U.S. Environmental Protection Agency
EPA Docket Center (EPA/DC) Air and Radiation Docket
Docket No. EPA–HQ–OAR–2019–0055
1200 Pennsylvania Avenue
NW Washington, DC 20460

Re: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine Standards
Docket No. EPA-HQ-OAR-2019-0055

To whom it may concern:

The following comments on the U.S. Environmental Protection Agency's (EPA) proposed Heavy-Duty Engine Standards are submitted by the over 50 organizations that make up the Moving Forward Network (MFN). The listed members submit the following comments both as individual/organizational comments as well as MFN comments: Air Alliance Houston, Backbone Campaign, Center for Community Action and Environmental Justice, Central Coast Alliance United for a Sustainable Economy (CAUSE), Central Valley Air Quality Coalition (Dr. Catherine Garoupa White, Executive Director), Citizen for a Sustainable Future, Clean Water Action, Duwamish River Community Coalition (DRCC), South Ward Environmental Alliance, CleanAirNow, Coalition for a Safe Environment, East Yard Communities for Environmental Justice, Respiratory Health Association, Earthjustice, EJ Working Group Hudson Hill (Michelle Howard), Groundwork Northeast Revitalization Group (Groundwork NRG), Harambee House, Ironbound Community Corporation, Little Village Environmental Justice Organization, Lowcountry Alliance for Model Communities, Mobile Environmental Justice Action Coalition (MEJAC), Natural Resources Defense Council, New Jersey Environmental Justice Alliance, Peoples Collective for Environmental Justice, Regional Asthma Management and Prevention, Rethink Energy Florida, Southeast CARE Coalition, Southwest Detroit Environmental Vision, Texas Environmental Justice Advocacy Services, Tallahassee Food Network, Tishman Environment and Design Center, Union of Concerned Scientists, West Long Beach Neighborhood Association, Warehouse Workers for Justice

Summary

Moving Forward Network's Comments on Proposed Heavy-Duty Engine Standards

For decades, communities across the country have been fighting for the right to breathe clean air. They have been forced to hold their breath for over 20 years as EPA has delayed adopting new standards that will once and for all clean up the deadly emissions from heavy-duty trucks and buses. The Administration and EPA often note their commitment to place environmental justice at the center of policies and programs, yet time and again, these efforts come up unacceptably short. As MFN Campaign Director and environmental justice advocate Angelo Logan put it, "the obvious answer is to dramatically speed up the use of zero-emission equipment—from the ships entering the ports, to the cargo handling vehicles at the docks, to the rail terminals and heavy-duty trucks moving goods to communities all over the country."[1] The question is not about how—we have the zero-emission, life-saving technology to make sure every person in the United States can breathe clean air. The question is whether the EPA and this Administration are willing to take the necessary action that prioritizes the health and well-being of communities and the planet over industry. [2]

As it stands, the current proposed criteria pollutant standards, both Option 1 and especially Option 2, will not relieve the daily burdens caused by the freight transportation system, felt by environmental justice communities but in fact risk an increase in these burdens from this polluting industry. The EPA's weak proposal is indefensible given the very real opportunity to bring zero emissions into the freight transportation system. Critical to implementing this Rule and subsequent Rules, the EPA must ensure that reductions in medium- and heavy-duty vehicle emissions occur within environmental justice communities. Unless and until EPA's proposal is significantly strengthened, this rule will, either perpetuate an already dangerous status quo and/or increase the impacts from medium and heavy-duty trucks and buses that are killing people.

The EPA needs to:

1. enact the most protective and stringent emission standards that ensure emission reductions in environmental justice communities;
2. transition to zero emission trucks and buses by setting stringent emissions standards and adopting a sales mandate;
3. require that all new trucks are zero emission by 2035 with intermediate targets and prioritization for deployment of in EJ communities;
4. retire all combustion trucks on or before 2045; and
5. Ensure that its rules do not allow for false solutions like natural gas.

As we documented in our October 26, 2021 letter to EPA,[3] EPA's legal duty is clear: the agency must adopt emission standards that reflect "the greatest degree of emission reduction achievable." But the agency's proposal is a far cry from meeting this obligation.

Zero-emission trucks are commercially available,[4] economically compelling,[5] and the single most effective solution for reducing freight emissions.[6] Advances in this technology are outpacing even the best estimates from just a few years ago—cost and technology assessments of battery-electric trucks from 2018 are already becoming obsolete. The barriers that once relegated ZEVs to a niche solution are shrinking, allowing zero-emission trucks to become a real solution in our battle against air and climate pollution. At

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[1] https://thehill.com/opinion/energy-environment/592963-bidens-opportunity-to-end-diesel-pollution-of-port-communities/

[2] https://thehill.com/opinion/energy-environment/592963-bidens-opportunity-to-end-diesel-pollution-of-port-communities/

[3] MFN Letter to Administrator Regan: https://www.movingforwardnetwork.com/wp-content/uploads/2021/11/MFN-Zero-Emission-in-Freight-Letter-to-EPA-10_26_21.pdf

[4] See MJ Bradley & Associates, Medium- & Heavy-Duty Vehicles (July 2021) http://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf.

[5] See Amol Phadke et al, Why Regional and Long-Haul Trucks are Primed for Electrification Now (Mar. 2021) https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf

[6] OECD, International Transport Forum, Transport Outlook - 2019, at 157 https://doi.org/10.1787/transp_outlook-en-2019-en stating "[s]caling up decarbonisation measures for road freight transport that have already been tested and are comparatively easy to introduce is one of the most immediate actions required."

every regulatory opportunity, EPA must include policies that center environmental justice solutions and rapidly advance ZEVs not just in certain market segments but for the entire truck sector.

MFN calls for the final proposal to include strong targets, including zero-emission targets, that reflect the technical feasibility and availability of zero-emission heavy-duty technology:

1. MFN urges EPA to finalize standards that include a separate standard for ZE trucks and require an increasing annual minimum number of ZE truck sales.
2. A zero-emission requirement should be separate and in addition to stronger heavy-duty combustion engine requirements to ensure maximum emission reductions are achieved to cut emissions from new combustion engines.
3. Barring a specific requirement for ZE trucks, EPA must lower the NOx standard to reflect feasible ZE trucks sales. If EPA insists on retaining ZE trucks in a vehicle NOx standard, EPA must lower the NOx standard to reflect the greatest degree of emission reductions achievable across the entire truck fleet based on the feasibility of widespread transition to ZE trucks.
4. Unless EPA intends to drive ZEV adoption, ZEV credits must be excluded from the NOx compliance calculation. Given the myriad risks posed by EPA's proposed averaging scheme, if EPA refuses to adopt more stringent standards that reflect the feasibility of achieving significant emissions reductions through the application of ZE truck technologies, EPA must remove ZEV credits from the NOx compliance calculations.

The following comments set forth a detailed, comprehensive proposal, on behalf of the MFN membership, to align EPA's heavy-duty emission standards with the Administration's own stated commitment to environmental justice communities. In addition to strengthening the proposal rule, we urge the Administration to adopt a comprehensive policy and programmatic agenda that aims to eliminate the toxic emissions and cumulative impacts that are a direct result of the heavily-polluting freight system.

"If we are talking about ending diesel, then we are talking about ending the shipment of diesel, then we're talking about ending the production of diesel, ending the piping of diesel, and ending the extraction of diesel, right? All of that comes to an end. So, it's not just about 1 truck, or that we want a 5% reduction of [diesel-using] trucks. We want to end the system [entirely]." - mark! Lopez East Yard Communities for Environmental Justice and MFN Advisory Board Member

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Introduction

The Moving Forward Network is a national network of organizations that center grassroots, frontline knowledge, expertise, and engagement with the communities across the United States that bear the negative impacts from the global freight transportation system. In collaboration with allies and partners, MFN identifies local solutions that call for community, industry, labor, government, and political action that advances equity, environmental justice, and a zero-emissions focused just transition. MFN's vision is for negatively-impacted communities to become healthy, sustainable spaces where individuals, families, students, and workers can thrive, free of the negative impacts of the freight transportation system. Core to MFN's values are our organizations' deep commitment to advancing environmental justice, equity, economic justice, and a just transition.

On October 26, 2021, the Moving Forward Network presented a letter to EPA detailing recommendations to address the disproportionate burdens caused by the freight transportation system on environmental justice communities. EPA must address the cumulative burdens across the entire freight sector and, while these comments will focus on the proposed Heavy Duty Truck Rule, we maintain that EPA must work from a "whole of government" approach and make intentional efforts to address the pollution and public health threats impacting environmental justice communities everyday. MFN's goals, priorities, and demands are summarized below:

1. First and foremost, any and all emission standards must eliminate all pollutant emissions, rather than focusing solely on reducing or eliminating carbon emissions. In this rulemaking, EPA should require that all new trucks be zero-emissions beginning in 2035, with robust interim targets before then. EPA should also set standards that require the retirement of all combustion trucks on or before 2045.

2. EPA must ensure that any new emission standards drive the market for zero-emission truck and bus technology.[7]

3. In setting these standards across the freight sector, EPA must consider environmental justice impacts and priorities "from source to tailpipe to grave."[8] Put another way, the agency must carefully consider any unintended consequences of the proposed regulatory design. For example, regulations must avoid promoting false solutions (e.g., carbon trading and/or "greenwashed" energy that comes from non-renewable and heavy-polluting sources such as natural gas, biomass, etc.) that will only lead to further burdening our environmental justice communities.

4. Transportation electrification must be accompanied by standards and regulations that support renewable electricity generation, i.e., wind and solar,[9] that will not further burden environmental

[7] Regulations must avoid promoting false solutions, (e.g., carbon trading and/or "greenwashed" energy that comes from non-renewable and heavy-polluting sources such as natural gas, biomass, etc.), that will only lead to further burdening our environmental justice communities

[8] "To grave" means that how and where waste from retired zero emission and diesel vehicles is considered in the planning and implementation of zero emission policies and programs.

[9] Renewable energy may have many definitions based on the source of energy. MFN considers solar and wind to be renewable energy. However, there are important EJ and equity implications that come from these "cleaner" energy sources (i.e siting,

justice communities. The EPA and its sister agencies should coordinate with environmental justice leaders in determining the siting details for the supporting electricity infrastructure to ensure that this does not lead to additional cumulative impacts and instead ensure mandatory emissions reductions for EJ communities.

I. The Environmental Justice Community Demands Zero-Emission Solutions for the Heavy-Duty Truck Sector

A. Freight Transportation System imposes Cumulative Impacts on Environmental Justice Communities

The Freight Transportation System Imposes Unacceptable Levels of Cumulative Impacts on Environmental Justice Communities. People who live near freight hubs or "diesel death zones"—including ports, highways, warehouses, and rail and intermodal yards—are disproportionately exposed to high concentrations of pollution from the combined activity of diesel-fueled heavy-duty trucks, equipment, rail, and vessels.[10] Countless studies show that diesel-powered vehicles emit fine particulate matter (PM2.5) and nitrogen oxides (NOx), which lead to numerous adverse health outcomes and even premature death. Additionally, heavy-duty trucks and buses are also a major source of climate-warming greenhouse gas (GHG) emissions.

Unfortunately, a huge number of people in the U.S. are affected by this pollution every day. For example, in 2016, EPA estimated that approximately 39 million people in the United States—mostly low-income people of color—live close to ports and are exposed to elevated levels of diesel pollution.[11] Another 45 million people live within 300 feet of a highway.[12] People of color and low-income households are disproportionately exposed to elevated levels of diesel pollution.[13] Indeed, our health, air pollution, and climate crises are among the most urgent environmental justice issues of our time.

Today, a person's zip code remains the most significant predictor of health and wellbeing. In fact, low-income neighborhoods and communities of color breathe in an average of 28 percent more NOx pollution

manufacturing, shipping, etc). All of these must be considered with EJ leadership before endorsing specific renewable energy recommendations.

10 See, e.g., Loma Linda University, Report, Project ENRRICH: A Public Health Assessment of Residential Proximity to a Goods Movement Railyard, *available at* http://www.aqmd.gov/docs/default-source/clean-air-plans/clean-communities-plan/enrrich_final_report_29may2014.pdf.

11 EPA, National Ports Strategy Assessment, at 1, 4 (Sept. 2016) available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100PGK9.pdf.

12 Office of Transportation and Air Quality. "Near Roadway Air Pollution and Health: Frequently Asked Questions." US EPA, August 2014. https://www.epa.gov/sites/default/files/2015-11/documents/420f14044_0.pdf.

13 ICF International, October 2019; Rosenbaum, Arlene, Seth Hartley, and Chris Holder. "Analysis of Diesel Particulate Matter Health Risk Disparities in Selected US Harbor Areas." American Journal of Public Health 101, no. S1 (December 1, 2011): S217–23. https://doi.org/10.2105/AJPH.2011.300190.

than higher-income and majority white neighborhoods.[14] For residents of environmental justice communities, this means that their lives can be 10-20 years shorter because of environmental pollution, compared to residents in wealthy white communities.[15]

It is well understood that diesel exhaust is "carcinogenic to humans," as determined by the World Health Organization, and leads to tens of thousands of premature deaths each year.[16] Diesel exhaust contains smog precursors, fine particulate matter—which can be inhaled and lodged in the lungs, and more than 40 known cancer-causing compounds.[17] Exposure to pollution from diesel-powered vehicles has also been linked to low birth rate, premature birth, lower IQ, diabetes, stroke, congestive heart failure, heart disease, obesity, asthma, and allergies.[18]

For decades, environmental justice advocates have called for the recognition of these devastating health harms, and an end to the disparate impacts and burdens our communities experience from the freight sector. MFN, its members, and allied organizations have published and contributed to numerous reports highlighting the impacts of freight transportation on frontline communities and workers. These reports include:

- MFN's May 2021 report *Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice*, provides an overview of the health impacts associated with goods movement, and the disproportionate burdens felt by residents that live on the frontlines of polluting ports, warehouses, railyards, and highways, who are largely people of color.[19] The

[14] Mary Angelique G. Demetillo et al., Space-Based Observational Constraints on NO2 Air Pollution Inequality From Diesel Traffic in Major US Cities, Geophys. Research Letters, Vol. 48 No. 17 (Aug. 25, 2021) https://doi.org/10.1029/2021GL094333

[15] https://www.ucsusa.org/resources/environmental-racism-heartland#read-online-content; https://www.today.com/specials/how-zip-code-affects-health-black-women/

[16] https://www.catf.us/2022/01/diesel-pollution-deadly-problem-united-states/, https://phys.org/news/2019-02-pollution-deaths-linked-diesel.html; "Diesel Engine Exhaust Carcinogenic." International Agency for Research on Cancer, World Health Organization, 12 June 2012, www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213_E.pdf; see also Kristina W. Whitworth, Elaine Symanski, and Ann L. Coker, Childhood Lymphohematopoietic Cancer Incidence and Hazardous Air Pollutants in Southeast Texas, 1995-2004, Envtl. Health Perspectives, Vol. 116 No. 11 (Nov. 2008), 1576-1580 (describing cancer risk linked to air pollutants).

[17] Cal. Air Res. Bd., "Summary: Diesel Particulate Matter Health Impacts," (last visited May 4, 2022), https://ww2.arb.ca.gov/resources/summary-diesel-particulate-matter-health-impacts.

[18] Wilhelm, Michelle, et al. "Traffic-Related Air Toxics and Term Low Birth Weight in Los Angeles County, California." Environmental Health Perspectives, vol. 120, no. 1, Aug. 2011, doi:10.3897/bdj.4.e7720.figure2f [exposure linked to low birth weight]; Christopher S. Malley, Johan C.I. Kuylenstierna, Harry W. Vallack, Daven K. Henze, Hannah Blencowe, Mike R. Ashmore. Preterm birth associated with maternal fine particulate matter exposure: A global, regional and national assessment. Environment International, 2017 [exposure linked to premature birth]; Perera, Frederica, et al. "Prenatal Airborne Polycyclic Aromatic Hydrocarbon Exposure and Child IQ at Age 5 Years." Pediatrics, vol. 124, no. 2, Aug. 2009, pp. 195–203, doi:10.1542/peds.2008-3506 [exposure linked to lower IQ]; ZJ, Andersen, et al. "Diabetes incidence and long-term exposure to air pollution: a cohort study." Diabetes Care, vol. 35, no. 1, Jan. 2012, pp. 92-98, doi: 10.2337/dc11-1155 [exposure linked to diabetes]; T., To et al. "Chronic disease prevalence in women and air pollution--A 30-year longitudinal cohort study." Environmental International, vol. 80, July 2015, pp. 26-32, doi: 10.1016/j.envint.2015.03.017 [exposure linked to diabetes, stroke, congestive heart failure, and heart disease in women]; Dong, Guang-Hui, et al. "Ambient Air Pollution and the Prevalence of Obesity in Chinese Children: The Seven Northeastern Cities Study." Obesity, vol. 22, pp. 795-800, doi: doi:10.1002/oby.20198 [exposure linked to obesity in children]; Finkelman, Fred. "Diesel exhaust particle exposure during pregnancy promotes development of asthma and atopy." The Journal of Allergy and Clinical Immunology, vol. 134, issue 1, pp. 73-74, doi: 10.1016/j.jaci.2014.04.002 [exposure linked to development of asthma and atopy].

[19] Moving Forward Network, Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice, available at https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-the-Case_Report_May2021.pdf.

report features frontline voices who are calling for an end to diesel truck pollution, and a full transition to zero-emissions.

- *Environmental Racism in the Heartland, Fighting for Equity and Health in Kansas City*, a report by MFN members Clean Air Now and Union of Concerned Scientists, exposes how concentrated freight transportation and industrial facilities, and a history of racist redlining practices, have combined to create disproportionate pollution exposures for environmental justice communities living in and around Kansas City.[20] The report discusses community efforts to establish an air monitoring network, and recommends policies to advance environmental justice solutions, including a shift to zero emission trucks.

- *Newark Community Impacts of Mobile Source Emissions*, a community-based participatory research study developed with contributions from the New Jersey Environmental Justice Alliance, members of the Coalition for Healthy Ports including Greenfaith, Ironbound Community Corporation, New Jersey Clean Water Action, and the Natural Resources Defense Council, found that the worst pollution hot spots occurred where freight facilities are concentrated, and along truck routes.[21] The study found that electrifying vehicles can lead to significant local benefits, but urged that electrification must occur simultaneously with reductions in power plant pollution, as these facilities are often located in the same areas that are disproportionately impacted by freight.

- *For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing*, published by Warehouse Workers for Justice, describes the heavy toll that a build out of warehouse distribution centers is having on Will County, Illinois. The report describes how pollution burdens fall disproportionately on Black and Latinx residents, and warehouse workers, who are on the frontlines of truck pollution.[22] The report also provides community air monitoring results, finding unhealthy spikes in $PM_{2.5}$ pollution.[23]

Often, freight operations are located in communities that have poor air quality and fail to achieve federal clean air standards. As many as 40 percent of U.S. ports and many other freight facilities are in areas that are not meeting the National Ambient Air Quality Standards for ozone and PM, and freight operations have been identified as major contributors to nonattainment issues.[24] On top of this, these same communities

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[20] Environmental Racism in the Heartland, Fighting for Equity and Health in Kansas City, available at https://www.ucsusa.org/sites/default/files/2021-11/ucs-mr-KC-10.21-Engl-web.pdf.

[21] M.J. Bradley & Associates, Newark community Impacts of Mobile Source Emissions, A Community-Based Participatory Research Analysis (Nov. 2020), at pp. 12-13, https://www.njeja.org/wp-content/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf.

[22] Madison Lisle and Yana Kalmyka, Warehouse Workers for Justice, For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing, at p. 13, https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf.

[23] Madison Lisle and Yana Kalmyka, Warehouse Workers for Justice, For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing, at p. 13, https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf.

[24] Clean Air Act Advisory Committee. "Ports Initiative Workgroup Report: Recommendations for the U.S. EPA." US EPA, September 2016. https://www.epa.gov/sites/default/files/2016-09/documents/ports_workgroup_report_for_epa_9_15_16.pdf; see, e.g., South Coast Air Quality Mgmt. Dist., Proposed Rule 2304 Indirect Source Rule for Commercial Marine Ports Working Group Meeting #1, Powerpoint (Feb. 25, 2022), at p. 2, available at https://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/pr-

suffer from a handful of additional harms from the freight sector: the paved areas and large, low buildings dominating freight facilities contribute to urban heat island effects, stormwater issues and other environmental impacts. Other industrial sources are often clustered near freight facilities, which means that communities impacted by diesel trucks are also impacted by *other* sources of air and water pollution, and toxic releases. These communities also face racism and other forms of discrimination that increase their vulnerability to environmental threats. In fact, freight-impacted communities are even more vulnerable to the impacts of air and other pollution because of socio-demographic stressors—including racial segregation, high rates of poverty, lack of access to affordable foods, and lack of access to healthcare—compared to communities that do not face these stressors.[25]

Add to all of this the reality that these same communities are also most at risk from the coming climate disaster. Today, global freight transport accounts for about 36 percent of overall transportation emissions, which itself accounts for one-quarter of overall CO_2 emissions, and therefore has a direct and significant impact on climate change.[26] Put another way, while road transport makes up only 18 percent of total freight activity, it constitutes more than half of all freight-related CO_2 emissions. So, in addition to the clear need to address the health and air quality issues from the freight industry, there are also massive climate benefits to decarbonizing this sector. In its 2022 report "Zeroing in on Healthy Air," the American Lung Association found that a nationwide transition to zero-emission light-, medium-, and heavy-duty vehicles, powered by non-combustion electricity, would save 110,000 lives and secure $1.2 trillion in public health benefits nationwide from 2020-2050.[27] These are health and economic savings that we cannot afford to waste. Yet this trend is even more worrisome than current figures indicate, since global freight traffic is accelerating substantially and emissions levels are therefore continuing to increase at an alarming rate.

The effects of a growing climate crisis are already being felt by port-adjacent communities in deadly and dangerous ways. These effects range from deadly heat waves, to flooding, to superstorms, and hurricanes.[28] Indeed, storm surge and hurricane events have significantly increased in severity and frequency in recent years. These superstorms, like Superstorm Sandy, have forced port-adjacent communities to confront new issues that are a direct result of an under-regulated freight transportation system.

The science behind cumulative impacts is substantial and growing.[29] In fact, MFN and its members have long pressed the federal government to acknowledge the multiple and thus cumulative environmental threats environmental justice communities face and their heightened vulnerability to those threats. Specifically, these cumulative impact analyses recognize not only that some individuals and communities face more pollution than others, but also that the same amount of pollution can result in more harm to

2304-wgm-no-1_2022-02-25.pdf?sfvrsn=8 (describing the ports of LA and Long Beach as the "single largest fixed source of air pollution in the South Coast Air Basin").

25 Environmental Justice Health Alliance for Chemical Policy Reform, Coming Clean, and Campaign for Healthier Solutions, Life at the Fenceline: Understanding Cumulative Health Hazards in Environmental Justice Communities (Sept. 2018), available at https://new.comingcleaninc.org/assets/media/documents/Life%20at%20the%20Fenceline%20-%20English%20-%20Public.pdf; Rachel Morello-Frosch et al., "Understanding the Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy," Health Affairs 30, no. 5 (2011): 879-998.

