



August 27, 2019

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Office of Transportation  
& Air Quality, US EPA

# EPA Overview of the Cleaner Trucks Initiative

## Association of Air Pollution Control Agencies Fall Business Meeting

# Office of Transportation & Air Quality Update

- Lot's happening in OTAQ this Summer & Fall
  - Fuels
    - Year-round E15 final rule issued in June
    - 2020 RFS proposal in July, with final rule expected in November
    - Fuel Regulatory Streamlining proposal expected early 2020
  - Engines and Vehicle
    - **Heavy-duty Clean Trucks Initiative proposal development**
    - **Diesel Marine Engine proposal**
    - Light-duty Vehicle GHG/CAFE SAFE Final Rule development
    - Additional, smaller scale regulatory actions

# 2008 Locomotive & Marine Engine Rule

- Covers all new marine diesel engines with per cylinder displacement up to 30 liters
  - Everything from small marine gensets and sailboat engines to propulsion engines for river and harbor tugs, push boats, pilot boats, fishing vessels, ferries, and offshore supply vessels
- Marine diesel engine standards
  - “Tier 3” levels: All new engines, phase-in by engine size beginning 2009
  - “Tier 4”: new engines >600 kiloWatts, phasing in 2014-2017
- Significant expected annual inventory reductions (2030, short tons)

	Commercial Marine	Recreational Marine	Total
PM <sub>2.5</sub>	13,700	90	14,000
NOx	371,000	4,400	376,000



# Marine Regulatory Relief

- EPA is developing a new proposal to address a Tier 4 engine availability issue for a small number of boats
  - Provide additional lead time for low-horsepower, high power-to-weight ratio engines used in certain vessels
- Proposal will also include provisions to provide flexibility in supplying fuel in the U.S. that meets 2020 global fuel sulfur standards for ships
- Notice of Proposed Rulemaking signed 8/26/2019



# Cleaner Trucks Initiative: Overview

- EPA Motivation
- Cleaner Trucks Initiative
- Program Elements being Explored
- Current EPA Activities
- Rulemaking Schedule
- Opportunities for Ongoing Engagement

# Motivation

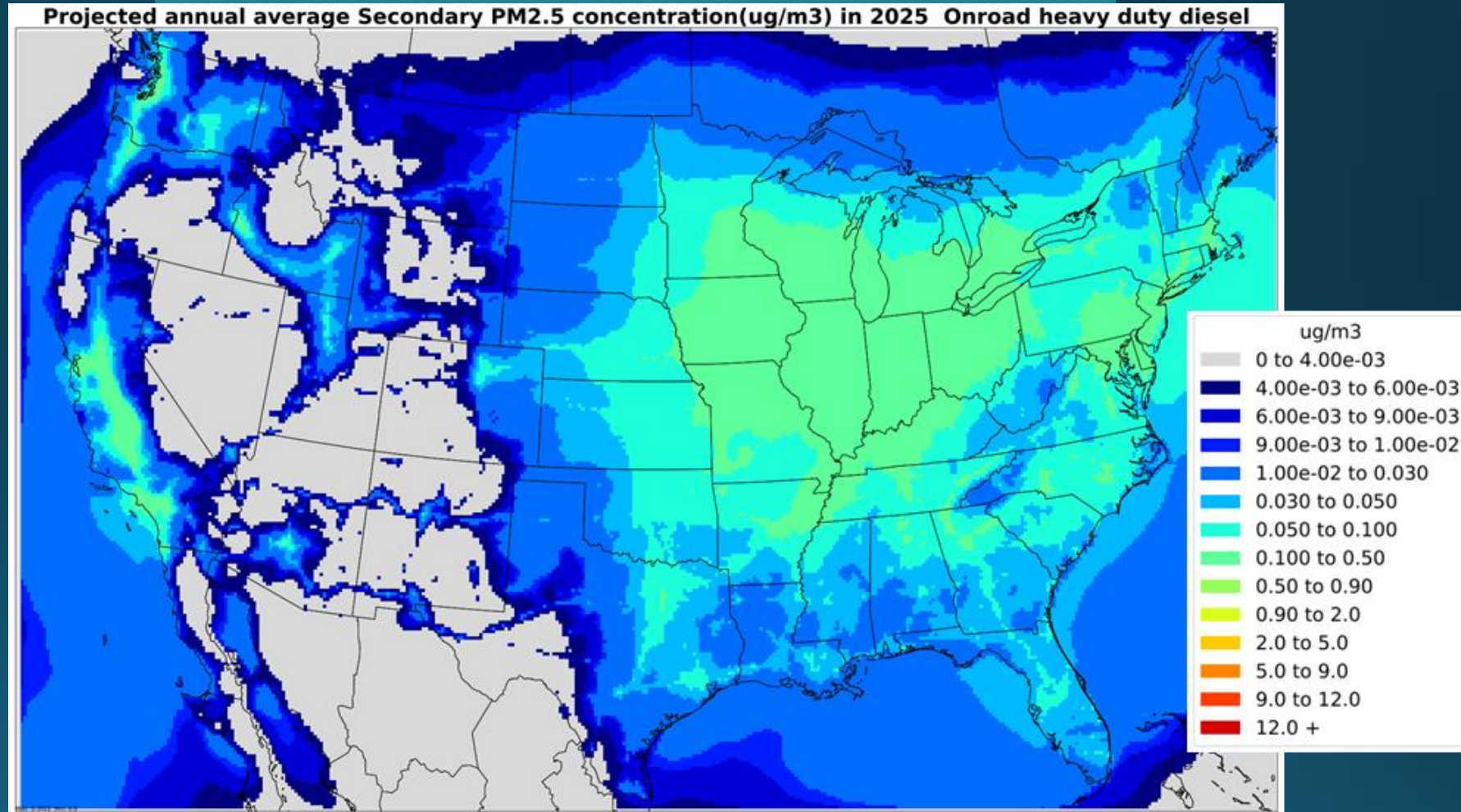
- EPA last revised NOx standards for heavy-duty trucks nearly 20 years ago
- We have an opportunity to modernize the requirements to better reflect the capability of available emissions control technologies
- EPA current emissions standards have lowered overall NOx emissions, but have not resulted in effective emission control under low-load conditions (when trucks are at idle, moving slowly, or in stop-and-go traffic)
  - By addressing low-load operation, we can improve NOx emission controls in cities and in areas of high traffic, making a big difference to communities



