May 16, 2022

Michael Regan, Administrator
U.S. Environmental Protection Agency
Air and Radiation Docket and Information Center
EPA Docket Center, EPA WJC West Building
1301 Constitution Avenue, NW Room 3334
Washington, DC 20004
Attention: *Docket ID No. EPA-HQ-OAR-2019-0055*

Re: Proposed Rule – Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards

Dear Administrator Regan:

The Ozone Transport Commission (OTC) and the Mid-Atlantic/Northeast Visibility Union (MANE-VU) are submitting comments to the U.S. Environmental Protection Agency (EPA) on its Notice of Proposed Rulemaking (NPRM) entitled *Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards* [(87 Fed. Reg. 17414 (March 28, 2022)].

In the 1990 Clean Air Act Amendments, Congress established the OTC in order to address regional ozone pollution affecting the OTC member jurisdictions. The OTC members are Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. In addressing their collective regional ozone problem, the OTC members are responsible for developing and implementing initiatives to reduce nitrogen oxides (NOx) and volatile organic compounds (VOCs), the emitted precursor air pollutants that contribute to the formation of ground-level ozone pollution. MANE-VU was formed to promote haze planning activities for the region by providing a forum for discussion, and encouraging coordinated actions, both within and outside of the region. MANE-VU's structure includes a board comprised of state and tribal commissioners/secretaries and air program directors.

The OTC and MANE-VU strongly support EPA's efforts to develop new heavy-duty engine and vehicle emission standards and test procedures that will reduce NOx emissions from heavy-duty trucks. NOx emissions are a primary precursor to the formation of ground-level ozone and secondary fine particulate matter ($PM_{2.5}$) and contribute to acid deposition, eutrophication, and visibility impairment in the OTC region.

Impact of NOx Emissions on Public Health and the Environment

NOx emissions are the major drivers of surface ozone concentrations at the regional scale in the eastern United States. Epidemiological studies provide strong evidence that ozone is associated with respiratory effects, including increased asthma attacks, as well as increased hospital admissions and emergency room visits for people suffering from respiratory diseases. High ozone concentrations can compromise the health and welfare of people living in the Ozone Transport Region (OTR). People of color and those with lower household incomes are often impacted by disproportionate amounts of diesel exhaust emissions and worsened health burdens due to poor air quality in US cities.[1] Ozone can cause chronic obstructive pulmonary disease (COPD), and long-term exposure may result in permanent lung damage, such as abnormal lung development in children. There is also consistent evidence that short-term exposure to ozone increases the risk of death from respiratory causes.[2] Furthermore, recent studies show that ozone concentrations below the current National Ambient Air Quality Standards (NAAQS) continue to contribute to the risk of premature death in sensitive populations, such as the elderly.[3]

Millions of OTR residents live in areas that violate the ozone NAAQS. Many areas of the OTR are designated as in nonattainment with the 2015 8-hour average ozone NAAQS of 70 parts per billion (ppb) (Figure 1). These nonattainment areas are struggling to achieve the 2015 ozone NAAQS, and on April 13, 2022, EPA proposed reclassifying a number of them from "marginal" to "moderate" nonattainment status for the 2015 ozone NAAQS, including Baltimore, MD; Greater Connecticut; Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE; and Washington, DC-MD-VA.[4] These areas failed to attain the 2015 ozone NAAQS by August 3, 2021, as required for "marginal" classifications, and will need additional pollution reductions, particularly for NOx, in order to meet the 2015 ozone NAAQS.

The OTR also includes the New York City (NYC) Combined Statistical Area (CSA). With over 20 million people, it is the largest CSA by population in the United States. It not only violates the 2015 ozone NAAQS, but also the less stringent 2008 8-hour ozone NAAQS of 75 ppb. On April 13, 2022, EPA proposed to reclassify the New York City/Long Island-Northern New Jersey-Southwest Connecticut area from "serious" to "severe" nonattainment because it failed to meet its "serious" attainment deadline of July 20, 2021.[5] This large metropolitan area will need additional pollution reductions to achieve both the 2008 and 2015 ozone NAAQS levels.

[1] Demetillo, M.A.G.; Harkins, C.; McDonald, B.C.; Chodrow, P.S.; Sun, K.; Pusede, S. E., "Space-Based Observational Constraints on NO_2 Air Pollution Inequality From Diesel Traffic in Major US Cities," *Geophys. Res. Lett.* 48: e2021GL094333 (2021). DOI: 10.1029/2021GL094333. Available at https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GL094333.

[2] U.S. EPA, "Health Effects of Ozone Pollution," https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution, last updated May 5, 2021. Accessed May 12, 2022.

[3] Di, Q., *et al.* "Air pollution and mortality in the Medicare population." *New England Journal of Medicine* 376.26 (2017): 2513-2522. DOI: 10.1056/NEJMoa1702747; Di, Q., *et al.* "Association of short-term exposure to air pollution with mortality in older adults." *JAMA* 318.24 (2017): 2446-2456. DOI: 10.1001/jama.2017.17923.

[4] 87 Fed. Reg. 21842 (April 13, 2022).

[5] 87 Fed. Reg. 21825 (April 13, 2022).

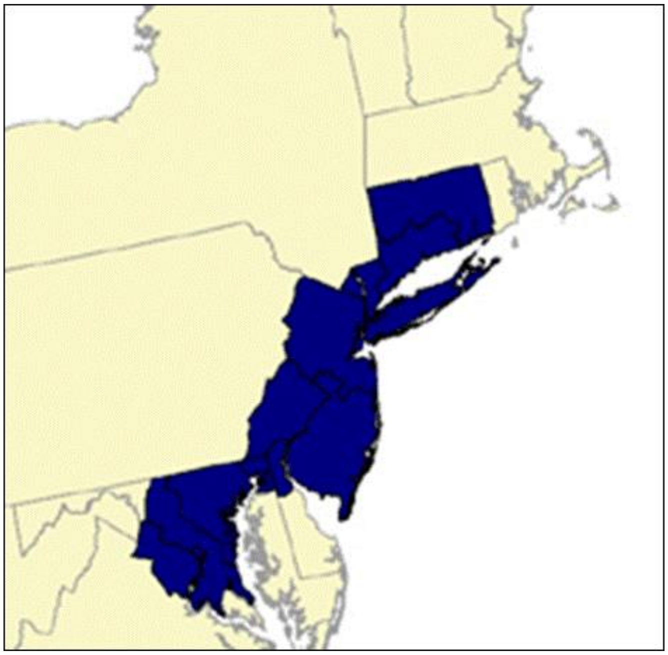

Figure 1. Ozone Nonattainment Areas in the OTR for the 70 ppb 8-Hour Average Ozone NAAQS.

While ozone is largely a summertime issue in the OTR, NOx emissions are a year-round problem, due to its role in producing secondary $PM_{2.5}$ in the colder seasons. $PM_{2.5}$ exposure is associated with a variety of health effects, including reduced lung function, irregular heartbeat, asthma attacks, heart attacks, and premature death in people with heart or lung disease.[6] The public health and environmental impacts of NOx are summarized in *Table 1*.

Table 1: Adverse Public Health and Environmental Impacts of NOx in the OTR.