26 IEA. "Tracking Transport 2020." IEA, 2020. https://www.iea.org/reports/tracking-transport-2020.

27 https://www.lung.org/getmedia/13248145-06f0-4e35-b79b-6dfacfd29a71/zeroing-in-on-healthy-air-report-2022.pdf

28 https://njadapt.rutgers.edu/docman-lister/resource-pdfs/116-environmental-justice-stakeholder/file

29 Yukyan Lam, Kim Wasserman, Juliana Pino, Olga Bautista, Peggy Salazar and Maria Lopez-Nunez, "Seeing the Whole: Using Cumulative Impacts to Advance Environmental Justice," February 2022, at 9-16 (discussing extrinsic and intrinsic factors).

people facing additional and compounded stressors than to people who do not face such stressors. It also recognizes that these multiple stressors are too often interrelated in their origins. The results are clear—people of color and people with low incomes face some of the highest levels of pollution, and are least equipped to ward off the consequences of this pollution.[30]

For example, a new study released in March 2022 examines the link between port-related traffic and hospital visits for respiratory, heart-related, and psychiatric issues, and concludes that people of color are more vulnerable to health impacts as a result of increased goods movement operations.[31] Adding just one vessel or increasing overall vessel tonnage in a nearby port leads to more than 3 additional hospital visits per year per thousand Black residents, compared to about 1 visit per thousand for white residents in the same area.[32] Relatedly, the study also found that reducing fossil fuel use in ports would significantly reduce air pollution concentration, and have an acute and positive *benefit* to local Black residents.

Moreover, MFN and its members have and continue to emphasize that a cumulative impact framing is so critical because it demonstrates the need to move away from fragmented, limited approaches as "solutions", and towards a more holistic, big-picture approach that will actually be able to address the real-world harms environmental justice communities face.

Yet, despite all these well-documented harms, the freight industry continues to grow rapidly in the very communities that are already overburdened, making it more urgent than ever that we fully and properly address our air pollution and climate crises. In fact, over the last three years, more people in the U.S. have experienced "very unhealthy" or "hazardous" air quality than in the last two decades, and people of color are now 3.6 times more likely than white people to live in a county with failing air quality, according to the American Lung Association.[33]

Likewise, truck traffic at ports, railyards, and warehouses is on the rise due to historic levels of online shopping, e-commerce, and congestion associated with the COVID-19 pandemic. According to the California Air Resources Board (CARB), during the second half of 2021, truck pollution associated with a surge in cargo volumes at the Ports of Los Angeles and Long Beach contributed almost 2 tons of *additional* NOx pollution every single day, on top of the existing emissions associated with business-as-usual cargo volumes prior to the pandemic.[34] Other freight-impacted communities have also seen spikes in activity as the e-commerce industry expands. The American Lung Association found that in the last three years, more US residents experienced "very unhealthy" or "hazardous" air quality than in the last two decades, with people of color 3.6 times more likely than white people to live in a county with failing air quality.[35]

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[30] Yukyan Lam, Kim Wasserman, Juliana Pino, Olga Bautista, Peggy Salazar and Maria Lopez-Nunez, "Seeing the Whole: Using Cumulative Impacts to Advance Environmental Justice," February 2022, at 9-16 (discussing extrinsic and intrinsic factors).

[31] Kenneth Gillingham and Pei Huang, Racial Disparities in the Health Effects from Air Pollution: Evidence from Ports (Mar. 15, 2022), available at https://resources.environment.yale.edu/gillingham/RacialDisparitiesAirPollution.pdf.

[32] Kenneth Gillingham and Pei Huang, Racial Disparities in the Health Effects from Air Pollution: Evidence from Ports (Mar. 15, 2022), at p. 32, available at https://resources.environment.yale.edu/gillingham/RacialDisparitiesAirPollution.pdf.

[33] American Lung Association, 2022 State of the Air, Key Findings, (last visited May 5, 2022), https://www.lung.org/research/sota/key-findings.

[34] Cal. Air Res. Bd., Emissions Impact of Freight Movement Increases and Congestion near Ports of Los Angeles and Long Beach: Jan. 2022 (Jan. 27, 2022 Update), available at https://ww2.arb.ca.gov/sites/default/files/2022-01/SPBP_Freight_Congestion_Emissions_Jan2022.pdf.

[35] American Lung Association, 2022 State of the Air, Key Findings, (last visited May 5, 2022), https://www.lung.org/research/sota/key-findings.

Moreover, critically, the COVID-19 pandemic has escalated the negative consequences from living in a "diesel death zone" or a region with poor air quality. Numerous studies now show that long-term exposure to air pollution makes people more vulnerable to complications and death from COVID-19.[36] That neighborhoods with high proportions of Black and Latinx residents experience disproportionately high levels of air pollution may help explain why these groups have suffered disproportionately from the COVID-19 pandemic.[37] Indeed, a recent study found that Los Angeles neighborhoods with the worst air pollution have experienced a 60 percent increase in mortality from COVID-19 compared to Los Angeles neighborhoods with the best air quality.[38] COVID-19 infections have been known to be more severe for people who are already diagnosed with asthma. A recent study from Harvard University found that a small increase in long-term exposure to PM2.5 leads to a large increase in the COVID-19 death rate.[39] One of the reasons that BIPOC (Black, Indigenous, and people of color) communities, are dying at higher rates from COVID-19 is because of the underlying health conditions like diabetes, heart disease, and asthma, all of which are linked to the disportionately high levels of air pollution in these communities. As Dr. Sacoby Wilson says, "Context matters. Place matters."[40] For EJ communities, place matters, and EPA should only be proposing regulations that guarantee health benefits and emission reductions for overburdened communities, especially as we now have the increased threat from COVID-19.

B. Health Consequences from Freight and Need for Zero Emission Solutions

Zero Emission Solutions Are Widely Available Today, Making These Health Consequences Even More Unconscionable. The electric vehicle landscape has changed dramatically since EPA adopted its Phase 2 GHG rule in 2016, and in astounding ways since EPA last updated its Heavy-Duty NOx standards some twenty years ago. Today, there are already a staggering number of zero-emission heavy-duty models available. In fact, there are over 100 models of battery-electric heavy-duty vehicles available for purchase – nearly twice the amount EPA cited in its Draft Regulatory Impact Assessment (RIA) for this rulemaking.[41,42] Moreover, the EPA's current Notice of Proposed Rulemaking (NPRM) and DRIA fail to cite critical technology developments beyond 2019, even though the battery-electric truck market has seen significant growth since then. A recent market assessment of the medium- and heavy-duty market by analysts at MJ Bradley & Associates examines the in-use truck fleet to assess readiness for adoption of zero-emission trucks.[43] The analysis factors in charging patterns, operating requirements, market status, and the business case. It relies on conservative assumptions (from a 2019 ICF study), but nevertheless, finds that 66% of the truck fleet has "strong potential for near-term [pre-2025] uptake."[44]

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[36] Xiao Wu et al., Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis, 6 Science Advances 45 (2020), https://projects.iq.harvard.edu/covid-pm.

[37] Jonah Lipsitt et al., Spatial analysis of COVID-19 and traffic-related air pollution in Los Angeles, 153 Env't Int'l. 106531 (Aug. 2021), https://doi.org/10.1016/j.envint.2021.106531.

[38] Id.

[39] Fine particulate matter and COVID-19 mortality in the United States, a national study on long-term exposure to air pollution and COVID-19 mortality in the United State, https://projects.iq.harvard.edu/covid-pm/home

[40] https://e360.yale.edu/features/connecting-the-dots-between-environmental-injustice-and-the-coronavirus

[41] US Department of Energy - https://afdc.energy.gov/vehicles/search/

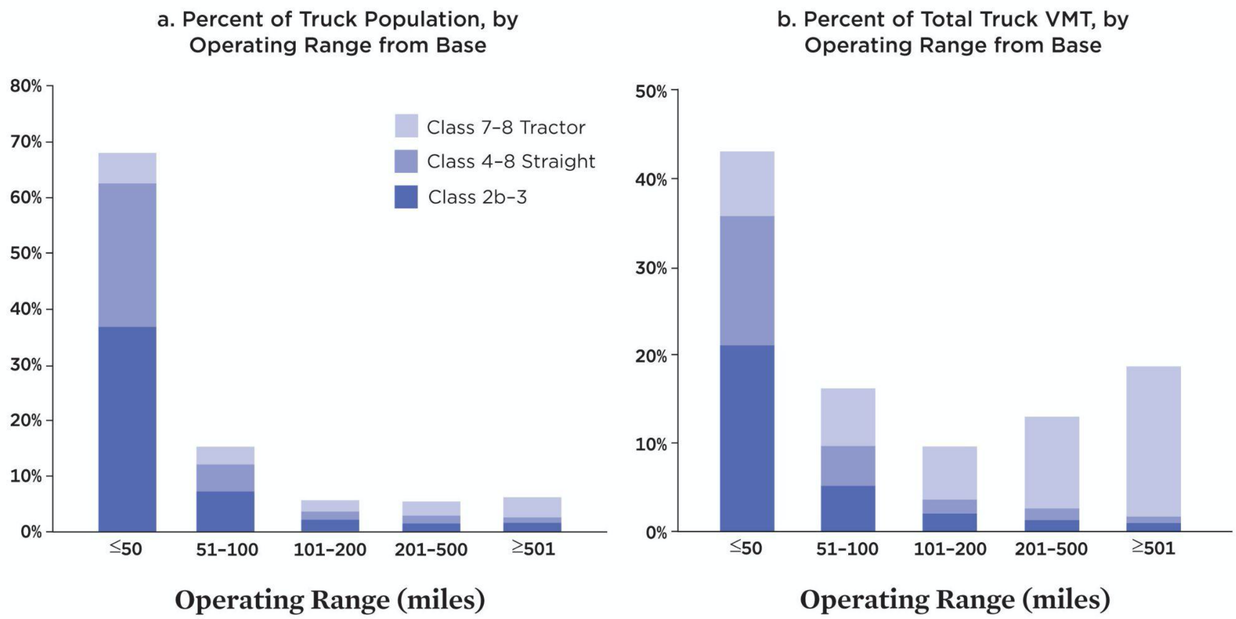
[42] Draft Regulatory Impact Analysis p. 57

[43] MJ Bradley, Market Medium- and Heavy-Duty Vehicle Market Structure and EV Readiness (July 2021) https://www.mjbradley.com/reports/medium-heavy-duty-vehicles-market-structure-environmental-impact-and-ev-readiness.

[44] Id.

According to the US Census Bureau's Vehicle In-Use Survey, 70 percent of HD vehicles travel less than 50 miles daily, meaning that range is not the concern it once was.[45] EPA correctly notes in the DRIA that urban delivery vehicles are fully primed for electrification, but fails to recognize that the potential to employ zero-emissions regional haul tractors and vocational trucks also exists today as a result of advances in battery technology and new availability of suitable models.[46]

Figure 1. Operating range of heavy-duty trucks[47]



Many heavy-duty trucks operate within 100-mile ranges (left), and many vehicle miles traveled (VMT) are attributable to trucks with operating ranges less than 100 miles (right). These trucks are particularly well-suited to early electrification efforts.

Fleet operators and truck manufacturers *themselves* are already transitioning to zero-emissions trucks. Indeed, industry is well ahead of most states, and especially the federal government, in terms of zero-emission heavy-duty truck adoption. This transition is significant, and speaks to the technical feasibility and availability of zero-emission trucks today—yet this reality is not reflected in EPA's current proposal. Well-established truck manufacturers like Daimler Trucks[48] and Volvo[49] are preparing for a clean transportation future by shifting to a fully zero-emissions product line by 2040 and models from newcomers like Nikola, Rivian, and Tesla are beginning to hit the roads. Amazon made headlines with its order for some 100,000 Rivian electric delivery vans and several of the nation's largest fleet owners including PepsiCo, Walmart,

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[45] US Census: https://www2.census.gov/library/publications/economic-census/2002/vehicle-inventory-and-use-survey/ec02tv-us.pdf
[46] Draft Regulatory Impact Analysis p. 54-55
[47] Figure from O'Dea, J. 2019. "Ready for Work," Union of Concerned Scientists. https://www.ucsusa.org/resources/ready-work. Data source is US Census Bureau (USCB). 2004. Vehicle Inventory and Use Survey. Washington, DC.
[48] Daimler Press Release: https://www.daimlertruck.com/innovation/efficient-emission-free/co2-neutral-transport.html
[49] Volvo Press Release: https://www.volvotrucks.com/en-en/news-stories/insights/articles/2021/apr/electric-trucks-may-go-mainstream-sooner-than-you-think-here-is-why.html

and JB Hunt have piloted and placed orders for electric tractor and delivery trucks.[50,51,52] Sysco, one of the largest food distribution companies in the world, has pledged to electrify 35 percent of its tractor fleet by 2030.[53]

To be sure, these companies are not transitioning to electric vehicles out of a sense of altruistic social and environmental responsibility – electric heavy-duty vehicles offer significant economic upsides for fleets. While the initial purchase cost for most zero-emissions models is currently higher than their combustion counterparts, their total lifetime costs can be lower in many use cases today. "The industry is moving quickly to deploy new technologies and the lifetime cost parity of HDEVs are rapidly approaching that of their combustion counterparts."[54]

As battery prices continue to decline, so will the upfront cost of electric trucks, furthering the cost parity for zero-emissions models. A February 2022 study from Roush Industries shows that electric class 5 delivery trucks will have the most favorable total cost of ownership (TCO) in the next two years, well before the first compliance period under the proposed regulation. Similarly, a total cost of ownership study by CARB, found that by 2030, ZEVs would be cheaper than diesel across every vehicle type examined, including Class 8 Sleeper Cabs, even while accounting for the costs associated with infrastructure and excluding rebates and incentives. The Department of Energy's own cost analysis (released the same day as EPA's draft rule) concluded that ZEVs can reach TCO parity with conventional diesel vehicles "by 2035 for all medium and heavy-duty (MD/HD) vehicle classes (without incentives)."[55] DOE concluded that if *economics alone* drove adoption, ZEVs could reach 42% of all MD/HD trucks by 2030.

Electric trucks have significantly reduced operating and maintenance costs compared to diesel trucks – over 50 percent in some cases.[56] Furthermore, the cost of electricity is far more stable than that of oil, which gives fleet operators more certainty in planning their business. Instead of worrying about the volatility of fossil fuels from geopolitics, our nation's trucks can do what they do best – deliver goods and services.

Advancements in zero-emission truck technology are being propelled by state-level ambition to tackle freight-related pollution. Six states that make up at least 17 percent of the U.S. medium- and heavy-duty vehicle market share have already adopted California's Advanced Clean Trucks (ACT) rule – a manufacturer requirement to increase ZEV sales to between 30-50 percent by 2030 and 40-75 percent by 2035, depending on vehicle class. In addition, 17 states and the District of Columbia (D.C.) – which make up 30 percent of the U.S. medium- and heavy-duty vehicle market share – signed a memorandum of understanding to achieve 100 percent zero-emission truck and bus sales by 2050, with an interim target of 30 percent ZEV sales by 2030.[57] According to a recent analysis by ERM, if all the MOU states adopted the

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50 https://www.transportdive.com/news/pepsi-pepsico-electric-trucks-ev/619236/

51 https://corporate.walmart.com/newsroom/2020/09/21/walmarts-regenerative-approach-going-beyond-sustainability

52 https://www.jbhunt.com/content/dam/jbhunt/jbh/corporate-responsibility/documents/210714_ESG_EnvironmentalSummary.pdf

53 https://www.sysco.com/dam/Sysco/About/Corporate-Social-Responsibility/Sysco-2021-Corporate-Social-Responsibility-Report.pdf

54 NRDC blog: https://www.nrdc.org/experts/patricio-portillo/epa-its-time-act-we-need-clean-trucks-now

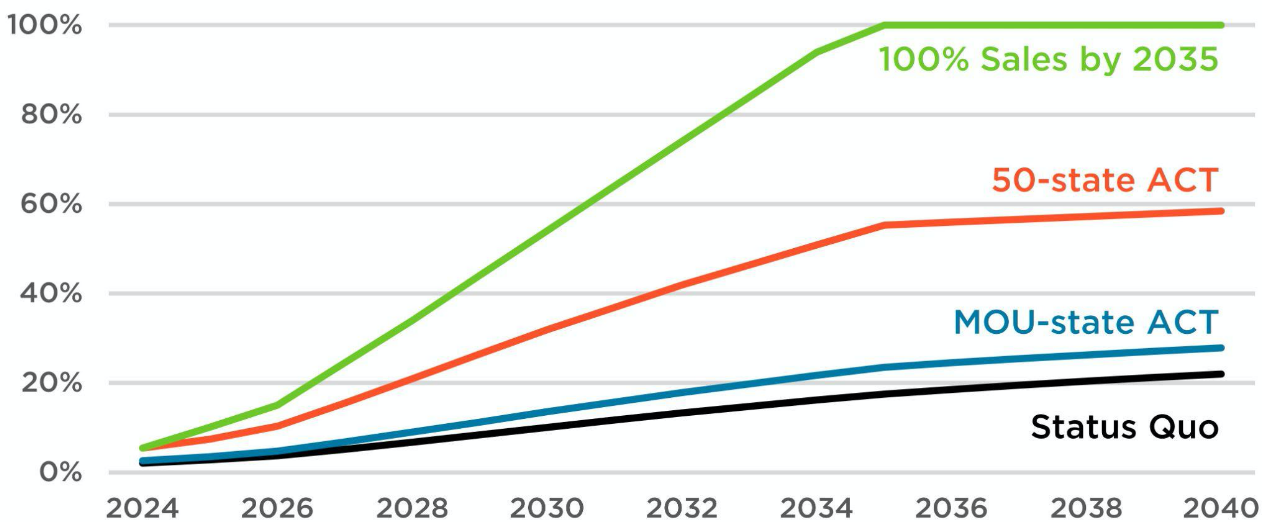
55 Catherine Ledna et al., Decarbonizing Medium & Heavy-Duty On-Road Vehicles Cost Analysis (Mar. 2022) https://www.nrel.gov/docs/fy22osti/82081.pdf at 2.

56 Roush Industries Inc., Table 67: https://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf

57 NESCAUM Medium- and Heavy-Duty Zero-Emission Vehicles: Action Plan Development Process:

ACT rule, 27 percent of the Class 4-8 U.S. fleet would transition to ZEV by midcentury.[58] While state ACT rule adoption is important, complementary federal action is critical to help address the remaining three-quarters of the fleet that must transition to ZEVs. These state actions demonstrate the feasibility of requiring zero-emission trucks but cannot move the nation forward on electrification alone – an analysis completed by the Union of Concerned Scientists (UCS) estimates that ZEVs will account for roughly 1 in 8 of national heavy-duty sales in 2030 if all California ZEV Standard states adopt the ACT. Other projections, like that from IEA's Global EV Data Explorer, confirm this insufficient sales share, with HD ZE trucks at around 7 percent in 2030 without federal intervention.[59] The same analysis completed by UCS shows that, if EPA adopted modest sales requirements like the ACT, it would more than double the anticipated market share for electric heavy-duty trucks (Figure 2).

Figure 2. Heavy-duty zero-emission truck marketshare in the United States under representative policy cases



Estimate of the share of new truck sales driven under different state and federal ZEV policy requirements under a conservative assessment of status quo market adoption.[60] *While state commitments are helping to drive the HDZEV market, even a nationwide adoption of the ACT would fall short of the level of sales needed to meet climate, health, and equity goals*

Throughout EPA's technological and market assessments in the NPRM and DRIA, the Agency notes the varying outlooks for HDZEV adoption in the coming years. What it does not do, however, is recognize that federal regulations, including mandates and incentives, are key to accelerating the national HDZEV

https://www.nescaum.org/documents/medium-and-heavy-duty-zero-emission-vehicles-action-plan-development-process/

58 Robo, E., D. Seamonds, and M. Freeman. 2022. Federal Clean Trucks Program: An analysis of the impacts of low-NOx and zero-emission medium- and heavy-duty trucks on the environment, public health, industry, and the economy. Report developed by ERM for the Natural Resources Defense Council and the Union of Concerned Scientists. ("ERM report")

59 IEA Global EV Data Explorer: https://www.iea.org/articles/global-ev-data-explore

60 IEA World Outlook 2021: https://www.iea.org/reports/world-energy-outlook-2021

market.[61,62] This is despite some of the key literature relied upon in the DRIA pointing towards the inclusion of government actions in rapid technology and adoption scenarios.[63] EPA cannot afford to waste this consequential opportunity to accelerate the market for HDZEVs within this rulemaking. It is beyond time for EPA to be part of the solution.

EPA requested how to *best consider the potential for ZEV technologies to significantly reduce air pollution from the heavy-duty vehicle sector*.[64] Put simply, vehicle electrification is the best method for controlling nitrogen oxide pollution from heavy-duty vehicles over the long term. Compliance for this rulemaking begins in MY 2027, roughly four years from its anticipated promulgation. HDZEVs have seen rapid technological growth and significant cost reductions over the past four years, and these are likely to accelerate even further in the near term. By excluding HDZEVs as the centerpiece of this regulation, EPA is all but guaranteeing that the regulation will be outdated before the first compliance period even begins.

II. EPA's Criteria Pollution Standards Must Require Feasible Zero-Emission Truck Technologies

The following section describes how ZE truck requirements must be properly incorporated into the final rule to meet the Clean Air Act's technology forcing mandate for criteria pollution standards. EPA's failure to require this available cleaner technology is unconscionable given the impacts in freight-adjacent communities and will actually undermine combustion engine emission reductions.

EPA's proposed NOx emission standards violate the law and must be fixed in this rulemaking. The Clean Air Act requires EPA to adopt "technology-forcing" standards to regulate emissions of NOx, carbon monoxide, hydrocarbons, and particulate matter from heavy-duty vehicles and engines. 42 U.S.C. § 7521(a)(3). As courts have explained, EPA cannot satisfy this mandate by adopting status quo standards. EPA's NOx emission standards should "project future advances in pollution control capability . . . [and] press for development and application of improved technology rather than be limited by that which exists today." *Nat. Res. Def. Council v. EPA,* 655 F.2d 318, 328 (D.C. Cir.1981) (quoting S.Rep. No. 91-1196, at 24 (1970) S.Rep. No. 91-1196, at 24 (1970)). The Act contemplates strong action to "force substantial change on the status quo on an industry-wide basis." *Cent. Valley Chrysler-Jeep, Inc. v. Goldstene*, 529 F. Supp. 2d 1151, 1178 (E.D. Cal. 2007), *as corrected* (Mar. 26, 2008). Specifically, the Act mandates that these regulations "shall contain standards which reflect the greatest degree of emission reduction achievable" by applying technology which "the Administrator determines will be available for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology." *Id.* § 7521(a)(3)(A)(i). Importantly, the "overriding

61 *Ibid.*

62 Resources for the Future, An Analysis of US Subsidies for Electric Buses and Freight Trucks - https://www.rff.org/publications/issue-briefs/an-analysis-of-us-subsidies-for-electric-buses-and-freight-trucks/

63 National Renewable Energy Laboratory, Electrification Futures Study, p. 3: https://www.nrel.gov/docs/fy18osti/70485.pdf

64 87 FR 17420

goal" of section 202 is addressing air quality and public health. *Husqvarna AB v. EPA*, 254 F.3d 195, 200 (D.C. Cir. 2001).[65] "[T]he other listed considerations, while significant, are subordinate to that goal." *Id.*

In light of this clear directive, EPA must revise its proposed NOx standards because neither Option 1 nor Option 2 come close to meeting this statutory obligation. MFN urges EPA to adopt a zero-emission NOx standard that appropriately reflects not merely the current and projected availability of zero-emission heavy-duty truck technology across the United States, but a level of transition to ZE truck technologies that is technologically feasible. The Clean Air Act plainly authorizes EPA to propose stringent NOx emission standards that rely on a reasoned prediction that a particular control technology "will be available for the model year to which such standards apply," so long as this prediction is supported by substantial evidence. *Id.* at 331-32; 42 U.S.C. § 7521(a)(3). EPA can demonstrate the reasonableness of its technology projections where it "answers any theoretical objections to the technology, identifies the major steps necessary for development of the technology, and gives plausible reasons for its belief that the industry will be able to solve these problems in the time remaining." *Nat. Res. Def. Council*, 655 F.2d at 331-32. Critically, EPA is "not required to rebut all speculation that unspecified factors may hinder 'real world' emission control." *Nat. Res. Def. Council v. Thomas*, 805 F.2d 410, 434 (D.C. Cir. 1986) (quoting *id.*, 655 F.2d at 334). EPA has made such forward-looking predictions that certain technology will be available, and should do so again here. *See, e.g.*, *Husqvarna AB*, 254 F.3d at 201 ("Substantial evidence . . . supports EPA's determination that the continued rapid development of engine technologies makes it probable that [specified engine technologies] will enable manufacturers to comply with the emission standards within the phase-in period.").

