U.S. Environmental Protection Agency
EPA Docket Center (EPA/DC) Air and Radiation Docket
Docket No. EPA–HQ–OAR–2022–0985
1200 Pennsylvania Avenue NW
Washington, DC 20460

Re: Phase 3 Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles Docket No. EPA–HQ–OAR–2022–0985

To whom it may concern:

The following comments are submitted by the over 50 member organizations represented by the Moving Forward Network (MFN). The listed members submit the following comments as individual/organizational comments and MFN comments:

Air Alliance Houston, Backbone Campaign, Center for Community Action and Environmental Justice (CCAEJ), Central California Asthma Collaborative, Citizen for a Sustainable Future, CleanAirNow, Clean Water Action NJ, Coalition for a Safe Environment (CFASE), Comite Civico Del Valle, Inc., Duwamish River Community Coalition, EarthJustice, Paul Cort, Sasan Saadat, Yasmine Agelidis, Adrian Martinez, East Yard Communities for Environmental Justice (EYCEJ), Environmental Health Coalition, Greater Frenchtown Revitalization Council, GreenLatinos, Groundwork Northeast Revitalization Group (Groundwork NRG), Harambee House/Citizen for Environmental Justice, Ironbound Community Corporation (ICC), Little Village Environmental Justice Organization (LVEJO), Lowcountry Alliance for Model Communities (LAMC), Mobile Environmental Justice Action Coalition (MEJAC), Natural Resources Defense Council (NRDC), New Jersey Environmental Justice Alliance (NJEJA), People's Collective for Environmental Justice, Regional Asthma Management and Prevention (RAMP), Respiratory Health Association (RHA), Rethink Energy Florida, Robert Laumbach M.D., Solutionary Rail, Southeast CARE Coalition Angela Harris, Raquel García - Southwest Detroit Environmental Vision (SDEV), South Ward Environmental Alliance (SWEA), Sustainability Action Network, Tallahassee Food Network (TFN), Warehouse Workers for Justice (WWJ), West Long Beach Neighborhood Association, Union of Concerned Scientists (UCS).

1. Introduction

Over the past ten years, the Moving Forward Network has advocated for the critical changes necessary to eliminate the pollution and public health impacts caused by the freight transportation sector. As detailed below, the excessive overburden of health and economic impacts targeted at frontline and fenceline communities, which are majority Black, Indigenous, and people of color (BIPOC) from low-income communities, is indisputable.

> *"We are dying every day. Our demands are ignored, and people die. We are tired of the minor changes, which are mere charity. We need something significant; we need environmental justice." - Dyna Anderson, New Jersey Environmental Justice Alliance.*[1]

Our communities suffer as a direct result of environmental racism caused by historical hazard siting of polluting facilities and residential redlining, often coupled with thousands of daily truck trips traversing their neighborhoods. The research is clear that there is a direct correlation between health disparities and the multitude of pollution sources, such as those caused by the freight transportation sector (ships, cargo handling equipment, warehouses, rail, marine vessels, etc.). These impacts, coupled with legislation and policy that are not created to ensure the health and protect the communities that are overburdened, have resulted in generational impacts shortening a person's lifespan.

> *"This is the legacy of American environmental racism. This is abundantly clear in the freight sector, resulting in millions of Americans living in 'diesel death zones.'"*[2]

Ultimately, a person's race and zip code are still the best predictors of their health, well-being, and life expectancy.[3]

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. Our organization's deep commitment to advancing environmental justice, equity, economic justice, and a just transition is core to MFN's values. Following MFN's core values, it urges the EPA to strengthen the proposed Phase 3 GHG Rule.

As a network, MFN has publicly and consistently supported EPA's authority and responsibility to pass the most stringent and protective standards that eliminate the daily toxic threats impacting our communities. Previous EPA rules like the Heavy Duty Truck Rule did not address

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[1] Dyna Anderson. New Jersey Environmental Justice Alliance. (June 5, 2023). https://njeja.org/

[2] Bruce Strouble. Achieving True Environmental Justice Requires Moving Beyond the Rhetoric. (April 5, 2023). https://thehill.com/opinion/energy-environment/3936273-achieving-true-environmental-justice-requires-moving-beyond-the-rhetoric/

[3] Amy Roeder. Zip Code Better Predictor of Health than Genetic Code. (August 2014). https://www.hsph.harvard.edu/news/features/zip-code-better-predictor-of-health-than-genetic-code/

the critical demands set forth by MFN members to ensure that there will be significant emission reductions within environmental justice communities from heavy-duty trucks. The HDT rule did not address zero-emission vehicles, dismissing the possibility of a clear pathway to zero emissions.

The EPA must strengthen the proposed Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. Protective standards must ensure that emissions are reduced in environmental justice communities. Stringent standards should use state regulations like the Advanced Clean Truck Rule as a baseline, and adopt more stringent controls. This Administration's commitment to environmental justice cannot end with words, a meeting, a press event, or money; policy and regulations are needed to ensure that frontline/fenceline communities are protected and thrive.

> *"We need to address the environmental racism now. My community is filled with thousands of trucks that spew toxic pollution and affects our residents on a daily basis. We recently did a truck count across the street from where over 800 senior citizens live and recreate. Our teams counted over 1,000 trucks per hour. Our community does not deserve to be forgotten and polluted.*
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> *The Phase 3 Greenhouse Gas Rule must guarantee reductions from heavy-duty trucks, especially in communities of color. When it comes to zero-emission trucks, we have the technology, we have the ability, but we need the regulations to make sure that these solutions are being implemented.* ***Stop choking our residents on rhetoric, and show that you care about our lives. That our lives matter more, too.*** *" -Asada Rashidi, South Ward Environmental Alliance*[4]

For decades, communities across the country have been fighting for the right to breathe clean air. Environmental racism and a lack of strong and protective regulations result in these frontline/fenceline communities and workers being forced to hold their breath.

The Administration and EPA often note their commitment to placing environmental justice at the center of policies and programs, including the recent Executive Orders 14037 & 14096. Time and time again, these efforts have come up unacceptably short. Nevertheless, MFN continues to remind EPA of the importance of having a justice framework within the regulatory process and advocate for the strongest and most protective standards. We expect EPA to remain faithful to their commitment to quarterly updates with MFN and continue to advocate for greater inclusion.

[4] Asada Rashidi. South Ward Environmental Alliance. (June 2, 2023). http://www.southwardea.com/.

In 2021 and 2022, MFN submitted a letter[5,6] to Administrator Regan highlighting specific issues that warranted EPA's immediate attention. MFN's position and demands are within EPA's authority, will ensure public health benefits, and are economically feasible given zero-emission[7] trucks are commercially available,[8] economically compelling,[9] and the single most effective solution for reducing freight emissions.[10]

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 every regulatory opportunity, EPA must include policies that center environmental justice solutions and rapidly advance ZEVs not just in specific market segments but for the entire truck sector. MFN members also submitted a detailed letter on the urgency and necessity for the EPA to address the largely unregulated rail and locomotive industry.

On March 15, 2023, thirty-seven members from the Moving Forward Network met with the EPA Administrator and staff to reiterate what must be included in the GHG draft rule to uphold the Administration's commitments to environmental justice and reach the intended goals from the GHG rule.

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[5] Moving Forward Network. Letter to Administrator Regan. (October 2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/11/MFN-Zero-Emission-in-Freight-Letter-to-EPA-10_26_21.pdf

[6] Moving Forward Network. Letter to Administrator Regan. (November 2022). https://www.movingforwardnetwork.com/wp-content/uploads/2022/11/MFN-Zero-Emission-in-Freight-EPA-One-Year-in-Review-11_17-.pdf

[7] MFN contextualizes zero-emission solutions as adhering to our framework of renewable energy. We cannot support solutions that do not account for upstream and downstream impacts. If we do so we risk trading pollution for more pollution and the same frontline and fenceline communities are left to suffer. 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, manufacturing, shipping, etc). All of these must be considered with EJ leadership before endorsing specific renewable energy recommendations. Included in our definition of renewable energy is that recommended fuel sources including ZEV technology must take into account impacts from source, to tailpipe to grave. "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. (See MFN 2021 and 2022 letter to Administrator Regan and MFN comments on Document (EPA-HQ-OAR-2019-0055-0983)

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

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

[10] OECD. International Transport Forum, Transport Outlook - 2019. (May 2019). p.157. https://doi.org/10.1787/transp_outlook-en-2019-en

The outcome of that meeting was a stated commitment from the Administration to continued engagement with MFN and our members. For MFN, we are committed to this continued engagement but also must reinforce our commitment to our proposed solutions and the urgency that the Administration move beyond rhetoric and into action. In summary, unless and until EPA's proposal is strengthened significantly, this rule would perpetuate an already dangerous and deadly status quo and squander a critical opportunity to address the impacts from medium and heavy-duty trucks and buses that are killing people.

Even though the evidence for a transition to ZEVs is clear, the standing draft Phase 3 GHG Rule made considerable conservative assumptions, resulting in an indefensibly weak proposal. Throughout its proposal, the EPA acknowledges that its assumptions are "conservative"—it did not consider the full impacts of the Inflation Reduction Act, nor did the agency consider how state standards would already provide a robust platform for growth for zero-emission vehicles. Eight states have already adopted California's Advanced Clean Truck rule that provides the platform for growth, making the assumptions taken by EPA unjustifiable. And, there is an unprecedented level of federal funding available to invest in infrastructure that will support the prioritization and deployment of zero-emission vehicles in the most impacted EJ communities. MFN calls for the final rule to include zero-emission targets stronger than the proposal and better reflect zero-emission heavy-duty technology's technical feasibility and availability.

