that the drayage industry can adapt to operational changes and adapt to new fueling procedures and limitations. Most of these natural gas drayage trucks are routinely being refueled at a small number of public stations located near the ports, although some motor carriers are installing onsite natural gas refueling stations. Refueling can take longer than diesel, and during peak times, the waiting time at the limited number of natural gas fueling stations can exceed one hour. Motor carriers have been able to make adjustments to this process. Weight and payload considerations significantly restrict the amount of onboard energy that LNG drayage trucks can carry compared to diesel trucks. However, in a local delivery application such as drayage, LNG trucks can provide plenty of driving range to meet daily operational requirements. In these ways and others, drayage truckers using natural gas rigs have been able to accommodate fuel-related changes in operational requirements. (TIAX, 17).

Implementation Mechanisms. The ports have shown ability to craft programs to transition on-road trucks to new technologies. The successful Clean Trucks Program provides one model of a feasible mechanism to do this for Pier S-related drayage. Through progressive bans of older vehicles and funding and fee mechanisms to provide incentives, the ports succeeded in transitioning from relatively old diesel truck drayage to thousands of new diesel trucks, and nearly 900 LNG trucks. The number of vehicles needed in connection with Pier S is less. In addition, through approval conditions on the marine terminal project, the lead agency has the ability to ensure cooperative actions by the applicant to assist in the transition.

Figure 1 Baıqon Electric Battery Truck

Fuel Cell Battery-Electric Trucks

Fuel cell vehicles utilize an electrochemical reaction of hydrogen and oxygen in fuel cell "stacks" to generate electricity onboard a vehicle to power electric motors. Fuel cells are typically combined with battery packs, potentially with plug-in charging capability, to extend the operating range of a battery-electric vehicle. Because the process is combustion free, there are no criteria pollutants or CO2 emissions from the vehicle.

Fuel cell vehicles are less commercially mature than battery-electric technologies, but have been successfully deployed in transit bus applications, and in passenger vehicles. The Port of Los Angeles recently awarded Vision Motor Corporation (Vision) of El Segundo, California a contract to outfit fifteen battery electric trucks with fuel cells for demonstration purposes. Total Transportation Services, Inc. (TTSI), a port drayage company, has stated an intent to buy 100 "Tyrano" fuel cell Class 8 trucks from Vision for $27 million, subject to an initial vehicle (which was delivered on July 22, 2011) performing as expected. TTSI also stated it may acquire an additional 300 vehicles. TTSI intends to test the initial truck for 18 months by using it to haul containers between the ports, rail yards and distribution facilities.

Vision estimates that its fuel cell electric battery trucks would have an operating range of 200 miles on a single charge, with the proposed 20 kg of hydrogen storage and 130 kWh battery pack, while at the same time lowering operating and maintenance costs as compared to diesel-powered trucks. The company's engineers report the vehicle has a rated gradability of 13% when fully loaded at 80,000 GVWR; this should enable it to meet all grades that will be encountered in short-haul drayage. (TIAX, 8).

TIAX recommends a multiple month demonstration period in drayage operations, followed by an assessment and a further large scale demonstration for 12 to 18 months. (TIAX, 22-23). Given these factors, it is expected that fuel cell battery-electric trucks can be developed and manufactured in sufficient time and quantities to fully serve Pier S in the 2017 to 2020 timeframe, even if modifications in response to demonstration tests are required.

The discussions above regarding number of vehicles needed, operational issues and implementation mechanisms are generally applicable to fuel cell trucks, although hydrogen fueling time would be less than Balqon truck charging time, and would be similar to fueling time for current LNG trucks. Per vehicle combined capital and operating costs, as well as fueling infrastructure costs, are projected by TIAX to be higher than for the Balqon truck, although costs could be below the TIAX projections if certain cost reductions expected by Vision are realized, and if cost of fueling infrastructure is recovered through revenue sales. (TIAX, 13, 16). In addition, as noted above, Vision does have a private purchaser with a potential sale of at least 100 units.