Ozone and $PM_{2.5}$	• Reduces lung function, aggravates asthma and other chronic lung diseases • Repeated exposure can cause permanent lung damage • Contributes to premature death • Disproportionate impact on Overburdened Communities
Acid deposition	• Damages forests • Damages aquatic ecosystems, e.g., Adirondacks and Great Northern Woods • Erodes manmade structures
Coastal and Marine Eutrophication	• Depletes oxygen in the water, which suffocates fish and other aquatic life in bays and estuaries, e.g., Chesapeake Bay, Narragansett Bay, and Long Island Sound
Visibility Impairment	• Contributes to regional haze that mars vistas and views in wilderness and urban areas

[6] U.S. EPA, "Health and Environmental Effects of Particulate Matter (PM)," https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm, last updated May 26, 2021. Accessed May 12, 2022.

The Need for NOx Reductions in the Northeast and Mid-Atlantic

Parts of the OTR continue to experience persistently high ozone levels affecting tens of millions of people. While air pollution levels have dropped over the years across much of the United States, the portions of the OTR listed in Table 2 continue to persistently exceed both past and recently revised federal health-based air quality standards for ground-level ozone.

Table 2: Areas Exceeding the National Ambient Air Quality Standards (NAAQS) for Ozone in the Northeast and Mid-Atlantic.

Nonattainment Area	Population	2020 Design Value (ppm)[7]	2015 NAAQS Status	2008 NAAQS Status
Greater Connecticut, CT	1,629,115	0.073	Marginal[a]	Serious
New York City, NY-NJ-CT	20,217,137	0.082	Moderate	Serious[b]
Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE	7,437,135	0.074	Marginal[a]	Marginal
Baltimore, MD	2,662,691	0.072	Marginal[a]	Moderate
Washington, DC-MD-VA	5,136,216	0.071	Marginal[a]	Maintenance

[a] On April 13, 2022, EPA proposed reclassifying to "Moderate" nonattainment status for the 2015 ozone NAAQS.
[b] On April 13, 2022, EPA proposed reclassifying to "Severe" nonattainment status for the 2008 ozone NAAQS.

In addition, urban residents can be exposed to higher levels of health-damaging $PM_{2.5}$ and toxic air pollutants concentrated at "hot-spots" near high-density traffic arteries. Freight transportation relies on trucks, trains, and ships operating within communities in the Northeast and mid-Atlantic to move goods. This activity generates a significant amount of localized air pollution in communities already overburdened by diesel exhaust pollution. Local emissions contribute to an ongoing health crisis in these communities.

To address the region's persistent air quality problems, reducing NOx from heavy-duty truck engines is of the utmost importance due to its role in local and regional ground-level ozone formation, as well as its contributions to $PM_{2.5}$ and to winter-time visibility impairment at Class 1 areas. The year-round benefits of measures that reduce heavy-duty vehicle NOx emissions are substantial.

An OTC analysis, shown in Figure 2, illustrates that onroad diesel vehicles, including heavy-duty vehicles (HDVs), are projected to be the third largest NOx emissions source in the OTR in

[7] U.S. EPA, Air Quality Design Values, https://www.epa.gov/air-trends/air-quality-design-values#report. Accessed April 25, 2022.

2023.[8] Emissions from highway trucks are estimated to comprise 20 percent of the region's total NOx emissions.

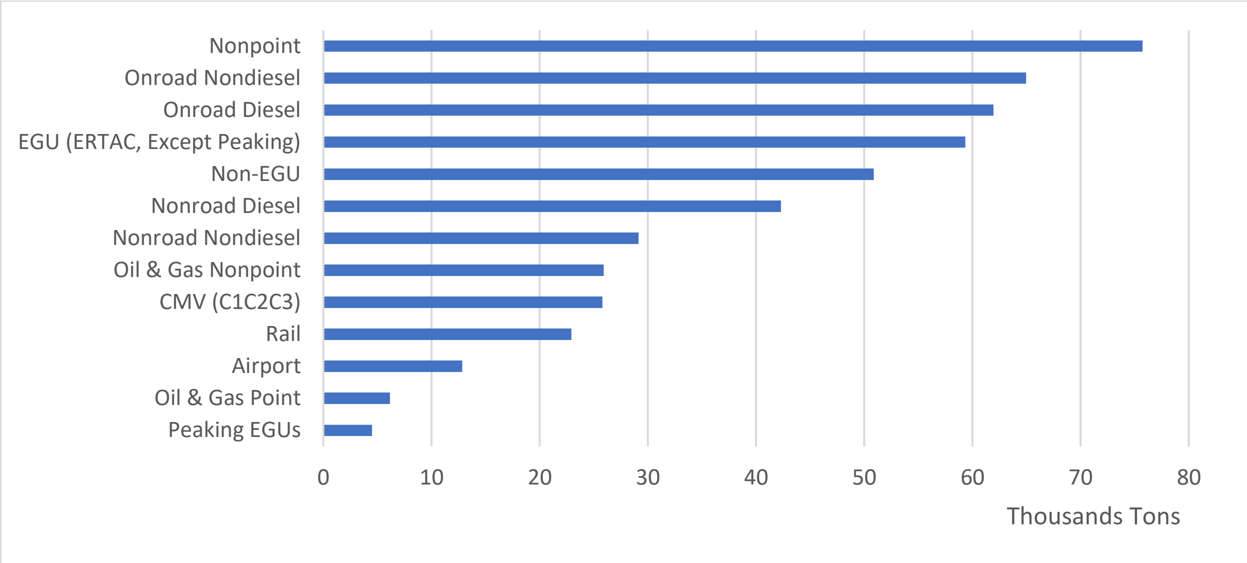

Figure 2: Modeled Ozone Season NOx Emissions in the OTR for Calendar Year 2023.

Moreover, the modeled NOx contribution from HDVs shown in Figure 2 is potentially underestimated, because the mobile source model used in developing the inventory does not account for high emitting heavy-duty trucks, such as glider vehicles and HDVs with tampered emission control systems. In-use testing data suggest that real-world NOx emissions are higher than modeled estimates, underscoring the need to achieve substantial NOx emission reductions from the heavy-duty diesel truck sector.[9]

To estimate the impact of onroad diesel emissions – the lion's share of which is emitted by HDVs – the OTC modeled the contribution (ppb) of onroad diesel to 8-hour maximum ozone concentrations at monitors in the OTR.[10] An example is provided in Figure 3, which shows the modeled contribution to total ozone from onroad diesel vehicles at each monitor in the OTR for which future-year 2023 photochemical modeling predicts continued nonattainment or maintenance challenges.

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[8] National Emissions Inventory Collaborative (2019). 2016v1 Emissions Modeling Platform. Retrieved from http://views.cira.colostate.edu/wiki/wiki/10202.

[9] Tan, Y., *et al.*, "On-Board Sensor-Based NOx Emissions from Heavy-Duty Diesel Vehicles," *Environmental Science and Technology*, 53: 5504-5511 (2019). DOI: 10.1021/acs.est.8b07048.

[10] OTC, "Ozone Transport Commission/Mid Atlantic Northeastern Visibility Union 2011 Based Modeling Platform Support Document – October 2018 Update," 2nd Version, October 18, 2018. Available at https://otcair.org/upload/Documents/Reports/OTC%20MANE-VU%202011%20Based%20Modeling%20Platform%20Support%20Document%20October%202018%20-%20Final.pdf. The modeling evaluated the 8-hour maximum ozone on the 4th highest day, which is the metric EPA uses to evaluate compliance with the ozone NAAQS.

