



CALIFORNIA
AIR RESOURCES BOARD

Heavy-Duty Low-NOx and Phase 2 GHG Plans

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Mobile Source Control Division

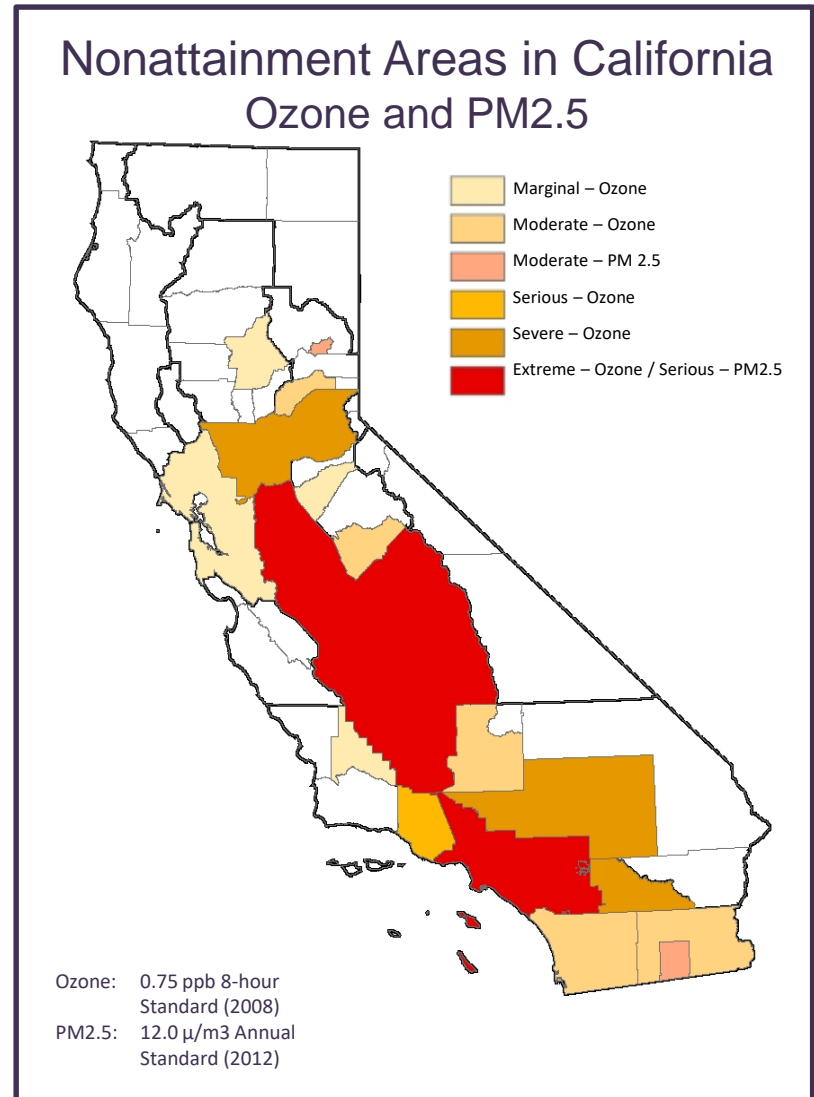
NACAA Fall Membership Meeting
Seattle, Washington
September 25-27, 2017

Outline

- Heavy-Duty Vehicles' Contribution to Air Quality
- California's Planned Heavy-Duty Measures
- Heavy-Duty Low-NO_x Plan
- Stakeholder Engagement