A. The final Rule should require Zero-Emission truck sales.

"EPA requests comment on whether and how to consider including specific sales requirements for ZE trucks." (87 FR 17420)

MFN urges EPA to finalize standards that include a separate standard for ZE trucks and require an increasing annual minimum number of ZE truck sales.[66] Studies have consistently found that clear regulatory market signals are necessary to spur investment in the manufacturing, supply chains, and supporting infrastructure necessary to support the transition to ZE vehicles. A study of California's transportation policies points to the ZEV sales requirement as sending a strong "signal, effectively channeling innovation activities towards ZEV development and increasing the availability of ZEVs for sale, where supply constraints have proven to be a major barrier to widespread uptake."[67] Multiple forward-looking models confirm that stringent ZEV mandates can play a large role in reducing emissions in the

[65] While Husqvarna AB relates to Section 213 of the Clean Air Act, the court's conclusions are just as relevant here because the statutory text of Section 213 and Section 202 are almost identical, and the court itself relied on cases interpreting the Section 202 language to support its analysis. Husqvarna AB, 254 F.3d at 201.

[66] The preamble explains that EPA is not proposing this sort of sales mandate but EPA's invitation for comment on sales requirements, and the overwhelming public testimony on such sales requirements suggest such requirements are well understood to be within the ambit of options for the final rule. *See, e.g.*, *Nat'l Mining Ass'n v. Mine Safety & Health Admin*, 512 F.3d 696, 699 (D.C. Cir. 2008); *City of Portland v. EPA*, 507 F.3d 706, 715 (D.C. Cir. 2007); *Ariz. Pub. Serv. Co. v. EPA*, 211 F.3d 1280, 1299 (D.C. Cir. 2000).

[67] John Axsen et al., Crafting strong, integrated policy mixes for deep CO2 mitigation in road transport Nature Climate Change (Aug 24, 2020) https://doi.org/10.1038/s41558-020-0877-y.

U.S.[68] Noting the clear evidence of ZEV mandates' effectiveness in the passenger vehicle space in California, researchers advised: "ZEV mandates should also be more actively considered for freight, drawing inspiration from California's recent [Advanced Clean Trucks] policy."[69]

Clear regulatory requirements prime the investment pump and can bring ZE truck production to scale, which in turn will advance technologies and drive down prices in a virtuous feedback loop.[70] California's experience just in *developing* the sales requirements of the Advanced Clean Truck rule was to see a rapid increase in the commercialization of ZE trucks, reinforced with strong fleet commitments to purchase the required ZE trucks and improved planning for the buildout of supporting charging infrastructure. Within the course of the CARB's rulemaking for the Advanced Clean Trucks rule, new manufacturer announcements enabled CARB staff to revise upward their ZEV targets for manufacturers.[71] In their updated analysis on increasing sales requirements, Staff noted that "the large number of ZEVs launched before the regulation begins [and] the more established ZEV marketplace…support higher ZEV sales requirements in the earlier years and is consistent with Board direction and many public comments seeking to increase the number of ZEVs deployed."[72] Having a separate requirement for the deployment of ZE trucks also ensures that the transition to ZE trucks does not undermine the stringency of combustion standards.

Manufacturers have acknowledged that the transition to ZE trucks is underway (press release pages for major truck manufacturers are dominated by news and stories about their electric trucks[73]). Industry experts testing ZEV trucks in real-world demonstrations concluded that "four market segments – vans and step vans, medium-duty box trucks, terminal tractors, and heavy-duty regional haul tractors – are ready to go electric," and specifically, that "half of heavy-duty regional haul tractors are electrifiable now." [74] As documented extensively in the previous section, there is widespread agreement, confirmed across multiple independent analyses, that these trucks already represent lower total costs of ownership in a large share of use cases.[75]

But the transition to ZE trucks is not happening at the pace necessary to address the public health crises created by truck pollution. As the Department of Energy's study highlights, "it is possible that demand for

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68 See, e. g. J.B. Greenblatt, Modeling California policy impacts on greenhouse gas emissions (Feb. 2015) https://escholarship.org/uc/item/9n62b5xv; and David Greene et al., Public policy and the transition to electric drive vehicles in the U.S.: the role of the zero emission vehicles mandate (Dec. 2014) https://doi.org/10.1016/J.ESR.2014.10.005.

69 John Axsen et al., Crafting strong, integrated policy mixes for deep CO2 mitigation in road transport Nature Climate Change (Aug 24, 2020) https://doi.org/10.1038/s41558-020-0877-y.

70 "[A ZEV mandate] sends the strongest transformational signal of all the policies examined, receiving a score of 5/5. As a regulatory policy, it is likely to be reasonably durable and it also provides clear directionality with respect to investment in PEVs" Noel Melton et al., Which plug-in electric vehicle policies are best? A multi-criteria evaluation framework applied to Canada (Dec. 2019) https://doi.org/10.1016/j.erss.2019.101411.

71 CARB, Updated Analysis Regarding Increased Manufacturer Zero-Emission Vehicles Sales Requirements – Attachment B (2019) https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/30dayattb.pdf

72 CARB, Updated Analysis Regarding Increased Manufacturer Zero-Emission Vehicles Sales Requirements – Attachment B (2019) https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/30dayattb.pdf

73 See, e.g., Volvo, "News and Stories" https://www.volvotrucks.com/en-en/news-stories.html; Daimler, "Global Media Site" https://media.daimlertruck.com/marsMediaSite/en/instance/ko/Start.xhtml?oid=4836258; Traton, Press Releases" https://traton.com/en/newsroom/press_releases.html;

74 NACFE, Electric Trucks Have Arrived, Documenting a Real-World Electric Trucking Demonstration (Jan 2022) https://nacfe.org/heavy-duty-regional-haul-tractors/.

75 CARB, Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document (Sept. 2021) https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf.

ZEVs could rise rapidly in MD/HD trucks once cost parity is reached" but "manufacturing capacity…will need to increase commensurately to support vehicle adoption."[76] Conventional manufacturers are incentivized to extend production of combustion trucks on existing manufacturing lines as long as possible to maximize the return on those old investments.[77] Their current business model also relies on selling diesel trucks at a low cost with lucrative service and maintenance agreements.[78] Setting a strong, feasible sales target in the final rule is critical to accelerate the transition to ZE trucks. The aforementioned ERM report found that a national ZEV sales requirement–with a schedule commensurate with the ACT rule–would result in 45 percent of the Class 4-8 fleet turning over to ZEV by 2040 and 73 percent by 2050.[79]

In terms of *how* to include a sales requirement, MFN recommends setting a separate ZE truck standard and phasing that standard in over time.[80] This proposal is separate and additive to EPA's heavy-duty combustion engine requirements to ensure maximum emission reductions are achieved from new combustion engines. This structure is the preferred pathway to getting to zero-emissions, as it guarantees emission reductions from both the combustion engines and deployment of ZEVs. It also provides certainty to the market by identifying a clear schedule for the percentage of ZEVs that must be sold nationally. This market signal can help unlock additional resources from the public and private sector, such as charging infrastructure investments. By separating ZEV requirements from combustion engine requirements, this structure also avoids promoting "false solution fuels" such as natural gas vehicles.

The proposal currently sets standards for all trucks, including ZE trucks, *see* NPRM at 17458 (noting proposed 40 CFR 1036.104), but does not set the ZE standards based on what is achievable by ZE technology. The proposed standards are indefensible under the CAA because they fail to set standards that reflect the greatest degree of emission reductions achievable by ZE trucks and allow ZE trucks to undermine the greatest degree of emission reductions achievable by combustion engine vehicles. The appropriate criteria pollutant standard for ZE trucks is 0 g/hp-hr. EPA should set a ZEV standard and phase that standard in, over time. similar to EPA's approach for phasing in the Tier 2 standards for small volume manufacturers of light duty vehicles and trucks. *See* 40 C.F.R. § 86.1811–04(k).

MFN believes 20 percent of new sales in model year 2027 being ZEV is a feasible target, and that those targets can reasonably increase 10 percent each year, such that 50 percent of sales would need to meet the ZEV standard in model year 2030, and 100 percent by model year 2035. To comply with the stability requirements of Clean Air Act section 202(a)(3)(C), EPA could finalize a phase-in schedule using the three-year average sales target, and increase that target every three years in line with a 100% target beginning

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[76] Id. at 3.

[77] See, e.g., Peter Wiedenhoff et al., "What the Shift to Zero-Emission Vehicles Means for Commercial Transportation" (Mar. 22, 2022) https://www.bcg.com/en-us/publications/2022/what-the-shift-to-zero-emission-vehicles-means-for-commercial-transportation ("Most incumbents face the dual challenge of ensuring that their existing businesses remain profitable even as they tackle the investment-heavy challenges of developing electric powertrains.")

[78] See, e.g. McKinsey&Company, Route 2030 – A Regional View of Truck Industry Profit Pools (Dec. 2018) at 7 ("[o]ur research reveals that advanced markets already exhibit greater profitability in aftersales than in new truck sales.") https://www.mckinsey.com/~/media/mckinsey/industries/automotive%20and%20assembly/our%20insights/a%20regional%20view%20of%20truck%20industry%20profit%20pools/a-regional-view-of-truck-industry-profit-pools-web-final.pdf .

[79] Robo et al. 2022.

[80] For another example of a similar regulatory design, see Ray Minjares and John Hannon, ICCT, "Briefing: Adapting US heavy-duty vehicle emission standards to support a zero-emission commercial truck and bus fleet" at 6-7 (Feb. 2020) (describing Dual Averaging Sets option) (available at: https://theicct.org/wp-content/uploads/2022/02/HDV-US-adapting-vehicle-emission-stds-zero-emission-commercial-truck-bus-fleet-feb22.pdf). The key to whatever design option EPA chooses is to ensure that the standard provides a clear signal to manufacturers that they must begin ramping up production of ZE trucks, and that by 2035 the expectation is that all trucks can and will be zero-emissions.

model year 2035. Thus, the first round of the ZEV standard would apply to 30% of sales for MY 2027-2029.

This initial round is consistent with the targets adopted by California, New York, New Jersey, Massachusetts, Washington and Oregon in the Advanced Clean Truck Rule, which requires between 15 and 30% of truck sales to be ZEVs between MY 2027-2029.[81] It is in line with deployment rates projected in Europe[82] and truckmakers' own voluntary commitments there to sell 100% zero-emission vehicles by 2040.[83] Moreover, the fleet operators that are members of the Corporate Electric Vehicle Alliance have already made commitments to purchase 330,000 commercial ZEVs, which would represent roughly 9 percent of truck sales over the first three-year compliance period of MY27-MY29.[84]

B. Barring a specific requirement for ZE trucks, EPA must lower the NOx standard to reflect feasible ZE trucks sales.

If EPA insists on retaining ZE trucks in a vehicle NOx standard,[85] EPA must lower the NOx standard to reflect the greatest degree of emission reductions achievable across the entire truck fleet based on the feasibility of widespread transition to ZE trucks. As discussed further below, the current proposed NOx standards, even under the more stringent Option 1, do not reflect the greatest degree of emission reductions achievable even looking only at feasible *combustion* technologies. The addition of ZE trucks to the compliance average entirely undermines any claim that the standards meet the technology-forcing requirements of the Act.

As noted above, there is ample evidence to expect that by model year 2027, 20 percent of new truck sales could be ZE trucks, and that number could increase year-over-year by roughly 10 percent to reach 100 percent by 2035. EPA's truck-wide standard therefore should be reduced to account for this feasible growth in ZE truck sales. Using 0.02 g/hp-hr as the conservative starting point for the emissions achievable by combustion engines (as noted, MFN believes even lower emissions are feasible), the combined standard for MY2027 should be no higher than 0.016 g/hp-hr to reflect that 20 percent of sales could feasibly be met with ZE trucks. To address stability requirements, EPA should set three-year standards that reflect the three-year average of projected ZE sales. Thus, for model years 2027 through 2029, EPA should assume an average of 30 percent ZE sales and set the three-year average standard at 0.014 g/hp-hr.

To safeguard against potential underestimates of ZE truck sales under this approach, EPA must also significantly and progressively lower the FEL cap to ensure combustion engine families continue to utilize state-of-the-art technologies.

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[81] Claire Buysse et al., California's Advanced Clean Trucks regulation: Sales requirements for zero-emission heavy-duty trucks (July 2020) at 9 https://theicct.org/sites/default/files/publications/CA-HDV-EV-policy-update-jul212020.pdf.

[82] "If Europe can deliver on its green Deal, with emission-cut targets rising to around 50% in 2030, the demand for green trucks will rise to as much as 50% of all the new ones sold." Peter Wiedenhoff et al., "What the Shift to Zero-Emission Vehicles Means for Commercial Transportation" (Mar. 22, 2022) https://www.bcg.com/en-us/publications/2022/what-the-shift-to-zero-emission-vehicles-means-for-commercial-transportation.

[83] ACEA – PIK, Joint Statement – The Transition to Zero-Emission Road Freight Transport (Dec. 2020) https://www.acea.auto/files/acea-pik-joint-statement-the-transition-to-zero-emission-road-freight-trans.pdf.

[84] CERES, "Major companies with large fleets release new electric vehicle 'blueprint' for car and truck manufacturers" (Jan 20, 2022) https://www.ceres.org/news-center/press-releases/major-companies-large-fleets-release-new-electric-vehicle-blueprint-car.

[85] EPA's proposed regulations label 40 C.F.R. Part 1036 as standards for heavy-duty "engines," but as EPA clarifies in the preamble, the standards for all regulated pollutants apply to all heavy-duty vehicle types including EVs. See 87 Fed. Reg at 17457-58.

C. Unless EPA intends to drive ZEV adoption, ZEV credits must be excluded from the NOx compliance calculation.

Given the myriad risks posed by EPA's proposed averaging scheme, if EPA refuses to adopt more stringent standards that reflect the feasibility of achieving significant emissions reductions through the application of ZE truck technologies, EPA must remove ZEV credits from the NOx compliance calculations. The current proposal fails to properly account for the on-going transition to ZEVs and the feasibility of ZEVs as NOx reduction technology, while allowing ZEV to undermine an already weak combustion engine standard. Consequently, the combustion engine standard will weaken over time as more ZEV are sold due to state policies and market economics. EPA cannot defend the inclusion of these credits with either Option 1 or Option 2 as meeting the requirements of the Act. Unless EPA intends to accelerate ZEV adoption, ZEV credits must be excluded from the NOx compliance calculation.

III. Stronger Combustion Engine Standards for Criteria Pollutants are Feasible and Required Under the Clean Air Act

EPA acknowledges that Option 1 of the proposed Criteria Pollutant Program is the strongest of the two co-proposals it is considering and claims that setting the level of standard outlined in Option 1 would be consistent with the agency's statutory authority.[86] However, even Option 1 contains glaring deficiencies, including failing to match the stringency of state trucks standards in the Heavy-Duty Omnibus (Omnibus) rule, improperly incorporating ZEV, excessive family emission limit (FEL) caps, and enabling false solutions through early crediting.

Meanwhile, Option 2 is woefully inadequate and does not warrant serious consideration. By EPA's own analysis, "Option 1 may be a more appropriate level of stringency, as it would result in a greater level of achievable emission reduction." Option 2 underperforms on all meaningful public health, environmental, and economic metrics and would be a disaster if adopted.

A. Aligning with the Heavy-Duty Omnibus Rule

Option 1 should immediately harmonize with state action in model year (MY) 2027. Instead of allowing a four-year delay in matching state-level stringency, Option 1 should immediately impose a NOx emission standard of 0.02 g/bhp-hr for spark ignition, light-, medium-, and heavy- duty engines through intermediate useful life and a 0.035 g/bhp-hr for heavy heavy-duty engines from intermediate useful life to full useful life.

Delaying alignment with the cost-effective Omnibus rule unnecessarily allows dirtier engines to continue to be sold, knowing they will stay on our roads for decades, denying life saving emissions reductions. The most stringent standard – already adopted by three states and being pursued by several more – must be immediately phased-in at the start.

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[86] 87 Fed. Reg. at 17436.

"We request comment on our proposal, including whether it is appropriate to fully harmonize the federal and CARB regulatory useful life periods in light of the authority and requirements of section 202, and any concerns if EPA were to finalize values that are or are not aligned with CARB for a given engine class or range of model years." (87 FR 17500)

EPA has not adequately explained its deviation from the standards of the Omnibus rule. While disparity between the rules may pose some challenge for manufacturers, central import is that EPA upholds its requirements under Section 202(a) of the Clean Air Act, to promulgate "standards which reflect the greatest degree of emission reduction achievable." In deviating from the Omnibus program, EPA has deviated from years of studies providing robust evidence supporting stronger standards.

EPA has erroneously set a standard of 35 mg/bhp-hr NO_X on the FTP/SET cycle for light-heavy- and medium-heavy-duty diesel (LHDD and MHDD) and heavy-duty Otto-cycle (HDO) engines. This standard is inconsistent with EPA's own data on the capability of these engines, in addition to the requirements of the Omnibus.

The proposed full useful life (FUL) of LHDD engines is 190,000 miles in 2027 and 270,000 miles in 2031. The proposed FUL of MHDD engines is 270,000 miles in 2027 and 350,000 miles in 2031. At 435,000 miles of accelerated aging, the SwRI demonstration of the Phase 3 RW system achieved a 20 mg/bhp-hr level of NO_X emissions on the FTP cycle, 17 mg/bhp-hr on the SET, and just 29 mg/bhp-hr on the LLC (Draft RIA Table 3-8). This level of aging (435,000 miles) exceeds the level of deterioration of even the 2031 FUL for either engine.

EPA's proposed stringency for LHDD and MHDD engines exceeds the feasibility demonstrated at SwRI by 75 percent on the FTP cycle (35 compared to 20 mg/bhp-hr), 106 percent on the SET cycle (35 compared to 17 mg/bhp-hr), and 210 percent on the LLC cycle (90 compared to 29 mg/bhp-hr). Such levels well exceed any reasonable compliance margin, and the agency has not explained anywhere its rationale for such gross differences. Perhaps even more evidence of its error is that its proposed 2031 standards are much more consistent with the available data, aligning with the Omnibus standards of 20 (FTP), 20 (SET), and 50 (LLC) mg/bhp-hr. This discrepancy between the 2027 and 2031 capabilities for LHDD and MHDD engines, is unaccounted for in both the Draft RIA or NPRM and is particularly surprising given the extended FULs in 2031 for these engines.

While the demonstration engine was a heavy-heavy-duty diesel (HHDD) engine, this cannot explain the gross error in EPA's proposal. Other demonstration projects on an MHDD engine were able to achieve the 20 mg/bhp-hr FTP standard.[87] Moreover, EPA's data shows relatively similar behavior across engine sizes when appropriately normalized.[88]

EPA's data on HDO engines shows that the best-performing 2019 gasoline-powered engines are already certified below the proposed Option 1 standard, with significant room for improvement according to the agency itself.[89]

Given the proposed FUL schedule, EPA should align its numerical stringency in 2027 with its values in 2031, which would thus align with the Omnibus and the available evidence.

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[87] Dhanraj, F., Dahodwala, M., Joshi, S., Koehler, E. et al., "Evaluation of 48V Technologies to Meet Future CO2 and Low NOx Emission Regulations for Medium Heavy-Duty Diesel Engines," SAE Technical Paper 2022-01-0555, 2022, doi:10.4271/2022-01-0555.

[88] Draft RIA, Table 3-21

[89] Draft RIA, Tables 3-35 and 3-40 (Demonstration Program).

California engaged in an extensive, multi-year process with significant stakeholder engagement to justify its Omnibus standards. Much of this work was done in collaboration with EPA—as such, the agency should be well apprised of the latest available technologies to reduce emissions from diesel engines. Generally, we find the agency's Draft RIA to reflect up-to-date information on technical potential. Unfortunately, not all of that work appears to be reflected in its feasibility analysis. Below, we assess some deficiencies in the agency's analysis and include additional references to support stronger emissions reductions requirements from conventionally powered trucks.

B. EPA's Technical Capability to Reduce Diesel Engine Emissions

"We request comment on all aspects of the proposed Options 1 and 2, or other alternatives roughly within the range of options covered by the proposed Options 1 and 2, including the revised emission standards and useful life and warranty periods, one and two-step approaches, model years of implementation and other provisions described in this proposal. Based on currently available information, in order to consider adopting the Alternative in the final rule, we believe we would need additional supporting data or other information to be able to conclude that the Alternative is feasible in the MY 2027 timeframe." (87 FR 17421)

EPA's rule stringencies do not fully reflect the technological capability to reduce emissions of nitrogen oxides from conventionally powered vehicles in the timeframe of this rule. The co-proposed options considered by EPA (Options 1 and 2) are not reflective of the full range of emissions reductions technology potential for diesel engines. Below, we outline ways in which the proposal must be strengthened to reflect the best available evidence.

1. Variable valve actuation

As noted by EPA, variable valve actuation (VVA) has been used for decades in light-duty vehicles (LDVs) to reduce fuel use, but recent advances in controls now allow for new efficiency strategies like part-time Atkinson and Miller cycles. VVA strategies for heavy-duty vehicles can build on those controls advancements to develop novel diesel valve control that can fine-tune intake/exhaust valve timing to reduce emissions and fuel use at the same time.

Early exhaust valve opening (EEVO) is one example of a strategy to utilize VVA in an effort to reduce emissions.[90] In this case, the exhaust valve is opened before completing the power stroke, which can thus significantly increase exhaust temperature, albeit at the expense of increased fuel use, and in some cases with trade-offs on other pollutants (HC, CO, $PM_{2.5}$). EPA notes these trade-offs in its Draft RIA (16). Careful optimization is key to EEVO, and these trade-offs can be managed through more advanced controls.[91] With such advanced controls in place, VVA can be used to compensate for any fuel penalty from EEVO through improved efficiency, such as early and late intake valve closing (EIVC, LIVC)—such

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[90] See, for example, Honardar, S., H. Busch, T. Schnorbus, C. Severin, A.F. Kolbeck, and T. Korfer. 2011. "Exhaust temperature management for diesel engines assessment of engine concepts and calibration strategies with regard to fuel penalty." SAE Technical Paper 2011-24-0176. Online at https://doi.org/10.4271/2011-24-0176 and Roberts, L., M. Magee, G. Shaver, A. Garg, J. McCarthy, E. Koeberlein, E. Holloway, R. Shute, D. Koeberlein, and D. Nielsen. 2015. "Modeling the impact of early exhaust valve opening on exhaust aftertreatment thermal management and efficiency for compression ignition engines." *Int. J. Eng. Res.* **16** (6), 773-794. Online at *https://doi.org/10.1177%2F1468087414551616*.