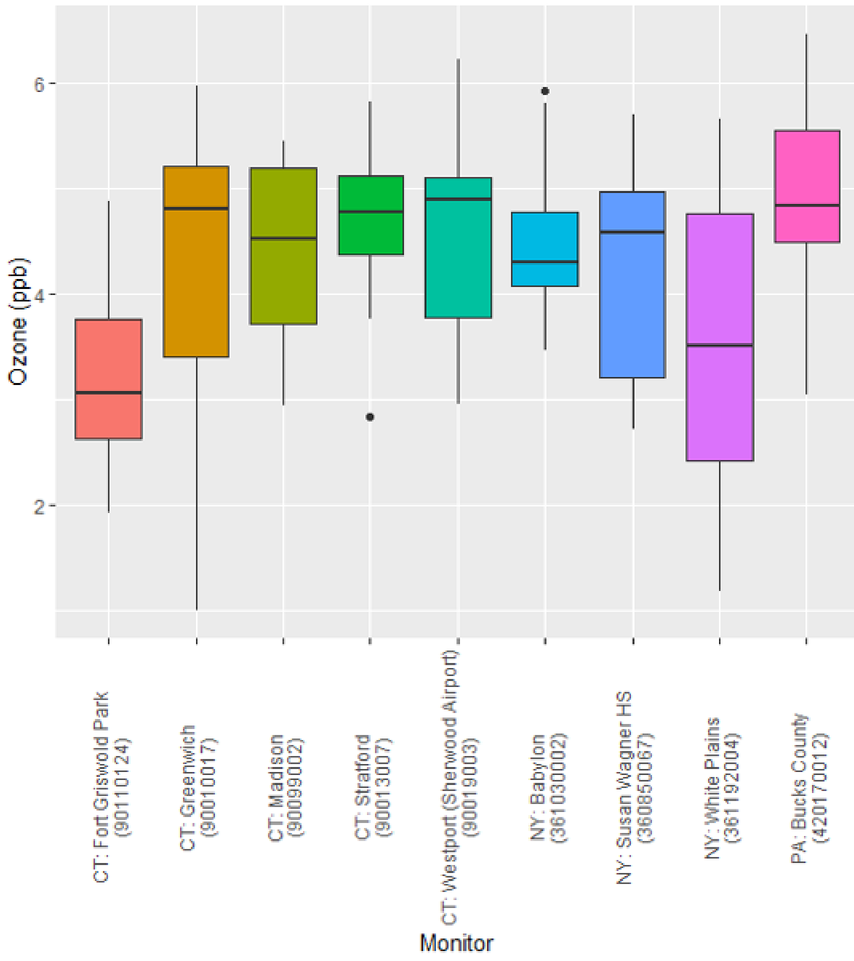

Figure 3: Maximum, Average, and Minimum Ozone Contribution from Diesel Vehicles on Exceedance Days.

Table 3 lists the percent contribution to total ozone from onroad diesel emissions at additional monitors in the OTR. Onroad diesel emissions are projected to contribute up to 10 ppb to total ozone and the projected contribution makes up between 10 and 17 percent of controllable ozone contributions on these days. Table 3 also shows the onroad diesel category's ranking in terms of the top emissions sectors that contribute total ozone at these monitors. Onroad diesel emissions are consistently projected to be the second, third, or fourth largest contributing sector to ozone, typically only behind area/nonpoint, onroad gasoline vehicles, and in some cases, electric generating units.

Table 3: Projected Ozone Contribution from Onroad Diesel Emissions at Selected Monitors (2023).

Monitor Location	State	Contribution (ppb)	Percentage Contribution to Total Controllable Ozone	Onroad Diesel Rank
Greenwich Point Park	CT	4.4	11.1 %	3
Bellevue State Park	DE	4.6	12.5 %	3
McMillan Reservoir	DC	5.8	14.2 %	2
Edgewood	MD	6.6	14.5 %	3
Ancora State Hospital	NJ	5.0	13.0 %	3
Susan Wagner HS	NY	4.7	12.2 %	4
NEA	PA	5.1	13.4 %	4
AJ	RI	3.8	10.4 %	4
Aurora Hills	VA	5.3	13.1 %	4

Absent adoption of stringent new engine NOx standards, emissions from HDVs will increase in future years as truck vehicle miles traveled (VMT) grows. The Federal Highway Administration (FHWA) projects that HDV ton miles travelled will increase by more than 30 percent over the next 25 years, as shown in Figure 4. This growth, if not counteracted by increased stringency of new engine emissions standards, will result in a significant increase in heavy-duty truck emissions.

We also note that highway trucks often travel long distances and can be registered in states far from where they operate. Therefore, a strong national program is needed to reduce highway truck emissions and maximize public health benefits in the OTR and nationally.

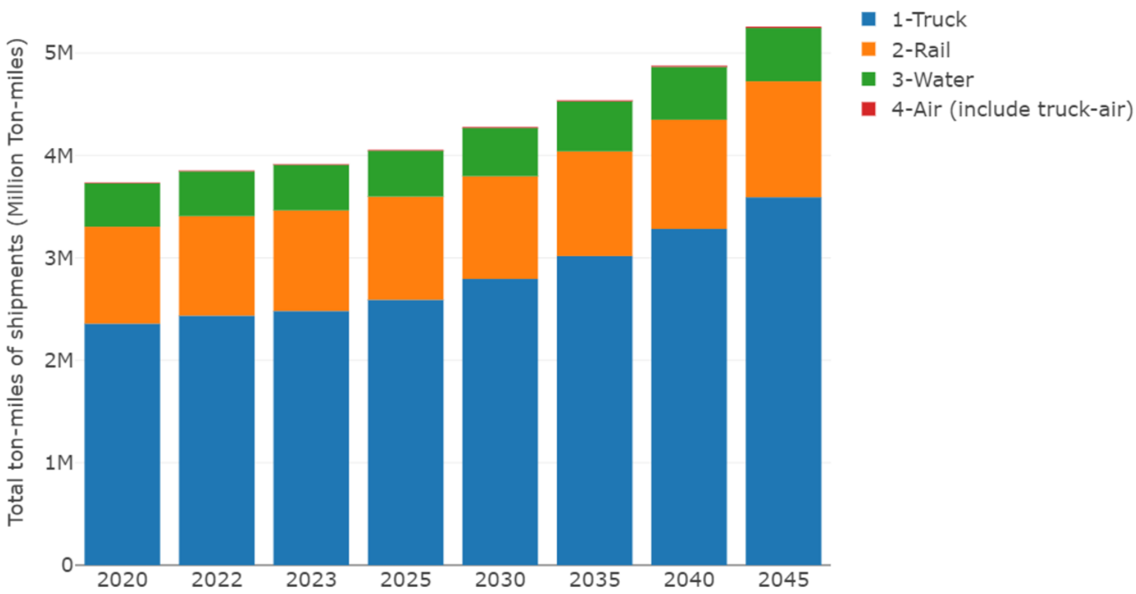

Figure 4: U.S. Freight Growth Projections from 2020 to 2045, low growth scenario, Source: FHWA Freight Analysis Framework Data.[11]

