

Zero Emission Technologies



Port Background



Port of
LONG BEACH
The Green Port

San Pedro Bay Ports

- Port of Los Angeles – 7.9 million TEUs
- Port of Long Beach – 6.0 million TEUs

- Total – 13.9 million TEUs in 2011



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San Pedro Bay Port Complex



Emissions and the Clean Air Action Plan

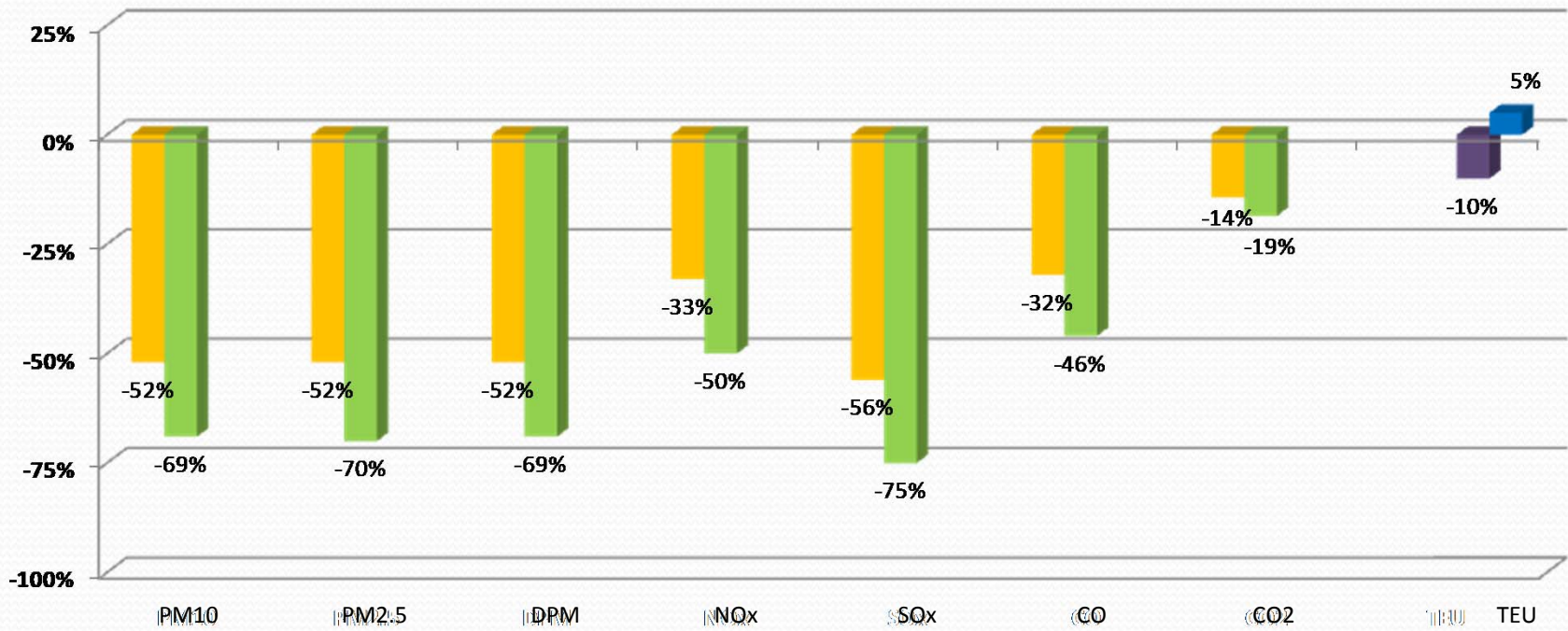


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2010 Emissions Inventory

Total Emissions Change

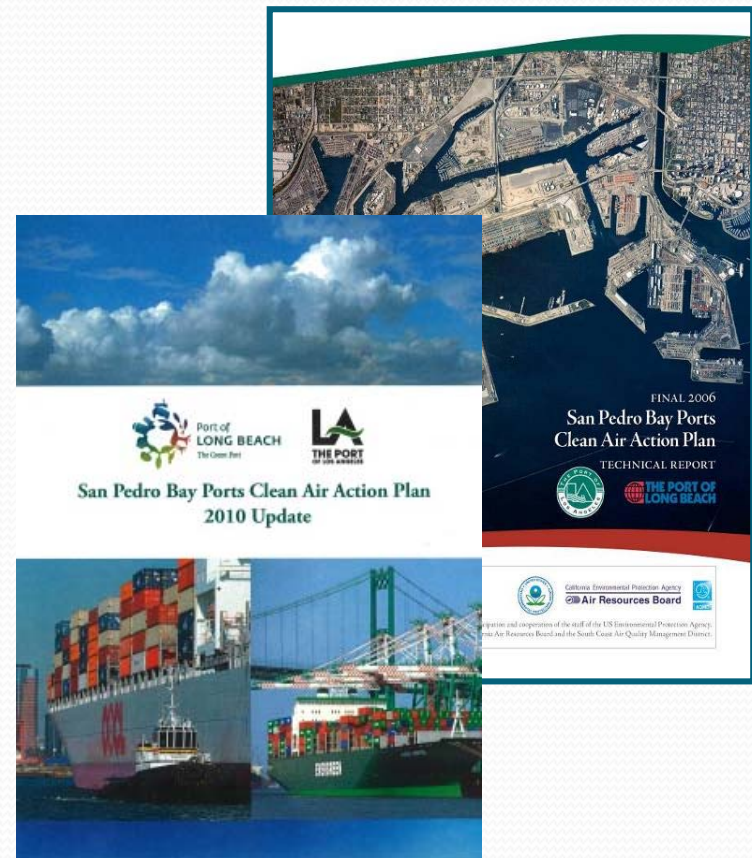
■ Previous Year CAAP Progress (2005-2009)
 ■ Current Year CAAP Progress (2005 - 2010)
 ■ TEU (2005-2009)
 ■ TEU (2005-2010)



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San Pedro Bay Ports Clean Air Action Plan (CAAP)

- **Comprehensive Five Year Action Plan**
 - Adopted in 2006
 - Focuses on DPM, NOx, SOx
 - Control measures for ships, harbor craft, trucks (Clean Truck Program), cargo handling equipment and locomotives
 - Joint Ports of LA and Long Beach
 - Significant multi-jurisdictional collaboration



2010 CAAP Update

- Updated in 2010
- Primary Addition: San Pedro Baywide Standards



San Pedro Bay Ports Clean Air Action Plan
2010 Update



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San Pedro Bay Standards

➤ Emissions Reduction Standards

➤ 2005 Baseline

➤ By 2014, reduce emissions by:

- 72% DPM
- 22% NOx
- 93% SOx

➤ By 2023, reduce emissions by:

- 77% DPM
- 59% NOx
- 93% SOx

San Pedro Bay Standards

- Health Risk Reduction Standard
 - By 2020, reduce the population-weighted residential cancer risk from port-related DPM emissions by 85%, in communities adjacent to the ports and throughout the port region



Technology Advancement Program



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Purpose of the TAP

Mission Statement:

- to accelerate the verification or commercial availability of new, clean technologies, through evaluation and demonstration, to move towards an emissions free port

• Objectives:

- Facilitate the development and implementation of new and emerging technologies to reduce air emissions
- Streamline the process for reaching consensus with the agencies on the emission reductions achieved by various technologies



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TAP Highlights

- \$1.5 million per port per year made available (\$3 million total)
