





San Pedro Bay Ports Clean Air Action Plan



Technology Advancement Program

Presented by:
Heather Tomley, Port of Long Beach
Kevin Maggay, Port of Los Angeles



Overview

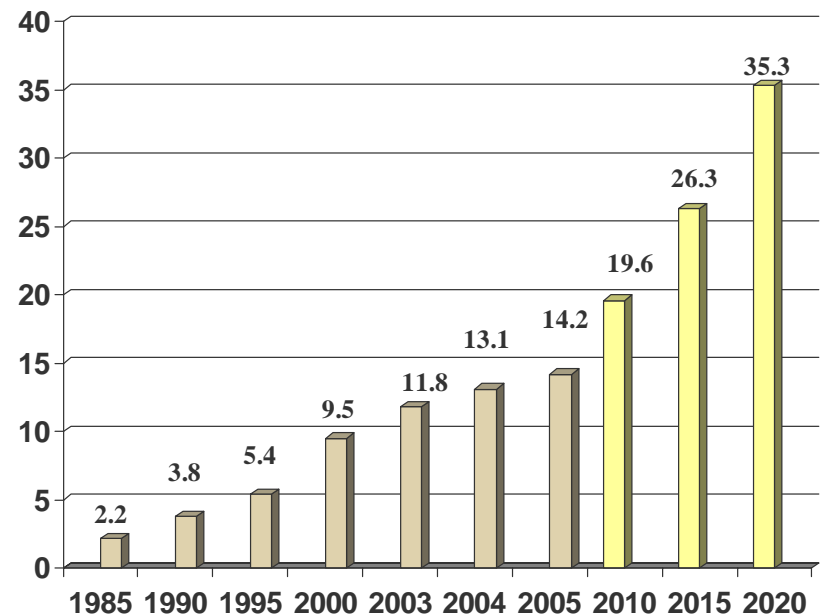
- Key to the ports' Clean Air Action Plan
- Goals and structure of the Technology Advancement Program
- Demonstration Projects




CAAP Drivers

- Minimize health risk from port operations
- Accelerate existing emissions reduction efforts
- Set consistent project-specific & source-specific standards
- Enable port development

*Anticipated TEU throughput growth
(million TEUs)*

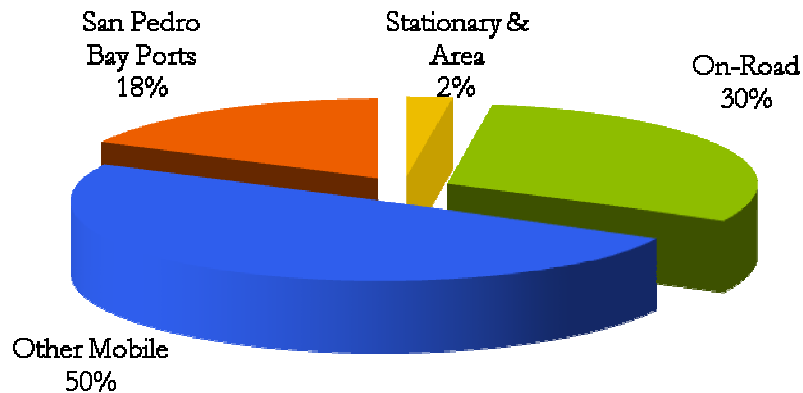


Target Pollutants: DPM, NOx, SOx

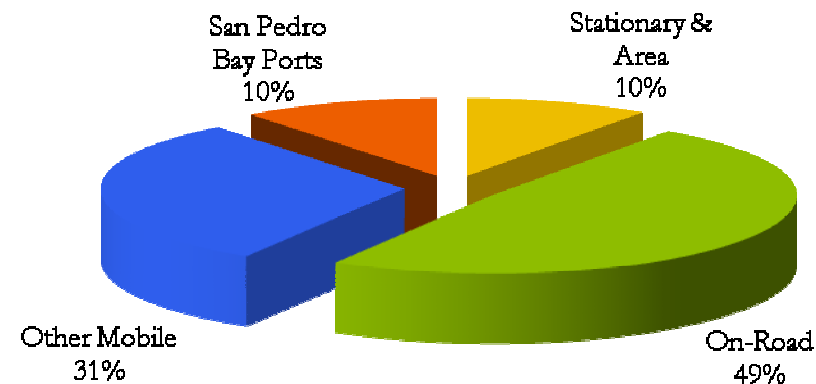
- **DPM-Diesel Particulate Matter:** Microscopic particles that includes soot from diesel exhaust; toxic air contaminant
 - **NOx-Nitrogen Oxides:** An ozone precursor that significantly contributes to smog
 - **SOx-Sulfur Oxides:** A precursor to particulates
 - **The South Coast Air Basin exceeds federal air quality standards for both ozone and particulate matter**
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Port-Related Contribution to Basin 2007