California's Ozone and PM Challenges

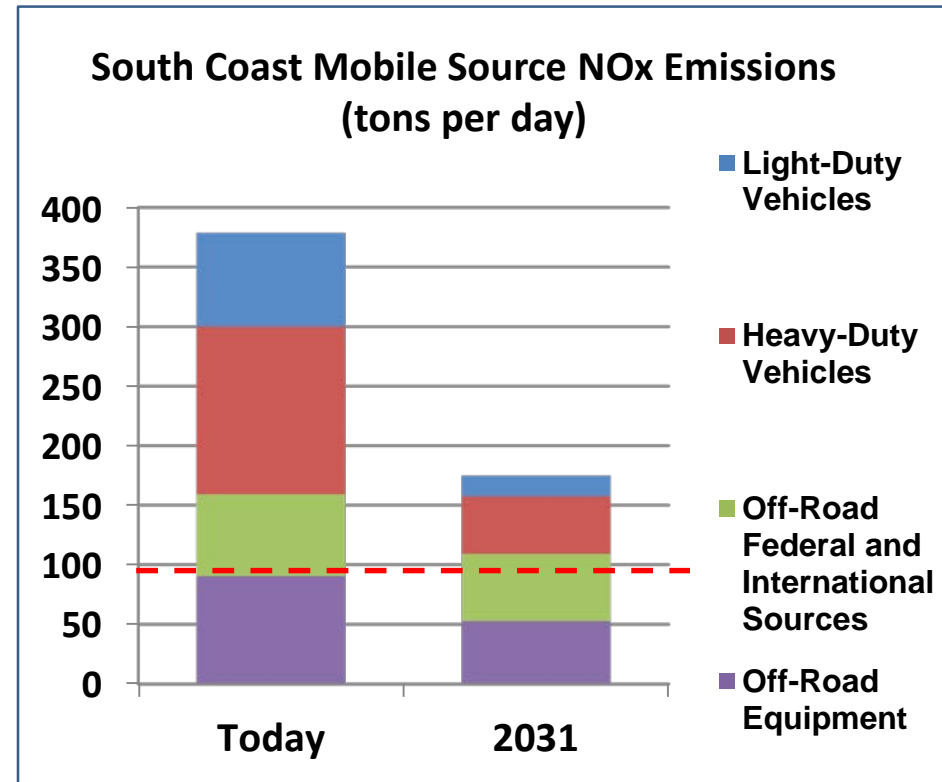
- **Over 12 million Californians breathe unhealthy air**
- **Most areas expected to attain standards by 2026**
- **Key challenges:**
 - South Coast ozone
 - San Joaquin Valley PM2.5



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

Rulemaking	Scheduled Board Hearing Date
Revisions to Periodic Smoke/Heavy-duty Vehicle Inspection Programs	December 2017
Revisions to the Warranty Period Requirements	December 2017
California Phase 2 GHG Standards	February 2018
Advanced Clean Local Trucks Measure	2018
Revisions to the NOx Standard <ul style="list-style-type: none"> - Test Procedures - In-Use Compliance Program, and - Durability/Useful Life Requirements 	2019
Heavy-duty Inspection and Maintenance Program	2020

