Roadmap for Zero Emissions

For the last five years, the ports of Long Beach and Los Angeles have been evaluating zero emission goods movement technologies prompted by Boards of Harbor Commissioners who are keenly interested in leading the nation's two greenest ports into a cleaner future, by community demands for cleaner air, and by regulatory pressure to reduce the ports' "fair share" of air emissions. This roadmap provides direction for moving forward with the identification, evaluation, and integration of zero emission technologies into ongoing port-related goods movement.

The ports do not propose a single strategy for achieving zero emission goods movement but rather a suite of solutions that together have the potential to dramatically improve air quality in local communities and throughout the region. There is no off-the-shelf technology or stand-alone strategy ready to launch to achieve zero emissions at the ports or throughout the region. This effort will require technological innovation, multiple approaches, and regional partnerships.

The economic benefits of the ports' activity are felt throughout the nation. However, the fact that the environmental impacts of trade are disproportionally felt in the local region led to the joint ports' landmark environmental initiative, the 2006 San Pedro Bay Ports Clean Air Action Plan (CAAP). While significant emission reductions have been achieved under the direction of the CAAP to date, emissions forecasting conducted by the ports indicate that implementation of all existing regulations and current CAAP control strategies, on their own, will not result in full achievement of the ports' goals. As a result, the ports must stay focused on identifying and reducing sources of port-related emissions. Zero emission technologies could bring the ports closer to achieving their goals and be a significant strategy for reducing not only greenhouse gas emissions but also America's dependence on foreign oil.

For a zero emission technology to be considered a good candidate for advancement by the ports, it must be capable of being implemented successfully and within a reasonable period of time, taking into account economic, environmental, legal, operational, and technological factors.

The ports' roadmap for moving forward with zero emission technologies includes the following key principles:

- The ports should pursue zero emission technologies for those segments of port operations where technically feasible and economically viable solutions are most likely to develop – on-road container drayage, in-terminal container handling, and railroad locomotives.
- The ports must identify the technology options that are best suited for integration into port-related operations.
- The ports must preserve flexibility in their approach to allow future zero emission technology advancements to be integrated into port-related operations.

- The ports must consider the ability of any proposed zero emission strategy to scale out to the region in order to maximize port-related and regional air quality and health risk reductions.
- None of the zero emission technology options considered to date is ready for full-scale implementation. However, the ports will immediately move forward with demonstrations and collaborative efforts that advance promising technologies toward feasible real-world implementation.

The ports identified several options for zero emission technologies and evaluated them against these principles. The technologies that best aligned with these principles were identified as candidates for near-term demonstration. These candidates advance zero emission technologies at the ports, but preserve flexibility for future innovations. Therefore, the recommended next steps on the road to an emissions free port are summarized in the following table:

Timeline	Source Category	Actions
Near Term **(within 3 years)**	On-Road Drayage	Conduct Technology Advancement Program (TAP) demonstrations of Vision Motors hybrid electric/hydrogen fuel cell and Balqon lithium-ion battery zero emission drayage truck technologies in short-haul port-related operations following approved testing protocols and within specified timelines. Both manufacturers will deliver trucks for testing by 3rd Quarter 2011. Industry representatives will participate in these demonstrations in an advisory capacity, along with the TAP Technical Advisory Committee (TAC), which includes the ports, Environmental Protection Agency (EPA), California Air Resources Board (CARB) and South Coast Air Quality Management District (AQMD); Select additional zero emission truck technologies for demonstration through the TAP process, with input from industry and the TAP TAC; Seek grant funding assistance and industry partnerships to support zero emission truck demonstration and deployment, as needed; Establish regional partnership with the Los Angeles Metropolitan Transportation Authority, Southern California Association of Governments, Gateway Cities, and others. Work together to define regional zero emission freight transport needs and develop criteria for evaluating options for moving forward with zero emission truck technologies on a regional scale; Working with the regional partnership, identify and evaluate specific range extension options for zero emission truck technologies, including hybridization, in-road LSM, and overhead catenary; Work with the regional collaborative to identify potential funding sources.

Timeline	Source Category	Actions
Near Term (within 3 years)	Cargo Handling Equipment	Conduct TAP demonstrations of Vision Motors hybrid electric/hydrogen fuel cell and Balqon lithium-ion battery zero emission yard tractor technologies in port-related operations following approved testing protocols and within specified timelines. Both manufacturers will deliver yard tractors for testing by 3rd Quarter 2011; Working with terminal operators, select additional zero emission cargo handling equipment technologies for demonstration through the TAP process, with TAC oversight; Working with terminal operators, develop performance specifications, operational requirements, and integration strategies for zero emission cargo handling equipment; Continue to facilitate electrification of RTGs and RMGs by ensuring adequate electrical capacity is available at marine terminals and require their use in new and redeveloped terminal projects; Apply for grant funding assistance to support zero emission cargo handling equipment demonstration and deployment at marine terminals, as needed.
	Rail Locomotives	Participate (with South Coast Air Quality Management District, the Center for Commercial Deployment of Transportation Technologies, and other stakeholders) in a proposed Proof of Concept demonstration of linear synchronous motor (LSM) technology applied to a single rail car test at the General Atomics facility in San Diego. The project is anticipated to be initiated by 4th Quarter 2011; Collaborate with rail companies and other stakeholders to further evaluate zero emission rail technologies, including LSM, overhead catenary, and battery electric tender car; As appropriate, participate in a phase 2 demonstration of LSM technology applied to multiple rail cars. The phase 2 test would be conducted at a testing center equipped to provide Federal Railroad Administration certification, such as the Transportation Technology Center rail test site in Pueblo, Colorado.

Timeline	Source Category	Actions
Longer Term (>3 years)	On-Road Drayage	Conduct broader operational and durability demonstration testing of advanced zero emission drayage truck technologies in short-haul port-related operations, as needed; Working with industry, evaluate operational compatibility of larger-scale zero emission truck deployment; Work with regional partnership on regional zero emission freight strategy implementation, and on demonstration projects for transitional technologies and technologies to extend zero emission truck range, including hybridization, in-road LSM, and overhead catenary; Assist with zero emission truck deployment by identifying funding opportunities and assisting with charging, wayside power or hydrogen fueling infrastructure as appropriate; Promote on-going improvements in battery technologies through TAP.
	Cargo Handling Equipment	Conduct broader operational and durability demonstration testing of advanced zero emission technologies for all cargo handling equipment, as needed; Assist with zero emission equipment deployment by identifying funding opportunities and assisting with charging or hydrogen fueling infrastructure as appropriate; Promote on-going improvements in battery technologies through TAP; Continue to facilitate electrification of RTGs and RMGs, and work with marine terminals to identify additional opportunities for integrating and implementing zero emission terminal operations.
	Rail Locomotives	Continue to participate, with a stakeholder collaborative, in existing or proposed zero emission rail demonstration projects, as appropriate; Continue to collaborate with rail companies and other stakeholders to evaluate strategies for integrating and implementing zero emission technologies into port-related rail operations; Work with stakeholders to secure funding for zero emission rail technologies.