[91] Salehi, R., and A.G. Stefanopoulou. 2018. "Optimal exhaust valve opening control for fast aftertreatment warm up in diesel engines." *Proceedings of ASME 2018 Dynamic Systems and Control Conference, Vol. 2*. DSCC2018-9178, V002T26A003. Online at *https://doi.org/10.1115/DSCC2018-9178*.

strategy can even be used to implement Miller cycle operation in the diesel engine. A forthcoming analysis as part of the Volvo SuperTruck program shows that Miller cycle operation can enable reduced NO_X emissions without compromising on efficiency.[92]

One particular VVA strategy which helps both reduce fuel consumption and address low-load emissions is cylinder deactivation (CDA), which EPA and CARB have incorporated into their heavy-duty engine demonstration work with SwRI. CDA has already been proven effective and durable in light-duty vehicles, but recent research shows the strong benefits of CDA in heavy-duty diesel vehicles as well. CDA essentially allows the engine to be downsized in real time—this has the effect of dramatically increasing the temperature of low load operation (about 100°C in an MHD engine) while improving overall fuel efficiency.[93] Importantly, this study found fuel savings (3.2 to 7.8 percent) and NO_X reduction (33 to 86 percent) over a range of real-world driving cycles emphasizing low load operation, without any modification to the production aftertreatment system. Even at low-load operation and idle conditions, heavy-duty CDA saw increases of 60-80°C with fuel savings of 8 to 28 percent.[94] EPA's own data, which was for some reason not cited in the Draft RIA, shows similar behavior, reducing tailpipe NO_X on the low-load cycle (LLC) by 77 percent, thanks to an average increase in temperature at the SCR inlet by 38°C.[95] Data on a third VVA system shows the same behavior but extends the applicability to medium-duty engines.[96] While this study was only a simulation, it shows tailpipe NO_X reductions of 29 to 49 percent while reducing CO_2 emissions by 1.6 to 3.5 percent over a range of representative cycles. A follow-up bench study by the same company on a heavy-heavy-duty engine saw a similar range of behavior, suggesting robustness of the original findings.[97]

EPA seems to have determined that there is a significant amount of certainty needed in the selection of VVA as an emissions reductions tool.[98] However, recent work shows that the same turbocharger can be used with and without CDA, and that there are multiple calibration strategies that can be deployed to keep the aftertreatment system warm while simultaneously reducing fuel use.[99]

EPA additionally noted concerns about noise, vibration, and harshness (NVH) with CDA; however, recent data from Eaton shows that relatively simple adjustments in mounting and damping can dramatically reduce

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92 Garcia, E., V. Triantopoulos, A. Boehman, A., M. Taylor, and J. Li. 2020. "Impact of Miller Cycle Strategies on Combustion Characteristics, Emissions and Efficiency in Heavy-Duty Diesel Engines." *SAE Technical Paper* 2020-01-1127. Online at *https://saemobilus.sae.org/content/2020-01-1127/*.

93 McCarthy, J. 2019a. Simultaneous CO2 and NOx Reduction for Medium & Heavy- Duty Diesel Engines Using Cylinder Deactivation. (Presentation). 16th SAE Brasil forum on diesel and alternative technologies for commercial and off-road vehicles, September 4, 2019.

94 McCarthy, J. 2019b. Meeting Future Low Load Emissions Using Cylinder Deactivation and EGR Pumps to Achieve Simultaneous NOx and CO2 Reduction. (Presentation). Emissions 2019 Conference, Livonia, MI, June 5, 2019.

95 Matheaus, A., Singh, J., Sanchez, L., Evans, D. et al., "Evaluation of Cylinder Deactivation on a Class 8 Truck over Light Load Cycles," SAE Technical Paper 2020-01-0800, 2020, doi:10.4271/2020-01-0800.

96 Scassa, M., Körfer, T., Chen, S.K., Fuerst, J. et al., "Smart Cylinder Deactivation Strategies to Improve Fuel Economy and Pollutant Emissions for Diesel-Powered Applications," SAE Technical Paper 2019-24-0055, 2019, doi:10.4271/2019-24-0055.

97 Srinivasan, V., Wolk, B., Cai, X., Henrichsen, L. et al., "Application of Dynamic Skip Fire for NOx and CO2 Emissions Reduction of Diesel Powertrains," SAE Int. J. Advances & Curr. Prac. in Mobility 4(1):225-235, 2022, doi:10.4271/2021-01-0450.

98 Draft RIA, p. 16.

99 Morris, A. and McCarthy, J., "The Effect of Heavy-Duty Diesel Cylinder Deactivation on Exhaust Temperature, Fuel Consumption, and Turbocharger Performance up to 3 bar BMEP," SAE Technical Paper 2020-01-1407, 2020, doi:10.4271/2020-01-1407.

such NVH issues.[100] Tula used a flywheel setup to reduce oscillations but showed that such a design could be accomplished without any additional modifications to packaging.[101]

EPA suggested that vocational vehicles in particular may not be able to take full advantage of CDA,[102] but these data on NVH and the applicability to reduced engine sizes suggests that CDA is broadly applicable to all heavy-duty applications and must be considered as a viable strategy to simultaneously reduce fuel consumption and both CO_2 and NOx emissions across a broad range of heavy-duty vehicle categories.

2. 48V mild hybridization

Mild hybridization is an emissions reduction strategy that is synergistic with the VVA strategy mentioned previously. Mild hybridization can offer a lower cost opportunity for emissions reductions than strong hybrids, particularly with increasing movement towards 48V electrification. Higher voltage allows for more efficient power distribution, and shifting the number of hydraulically or mechanically-driven accessories to electric operation has benefits not just for efficiency but also packaging of the engine compartment. A 48V mild hybrid system simply builds upon these already existing rationale for moving to a 48V electric system and uses it for better regenerative braking and more responsive stop-start.

Many strategies would benefit from 48V mild hybridization—for example, a 48V electrical system is an enabler for devices like an electrically driven turbocharger,[103] an electrically heated catalyst,[104] or an electrified EGR pump.[105] Recent analysis shows such a system deployed in a medium-duty application is capable of simultaneously meeting both a 20 mg/bhp-hr standard on the FTP cycle and its 2027 GHG target.[106] A recent study by Eaton at SwRI showed that an electric heater connected to a 48V system worked synergistically with CDA, further reducing fuel use while improving NOx reduction at low-load conditions.[107] According to the paper, this system, too, is broadly applicable to a range of heavy-duty classes and operating conditions.

The cost-competitiveness of these 48V systems is well established. One analysis projected that 48V systems in line-haul operation would cost less than $7,000 for up to 4 percent fuel savings in 2025.[108] A recent report by the National Academies estimated 2022 costs for a 48V mild hybrid system to range from $4,584-5,010 (Class 4) up to $10,080-11,700 (Class 8 vocational), noting that "costs will likely come down in the 2022 and 2030 timeframes," with fuel savings ranging from 16-22 percent depending on the duty cycle.[109] These costs are substantially reduced compared to those previously used by EPA.[110]

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[100] Pieczko, M., McCarthy, Jr., J., and Hamler, J., "Mitigating Vibration for a Heavy-Duty Diesel Cylinder Deactivation Truck," SAE Technical Paper 2021-01-0661, 2021, doi:10.4271/2021-01-0661.

[101] Srinivasan et al. 2021

[102] Draft RIA pp. 16-17

[103] MECA. 2020. Technology feasibility for heavy-duty diesel trucks in achieving 90 percent lower NOx standards in 2027. February 2020. Online at *http://www.meca.org/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf.*

[104] Dorobantu, M. 2019. Commercial Vehicle Powertrains in the Era of Simultaneous NOx and CO2 Reduction. (Presentation). 16th SAE Brasil forum on diesel and alternative technologies for commercial and off-road vehicles, September 4, 2019.

[105] McCarthy 2019b

[106] Dhanraj et al. 2022

[107] Matheaus et al. 2021

[108] Tarnutzer, S.A. 2017. New and Emerging Energy Conversion Opportunities. (Presentation). SAE Commercial Vehicle Engineering Conference, Chicago, Sept. 2017.

[109] NRC. 2020. Reducing Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two: Final Report. Washington, DC: The National Academies Press. Online at *https://doi.org/10.17226/25542.* p. 230.

[110] Compare to EPA-420-R-16-900, p. 2-175.

3. Opposed-piston engines

EPA noted the potential for opposed-piston engines to play a significant role in emissions reductions:

> "Opposed-piston engine technology has not yet been proven feasible in Class 8 on-highway applications, but *if feasibility is shown, then the technology could provide another pathway to ultra-low NOX, high efficiency engine technology for heavy-duty vehicle fleets*. If the demonstration project cited above is successful, then it may lead to early-commercial deployment of opposed-piston diesel engines for heavy-duty on-highway applications in the near-term. As such, it may be reasonable to anticipate commercialization of heavy-duty opposed-piston diesel engine technology by model year 2027." (EPA Draft RIA, p. 22)

Recent data from Achates Power confirms the success of the cited demonstration program, with wide margins for compliance. Lab test results confirm that this engine design is capable of meeting simultaneously EPA's greenhouse gas engine emissions requirements for 2027 and the Omnibus rule, "in a cost-effective and robust manner."[111]

Not only has this novel design been confirmed in the lab, but this engine is now being deployed in real-world operation, pulling freight for Wal-Mart. Early test results indicate compliance with EPA's proposed in-use requirements.[112]

4. Increased full useful life and warranty periods

"We request comment on the proposed approach to base these mileages on the data presented. We request additional data to inform our consideration of appropriate useful life mileages, including rebuilding, replacement, and scrappage data, or other data that may represent the operational life of a heavy duty highway engine. We also request comment on what portion of an engine's operational life should be covered by the regulatory useful life and whether it should depend on specific characteristics of the engine (e.g., primary intended service class)." (87 FR 17501)

a. The need to adopt stronger warranty requirements

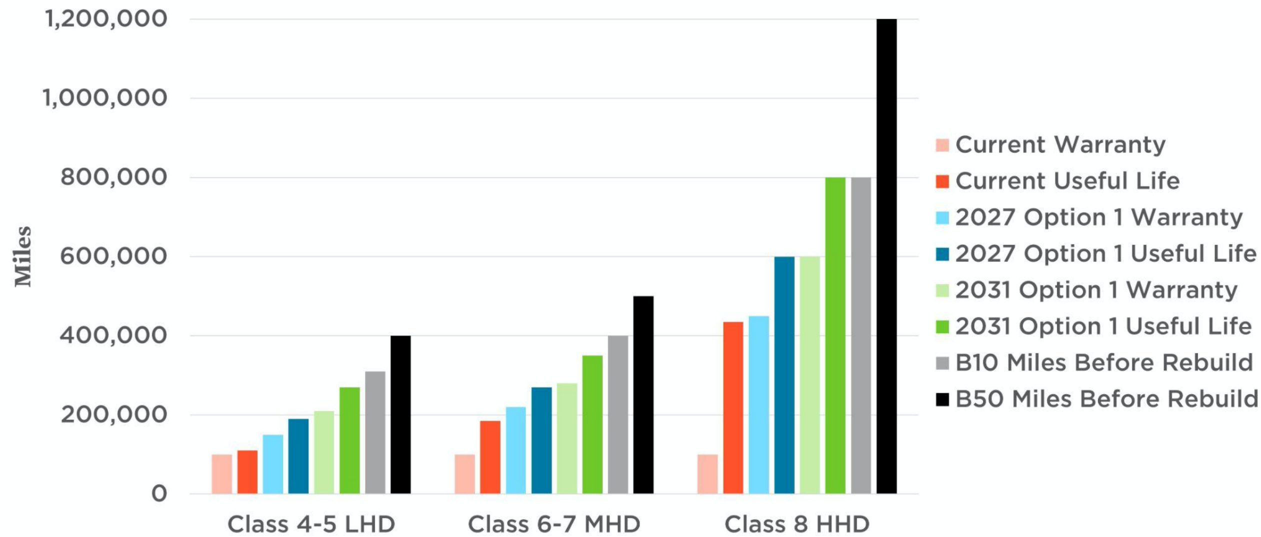
Heavy-duty diesel engines last well beyond the current useful lifetime, with 90 percent of engines lasting nearly double the current regulatory requirement, and 50 percent of Class 8 engines nearly triple (Figure 3). As a result, the regulatory 100,000-mile warranty requirement is only a very small fraction of the expected lifetime of the engine and is well behind typical warranties and extended warranties of 250,000 and 500,000 miles.[113]

Figure 3. Engine warranty and useful-life periods, compared to average rebuild mileage

[111] Salvi, A., Redon, F., Youngren, D., and Fromm, L., "Low CO2, Ultralow NOx Heavy Duty Diesel Engine: Experimental Results," SAE Technical Paper 2022-01-0426, 2022, doi:10.4271/2022-01-0426.

[112] https://achatespower.com/wp-content/uploads/2022/04/Achates-Power-In-Use-Emissions-Measurements.pdf

[113] CARB. 2017. Proposed heavy-duty vehicle (HDV) warranty period amendments. (Presentation). Heavy-duty low NOx rulemaking workshop, Diamond Bar, CA, July 12, 2017. Online at *https://ww3.arb.ca.gov/msprog/hdlownox/files/workshop071217/warrantyws_presentation.pdf*.



Heavy-duty engines can last up to 1.2 million miles before a rebuild, yet the current warranty extends to just 100,000 miles, and the useful-life period is only 435,000 miles. The proposed changes to the warranty and useful-life periods for heavy-duty vehicles more closely mirrors the real-world operation of these engines and would help maintain working emissions controls while diminishing any costs incurred by the operators.

The useful life is critical to ensure adequate testing such that emissions controls are functional for the life of the engine. The warranty period, however, is more important to minimize tampering or disrepair, and shifts the cost of failures onto the manufacturer rather than the driver. Currently, the market allows manufacturers to profit from producing less durable products–increasing warranty requirements thus helps shift the responsibility for creating more durable emissions controls back to the entity with design control.

Repair costs and downtime can be a significant burden for drivers, and survey data has shown that there is a significant interest in coverage that better reflects the operational lifetime of the vehicle.[114] Nearly one-quarter of respondents in that study already opt for an extended warranty, with a substantial share of those respondents' choosing warranties that exceed the current useful-life requirements of the engine. A majority of owner-operators suggested future warranty coverage should meet or exceed 500,000 miles, well above the current minimum. This is borne out in more recent analysis of the market, which shows that 85 percent of the market already opts for an extended warranty, with just about half of those users opting for warranty coverage of at least 500,000 miles.[115]

b. Adopting a one-step approach to warranty improvements

"We expect that the changes to useful life in proposed Options 1 and 2 would improve component durability, but additional increases in useful life, such as those associated with the proposed MY 2031 standards in proposed Option 1, may take manufacturers more time to develop (see Section IV for more discussion). Therefore, proposed Option 1 includes a two-step approach to allow additional lead time for manufacturers to develop emission control components durable enough for the proposed longer useful life

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[114] Kerschner, B., and D. Barker. 2017. Survey and analysis of heavy-duty vehicle warranties in California (15MSC009). Prepared by the Institute for Social Research for the California Air Resources Board, December 2017. Online at https://ww3.arb.ca.gov/regact/2018/hdwarranty18/apph.pdf.

[115] https://ww2.arb.ca.gov/sites/default/files/2022-01/warranty_cost_study_final_report.pdf

periods. In Section III.A we request comment on the two-step approach in proposed Option 1." (87 FR 17438)

EPA's two-step approach to useful life and warranty matches that of the Omnibus rule. However, the Omnibus approach was limited, in part, to uncertainty in the research at SwRI, which forced CARB to linearly extrapolate data on reduced aging of the emissions control system.[116] Since then, the SwRI research has continued, and the most recent data shows that the emissions controls at the 2031 FUL of 800,000 indeed perform as expected, with compliance margin—in fact, for the LLC and RMC cycles, the Stage 3RW shows quite wide compliance margins of 60 percent and 22 percent, respectively, eliminating any question of uncertainty in the longevity and durability of the system.[117] Given the increased data on the viability of the technology and the need to ensure robust emissions reductions as quickly as possible from the largest swath of vehicles, EPA cannot justify delayed requirements on useful life and warranty, and must pull forward its proposed 2031 Option 1 values to 2027.

"We request comment, including relevant data and other information, on the feasibility of the implementation model year, numeric levels of the emission standards, and useful life and warranty periods included in the Alternative, or other alternatives outside the range of options covered by the proposed Options 1 and 2 standards." (87 FR 17471)

Data from the CARB Phase 3 and EPA Phase 3 RW projects at SwRI are the most thorough assessments of the technical capability to reduce diesel emissions in the 2027 timeframe.[118] Additional projects, including those mentioned above, extend some of that capability or provide manufacturers with alternate strategies to achieve levels of compliance that are at least as stringent as those in the Omnibus rule.

5. In-use ("off-cycle") compliance

"We request comment on the proposed Options 1 and 2 off-cycle standards, as well as the overall structure of the off-cycle program." (87 FR 17476)

EPA has appropriately proposed to revamp its in-use compliance program entirely. The "not-to-exceed" (NTE) test protocol have proven woefully inadequate for modern diesel engines—recent data shows that just 9.7 percent engine operation time is covered under the current NTE protocol.[119] While the small number of NTE events averaged 0.18 g NO_X/bhp-hr,[120] total route emissions were more than double that, at 0.42 g/bhp-hr. Importantly, these ignored events are not random—low-speed operation is almost entirely excluded, even though it represents roughly half of the operational time for many vehicles, particularly in urban settings. Worse, it is exactly these low-speed operating conditions where modern diesel emissions controls are most likely to fail.

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116 https://ww2.arb.ca.gov/sites/default/files/barcu/board/rulemaking/hdomnibuslownox/fsor.pdf, pp. 163-4.

117 EPA-HQ-OAR-2019-0055-1082.

118 See, Sharp, C.A., Further development and validation of technologies to lower oxides of nitrogen emissions from heavy-duty vehicles: Low NOx demonstration program – Stage 3. Final report, prepared for California Air Resources Board, April 16, 2021; Sharp, C.A., "Update on continuing progress towards 2027 heavy-duty low NOx targets," presented to the 32nd CRC real world emissions workshop, March 14, 2022; and Draft RIA Tables 3-3 through 3-9.

119 Badshah, H., F. Posada, and R. Muncrief. 2019. Current state of NOx emissions from in-use heavy-duty diesel vehicles in the United States. White paper from the International Council on Clean Transportation, November 26, 2019. Online at https://theicct.org/publication/current-state-of-nox-emissions-from-in-use-heavy-duty-diesel-vehicles-in-the-united-states/

120 Where possible, mg/bhp-hr are used, to directly compare with EPA's proposed standards. However, in research papers, such accuracy is not always reported. In response to EPA's request for comment on the use of SI standard units (87 FR 17472), we generally support the use of mg/bhp-hr and think it more accurately reflects the precision and accuracy of the standards and tools to enforce those standards.

Table 1. Comparison of standards with data on representative test cycles (intermediate useful life)[121]

Data Source	Idle Load Bin	Low Load Bin	Medium/High Load Bin
EPA Proposed Option 1 (2027-2030)	10 g/hr	180 mg/bhp-hr	70 mg/bhp-hr
EPA Proposed Option 1 (2031+, IUL)	7.5 g/hr	75 mg/bhp-hr	30 mg/bhp-hr
CARB Omnibus (2027+, IUL)	10 g/hr	100 mg/bhp-hr	40 mg/bhp-hr
CARB Omnibus (2031+, IUL)	7.5 g/hr	75 mg/bhp-hr	30 mg/bhp-hr
EPA Stage 3RW at 435,000-mile DAAAC	0.3-1.4 g/hr	15-41 mg/bhp-hr	16-33 mg/bhp-hr

Table 2. Comparison of standards with data on representative test cycles (full useful life)[122]

Data Source	Idle Load Bin	Low Load Bin	Medium/High Load Bin
EPA Proposed Option 1 (2027-2030)	10 g/hr	180 mg/bhp-hr	70 mg/bhp-hr
EPA Proposed Option 1 (2031+, FUL)	7.5 g/hr	150 mg/bhp-hr	60 mg/bhp-hr
CARB Omnibus (2027-2030, FUL)	10 g/hr	180 mg/bhp-hr	70 mg/bhp-hr
CARB Omnibus (2031+, FUL)	7.5 g/hr	150 mg/bhp-hr	60 mg/bhp-hr
EPA Stage 3RW at 800,000-mile DAAAC	0.4-3.3 g/hr	33-48 mg/bhp-hr	22-46 mg/bhp-hr

We support EPA's proposal to move forward with the moving-average-window (MAW) approach, which will better capture all real-world behavior. However, the numerical values used in this program in 2027 are wholly inadequate, arbitrary, and undermine the efficacy of the proposed NO_X program. EPA itself even notes that its own system performed well below the Option 1 standards,[123] and we've included Tables 1 and 2 to reinforce this point.

In examining Table 1, it's important to recognize that there is an additional compliance margin for the proposed MAW approach related to assumed measurement accuracy—as proposed, this is "10 percent of the off-cycle standard for a given bin."[124] Under EPA's own proposed protocol, its demonstration powertrain already complies with the 2031 off-cycle requirements, for all load bins, under all representative test cycles. In fact, there is a compliance margin of more than 80 percent for the idle bin at intermediate useful life, and about 50 percent for the low-load bin even under the most stressing test cycle, well beyond what is reasonable. Even under the Omnibus regulation's intermediate useful life requirements, which are

121 Data sources: NPRM, Omnibus, Sharp 2022 CRC
122 *Ibid.*
123 "As can be seen see from the results in Table III-18, the EPA Stage 3 engine performed well below the proposed Options 1 and 2 NO_X standards," 87 FR 17475.
124 87 FR 17477.

more stringent in 2027-2030 than Option 1, there is more than sufficient margin for compliance, owing to the conservative approach taken by CARB in proposing those standards nearly two years ago.

Table 2 shows that these margins are even greater over the full useful life of the vehicle for the low-load and medium/high-load bins—at 800,000 miles, the low-load bin has a 70 percent compliance margin, and the medium/high-load bin a 30 percent compliance margin. Given that this is an absolute worst case scenario, with more efficient test cycles showing as much as 80- or even 90-percent margins, this suggests that EPA should be setting off-cycle compliance standards that are even more stringent than those in the Omnibus regulation.

Moreover, it is not just EPA's data which shows that there is overly sufficient margins of compliance—Achates Power's test data on its own heavy-duty engine further confirms that it is possible to achieve CARB's limits.[125]

EPA has appropriately identified three bins which are representative of current test procedures (idle test, LLC, and FTP); however, EPA should maintain no worse than a 1.5X assumption on real-world operation (compared to the standards) under the proposed bin structure.

At worst, we urge EPA to pull forward its 2031 off-cycle numerical requirements to the 2027 model year, and EPA should consider further tightening the limits of its idle and low-load bins, in particular, based on its own data. Communities cannot afford four more years' worth of trucks that are allowed to pollute well beyond what is technically achievable.

6. Family Emissions Limits (FEL)

"We request comment on our proposed FEL caps, including our approach to base the cap for MY 2027 through 2030 under Option 1, or MY 2027 and later under Option 2, on the recent average NO_X emission levels. We request comment on whether the NO_X FEL_{FTP} cap in MY 2027 should be set at a different value, ranging from the current federal NO_X standard of 205 mg/hp-hr to the 50 mg/hp-hr standard that will be in place for engines subject to CARB's HD Omnibus rule starting in MY 2024." (87 FR 17552)

EPA's standards are defined as an *average* compliance value. This means that to the degree trucks are able to perform better than the average standard, a manufacturer can earn credits. These credits can then be used to offset vehicles that emit *more* of the harmful emissions than required by the average level of compliance. The only limit as to how dirty an individual truck can be is provided by the family emissions limit (FEL) cap.

For Option 1, EPA has proposed setting the FEL cap at 150 mg/bhp-hr NO_X in 2027, a level "which is consistent with the average NO_X emission levels achieved by recently certified CI engines."[126] This means that at least through 2030, trucks can be certified to a level consistent with compliance with a standard promulgated *three decades earlier*.

[125] "These results suggest that OP Engine can achieve future 2027 regulations with sufficient margin to satisfy the 800k mile warranty requirement, based on a 50% discount on aftertreatment degradation factors determined for zero to 435k miles applied to 435k to 800k miles," Salvi et al. 2022.

