



Clean Fuels Program Advisory Group Meeting

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Technology Advancement Office



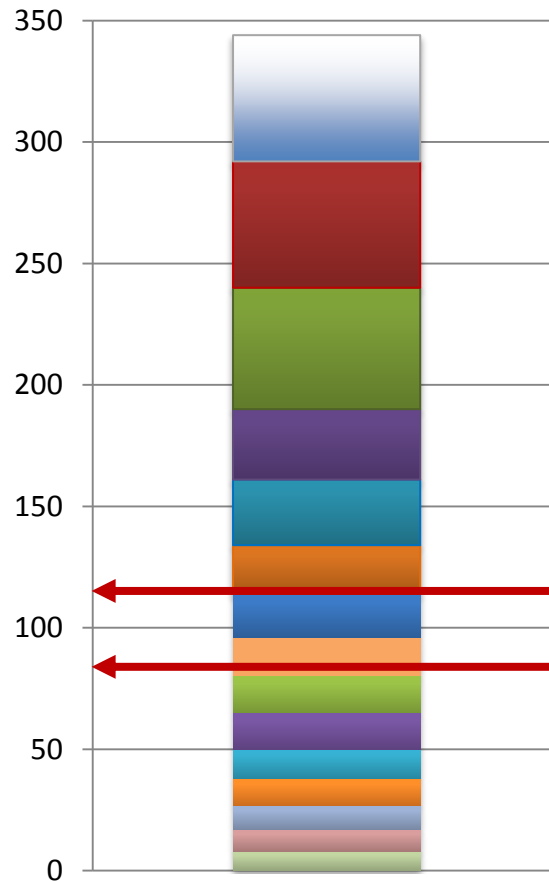
Key Regional Air Quality Challenge: Reducing Nitrogen Oxides from Mobile Sources

- Attaining federal ozone and PM_{2.5} standards will require substantial NO_x reductions *beyond adopted rules*
- Ozone standard will likely require the greatest reductions
 - Attainment Deadlines:
 - **2023** (80 ppb standard)
 - **2032 timeframe** (75 ppb standard)



Top 15 NO_x Categories: 2023 NO_x Emissions With Adopted Rules Preliminary SCAQMD Estimates¹

- Oceangoing Vessels
- Off-Road Eq^t
- Heavy Duty Diesel Trucks
- Aircraft
- Large Stationary
- Light Duty Trucks
- Locomotives
- Recreational Boats
- Heavy Duty Gasoline Trucks
- Light Duty Cars
- Residential Fuel Combustion
- Commercial Boats
- Medium Duty Trucks
- Heavy Duty Buses
- Service/Commercial



2023 NO_x carrying capacity for 80 ppb federal ozone standard²

Preliminary 2032(?) NO_x carrying capacity for current 75 ppb federal ozone standard

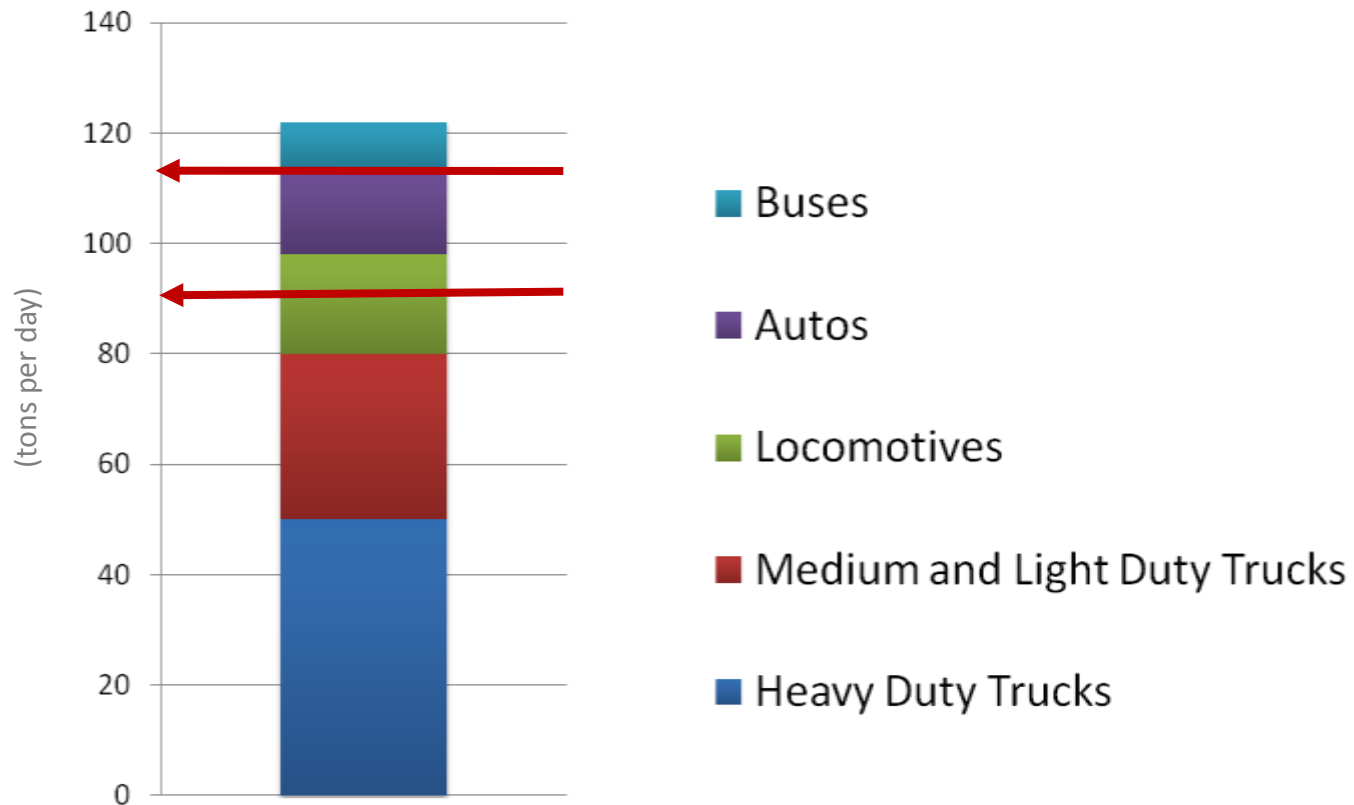
1. Preliminary emissions estimates based on data updated from 2007 AQMP where available: CARB 2010 emissions projections for trucks and off-road equipment; IMO Tier 1 – 3 for ocean vessels; EPA 2008 rule for locomotives; 2007 AQMP short-term measures for other categories. Range for oceangoing vessels (20 -52) based on varying deployment assumptions for IMO Tier 2 and 3 vessels and range of ports' cargo forecasts.