Because of the importance of HDVs to air quality and public health in the OTR, in 2019, the OTC requested that EPA make the Cleaner Trucks Initiative one of its most urgent priorities.[12] In February of 2020, the OTC and MANE-VU provided comments on EPA's Advanced Notice of Proposed Rulemaking calling on EPA to set emission standards for heavy-duty vehicles at 90 percent below the current standard and to harmonize with the California Omnibus regulation.[13] In June of 2020, the OTC sent a letter to EPA calling on the Agency to expeditiously propose a heavy-duty engine NOx standard 90 percent below current levels.[14] And in October of 2021, the OTC Mobile Sources Committee wrote to the EPA Administrator and to the Council on Environmental Quality asking EPA to act expeditiously to set stronger standards for heavy-duty engines and vehicles.[15] EPA's response to a 2016 petition joined by a number of the OTC states recognized the importance of NOx emission reductions for the OTC region and across the country.[16] In addition, EPA's *Greenhouse Gas Emissions and Fuel Efficiency Standards for*

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[11] Oak Ridge National Laboratory, Center for Transportation Analysis, "Freight Analysis Framework Data Tabulation Tool (FAF4)," Freight Analysis Framework (FAF) (ornl.gov). Accessed May 11, 2022.
[12] OTC letter to A. Wheeler, EPA Administrator, re: Cleaner Trucks Initiative, August 28, 2019. Available at https://otcair.org/upload/Documents/Correspondence/EPA%20NOx%20Letter.pdf.
[13] OTC comments to EPA on its Advance Notice of Proposed Rulemaking entitled "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine Standards," February 20, 2020. Available at https://otcair.org/upload/Documents/Correspondence/OTC-MANEVU CTI ANPR comments 20200220 final.pdf.
[14] OTC letter to A. Wheeler, EPA Administrator, re: expeditious development of NPRM, June 3, 2020. Available at https://otcair.org/upload/Documents/Correspondence/20200603 OTC Letter to EPA MHDV NOx.pdf.
[15] OTC letter to M. Regan, EPA Administrator, and A. Brown, CEQ Senior Director for Transportation Emissions, October 22, 2021. Available at https://otcair.org/upload/Documents/Correspondence/OTC%20letter%20to%20EPA%20CEQ%20re%20HDV%20NOx%20standards%2020211022.pdf.
[16] U.S. EPA, "Memorandum in Response to Petition to EPA for Rulemaking to Adopt Ultra Low NOx Exhaust Emission Standards for On-Road Heavy-Duty Trucks and Engines," December 20, 2016. Available at https://www.epa.gov/sites/production/files/2016-12/documents/nox-memorandum-nox-petition-response-2016-12-20.pdf. Accessed April 25, 2022.

Medium- and Heavy-Duty Engines and Vehicles –Phase 2 final regulation also detailed the importance of NOx reductions to the Northeast and Mid-Atlantic regions, stating that:

> EPA received compelling letters and comments from [NACAA, NESCAUM, OTC, and SCAQMD], explaining the critical and urgent need to reduce NOx emissions that significantly contribute to ozone and fine particulate air quality problems in their represented areas. The comments describe the challenges many areas face in meeting both the 2008 and recently strengthened 2015 ozone NAAQS. These organizations point to the significant contribution of heavy-duty vehicles to NOx emissions in their areas.[17]

The OTR had been making progress for over a decade at addressing its regional ozone problem, with ozone levels trending downward due to the adoption of measures that reduce emissions of ozone precursors. In recent years, however, air quality monitoring data no longer show a declining trend. Figure 5 shows the number of days in Connecticut where maximum 8-hour ozone was measured above the 2008 and 2015 ozone NAAQS for each year from 1976 to 2018. After significant improvements in the earlier years, the number of high ozone days in Connecticut has remained level or has slightly increased since 2011. Similar patterns have been recorded in other OTC states, as can be seen in Figure 6.

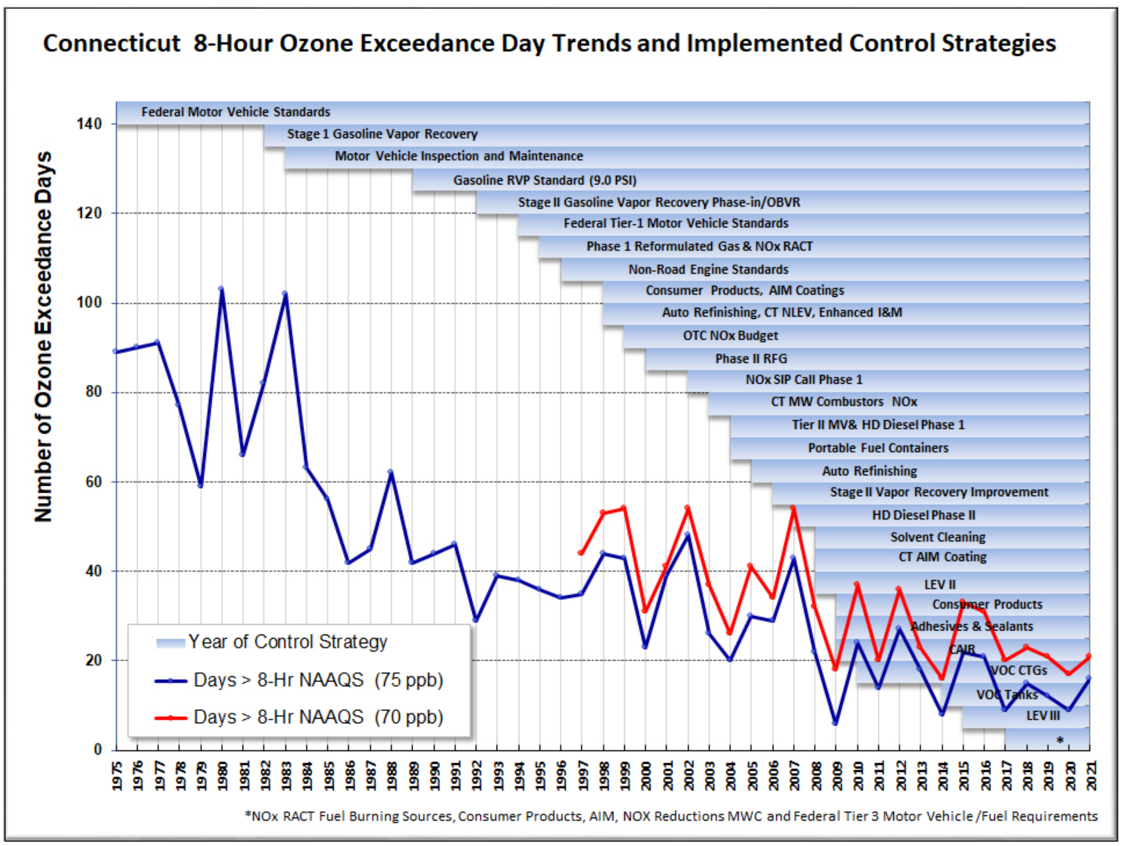

Figure 5: Connecticut 8-Hour Ozone Exceedance Trends and Implemented NOx Control Measures.

[17] 81 Fed. Reg. 73478 (Oct. 25, 2016), at 73523.