- 28 projects including:
 - World's first hybrid tug boat
 - Hybrid yard tractors
 - Hybrid RTGs
 - CNG drayage truck
 - Tier 4 retrofits for harbor craft
 - DPFs



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Zero Emission Technologies



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Zero Emission Technologies

- “Zero emission technologies” have been defined by the California Air Resources Board (CARB) as technologies that do not directly emit criteria pollutants, such as hydrocarbons, carbon monoxide, nitrogen oxides (NOx) or particulate matter (PM).
- Zero emission technologies may indirectly produce small amounts of emissions, for example, when an electric vehicle plugs into grid power to recharge the on-board batteries, therefore contributing in small part to emissions at the power plant source.

Zero Emission Roadmap

- Port as a Catalyst
- Cant Do It Alone
- No Silver Bullet
- Fit into Operations
- Programmatic approach

Roadmap for Moving Forward with
Zero Emission Technologies
at the Ports of Long Beach and Los Angeles



Technical Report

Updated August 2011

FINAL

Zero Emission Technology Development Program

- Stand-alone expansion of the TAP focused on ZE technologies for Rail, CHE and Trucks
 - Joint with POLB
 - Evaluation Process
 - POC → **In-Use Demo** → Large Scale Demo
 - Collaboration (Regional Collaborative, IWG)
 - Evaluation Criteria



Zero Emission Technology Development Program

- Evaluation Criteria
 - Emission and Health Risk Reduction
 - Constructability
 - Technical Readiness
 - Operation Compatibility
 - Regional Scalability
 - Cost and Economic Sustainability
 - Timeline for Implementation

Target Sources

- Focus on technologically feasible and economically viable options:
 - Drayage (11% DPM, 12% NOx)
 - 300k+ trips per month
 - 11,228 trucks registered in PDTR
 - Near Dock Rail Yard can have 2 million trips per year
 - Terminal Equipment (7% DPM, 10% NOx)
 - Approx 1,000 yard tractors at each port
 - Locomotives (10% DPM, 19% NOx)
 - Near Dock Rail Yard can have 8 trains per day

Current Zero Emission Projects

- Balqon Yard Tractor
 - Battery Plug-in
 - Lithium Ion Batteries (700 Ahr)
 - 230 kwh battery
 - Over 750 hours of testing complete at port facility
 - 12 hour run times on single charge
 - Port owns 14 units, goal is to deploy all of them by June 30, 2012 into demonstration testing.



