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

December 12, 2013
California Environmental Protection Agency
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

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>Baseline CO2 Emissions</th>
<th>CO2 Emissions with Phase 1</th>
<th>CO2 Reductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>43.2</td>
<td>40.1</td>
<td>7.2%</td>
</tr>
<tr>
<td>2035</td>
<td>55.5</td>
<td>48.6</td>
<td>12.5%</td>
</tr>
</tbody>
</table>
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
• 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

<table>
<thead>
<tr>
<th>Vehicle Category</th>
<th>Current TTGHG Rule Requirements</th>
<th>Proposed Amendment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor (MY 2011 and newer)</td>
<td>• Aerodynamic</td>
<td>Sunset for MY 2014 and newer</td>
</tr>
<tr>
<td></td>
<td>• Low Rolling Resistance Tires</td>
<td></td>
</tr>
<tr>
<td>Tractor (MY 2010 and older)</td>
<td>• Low Rolling Resistance Tires</td>
<td>No Change</td>
</tr>
<tr>
<td>Trailer (53 foot box-type)</td>
<td>• Aerodynamic</td>
<td>No Change</td>
</tr>
<tr>
<td></td>
<td>• Low Rolling Resistance Tires</td>
<td></td>
</tr>
</tbody>
</table>
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

NOx Emission Standard (g/bhp-hr)

Model Year


Opt NOx
## Proposed Optional NOx Standards

<table>
<thead>
<tr>
<th>NOx Level (g/bhp-hr)</th>
<th>% Below Current Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 (Current)</td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td>- 50%</td>
</tr>
<tr>
<td>0.05</td>
<td>- 75%</td>
</tr>
<tr>
<td>0.02</td>
<td>- 90%</td>
</tr>
</tbody>
</table>
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

Phase 1
- Model Years 2014-2019

Phase 2
- Beyond Model Year 2019
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
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