Proposed Regulations and Regulatory Amendments to Reduce Greenhouse Gas (GHG) and Oxides of Nitrogen (NOx) from On-Road Trucks



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California Environmental Protection Agency

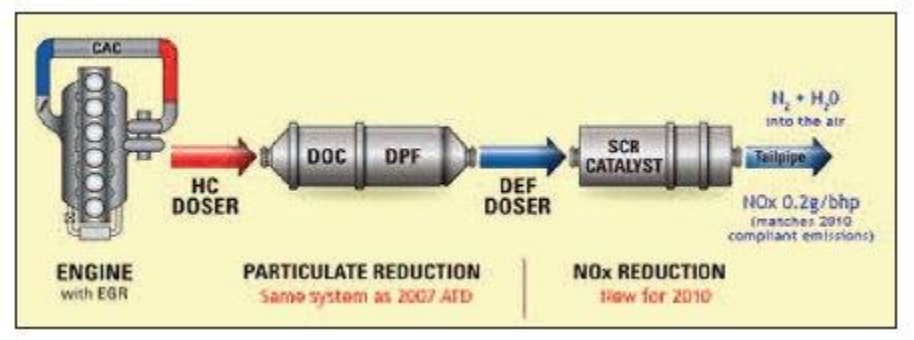
California Environmental Protection Agency
AIR RESOURCES BOARD

Outline

- Introduction
- Proposal
  - New GHG Phase 1 Emission Standards for Medium and Heavy-Duty (HD) Vehicles and Engines
  - Amend Tractor-Trailer GHG Regulation
  - New Optional NOx Standards
  - Amend Idling Measure
  - Update Hybrid-Electric Vehicle Certification Procedures
- Development of Phase 2 Standards
- Next Steps
- Conclusion

Current Heavy-Duty Truck Program

- On-road HD truck emission standards
  - 2010 Standards
    - 90% reduction in NOx and PM from 2004
    - Led to DPF and SCR usage



- California in-use programs require use of these vehicles

Need Lower-Emitting Trucks to Meet Ambitious GHG and NOx Targets

GHG

- AB 32 – Achieve 1990 level emissions by 2020
- E.O. S-3-05 – Reduce GHG 80% below 1990 by 2050
- HD trucks emit ~8% of California GHG

NOx

- 2023 and 2032 federal Ozone standards
- ~90% further NOx reduction needed in South Coast and San Joaquin by 2032
- HD trucks emit ~32% of California NOx

ARB's Vision of Lower–Emitting Trucks

- Improved efficiency / lower operating costs
  - Engine/drivetrain improvements
  - Vehicle improvements
- Operate on low-carbon fuels
- Designed for specific applications

Proposed Standards and Amendments Designed to Usher In New Generations of Lower-Emitting Trucks

- Establish California HD GHG program harmonized with national program
- Establish new, optional provisions designed to promote innovation
- Ensure test procedures are appropriate for today's hybrid technologies
- Enhance enforcement and implementation of existing standards

New GHG Phase 1 Emission Standards

U.S. EPA Phase 1: Overview

- Establishes GHG standards for medium- and HD engines and vehicles
- Standards based on off-the-shelf technologies
- Vehicle standards in three categories
  - Semi-Tractors (trailers not included)
  - Vocational vehicles
  - HD pickups and vans
- Begins with 2014 model year, stringency increases through 2019 model year

U.S. EPA Phase 1: Overview (continued)

- Demonstrate tractor-trailer and vocational vehicle compliance using GHG Emissions Model (GEM)
- Pick-ups and vans compliance based on dynamometer testing
- Anticipated compliance strategies:
  - Engine improvements
  - Low rolling resistance tires
  - Mass reduction
  - Improved aerodynamics
  - Reduced idling

ARB Phase 1 to Create Nationally Harmonized Program

- Adopt the U.S. Environmental Protection Agency's (U.S. EPA) Phase 1 standards
  - Same structure and stringency levels as U.S. EPA
- Nationally harmonized program so manufacturers can have one national strategy
  - "Deemed to Comply" allowance

California Phase 1 Carbon Dioxide (CO2) Benefits

CO2 Emissions from Affected Vehicles (in million metric tons per year)			
Calendar Year	Baseline CO2 Emissions	CO2 Emissions with Phase 1	CO2 Reductions
2020	43.2	40.1	7.2%
2035	55.5	48.6	12.5%

ARB Phase 1: Distinctions from U.S. EPA

- Definition of urban bus
- Initial credits in U.S. EPA rule
- Other minor distinctions
  - Reporting, labeling, idling requirements

15-Day Change

- California-specific vehicle and engine labeling not required until January 1, 2015.

