LOOKING AHEAD TO THE NEXT PHASE OF HEAVY-DUTY GREENHOUSE GAS AND FUEL EFFICIENCY STANDARDS

U.S. Environmental Protection Agency
National Highway traffic Safety Administration
Topics

• MD/HD Emissions

• Phase 1
  – Program Overview

• Phase 2
  – Possible Scope
  – Federal Research

• California and International Regulatory Landscape

Phase 1
• Model Years 2014-2018/19

Phase 2
• Beyond Model Year 2018
Why GHG Emissions Matter

Atmospheric CO₂ Concentration (ppm)

Average Temperature (degrees F)

Sea Level Change (inches)

http://www.epa.gov/climatechange/science/future.html
US Transportation Related GHG Emissions (Tg CO2eq) 2012

Source: U.S. Energy Information Administration, Annual Energy Outlook 2014
Transportation Sector Energy Use 2012

Source: U.S. Energy Information Administration, Annual Energy Outlook 2014
World-Wide Transportation Energy Use: HD Vehicle Grows Faster than any Other Transportation Sub-sector

- World-wide, HD vehicle energy demand estimated to grow by 65% over next 30 years.
- In 2040, HD Vehicles projected to be largest transportation sub-sector use of energy.
- 40% of all transportation energy.

ExxonMobil 2013 Energy Outlook Report
World-Wide Transportation Energy Use: Heavy-duty Grows in All Regions, with Asia Pacific by Far the Largest

Heavy duty transportation demand by region
Millions of oil-equivalent barrels per day

- Asia Pacific
- North America
- Europe
- Latin America
- Middle East
- Rest of world

Heavy duty transportation intensity
Oil-equivalent barrels per thousand dollars of GDP

ExxonMobil 2013 Energy Outlook Report
MD/HD Phase 1 – Highlights

- First ever Medium- & Heavy-Duty Standards
- Will reduce fuel consumption, CO2 emissions, and operating costs for thousands of businesses
- Allows manufacturers to produce a single fleet of vehicles to meet requirement
- EPA & NHTSA conducted significant stakeholder outreach as part of this rulemaking development

- 530 million barrels less oil
- 270 MMT lower GHGs
- $50 billion in fuel savings
- $49 billion in net benefits
Phase 1 – Standards Implementation

- EPA GHG standards are mandatory beginning in Model Year 2014
- NHTSA fuel efficiency standards are mandatory beginning in Model Year 2016
  - Voluntary early compliance MY 2014 & 2015

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Phase 1 – Divides diverse MD/HD vehicle sector into 4 distinct categories

Semi tractors (not trailers)

Full-size pickup trucks & work vans

Vocational vehicles

Heavy Duty Engines
Phase 1 – Pollutants addressed and flexibilities

- EPA regulates CO$_2$, N$_2$O, CH$_4$ and HFCs.
- NHTSA regulates fuel consumption.
- Both agencies offer manufacturers flexibilities including credit Averaging, Banking and Trading (ABT), among other provisions.
“During the President’s second term, the Administration will once again partner with industry leaders and other key stakeholders to develop post-2018 fuel economy standards for heavy-duty vehicles ….”
Joint NHTSA/EPA rulemaking process with notice and opportunity for public review and comment.

Heavy-duty Phase 2 May Include:

- Potential inclusion of trailers
- Additional and new technologies beyond Phase 1
- Refined test procedures and updates to the GEM vehicle simulation compliance model
- Updated technology, economic and environmental assessments
- Updating flexibilities
Technology Evaluations

- Study of fuel-efficiency technologies for medium- and heavy-duty vehicles in the years prior to and in the Phase 2 timeframe
- Evaluate the effectiveness and costs

Test procedure development, refinement and validation studies

- Evaluate improvements to Phase 1 drive cycles, and additional cycles
- Refine and evaluate aerodynamic and powertrain test procedure approaches
- Considering improvements to Greenhouse Gas Emissions compliance model (GEM)
### NHTSA/EPA Research: Engine Technologies

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<th>Improved Selective Catalytic Reduction (SCR) Conversion, combined with reducing or removing EGR</th>
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<td>Air Handling Improvement</td>
<td>Lean Burn GDI w/ SCR</td>
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<td>Engine Down-sizing</td>
<td>Stoichiometric Gasoline Direct Injection (GDI)</td>
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<td>Engine Down-speeding (reduced cruise RPM, combined with transmission technology)</td>
<td>Stop / Start</td>
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<td>Engine Friction Reduction</td>
<td>Turbo Efficiency Improvement</td>
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<td>Variable Valve Timing</td>
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<td>GDI + Cooled EGR</td>
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*Technology application varies by vehicle class, vocation, and engine fuel type*
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<th>Technology</th>
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<td>A/C Reduced Reheat</td>
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<td>Automatic Engine Shutdown</td>
<td>Improved Aerodynamics</td>
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<td>Automatic Tire Pressure Control</td>
<td>Improved Transmissions (more gears, higher ratio spread, shift points)</td>
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<td>Battery Auxiliary Power Unit</td>
<td>Low Rolling Resistance Tires</td>
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<td>Dual Clutch Transmission</td>
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<td>Fan Power Demand Reduction</td>
<td>Weight Reduction</td>
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*Technology application will vary by vehicle class, vocation, and engine fuel type*
• 2010
  • Issued, “Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles”
  • EPA and NHTSA considered this study in support of Phase 1

• 2014
  • As required by 2007 Energy Independence and Security Act, NHTSA sponsored a second NAS study for heavy-duty
  • Published an interim report in April 2014 to help inform Phase 2 considerations
  • Final report expected in 2016 to inform considerations beyond Phase 2
What’s Happening in California?

- **2008:** ARB adopts mandatory fleet-level requirements for tractors and trailers
  - Based on EPA SmartWay performance

- **2012:** ARB Releases 2050 Vision for Clean Air document
  - Calls for significant additional NO\(_x\) and CO\(_2\) reductions from heavy-duty sector

- **2013:** Adopting EPA GHG Phase 1 Standards
  - Board hearing in December 2013
  - Similar to ARB’s adoption of HD criteria emissions standards
  - Also adopting new voluntary Low NOx standards for heavy-duty
  - Signaled intent to move beyond Federal Phase 1

- ARB Participation in Federal Phase 2 Standards Development
What’s happening Internationally?

- **North America (Environment Canada / Transport Canada)**
  - Canada finalizing adoption of US HD GHG Phase 1
  - EPA/NHTSA coordinating Phase 2 technical work with EC & TC

- **Europe (DG CLIMA / DG JRC)**
  - Developing test procedures and a simulation tool
  - Evaluating a range of policy options
  - Initial direction might include reporting or labeling

- **China (MIIT / CATARC)**
  - Finalized an industry standard based on chassis dyno testing parent vehicles and simulating child variants
  - Working toward national standards

- **Japan (MLIT / NTSEL)**
  - First movers in regulatory world with “top-runner” program
  - Supporting opportunities for international harmonization
The fastest growing transportation sub-sector is heavy-duty. Reducing GHGs and fuel consumption from this sector will be vital toward addressing climate change and energy security.

EPA and NHTSA are currently implementing the first-ever national program for medium- and heavy-duty GHG and fuel efficiency.

EPA and NHTSA are committed to fulfilling the President’s Climate Action Plan by proposing and finalizing “Phase 2” of this national program.

EPA and NHTSA will propose rule by end of March 2015 and finalize rule by end of March 2016.

Significant technical work is underway to develop Phase 2.

For Phase 2 EPA and NHTSA are continuing our significant stakeholder outreach, which helped make Phase 1 a success.