Heavy-Duty Low-NOx and Phase 2 GHG Plans

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Outline

• Heavy-Duty Vehicles’ Contribution to Air Quality
• California’s Planned Heavy-Duty Measures
• Heavy-Duty Low-NO\textsubscript{X} Plan
• Stakeholder Engagement
California’s Ozone and PM Challenges

• Over 12 million Californians breathe unhealthy air

• Most areas expected to attain standards by 2026

• Key challenges:
  – South Coast ozone
  – San Joaquin Valley PM2.5
South Coast Emissions Inventory

Key Sources

• NOx benefits by 2031 with current program
  – Mobile source emissions reduced over 50 percent
  – Heavy-duty vehicle emissions reduced by nearly 70 percent

• Heavy-duty trucks and federal sources remain largest contributors

• Heavy-duty trucks emit 33 percent of statewide NOx, 509 tpd

• Need to reduce heavy-duty NOx by 90 percent
California’s Planned Heavy-Duty Measures
## Heavy-Duty Truck Rulemakings

### Scheduled Board Dates

<table>
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<th>Rulemaking</th>
<th>Scheduled Board Hearing Date</th>
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<tr>
<td>Revisions to Periodic Smoke/Heavy-duty Vehicle Inspection Programs</td>
<td>December 2017</td>
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<td>Revisions to the Warranty Period Requirements</td>
<td>December 2017</td>
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<td>California Phase 2 GHG Standards</td>
<td>February 2018</td>
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<td>Advanced Clean Local Trucks Measure</td>
<td>2018</td>
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<td>Revisions to the NOx Standard</td>
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<td>- Test Procedures</td>
<td>2019</td>
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<td>- In-Use Compliance Program, and</td>
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<td>- Durability/Useful Life Requirements</td>
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<td>Heavy-duty Inspection and Maintenance Program</td>
<td>2020</td>
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Smoke Inspection Amendments

• Periodic Smoke Inspection Program (PSIP) and Heavy-duty Vehicle Inspection Program (HDVIP) currently require:
  – Annual testing for fleets of 2+ trucks
  – 40 percent opacity limit
  – Roadside testing

• Staff proposing:
  – Lowering opacity limit to 5 percent for filter equipped, 20-40 percent for non-filter equipped trucks

• Workshops held in September 2016, February 2017, May 2017

• More info at https://www.arb.ca.gov/msprog/hdim/hdim.htm
Heavy-duty Warranty Revisions

- Current warranty requirements do not adequately reflect the real-world longevity of modern heavy-duty trucks and buses

- Considering lengthening minimum emissions-related warranty period

Class 8 Heavy-Duty Truck

- Warranty requirement
- Durability useful life for certification
- Typical mileage before first rebuild

Vehicle Miles Traveled

0
200,000
400,000
600,000
800,000
1,000,000
1,200,000

B50 miles before rebuild
B10 miles before rebuild
Proposing to Adopt California Phase 2 Regulation that Harmonizes with Federal Phase 2

• Harmonize with the federal rules in structure, timing, and stringency
• No “deemed to comply” for certification
• Trailer lawsuit pending
• California differences: labeling requirements, additional incentive for advanced technologies, alignment with existing California programs,
• Workshops held in February and August, 2017: https://www.arb.ca.gov/msprog/onroad/caphase2ghg/caphase2ghg.htm
Advanced Clean Local Trucks Measure

• Regulation Overview:
  – Accelerate early market for zero emission trucks
  – Manufacturer sales requirement begins with 2023 model year
  – Long-term transition to performance based goals post 2030

• Proposal Concept:
  – A percentage of medium- and heavy-duty sales by chassis manufacturers must consist of zero emission capable vehicles
  – Manufacturers must generate credits equivalent to a percentage of their total model year sales
    • Class 2B-3
    • Class 4-7 (with optional credits for Class 8)

• Workshops held November 2016, January 2017, April 2017, August 2017
Heavy-Duty Low-NOx Plan
CARB Current NOx Standards

- Current Mandatory NOx Standard: 0.20 g/bhp-hr

- Optional NOx standards
  - 90%, 75%, and 50% below 2010 NOx standards
  - 0.02 g/bhp-hr, 0.05 g/bhp-hr, and 0.10 g/bhp-hr

- CARB Certified Engines:
  - 8.9L Cummins ISL G CNG certified to 0.02 g/bhp-hr
  - 6.8L Roush CleanTech V10 – LPG certified to 0.05 g/bhp-hr
  - 6.8L Roush CleanTech V10 – CNG certified to 0.1 g/bhp-hr
  - 6.7L Cummins ISB6.7 – CNG certified to 0.1 g/bhp-hr
  - Cummins announced expectation to accept orders 1st Q 2018 for 12L CNG certified to 0.02 g/bhp-hr
Establish Low-NOx Engine Standard

• **Goal:**
  – Develop heavy-duty low-NOx engine standard
  – Develop low-load certification cycle
  – Work collaboratively with U.S. EPA to establish national low-NOx engine standard

• **Timeframe:**
  – CARB Board date: 2019
  – Implementation schedule: 2023 – 2027

• **Heavy-duty low-NOx research:**
  – CARB has initiated three research studies looking at reducing heavy-duty NOx emissions (currently in progress at Southwest Research Institute)

[https://www.arb.ca.gov/msprog/hdlownox/hdlownox.htm](https://www.arb.ca.gov/msprog/hdlownox/hdlownox.htm)
Improve Applicability of In-Use Testing

- Current in-use compliance requirements, Not-to-Exceed (NTE), apply only in certain conditions
- Cannot fully assess emissions during the majority of in-use operations
- Revised test protocol planned that would act as a standalone “standard” at time of certification and beyond

Fraction of Time

- NTE Zone, Exclusions: 50.1%
- Outside NTE Zone: 44.1%
- NTE Event: 5.8%

Low NOx Standards
Comprehensive Heavy-duty I/M

- Take advantage of on-board diagnostic (OBD) system for 2013 and newer vehicles
- Consider remote OBD/telematics
- Require heavy-duty repair shop licensing/mechanic competency
- Evaluate use of remote emission sensing
- Ensure aftertreatment systems (diesel particulate filters and SCR systems) are operating properly
- More info at [https://www.arb.ca.gov/msprog/hdim/hdim.htm](https://www.arb.ca.gov/msprog/hdim/hdim.htm)
How can CARB best engage interested stakeholders in our efforts?
Stakeholder Engagement

• First workshop on Low-NOx held on Nov. 3, 2016
• Several workgroup meetings held in the last 3 months
• Five workgroups
  – Heavy-duty Certification Standards and Test Procedures Workgroup
  – Heavy-duty In-Use Compliance/Testing/Not-to-Exceed Workgroup
  – Warranty Workgroup
  – Durability/Useful Life Workgroup
  – Emissions Inventory Workgroup

• Purpose
  – Provide stakeholders the opportunity to provide suggestions and comments
  – Exchange data and ideas between CARB staff and stakeholders to make informed decisions

• Detailed workgroup description and how to join:
  https://www.arb.ca.gov/msprog/hdlownox/files/workgroup_description.pdf
Opportunities for Future Collaboration

• Joining the HD Low-NOx workgroups
  – Opportunity to engage
  – Encourage national/international adoption of California standards
  – Promote greater alignment to reduce cost burden of compliance

• CARB staff available to present at meetings, conferences

• Pool resources on research activities
  – Funding, in-kind support
  – MECA, South Coast District, ports already contributing
  – Additional interest?
Questions?

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