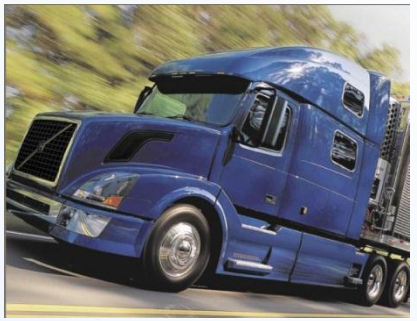
Proposed Modifications to the Tractor-Trailer Greenhouse Gas Regulation (TTGHG)

Overview: Current California TTGHG Regulation

- Effective January 1, 2010
- Reduces GHG emissions from long-haul tractor-trailers by improving
  - Tractor aerodynamics
  - 53'+ box-type trailer aerodynamics (skirts, etc.)
  - Tire rolling resistance
- Based on elements of U.S. EPA SmartWay Program

Current California Tractor Requirements

- Tractors pulling 53-foot or greater box-type trailers in California
  - 2011+ model year sleeper cabs
    - SmartWay designated by 1/1/2010
  - 2011+ model year day cabs
    - Low rolling resistance tires by 1/1/2010
  - All pre-2011 model year sleeper cabs and day cabs
    - Low rolling resistance tires by 1/1/2013



Proposed Tractor Amendments to Harmonize with Phase 1

Vehicle Category	Current TTGHG Rule Requirements	Proposed Amendment
Tractor (MY 2011 and newer)	• Aerodynamic • Low Rolling Resistance Tires	**Sunset for MY 2014 and newer**
Tractor (MY 2010 and older)	• Low Rolling Resistance Tires	No Change
Trailer (53 foot box-type)	• Aerodynamic • Low Rolling Resistance Tires	No Change

Other Minor Amendments

- Clarify definition of “sleeper-cab tractor” to only apply to tractors originally manufactured with a sleeper-cab

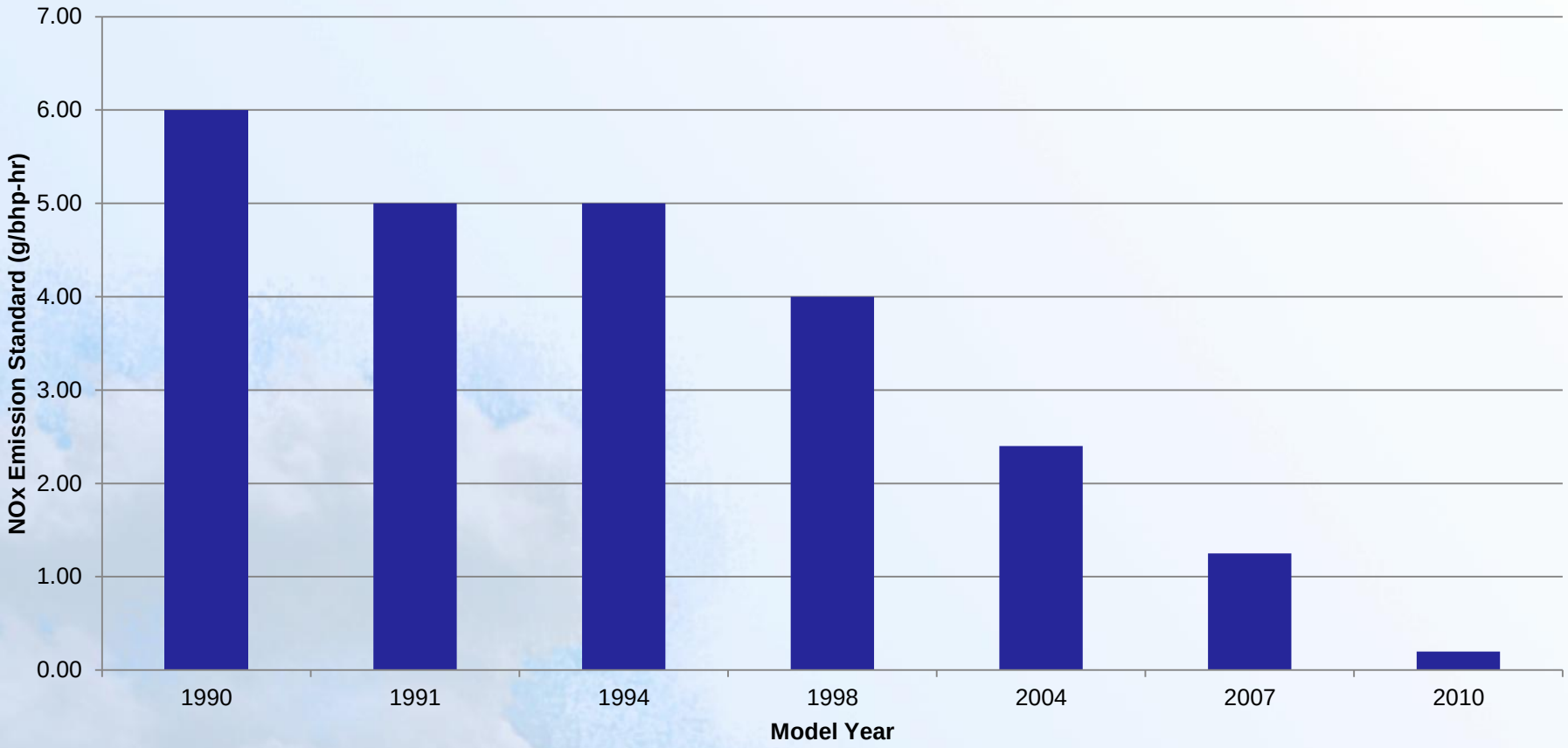
- Other minor clarifying and corrective changes