[126] 87 FR 17552.

a. Technical justification for a lower FEL cap

Setting the FEL cap at a level consistent with today's technology falls well short of EPA's mandate under the Clean Air Act to set "standards which reflect the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available for the model year to which such standards apply."[127]

SwRI's Stage 1 testing program showed that updates to engine calibration alone were able to reduce the tailpipe emissions of a modern diesel engine by 36 percent, to 0.09 g/bhp-hr.[128] Simply by adding a heated catalyst, the system was able to reduce tailpipe NO_X emissions below 0.05 g/bhp-hr, the Omnibus standard for 2024. These are minor changes to engine configurations, which is, in part, why they were used in the justification for the Omnibus standards in this timeframe.[129]

The Omnibus standard will be enforced in a number of states by 2027, representing at least 9 percent of the total market, and likely more (see Section IV.D.5.c for further discussion). For three years, that standard will have been mandating an *average* requirement of 50 mg/bhp-hr, and in 2027 a *maximum* standard of 50 mg/bhp-hr. With such a substantial share of the market already required to achieve this standard or less, and a number of technological paths for manufacturers to achieve this standard, it is hard to argue on a technical basis that this should not be, at absolute worst, the upper level of emissions for all kinds of trucks.

b. Historical precedence to justify a lower FEL cap

EPA offers an historical precedent of setting the FEL at the previous standard level.[130] However, this is not true for the rules currently on the books—the current HD diesel FEL cap is 0.5 g/bhp-hr NO_X (2010+), whereas the previous average standard (2004-2006) was 2 g/bhp-hr.[131] In citing the reason for not leaving the FEL at 2 g/bhp-hr and instead moving to the current 0.5 g/bhp-hr cap, EPA explicitly notes the 90 percent difference between the 0.2 and 2 g/bhp-hr NO_X standards.[132]

The situation the industry faces today is vastly different than in 2001. Whereas previously the new rules were predicated on unknown technologies, here there is much more certainty as to the capability of diesel powertrains to meet the requirements, with established technologies like variable-valve actuation, 48V hybridization, and evolutionary improvements in emissions controls. One similarity, however, is the tremendous disparity between the new average requirements and the old regulations. Here again EPA is expected to reduce emissions by 90 percent on the FTP cycle, and, as such, it is more important to worry about the disparity between different new trucks on the road and the capability of manufacturers to meet more stringent standards in the allocated timeframe.

It is clear based on available technology and the latest evidence that manufacturers are more than capable of meeting much stronger standards than have been on the books since 2010 (see Section III.B). This is precisely what the Omnibus program was meant to address, beginning 3 years prior to EPA's proposed rule. It is therefore appropriate that EPA align its FELs with the Omnibus program. These limits yield identical percentage improvements from the FELs and average standards from 2010 to 2027.

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[127] 42 U.S.C. § 7521(a)(3)(A).

[128] https://ww2.arb.ca.gov/sites/default/files/classic/research/apr/past/13-312.pdf

[129] https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hdomnibuslownox/appi.pdf

[130] 87 FR 17552

[131] The standard was either a combined 2.5 g/bhp-hr cap for NMHC+NOX, with a 0.5 limit on just NMHC, or a 2.4 g/bhp-hr cap on NMHC+NOX.

[132] 66 FR 5111

In 2027, EPA's FELs for LHDD and MHDD engines should be set no higher than 50 mg/bhp-hr, representing a 30 mg/bhp-hr shortfall from our recommended average standard, and a 90 percent reduction from the current FEL, consistent with the 90 percent reduction in the average standard. For HHDD engines, the gap should be identical (30 mg/bhp-hr), but the longer useful lifetime requires an additional margin, putting this limit at no more than 65 mg/bhp-hr. Should EPA set an intermediate lifetime limit on HHDD engines, its limits would be identical to the LHDD and MHDD engine requirements.

For 2031, the FELs appear to be aligned with the Omnibus rule. However, EPA should consider whether it is appropriate to allow in perpetuity a difference of 150 percent of FTP-cycle NO_X emissions. Given the concerns about equity, and where the dirtiest trucks on the road inevitably end up (Section III.B.6.c), EPA should continue to tighten the FEL over time.

"We also request comment on the proposal to set the proposed Option 1 MY 2031 NO_X FEL caps at 30 mg/hp-hr above the full useful life standards. We request comment on whether different FEL caps should be considered if we finalize standards other than those proposed (i.e., within the range between the standards of proposed Options 1 and 2 as described in the feasibility analysis of Section III)." (87 FR 17552)

With respect to the 30 mg/bhp-hr value, it is important to note that it is not that 30 mg/bhp-hr is an appropriate gap, but that 50 mg/bhp-hr is a technically justified maximum, which so happens to have a difference of 30 mg/bhp-hr. The FEL is the level achieved by the worst-performing trucks. As technology continues to be improved and is broadly used across the entire fleet, the FEL should be reduced to reflect the fact that those worst vehicles can perform better than previously allowed, regardless of the value set by the average emissions standards.

Implicit in the existence of the FEL is EPA's belief that some trucks should be allowed to emit more pollution than others. However, 100 percent of today's heavy-duty diesel engines are certified to the required average standard (0.2 g/bhp-hr) or better. This indicates that there is no difference in technical capability across truck applications to meet today's standards. Therefore, FELs above the average technical capabilities of diesel engines should be considered a temporary, transitional option available only in the initial years of the standard, if at all. Given its mandate under the Clean Air Act and the wealth of evidence on the technological capability of diesel control technologies, not to mention the growing number of applications for zero-emissions vehicles, EPA should consider whether it is appropriate at all in the long run to maintain FELs that do not reflect the maximum technical capability to reduce emissions.

c. Equity considerations for a lower FEL cap

As noted above, the FEL cap (and by extension the averaging program) allows some trucks to pollute more than others. Unfortunately, those more polluting trucks are frequently in operation or operating conditions where they are likely to do the most damage–in communities already overburdened by pollution. For example, port drayage operations involve high volume freight flows, and freight operators use older trucks to limit the marginal costs, *even in regions with targeted environmental policies meant to limit the use of older trucks.*[133]

A recent study of real-world emissions control operations showed that under urban operating conditions, including goods movement and delivery with extended low-load conditions, diesel vehicles with modern

[133] See https://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1150&context=gguelj and the references contained therein.

emissions controls performed just 33 percent better on average than those without an SCR system,[134] despite a required reduction of more than 90 percent on the federal test cycles. Other studies have shown similar conditions—while line-haul tractors may spend a significant share of time at highway speeds, the vocational operations most common in urban centers spend a lot more time at conditions where modern diesel controls are functioning suboptimally.[135]

EPA acknowledges this issue in its establishment of the low-load cycle (87 FR 17463). However, the flaws in the FELs on the FTP cycle are even further exacerbated on the LLC, which has even greater margins for compliance, virtually eliminating any possible potential gains this cycle could have for the worst performing vehicles: while the FEL_{FTP} is defined as 150 mg/bhp-hr for 2027-2030 diesel engines under Option 1, FEL_{LLC} is 150 / 35 × 90 = 385 mg/bhp-hr (87 FR 17551), a value that is worse than some 2017-2019 diesel engines achieve today (87 FR 17470, Table III-12).[136]

By setting its FEL as high as it has, EPA is proposing to allow in perpetuity vehicles that its own data show far exceed the levels of pollution allowed by current test procedures, in precisely the communities that are already overburdened by freight pollution. This is yet another example of how even EPA's most stringent proposed standard would prolong systemic environmental inequities in freight pollution and fall short of the Act's requirements.

7. Legacy Engines

"We are considering a flexibility allowing engine manufacturers, for model years 2027 through 2029 only, to certify up to 5 percent of their total production volume of heavy-duty highway compression-ignition (CI) engines in a given model year to the current, pre-MY 2027 engine provisions of 40 CFR part 86, subpart A. … Under this potential option, we are requesting comment on cases where packaging and design challenges are present, allowing specialty vocational vehicle manufacturers to install exempt engines, as long as the number of exempt engines installed does not exceed 5 percent of the engine manufacturer's total production volume." (87 FR 17565)

The current program has not resulted in the emissions reductions originally promised, owing in large part to shortcomings in the certification procedures on the books today. These are detailed extensively in the NPRM in the agency's justifications for the low-load cycle, increases in warranty and useful life, and updates to the off-cycle program, and more.

As detailed in the section on credit provisions (Section IV.D), particularly the transitional credit program, there is no need for additional flexibility for the dirty diesel engines held to today's weak standards. In fact, there is already far too much flexibility in the proposal which undermines the standards and will eat away at the proposed reductions in damaging NO_X emissions this rule is purported to target.

It is abhorrent that EPA would consider further weakening the rule by giving credits to legacy engines certified to 20-year-old standards. Furthermore, the engines found in these vehicles are generally produced

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134 McCaffery, C., et al. "Real-world NOx emissions from heavy-duty diesel, natural gas, and diesel hybrid electric vehicles of different vocations on California roadways," *Science of the Total Environment* 784 (2021), 147224. DOI: 10.1016/jscitotenv.2021.147224. https://doi.org/10.1016/j.scitotenv.2021.147224.

135 Boriboonsomsin, B., et al. "Real-world exhaust temperature profiles of on-road heavy-duty diesel vehicles equipped with selective catalytic reduction," *Science of the Total Environment* 634 (1 Sept 2018), 909-921. DOI: 10.1016/j.scitotenv.2018.03.362. https://doi.org/10.1016/j.scitotenv.2018.03.362.

136 150 mg/bhp-hr is the FEL_FTP limit; 35 mg/bhp-hr is the required standard on the FTP cycle; and 90 mg/bhp-hr is the required standard on the LLC cycle.

by the same large-volume manufacturers that are found in the highest mileage vehicles, Class 8 tractors. In fact, the largest engine manufacturer, Cummins, boasts of one of the identified applications that "more firefighting and EMS professionals depend on Cummins than any other diesel engine."[137]

The proposed 5 percent exemption is patently absurd—from Cummins alone, such a target could mean that over 10,000 vehicles could be exempted from the proposed standards. Factor in Detroit Diesel and Ford engines, two other high-volume vocational engine manufacturers, and that would mean 20,000 vehicles in 2027-2029 could be exempted at standards that emit nearly 6 times more NO_X emissions on the FTP cycle than the already-weak proposed Option 1, a number that is larger when you consider the differences in off-cycle certification and other protections which strengthen real-world emissions reductions compared to the current program.

The proposed exemption is so large that these vehicles could easily represent 20-25 percent of the total NO_X emissions from 2027-2029 vehicles. This proposal is as though EPA were creating a loophole comparable to the glider vehicle provisions it limited in the Phase 2 regulations. Moreover, because these vehicles are certified to a different crediting process, whose credits are not eligible to be transferred according to the proposal (87 FR 17553), it is not even clear that these vehicles will be credited against a manufacturer's annual average requirements, which means those emissions will not be made up for in gains elsewhere. At least if such engines were credited against EPA's already too-high FELs, there would be some attempt at recovering those lost emissions!

Finally, 100 percent of diesel engines certified since 2019 have been certified at or below the current average requirement. There is no indication that manufacturers need the added flexibility provided, and the Omnibus standards in effect in 15 percent of the market for new vehicles already require engines below the current standard. This argument is further detailed in Section III.B.6.1 above, in the technical justification opposing a high FEL.

Even under the limited low-volume constraints supposed by EPA, it is possible to achieve a standard much reduced from the current levels, and EPA should eliminate any exemption to such reductions in its finalization of the rule, particularly those that would further the unprotective standards currently on the books.

C. Idling standards

"We request comment on whether EPA should make the idle standards mandatory instead of voluntary for MY 2027 and beyond, as well as whether EPA should set clean idle standards for HC, CO, and PM emissions (in g/hr) rather than capping the idle emissions for those pollutants based on the measured emission levels during the idle segments of the FTP or the idle mode in the SET. We request comment on the need for EPA to define a label that would be put on the vehicles that are certified to the optional idle standard." (87 FR 17464)

Beginning in 2008, California required new trucks sold in the state to meet a "Clean Idle" standard. There are two means by which a truck can be certified to the standard, either by having an automatic shut-off that cuts the engine after five minutes of idling, or by meeting a 30 g/hr NOx idling standard. Rather than an increase in availability of stop-start and zero-emission technologies, which CARB's idle rule was meant to

[137] https://www.cummins.com/engine-applications/fire-and-emergency

promote,[138] all heavy-duty engines in 2020 comply with the standard by meeting the 30 g/hr requirement.[139] Though this standard was implemented only in California, it has driven 50-state improvements, with EPA's in-use data showing that the vast majority of diesel engines meet the 30 g/hr threshold.[140]

In-use data shows a higher fraction of idling than current test procedures,[141] and it is well-established by EPA's data that idling is precisely the type of low-load operation where current emissions controls behave sub-optimally, a major rationale for the LLC. EPA's own in-use ("off-cycle") program bases the lowest level bin on idle test emissions, indicating both a heightened awareness of the problems these emissions hold and an understanding that it represents a significant share of general truck operations.

As EPA noted, CARB has lowered this standard to 10 g/hr for 2024, and to 5 g/hr for 2027 and beyond. This is not voluntary in California, and it should not be voluntary federally, either. The best-performing current engines can already achieve the 5 g/hr requirement.[142] EPA's SwRI data shows that its Stage 3RW engine is also capable of meeting such a standard, with a wide compliance margin.[143] And Achates Power's opposed-piston engine meets CARB's 5 g/hr requirement with even greater compliance margins.[144]

Given the importance of reducing idling emissions to communities near ports and warehouses and other heavily-trafficked areas, not only should EPA make its idling standards mandatory, but it should consider setting standards that fall well below CARB's current "Clean Idle" limits, which appear extremely conservative given the technical capacity of the next generation of diesel engines.

D. PM Controls

EPA is proposing two changes which have the potential to significantly reduce particulate matter emissions: 1) a reduced PM standard and 2) requiring closed crankcase emissions. Our support for these changes is discussed below.

1. Proposed PM standard reduction

"Lowering the standard to 5 mg/hp-hr would ensure that future engines will maintain the low level of PM emissions of the current engines. Taking into account measurement variability of the PM measurement test procedure in the proposed PM standards, we believe that PM emissions from current diesel engines are at the lowest feasible level for MY 2027 and later engines. We request comment on whether 5 mg/hp-hr provides enough margin for particular engine designs." (87 FR 17462)

EPA's certification program as well as its in-use test data both confirm that today's diesel trucks emit significantly less particulate pollution than pre-2007/2010 vehicles. In fact, every 2021-2022 certified diesel engine achieves an FTP/SET standard below EPA's proposed standard for 2027,[145] indicating that there is

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138 Chen, D. 2008. California's heavy-duty vehicle idling regulations. (Presentation). NCSL conference call, January 28, 2008. Online at *https://www.ncsl.org/print/energy/dchenidling07.pdf*.

139 CARB. 2020. New Vehicle and Engine Certification: Executive Orders for MY2020 Medium-Duty and Heavy-Duty Engines. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/nvepb/executive_orders/EO%20Summaries/MDE-HDE/EO_Summary__MDE-HDE__2020__Public.xlsx.

140 Badshah, et al. 2019, Figure 13.

141 See, e.g., Boriboonsomsin, et al. 2018 and Badshah, et al. 2019.

142 https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hdomnibuslownox/isor.pdf, Figure III-3.

143 EPA-HQ-OAR-2019-0055-1082

144 Salvi et al. 2022

145 EPA. 2022. Heavy-duty highway gasoline and diesel certification data (Model years: 2015-present), updated February 2022. https://www.epa.gov/system/files/documents/2022-02/heavy-duty-gas-and-diesel-engines-2015-present.xlsx.

currently more than a 50 percent compliance margin. Furthermore, the most recent data on EPA's Stage 3RW system indicates PM values below 5 mg/bhp-hr on all test cycles, all the way up to 800,000 miles.[146] On the FTP and SET test cycles, in particular, the SwRI data exhibit more than a 70 percent margin at the 2031 FUL, indicating that diesel technology can meet a standard well below the proposed 5 mg/bhp-hr on the FTP and SET cycles.

It is critical that EPA eliminate any potential for backsliding on the progress made to date on direct particulate matter emissions and encourage even further gains by setting mandatory PM standards for heavy-duty engines that are at least as stringent as the proposed Option 1 standards.

2. Closed crankcase requirements

"Because all new highway heavy-duty diesel engines on the market today are equipped with turbochargers, they are not required to have closed crankcases under the current regulations. Manufacturer compliance data indicate approximately one-third of current highway heavy-duty diesel engines have closed crankcases, indicating that some heavy-duty engine manufacturers have developed systems for controlling crankcase emissions that do not negatively impact the turbocharger. EPA is proposing provisions in 40 CFR 1036.115(a) to require a closed crankcase ventilation system for all highway compression-ignition engines to prevent crankcase emissions from being emitted directly to the atmosphere starting for MY 2027 engines." (87 FR 17466)

Because of the progress made on tailpipe particulate matter emissions, PM emissions from open crankcases have become a dominant source of the remaining operating PM emissions from heavy-duty trucks. Manufacturers of emissions controls estimated that "crankcase PM can represent over 60 percent of the total PM footprint of a 2007 DPF equipped truck."[147] EPA appropriately notes that a substantial share of the market has already adopted closed crankcases, indicating the technological feasibility of this new requirement. Suppliers support this requirement, noting that "closed crankcase technology is readily available."[148]

As a significant source of harmful particulate emissions, crankcase blowby gases pose an obvious health risk to all communities in which heavy-duty trucks operate. However, crankcase emissions can also provide an acute problem to the truck drivers most directly and repeatedly exposed to such emissions.[149] It is no wonder that both industry and regulators support containing such harmful emissions.[150]

Given the wide availability of the technology and the broad harm that these emissions cause, we support EPA's proposal to require closed crankcases on all heavy-duty vehicles, for all fuels.

IV. Additional Comments on Unintended Consequences

A. Labor Considerations

[146] EPA-HQ-OAR-2019-0055-1082

[147] MECA 2020, https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-0365, p. 17.

[148] MEMA 2020, https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-0462, p. 6.

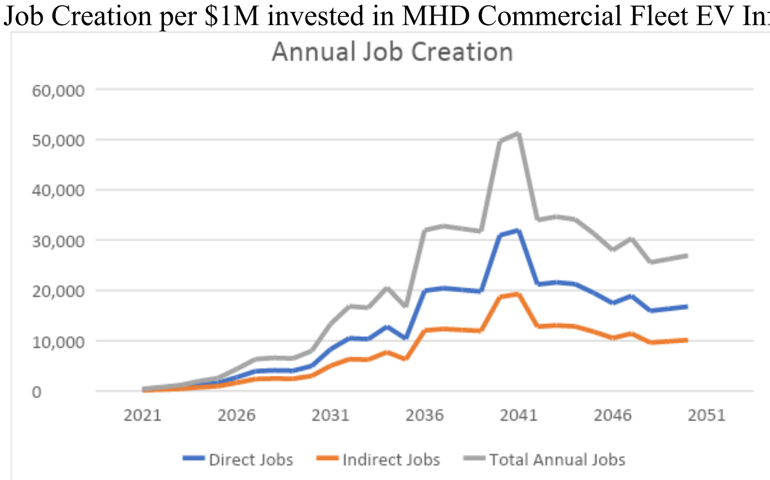
[149] EPA-HQ-OAR-2019-0055-0987

[150] MECA 2020, MEMA 2020, and ODEQ 2020 (https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-0464).

Labor and those working in the freight sector (including truckers, equipment operators, warehouse and logistics workers, and others) are essential constituents in the quest for a just transition to a cleaner energy economy, air quality improvements, zero emissions, and climate mitigations. Many workers not only work in industries (such as trucking) that expose them to toxics and impact their health, but they also live in communities disproportionately bearing the burdens of pollution. Regulations to strengthen emission standards as well as further zero emission trucks need to account for more than just the effects of the policy on job growth. Standards should include an economic analysis of the proposed regulation and alternatives as well as include provisions to ensure that these increases in jobs are coupled with labor standards to ensure that workers are benefiting by more than just access but quality of job.

MFN provided a detailed analysis in our Making the Case for Zero-Emission Solutions in Freight[151] report on the economic benefits of zero emissions for different labor sectors through the freight transportation system, including manufacturing, maintenance, etc. MFN found that if money and resources were prioritized for the commercial fleet infracture, the job creation alone from direct and indirect work would be at around 30,000 additional jobs by 2037 (Figure 4). This estimate far outweighs the claims that under the current structures of the rule EPA could be affecting jobs.

Figure 4. Job Creation per $1M invested in MHD Commercial Fleet EV Infrastructure

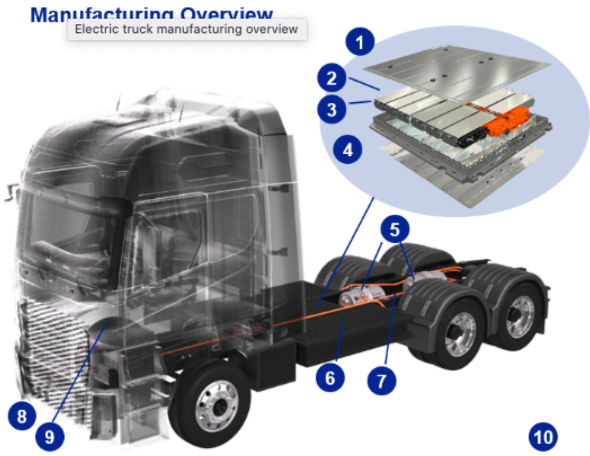


1. Job Creation and Labor Considerations

A strong ZEV sales requirement coupled with the emission standard has the potential to achieve one of the goals of the Biden administration to develop domestic manufacturing jobs. A new report from SAFE highlights the potential for more than 270,000 jobs "through investment in transportation manufacturing grants and tax incentives" and nearly 154,000 jobs through "incentives that make it cheaper to buy medium and heavy-duty electric vehicles, like trucks and buses."

Figure 5. Manufacturing overview of heavy-duty electric trucks[152]

151 https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-the-Case_Report_May2021.pdf
152 https://www.edf.org/zero-emission-trucks-generating-jobs-across-us



	Sub-Segment	Description
1	Battery Packs	Battery pack through sorting of cells, assembly of modules and pack and BMS integration
2	Battery Raw Materials	Base materials for cathodes, anodes and other components and refined metal chemicals
3	Battery Cells	Cells made from manufacturing electrodes, assembling and finishing cells
4	BMS	Battery management system – controls battery and optimizes performance (circuit board, I/O software, control algorithms)
5	Electric motor	Electric traction motor or powertrain (incl. axles) for propulsion as well as regeneration (while breaking)
6	Inverters/ Converters	Inverters for DC to AC (for electric motor) and AC to DC for regenerative braking, Converters convert high-voltage DC power to lower voltage for other vehicle systems
7	Other electrical	Controllers (regulating energy and thereby speed), onboard computers, chips, and high voltage harnesses
8	Vehicle Design	Commercial ZEV design
9	Body Manufacturing	Body structures and assemblies (e.g. frames, cab, hood, side rails, cross-members)
10	Vehicle Assembly	Commercial ZEV assembly combining all systems

Many of the components that make up an MHD internal combustion engine (ICE) vehicle are the same as a ZEV. However, there are key electric drive components that differentiate a ZEV, such as battery packs, electric motor, inverters and converters, along with other electrical parts. These various components, from materials sourcing, to design, to assembly, all make up the long list of sub-segments within the ZEV manufacturing segment of the supply chain.

ERM's analysis found that a national ACT-style rule combined with a federal NOx standard that aligns with the Heavy-Duty Omnibus rule would generate a 63,000 net increase in jobs and net GDP growth of over $10 billion by 2035.[153] Importantly, the average wages for the new jobs created are roughly double the average wages of those replaced.