Current Zero Emission Projects

- Balqon On-Road
 - Battery Plug-in
 - Lithium Ion Batteries (700 Ahr)
 - Expecting 100 mile range
 - 2-3 hour charge time
 - Expected Delivery March 2012



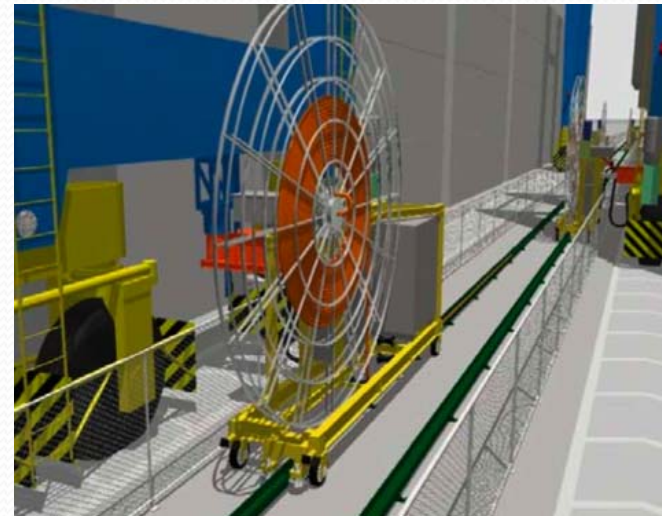
Current Zero Emission Projects

- Vision On-Road
 - Hydrogen Fuel cell
 - 200 or 400 mile range
 - 20 or 40 kg hydrogen storage
 - 400-536 HP
 - 3,200 lbs-ft torque
 - One unit undergoing initial testing



Current Zero Emission Projects

- Electric RTGs
 - Retrofit
 - Above ground trench for cables
 - Cable Reel Carrier (CRC) Design

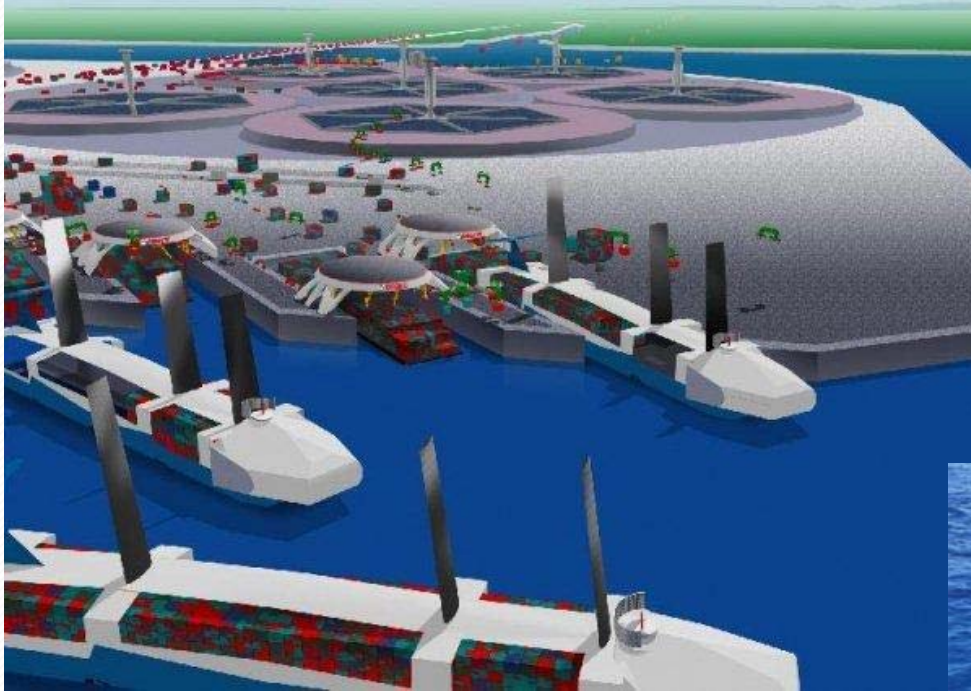


Upcoming Zero Emission Projects

- Vision Terminal Tractor
 - H2 with electric drive
- Volvo On-Road
 - Diesel Hybrid w/wayside power capabilities
- Artisan
 - Battery Plug-in
- Linear Synchronous Motors
 - RFP by SCAQMD for POC closes in March 2012
- Siemens
 - Overhead Catenary (exploratory)



Port of the Future?



Source: Cargotech, Port 2060



Port of the Future?



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