15-Day Changes

- Three-month grace period for new trailers
- Streamlining the Trailer Aerodynamic Equipment Compliance Delay

Optional NOx Standards

HD Engine Standards Driving NOx Emissions Lower



Proposed Optional NOx Standards

NOx Level (g/bhp-hr)	% Below Current Standard
0.2 (Current)	
0.1	- 50%
0.05	- 75%
0.02	- 90%

Lower NOx Standards Are Feasible

- About 8 percent of engines sold in 2012 were certified at levels 0.07 g/bhp-hr or less
- Existing NOx emission reduction technology can be improved
  - Selective Catalytic Reduction (Diesel engines)
  - Three-Way Catalyst (Natural gas engines)
- Lay groundwork for future mandatory standards

Low NOx Demonstration Projects Currently Underway

- Southwest Research Institute (SwRI)
  - Sponsored by ARB
  - Demonstrate 0.02 g/bhp-hr NOx diesel and natural gas heavy-duty engines
  - Goal is no GHG/fuel efficiency penalty
  - Completion late 2015
- National Renewable Energy Laboratory/SwRI
  - Sponsored by South Coast AQMD
  - Commercialize 0.02 g/bhp-hr NOx engine
  - “On the Road” soon after completion of project
  - Completion end of 2016

Deployment Opportunities

- Some opportunities for funding optional low NOx engines in Carl Moyer and Bond 1B programs

- Potential changes to Truck and Bus Rule to incentivize early deployments

15-Day Change

- Revise on-board diagnostic requirements for the optional NOx standards
  - Maintain current stringency
  - Will monitor and revisit in the future

Amendments to the Air Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling (Idling ATCM)

Current Requirements

- Reduces exposure to diesel exhaust
- Applicable since 2005
- Applies to operators of diesel-fueled commercial trucks and buses
- Requirements
  - Limits idling to 5 minutes
  - Optional main engine idling standard in lieu of engine shutdown

Need to Amend the Idling ATCM

- Need for improved enforcement capabilities
  - Currently rule applies only to the vehicle driver
  - Many citations remain unresolved
  - Driver often not present or available to receive citation
  - No recourse for enforcement staff to identify delinquent driver and settle open unsigned citations
- Modify certain definitions to provide clarity

Proposed Amendments to the Idling ATCM

- In addition to the driver, hold the vehicle **owner** and **motor carrier** accountable
- Modify definition of “Restricted Area” to include “schools”, “hotels”, and “motels”
- Effective Date: January 1, 2015