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 stated commitment to environmental justice communities. In addition to strengthening the proposed 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.

- **Address the gaps from the 2022 Heavy-Duty Engine and Vehicle Standards Rule (NOx).** This rule did not address the critical demands set forth by MFN members to ensure that there will be meaningful emission reductions within environmental justice communities from heavy-duty trucks and create a clear pathway for zero-emission vehicles.

- **Ensure a clear pathway to zero emissions by mandating all new vehicles be zero emissions by 2035, including a sales mandate.** This mandate for zero-emission vehicles must include a scrapping program so that cumulative impacts from the increased number of trucks do not further burden environmental justice communities. There is a critical opportunity right now to leverage federal funding, such as funds committed under the Inflation Reduction Act, to deploy zero-emission infrastructure in overburdened EJ communities. A whole-of-government approach is needed to ensure these investments advance equity and to begin planning today in order to support large-scale deployment of zero-emission trucks on the road.

- **Prioritize zero emissions for *freight trucks,*** i.e., Class 7 and 8 (short-haul) drayage trucks. These trucks have never been prioritized in heavy-duty truck regulations and are some of the oldest and most-polluting vehicles in frontline and fence-line communities. The rule must include a mandatory scrapping program to prevent a scenario in which: port-adjacent communities are further burdened by the existing diesel truck fleet and new ZEVs. Establishing a scrapping program is critical to preventing the re-sale, migration, and increased density of dirty diesel heavy-duty vehicles in already overburdened, largely BIPOC and low-income communities where goods movement is concentrated.

- **Include environmental justice and public health analyses** to ensure a sufficiently stringent rule and its implementation.

- Even though EPA did not add it, MFN still maintains that the rule must include a **multi-pollutant standard** that regulates greenhouse gas emissions and additional pollutants, including nitrogen oxides (NOx) and particulate matter (PM), to prevent dangerous combustion-based fuel source alternatives and false solutions like natural gas from being considered as part of "zero-emission".

2. Table of Contents

3. Executive Summary

As it stands, all of the options in EPA's Phase 3 proposed rule will not relieve the daily burdens caused by the freight transportation system, in particular heavy-duty trucks. Our demands detailed throughout the letter center on a goal to eliminate emissions from freight transportation, prioritize environmental justice communities and address the cumulative impacts caused by the freight sector. EPA must finalize standards stronger than its preferred proposal. The agency should set a strong standard paired with a sales mandate, that would ensure a clear pathway to 100% new heavy-duty vehicles being zero emissions by 2035. Additionally, this mandate for zero-emission vehicles would include a scrapping program so that cumulative impacts from the increased number of trucks do not further burden environmental justice communities. A whole-of-government approach is needed to ensure these investments advance equity and to begin planning today to support large-scale deployment of zero-emission trucks on the road.

Our comments also touch on several key points: Firstly, EPA has the authority to adopt a strong standard as provided by Clean Air Act (Act) section 202(a). While the Clean Air Act contemplates that EPA might limit the stringency of standards based on its assessment of what is feasible, in the case of the Phase 3 rule, the agency's refusal to adopt the strongest standard is not based on the identification of any technological or engineering barriers. In fact, EPA's proposal even undercuts state action underway through the Advance Clean Trucks rule (which has been adopted by approximately 20 percent of the medium- and heavy-duty trucks market) and manufacturer commitments to sell only zero-emission trucks, offering no reasons for why those predictions are not achievable.

Secondly, given the weak stringency of standards in *EPA's Main Proposal* and that the proposed standards do not require or mandate the use of a specific technology for compliance, EPA leaves room for scenarios where the industry can comply with fewer ZEVs than those projected under its preferred approach ("*EPA's Main Proposal"*). Additionally, EPA fails to analyze the impacts of non-zero emission vehicle trucks properly. The proposal is structured in a manner that does not provide certainty that truly clean technologies will be used to comply with the standard. To strengthen its proposal, EPA must not allow "false solutions" like alternative combustion fuels (e.g., hydrogen combustion and natural gas) to be included in its zero-emission definition and should explore incorporating other structural additions to the rule that will provide certainty that truly clean, zero-emission vehicles will be deployed at the rate needed to provide relief to our communities.

Thirdly, our comments provide analytical justifications for why a strong standard is feasible and challenges the agency's flawed assumptions around feasibility. We show that the technology exists, that there will be enough materials and battery supply chain production to electrify these vehicles, and that significant public and private investments are being made for this transition to occur. Additionally, we show that adopting a strong standard is economical, provides cost savings, and we urge EPA to account for more than just the effects of emissions standards on job growth and ensure that its policies consider the importance of a just transition with high quality jobs.

Lastly, we show that the potential benefits the agency associates with the various policy scenarios are more likely to be realized under a policy scenario that reflects the MFN recommended approach (where 100 percent of all new vehicle sales are zero emissions by 2035) —which would also satisfy the law, meet moral obligations, and allow the agency to live up to its promise to provide relief to environmental justice communities

4. MFN Demands Zero-Emission Solutions for the Heavy-Duty Truck Sector to Finally Address the Freight System's Impacts on Environmental Justice Communities

MFN and its members have long pressed the federal government to acknowledge the multiple and cumulative harms that environmental justice communities face and their heightened vulnerability to those threats. Cumulative impact analyses recognize that some individuals and communities face more pollution than others and that the same amount of pollution can result in more harm to 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.[11]

Heavy-duty vehicles generate 25% of the total global warming emissions from the transportation sector in the entire country — outsized emissions contribute to the sector that's already contributing the largest share of global warming emissions.[12] In 2020, heavy-duty vehicles represented approximately 6% of the on-road fleet but generated 59% of ozone- and particle-forming NOx emissions and 55% of the particle pollution (including brake and tire particles).[13] With the e-commerce industry rapidly expanding, the US is seeing increases in the

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[11] 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). p. 9-16. https://static1.squarespace.com/static/634ec24de312bd652b110530/t/63d9652fdaa29811a5a498d8/1675191601636/seeing-whole-cumulative-impacts-analysis-ej-report.pdf

[12] U.S. EPA, OAR. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2020. (April 2022). https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020

[13] American Lung Association. Zeroing in on Healthy Air. (March 2022). p. 7. https://www.lung.org/getmedia/13248145-06f0-4e35-b79b-6dfacfd29a71/zeroing-in-on-healthy-air-report-2022.pdf.

overall emissions of the sector.[14] Most heavy-duty trucks on the road today are powered by diesel engines, the exhaust from which poses a direct threat to human health and the environment. Diesel engines emit a mixture of pollutants, including NOx, VOCs, and $PM_{2.5}$, all of which have been directly linked to severe health consequences, including neurological, cardiovascular, respiratory, reproductive, and/or immune system damage.[15]

Heavy-duty trucking contributes massively to the air pollution being inhaled across the country. Nearly 36% of Americans—119.6 million people—still live in places with failing grades for unhealthy levels of ozone or particle pollution.[16] Despite improvements from previous years, the number of people living in counties with failing grades for daily spikes in deadly particle pollution was 63.7 million, the most ever reported under the current national standard.[17] In recent years, the findings have added evidence that a changing climate is making it harder to protect human health—the three years covered by the referenced report ranked among the seven hottest years on record globally. High ozone days and spikes in particle pollution related to heat, drought, and wildfires are putting millions of people at risk and adding challenges to the work that states and cities are doing across the nation to clean up air pollution.

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.[18] 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.[19] 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.[20]

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[14]Alfredo Rivera, Ben King, John Larsen, and Kate Larsen, Rhodium Group, Preliminary US Greenhouse Gas Emissions Estimates for 2022 (Jan. 10, 2023), https://rhg.com/research/us-greenhouse-gas-emissions-2022/.
[15] US EPA, Research on Health Effects, Exposure, & Risk from Mobile Source Pollution. (Feb. 21, 2022). https://www.epa.gov/mobile-source-pollution/research-health-effects-exposure-risk-mobile-source-pollution.

[16] American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023).

[17] *Id.*

[18] Clean Air Task Force. Diesel pollution is a deadly problem in the United States. (January 20, 2022), https://www.catf.us/2022/01/diesel-pollution-deadly-problem-united-states/; Phys.org, Nearly 50% of transport pollution deaths linked to diesel: study. (Feb. 27, 2019). https://phys.org/news/2019-02-pollution-deaths-linked-diesel.html; International Agency for Research on Cancer, World Health Organization. Diesel Engine Exhaust Carcinogenic. (June 12, 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 (November 2008), 1576-1580.

[19] California Air Resources Board. Summary: Diesel Particulate Matter Health Impacts. https://ww2.arb.ca.gov/resources/summary-diesel-particulate-matter-health-impacts. (last accessed: May 4, 2022)

[20] 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. (August 2011). doi:10.3897/bdj.4.e7720.figure2f;

In the context of the freight system in the United States, the facilities, corridors, and neighborhoods that are most heavily trafficked by heavy-duty trucks are often located in communities of color that are experiencing cumulative impacts from multiple sources of pollution and compounding socioeconomic factors. This pattern of development is the result of racist redlining practices that have systematically burdened people of color with disproportionate exposure to pollution.