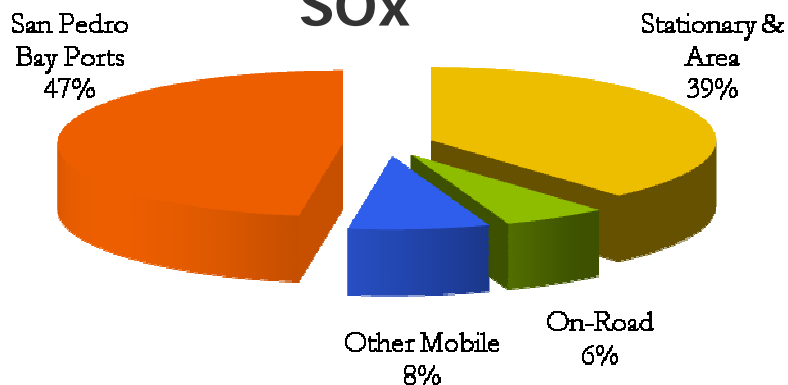
DPM



NOx

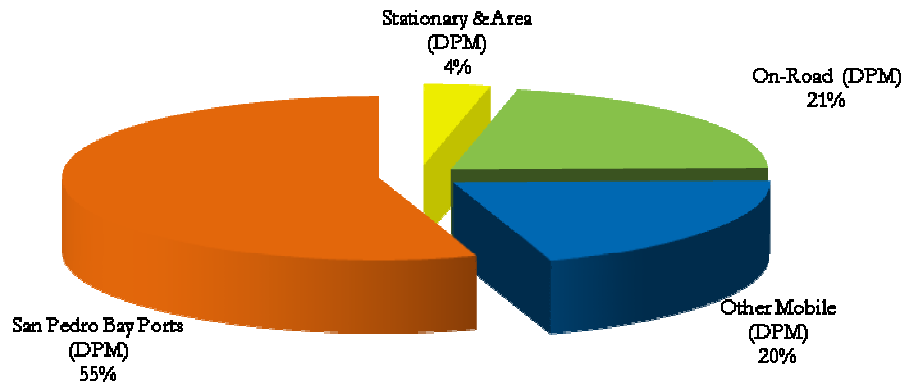


SOx

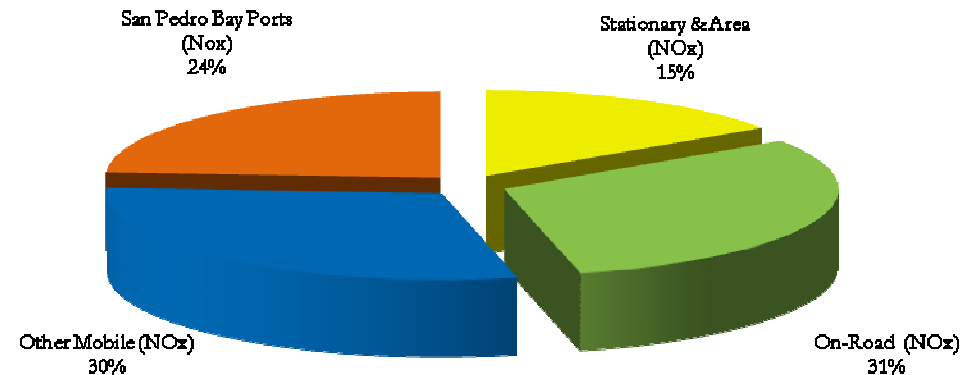


Projected Port-Related Contribution 2023 Without CAAP Implementation

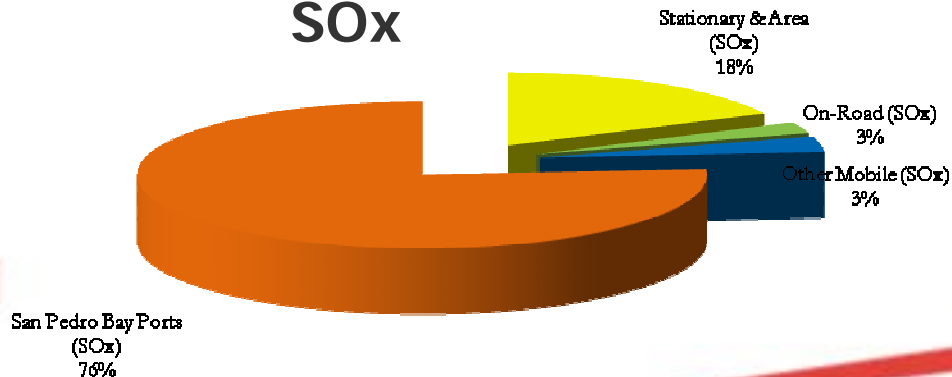