# Impact of NO<sub>x</sub> Emissions from Heavy-Duty Diesel Vehicles

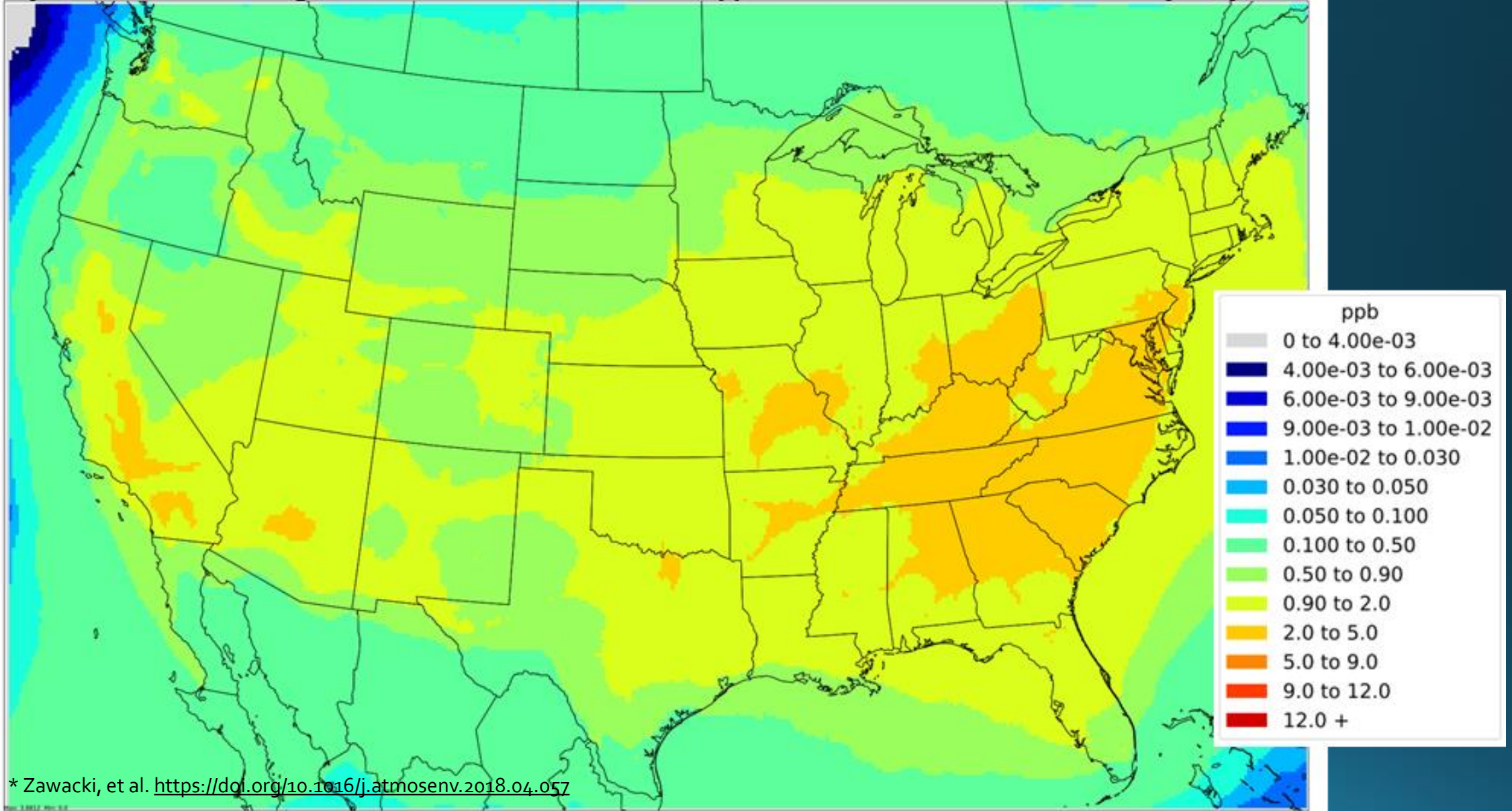
## HDD NO<sub>x</sub> Contribution to Ambient PM<sub>2.5</sub> in 2025