Although people of color are 41% of the overall population of the U.S., they are 54% of the nearly 120 million people living in counties with at least one failing grade.[21] A person's zip code remains the most significant predictor of health and well-being. In fact, low-income neighborhoods and communities of color breathe an average of 28% more NOx pollution than higher-income and majority white neighborhoods.[22] For residents of environmental justice communities, this means that their lives can be 10 to 20 years shorter because of environmental pollution compared to residents in wealthy white communities.[23] In the counties with the worst air quality, 72% of the 18 million residents are people of color, compared to the 28% who are white.[24] In Kansas City, MO, neighborhoods East of Troost are above the 90th percentile for respiratory health disease. The Kansas City, Missouri, public health data demonstrates that the life expectancy difference is between 15 and 18 years. According to the CDC, neighborhoods like Armourdale and Argentine in Kansas City, Kansas, have a shorter life expectancy of 22

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); Perera, Frederica, et al. Prenatal Airborne Polycyclic Aromatic Hydrocarbon Exposure and Child IQ at Age 5 Years. Pediatrics. Vol. 124. No. 2. (Aug. 2009). p. 195–203. doi:10.1542/peds.2008-3506 ; ZJ, Andersen, et al. Diabetes incidence and long-term exposure to air pollution: a cohort study. Diabetes Care. Vol. 35. No. 1. (January 2012). p. 92-98. doi: 10.2337/dc11-1155; T., To et al. Chronic disease prevalence in women and air pollution--A 30-year longitudinal cohort study. Environmental International. Vol. 80.(July 2015). p. 26-32, doi: 10.1016/j.envint.2015.03.017; Dong, Guang-Hui, et al. Ambient Air Pollution and the Prevalence of Obesity in Chinese Children: The Seven Northeastern Cities Study. Obesity. Vol. 22. p. 795-800, doi: doi:10.1002/oby.20198; 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. p. 73-74, doi: 10.1016/j.jaci.2014.04.002.

[21] *Id.*

[22] 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 (August 25, 2021) https://doi.org/10.1029/2021GL094333

[23] Genna Reed, Beto Lugo-Martinez, and Casey Kalman. Environmental Racism in the Heartland: Fighting for Equity and Health in Kansas City. (2021). Cambridge, MA: Union of Concerned Scientists. https://doi.org/10.47923/2021.14322.

[24] American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023); Wyandotte, Kansas. County Health Rankings & Roadmaps. (n.d.). https://www.countyhealthrankings.org/explore-health-rankings/kansas/wyandotte?year=2023 (last accessed: June 7, 2023)

years.[25] Kansas City, like many other parts of the nation, experiences high-risk zip codes where asthma, heart disease, and cancer are above the national average and are the same areas sliced by highways, rail systems in the nation, and neighbors to chemical facilities.

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. Diesel exhaust contains carcinogens and toxic air pollutants that significantly affect the health of communities living in close proximity to truck tailpipe pollution. Additionally, as many as 40 percent of U.S. ports and many other freight facilities are in areas that are not achieving federal clean air standards for ozone and particulate matter pollution, and freight operations have been identified as significant contributors to nonattainment issues.[26]

On top of disproportionate exposure to air pollution, freight-impacted communities suffer from several 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.[27]

Add to all of this the reality that these same communities are also most at risk from the coming climate disaster. 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

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[25] American Lung Association. 2023 State of the Air, Key Findings. https://www.lung.org/research/sota/key-findings (last accessed: June 1, 2023)

[26] 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). p. 2 https://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/pr-2304-wgm-no-1_2022-02-25.pdf?sfvrsn=8

[27] 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 (September 2018). 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). p.879-998.

flooding, to superstorms and hurricanes.[28] Indeed, storm surges 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 increasing frequency and severity of natural disasters hit these communities hardest, and they receive lower levels of reinvestment after these events. Moreover, they are more likely to have inadequate infrastructure and insurance and are "more likely to live near industrial facilities and are therefore at a higher risk for chemical spills and toxic leaks resulting from toxic storms."[29] In total, low-income communities and communities of color "are found to be particularly more vulnerable to heatwaves, extreme weather events, environmental degradation, and subsequent labor market dislocations."[30]

The COVID-19 pandemic has escalated the negative consequences of 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.[31] 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.[32] Indeed, one 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.[33] COVID-19 infections have been known to be more severe for people who are already diagnosed with asthma. A 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.[34] One of the reasons that BIPOC communities are dying at higher rates from COVID-19 is because of underlying health conditions like diabetes, heart disease, and asthma, all of which are diseases that are more prevalent for communities of color and low-income communities and are also linked to the disproportionately high levels of air pollution in these communities.

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[28]Nicky Sheats. Stakeholder Engagement Report: Environmental Justice. Climate Change Preparedness in New Jersey. New Jersey Climate Adaptation Alliance (NJCAA). (2014). https://njadapt.rutgers.edu/docman-lister/resource-pdfs/116-environmental-justice-stakeholder/file.

[29] Princeton University. Racial Disparities and Climate Change. (August 15, 2020). https://psci.princeton.edu/tips/2020/8/15/racial-disparities-and-climate-change.

[30] *Id.*

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

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

[33] *Id.*

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

Many studies have demonstrated the importance of race as a component of cumulative impacts, and the science behind this field is growing.[35] For example, a study released in March 2022 examined the link between port-related traffic and hospital visits for respiratory, heart-related, and psychiatric issues and concluded that people of color are more vulnerable to health impacts as a result of increased goods movement operations.[36] Adding just one vessel or increasing overall vessel tonnage in a nearby port leads to more than three additional hospital visits per year per thousand Black residents, compared to about one visit per thousand for white residents in the same area.[37] 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.

MFN, its members, and allied organizations have published and contributed to numerous reports highlighting the cumulative 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.[38] The 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.[39] The report discusses community efforts to establish an air monitoring network and recommends

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[35] 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). p. 9-16. https://static1.squarespace.com/static/634ec24de312bd652b110530/t/63d9652fdaa29811a5a498d8/1675191601636/seeing-whole-cumulative-impacts-analysis-ej-report.pdf

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

[37] Id. p. 32

[38] Moving Forward Network. Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice. (2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-theCase_Report_May2021.pdf.

[39] Genna Reed, Beto Lugo-Martinez, and Casey Kalman. Environmental Racism in the Heartland: Fighting for Equity and Health in Kansas City. (2021). Cambridge, MA: Union of Concerned Scientists. https://doi.org/10.47923/2021.14322.

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.[40] The study found that electrifying vehicles can lead to significant local benefits but urged that electrification must coincide 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.[41] The report also provides community air monitoring results, finding unhealthy spikes in PM2.5 pollution.

- *Warehouses, Pollution, and Social Disparities: An analytical view of the logistics industry's impacts on environmental justice communities across Southern California*, authored by People's Collective for Environmental Justice and the University of Redlands, analyzed over 3,300 warehouses over 100,000 sq ft in Southern California.[42] The report analyzes the expansion of the e-commerce industry compared to the location of existing pollution sources and sociodemographic data, demonstrating a correlation with health, economics, and racial disparities.

The following testimonials of people's lived experiences in freight communities summarize what these studies have consistently reaffirmed:

> *My name is Atenas Mena, and I'm the co-executive director of CleanAirNow. I'm also a first-generation Mexican-American, a Kansas Citian born and raised, and a nurse…I'm*

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[40] M.J. Bradley & Associates. Newark Community Impacts of Mobile Source Emissions, A Community-Based Participatory Research Analysis (November 2020). p. 12-13. https://www.njeja.org/wpcontent/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf.

[41] 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. (Nd). p. 13, https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf.

[42] Ivette Torres and Anthony Victor. People's Collective for Environmental Justice, and Dan Klooster. Warehouses, Pollution, and Social Disparities: An analytical view of the logistics industry's impacts on environmental justice communities across Southern California. University of Redlands. (April 2021). https://earthjustice.org/wp-content/uploads/warehouse_research_report_4.15.2021.pdf.

here to encourage EPA to responsibly, effectively, and quickly implement the strongest standards possible for the phase three greenhouse gas rule. Over 12 million Americans with asthma live in counties that fail to meet minimal standards for air quality, according to the American Lung Association. Our failure to effectively address air pollution contributes to heart disease, lung diseases, cancer, neurodegenerative diseases like Parkinson's, and many other chronic and acute illnesses affecting the young and old alike. This failure to control pollution makes breathing a health risk. Add to these health consequences the profound impact of climate change, and humanity is at an inflection point where all of us, especially our government and industry, must take action. Kansas City is not siloed in this large and impactful discrepancy. Our nation has been overburdening environmental justice communities by having them bear the brunt of systemic racism with the legacy of redlining, zoning, and dumping practices, leaving families without access to clean air, water, and land. As a member of MFN, I want to elevate what has been and continues to be demanded: ensure a clear pathway to zero emissions with a sales mandate with 100% zero-emission trucks by 2035, not 50%, prioritization of zero emissions for the freight trucks classes seven and eight short haul, environmental justice and public health analysis to ensure sufficient, stringent rules. ***We all have the right to take a deep breath, inhale clean air, and supply us with oxygen, not toxins. Our communities do not need false promises of alternative fuels. We need zero emissions now…***

Atenas Mena
Co-Executive Director
CleanAirNow[43]

To the Environmental Protection Agency,

I am Christian Poulsen, the Clean Air Program Manager at the Duwamish River Community Coalition. I am writing to you today on behalf of the Duwamish Valley residents, Seattle's most diverse and socioeconomically vulnerable community. This community, primarily composed of BIPOC, immigrants, and low-income families, has long borne the brunt of severe environmental injustice.

The intensity of drayage and trucking activity associated with port-related commerce in our region contributes significantly to the poor air quality plaguing our community.

[43] Atenas Mena. CleanAirNow. Public Comment Hearing Phase 3 GHG Rule EPA. (May 2, 2023).

Diesel emissions, laden with dangerous toxins, cast a heavy cloud over our neighborhoods, leading to severe health repercussions for our residents.