DPM



NOx



SOx



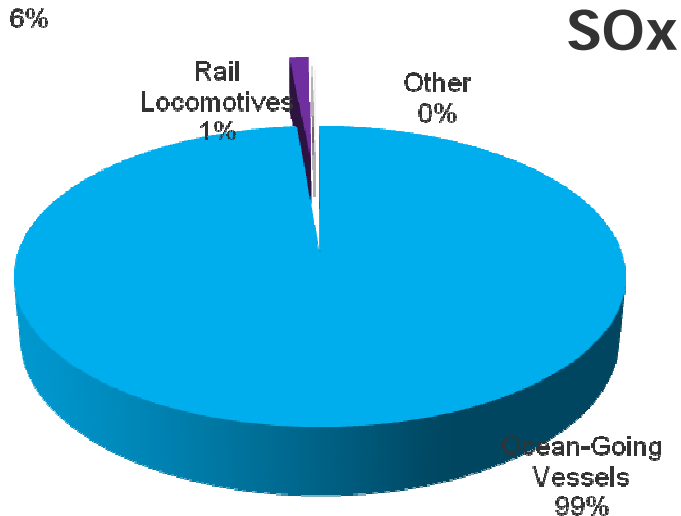
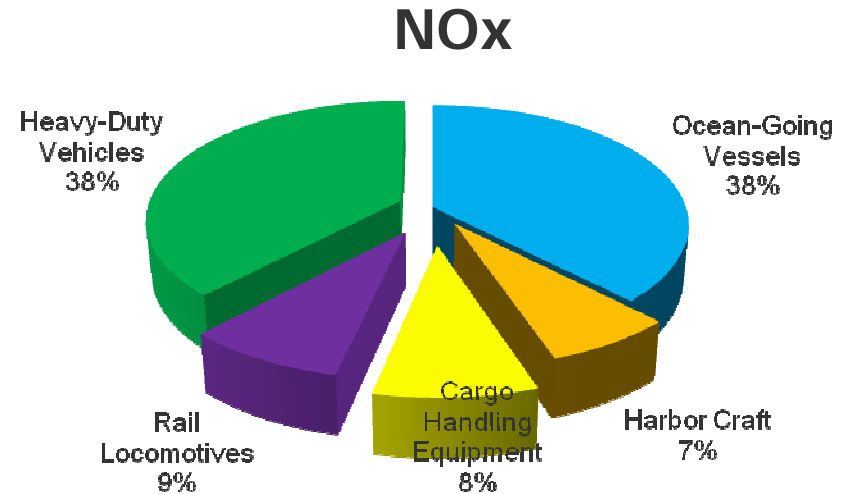
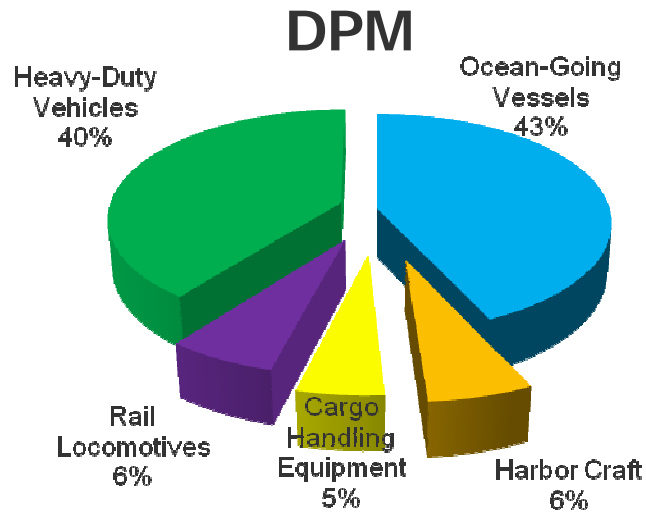
Sources and Challenges

Reducing emissions from all source categories...