2. 1997 80 ppb federal ambient ozone standard. Source: 2007 AQMP.

South Coast Air Basin

Landside Transportation Sources

2023 NO_x Emissions
With Rules Adopted (Preliminary Estimates)¹



1. Preliminary emissions estimates based on data updated from 2007 AQMP where available; EPA 2008 locomotive rule; updated 2010 CARB truck emissions data.

Clean Fuels Program Priority Projects

- Zero Tailpipe Emission Container Transport
- Hybrid Trucks and EV Outreach
- Advanced Natural Gas Engines for Trucks

Zero Tailpipe Emission Container Transport

The long-term goal is for a zero-emission truck corridor along the I-710 and CA-60 freeways as proposed in the Southern California Association of Governments (SCAG) Regional Transportation Plan



Zero Tailpipe Emission Container Transport

Catenary truck project

- Southern California Zero Emission Freight Movement Regional Collaborative
- Two locations are under consideration: Navy Way inside the port of LA and on the Terminal Island Freeway
- Type of Truck Platforms
 - Diesel Hybrid
 - CNG Hybrid
 - Battery Electric
 - Fuel Cell



Hybrid Electric Trucks

- Demonstration and evaluation of medium-duty PHEVs
- Approximately 10% of total 2023 NOx emissions
- Develop a production-ready PHEV system for Class 2 as well as 6–8 vehicles
- Zero emission range
- Utility truck onsite all electric operation
- Funding
 - \$45 million DOE
 - \$5 million CEC
 - \$3 million EPRI
 - \$40 million Industry Partners

Hybrid Electric Trucks

- **Odyne Utility Truck Application (Class 6-8)**

- Class 6-8 chassis with diesel engine
- Odyne plug-in hybrid drive system with 10 miles of equivalent all-electric range or 3 hours of onsite all-electric operation



- **Pickup Truck Application (Class 2)**

- Chevrolet Silverado 4x4 or RWD with gasoline engine
- VIA series plug-in hybrid drive system
- Up to 40 miles of all-electric range



- **Van Application (Class 2)**

- Chevrolet Express (G-Van) RWD with gasoline engine
- VIA series plug-in hybrid drive system
- Up to 30 miles of all-electric range



EV Charging Infrastructure Projects

EV Readiness Programs

- \$1M DOE Clean Cities Program grant for PEV infrastructure planning, AQMD as lead agency
 - Six regional plans, statewide guidelines document, education outreach workshops
 - Compile regional plans into statewide plan
- \$200K from CEC grant for PEV infrastructure planning, SCAG and AQMD co-lead agencies
 - Fund sub-regional studies that feed into regional PEV infrastructure plan
- DC Fast Charger Installations
 - Along major freeways
 - Increase electric vehicle miles travelled
- Level 2 EV charger installations
 - SoCalEV project



Hydrogen Fueling Infrastructure

- AB 923 Reauthorization
- Hydrogen Fueling Infrastructure
 - CaFCP estimate 53,000 FCVs by 2017
 - Approximately 100 stations necessary
 - Need \$65 million in additional funding
 - AB 8 and SB 11



Advanced Natural Gas Engines for Trucks

- Cummins Westport Project
 - Develop and demonstrate 15L natural gas HPDI engine
 - 400-450hp
 - Certified at 0.2 g/bhp-hr NOx and 0.01 g/bhp-hr PM
- Cummins Project
 - Develop and demonstrate 8.9L natural gas engine
 - 350 hp
 - Certified at 0.2 g/bhp-hr NOx and 0.01 g/bhp-hr PM



Advanced Natural Gas Engines for Trucks

- Develop and Demonstrate low-emission natural gas engines for trucks
 - 2010 standard 0.2 g/bhp-hr NO_x
 - Approximately 0.02 g/bhp-hr NO_x
- Technology
 - Open
- Potential Project Partners
 - CEC, SoCal Gas, San Joaquin APCD, DOE
- Release RFP April 2013