The Duwamish Valley is afflicted with the highest rates of childhood asthma hospitalizations in the county. Our life expectancy is 13 years shorter compared to wealthier, predominantly white regions of Seattle. We are subject to myriad other health issues as a direct result of exposure to high levels of diesel emissions.

In light of these detrimental effects, we respectfully urge the EPA to consider adopting the essential demands set forth by the Moving Forward Network (MFN). MFN's vision for a cleaner, healthier future includes a critical transition to zero-emission trucks and buses, the retirement of all combustion trucks by 2045, the establishment of stringent emissions standards, and the prioritization of environmental justice "from source to tailpipe to grave."

The Heavy Duty Truck Rule, or the NOx rule, which was released in December 2022, regrettably fell short of our communities' needs and the MFN's recommended standards. It's a poignant reminder that our fight for breathable air and environmental justice continues.

Zero-emission solutions are not only available, but they are also economically and technologically feasible. We, as the collective voice representing over two million people nationwide, implore the EPA to address the urgent issue of diesel truck pollution. We steadfastly demand a just transition to 100% zero-emission by 2035.

Our call is not merely for the betterment of the environment but also for the provision of genuinely green jobs. Jobs that yield economic and health benefits for workers and their communities, which, in the case of environmental justice communities, are often the same.

We seek an assertive shift towards zero emissions across the freight sector, particularly focusing on freight trucks and heavy-duty trucks. Concentrating on zero-emission trucks could catalyze a significant change in the freight industry, with new trucks ideally entering drayage services first, owing to their limited range.

In conclusion, our appeal to the EPA is for more than a reduction in emissions; it is a plea for justice, for health, and for the right to live in a clean environment. We are *hopeful that, with your support, we can initiate tangible change and ensure a brighter, healthier future for the Duwamish Valley residents.*

Thank you for your attention to this critical matter.

Sincerely,

Christian Poulsen
Clean Air Program Manager
Duwamish River Community Coalition

Hello, my name is Dyna Anderson, and I am the Program Manager at New Jersey Environmental Justice Alliance (NJEJA) and a member of the Moving Forward Network. I am not only the Program Manager of NJEJA but a current resident of an EJ Community in NJ. I am here today not only because it is my job to be, but because I have a responsibility to myself, my family, and my community to make sure that the issues we are experiencing are being heard and addressed. I live 12 minutes away from Port Newark-Elizabeth. On average, 7000 trucks travel through our communities daily, emitting deadly diesel in our homes, schools, and recreational spaces and polluting our environment in general. Diesel emissions are responsible for 21,000 early deaths annually and are linked to asthma, cancer, and other health conditions. ***I am a testament to what diesel pollution can do to one's health. I was diagnosed with diabetes at the age of 12, one month after moving to Newark from Jamaica. Members of my immediate family and friends struggle with health issues as well due to the diesel-death zone we live in. Approximately everyone I know has asthma, other respiratory issues, or some health condition that can be traced back to diesel pollution.*** *Last week, I participated in a Truck Count in the South Ward of Newark. Within an hour, I counted 21 Buses, 83 Medium Duty Trucks, and 277 Heavy Duty Trucks. Let me repeat that, 277 heavy-duty trucks in 1 hour. This was eye-opening because I have lived near the intersection where I did this count and never realized the number of trucks that pass by emitting deadly diesel. In the words of Fannie Lou Hamer, "We are sick and tired of being sick and tired."*

We demand that the Rule:

- *Include a cumulative impacts approach to account for the total amount of pollution that is composed of different types of pollutants.*
- *Include a multipollutant standards approach that regulates greenhouse gas emissions and additional pollutants, including nitrogen oxides (NOx) and particulate matter (PM). This is important in order to prevent false solutions like natural gas from being considered as part of zero emissions.*

- *Address the 2022 Heavy Duty Truck Rule's gaps.*
- *Outline a clear pathway to zero emission with a sales mandate of 100% zero-emission trucks by 2035. Zero must mean zero.*
- *Ensure that heavy-duty trucks are prioritized for zero emissions*
- *Incorporate environmental justice and public health analysis to inform the stringency of the rule and the implementation phase.*

I urge you to fulfill these demands because we are dying; every day, our demands are ignored, and people die. In the words of Ginetta Sagan, ***Silence in the face of injustice is complicity with the oppressor.***

Dyna Anderson
Program Manager
New Jersey Environmental Justice Alliance

Hi, my name is Jayla Atkinson, and I'm here today to share my experience as a community member. Growing up in a very industrial city, my health has suffered my entire life. I've missed out on birthdays, holidays, and many fun experiences I should have had as a kid because I was sick. And even still today, my health impacts my job, my relationships, everything I do.

When I was young, we didn't know the full impact pollution was having on our health, but today we are aware of the health impacts that diesel pollution has on our youth, and we are still not protecting them. To have the privilege to know means you have the responsibility to do, and we are letting them be exposed to pollutants that can not only impact their physical health, but it's been concluded that these pollutants can cause behavioral problems and mental illnesses that can cause them problems for the rest of their lives. These kids didn't ask for this, and it's up to us to start making some serious changes to protect our most vulnerable population.

This rule should require a 100% zero emission target by 2035, and that means no natural gas, either. All sources of pollution should be measured and considered when the goal is zero emissions. Grassroots organizations are out here doing all that they can, and we need the EPA to help create a clear path to justice for our most vulnerable communities by ensuring that their wellbeing is considered in every aspect of this rule, right down to things like including a scrap program so they are not further burdened by an increased *number of trucks.* ***We need the EPA to make sure solutions are being implemented in ways that guarantee lower emissions for environmental justice communities.***

Jayla Atkinson
Community Organizer
CleanAirNow

Our lungs are being filled with diesel soot. CleanAirNow takes it upon ourselves to take action to make sure our air is breathable. We equip ourselves with the knowledge and technical capacity to do it effectively by conducting our own community led research because we suffer from deadly diesel fumes and the continued assault on our lives. Our community led research found that diesel exhaust air pollution levels were high enough to send people to the hospital Our community led research prompted the KC-Traq Study. However, the agency study was ineffective because they excluded guidance from the community the very people who initially collected the data. Because in the creation of zero emission infrastructure and solutions, we must prioritize those at the fenceline. Justice demands holding governments and polluters accountable for complacency. Nothing less will adequately impact the future of our health and welfare. The need for justice is urgent. All of us, collectively, can take a step in the right direction by protecting not only the fenceline communities who deserve justice, but everyone else by preventing pollution. ***The GHG Rule should be advancing zero emissions and we call on EPA to enact the strongest possible standards to protect our public health.****"*

Beto Lugo Martinez
Co-Executive Director
Clean Air Now

These comments document $34 billion in infrastructure investments not yet in the ground that could support strong HDV standards. The support for infrastructure investment is unprecedented. However, *as an EJ EV infrastructure developer, I can confidently say that there are timelines set forth by advocates that put significant pressure on regulators to meet certain goals by certain years, which can have unintended consequences of leaving EJ communities behind. EJ communities lack adequate infrastructure, i.e., lack of utility power accessibility, site improvements, electrical upgrade, etc... As a result, projects are being funded by "shovel readiness," which cuts out disadvantaged communities (DACs) or EJ communities from equitable participation. The outcome risk at this very moment is that fully developed communities will take first priority over EJ/DAC's. Our communities deserve the "wins" (transition to zero-emission vehicles) not* *just to be a benefit climate but also to ensure that there are on-ground ej community benefits. This can only be accomplished with real equity built in, especially as it relates to infrastructure development.*

Louis Olmedo
Executive Director
Comite Civico del Valle, Inc

As the Agency works to finalize this and similar rules, EPA should communicate regularly with environmental justice groups to learn from the experience of these impacted communities. Doing this will ensure that environmental justice considerations and solutions are appropriately discussed, evaluated, and adopted, with expert input from those on the frontlines of truck impacts. EPA should also use the comments (or letters or other calls to action) the Agency has received from environmental justice groups on this rule (and on other rules) and appropriately evaluate the concerns raised by these groups and the requested solutions.

5. EPA Must Finalize Stronger Standards than its Preferred Proposal

EPA's authority for adopting these Phase 3 standards is provided by Clean Air Act (Act) section 202(a). Section 202(a)(1) directs EPA to "prescribe (and from time to time revise)... standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 42 U.S.C. § 7521(a)(1). The Supreme Court in *Massachusetts v. EPA*, 549 U.S. 497, 529 (2007), ruled that greenhouse gases are "unambiguously" air pollutants that may be regulated under section 202. EPA has found that the emissions of these pollutants from motor vehicles, including medium and heavy-duty trucks, contribute to pollution that is anticipated to endanger public health and welfare. 74 Fed. Reg. 66496, 66499 (Dec. 15, 2009).

As courts have recognized, the task assigned in section 202(a) is to "utilize[e] emission standards to prevent reasonably anticipated endangerment from maturing into concrete harm." *Coal. For Responsible Regulations, Inc. v. EPA*, 684 F.3d 102, 122 (D.C. Cir. 2012). Regulations prescribed under section 202(a)(1) must "take effect after such period as the Administrator finds necessary to permit the development of the requisite technology, giving appropriate consideration to the cost of compliance within such period." 42 U.S.C. § 7521(a)(2). Congress' expectation was that EPA would "press for the development and application of improved technology rather than be limited by that which exists today." *NRDC v. EPA*, 665 F.2d 318, 328 (D.C. Cir. 1981) (quoting S.Rep.No. 1196, 91st Cong., 2d. Sess. 24 (1970)).