- Ocean-going vessels, harbor craft locomotives, cargo handling equipment and trucks

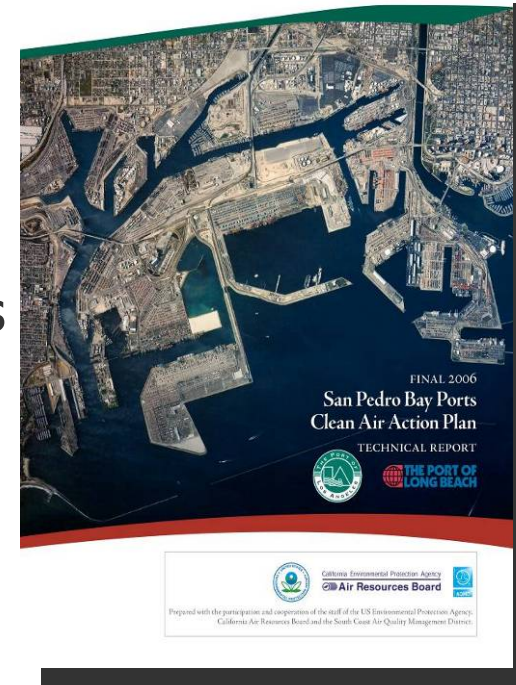


Pollutant Contribution by Source



CAAP Development

- Developed in cooperation with our partners, with stakeholder input
- Comprehensive plan
 - Standards and goals
 - Control measures for all source categories
 - Technology Advancement Program
 - Emissions reduction
 - Port budget requirements
- Adopted at joint port Board meeting in late 2006






Technology Advancement Program



Technology Advancement Program

As an integral component to the CAAP...

The ports' TAP aims to:


- Encourage technology innovation
 - Demonstrate effectiveness of new technologies
 - Accelerate commercial availability of new technologies
 - Improve emissions reduction
 - Provide more options for meeting the goals of the CAAP
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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 development and implementation of new and emerging technologies to reduce air emissions
 - Streamline process for reaching consensus with the agencies on emissions reduction achieved by various technologies
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TAP Advisory Committee

Combining expertise and resources...

- Port of Long Beach
- Port of Los Angeles
- Advisory Committee
 - EPA, CARB, AQMD
 - Serve in an advisory capacity to the ports for screening, evaluating and recommending projects
 - Streamline process for reaching consensus on performance of the technology