Figure 5 also includes an extensive list of requirements that have been adopted in Connecticut and other OTC states to reduce emission of the ozone precursors from stationary sources, area sources, fuels, mobile sources, and consumer products. Imposing further control requirements on many of these source categories would be more costly than controlling heavy-duty engine emissions and would create disproportionate economic burden for those sources. The OTC estimated that the cost of additional NOx controls for industrial, commercial, and institutional boilers (100 million British Thermal Units per hour in size) ranges from $2,700 to $21,000 per ton of NOx reduced, as compared to a cost range of $1,000 to $5,000 per ton of NOx reduced from HDVs.[18,19]

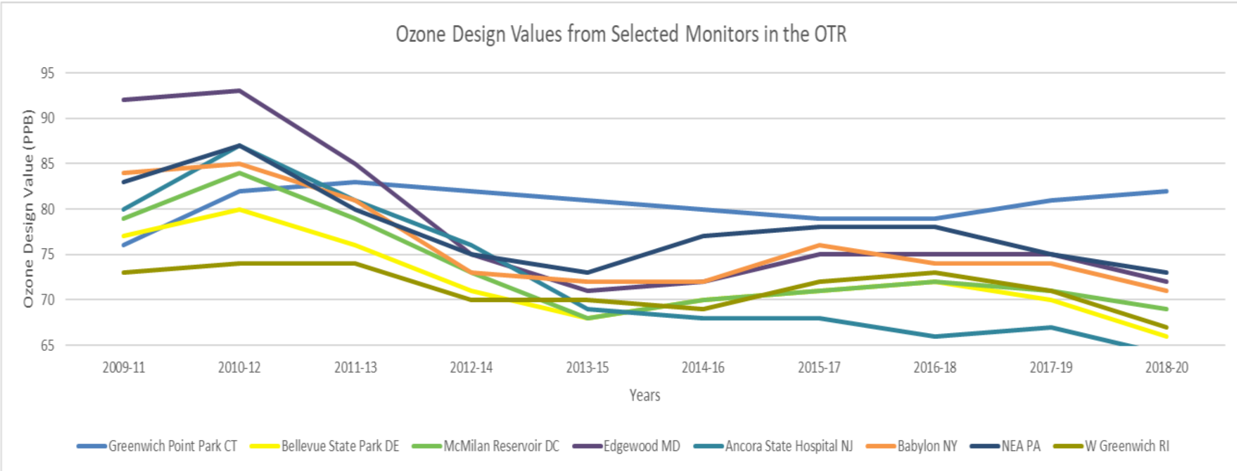

Figure 6: Ozone Design Values from Selected Monitors in the OTR from 2009-11 to 2018-20.

As noted previously, the New York-Northern New Jersey-Long Island ozone nonattainment area consistently fails to meet its attainment deadlines for the 2008 8-hour ozone NAAQS (0.075 ppm), and EPA has now proposed to re-classify this area to severe nonattainment status for the NAAQS.

Not only have ozone design value improvements stalled, the region has experienced unusually high peak ozone concentrations in recent years. In July of 2018, the New York City metropolitan region saw a 1-hour ozone average of 143 ppb, a peak level not seen in this area in more than 10 years.

The satellite imagery in Figure 7 readily shows visible nitrogen dioxide (NO_2) pollution (a major component of NOx) along the Northeast Corridor, with the highest concentrations of NO_2 in the New York City area. The figure shows the NO_2 vertical column concentration measured during daily overpasses by the TROPOMI satellite for weekdays (Monday-Friday) during May through September in 2018. Much of the NO_2 pollution is near the surface close to its emission sources. High density ground level NOx emissions in large urban areas not only react to create low

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[18] OTC/Lake Michigan Air Directors Consortium (LADCO), "Evaluation of Control Options for Industrial, Commercial and Institutional (ICI) Boilers," May 2010.

[19] Manufacturers of Emission Controls Association, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027," February, 2020. Available at https://www.meca.org/wp-content/uploads/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf. Accessed May 4, 2022.

elevation ozone, but also mix upward into higher altitudes, which is shown in the NO_2 vertical column measurements. Power plants in some locations enhance the vertical column measurements as many of them inject their emissions into higher altitudes. As a result, low-level emissions such as those from HDVs are an important component to local ozone production while power plant emissions have a greater relative tendency to contribute to downwind ozone production.

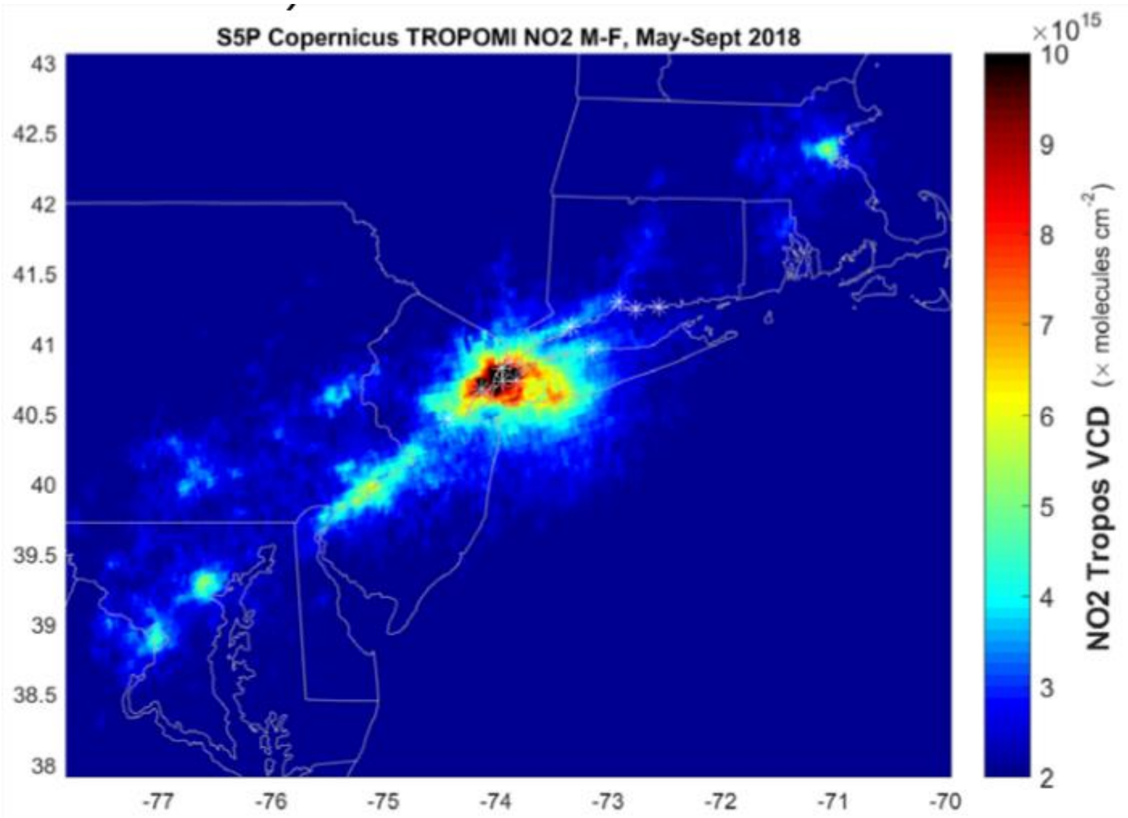

Figure 7: TROPOMI Satellite Imagery Showing High NO_2 Concentrations in the Northeast Corridor.

Figure 8 shows satellite imagery of NO_2 concentrations during the winter in the Northeast and Mid-Atlantic on February 18, 2019, a day with particularly severe haze. NO_2 concentrations are abundant and dominant along the I-91/95 corridor from Virginia to Massachusetts, suggesting a strong mobile source NOx contribution. These are major arteries where goods are being transported by truck from the ports of Baltimore, Philadelphia, and New York. Note how clearly defined the area of red is along I-91 in central Connecticut and Massachusetts. In addition to region-wide stagnation on this particular day, the strength of the NO_2 signal also reflects the longer NO_2 lifetime in winter.