The exercise envisioned by the statute is to assess the need for emission reductions from vehicles and determine what reductions are feasible. In the feasibility analysis, "[i]n the absence of theoretical objections to the technology," EPA's task is "to identify the major steps necessary for the development of the technology], and give plausible reasons for its belief that the industry will be able to solve those problems in the time remaining." NRDC, 655 F.2d at 333.

EPA's Phase 3 proposal appears wholly disconnected from the exercise anticipated by the statute and described by the courts. EPA's proposed standards are not tied to any assessment of what emission reductions are needed to address the endangerment posed by greenhouse gas emissions from medium- and heavy-duty trucks. As part of the U.N. Framework Convention on Climate Change, President Biden committed the United States to reach net-zero emissions economy-wide by no later than 2050. The President's National Climate Task Force, in turn, established a 2030 emissions target of 50 to 52 percent reductions in U.S. greenhouse gas pollution from 2005 levels ("nationally determined contribution" or "NDC"). Given the average useful life of a heavy-duty truck is around 15 years, to reach net-zero by 2050 means ending the sale of new combustion trucks in the 2035 timeframe. A 2023 ICCT report modeled a NDC-consistent scenario for the Phase 3 standards.[44] EPA's proposal neither aligns with a NDC-consistent scenario nor puts the U.S. on a trajectory consistent with requiring all zero-emission trucks beginning in 2035. EPA must offer some rationale for not adopting standards commensurate with addressing the endangerment it has identified, or the commitments made to reduce economy-wide GHG emissions.

The Act contemplates that EPA might limit the stringency of standards based on its assessment of what is feasible, but EPA's refusal to adopt the standards necessary to address the identified problem is not based on the identification of any technological or engineering barriers. Zero-emission technology already exists and is commercially available for virtually every category of medium and heavy-duty truck.[45] As the proposal notes, manufacturers have announced commitments to sell only zero-emission trucks, and EPA has offered no reasons why those predictions are not achievable. *Cf. NRDC*, 655 F.2d at 335 ("[T]he industry's own predictions, while not determinative, support the view that success in this kind of research can realistically be expected within the proposed time frame."). As outlined below, there is every reason to believe that zero-emission technologies will advance to the point that deployment levels well above EPA's proposed standards are feasible and cost-beneficial.

Instead of looking at what is needed and possible, EPA equates technological "feasibility" with a projection of the voluntary "adoption rate" of zero-emission technologies and sets the proposed standard based on its assessment of the number of zero-emission trucks consumers will be willing to purchase. 88 Fed. Reg. at 25958; *id.* at 26003 ("In this proposal, we considered willingness to purchase (such as practicability, payback, and costs for vehicle purchasers including EVSE) in determining the appropriate levels of the proposed standards."). There is no

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[44] Pierre-Louis Ragon, Claire Buysse, Arijit Sen, Michelle Meyer, Jonathan Benoit, Josh Miller, Felipe Rodríguez. Potential Benefits of the U.S. Phase 3 Greenhouse Gas Emissions Regulation for Heavy-Duty Vehicles. The International Council on Clean Transportation. (April 2023).

[45] *See* CARB, Advanced Clean Fleets Regulation, Initial Statement of Reasons, App. J (Aug. 30, 2022) (available at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/appj.xlsm).

statutory basis for this approach, and it has no rational connection to the standard-setting exercise outlined by Congress.

At a superficial level, one might claim that it is not feasible for manufacturers to sell cleaner trucks if purchasers are unwilling to buy them, but that is not a rational measure of what is technologically feasible because such a superficial claim ignores the ability of manufacturers to influence those purchaser decisions. The Act cannot be read to allow consumer preferences—especially "edge-case" outlier preferences—to trump the adoption of feasible controls necessary to protect public health and welfare. In *Int'l Harvester Co. v. Ruckelshaus*, 478 F.2d. 615, 640 (D.C. Cir. 1973), the Court agreed with EPA's position that "as long as feasible technology permits the demand for new [vehicles] to be generally met, the basic requirements of the Act would be satisfied, even though this might occasion fewer models and a more limited choice of engine types," and concluded, "[t]he driving preferences of hot rodders are not to outweigh the goal of a clean environment." Even in the worst-case scenario, i.e., that zero-emission technology could not meet the needs of every single purchaser – a scenario that has no actual record basis and is inconsistent with the manufacturers' own views on where the market is headed – there is no indication that Congress intended EPA to use such assertions to reject feasible and necessary emission standards.

EPA's statutory task is not to ensure all future trucks can operate in the same manner that they currently do, nor should that be EPA's task—that is the manufacturers' task. As they have since EPA started adopting vehicle standards, manufacturers can decide how to make vehicles that purchasers want *and* that comply with the emission standards required to protect public health and welfare. This may involve marketing, pricing adjustments, financing incentives, adding other features or functionality that are more desirable, or innovating technology to meet those consumer demands. *See, e.g.*, RMI, "Reality Check: Electric Trucks are Viable Today," at (May 25, 2022) (available at: https://rmi.org/reality-check-electric-trucks-are-viable-today/) (noting that driver retention is a problem in the industry and drivers love electric trucks because they offer multiple advantages over combustion trucks). Today's trucks, even as they meet the EPA standards that have been adopted over the years, are more technologically advanced and capable of doing much more than the trucks that consumers demanded before EPA's standards.

EPA's elevation of consumer willingness to purchase as the key indication of feasibility is undermined by EPA's own statements noting the manufacturers' ability to influence purchaser decisions. For example, EPA notes that "manufacturers typically price certain products higher than average and others lower than average (i.e., they cross-subsidize)" to influence purchase decisions. 88 Fed. Reg. at 26027; *see also id.* at 26029. EPA also notes that putting more zero-emission trucks on the road will increase purchaser exposure and comfort with these new technologies and that manufacturers can also influence adoption by educating purchasers on the benefits of zero-emission trucks (i.e., marketing). *Id.* at 26069; *see also* Draft Regulatory Impact Analysis, at 417 (April 2023). EPA's projected adoption rate includes no analysis of how that rate might be influenced by the very tools EPA highlights in its own proposal.

EPA cannot simply propose *any* standard that it finds is feasible and claim that Congress' directive has been met. The statutory language in section 202(a) is broad but not without criteria. Congress cabins the standard-setting process by highlighting the need to address endangerment to the degree technologically feasible. EPA's refusal to propose standards based either on what is necessary to address the endangerment posed by truck GHG emissions or on the limits of what is technologically feasible unmoors the standards from any statutory criteria and is arbitrary and capricious. EPA must finalize the strong, feasible standards that are necessary to address the impacts posed by these emissions.

Given the urgency of the climate crisis and the impact that heavy-duty vehicle pollution has on our climate and the air we breathe, EPA should adopt the strongest and most protective rule that puts us on a trajectory to all new vehicle sales being 100 percent zero-emission vehicles (ZEVs) by 2035. The most stringent option posed by the EPA results in the deployment of 42 percent of new vehicles[46] sold being ZEVs in 2032 and a 10 percent reduction of greenhouse gas emissions by 2032 (relative to 2026). The finalized rule must go further than even the strongest of the two scenarios that the EPA requested comment on in the draft rule. Any final version of this rule that does not accomplish this will be insufficient to address the public health and environmental harms caused by diesel heavy-duty vehicle pollution, especially when not paired with requirements for non-combustion-based, zero-emission solutions.

EPA projects that its preferred approach would only achieve 50 percent of ZEV sales by 2032 for vocational vehicles, 35 percent for short-haul tractors, and 25 percent for long-haul tractors, but the Agency's preferred proposal fails even to match publicly committed goals from prominent industry figures, such as Daimler, Ford, Navistar, and Volvo, who have made a range of commitments to increase their share of ZEV sales. These commitments range from 50 percent to 67 percent of sales by 2030, to 100 percent of sales as soon as 2035. Most, if not all, of the Agency's justifications for the *EPA Main Proposal* are equally, if not more, applicable to *Industry Commitments Alternative Proposal*. While the *Industry Commitments Alternative Proposal* ultimately falls short of what is needed for achieving 100 percent zero emissions by 2035, this proposal includes the stringency levels that are the least inappropriate of all the variations of the proposal offered up for comment by the EPA, and these stringency levels are also feasible to meet for all model years of the program. Additionally, the necessary benefits to the climate and for public health and welfare will only be realized by a rule that ensures all new vehicles sold are zero emissions by 2035, and certainly not likely with any scenarios weaker than the *Industry Commitments Alternative Proposal*.

Phase 3 follows a trend in which solutions to address the deadly harms of diesel pollution are looking to include unproven, potentially dangerous "alternatives" to diesel by allowing for alternative fuel sources such as natural gas and, in the case of this policy, hydrogen. These "bridge" fuels only further the environmental injustices caused by freight, and risk exchanging one source of pollution for another, arguably increasing the impacts because of pollution from pipelines and production to stacks and waste.

[46] Specific to heavy-duty vehicles as defined by the rule.

States across the country are leading the transition to zero-emission trucks, and EPA's proposal fails to match state ambition or account for the ZEV adoption rates that would result from compliance with the Advanced Clean Trucks (ACT) program. The ACT has already been adopted by 8 states—representing about 20 percent of the medium- and heavy-duty trucks market —and more states are considering following suit.[47] In fact, in May of 2023, Rhode Island announced its intention to adopt the ACT rule. EPA projects that if it set a national standard that aligns with the ZEV adoption levels under the ACT rule, this would result in 60 percent ZEV sales for vocational vehicles and 40 percent ZEV sales for tractors – ZEV deployment levels that exceed those expected under *EPA's Main Proposal*. This, too, serves as another justification for why *EPA's Main Proposal* is insufficient (as well as any proposals weaker than the *Industry Commitments Alternative Proposal* and the MFN recommended approach).