2. EPA Must Reject the "Pre-Buy/No-Buy" Myth

A frequent industry claim that EPA should forcefully reject in response to comments is that new emission standards cause a "pre-buy/no-buy" phenomenon. The theory goes that complying with new standards comes at an exorbitant cost, causing fleets to stock up on older truck models before the new standard comes into effect ("pre-buy") resulting in a sharp decrease in sales after the standard begins ("no-buy"). Because of this wild oscillation in demand, manufacturers claim standards will result in job cuts—something they claim happened with previous heavy-duty vehicle emission standards. Any scrutiny of the impact of past emission standards on purchasing behavior shows that manufacturers are superimposing trendlines and erroneously calling that a causal relationship.

A more rigorous econometric approach was conducted to evaluate the 2007 federal truck emission update impact on truck sales. The analysis found that regulatory "anticipation" caused a spike in truck sales before the rule began, followed by a slump once it came into effect.[154] But, critically, the spike and slump were

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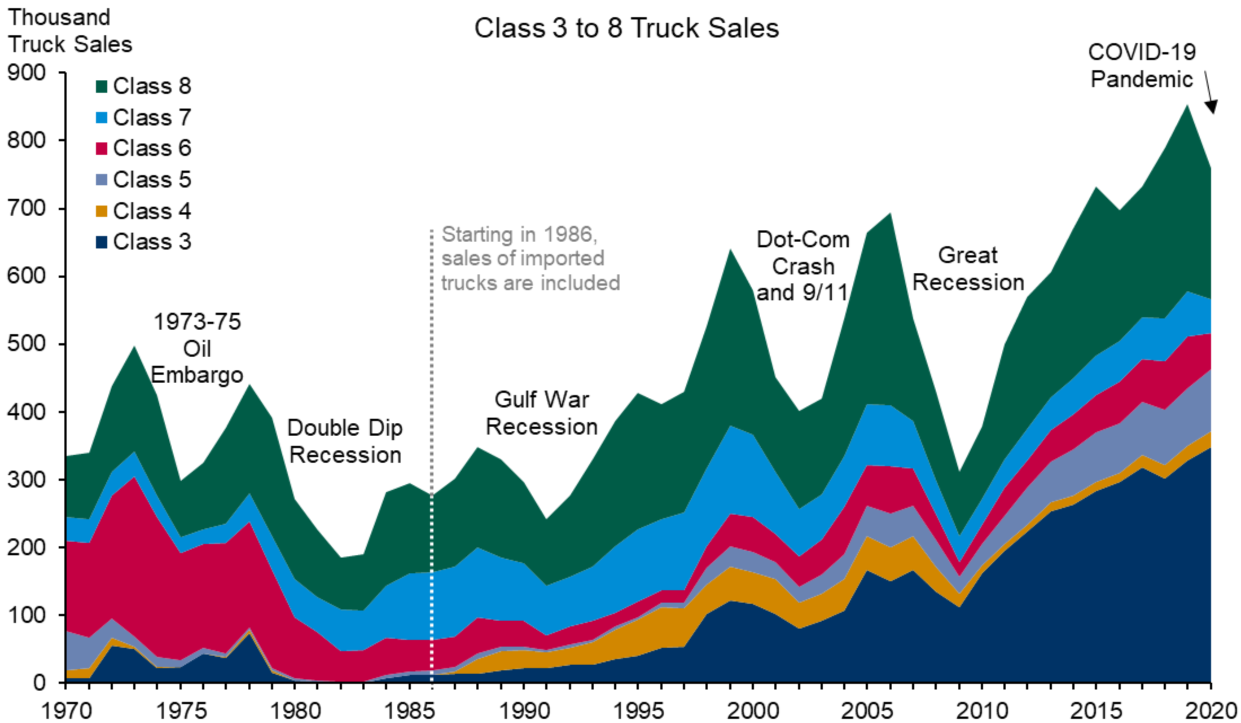
[153] Robo et al. 2022, p. 4.

[154] https://www.sciencedirect.com/science/article/abs/pii/S0095069617306848?via%3Dihub

extremely short-lived (only seven months before and after), and caused by other macroeconomic factors (GDP and oil price changes). Moreover, the number of vehicle sales impacted was small, roughly 30,000 nationally, and almost 30 percent of these sales were attributable to GDP and oil price changes. In fact, further examination of historical Class 3-8 sales data shows a clear correlation between decreased truck sales and periods of economic downturn (Figure 6).

Figure 6. Class 3-8 truck sales in the United States, 1970-2020



Source: ERM analysis based on Transportation Energy Data Book[155]

Further, the 2007 standard required an entirely new emission control technology. In comparison, the 2010 federal truck standard, which the report also evaluated, only required minor improvements to existing technology and did not experience any pre-buy/no-buy behavior. This is vital because an enhanced version of EPA's Option 1 that aligns with the Heavy-Duty Omnibus rule only necessitates improvements to existing technology, not entirely new technologies, and is much more similar to the 2010 update.

Additionally, the only cost data that manufacturers can point to comes from an unverifiable survey conducted on their members with wildly inflated projections. In contrast, numerous third parties, including the California Air Resources Board[156] and the manufacturers of emission control systems,[157] have published

[155] Stacy Davis and Robert Boundy, Transportation Energy Data Book Edition 40 (Oak Ridge National Laboratory, US Department of Energy, August 2021), Table 5.3, https://tedb.ornl.gov/wp-content/uploads/2022/03/TEDB_Ed_40.pdf.
[156] California Air Resources Board Staff Report on the Warranty Cost Study for 2022 and Subsequent Model Year Heavy-duty Diesel Engines. https://ww2.arb.ca.gov/sites/default/files/2022-01/warranty_cost_study_final_report.pdf.
[157] https://www.meca.org/wp-content/uploads/resources/MECA_2027_Low_NOx_White_Paper_FINAL.pdf, pp. 24-25.

extensive cost projections that are orders of magnitude less than the industry survey. Many of these studies are backed by actual lab testing and all results are publicly available.

3. Worker Exploitation and Misclassification

The exploitative practice of a freight transportation system that relies on misclassified workers ultimately undermines any regulatory policy that aims to "clean up" the trucking industry by shifting costs of emissions reductions to the most economically vulnerable within the industry. However, with the correct policy levers in place and working with the whole of government approach, while centering frontline and fence line experience and knowledge the EPA could be proposing the necessary successful Rule that would move ZEVS with the goal of just transition and entering environmental justice. Otherwise, we risk leaving zero emission transition up to chance. [158]

> In the workplace, the just transition framework centers the voices of workers whose jobs will radically transform by the promise of clean energy industries. Bearing in mind that the jobs of truckers and some warehouse workers might look quite different in an electrified world, looking to workers to provide leadership on what their needs will look like around training, affordability, and working conditions is a way to ensure a fair progression to EVs.[159]

Port drivers have become indentured servants to their trucks. "Drivers are on the job five days a week, from ten to twelve hours a day, earning an average income of $28,000 per year."[160] Because they are not considered to be employees they have no benefits -- no health care, pension, paid vacation, etc. As previously stated, drivers have to pay the total cost of their rigs and of being on the road.

In the National Employment Law Project Report in 2014, *Big Rig: Poverty, Pollution, and the Misclassification of Truck Drivers at America's Ports,* found that over 60% of port truck drivers are misclassified as independent contractors.[161] The labor practice of misclassifying workers in the trucking industry undermines climate action by shifting the costs of emission reductions from companies onto the most economically vulnerable in the industry: contract truck drivers. Contract truck drivers often earn a low income and face high capital costs. These drivers "purchase" the truck that will fall under the new emission standard at a higher cost and are responsible for paying the for ownership and operation costs that can be significantly above their earnings. Drivers are often in the position of absorbing the costs of upgrading to new technologies, while trucking companies externalize their costs.

To begin to address the issues of exploitation of the workforce especially for port truck drivers the EPA needs to propose a just transition towards zero emission vehicles. This means that there would be supportive policies and programs needed to ensure that workers within the port transportation sector are not further burdened but actually could benefit from the increases in job growth. MFN is committed to a just transition

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158 https://laborcenter.berkeley.edu/pdf/2019/Truck-Driver-Misclassification.pdf

159 https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf

160 Bensman, David. (2009). Port trucking down the low road: a sad story of deregulation. Rutgers University. DEMOS pg.5

161 https://www.nelp.org/wp-content/uploads/2015/03/Big-Rig-Overhaul-Misclassification-Port-Truck-Drivers-Labor-Law-Enforcement.pdf

towards zero emissions.[162] This means that the voices of workers are critical to the success of policies and programs that will ultimately move towards zero emission solutions across the freight transportation system.

"Just transition advocates within the labor movement often say that while 'transition is assured, justice is not.'" - Warehouse Workers for Justice, For Good Jobs & Clean Air, How a Just Transition to Zero Emission Vehicles Can Transform Warehousing[163]

B. EPA's Health Benefit Analysis and Race

EPA documented some of the connections between this rulemaking and environmental justice in the NPRM[164], but it needs a more detailed analysis if it is going to actually reduce harms in environmental justice communities. Environmental racism in the impacts from heavy-duty truck pollution shows up in multiple ways—not limited to disproportionately high exposure to pollution, already elevated incidence rates of health risks such as asthma and premature mortality, and amplified effects of environmental exposures from social vulnerabilities such as cumulative physiological "wear and tear" and stress.[165] We recommend that EPA further consider the disparate impacts of the rule and alternatives through analyzing race/ethnicity-stratified health benefits. This is already being done in other EPA rulemakings, and would more accurately capture the distribution of health impacts to environmental justice communities and result in a more accurate total health benefit as well.

Analyzing race/ethnicity-stratified health benefits is the next logical step from the existing analysis in the RIA. EPA's demographic analysis of air quality impacts of the rule shows that in the 2045 baseline, nearly double the number of people of color live in areas with the worst air quality compared with non-Hispanic Whites. These areas are also where the largest PM2.5 and ozone reductions occur due to Option 1. This is an important analytical step, and it is also important to outline how the resulting health risks are affected by these changes in exposures. As noted above, capturing the differences in exposure and exposure reductions from the rule only captures one part of its environmental justice impacts. A stratified health benefit analysis provides a view on how these exposure reductions are ultimately felt by different groups. These disparities in health impacts are often magnified when compared to disparities in exposure reductions, given the overlay of elevated incidence rates of health risks and the amplified health effects due to other vulnerabilities in communities of color (i.e., "cumulative impacts" as discussed elsewhere in these

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162 The Just Transition Alliance defines this concept as "a principle, a process and a practice. The principle of just transition is that a healthy economy and a clean environment can and should co-exist. The process for achieving this vision should be a fair one that should not cost workers or community residents their health, environment, jobs, or economic assets. "What Is Just Transition?" Just Transition Alliance, http://jtalliance.org/what-is-just transition/.

163 https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf

164 87 FR 17451-54 (Section II.B.8)

165 Morello-Frosch, Rachel, Miriam Zuk, Michael Jerrett, Bhavna Shamasunder, and Amy D. Kyle. "Understanding The Cumulative Impacts Of Inequalities In Environmental Health: Implications For Policy." *Health Affairs* 30, no. 5 (May 2011): 879–87. https://doi.org/10.1377/hlthaff.2011.0153.; Payne-Sturges, Devon C., Gilbert C. Gee, and Deborah A. Cory-Slechta. "Confronting Racism in Environmental Health Sciences: Moving the Science Forward for Eliminating Racial Inequities." *Environmental Health Perspectives* 129, no. 5 (May 2021): EHP8186, 055002. https://doi.org/10.1289/EHP8186.; Spiller, Elisheba, Jeremy Proville, Ananya Roy, and Nicholas Z. Muller. "Mortality Risk from PM2.5: A Comparison of Modeling Approaches to Identify Disparities across Racial/Ethnic Groups in Policy Outcomes." *Environmental Health Perspectives* 129, no. 12 (December 2021): 127004. https://doi.org/10.1289/EHP9001.

comments). Lastly, stratified health risk analyses can help communicate the impacts of the rule to stakeholders and promote meaningful involvement.[166]

EPA has shown strong documented support for analyzing health impacts by race/ethnicity within their rulemaking. Most notably, the *2019 PM2.5 Integrated Science Assessment (ISA)* and draft supplement cite extensive evidence supporting racial and ethnic differences in PM2.5 exposure and health effects, especially within Hispanic and non-Hispanic Black populations.[167] EPA's 2016 "Technical Guidance for Assessing Environmental Justice in Regulatory Analysis" recommends analysts to "present information on estimated health and environmental risks, exposures, outcomes, benefits and other relevant effects disaggregated by income and race/ethnicity", while acknowledging context-specific data limitations, time and resource constraints, and analytic challenges.[168] EPA has already conducted such an analysis in its *Policy Assessment for the Reconsideration of the National Ambient Air Quality Standards for Particulate Matter (External Review Draft – October 2021)*, where it analyzed the effects of race/ethnicity-stratified health impact functions and baseline incidence data on mortality risk rate reductions from a number of different NAAQS modeling scenarios. This stratified analysis was reviewed favorably by the Clean Air Scientific Advisory Committee (CASAC), and its methods can be useful in other air quality rulemakings.

Showing the distributional effects of the rule is a small additional step in light of the tremendous amount of work done in the rest of the RIA.[169] In this case, the health benefit analysis already includes spatially distributed modeled health impact results, and matching this to the projected population distribution by race/ethnicity is a small effort. EPA's Environmental Justice Strategy and Executive Order 12898 make clear the necessity for distributional analyses to ensure EPA policies and programs do not exacerbate environmental injustices, but it is also important to document where policies have the potential to mitigate disparities, and assess to what extent it does. There are a few caveats when doing this, notably that it is based on *modeled* exposures and *projected* population distributions, where populations in each grid cell are assumed to experience the same pollution.[170]

Including racially-specific health benefits can also more accurately assess the total health benefits of the rule. Spiller et al. (2021) has shown that including race/ethnicity-specific mortality incidence rates or health impact functions (HIFs) can both change the distribution of health benefits as well as increase total premature mortality estimates by 9%.[171] Similarly, in the case of Proposed Option 1 of this rule, not using race/ethnicity-specific health impact functions underestimates the total PM2.5 premature mortality

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[166] A goal noted in EPA's definition of environmental justice and "Guidance on Considering Environmental Justice During the Development of a Regulatory Action." Environmental Protection Agency, https://www.epa.gov/environmentaljustice/guidance-considering-environmental-justice-during-development-action

[167] NRPM at 119. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=347534 and https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=352823

[168] "Technical Guidance for Assessing Environmental Justice in Regulatory Analysis." Epa.gov, Environmental Protection Agency, https://www.epa.gov/sites/production/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf. (June 2016) at 13.

[169] Banzhaf, H Spencer. "Regulatory Impact Analyses of Environmental Justice Effects," National Center for Environmental Economics Working Paper Series, 10–08 (2010). https://www.epa.gov/sites/default/files/2014-12/documents/regulatory_impact_analyses_of_environmental_justice_effects.pdf at 17.

[170] Post, Ellen S., Anna Belova, and Jin Huang. "Distributional Benefit Analysis of a National Air Quality Rule." *International Journal of Environmental Research and Public Health* 8, no. 6 (June 1, 2011): 1872–92. https://doi.org/10.3390/ijerph8061872.

[171] Spiller, Elisheba, Jeremy Proville, Ananya Roy, and Nicholas Z. Muller. "Mortality Risk from PM2.5: A Comparison of Modeling Approaches to Identify Disparities across Racial/Ethnic Groups in Policy Outcomes." *Environmental Health Perspectives* 129, no. 12 (December 2021): 127004. https://doi.org/10.1289/EHP9001.

reduction by around 16%. This translates to a $1.2 billion underestimation of health benefits from PM2.5 premature mortality reduction alone. Notably, benefits to Black populations are underestimated by 64%, benefits to Hispanic populations are underestimated by 36%, and benefits to White populations are overestimated by 16%. Table 3 below shows the full distribution of results from an illustrative stratified analysis.

Table 3. Stratified analysis of annual PM2.5 premature mortality benefits to populations over 65 y of age in the United States of Proposed Option 1 in 2045[172]

Race/ethnicity	*Average HIF (% of total)*	*Race-stratified HIF (% of total)*	*National share of older populations by racial/ethnic group, as a percentage of the total population above 65 y of age*
Native Americans	4 (0.5%)	5 (0.6%)	0.6%
Asian Americans	35 (4.4%)	46 (4.8%)	6.9%
Black Americans	100 (13%)	275 (29%)	12%
Hispanic Americans	87 (11%)	136 (14%)	17%
White Americans	580 (72%)	499 (52%)	64%
All groups	800	960	100%

The benefits in the stratified analysis above are modest compared to the thousands of deaths from diesel pollution across the country every year.[173] The use of race/ethnicity stratified HIFs avoids underestimation of total health benefits as well as provides a more accurate portrayal of health benefits by race/ethnicity. This is just an illustrative analysis, and we encourage EPA to conduct its own, acknowledging difficulties in data collection, certainty, and health impact function availability for other health endpoints. Further analysis should situate these policies within a holistic cumulative impacts framing that guarantees reduction of harms in environmental justice communities.

C. Civil Rights and State Implementation Plans (SIPs)

It is critical that, in this rulemaking, USEPA sends a strong signal to the market and regulators that long-standing burdens to communities and increasing disparities in burdens from heavy-duty trucks cannot continue. While Section 202 of the Clean Air Act itself does not on its face address the spatial/geographic distribution of heavy-duty trucks and other vehicles once manufactured and sold, USEPA has obligations under the Clean Air Act and Title VI of the Civil Rights Act to ensure that state agency receiving funds for

[172] This analysis used the same PM2.5 air quality surfaces as in the RIA, but incorporates BenMAP's in-built health impact functions to use race/ethnicity-specific health impact functions for PM2.5 mortality from Di, Q., Wang, Y., Zanobetti, A., Wang, Y., Koutrakis, P., Choirat, C., Dominici, F. and Schwartz, J.D. 2017. Air pollution and mortality in the Medicare population. New Engl J Med 376(26): 2513-2522. Values show two significant digits. Race/ethnicity-specific mortality incidence is not used in BenMAP's projected datasets, and its impact was not analyzed here.

[173] https://www.catf.us/deathsbydiesel/

their air programs address disparities in burdens from heavy duty trucks through their State Implementation Plans (SIPs).[174]

USEPA can and should help support states doing so by setting a standard under Section 202 that ensures robust availability of the cleanest trucks across the country, in all states, cities and other municipalities facing the heavy and disparate toll of the logistics industry.

D. Promoting False Solutions through Counterproductive Crediting Programs

As described below, EPA's proposal includes a myriad of loopholes which reduce the effectiveness of a proposal that already does not meet the requirements of the Clean Air Act. EPA has considered neither the health impacts of these programs nor their counterproductivity towards driving emissions reductions.

In assessing the impacts of such crediting programs, EPA must give greater consideration to the distribution of the range of vehicles covered by its program. Engines are credited not by the health impacts of their emissions but by a generic lab test. In order to assess the distributive health impacts of its NOx program broadly, and its crediting program more specifically, EPA should be collecting in-use data on the vehicles being credited. For example, there is a substantial difference between the public health impact of a zero-emission truck being deployed outside an environmental justice community and used to offset the sale of a dirtier diesel truck being driven through such a community than vice versa. EPA must ensure that credits awarded for deployment of cleaner trucks are actually benefiting the communities most impacted by freight pollution, and the agency should move forward with efforts to prioritize deployments in the most freight-impacted communities.

1. Early Action Credits

EPA's generous early action credits must be removed as they unnecessarily dilute the emission standard while incentivizing a harmful, dead-end technology: natural gas vehicles. A strong fleet averaging system inherently incentivizes early action since earlier reductions can ease manufacturer compliance and provide flexibility, rendering early action credits redundant. Further, since natural gas vehicles, under the current inadequate testing and certification regimes, are falsely labeled as "low NOx" vehicles, early action credits functions as a carve out for these vehicles.

It is vital that EPA avoid incentivizing natural gas vehicles, which perpetuate reliance on fossil fuels whose production and use—from drilling to transporting to refining to storage—is rife with emissions that adversely impact communities, public health, and the environment.[175] Moreover, supporting combustion technologies, particularly where additional fueling infrastructure is required, locks in long-term fossil fuel investments that risk becoming stranded assets.

Beyond the financial and stranded cost risks, there is also risk that natural gas vehicles will not achieve their claimed emission levels. Preliminary results from an on-going study of 200 medium- and heavy-duty

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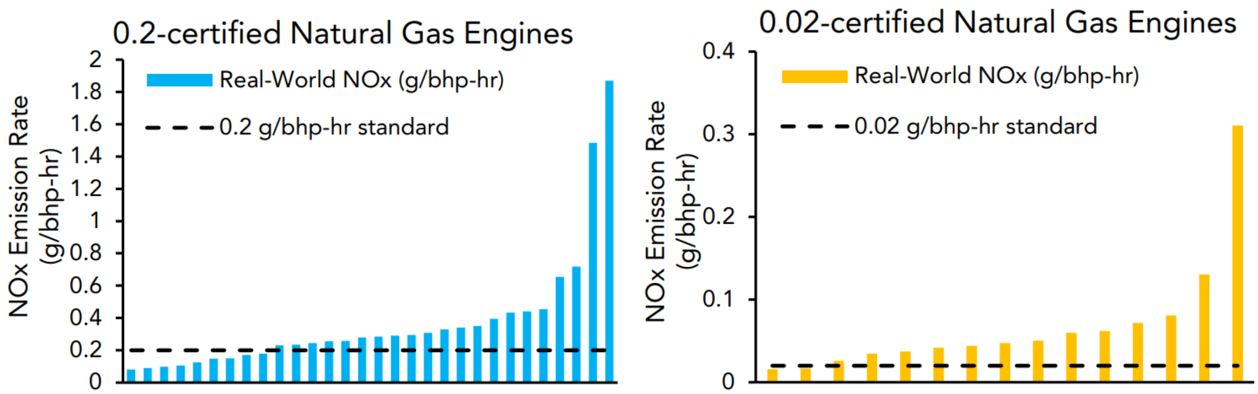
[174] USEPA also may have civil rights obligations to ensure that localities receiving federal funds similarly do not create or perpetuate disparities in pollution and/or cumulative impacts from the logistics sector, as does its federal counterpart the Department of Housing and Urban Development. *See* 42 U.S.C. § 2000d-1 and 40 C.F.R. 7.15 ("This part applies to *all* applicants for, and recipients of, EPA assistance in the operation of programs or activities receiving such assistance" (emphasis added).)

[175] https://envhealthcenters.usc.edu/infographics/infographic-natural-gas

vehicles show that natural gas vehicles emit well above their certification when tested in the real world.[176] Thirty natural gas vehicles certified at the current NOx standard of 0.2 grams per brake horsepower hour (g/bhp-hr) and 15 natural gas vehicles certified at the optional low NOx standard of 0.02 g/bhp-hr were tested using a Portable Emission Measurement System (PEMS). The results were alarming, with 0.2-certfied vehicles emitting, on average, roughly double their certification rate, and the 0.02-certified vehicles emitting roughly triple (Figure 7).

Figure 7. Real-world NOx emissions from natural gas engines



The study also found that "[a]s vehicles age and accumulate mileage, emission control systems can deteriorate as a result of natural degradation or mal-maintenance, which can lead to emissions that are often much higher than their certification standard." A related study comparing technology specific emission control system deterioration found that as natural gas vehicles age, they can and do pollute more than their diesel counterparts and, by extension, exponentially more than EVs.[177]

2. Electric Vehicle Credits

"If, for example, the BEV and FCEV technologies were projected to reach a greater degree of market penetration than our current projections, we could incorporate that level of BEV and FCEV penetration into a calculation of an appropriate numerical standard to represent the combined benefits of achieving NO_X control from engines along with zero tailpipe NO_X emissions from BEV and FCEV technologies. Depending on achieved and forecasted future penetration rates and EPA decisions in the rulemaking, this option could lead to a more stringent NO_X emission standard that would be achieved only if manufacturers develop and produce a certain number of powertrain technologies with zero-tailpipe NO_X emissions. We request comment on both the broad principle of factoring BEV and FCEV penetration into an assessment of the feasibility of NO_X emission standards in the final rule, or future rules, as well as data and methods that EPA could use to appropriately forecast market penetration levels and analyze cost and emissions impacts." (87 FR 17561)

176 https://ww2.arb.ca.gov/sites/default/files/2021-04/Natural_Gas_HD_Engines_Fact_Sheet.pdf

177 Marc Besch et al., In-use emissions and chassis dynamometer emissions rates of heavy-duty diesel and alternative fueled vehicles operating in Southern California, 30th CRC Real World Emissions Workshop (Mar. 2021) [hereinafter "30th CRC Real World Emissions Presentation"].