- Large contributor to mobile source NO<sub>x</sub>
- One of the largest mobile source contributors to ozone in 2025
- Significant mobile source contributor to PM<sub>2.5</sub> in 2025, due to
  - NO<sub>x</sub> emissions which form PM & Directly emitted PM



# Heavy-Duty Diesel NOx Contribution to Ozone in 2025

Projected 8-h max Average Seasonal Ozone concentration(ppb) from NOx in 2025 Onroad heavy duty diesel





# State & Local Air Quality Agencies June 2016 Petition

- Many HD vehicles travel interstate, and areas impacted most by NOx emissions are distributed around the country
- June 2016: ~ 20 state and local air quality agencies petitioned EPA to undertake a new HD NOx rule
- December 2016: EPA responded
  - Acknowledge the need for additional NOx reductions
  - EPA will initiate technical work that could be used to support a future action

## Petition to EPA for Rulemaking to Adopt Ultra-Low NOx Exhaust Emission Standards for On-Road Heavy-Duty Trucks and Engines

Submitted by:

South Coast Air Quality Management District  
Pima County Dept. of Environmental Quality (Arizona)  
Bay Area Air Quality Management District (California)  
Connecticut Dept. of Energy and Environmental Protection  
Delaware Dept. of Natural Resources and Environmental Control, Division of Air Quality  
Washoe Co. Health District, Air Quality Management (Nevada)  
New Hampshire Dept. of Environmental Services  
New York City Dept. of Environmental Protection (New York)  
Akron Regional Air Quality Management District (Ohio)  
Washington State Dept. of Ecology  
Puget Sound Clean Air Agency (Washington)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

December 20, 2016

OFFICE OF  
AIR AND RADIATION

Mr. Wayne Nastri  
Acting Executive Officer  
South Coast Air Quality Management District  
21865 Copley Drive  
Diamond Bar, California 91765

Dear Mr. Nastri:

On June 3, 2016, South Coast Air Quality Management District, Pima County Dept. of Environmental Quality, Bay Area Air Quality Management District, Connecticut Dept. of Energy and Environmental Protection, Delaware Dept. of Natural Resources and Environmental Control, Washoe County Health District, New Hampshire Dept. of Environmental Services, New York City Dept. of Environmental Protection, Akron Regional Air Quality Management District, Washington State Dept. of Ecology, and Puget Sound Clean Air Agency ("Petitioners") sent a letter to the Environmental Protection Agency (EPA or the Agency) petitioning the Agency to conduct a rulemaking to establish new ultra-low NOx emission standards for heavy-duty engines and trucks.

Shortly thereafter, a number of other organizations notified the Agency that they were also joining this petition, including Rhode Island Department of Environmental Management, Massachusetts Department of Environmental Protection, Coalition for Clean Air, Vermont Department of Environmental Conservation, San Bernardino Associated Governments, New York State Department of Environmental Conservation, Port of Los Angeles, Sacramento Metropolitan Air Quality Management District, and California Air Pollution Control Officers Association.