6. EPA's Weak Proposal is Based on Faulty Analyses of Impacts and Benefits

6.1. Flaws in EPA's Assessment of Impacts

It is clear that drastic emission reductions from the heavy-duty truck sector are needed to advance public health and address climate change. EPA's analysis of the climate and health impacts of the rule vastly underestimates its potential benefits. EPA should update the analyses by (1) using a 1.7% discount rate rather than 3%; (2) updating the social cost of carbon calculations by utilizing the most recent science; and (3) developing additional analyses on health benefits in alignment with the December 2022 Science Advisory Board (SAB) report assessing the EPA's proposed regulation for NOx emissions from heavy-duty trucks.

First, EPA's calculation of $87 billion in climate benefits and $15-$29 billion in non-GHG benefits are significant underestimates because they are based on an outdated 3% discount rate. The White House Office of Management and Budget Office of Information and Regulatory Affairs recently proposed Circular A-4 to guide federal agencies' regulatory analyses, finding that a 1.7% discount rate is accurate and supported by the most recent evidence.[48] EPA's use of a 3% discount rate inaccurately undervalues future benefits to the public, and EPA should utilize the more accurate 1.7% discount rate. In addition, EPA should remove the alternative analysis looking at a 7% discount rate, as this undervalues benefits to future generations.

Second, EPA acknowledges that the assumptions it uses to calculate the social cost of carbon benefits are an underestimate, yet still fails to update these estimates using the most recent

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[47] Larissa Koehler. Nearly Two Dozen U.S. and Canadian States Endorse Roadmap to 100% Zero-Emission Trucks by 2050. Environmental Defense Fund. (July 27, 2022). ttps://www.edf.org/media/nearly-two-dozen-us-and-canadian-states-endorse-roadmap-100-zero-emission-trucks-2050#:~:text=The%20Advanced%20Clean%20Trucks%20(ACT,and%20heavy%2Dduty%20vehicle%20marketplace.
[48] Office of Information and Regulatory Affairs. Circular A-4, Draft for Public Review. (April 6, 2023). p. 76. https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf.

science.[49] EPA itself has recommended a much higher social cost of carbon value than is being utilized here – at $190 per metric ton of CO_2, using a 2 percent discount rate.[50]

The SAB also found that "there are new studies showing that the health damages of climate change are significantly higher than estimated in earlier studies."[51] EPA should utilize its own analysis, the reports cited by the SAB (listed below), and any more recent information that can offer a more accurate estimate of the social cost of carbon:

- Rennert, K., Errickson, F., Prest, B.C., et al. 2022. Comprehensive evidence implies a higher social cost of CO2. Nature 610, 687–692. https://doi.org/10.1038/s41586-022-05224-9. This study recommends a much higher social cost of carbon – at $185 per metric ton of CO_2, at a 2 percent discount rate.

- Carleton, T., Jina, A., Delgado, M., Greenstone, M., Houser, T., Hsiang, S., Hultgren, A., Kopp, R.E., McCusker, K.E., Nath, I., Rising, J., Rode, A., Seo, H.K., Vianene, A., Yuan, J., and Zhang, A.T. 2022. Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits. The Quarterly Journal of Economics 1–69. https://doi.org/10.1093/qje/qjac020. Advance Access publication on April 21, 2022.

Third, EPA should conduct a more robust assessment of health benefits, following the guidance from the SAB's recent report. As discussed in more detail below, EPA relied on a national-average benefit-per-ton (BPT) approach to calculate $PM_{2.5}$ health benefits and conducted no air modeling in connection with the rule. This approach prevents EPA from analyzing the health benefits of ambient ozone reduction and NO_X health impacts, mobile air toxics, improved ecosystem effects, or visibility, severely underestimating the benefits of the rule.[52] In particular, EPA conducts no analysis of the health benefits from reducing ozone and nitrogen oxides pollution[53] despite the SAB's report, which provides in great detail the causal connection

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[49] U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). ("The social cost of carbon calculations included estimating global social benefits of CO2, CH4, and N2O emission reductions using social cost of GHG estimates from the February 2021 Technical Support Document (TSD): Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under E.O. 13990 (IWG 2021). These SC-GHG estimates are interim values developed under E.O. 13990 for use in benefit-cost analyses until updated estimates of the impacts of climate change can be developed based on the best available climate science and economics.").

[50] U.S. EPA. EPA External Review Draft of Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances. Docket ID No. EPA-HQ-OAR-2021-0317. (Sept. 2022). p. 3. https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf.

[51] Science Advisory Board. Regulatory Review of Science Supporting EPA Decisions for the Proposed Rule: Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards. No. EPA-SAB-23-001. (December 15, 2022). https://sab.epa.gov/ords/sab/f?p=100:12:17203034137454 [hereinafter "SAB Review of Heavy Duty Truck Rule"].

[52] U.S. EPA. Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3. EPA-420-D-23-004. (Apr. 2023). p. 451, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

[53] *Id.* Table 7-20. p. 466-67.

between near-roadway nitrogen oxides pollution and health impacts, and urges EPA to conduct local-scale analysis of these impacts in future rulemakings.[54] EPA should update its analysis to consider a vast portion of the health benefits that will result from the rule that are currently not being counted.

6.2. *EPA's EJ Analysis Is Insufficient and Should Be Updated to Fully Address Cumulative Impacts*

President Biden's recent April 2023 Executive Order on *Revitalizing Our Nation's Commitment to Environmental Justice for All* explicitly recognizes the role that cumulative impacts play in EJ communities and repeatedly directs federal agencies to evaluate and address the potential cumulative impacts associated with federal actions.[55] In addition, both 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.

The proposed rule fails to meet these directives. While EPA's analysis briefly acknowledges some of the cumulative impacts facing communities that are overburdened by truck traffic, EPA fails to quantify any of the distributional benefits or harms to EJ communities that could result from the proposed rule. EPA states in the proposal that the Agency "did not consider any potential disproportionate impacts of vehicle emissions in selecting the proposed CO2 emissions standards," despite acknowledging that the Agency "view[s] mitigation of disproportionate impacts of vehicle GHG emissions as one element of protecting public health consistent with [their authority under] CAA section 202."[56]

The failure to consider disproportionate and cumulative impacts on EJ communities in the rulemaking is unacceptable and must be revised. The current analysis fails to accurately consider the potential health impacts for EJ communities that are facing multiple stressors. The analysis also fails to address the potential harms that transitioning to new technologies may have on EJ communities under the rule. Had EPA considered the potential disproportionate and cumulative impacts of vehicle emissions in developing this proposal, the Agency would have structured the rule so that only the cleanest vehicles would be incentivized and so that reductions of other health-harming pollutants (like the non-GHG criteria pollutants and air toxics the rule indirectly affects) are guaranteed. Additionally, the Agency would have structured the rule in a manner that

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[54] SAB Review of Heavy Duty Truck Rule. p. 1-7.

[55] The White House. Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All (April 21, 2023). https://www.whitehouse.gov/briefing-room/presidential-actions/2023/04/21/executive-order-on-revitalizing-our-nations-commitment-to-environmental-justice-for-all/.

[56] U.S. EPA. Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3. 88 Fed. Reg. 25926, 26063. (April 27, 2023). https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

provides enough certainty that manufacturers would deploy ZEVs at the levels needed to result in clean air benefits to frontline and fence line communities.

As an initial matter, we reiterate our request that EPA address cumulative impacts and apply a multipollutant standard in this rule that would account for multiple pollutant impacts from diesel trucks, better account for cumulative impacts, and ensure that no false solution fuel sources would be considered zero emissions. Short of promulgating a multi-pollutant standard, EPA should revise the draft by (1) analyzing race-specific health impacts of the rule; (2) conducting a full analysis of the "cradle-to-grave" impacts of the rule that could impact communities upstream or downstream of where trucks are placed; and (3) considering measures to address distributional impacts of the rule, and ensure that in implementation, overburdened communities will realize emission reductions benefits. Conducting these analyses is vital to effectuating President Biden's Executive Order and accurately evaluating the costs and benefits of the rule in protecting public health in line with EPA's authority under CAA section 202.

First, EPA should conduct race-specific health analysis to assess the total health benefits of the rule more accurately. Spiller et al. (2021) have 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%.[57] A stratified health benefit analysis provides a view on how 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"). Lastly, stratified health risk analyses can help communicate the impacts of the rule to stakeholders and promote meaningful involvement.[58]

EPA should consider the robust recommendations contained in the December 2022 Science Advisory Board report assessing EPA's proposed regulation for NOx emissions from heavy-duty trucks, which also supports conducting this analysis.[59] The SAB report found that "current methods used in EPA's Draft Regulatory Impact Analyses (RIAs) are not sufficient to capture community-scale benefits."[60] The SAB concluded and "strongly" recommended that "EPA develop a strategy for systematic, quantitative evaluation of the environmental justice (EJ) impacts of air pollution regulations."[61] SAB's recommendation included consideration of

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[57] 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. V. 129. N. 12. (December 2021). 127004. https://doi.org/10.1289/EHP9001.

[58] U.S. EPA. Guidance on Considering Environmental Justice During the Development of a Regulatory Action. (Nd).
https://www.epa.gov/environmentaljustice/guidance-considering-environmental-justice-during-development-action.
[59] SAB Review of Heavy Duty Truck Rule.

[60] *Id.* at p. viii.

[61] *Id.*

race-specific health analyses and cumulative impacts, among other specific recommendations for improving regulatory analyses for air quality and greenhouse gas related rulemaking.