As noted in Section II, zero-emission trucks *are* projected to reach a much greater degree of market penetration than EPA's projections. However, the best way of driving the adoption of these vehicles is to require their sale.

By crediting the sale of these zero-emission solutions without considering them when setting the average requirements, EPA has created a perverse situation where the sale of a zero-emission truck results in the sale of a dirtier diesel vehicle. This is untenable for the communities suffering from freight pollution, particularly when the dirtiest vehicles on the road are likely to end up in those overburdened communities.[178]

EPA's best option is to consider and drive the sale of these vehicles separately, as outlined in Section II.A. If EPA insists on retaining zero-emission trucks in a vehicle NO_X standard, EPA must lower the NO_X standard to reflect the greatest degree of emission reductions achievable across the entire truck fleet based on the feasibility of widespread transition to zero-emission trucks, as outlined in Section II.B.

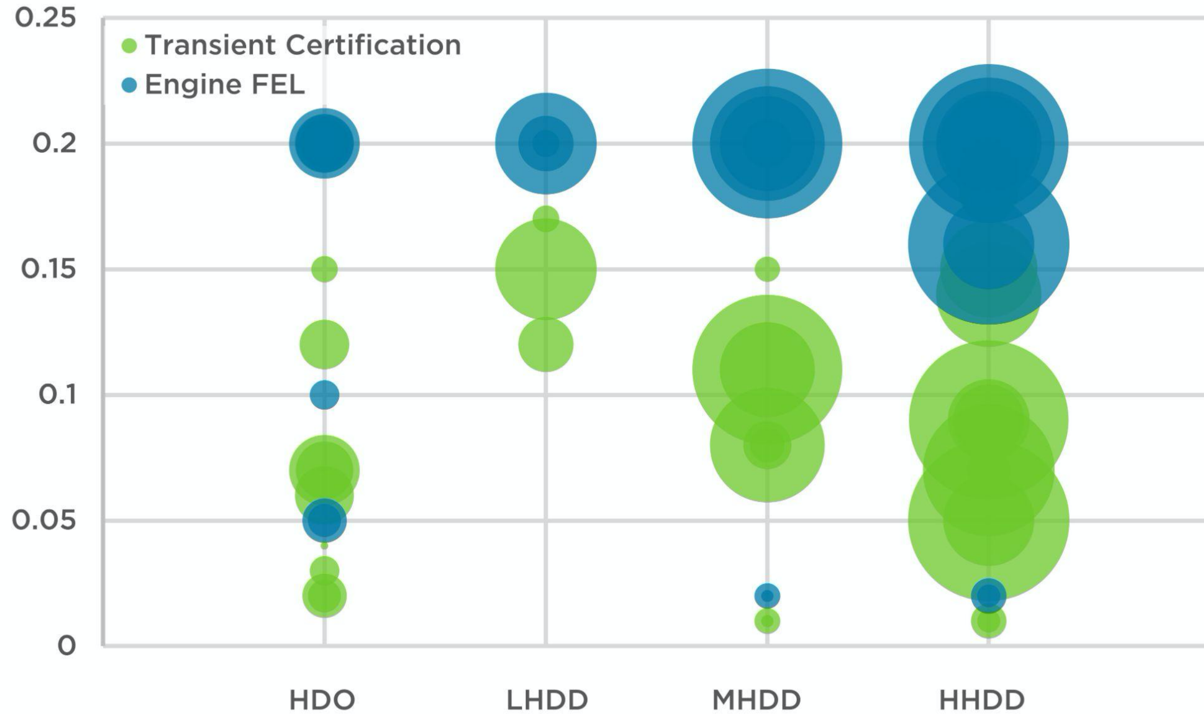
3. Transitional Credits

"We request comment on our proposed approach to offer transitional NO_X emission credits that incentivize manufacturers to adopt the proposed test procedures earlier than required in MY 2027." (87 FR 17553-4)

There is no need to incentivize manufacturers to adopt the proposed test procedures earlier than required in MY 2027 because they are already required to adopt essentially identical test procedures beginning in 2024 under the Omnibus program. Moreover, any such transitional program will lead to a windfall of credits for manufacturers meeting the required state Omnibus standards, which are 75 percent lower in the 2024-2026 timeframe than the federal program. These credits will then be used to delay emissions reductions nationwide.

Figure 8. Model year 2022 heavy-duty engine certification values

[178] See Chernova 2018 (https://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1150&context=gguelj) and references contained therein.



Model heavy-duty engines are all certified at or below the 0.2 g NO_X/bhp-hr average FTP/SET requirements (blue bubbles). The sales-weighted average compliance margin for these engines is over 50 percent, with many achieving FTP test values far below the standard (green bubbles). The size of the bubble corresponds to sales volume estimates. Importantly, a high-volume product from a major manufacturer was just certified to a 0.16 FEL_{FTP}, which only bolsters concerns about windfall credits for today's engines delaying future progress.

In addition to the windfall credits from vehicles sold in states where the Omnibus standards are in place, manufacturers will likely be able to certify 2024-2026 engines to the new test procedures with little effort, and doing so will result in a substantial amount of credits owing to the current, weak average NO_X standards. Every engine today is certified at or below the average required standard, with an average sales-weighted compliance margin of just over 50 percent between the FEL_{FTP} and the value from the certification test (Figure 8).[179] This large compliance margin likely covers any difference owing to the new test procedures—the scalar provided for the 2027 FEL_{LLC}/FEL_{FTP} is 90/35 = 2.6, and the best-performing engines from 2017-2019 already achieved a scalar of 3.5, just a 25 percent difference, and well below the level of wiggle room provided by the current compliance margin.

We support EPA's proposal to exclude the current credit balances (87 FR 17553); however, the transitional credit program raises all the same concerns, and all the same risks. With only marginal improvements in performance owing to the new test procedures, it is far more critical that EPA push manufacturers to adopt new technology rather than meet new tests, and the best way to do this is to limit any flexibilities for

179 See Section IV.3.5 on credit impacts for a more detailed description of the estimated sales figures in Figure 8.

manufacturers. The transitional credit program undermines efforts to reduce emissions in 2027 and beyond by rewarding the status quo. It should therefore be eliminated from the proposal in the final rule.

"We request comment on if CI engines should be subject to off-cycle standards as proposed in 40 CFR part 1036, subpart E, to qualify for the transitional credits." (87 FR 17554)

While we oppose these credits, if EPA moves forward with this program, it must ensure that any credits are predicated on meeting all of the changes in program design changes adopted by EPA beginning in 2027 to improve the robustness of any test-cycle reductions in the real world. Critical to these changes is the elimination of the NTE program and the adoption of the moving-average-window approach to ensure that these newer trucks are seeing required reductions in real-world emissions on the road and the adoption of the low-load cycle, which better reflects the need to capture operations where today's vehicles fail miserably. If EPA moves forward with the credits they must ensure that reductions in medium- and heavy-duty vehicle emissions occur within environmental justice communities by requiring the ZEVs are deployed in environmental justice communities. EPA must require that these vehicles are part of a publicly available tracking system to ensure adherence to the Rule.

We are absolutely opposed to credits for any engines that do not adhere to updated testing and compliance procedures that are at least as effective as those already met by the state Omnibus.

"We are specifically interested in comments on other approaches to calculating transitional credits before MY 2027 that would account for the differences in our current and proposed compliance programs." (87 FR 17554)

There should be absolutely no credits awarded for legacy engines nor legacy technologies. The difference is these engines cannot simply be captured in a conforming factor—it goes directly to the operation of the engine itself and the corresponding emissions controls. The current test procedures have not led to the reductions promised—there is absolutely no reason not to require that all certified engines moving forward are required to be certified under the updated procedure, directly assessing their emissions under the new protocol, without any conditional fudge factor that could be manipulated or gamed and would lead to a continuation of the inadequate compliance procedures to-date.

"We also request comment on our proposal to apply a five-year credit life for transitional NO_X emission credits." (87 FR 17554)

As is noted below, the impact that the credit program could have on future emissions requirements is substantial. This is particularly true in the years prior to 2027, when the difference between what is feasible and what is required is (at an absolute level) the greatest. While we oppose the generation of any credits in this time period, worse still is the possibility that any such credits could linger as late as 2031. If granting any such credits, EPA should propose a limit of no more than three years, as discussed below.

4. Credit Lifetime

"As specified in the proposed 40 CFR 1036.740(d), NO_X emission credits generated for use in MY 2027 and later could be used for five model years after the year in which they are generated. … We request comment on our proposed five-year credit life." (87 FR 17552-3)

Three years, not five, is a reasonable timeframe to average out year-to-year variability and should therefore be an appropriate credit lifetime. EPA's three-year stability requirement under the Clean Air Act § 202(a)(3)(C) represents an industry standard pace of improvement to which manufacturers already adhere and plan against. Prior to EPA's elimination of credit lifetime, NO_X and particulate emission credits had a three-year expiration (40 CFR § 86.091-14(f)(1) [2004][180]).

Acknowledging the harm that the current indefinite credit system would cause were it allowed to persist, EPA has not justified its choice of five years, and a three-year lifetime is both more protective under the Clean Air Act and has previously been used by the agency. In fact, prior to its most recent elimination of a credit lifetime, EPA had proposed reintroducing the three-year lifetime after a temporary transition period but finalized an infinite credit lifetime based on a rationale it now rejects[181]— a return to the previous three-year lifetime for credits is thus the natural outcome of such action.

To appropriately limit the environmental harm caused by credit usage, EPA should reinstate the three-year (not five-) credit lifetime, if it is to have a banking and trading program at all.

5. Credit Impacts

The total impact of the above crediting provisions is quite large, yet EPA has not completed any analysis of the environmental and/or public health impacts of these provisions. EPA has not required the necessary mechanisms to track the crediting provisions or guidance to prioritize environmental justice communities for the deployment of ZEV. If the agency had done a complete analysis, it would see clearly the deleterious effect such actions have on the efficacy of the program.

Below, we detail the harms posed by the agency's proposed flexibilities. In short, the proposed flexibilities are weak enough to virtually turn the 2027-2030 phase of the Option 1 standard from a 0.035 g NO_X/bhp-hr standard, on paper, into a 0.05 g NO_X/bhp-hr standard, in practice. These flexibilities under status quo deployment eliminates 12 percent of the benefits of the first step of the proposed Option 1—some of the more likely scenarios of electric vehicle adoption and/or the likely possibility that additional states adopt the Omnibus standards would only further erode the benefits of EPA's proposed program as a result of these unnecessary flexibilities.

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180 This section of the CFR has since been amended, but an archival reference is available here: https://www.govinfo.gov/content/pkg/CFR-2004-title40-vol17/pdf/CFR-2004-title40-vol17-sec86-091-15.pdf.

181 E.g., compare EPA-420-R-97-102, pp. 19-22 ("EPA believes that a limit on credit life would in this case to some degree stifle the development and introduction of new technology.") and 87 FR 17552-3 ("Manufacturers could continue to generate credits by adopting increasingly advanced technologies. … We believe a five-year credit life adequately covers a transition period for that option, while continuing to encourage technology development in later years.").

a. Defining the baseline diesel engine fleet for this analysis

In order to estimate the impacts of the program, we have primarily relied upon three key sources of data: 2022 heavy-duty engine certification data;[182] engine production and installation data for 2019,[183] the last year for which data is available which predates the temporary supply chain issues which have occurred as a result of the pandemic; and new vehicle registration data for 2019-2021,[184] sorted by vehicle class, fuel, and state.

While engine configurations are available in numerous horsepower configurations, they are generally certified under a single FEL, so we have reduced the number of engines to 34, covering the different fuels and engine classes the engine might be deployed.[185] While the Wards data identifies engine manufacturers for a given gross-vehicle-weight rating (GVWR) class, it does not identify which of the engines manufactured by a given supplier is deployed to those vehicles, except in the case of Class 8 sales, where the data distinguishes between engines greater than or less than 10 liters in volume. Therefore, to assign these engines we have used our best technical judgment in assigning engines, including distinguishing between classes within a given engine class (e.g., LHDD encompasses both Class 4 and Class 5 vehicles) as well as additional data on engine configurations from manufacturers (for example, the engine manufacturers themselves or specific applications such as transit or school buses, where only a subset of engines might be deployed), or data from the Phase 1 greenhouse gas program.[186]

<u>Validation of this baseline</u>

"We are not proposing in this rulemaking to make a determination in favor of confidential treatment for any information collected for certification and compliance of engines, vehicles, equipment, and products subject to evaporative emission standards. ... The information categories we are proposing in this action are: (1) Certification and compliance information, (2) fleet value information, (3) source family information, (4) test information and results, (5) averaging, banking, and trading (''ABT'') credit information, (6) production volume information, (7) defect and recall information, and (8) selective enforcement audit (''SEA'') compliance information. ... We are requesting comment on the following: (1) Our proposed categories of information; (2) the proposed confidentiality determination on each category; and (3) our placement of each data point under the category proposed." (87 FR 17610-11)

While we have utilized numerous resources and the best data publicly available, we have no way to validate our estimates of the sales-weighted distribution of certified engines and the credits generated by these engines, owing to the limitations of the current confidentiality-determination process. While greater data is available under the light- and heavy-duty vehicle greenhouse gas programs, and stakeholders including state

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182 https://www.epa.gov/system/files/documents/2022-02/heavy-duty-gas-and-diesel-engines-2015-present.xlsx (updated February 2022)
183 https://wardsintelligence.informa.com/WI964489/North-America-Factory-Sales-December-2019
184 Atlas EV Hub, Medium- and Heavy-duty Vehicle Registrations Dashboard, which collects data from IHS Markit: https://www.atlasevhub.com/materials/medium-and-heavy-duty-vehicle-electrification/
185 For example, while Cummins' L9 engine is available in at least 9 different configurations, our analysis reduces this to 4 separate assigned engines, first to distinguish between L9 diesel and L9N compressed natural gas fuels, and then assigning each of those to both medium- and heavy-heavy-duty diesel engine classes (MHDD and HHDD, respectively).
186 https://www.epa.gov/compliance-and-fuel-economy-data/epa-heavy-duty-vehicle-and-engine-greenhouse-gas-emissions

regulators and the engine manufacturers themselves have access to this engine certification data, the general public does not.

Information about credits and compliance goes directly to the public's ability to assess how well the program is driving actual emissions reductions, as compared to the generation of credits from so-called flexibilities which can undercut those reductions. Transparency in such credits is critical.

The purported basis for concealing "Confidential Business Information" (CBI) is that it would provide competitors with an advantage. However, many of the information categories EPA has proposed eliminating confidential treatment for are already available to competitors through expensive industry databases. Manufacturers are therefore not at greater risk under the proposed relaxation of these specific categories, and it is the public who is at risk if they continue to remain in the dark under the current constraints.

For example, the real-world performance data provided by EPA on heavy-duty trucks[187] illustrated the massive shortcomings in the current test procedures and emissions control equipment as well as the harms those vehicles posed in real-world operation, and organizations were able to sort through that data to identify systemic problems and aid in advocating for solutions.[188] However, by the time this data was released, some of those dirty vehicles had been polluting communities for as many as 8 years. Moreover, there was no way to assess the health impacts of these shortfalls because while information about an individual truck and engine configuration were identified (e.g., a 2010 Ford F-650 delivery vehicle with a Cummins ISB 6.7 diesel engine), there is little information on usage or sales to extrapolate the breadth of the shortfall of emissions from these trucks. Given the breadth of data collected by the agency as part of its proposed off-cycle program and the value that such detailed data can have for communities affected on the ground by freight traffic, expanding the availability of this data collected as part of regulatory compliance, can help identify such problematic issues in a timelier manner.

By improving transparency of its datasets, EPA can also ensure that its own data is more accurate. Environmental justice communities that directly experience the emissions from these trucks and the volume of traffic from these trucks have had to hold truck counts because of outdated data being considered by the agency. Greater transparency in the assumptions being used by EPA can improve clarity to the public how valid its assumptions are (or not), and provide another check for the community to assess when EPA's assumptions are inconsistent with local freight impacts.

We strongly support the greater transparency that the proposed adjustments to CBI determination will have. Moving forward, we request that EPA continue to improve transparency for all of its vehicle programs regulated under the Clean Air Act, particularly on reporting more data at an engine/vehicle level to understand how individual classes, applications, and/or manufacturers may be responding to these regulations. The public deserves more information to fully understand engine and vehicle emissions performance, including for specific configurations. Currently manufacturers already have such access—it's long past time that the public does as well.

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[187] https://www.epa.gov/compliance-and-fuel-economy-data/manufacturer-run-use-testing-program-data-heavy-duty-diesel-1

[188] For example, https://theicct.org/publication/current-state-of-nox-emissions-from-in-use-heavy-duty-diesel-vehicles-in-the-united-states/.

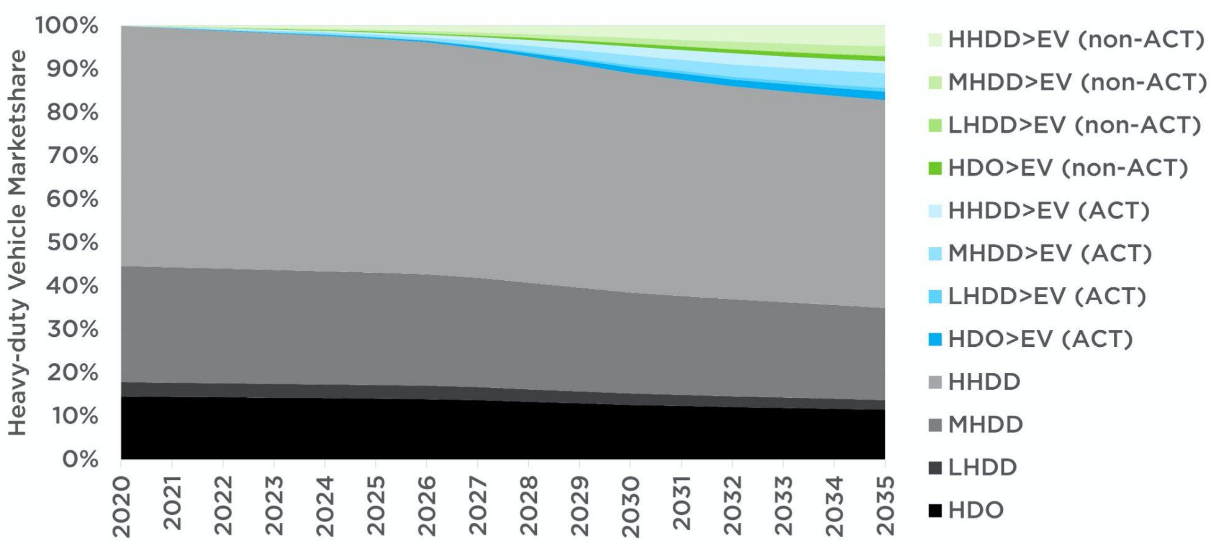
b. Defining baseline zero-emission vehicle deployment for this analysis

To project forward growth in the Class 4-8 ZEV market, we have conservatively assumed a rate of adoption consistent with the International Energy Agency's baseline policy case for 2030 in the United States,[189] the majority of sales which are the result of California adopting the Advanced Clean Truck rule. We have then further adjusted the sales of EVs upward to reflect the additional adoption of the Advanced Clean Truck rule by Massachusetts, New Jersey, New York, Oregon, and Washington, which the IEA baseline did not account for, using the regulatory requirements and registration data.

This baseline scenario is meant to represent a conservative but reasonable assessment of adoption of zero-emission trucks in order to better assess the impacts of the crediting provisions on conventional internal combustion engine trucks (Figure 9). As noted elsewhere in our comments, the actual future adoption of zero-emission trucks is likely to be much higher, owing to incentives, the cost-effectiveness of the technology, and additional state action like the MOU.

For all these reasons, this analysis is likely an underestimate of the impact of the ZEV crediting program. Furthermore, we have not considered in the below analysis any attempt by the agency to actually drive sales of zero-emission vehicles, because the agency did not do so in its proposal.

Figure 9. Baseline electric truck marketshare, by EPA engine class



A conservative estimate of status quo deployment finds that electric trucks would achieve an 11 percent marketshare by 2030, with just over 6 percent of that market coming from conventional vehicles powered by engines (HDO, LHDD, MHDD, or HHDD) transitioning to zero-emission powertrains in states that have adopted the Advanced Clean Trucks rule (ACT), representing 15 percent of total vehicle sales.

189 https://www.iea.org/reports/global-ev-outlook-2021

c. Credits generated under the proposal

Our analysis identifies three main buckets of credits: 1) engines certified below today's standards which will qualify for the transitional credit program; 2) engines certified to the Omnibus standards, which will qualify either for the transitional credit program or will, on average, achieve a standard below the federal requirements; and 3) zero-emission vehicles, which earn credits under the proposed provision for plug-in and fuel-cell electric vehicles.

While current certification procedures are not identical to the certification procedures required to qualify for the transitional credit program, as noted in Section IV.D.3 there is sufficient compliance margin such that these engines will almost certainly qualify for the program, and these credits are of such a large magnitude that it is obviously within the polluting industry's interest to take advantage of such a generous crediting program. Moreover, this is a conservative estimate of the likely availability of credits because this assumes no improved performance in the next two years of engines. Finally, for simplicity engines which would likely qualify for EPA's early credit program (and thus be able to use a credit multiplier) have been lumped into the transitional credit program only, and there has been no attempt to quantify the credits earned by those engines beginning in 2027, an additional conservative estimate.

For the Omnibus credits, it was assumed that all six states which have currently adopted ACT will move forward to adopt the Omnibus. To-date, three ACT states have done so (California, Oregon, and Massachusetts), representing 60 percent of the current ACT sales volume. Washington and New Jersey both have ongoing regulatory procedures to align with the Omnibus, and it is likely that New York, which just completed its ACT process less than six months ago, could follow.[190]

Additionally, numerous other states could join the Omnibus program. Colorado is currently considering the program as part of its 2022 Clean Truck Strategy.[191] Connecticut, which is not included in either ACT or Omnibus states, just passed a bill permitting the Commissioner of Energy and Environmental Protection to "implement the medium and heavy-duty motor vehicle standards of the state of California," which includes both ACT and Omnibus, signaling even more vehicles required to meet such standards.[192] Moreover, there are numerous other advocacy efforts moving forward at the state level to adopt these stronger standards and additional complementary policies to cut freight pollution in light of federal inaction and the severity of the problem facing communities today.

The determination of electric vehicle sales was described above. Because the proposal does not permit heavy-duty Otto-cycle (HDO) engines to receive credits, it was assumed consistent with the proposal that these credits would be allocated to the respective diesel engine class based on the GVWR of the according vehicle. Sales of HDO engines are dominated by Class 4-5 vehicles, so the majority of such generated credits (about 60 percent) applied toward LHDD engines.

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190 Washington: https://ecology.wa.gov/Regulations-Permits/Laws-rules-rulemaking/Rulemaking/WAC173-423-400Jan18. New Jersey: https://www.nj.gov/dep/njpact/materials.html#NJPACT-co2trucks20200910-am. New York: https://www.dec.ny.gov/docs/air_pdf/adopted218.pdf.