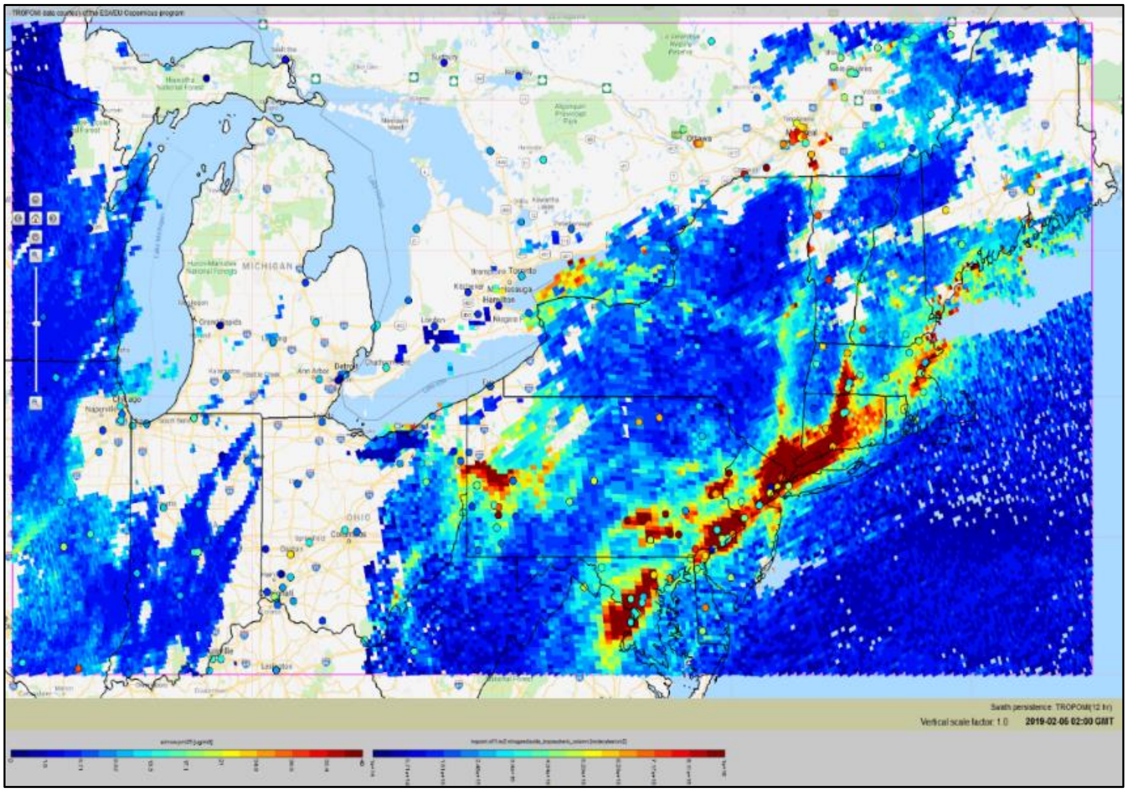

Figure 8: TROPOMI Satellite Data of Wintertime NO_2 – Virginia to Massachusetts.

Because of its role in secondary particulate formation, reducing HDV NOx emissions will improve visibility in MANE-VU federal Class I areas. There are seven federal Class I areas in the region that have historically faced some of the worst visibility in the nation. Analyses of monitoring data from the Interagency Monitoring of Protected Visual Environment (IMPROVE) network show the increasing importance of nitrate formation on visibility impairment, in particular at the Brigantine Wilderness Area in the Edwin B. Forsythe National Wildlife Refuge in New Jersey.[20] In addition, as was shown in Figure 2, HDVs are the third largest source of NOx emissions in the region. Because of this, the MANE-VU states, through the MANE-VU Regional Planning Organization process, requested that EPA implement a program to reduce NOx emissions from HDVs.[21]

Emission standards for medium- and heavy-duty trucks were last finalized in 2001, more than 20 years ago. Since then, extensive experience in implementation and monitoring has provided a substantial body of evidence supporting more stringent standards over the Federal Test Procedure (FTP), Supplemental Emissions Test (SET), and Ramped Modal Cycle (RMC).

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[20] Mid-Atlantic/Northeast Visibility Union. "Mid-Atlantic/Northeast U.S. Visibility Data 2004-2017 (2nd RH SIP Metrics)," December 18, 2018. Available at https://otcair.org/MANEVU/Upload/Publication/Reports/MANE-VU_Trends_2004-2017_Report_Plots_2nd_SIP_11112018.zip.

[21] Mid-Atlantic/Northeast Visibility Union. "Statement of the MANE-VU States Concerning a Course of Action by the Environmental Protection Agency and Federal Land Managers toward Assuring Reasonable Progress for the Second Regional Haze Implementation Period (2018-2028)," August 25, 2017. Available at https://otcair.org/MANEVU/Upload/Publication/Formal%20Actions/MANE-VU%20FLM%20Final%20Ask%208-25-2017.pdf.

Advanced catalyst formulations, passive and active thermal management strategies, approaches to reducing pumping losses, engine calibration and hardware changes, and electrification are examples of technologies that can be used to substantially reduce NOx emissions while maintaining carbon dioxide emissions at levels required by the Phase 2 heavy-duty greenhouse gas (GHG) standards. Some of these technologies will most likely be explored prior to model year 2027 to meet the EPA Phase 2 GHG and California Air Resources Board (CARB) 2024 Low NOx programs.

OTC and MANE-VU's specific comments on the NPRM are provided below.

Recommendations

Heavy-Duty Engine NOx Standards in 2027: Given the urgent need to reduce NOx emissions from heavy-duty vehicles to improve public health and air quality, we strongly encourage EPA to finalize NOx emission limits equivalent to those in the CARB Heavy-Duty Omnibus Regulation. Specifically, OTC supports the adoption of a 0.020 gram NOx engine standard in 2027 at intermediate useful life and a 0.035 gram NOx standard at full useful life, as specified in CARB's Omnibus regulation. There is ample data from CARB, EPA, and other research programs that support the feasibility of introducing a 0.020 gram NOx standard at intermediate useful life in 2027. [22,23,24,25,26,27]

The Clean Air Act requires ozone NAAQS attainment as "expeditiously as practicable," and EPA's proposed Options 1 and 2 do not meet this requirement. The introduction of effective and available heavy-duty engine and vehicle pollution reduction technologies will assist jurisdictions in the OTR in reaching attainment of the ozone standards. This is the most "expeditiously as practicable" path called for by the Clean Air Act and anything less than this will not be acceptable.

Should EPA choose Option 1, we urge the Agency to make the following changes to the proposed standards:

Low Load Cycle (LLC): We strongly support the establishment of EPA's proposed low load certification cycle and the inclusion of auxiliary load in the cycle. Test data evaluated by the

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[22] Manufacturers of Emission Controls Association, "Technology Feasibility for Heavy-Duty Diesel Trucks in Achieving 90% Lower NOx Standards in 2027," February, 2020. Available at https://www.meca.org/wp-content/uploads/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf. Accessed May 4, 2022.