Figure 2 Vision Zero-Emission Fuel Cell Battery Electric Truck

Hybrid-Electric with All-Electric Range (AER) Trucks

Hybrid vehicles combine a vehicle's traditional internal combustion engine with an electric motor. Hybrid-electric heavy-duty trucks that improve fuel mileage are in commercial operation today. Hybrid-electric technologies can also be designed to allow all electric propulsion for certain distances, similar to the Chevrolet Volt passenger automobile which is currently being marketed. The large vehicle drive-train manufacturer Meritor has developed such a heavy-duty truck and it is being demonstrated by Walmart Inc. in the Detroit area. This "dual mode" vehicle was developed as part of a U.S. Department of Energy program. Besides the advantages of increased range flexibility, dual-mode hybrid trucks can incorporate smaller battery packs as compared to those for all-battery electric trucks. This saves weight and cost while increasing range.

The Meritor truck is powered solely by battery power (i.e. produces zero emissions) at speeds less than 48 mph. (http://walmartstores.com/sustainability/9071.aspx). This speed is likely sufficient to serve Pier S to near-dock yard drayage needs. The vehicle can maintain zero-emission operation for 20 miles, sufficient for two round trips to near dock rail yards with zero emissions, but the vehicle could be coupled with plug-in charging capability. The latter would open the potential for 24-hour zero-emission operation using existing quick-charge technologies. Battery capacity could also be augmented in production units, based on specific needs.

Figure 3: Dual-Mode Hybrid (Meritor)

The discussions above regarding number of vehicles needed, operational issues and implementation mechanisms are generally applicable to hybrid AER trucks. Costs for commercially available units are unknown at this time, but would likely be slightly more than conventional hybrids as larger battery packs would be needed for the electric only mode. The incremental cost compared to a diesel truck is anticipated to be approximately $50,000-70,000 depending on the capacity of the battery pack. This incremental cost is similar for LNG trucks which were successfully funded through a combination of grants for the Ports' Clean Truck Program (see below).

Since this technology is currently being demonstrated and is similar to hybrid electric technologies that are currently being marketed, it is expected that hybrid AER trucks could be deployed in a similar timeframe as full battery-electric trucks. As with the other zero-emission technologies described here, a key need to ensure timely deployment is a clear message from the ports to technology developers that such technologies will be required.

Trucks With Wayside Power (e.g. "Trolley Trucks")

As noted above, given the relatively short distance between the ports and near dock rail yards, several types of zero-emission trucks can feasibly be made available in coming years. One largely existing technology that could be used to serve this need, as well as move trucks regionwide, is wayside power to power motors and/or charge vehicle batteries. Wayside power from overhead catenary wires is commonly provided to on-road transit buses, and has been used for heavy mining trucks. Other potential wayside power technologies that serve the same purpose include linear induction, which can charge batteries from electromagnetic systems in roadbeds without a physical connection or exposed wires.

An example of how wayside power is feasible would be to outfit a battery-electric or hybrid AER truck with a connection to overhead catenary wires. Many cities operate electric transit buses that drive on streets with overhead wires, as well as streets without them. In such cities, "dual-mode" buses have capability to disconnect from the overhead wire and drive like a conventional bus. In Boston and other places, such buses are propelled "off wire" by diesel engines. In Rome, such buses are propelled off wire by battery power to the same electric motors used on wire. The batteries are charged as the bus operates on the wired roadways.

Figure 4 shows a dual-mode electric and battery-electric transit bus with detachable catenary connection in Rome, Italy.[1]

Figure 4 Dual-Mode Battery Electric Transit Bus (Rome)

The global technology manufacturer Siemens has also developed a prototype truck to catenary wire connection for this purpose. Figure 5 shows a photo of this system on a pilot roadway in Germany. The truck is a hybrid electric with zero emission all electric operation when connected to the overhead wire. The truck automatically senses the wire which allows the driver to raise the pantograph connection while driving. The pantograph automatically retracts when the truck leaves the lane with catenary power. The powered lane can be shared by cars and traditional trucks. The truck may be operated off the powered lane propelled by a diesel engine, or could be configured with battery or fuel cell power sources.

Figure 5 Truck Catenary (Siemens)

[1] Other proposals have been evaluated and awarded by the SCAQMD and the CEC to develop catenary trucks and hybrid trucks with AER. Similarly, in 2010, Volvo announced an award by the Swedish Energy Agency to develop a "slide in" technology for both automobiles and trucks which would provide wayside power from the road to the vehicle using a connection from the bottom of the vehicle to a slot in the roadway (http://www.energimyndigheten.se/en/Press/Press-releases/New-initiatives-in-electrical-vehicles/).