In the following memorandum, the EPA provides its response to the June 3 petition. In summary, the EPA will initiate work necessary to issue a Notice of Proposed Rulemaking with the intention of proposing standards that could begin in Model Year 2024 (a major engine and vehicle standards implementation milestone year in the heavy-duty Phase 2 GHG program), consistent with the lead-time requirements of the Clean Air Act.

As the EPA develops this proposal the Agency will engage with a wide range of stakeholders, including the petitioners, the heavy-duty vehicle and engine manufacturers, labor unions, technology suppliers, environmental non-governmental organizations, state and local air quality agencies which were not part of the petition, truck dealerships, trucking fleets, truck drivers and truck owners. The EPA plans to work closely with the California Air Resources Board (CARB) to consider the development of a new harmonized Federal and California program to reduce NOx emissions from heavy-duty on-highway engines and vehicles that could be adopted not only by the EPA, but also by CARB, in order to maintain a 50-state program.

# The Cleaner Trucks Initiative

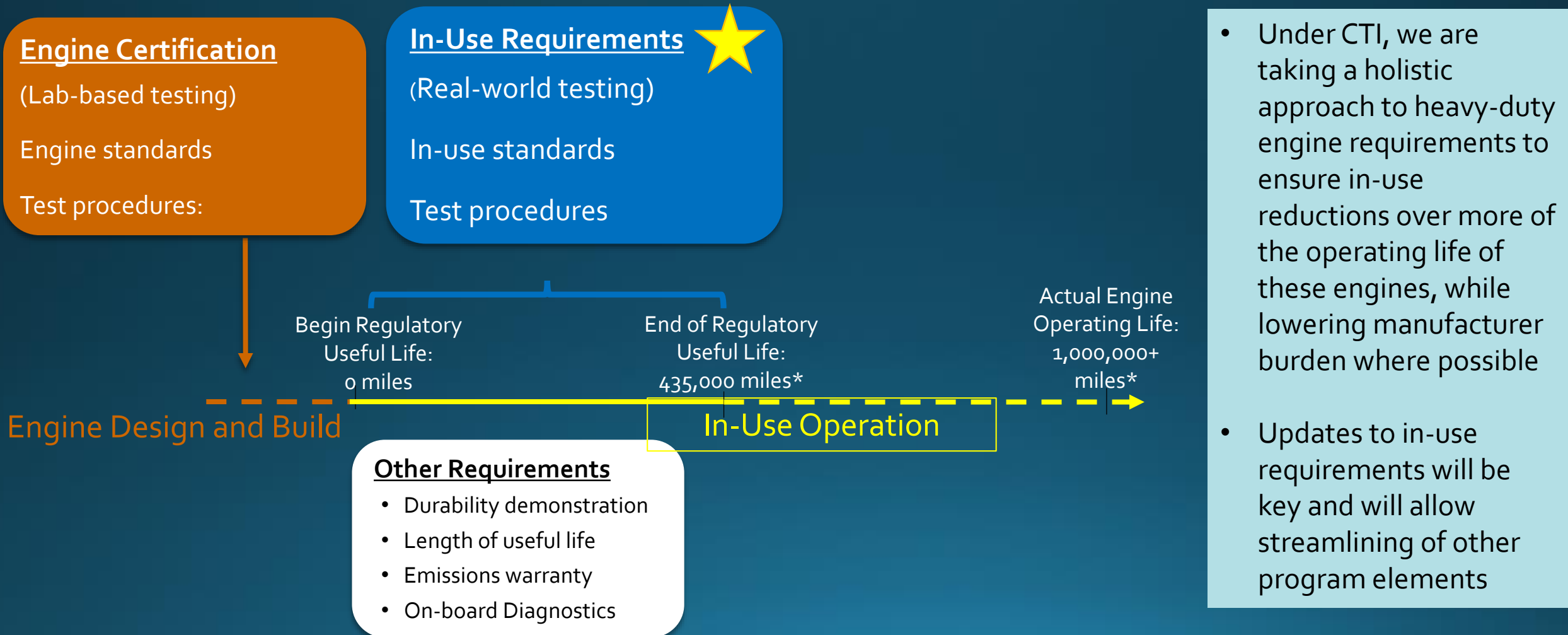
- On November 13, 2018, EPA Administrator Andrew Wheeler announced the “Cleaner Trucks Initiative” (CTI)
- Objective is to achieve lower NO<sub>x</sub> emissions *nationwide*—
  - Ensure real world emissions reductions
  - Improving certification and in-use testing requirements
  - Pursue a national, harmonized program
  - Focus on NO<sub>x</sub>, but take a broad look at other heavy-duty engine emissions
- Identify cost-effective means of ensuring real-world compliance and explore opportunities to streamline existing requirements