Amend the California Interim Certification Procedures For 2004 and Subsequent Model Hybrid-Electric Vehicles

Current HD Hybrid Certification Procedures

- Approved by Board October 2002
- Used by manufacturers seeking voluntary vehicle-based certification
- Adopted in conjunction with modifications to the Public Transit Bus Fleet Rule
- Focused on hybrid urban buses

Update HD Hybrid Certification Procedures to Apply More Broadly

- Applicable to wider range of heavy-duty vehicles and hybrid technologies
  - Wider variety of vocational hybrid vehicles
  - New hybrid technologies like plug-in hybrid electric
- Update definitions and testing practices
- Interim procedures to remain voluntary

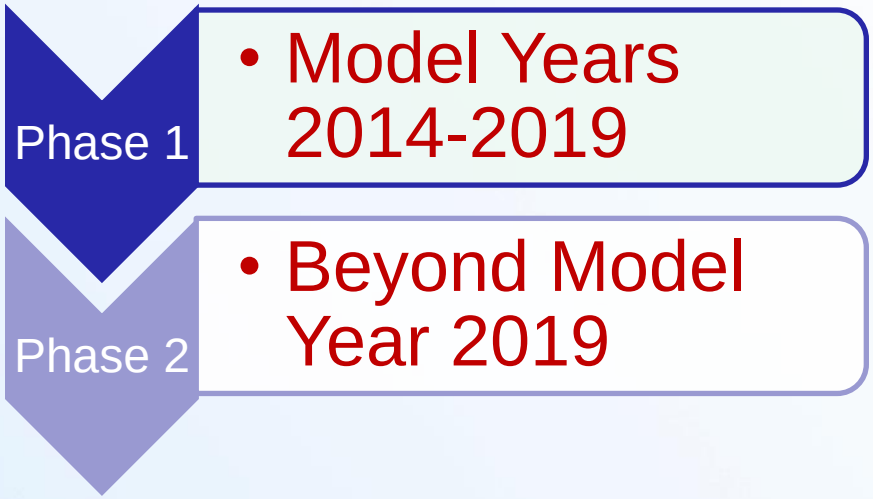
15-Day Changes

- Revise title to include other hybrid vehicles
- Clarification regarding use of fans during testing
- Allow alternate measurement methods for battery connections to hybrid system
- Require preconditioning of hybrid system components and engine aftertreatment systems

The Next Step: GHG Phase 2

- President Obama's 2013 Climate Action Plan
  -Administration to partner with industry leaders and other key stakeholders to develop post-2019 fuel economy standards for heavy-duty vehicles

- More stringent GHG emission standards for medium- and HD trucks



GHG Phase 2 Schedule

- U.S.EPA, the National Highway Traffic Safety Administration, and ARB working jointly
- U.S. EPA: Adopt GHG Phase 2 final rule by late 2015
- ARB: Adopt in 2016 together with lower CA NOx standards

California Environmental Protection Agency
Air Resources Board

NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

GHG Phase 2 Stringency

- May include trailers and additional requirements for vocational vehicle manufacturers
- Additional and new technologies such as:
  - Waste heat recovery
  - Engine down speeding
  - Engine down sizing
  - Mild/full/plug-in hybrid
  - Additional aerodynamic improvements
  - Improved transmissions, etc
- Refined test procedures and GEM model
- ARB interested in inclusion of trailers and maximum NOx reductions

Recommendation: Approve Staff's Proposal, with 15-Day Changes

- **New GHG Phase I Emission Standards**
  - Allow California to certify engines and vehicles and enforce standards
  - Pave way for Phase 2
- **Amendments to the Tractor-Trailer GHG Regulation**
  - Remove duplicative California-only requirements
- **Optional Oxides of Nitrogen Standards**
  - Pave way for future NOx reduction
- **Amendments to the Idling ATCM**
  - Improve enforcement
- **Amendments to Certification Procedures For Hybrid-Electric Vehicles**
  - Better quantify emissions from hybrid vehicles

Next Step In Meeting Air Quality and Climate Goals

- Promotes development and use of new emission reducing technologies for HD vehicles and engines
- Focused on GHG and NOx emissions
- Next step toward cleaner generations of trucks