As applied to hybrid AER trucks, wayside power could provide zero-emission operation and battery charging on key transport corridors, allowing the vehicle to operate beyond such corridors in zero-emission mode. As the battery is depleted, the vehicle would have the flexibility for extended operation on fossil fuel power.

As existing technologies long used in the transit bus sector, an application of wayside power for trucks would be technologically feasible and could be implemented soon after deployment of battery-electric or hybrid AER trucks.

The key feasibility and cost issues presented by wayside power are associated with need for power infrastructure such as overhead catenary wires. Rights of way must have room for such infrastructure, although they could be limited to key corridors and still provide the battery charging benefits described above. Cost of overhead catenary wires would have to be estimated by corridor as it varies by circumstance, e.g. based on available space, but would likely be from one to several million dollars per mile. For the approximate five mile distance from ports to near-dock yards, this cost would be a small fraction of the $650,000,000 capital costs of the Pier S project. Operational cost benefits due to reduced fuel and maintenance costs for electric technologies would offset a portion of these costs.

Based on conversations with Siemens and other equipment manufacturers, AQMD technology advancement staff concludes it would be feasible to deploy catenary electric trucks early in the life of the Pier S project.

Zero Emission Implementation Timeline Overview

A Gantt chart of the likely zero-emission technologies is shown in Figure 6, which illustrates expected timeframes for development, validation and evaluation of technologies. The timeframes are based on status of the specific technologies, and on typical timeframes for the referenced actions. These timeframes are based on proposals received for such technologies as well as technical experience by the Technology Advancement Office at the SCAQMD. Although each technology provider and manufacturer may describe these phases differently, the cycles are all on the order of five to seven years from development to commercialization. The development phase includes design and non-recurring engineering activities for the prototype technology. This phase also typically includes limited testing or simulation in preparation for field trials. The validation phase includes testing and demonstration of the technology in the field, data collection for design changes and optimization. During this phase, the technology design is tested to the actual performance standards (e.g., towing capability, gradability, speed, etc.). The final fleet evaluation phase includes multiple units in actual fleet or real-world use with potential for accelerated durability testing to gauge maintenance and reliability issues.

During this phase, testing is conducted to ensure safety as well as working with the appropriate agencies for commercial certification.

It should be noted that the development phases for many of the truck projects were already initiated in 2008-2009 through efforts at the Ports, the SCAQMD and the DOE. The last phase of "evaluation" includes durability and certification activities, which may lengthen the phase depending on the field-trial experiences. Timeframes could also be shortened if sufficient funding is applied to increase resources toward that effort by the manufacturer. However, considering the current levels of product development and uncertainty, it is clear that, given sufficient clarity of purpose, all described technologies can be commercialized by 2017-2020, with some at earlier dates.