[23] Southwest Research Institute, "Update on Heavy-Duty Low NOx Demonstration Programs at SwRI," November 2019. Available at https://ww3.arb.ca.gov/msprog/hdlownox/files/workgroup_20190926/guest/swri_hd_low_nox_demo_programs.pdf. Accessed May 12, 2022.

[24] Sharp, C.; Neely, G.; Rao, S.; Zaval, B., "An Update on Continuing Progress Towards Heavy-Duty Low NOx and CO_2 in 2027 and Beyond," Southwest Research Institute, WCX, Detroit, Michigan, April 5-7, 2022.

[25] U.S. EPA, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards Draft Regulatory Impact Analysis," EPA-420-D-22-001, March 2022. Available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10144K0.pdf. Accessed May 12, 2022.

[26] Achates Power, "Heavy Duty Opposed Piston Engine Demonstration," CRC Real World Emissions Workshop, March 15, 2022.

[27] Mendoza Villafuerte, P.; Demuynck, J.; Bosteels, D., "Ultra-Low NOx Emissions with a Close-Coupled Emission Control System on a Heavy-Duty Truck Application," Society of Automotive Engineers, September 21, 2021. Available at https://www.aecc.eu/wp-content/uploads/2021/09/2021-01-1228.pdf. Accessed April 25, 2022.

International Council on Clean Transportation (ICCT), NESCAUM, CARB, and others demonstrate the substantial contribution to overall heavy-duty engine emissions due to low load operation.[28,29,30,31] In the Northeast and mid-Atlantic, recent data logging of onroad tractor trailers over 100 days of travel found that up to 40 percent of tractor trailer NOx was emitted at low load.[32] Taken together, these studies strongly point to the need for additional NOx controls at low load cycles.

Low load cycles and excess NOx emissions are of particular concern in Overburdened Communities located near busy truck routes and where trucks operate in stop and go conditions.

While we support the certification test cycle proposed by EPA, we request that EPA finalize a more stringent low load NOx standard for model year 2027-2030 engines. The proposed standard in Option 1 of 90 milligrams/hp-hour is significantly higher than CARB and EPA data show is achievable for MY 2027. For example, an upgraded Cummins engine with cylinder deactivation, improved engine calibration, and advanced aftertreatment had LLC NOx emissions of 0.036 and 0.053 g/bhp-hr.[33,34] Results from EPA's Heavy-duty Low NOx Stage 3 Research Program show the proposed Option 1 LLC standards are well above what the test data demonstrate are feasible at 435,000 miles, 600,000 miles, and 800,000 miles.[35,36] EPA's test data indicate a 35 to 40 mg/bhp-hr standard is feasible in 2027. OTC supports a more stringent low load certification standard beginning in model year 2027. Given that 2027 to 2030 model year heavy-duty vehicles will be in service for many years to come, it is essential we realize the greatest NOx reductions possible with the implementation of new emissions standards.

Idle Standard: We request that EPA finalize a mandatory idle standard of 5 g/hr for model year 2027 and subsequent model year engines, as CARB has finalized for its Omnibus regulation,

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[28] U.S. EPA, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards Draft Regulatory Impact Analysis," EPA-420-D-22-001, March 2022. Available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10144K0.pdf. *See* page 84.

[29] Badshah, H.; Posada, F.; Muncrief, R., "Current State of NOx Emissions from In-Use Heavy-Duty Diesel Vehicles in the United States," 26 November 2019. Available at https://theicct.org/publications/nox-emissions-us-hdv-diesel-vehicles. Accessed May 12, 2022.

[30] Sharp, C., Southwest Research Institute, "Update on Heavy-Duty Low NOx Demonstration Programs at SwRI," September 26, 2019. Available at https://ww2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/workgroup_20190926/guest/swri_hd_low_nox_demo_programs.pdf?_ga=2.85472537.1256936515.1649334668-1678718972.1597669978. Accessed May 12, 2022.

[31] NESCAUM and Environment and Climate Change Canada, "Heavy-Duty Vehicle In-Use NOx Testing Report, Interim Results, July 2021, submitted for publication, available upon request.

[32] *Ibid.*

[33] CARB "Heavy Duty Low NOx Program, Low Load Cycle," Public Workshop, September 26, 2019. Available at https://ww3.arb.ca.gov/msprog/hdlownox/files/workgroup_20190926/staff/03_llc.pdf. Accessed April 25, 2022.

[34] Sharp, C., Southwest Research Institute, "Update on Heavy-Duty Low NOx Demonstration Programs at SwRI," September 26, 2019. Available at https://ww2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/workgroup_20190926/guest/swri_hd_low_nox_demo_programs.pdf?_ga=2.85472537.1256936515.1649334668-1678718972.1597669978. Accessed May 12, 2022.

[35] U.S. EPA, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards Draft Regulatory Impact Analysis," EPA-420-D-22-001, March 2022. Available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10144K0.pdf. Accessed May 12, 2022.

[36] U.S. EPA, "Test Results from EPA Diesel Engine Demonstration," Memorandum from J. Sanchez, OAR/OTAQ/ASD, to Docket EPA-HQ-OAR-2019-0055, May 3, 2022. Available at https://www.regulations.gov/document/EPA-HQ-OAR-2019-0055-1082. Accessed May 12, 2022.

rather than an optional standard. A Center for Environmental Research and Technology (CE-CERT) study found that vocational vehicles spend approximately 33% of the time at idle.[37] Idling trucks emit pollution in crowded urban areas in communities already overburdened with air pollution.[38] Southwest Research Institute's Stage 3 research program found that idle emissions from 0.30 to 1.40 grams per hour at 435,000 miles on five different duty cycles and 0.40 to 3.3 grams NOx per hour at 800,000 miles are feasible.[39] These values are well below the proposed standard and demonstrate the feasibility of NOx control at idle through 800,000 miles. Given these and other test results, we encourage EPA to make the idle standard mandatory and consider increasing the stringency of the standard in the final rule.

SCR inducement: The maximum speeds for low-speed vehicles given in Proposed Inducement Schedules, Table IV-13 as 50, 45, 40, and 35 miles per hour (mph) should be revised. OTC and MANE-VU recommend that the maximum speeds given for all four proposed engine hours of operation for low-speed vehicles should be reduced. Owners of low-speed vehicles, which are often locally driven delivery vehicles, will not be induced to repair their vehicles in a timely manner with the proposed maximum speeds given in Table IV-13. A locally driven delivery vehicle could operate at the lowest speed of 35 mph without much of a performance penalty in a congested traffic area. Many roads in urban areas have speed limits of 25 mph or lower. In addition, many of the problems cited by commentators that arise when an engine is derated, such as towing expense and time lost when drivers and their vehicles are stranded far from home, would not greatly affect low-speed, locally driven vehicles. Therefore, it is not appropriate or necessary to allow locally driven low-speed vehicles to drive as fast as allowed in the proposed Inducement Schedule.

Even for those vehicles where the engine derating is an incentive to perform required maintenance, the new schedule allows for up to 60 hours of operation before the final inducement goes into effect. This could amount to 60 hours of driving on local streets, near schools, small businesses, and residences without emissions control. We strongly urge EPA to reconsider the low-speed vehicle inducement schedule and make the derated vehicle speeds significantly lower.