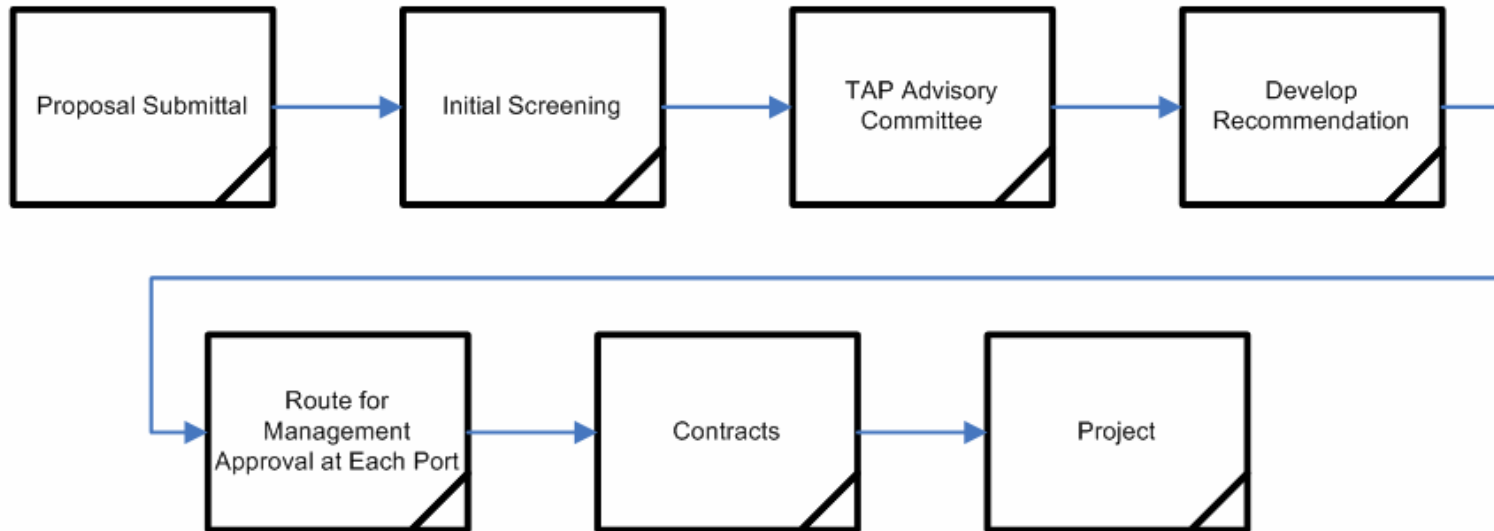


New/Emerging Technology Demonstration Types of Projects


- Port-generated projects
- Solicited proposals
- Unsolicited proposals



Unsolicited Proposal Process



TAP Project Requirements Screening/Evaluation

- **Technology Application**
 - **CARB Verification**
 - **Matching Funds**
 - **Emissions Reduction**
 - DPM, NO_x, SO_x
 - GHGs, ultrafines
 - **Ability to meet needs of the port industry**
 - **Cost**
 - **Feasibility - development status; qualifications**
 - **Statement of Work – technical approach; schedule**
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TAP Funding

- Port of Long Beach: \$1.5 million per year
- Port of Los Angeles: \$1.5 million per year
- Total Funding over 5 years: \$15 million





Technology Demonstration Projects



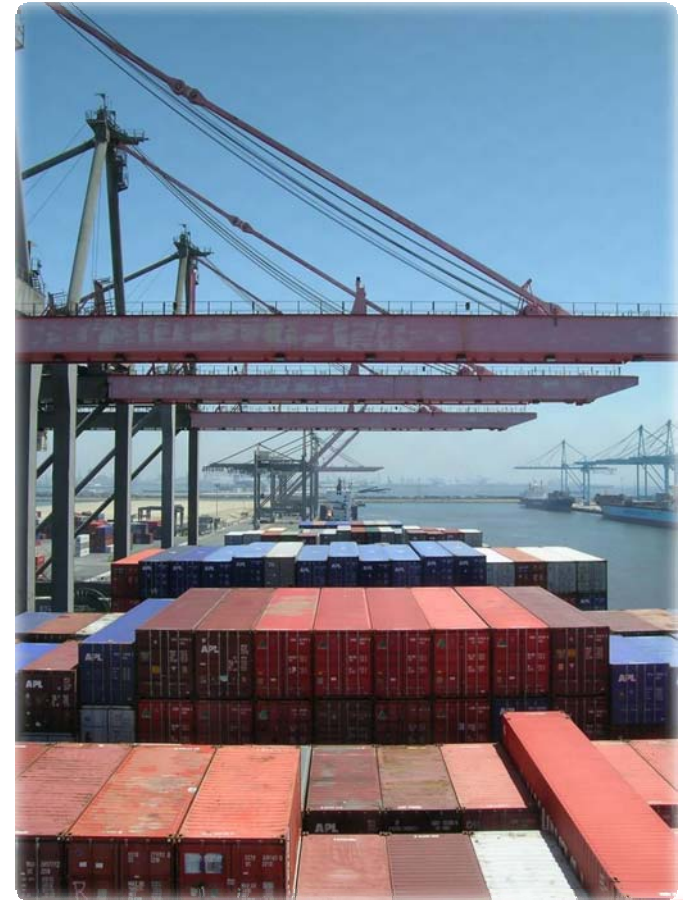
Advanced Marine Emission Control System

- “ Sock on a Stack”
- Project partners: ACTI, POLB, POLA, and SCAQMD
- Combined ports' contribution: \$299,054
- Tested
 - Up to 98% PM
 - Up to 95% NOx



APL Singapore Vessel Retrofit

- Emulsified fuel for main & auxiliary engines
- Fuel efficient slide valve technology
- Project partners: APL, POLB, POLA, CARB, air districts
- Combined ports' contribution: \$45,000
- Both oxides of nitrogen & particulate matter reduced



Foss Maritime Diesel/Electric Tugboat

- 1st hybrid technology in a tugboat
- Delivered January 23, 2009
- Equipped with diesel-electric hybrid engine
- Project partners: Foss, POLB, and POLA
- Combined ports' contribution:
\$ 1.4 million
- Anticipated benefits:
 - Over 70% of engine time saved!
 - 20 – 30% fuel savings
 - 44% reduction of oxides of nitrogen
particulate matter