# Clean Air Act – Section 202(a) provides specific direction to EPA for Highway Heavy-duty Engines & Vehicles

- Set Standards for air pollutants & revise from time to time, must provide 3 years of stability between standards
- Implement after lead-time necessary to develop and apply technology, must provide at least 4 years
- Standards applicable for the engine/vehicle useful life
- Give appropriate consideration to the cost of compliance
- Emission standards for HC, CO, NO<sub>x</sub>, PM must reflect the greatest degree of emission reduction achievable through technology – considering lead time, cost, energy, & safety

# Current Heavy-Duty Engine Requirements

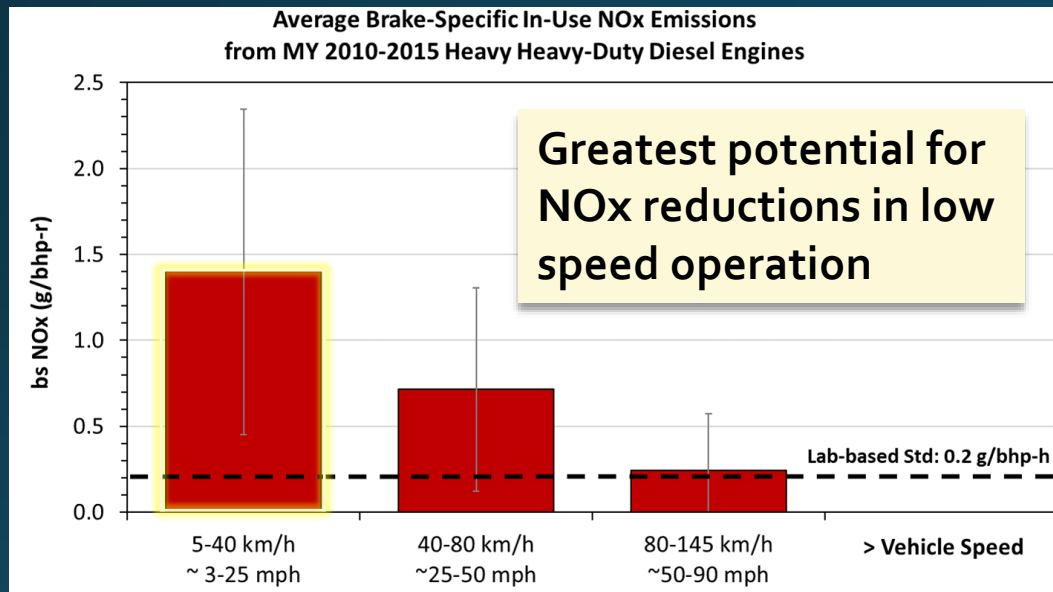


\* For Heavy Heavy-Duty Diesel Engines

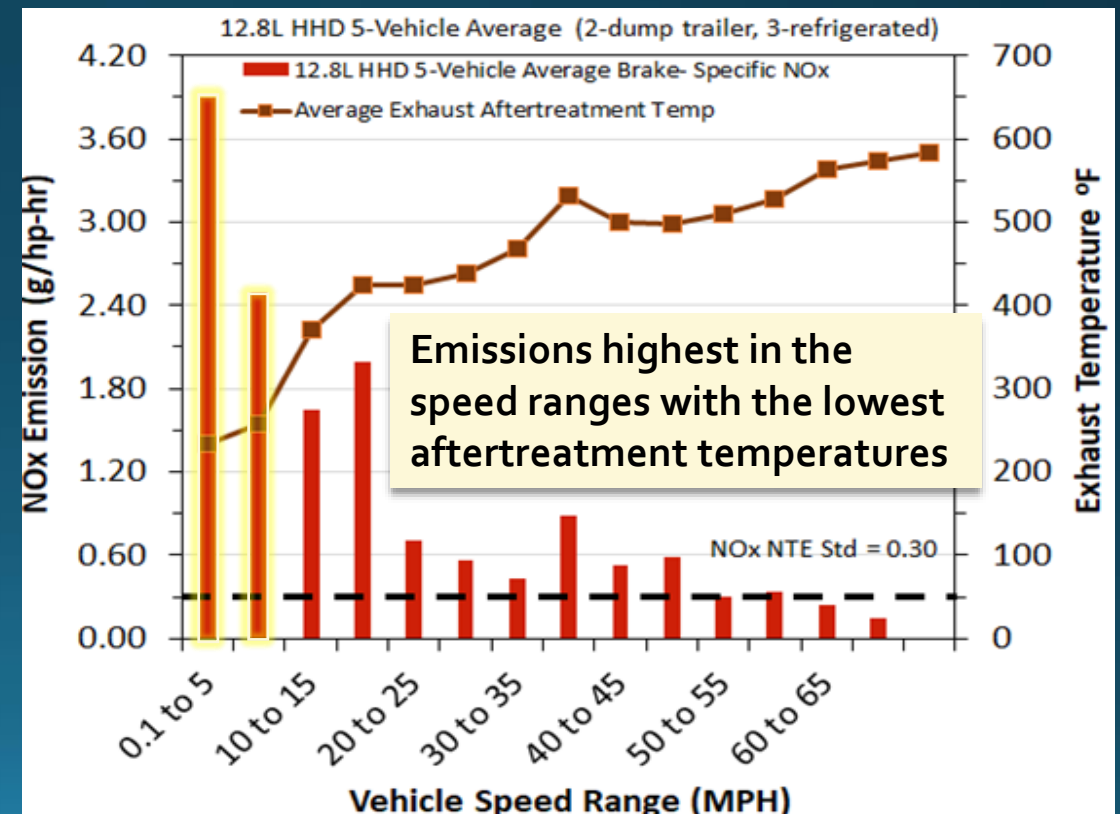


# Where do we see higher NOx emissions on the road? During Low Load Operation

Data from 93 vehicles; all engines certified to 0.2 g/bhp-h in pre-production lab tests

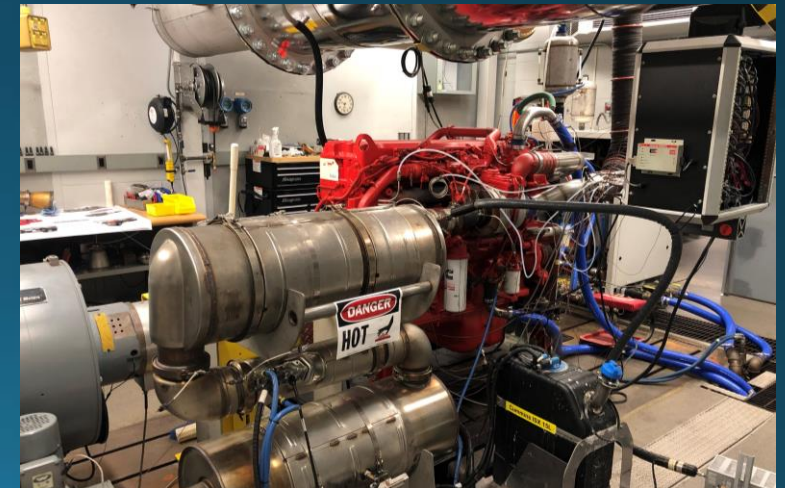


Data from 5 vehicles; all engines passed in-use testing standard of 0.3 g/bhp-h for conditions outlined in the test procedure



# Key Program Elements being Explored

- **Nationwide Emissions Reductions**
  - Work to closely align CARB and Federal long-term programs
  - Continue technical coordination with CARB and industry
- **Ensure In-Use Emissions Reductions**
  - New in-use protocol that covers “all” in-use operation
  - Conducting and contributing to multiple technology demonstration programs
  - Regulatory useful life and warranty that reflect current operating life
- **Streamline & Modernize Requirements**
  - Accelerated aging protocol for diesel aftertreatment systems
  - Incentives for advanced technologies: 0 gram NOx
- **Effective EPA Compliance & Enforcement**
  - Utilize onboard data streams to identify emissions compliance concerns early
  - Consider technologies which can discourage tampering with emissions control technologies



# CTI Rulemaking Timeframe and Current Status

- Targeting 2020 for a Notice of Proposed Rulemaking
  - Comment period after the proposal, followed by Final Rulemaking
- Currently in the information-gathering stage
  - Early outreach to stakeholders
  - Continuing engagement and coordination with California Air Resources Board (CARB) staff on technical work
  - Assessing technical feasibility - Evaluating the effectiveness of advanced technologies and compliance strategies
  - Developing cost, benefit, emissions inventory, air quality, and economic analyses to inform the CTI proposal

# CTI: Early EPA Stakeholder Engagement

(Not Comprehensive)