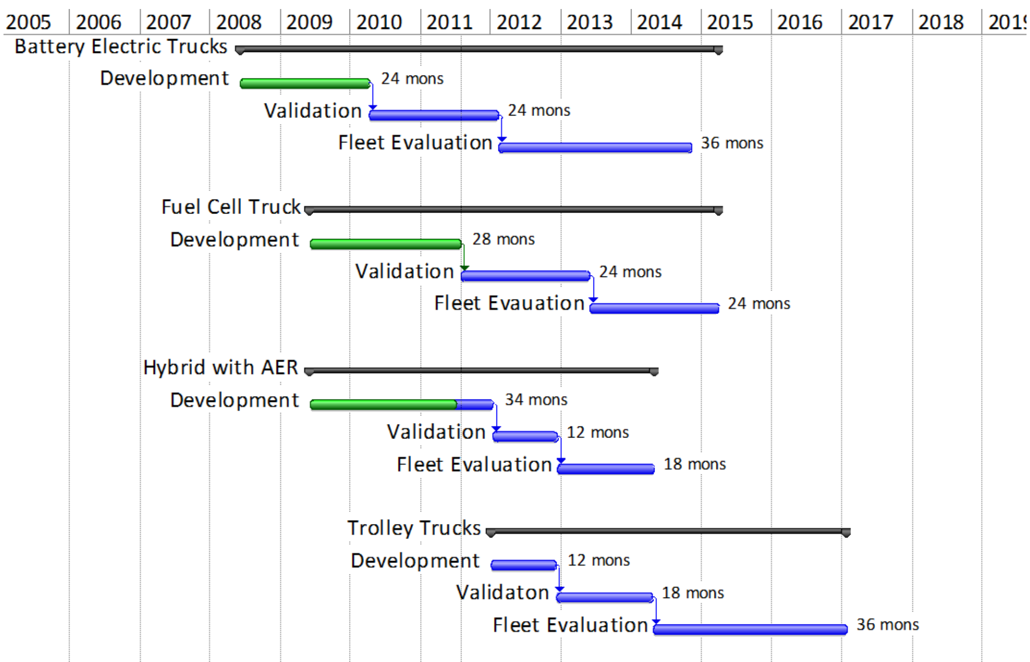

Figure 6: Commercialization Timeframes For Zero Emission Technologies

Financing Support for Zero-Emission Technologies

A key aspect of technology development and commercialization is initiating and ensuring activities by technology manufacturers. Government can facilitate this by ensuring a market for the end product (e.g. by adopting emission control requirements), and by offsetting the typically high cost of technology development and initial deployment through funding incentives. This strategy has been used in Europe for zero-emission technologies, which is why manufacturers are working on zero-emission trucks, namely Siemens and Volvo. State and local governments in California have a long history of successfully requiring and incentivizing deployment of new technologies (see examples below). Actions by the ports to require or incentivize clean technologies are thus of critical importance.

As noted above, the ports have implementation mechanisms such as project approval conditions and port rulemaking that can require transition to new technologies. In addition, a variety of sources exist for development and incentive funding. Potential sources of funding for air quality technologies in connection with the Pier S project include, but are not limited to, the ports, AQMD, and the future tenant. State and local governments have a long history of incentivizing cleaner technologies through collaborative efforts. A recent example is the partnership with CARB, the Port of Los Angeles, the Port of Long Beach, U.S. Department of Energy, California Energy Commission and U.S. EPA for the buydown of the cleaner but more expensive natural gas trucks as part of the Ports Clean Truck Program. The AQMD utilized the existing Proposition 1B incentive of $50,000 per truck but augmented this with an additional $50,000 through grants from the U.S. Department of Energy, California Energy Commission and U.S. EPA as well as AQMD funds and the Ports. With the $100,000 incentive, fleets and independent operators were able to offset the higher cost of natural gas trucks which are approximately $150,000 – 170,000. Through this collection of incentives, the AQMD was successfully able to purchase over 690 natural gas trucks as part of the Ports' Clean Truck Program.

Other funding examples include the Hybrid Voucher Incentive Program (HVIP), which provides $20,000 per hybrid truck, including all-electric technologies. The AQMD further supplemented the HVIP by adding $1.5M for vehicles deployed in the South Coast Region. In May 2011, the California Energy Commission added an additional $4M to the HVIP to further incentivize electric vehicles making the per truck funding $40,000 to $50,000. A list of currently available incentives for heavy-duty zero-emission trucks is included in the table below.

Incentive Program	Sunset Date	Project Category	Current Maximum Potential Funding/Credit Amounts
Carl Moyer Program	2015	New Purchase	25% of Total Purchase Price (Up to Cost-Effectiveness Limit of $16,640 per ton)
		Repower	$30,000 per truck
Proposition 1B	2013	Replacement	$60,000 per truck
		Repower	$30,000 per truck
HVIP	2015	New Purchase	$25,000 per truck (33 - 38K GVWR)
			$30,000 per truck (>38K GVWR)
Hybrid and Electric Trucks and Infrastructure Act (S. 1285)	Proposed to end by Dec. 2015	New Purchase	$24,000 per truck

Although some of these programs may not be in place at the time of the project initiation, it is anticipated that, given market demand, similar or renewed funding will be available.

Conclusion

Based on the above, there is substantial evidence to conclude that zero emission technologies can be deployed in the 2017 to 2020 timeframe, or earlier, to move containers between the ports and near-dock railyards — if the port requires such deployment.