OceanAir Eco Tug

- Tier II retrofit of Electro-Motive Diesel Engines
- Project Partner: OceanAir Environmental, Millennium Maritime, Inc., POLA, POLB
- Addition of a center engine equipped with SCR
- Ports' contribution: \$700K
- Anticipated benefits:
 - Up to 14 tons per year of NOx
 - Up to 1.73 tons per year of PM



LNG Yard Hostler

- First application of LNG in cargo handling equipment
- Demonstrated in both POLB and POLA terminals
- Performance Evaluation Study
- Business Case Assessment
- Project partners: POLB, USEPA
- POLB Contribution: \$350K
- Results:
 - Good operational performance
 - DPM reductions
 - NOx emissions increased compared to diesel



Hybrid Yard Hostler

- Hybrid yard hostler project developed by POLB
- Develop and demonstrate performance of hybrid technology in yard hostler application
- Project partners: LBCT, POLB, POLA, USEPA
- Combined ports' contribution: \$600K
- Anticipated benefits:
 - 93% NO_x and PM emissions reduction



Vycon REGEN System

- Flywheel energy storage system
- Installed on Rubber Tired Gantry Cranes (RTGs)
- CARB verification achieved
- Project partners: Vycon, POLB, POLA, AQMD
- Combined ports' contribution: \$23K
- Benefits:
 - Verified as Level 1 technology
 - 25% PM reductions
 - 30% NOx reductions
 - 30% CO2 reductions
 - 35% fuel savings



LBCT Eco Crane

- Replace 680 brake horsepower with hybrid system
- Project partners: LBCT, POLB, POLA
- Combined ports' contribution: \$350k
- Anticipated benefits:
 - 85 to 90% total emissions reduction



EcoEnergy Solutions Emulsified B20

- Low water (8-10%) content emulsification blended with 20% biodiesel
- Elimination of NOx increase associated with biodiesel
- Combined ports' contribution: \$88K
- Anticipated benefits:
 - 57% PM
 - 8-10% NOx
 - 12.6% CO₂



Balqon Electric Terminal Tractor and On-Road Truck

- Development of a prototype low-speed full-electric on-road truck and terminal yard tractor.
- Project Partners: Balqon, POLA, SCAQMD
- Potential future option for short-haul drayage/intermodal
- Anticipated benefits:
 - Nearly 100% emissions reduction



Johnson Matthey

- SCRT retrofit system for on-road truck with diesel particulate filter (DPF)
- Project partners: JM, POLB, POLA
- Combined ports' contribution: \$261,232
- Anticipated benefits:
 - 85% PM, hydrocarbons, and CO emissions reduction
 - Between 60 to 80% NOx emissions reduction
 - Clean Truck Program compliance



Westport LNG Engine

- Development of LNG Heavy Duty Truck
- Early compliance with the 2010 Emission Standard
- Project partners: Westport Power, Clean Energy, CEC, POLB, POLA, AQMD
- Combined ports' contribution: \$500K
- Benefits:
 - NOx emissions reduced by 0.45 tpy
 - GHG emissions reduced by 15-20%



SoCalGas CNG Port Truck

- Compressed Natural Gas class 8 tractor truck
- Equipped with Cummings ISL G engine
- Meets CARB 2010 NOx standards of 0.2 g/bhp-hr
- Project Partners: The Gas Company, POLA, POLB, SCAQMD, Autocar, Cal Cartage
- Ports' contribution: \$223K
- Emissions reduction:
 - 83% reduction in NOx




Pacific Harbor Line Locomotive Retrofit

- 1st time in the United States
- Tier 2 switch locomotive engines
- Retrofit with MobiClean™ Diesel Particulate Filters
- Anticipated benefit:
 - Over 90% of particulate matter reduced



Next Steps

- **Proposal Template**
 - **TAP Database**
 - **Increased Outreach**
 - **Identifying Areas of Improvement**
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and BEYOND...

- **Encourage Conceptual Ideas**
- **Work with Additional Partners**
- **TAP Expansion**





San Pedro Bay Ports Clean Air Action Plan

Learn more about the Clean Air Action Plan - www.cleanairactionplan.org

CONTACTS

Heather Tomley
Port of Long Beach
Assistant Director of
Environmental Planning
562.590.4160
tomley@polb.com

Kevin Maggay
Port of Los Angeles
Environmental Specialist
310.221.3947
kmaggay@portla.org