Specifically, SAB urged EPA to consider "cumulative exposure to multiple risk factors, including exposure to other air pollutants, heat, and lead" in future rulemaking.[62] In the context of truck pollution, SAB stated:

> *The SAB finds that information on the effect of heavy-duty vehicles on local air pollution would be informative for this rule, both generally and considering concerns for equity across differentially exposed communities. Plausibly causal estimates in the economics literature show that exposure to vehicle emissions near major roadways increases premature adult mortality (Anderson 2020), infant mortality (Currie and Walker 2011, Knittel et al. 2016), childhood asthma (Marcus 2017), and other important negative outcomes such as violent crime (Herrnstadt et al. 2021). Evidence also suggests that the negative effects of vehicle emissions from roadways on infant health are greater for low-income than for high-income households (Long et al. 2021) and greater for more vulnerable (i.e., lower birthweight) infants (Knittel et al. 2016). The impacts of heavy-duty vehicle emissions, in isolation, are not as well-studied, but some evidence suggests that reducing diesel emissions from heavy trucks (even if replaced by a similar flow of light-duty gasoline vehicles) reduces cardiovascular and respiratory hospitalizations and deaths (He et al. 2018). Taken together, these papers suggest that households in close proximity to major roadways suffer differential health effects from transportation emissions and that those effects may raise significant environmental justice concerns given the typical demographic composition of neighborhoods near highways (Rowangould 2013), especially truck freight routes (U.S. EPA 2021).*[63]

EPA's draft rule qualitatively describes some connections between this rulemaking and cumulative impacts facing truck-impacted communities in the EJ analysis and even goes so far as to include a quantitative analysis of the demographics of households living within 300 feet of roadways.[64] This analysis reveals (unsurprisingly) that more often, communities of color and low-income communities are those impacted by truck routes.[65] EPA should build on this demographic data, conduct air modeling, and develop a racially-stratified health benefits analysis to more accurately quantify the benefits of the rule to EJ communities. If it is not feasible to conduct this analysis for the entire rule, EPA should do this for targeted geographic areas that are high in truck traffic.[66] Moreover, EPA should explicitly acknowledge the practice of redlining

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[62] *Id.* at p. 3.
[63] *Id.*

[64] U.S. EPA. Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3. EPA-420-D-23-004. (April 2023). p. 396-398. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

[65] *Id.*

[66] SAB Review of Heavy-Duty Truck Rule. p. 16.

and how that has created disparities for communities of color being disproportionately exposed to near-roadway pollution.[67]

The SAB urged that in future analyses, EPA should estimate impacts within a small distance of large roads/highways (perhaps in urban areas most likely to be affected) to describe better differential impacts by race, income, and other characteristics of exposed populations. Aggregation impairs the Agency's ability to analyze local impacts.[68] Here, EPA is basing its health benefit analysis on the national-average benefit-per-ton (BPT) of PM reductions.[69] This aggregated approach masks the localized impacts of the rule.[70] More localized data is available for EPA to consider. For example, the American Lung Association's recent State of the Air Report specifically hones in on heavy-trucking corridors and routes and issues projected health benefits at the county level (although county-level is still too aggregated for community-scale impacts, and even finer-level data should be examined). Additionally, other existing data from the California Air Resources Board (CARB) should be carefully considered, including all final data associated with CARB's Heavy-Duty Low NOx Omnibus rule.

As discussed above, environmental racism shows up in multiple ways in the impacts from heavy-duty truck pollution —including, but no 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.[71] We recommend that EPA further consider the disparate impacts of the rule and alternatives by analyzing race/ethnicity-stratified health benefits. This analysis would more accurately capture the distribution of health impacts to environmental justice communities and result in a more accurate total health and climate benefits as well.

Second, EPA should update the EJ analysis to thoroughly analyze the "cradle to grave" impacts of the proposal and the potential disproportionate and cumulative impacts that EJ communities may face as a consequence of the rule. For example, the EJ analysis acknowledges that electricity generating units disproportionately impact communities of color and may experience

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[67] *Id.* p. 9.

[68] *Id.* p. 15.

[69] U.S. EPA, Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3. EPA-420-D-23-004. (April 2023). p. 452. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

[70] *Id.* p. 468.

[71] 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. V. 30. No. 5. (May 2011). p. 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. V. 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. V. 129. No. 12. (December 2021). 127004. https://doi.org/10.1289/EHP9001.

some disbenefits where fossil fuel is burned for electricity generation.[72] However, EPA failed to fully consider the upstream and downstream impacts associated with energy generation, especially the disproportionate impacts and potential harms to EJ communities. This is critical to analyze, and EPA should quantify and evaluate these impacts in detail and include measures to avoid and mitigate these effects.

The proposed rule fails to consider the full lifecycle impacts associated with technologies that will be used to comply with the rule. This includes a full life cycle analysis of the battery supply chain; a life cycle analysis of hydrogen (including grey, blue, green, and any other forms of hydrogen) that could fuel trucks and assessing the emissions associated with hydrogen combustion; and life cycle analysis of diesel and natural gas fuels that could comply with the rule. Conducting these "cradle to grave" analyses is necessary to consider the localized environmental justice harms that could result from technology choices.

Third, EPA should consider additional measures to ensure that overburdened EJ communities will receive the benefits of transitioning to cleaner trucks. It is critical that, in this rulemaking, EPA sends a strong signal to the market and regulators that longstanding burdens to communities and increasing disparities in burdens from heavy-duty trucks cannot continue. EPA has obligations under the Clean Air Act and Title VI of the Civil Rights Act to ensure that state agencies receiving funds for their air programs address disparities in burdens from heavy-duty trucks through their State Implementation Plans (SIPs).[73] EPA can and should help support states by setting a standard under Section 202 that ensures robust availability of the cleanest trucks across the country in states, cities, and other municipalities facing the heavy and disparate toll of the logistics industry.

A cumulative impact framing is 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 be able to address the real-world harms environmental justice communities face. As Dr. Sacoby Wilson says, "Context matters. Place matters."[74] For EJ communities, place matters, and EPA should only propose regulations that guarantee health benefits and emission reductions for overburdened communities.

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[72] U.S. EPA. Draft Regulatory Impact Analysis, Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles: Phase 3, EPA-420-D-23-004. (April 2023). p. 398. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10178RN.pdf.

[73] U.S. EPA 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).)

[74] Katherine Bagley. Connecting the Dots Between Environmental Injustice and the Coronavirus. (May 7, 2020). https://e360.yale.edu/features/connecting-the-dots-between-environmental-injustice-and-the-coronavirus.

6.3. *Labor and Workplace Impacts Must be Integrated into EPA's Analysis*

There has been a dearth of federal labor policies and standards ensuring that there are protective workplace environments, that wages reflect the cost of living, and that workers have the right to organize. In fact, over the last few decades, industries have increased their reliance on temporary or third-party worker hiring practices, thus further distancing the employers from their responsibility to prioritize workers' rights, health, and safety.

While improving the standards across the freight sector is critical, enforcement expansion must also be intentional and prioritized. Labor and those working in and adjacent to the freight sector (including truck drivers, equipment operators, warehouse and logistics workers, manufacturers, small business repair shops, 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.[75]

Regulations to strengthen emission standards and 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 and provisions to ensure that these increases in jobs result in workers benefiting in access to good quality jobs.

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. The NESCAUM Action Plan noted that "small trucking companies operating with six or fewer trucks make up 90 percent of carriers in the United States."[76]

However, with the correct policy levers in place, working with the whole-of-government approach while centering frontline and fenceline experience and knowledge, EPA could propose the necessary successful rule that would move ZEVs with the goal of just transition and promoting environmental justice. In the workplace, the just transition framework centers the voices of workers whose jobs will radically transform with the promise of clean energy industries. Workers' voices are critical to the success of policies and programs that will ultimately move towards zero-emission solutions across the freight transportation system.

[75] 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/.

[76] ZEV Taskforce. Multi-State Medium-And Heavy-Duty Zero-Emission Vehicle Action Plan A Policy Framework to Eliminate Harmful Truck and Bus Emissions. (July 2022). p. 21. https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf

"Just transition advocates within the labor movement often say that while 'transition is assured, justice is not.'" - **Warehouse Workers for Justice**[77]

6.3.1. Misclassification

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 ZEVs.[78] Since deregulation in the '80s, 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."[79] Because they are not considered employees, they have no benefits -- no health care, pension, paid vacation, etc. Drivers must pay the total cost of their rigs and be on the road. In 2014, the National Employment Law Project report, "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.[80] The low road 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.[81]

> *Drivers are often in the position of absorbing the costs of upgrading to new technologies, while trucking companies externalize their costs. Instead of purchasing new trucks to replace older trucks that have reached the end of their useful lives, many smaller fleets, independent owner/operators, and contract drivers buy used trucks on the secondary market. Because these smaller fleets and contract drivers often have slimmer profit margins, fewer capital resources, and less certain access to credit, there is less capacity to assume the inherent risks and uncertainties associated with adoption of new technology.* [82]

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[77] 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. (Nd). p. 13, https://www.ww4j.org/uploads/7/0/0/6/70064813/wwj_report_good_jobs_clean_air.pdf.

[78] *Id*.

[79] David Bensman. Port trucking down the low road: a sad story of deregulation. Rutgers University. (2009). p.5

[80] Rebecca Smith, Paul Alexander, Marvy Jon Zerolnick. The Big Rig Overhaul Restoring Middle-Class Jobs at America's Ports Through Labor Law Enforcement. (February 2014). https://www.nelp.org/wp-content/uploads/2015/03/Big-Rig-Overhaul-Misclassification-Port-Truck-Drivers-Labor-Law-Enforcement.pdf

[81] Appel, Sam, and Carol Zabin. Truck Driver Misclassification: Climate, Labor, and Environmental Justice Impacts. UC Berkeley Labor Center. (August 2019). https://laborcenter.berkeley.edu/pdf/2019/Truck-Driver-Misclassification.pdf.