## User Community



## State, Local, Tribal Governments & Air Associations



ECOS



South Coast AQMD



ASSOCIATION OF AIR POLLUTION CONTROL AGENCIES



## Suppliers & Labor



TENNECO



## Clean Air & Env. NGOs



## OEMs



PACCAR

DAIMLER

NAVISTAR



VOLVO TRUCKS



ISUZU FCA



# CTI: Ongoing Technical Assessment

(Not Comprehensive)



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SOUTHWEST RESEARCH INSTITUTE

- Baseline HDD engine performance over engine dyno test cycles
- HDD cylinder deactivation demonstration
- HD gasoline baseline and advanced technology demonstration



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL VEHICLE AND  
FUEL EMISSIONS LABORATORY

- Evaluate baseline emissions (HDIUT)
- HD gasoline assessment
- Next generation engine and aftertreatment demonstration
- HDV chassis & PEMS testing
- NO<sub>x</sub> sensor performance



Truck & Engine  
Manufacturers  
Association™

- WVU activity and in-use emissions study
- Possible NO<sub>x</sub> sensor performance evaluation at SwRI



CALIFORNIA  
AIR RESOURCES BOARD

- Advanced technology demonstration (Stage 1-3 HDD engines)
- Low-load cycle development
- NREL cost study

## Additional Stakeholder Data

- Possible telematic data from a HD truck fleet

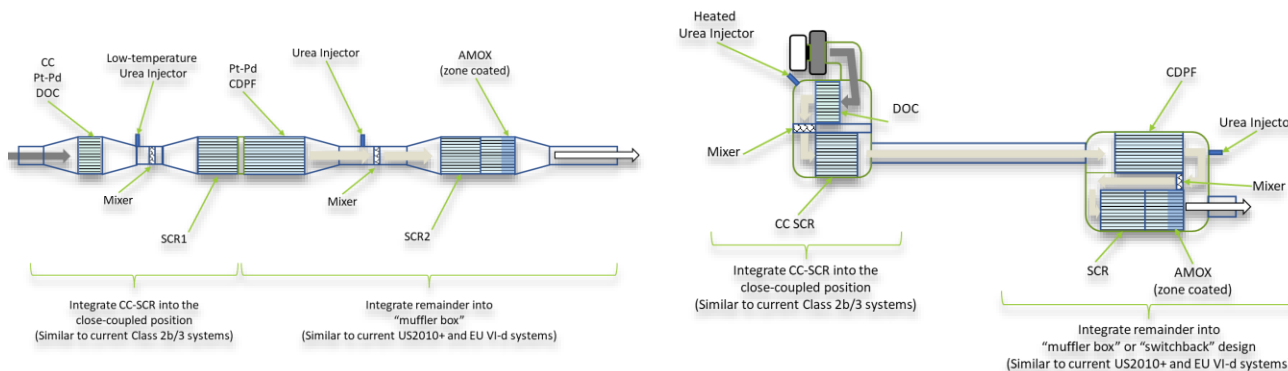


Environment and  
Climate Change Canada

- HDV chassis & PEMS testing
- NO<sub>x</sub> sensor performance

# EPA Technology Assessment

Evaluating performance of next generation  
aftertreatment configurations and formulations



Exploring cylinder  
deactivation to increase  
diesel exhaust temperatures  
without raising CO<sub>2</sub>  
emissions

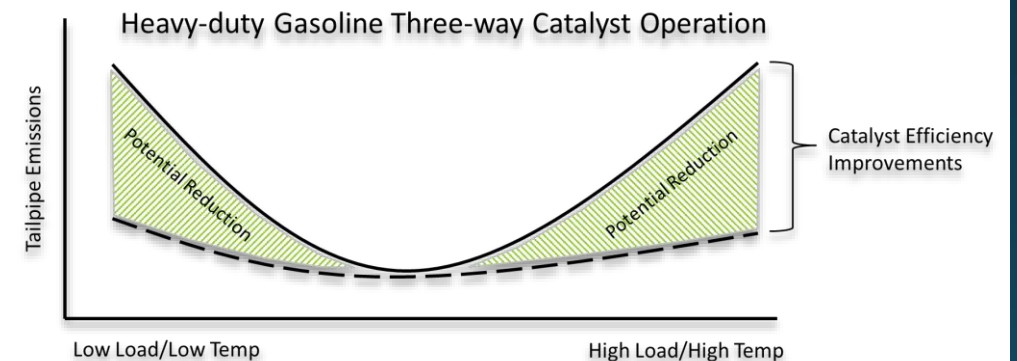


Cylinder Deactivation (Eaton)