Interim In-Use Standards: EPA is considering finalizing higher temporary in-use standards for all the proposed duty cycle and off-cycle heavy-duty engines and requested comment on whether the Agency should consider including in the final rule interim in-use standards to account for potential variabilities in performance during the early years of implementing new technology. Tables IV-16 and IV-17 of the preamble list potential low-end and high-end ranges for the potential in-use standards. OTC requests that EPA not finalize the proposed interim in-use standards, or if interim standards are finalized, that they be significantly more stringent than the ones proposed. With regard to the low load interim in-use standards proposed, test data show that NOx emissions of 0.036 to 0.053 g/bhp-hr on the CARB low load cycle are technically feasible.

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[37] *See* footnote 35, at p. 75.
[38] Michael J. Bradley & Associates, "Newark Community Impacts of Mobile Sources." November 2020. Available at MJBA_Report_NewarkCommunityElectrification_Nov2020.pdf. Accessed May 12, 2022.
[39] *See* footnote 24 (Sharp *et al.*, Southwest Research Institute, April 5-7, 2022).

Manufacturers will have five years to prepare for commercial application of technologies to reduce low load emissions. Therefore, finalizing in-use NOx emissions standards between 0.07 to 0.20 g/bhp-hr (70 mg/bhp-hr to 200 mg/bhp-hr) would substantially weaken the low load emissions requirements. Similarly, the FTP, SET, and idle interim in-use standards EPA is considering are significantly higher than what has already been demonstrated at intermediate and full useful life.

Averaging Banking and Trading: The OTC supports EPA's proposal to not allow Averaging, Banking, and Trading (ABT) for PM or hydrocarbons for model year 2027 and later engines. However, EPA proposes to continue to allow ABT of NOx credits generated against applicable heavy-duty diesel engine NOx standards. As part of this proposal, manufacturers could certify battery electric and fuel cell vehicles to generate NOx emissions credits. The OTC does not support the inclusion of a NOx emission credit or ABT scheme.

EPA acknowledges in the NPRM that its proposed NOx standards are feasible without the use of credits.[40] Even so, the agency proposes a NOx credit-generation scheme and ABT that would allow manufacturers to use credits generated from engines with emission levels below the standards to produce engines with emission levels above the standards. We are especially concerned that EPA's proposed family emission limit (FEL) cap of 0.15 grams of NOx between 2027 and 2030 could cause significant erosion of the stringency of the heavy-duty engine NOx standards. In addition, if heavy-duty ZEV sales exceed EPA's projections, substantial heavy-duty engine NOx credits would be available in the ABT program. The projections for heavy-duty ZEV sales in the NPRM rely on data from 2016 or earlier. Significant technical and policy developments have occurred since those studies were published. Because of this, we believe heavy-duty ZEV sales will be significantly greater than the 1.5 percent of heavy-duty vehicle sales in 2027 and subsequent model years that EPA assumed. Further, with a NOx ABT program, higher NOx emitting engines could be driven in Overburdened Communities in the OTR, potentially exacerbating the adverse health effects from gasoline and diesel vehicle emissions. Given these concerns and the urgent need to reduce NOx emissions in the OTR, we are opposed to heavy-duty engine NOx ABT.

Deterioration factor demonstration: EPA has proposed to establish a new deterioration factor determination option, where manufacturers would be able to perform dynamometer testing of an engine and aftertreatment system to a mileage that is less than regulatory useful life. Manufacturers would then bench age the aftertreatment system to regulatory useful life and combine the aftertreatment system with an engine that represents the engine family. Manufacturers would run the combined engine and bench-aged aftertreatment for at least 100 hours before collecting emission data for determination of the deterioration factor. OTC encourages EPA to continue to include the engine in the deterioration factor determination. While it may be possible to move to the proposed new bench-aged aftertreatment option with more data, we do not believe there are sufficient data to ensure this method accurately evaluates the durability of the emission-related components in a certified configuration. We encourage

[40] 87 Fed. Reg. 17414 (March 28, 2022), at 17550.

EPA to align with CARB on the procedure for the deterioration factor determination. We believe both significant engine operation and accelerated aftertreatment are needed, and not accelerated aftertreatment aging alone.

Tampering-related provisions: The OTC members are prioritizing detection and enforcement against tampered vehicles because tampered vehicles substantially increase vehicle NOx emissions. Given the importance of identifying tampered vehicles and enforcing against emission control system tampering, OTC supports EPA proposed provision to ensure that there are measures in place to prevent engine control module (ECM) tampering. EPA proposes that manufacturers include a document at time of certification that outlines and describes the process and/or industry technical standards that were used to prevent unauthorized access to the ECM on the vehicle. This document shall describe the measures that a manufacturer has used to: prevent unauthorized access to the ECM; ensure that calibration values, software, or diagnostic features cannot be overwritten or otherwise disabled; and respond to repeated, unauthorized attempts to reprogram the ECM, if they become aware of such attempts.

Proposed Option 2: We strongly oppose Option 2 in EPA's proposal. Technical analyses demonstrate that substantially more stringent NOx controls are feasible and cost effective for model year 2027 and later heavy-duty engines and vehicles than would be required under this option. Certification data from current model year engines show that mass NOx emissions from some engines are close to the level proposed for the Option 2 FTP and SET NOx standards for model year 2027 and later engines.[41,42,43] The standards proposed for Option 2 would only require minor calibration adjustments and minimal hardware modification. Further, EPA's own analysis found that Option 2 is less cost effective than Option 1. Option 2 will not deliver the needed emissions reductions in Overburdened Communities or provide sufficient assistance to states in attaining the ozone NAAQS and would leave substantial and cost-effective NOx reductions on the table.

As discussed throughout this letter, OTC member jurisdictions continue to face nonattainment challenges with the ozone NAAQS and millions of residents in the OTR continue to breathe unhealthy air. In addition, MANE-VU technical analysis has shown that year-round NOx reductions are needed if its member jurisdictions are to continue making reasonable progress towards the Regional Haze Rule goal of natural visibility conditions at Class I areas by 2064. The OTC and MANE-VU stand ready to assist the Agency in the development of this important regulation. If you have any questions or would like to discuss these comments further, please

[41] CARB Executive Order A-242-0139, "Volvo Group Trucks Technology," (FTP of 0.06), January 3, 2020, at https://ww3.arb.ca.gov/msprog/onroad/cert/mdehdehdv/2020/volvogrouptrucks_hhdd_a2420139_12d8_0d20-0d01.pdf. Accessed April 25, 2022.

[42] CARB Executive Order A-021-0723, Cummins engine family MCEXH0912XCA (FTP of 0.07), *see* "New Vehicle and Engine Certification: Executive Orders for MY2021 Medium-Duty and Heavy-Duty Engines" at https://ww2.arb.ca.gov/new-vehicle-and-engine-certification-executive-orders-my2021-medium-duty-and-heavy-duty-engines. Accessed April 25, 2022.

[43] CARB Executive Order A-290-0168-1, Detroit Diesel Corporation engine family KDDXH12.8FED (FTP of 0.06), *see* "New Vehicle and Engine Certification: Executive Orders for MY2019 Medium-Duty and Heavy-Duty Engines" at https://ww2.arb.ca.gov/new-vehicle-and-engine-certification-executive-orders-my2019-medium-duty-and-heavy-duty-engines. Accessed April 25, 2022.

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Sincerely,

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cc: OTC/MANE-VU Commissioners and Air Directors
U.S. EPA Regional Administrators for Regions I, II, and III