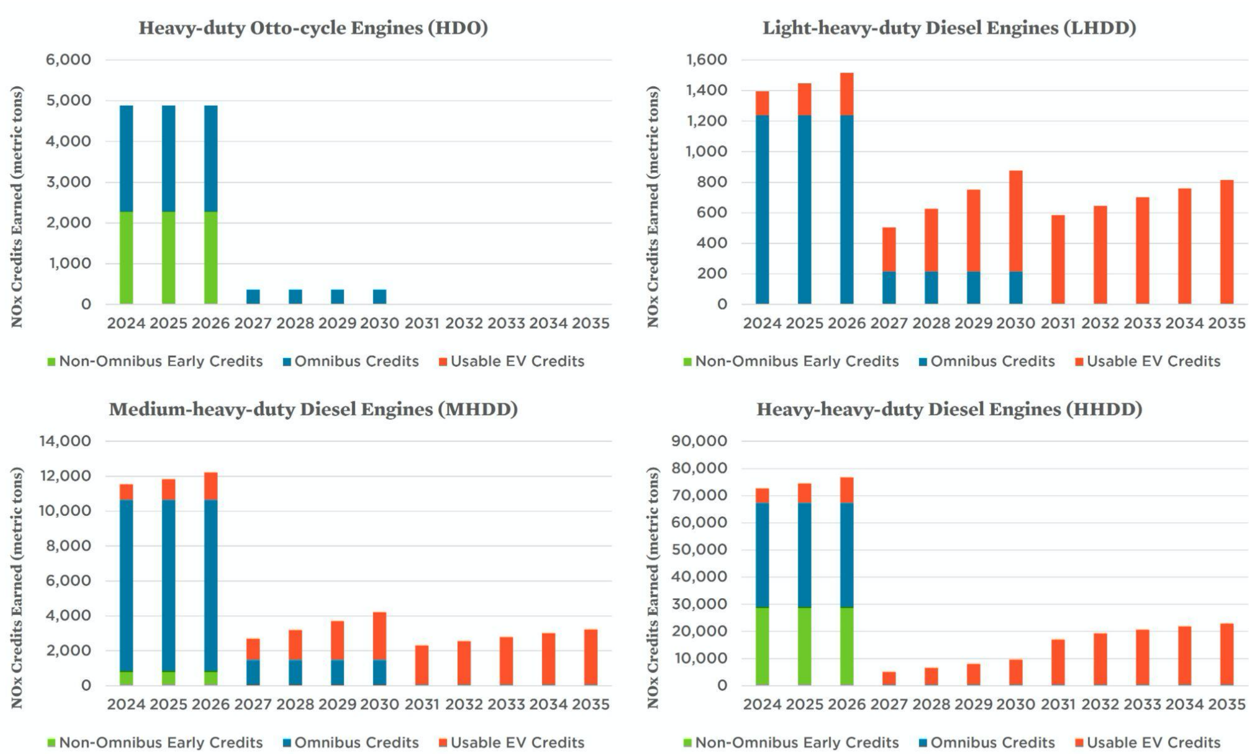
191 https://freight.colorado.gov/sites/freight/files/documents/CleanTruckStrategy.pdf, p. 4, calls for "new trucks sold in the state to produce 90% less NOx emissions than current standards starting in 2027."

192 https://legiscan.com/CT/text/SB00004/id/2579528/Connecticut-2022-SB00004-Chaptered.pdf.

To convert NO_X certification levels into awarded credits, we've utilized the same procedure adopted by EPA in its MOVES modeling—for diesel engines, the work assumed over the FTP cycle is based on a linear function of the horsepower of the engine, where we've used the certified horsepower corresponding to the FEL; for gasoline engines, we've used a fixed value based on limited data.[193] This is then combined with an assumed mileage factor for the FTP cycle (6.3 miles for gasoline vehicles, 6.5 miles for diesel) to yield an engines conformance factor. For reference, the average conformance factors for engine classes are: HDO, 3.07; LHDD, 3.50; MHDD, 3.90; and HHDD, 4.88. Because credits are not allowed to be traded between engine classes, however, there is little impact on any of the results stemming from the use of such estimates.

The magnitude of these credit programs is quite large (Figure 10). This is, however, not surprising—the transition credit program awards credit compared to a 0.2 g/bhp-hr standard. HHDD engines see a large number of early credits related to the deployment of high-volume products like Detroit Diesel's latest DD13, which is certified to a 0.16 g/bhp-hr standard, as well as a small volume of CNG engines. HDO engines see a significant share of early credits due to the large volume of propane engines as well as the large share of gasoline engines certified below the 0.2 g/bhp-hr NOx standard. Very few LHDD and MHDD products are currently certified below today's standards so are not projected to earn a significant share of transitional credits; however, as indicated by Figure 2, there is plenty of room at the margins for that to change.

Figure 10. Credits awarded under EPA's proposed Option 1 under a conservative baseline scenario



Under our analysis. over 325,000 metric tons of lifetime NO_X emissions are credited through 2030, and

193 https://www.epa.gov/sites/default/files/2017-08/documents/03-heavy-duty-start-emission-rates-2017-06-07.pdf, slides 9 and 10.

nearly 450,000 metric tons through 2035. The majority of these credits stem from vehicles sold under state regulations that are stronger than the current federal program, representing a windfall credit for manufacturers that erodes the benefits of the proposed federal program.

The majority of credits earned under our projections is granted for engines sold under the Omnibus standards, which are already required to achieve standards below the federal requirements in 2024 and beyond. For all but HHDD engines, these standards continue to be stronger than Option 1 in the 2027-2030 timeframe, yielding additional credits.

ZEV credits from Omnibus states were considered in the 2024-2026 timeframe under the Omnibus average stringency, since manufacturers can earn ZEV credits toward their requirements in that timeframe. However, nationwide sales in the 2024-2026 period still yield ZEV credits. As zero-emission trucks approach even just an 11 percent marketshare in 2030, credits from these vehicles surpass 13,000 metric tons—by 2035, at a projected share of just 17 percent this is doubled to 26,000 owing to increased FUL as well as marketshare.

d. Credit utilization and ensuing impacts

Owing to the nature of the banking and trading program, these credits have a significant impact on the emissions from the remaining vehicles in the fleet, especially in the early years of the program. Manufacturers have a range of ways in which they could utilize these credits, so it is impossible to capture every nuance in possible outcomes. Below, we consider two different ways to utilize those credits, as well as different limitations EPA could impose on the credit generation programs.

It should again be emphasized that we do not support the use of these credit programs, generally, as they undermine the real-world emissions reductions desperately needed in communities impacted by the freight sector. The analysis below is meant to be illustrative for EPA, emphasizing the need to consider the impacts of their proposed flexibilities in both their analysis of the feasibility of the standard and the degree to which they are upholding their legal requirements under the Clean Air Act.

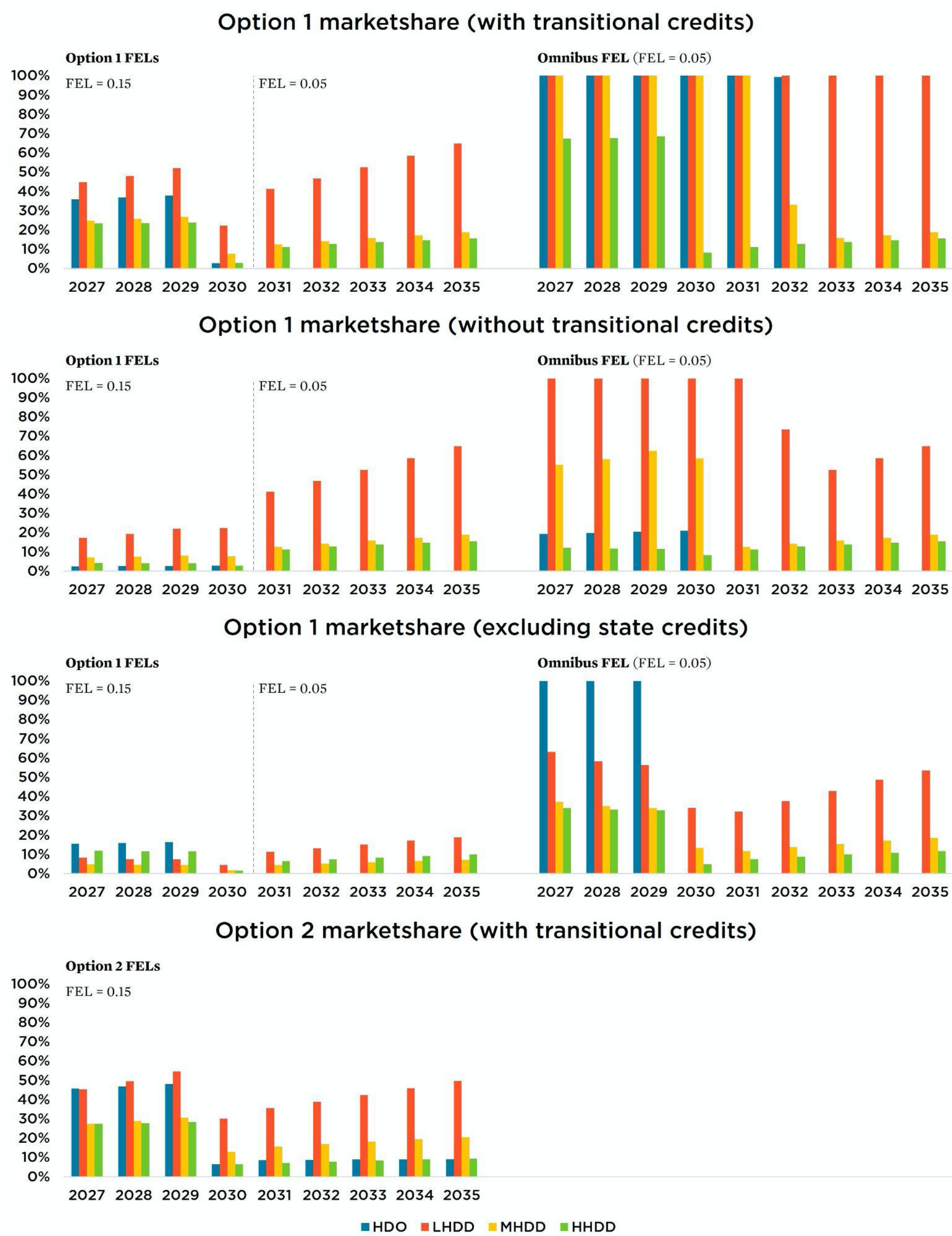
The first way in which manufacturers could choose to deploy the credits earned under EPA's flexibilities would be to maximize the number of vehicles sold at the worst polluting level allowed under EPA's program. Such a deployment strategy is indicated in the panes of Figure 11 on the left side of the figure. Here it is assumed that manufacturers would sell as many engines with an FEL_{FTP} = 150 mg NO_X/bhp-hr as possible in the 2027-2030 timeframe, and as many engines with an FEL_{FTP} = 50 mg NO_X/bhp-hr in 2031 and beyond.

An alternative strategy would be to maximize the bare minimum improvements needed over the largest share of the fleet. As noted elsewhere in this document, the 50 mg NO_X/bhp-hr FTP standard can be achieved with minimal changes in configuration and technology.[194]Therefore, rather than target credit usage at a narrow selection of engines, a manufacturer may choose instead to minimize the improvements broadly

[194] See https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hdomnibuslownox/appi.pdf pp. 18-21 for an analysis of the small changes needed based on data from Southwest Research Institute.

over the entire volume of engines. This is represented by the panes of Figure 11 on the right. This FEL also represents the FEL for the Omnibus standards, and the required average FEL for Option 2.

Figure 11. Share of conventional engines achieving a given FEL under different regulatory conditions



EPA's proposed credit program has the potential to substantially erode the benefits of stronger NO_X tailpipe standards, delaying the deployment of cleaner trucks. As proposed, EPA's proposal would mean that 27 percent of all engines sold in 2027-2029 would be no better than today's engines under Option 1. Under Option 2, this number would be 32 percent, with at least 10 percent of engines never *being required to improve compared to today's engines. While excluding vehicles sold in states adopting California's truck standards or excluding the proposed transitional credit program can help reduce the impacts of these credit* *provisions, only excluding them entirely can forestall their adverse impacts on the efficacy of the federal NO_X program, and EPA must carefully consider these impacts under its requirements under the Clean Air Act before finalization.*

The graphs in Figure 11 show the marketshare of a given FEL as a share of engines in a given engine class. The top-most figure represents the proposed Option 1 program. As indicated by the left-hand graph, we see that in the 2027-2029 period, nearly one-quarter of MHDD and HHDD engines, more than one-third of HDO engines, and nearly half of all LHDD engines could be deployed with an FEL_{FTP} = 150 mg NO_X/bhp-hr. EPA considers this FEL level "consistent with the average NOX emission levels achieved by recently certified CI engines," so this would mean that 27 percent of all engines sold in 2027-2029 would be no better than today's engines.

In the right-hand graph, credits for LHDD engines are sufficient as to require no improvement in those engines, thanks to the overwhelming share of zero-emission credits earned and the disproportionately small share of certified LHDD engines. However, three-quarters of all engines sold in the first step of Option 1 could be certified at the average level required under the weakest standard considered by EPA (Option 2). In fact, more than 15 percent of the fleet would *never* be required to improve beyond an FEL_{FTP} = 50 mg NO_X/bhp-hr, even under the more stringent second step beginning in 2031.

The bottom-most figure shows how the weakest standard considered by EPA would further be weakened by the adoption of this credit program. Nearly a third of engines sold in 2027-2029 would be allowed not to improve from today's certification levels, and more than 10 percent of all engines sold would *never* be required to improve beyond those levels.

In total, at least 12 percent of the lifetime benefits of the first step of Option 1 (2027-2030) are expected to be given away under the credit provisions proposed. For the weaker Option 2 over this same timeframe, this increases to 17 percent of a program that is, as proposed, substantially less effective.

e. Limiting the harm from the proposed credit programs

Given the harm caused by the proposed credit program, the best option for EPA is to simply eliminate all bonus crediting provisions—given the extensive lead-time and technical feasibility to reduce emissions from the freight sector, manufacturers do not need help transitioning to the levels of standards required by Option 1 or even the Omnibus. The so-called flexibilities provided are clearly detrimental to EPA's obligation to protect public health and welfare from pollution, the response most consistent with the agency's legal obligations under the Clean Air Act is to simply eliminate these provisions.

However, should EPA not take the more protective step of eliminating the proposed crediting provisions, there are measures that can be taken to improve the proposed credit program.

One clear issue is the windfall that results from the result of state regulatory programs that are more protective than the federal program. Elsewhere, we have noted that EPA should be factoring in the impacts that these state actions will have on the industry in assessing the feasibility of the program. However, if the agency does not adjust its stringency in response to these regulations, it must isolate the impact of those regulations. To do this, it can do as it has previously done in heavy-duty engine regulations and exclude engines certified to stronger state standards.[195] The results of this are shown in the third graph of Figure 11. The result of this is to substantially reduce the impacts of the crediting program by excluding zero-emission vehicles driven by state adoption of the ACT, but it also excludes the impact of credits earned in 2027-2030 from engine classes other than HHDD resulting from Option 1 being weaker than the Omnibus rule. On net, this cuts the number of available credits by more than 50 percent.

One additional obvious issue is the delay that the transitional credit program specifically causes. As noted above, three-quarters of engines sold under the first step of Option 1 could be certified to an FEL_{FTP} = 50 mg NO_X/bhp-hr, the dirtiest engine allowed under the Omnibus and a level required, on average, beginning in 2024, a full *seven years* before the second step in the Option 1 program. This level of delay allowed under EPA's proposal flies in the face of what is needed in areas around the country to meet federal air quality standards, which is immediate action to reduce emissions from the freight sector.[196] To reduce the amount of delayed action allowed under EPA's proposal, the agency should eliminate the transitional credit program. Eliminating the transitional credit program would cut credits available in the first step of the Option 1 program by nearly 80 percent. By reducing the credits available in this critical, initial part of the proposed regulation, EPA would increase the likelihood that manufacturers deploy the much needed cleaner trucks more quickly. However, in the long run, eliminating the transitional credit program alone would not mitigate the harm caused by the agency's credit program, which would permit at least 15 percent of heavy-duty vehicles sold under the second phase of the proposed Option 1 program to be certified to the dirtiest allowed FEL.

In addition to the above changes to the program, we refer EPA to our comments on the zero-emission vehicle crediting program specifically (Section II.B).

V. EPA Must Also Adopt Stronger GHG Standards

In the proposed rule, EPA requests comment on *how the agency can best consider the potential for ZEV technology to significantly reduce air pollution from the heavy-duty vehicle sector, including but not limited to whether and how to consider including specific sales requirements for [heavy-duty] ZEVs*.

While incentivizing zero-emission vehicle sales would be best incorporated into the NOx portion the EPA's final rule, it is possible to incentivize this transition through targeted revisions to the GHG Phase 2 program,

195 "It is worth clarifying that this phase-in excludes California complete heavy-duty vehicles, which are already required to be certified to the California emission standards. It also excludes vehicles sold in any state that has adopted California emission standards for complete heavy-duty vehicles. It would be inappropriate to allow manufacturers to ''double-count'' the vehicles by allowing them to count those vehicles both as part of their compliance with this phase-in and for compliance with California requirements. We would handle heavy-duty engines similarly if California were to adopt different emission standards than those being established by this rule." (66 FR 5043)

196 "[California's South Coast Air] Basin will be unable to achieve the ozone standards by the attainment dates of 2024 and 2032 without the additional emissions reductions from a revision of the existing on-road heavy-duty engine exhaust emission standards for NOx. A nationwide standard is also critical in assisting other states to achieve the more stringent 2015 NAAQS." Letter to EPA Administrator Gina McCarthy from The South Coast Air Quality Management District, et al., June 3, 2016. https://www.epa.gov/sites/default/files/2016-09/documents/petition_to_epa_ultra_low_nox_hd_trucks_and_engines.pdf. "The Ozone Transport Commission concluded in its 2020 Annual Report that, to address the persistent air quality issues in the tri-state area [of Connecticut, New Jersey, and New York], reducing NOx from heavy-duty diesel vehicles is of 'utmost importance.'" Letter to National Climate Advisor Gina McCarthy and EPA Administrator Michael Regan from the Attorneys General of Connecticut, New Jersey, and New York, November 23, 2021. https://portal.ct.gov/-/media/AG/Press_Releases/2021/NY-CT-NJ-Letter-RE-Heavy-Duty-Truck-NOx-Emission-Standards_112321.pdf.

as well, especially since these targeted updates are being crafted to reflect the "outlook for heavy-duty electric vehicles."

Similar to our proposal above, *in which a fleet averaging requirement that goes to zero g/bhp-hr emissions for spark ignition, light-, medium- and heavy heavy-duty engines through intermediate useful life and full useful life no later than 2035* proposed in the NOx section of our comments, EPA could make use of a fleet averaging requirement that increases in stringency and eventually goes to zero g of CO_2/ton-mile. This structure would allow ZEVs to play a larger role in "enabling stringent emission standards" and "balance further incentivizing zero and near-zero emissions vehicle development [while] ensuring that the standards achieve an appropriate fleet-wide level of CO_2 emissions reductions," both of which are stated considerations of EPA's, per the proposed rule.

Additionally, the EPA should further explore the relationship between the proposed rule and its Phase 2 stringency updates and the rapid electrification of the vehicle sectors the proposed updates intend to target. Ideally, EPA should set GHG stringency targets based on what the ICE engines are capable of meeting on their own, without averaging in zero-emission vehicles for compliance. Without taking this into account, the agency will be setting up many of the ICE vehicles in these sectors to backslide and avoid real-world emission improvements by allowing manufacturers to use ZEVs that were already expected to come to market for compliance – especially since EPA's proposal currently undercounts the ZEV market in MY 2027.

Finally, EPA notes that "advanced technology credit multipliers for CO_2 emissions in HD GHG Phase 2 may no longer be appropriate based on [the agency's] current understanding of the [heavy-duty] market." We agree and urge EPA to under no circumstances extend multipliers beyond their currently expected MY 2027 phaseout and would even recommend an earlier than MY 2027 phaseout, since industry has shown that the technology needed to meet the proposed MY 2031 standards already exists today. For example, Eaton – a power management company – has already demonstrated that diesel emission reduction technologies for NOx emissions are already showing compliance with MY 2031 standards and is doing so at minimal cost and with GHG reduction benefits too.[197] In addition, EPA should exclude any vehicles certified under the Advanced Clean Trucks (ACT) program and sold in an ACT state (California and any other state that has adopted the ACT or in the future adopts the ACT) from eligibility for the multiplier program.

VI: Conclusion

President Biden has directed the entire federal government and the Environmental Protection Agency (EPA) to prioritize protecting and investing in overburdened and underserved communities across America. EPA plays a leading role in delivering environmental and public benefits for communities with environmental justice (EJ) concerns through our policies, programs, and activities.[198]

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197 In a series of private meetings, Eaton Technology gave a presentation titled 'Eaton Technology and Test Results for Future Regulations,' where they shared test results that demonstrated that diesel emission reduction technologies for NOx emissions are already showing compliance with the proposed standards for MY 2031. The private meeting that we took part in that is referenced in these comments occurred on April 26, 2022.

198 https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10144Y3.pdf

Along with the announcement for this rule the EPA shared the *Transportation and Environmental Justice* resource. In this document the EPA highlighted the impacts from the freight transportation system on environmental justice communities and their “comprehensive” approach to address the impacts from Medium- and Heavy-Duty Trucks. The above critical recommendations on how EPA needs to strengthen this rule and move in an intentional and significant way to zero emission vehicles does just that. The current two Options for emissions standards fall dangerously short and leave environmental justice communities and the millions of people who live in them at great risk for many years to come. The zero emissions component and proposed averaging scheme in no way aims to drive ZE sales and in fact could lead to increased emissions in environmental justice communities. MFN is committed to working with EPA to ensure that the regulations around freight impacts does actually meet the intended call to action that the Present set forth. We need EPA to act as the leaders the President is referencing and prioritize solutions which protect and prioritize overburdened and underserved communities. This Rule in its current draft does not meet this call to action. We cannot wait for future rules or proposals to address these impacts. We need EVERY rule, program, incentive that comes from EPA to prioritize addressing environmental racism, and protect environmental justice Now. The lives of our communities are at stake.

Thank you for the opportunity to provide input on this important rulemaking. If there are any follow-up questions, please contact Angelo Logan, MFN Policy and Campaign Director alogan@oxy.edu and Molly Greenberg MFN Campaign Manager at greenberm@oxy.edu.

These comments are submitted on behalf of the entire MFN Network and our over 50 member organizations as well as the following individual organizations: Air Alliance Houston, Backbone Campaign, Center for Community Action and Environmental Justice, Central Coast Alliance United for a Sustainable Economy (CAUSE), Central Valley Air Quality Coalition (Dr. Catherine Garoupa White, Executive Director), Citizen for a Sustainable Future, Clean Water Action, Duwamish River Community Coalition (DRCC), South Ward Environmental Alliance, CleanAirNow, Coalition for a Safe Environment, East Yard Communities for Environmental Justice, Respiratory Health Association, Earthjustice, EJ Working Group Hudson Hill (Michelle Howard), Groundwork Northeast Revitalization Group (Groundwork NRG), Harambee House, Ironbound Community Corporation, Little Village Environmental Justice Organization, Lowcountry Alliance for Model Communities, Mobile Environmental Justice Action Coalition (MEJAC), Natural Resources Defense Council, New Jersey Environmental Justice Alliance, Peoples Collective for Environmental Justice, Regional Asthma Management and Prevention, Rethink Energy Florida, Southeast CARE Coalition, Southwest Detroit Environmental Vision, Texas Environmental Justice Advocacy Services, Tallahassee Food Network, Tishman Environment and Design Center, Union of Concerned Scientists, West Long Beach Neighborhood Association, Warehouse Workers for Justice