**EPA** UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL VEHICLE AND  
FUEL EMISSIONS LABORATORY

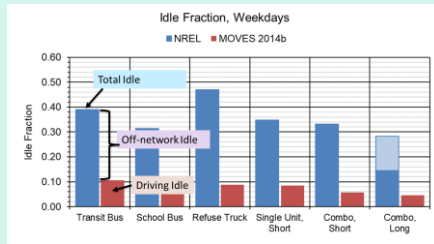
Investigating strategies to improve  
HD gasoline catalyst performance



# CTI: Major Updates for Heavy-duty Emissions Projections

## New Data On...

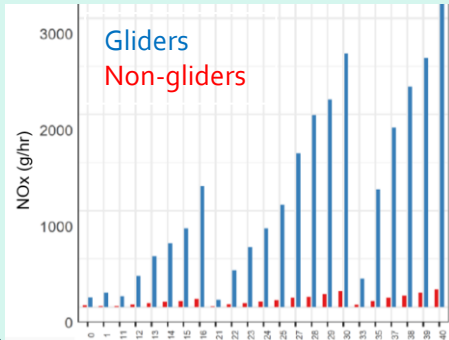
### HD Activity



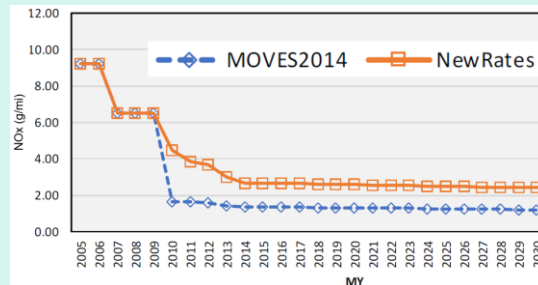
### VMT & Vehicle Populations



### Glider Vehicles



### HD Emission Rates



Updated  
for NPRM\*

## CTI Proposal

Emissions Inventories

Full Air Quality  
Analysis (CMAQ)

Benefits Calculations  
(BenMAP)

Proposed Program  
Benefit Cost Analysis

\* Will not be a new release of MOVES – an update for the NPRM analysis

# CARB Heavy-duty NOx Activities



- California Air Resources Board (CARB) has been developing a major heavy-duty diesel program revisions, including lower NOx standards, for several years
- CARB time line can enable faster implementation than US EPA
  - CARB likely to adopt new standards in early 2020, with new NOx standards implementation to begin in 2024. This is sooner than EPA can require
- CARB staff issued a White Paper in April 2019, detailing their views for a 2024 program, and noting additional improvements for 2027
- EPA staff continue to coordinate on technical issues with CARB, and we are exploring approaches with CARB and industry to maintain the historic EPA-CARB coordinated 50-state program approach



# AAPCA Opportunities for Engagement

- **Opportunities for communication**

- Meetings with OTAQ staff to discuss updates on EPA work and share your perspectives related to the rulemaking
- Periodic meetings with OTAQ Office Director Dunham and/or OAR Assistant Administrator Idsal

- **Information of interest to EPA**

- Your perspectives (and analysis where available) on the role of heavy-duty vehicle NOx emissions in your air quality, or other environmental challenges
  - Is this effort important to achieving your goals, and why?
    - Attainment, transport, visibility, deposition, etc....
  - Any specific data sources, analyses, case studies from your area?
  - Specific issues or concerns with the potential regulatory program?

# Points of Contact in EPA's Office of Transportation & Air Quality

- CTI Rulemaking Team Leads
  - Christy Parsons, [Parsons.Christy@epa.gov](mailto:Parsons.Christy@epa.gov), 734-214-4243
  - James Sanchez, [Sanchez.James@epa.gov](mailto:Sanchez.James@epa.gov), 734-214-4439
  - Jessica Brakora, [Brakora.Jessica@epa.gov](mailto:Brakora.Jessica@epa.gov), 734-214-4936
- Brian Nelson, Director, Assessment & Standards Division's Heavy-Duty Onroad & Nonroad Center, [Nelson.Brian@epa.gov](mailto:Nelson.Brian@epa.gov), 734-214-4278
- Kathryn Sargeant, Deputy Director, Assessment & Standards Division, [Sargeant.Kathryn@epa.gov](mailto:Sargeant.Kathryn@epa.gov), 734-214-4441
- Bill Charmley, Director, Assessment & Standards Division, [Charmley.William@epa.gov](mailto:Charmley.William@epa.gov), 734-214-4466