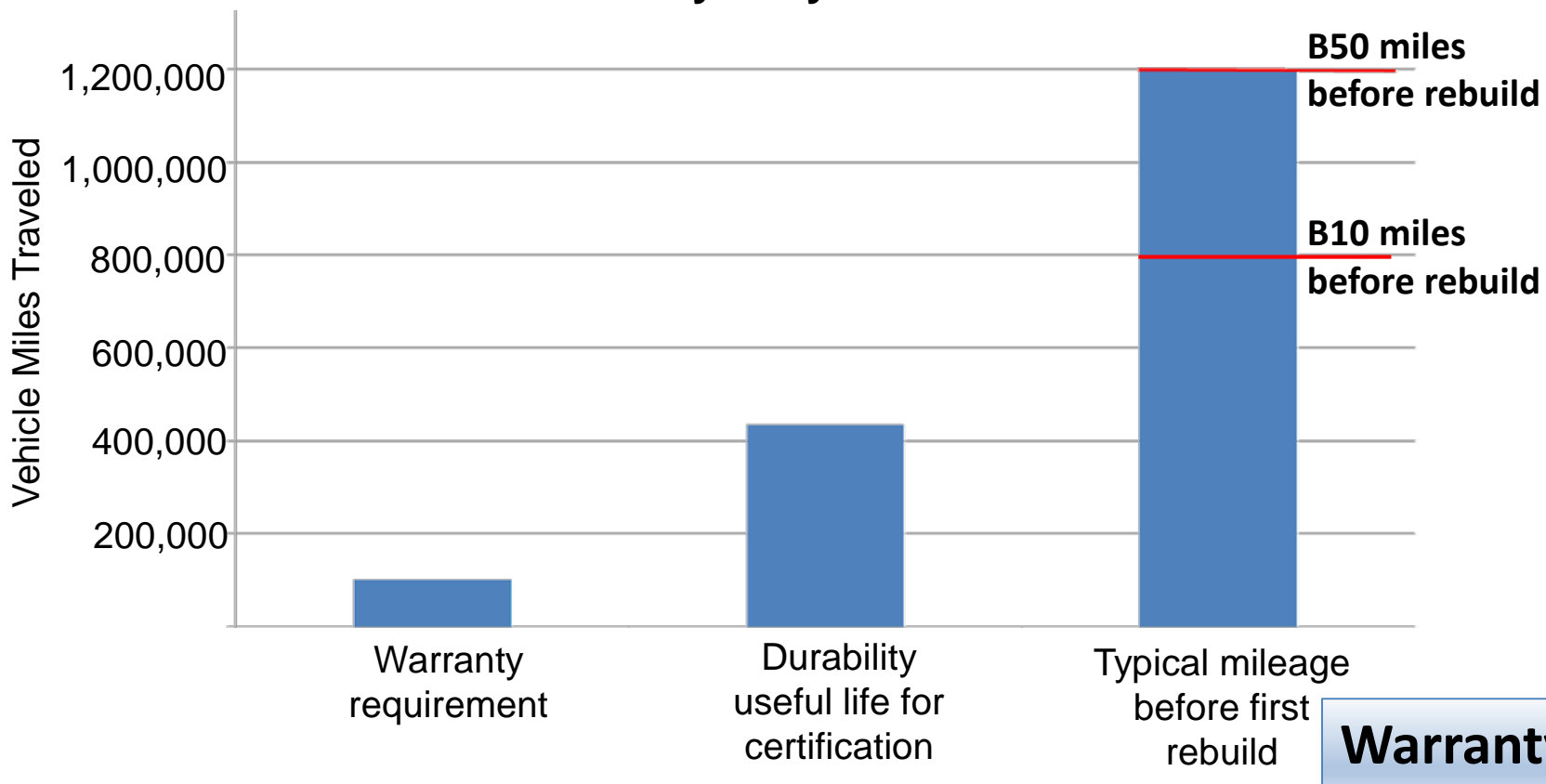
Smoke Inspection Amendments

- **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



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-NO_x Plan

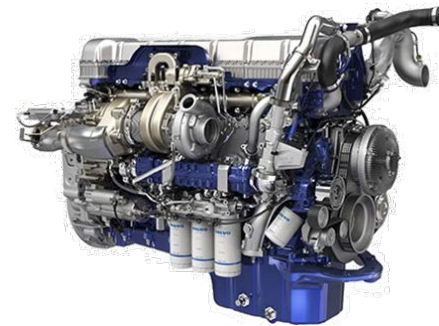
CARB Current NOx Standards

- **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)

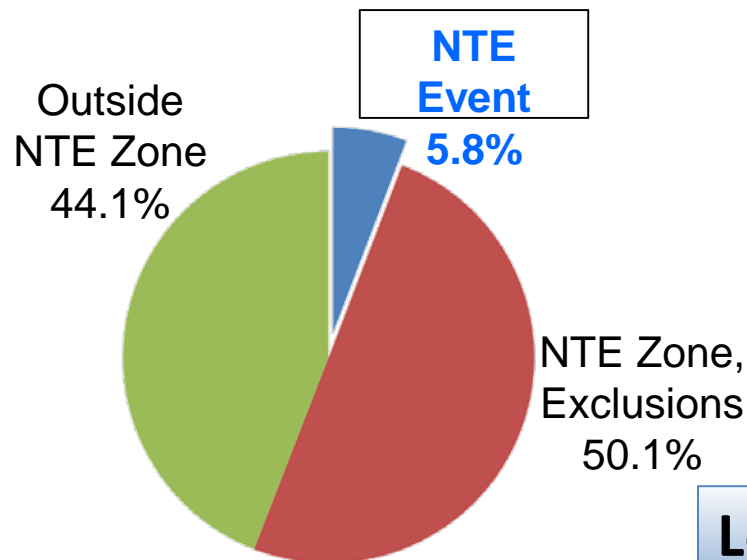


<https://www.arb.ca.gov/msprog/hdlownox/hdlownox.htm>

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



Low NO_x 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>



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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