[82] ZEV Taskforce. Multi-State Medium-And Heavy-Duty Zero-Emission Vehicle Action Plan A Policy Framework to Eliminate Harmful Truck and Bus Emissions. (July 2022). p. 21. https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zev-action-plan.pdf

To address the issues of workforce exploitation, especially for port truck drivers, EPA needs to propose a just transition towards zero-emission vehicles. Just transition to ZEVs ensures that workers within the port transportation sector are not further burdened but benefit from increased job growth. Several policy measures would support this; first and foremost, state and federal standards are in place to protect drivers from misclassification, which is, in effect, a form of indentured servitude. Worker rights groups want to see support for the passage of the Protecting the Right to Organize (PRO) Act of 2021,[83] which would address the issue of worker misclassification and protect the right of workers to organize. They would also like the restrengthening of the Obama-era Fair Labor Standard Act[84] concerning employee and contractor classifications, which the Trump administration weakened.

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. Currently, supporting these misclassified workers is possible and feasible with the billions the government has been putting into zero emissions and freight. EPA should apply the whole-of-government approach and leverage these new resources from the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL), coupled with the Administration's priority to implement Justice 40. These combined efforts could create a ZEV implementation program that prioritizes just transition.

The Biden Administration's recent EO *Revitalizing Our Nation's Commitment to Environmental Justice for All* provides clear directives that EPA should apply the administration's whole-of-government commitment to this rule. This means accounting for labor, impacts, and solutions as well as coordination with at least the Department of Labor, Department of Energy, Office of Environmental Justice, and Department of Transportation.[85]

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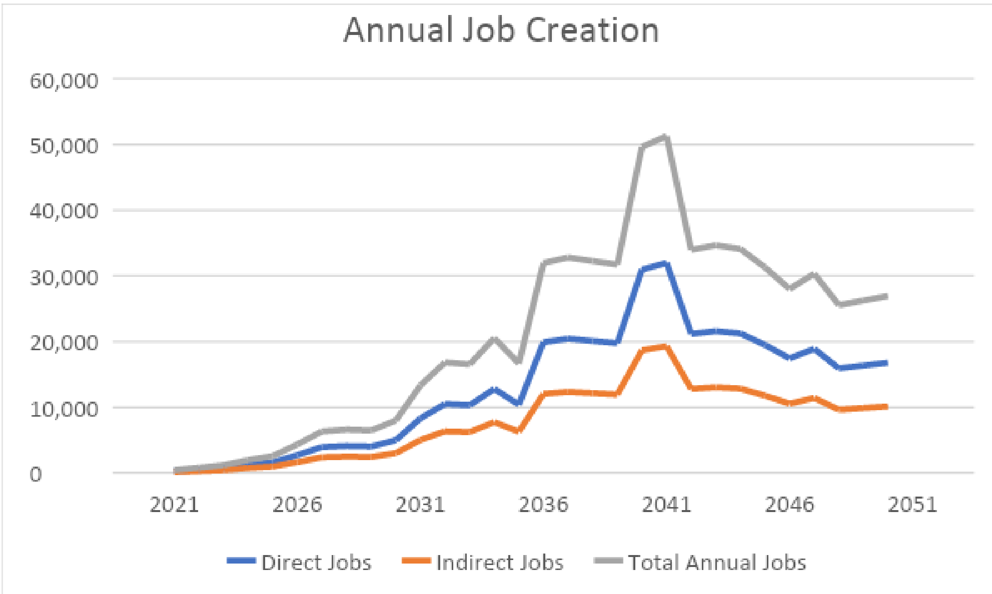
[83] Education & Labor Committee. Protecting the Right to Organize Act Section by Section. Education & Labor Committee. (2021). https://edlabor.house.gov/imo/media/doc/Section%20by%20Section%20-%20PRO%20Act.pdf.
[84] Office of Financial Management. Fair Labor Standards Act (FLSA). Office of Financial Management.(2019). https://ofm.wa.gov/state-human-resources/compensation-job-classes/compensation-administration/fair-labor-standards-act-flsa-washington-minimum-wage-act-wmwa/fair-labor-standards-act-flsa.

[85] Deepen the Biden-Harris Administration's whole-of-government commitment to environmental justice. Better protect overburdened communities from pollution and environmental harms. The Executive Order directs agencies to consider measures to address and prevent disproportionate and adverse environmental and health impacts on communities, including the cumulative impacts of pollution and other burdens like climate change. Promote the latest science, data, and research, including on cumulative impacts. https://www.whitehouse.gov/briefing-room/statements-releases/2023/04/21/fact-sheet-president-biden-signs-executive-order-to-revitalize-our-nations-commitment-to-environmental-justice-for-all/

MFN provided a detailed analysis in our *Making the Case for Zero-Emission Solutions in Freight*[86] 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 the Administration prioritized money and resources in the transition to zero-emissions for the commercial fleet infrastructure, the job creation alone from direct and indirect work would be at around 30,000 additional jobs by 2037 (Figure 1).

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



A strong ZEV requirement 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." And research conducted on behalf of *EV Infrastructure Strike Force* suggests that, if the Biden Administration's goal of deploying 500,000 EV charging stations is met with public fast charging stations, it will support about 30,000 job-years.[87]

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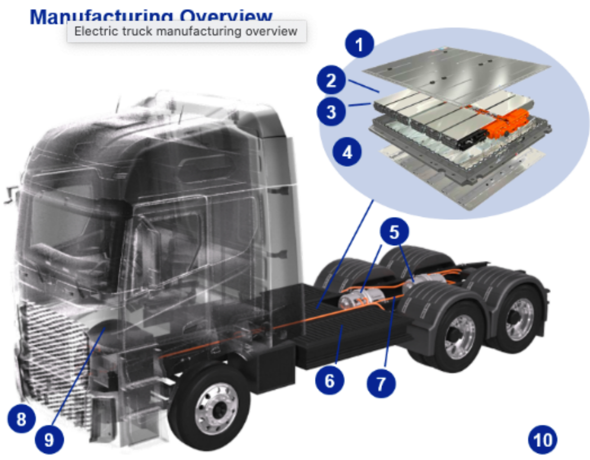
[86] Moving Forward Network. Making the Case for Zero-Emission Solutions in Freight: Community Voices for Equity and Environmental Justice. (2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/10/MFN_Making-theCase_Report_May2021.pdf.

[87] Edward W. Carr. James J. Winebrake. Samuel G. Winebrake. Workforce Projections to Support Battery Electric Vehicle Charging Infrastructure Installation, Energy and Environmental Research Associates, LLC. Available at: https://etcommunity.org/assets/files/Workforce-ProjectionstoSupportBatteryElectricVehicleChargingInfrastructureInstallation-Final202106082.pdf

Figure 2. Manufacturing overview of heavy-duty electric trucks[88]



	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) vehicles are the same as a ZEV. However, key electric drive components differentiate a ZEV, such as battery packs, electric motors, inverters and converters, and 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.

In the case of the previous NOx regulation, ERM's analysis found that a strong ZEV Rule would generate a 63,000 net increase in jobs and net GDP growth of over $10 billion by 2035.[89] Importantly, the average wages for the new jobs created are roughly double the average wages of those replaced.

6.4. *EPA's Analysis Fails to Properly Analyze Impacts of Non-ZEV Trucks*

Phase 3 follows a trend in which solutions to address the deadly harms of diesel pollution are looking to include unproven, potentially dangerous "alternatives" to diesel by allowing for alternative fuel sources such as natural gas and, in the case of this policy, hydrogen combustion technologies. These "bridge" fuels and technologies only further the environmental injustices caused by the freight, and exchange one source of pollution for another, arguably increasing the impacts because of pollution from pipelines and production to stacks and waste.

Given the weak stringency of EPA's *Main Proposal* and that the proposed standards do not require or mandate the use of a specific technology for compliance, EPA leaves room for

[88] Environmental Defense Fund. Zero-emission trucks generating jobs across the U.S. https://www.edf.org/zero-emission-trucks-generating-jobs-across-us (last accessed: June 2023)
[89] Robo et al. (2022). p. 4.

scenarios where the industry can comply with fewer ZEVs than those projected under the Agency's preferred approach.

EPA must not allow alternative combustion fuels ("false solutions") to be included in their zero-emission definition. Instead, EPA should adhere to the precautionary approach, which turns traditional environmental policy on its head. Instead of asking, "How much harm is allowable?" the precautionary approach asks us to consider, "How little harm is possible?" The precautionary approach urges a full evaluation of available alternatives to prevent or minimize harm.[90]

Since the Agency focuses solely on reducing CO2 and not cumulative impacts and other pollutants, harmful technologies like hydrogen combustion technologies and natural gas remain options. Although hydrogen combustion technology may not produce CO_2 when combusted, it does produce other pollutants, including nitrogen oxide (NOx) emissions.

Unfortunately, the Agency's proposal does not appropriately take into account the impact hydrogen combustion engines will have on the communities this rule is meant to protect. For example, EPA's proposal accounts for hydrogen ICE vehicles as having zero tailpipe emissions, even though upstream emissions from the production and distribution of hydrogen can be significant. This is particularly concerning because 99 percent of hydrogen is produced from fossil fuels, and only 0.02 percent of hydrogen produced today is green hydrogen (derived from using 100% renewable energy to split hydrogen from water molecules).[91]

Additionally, hydrogen (despite the color; blue, green, etc.) itself can indirectly contribute to greenhouse gas emissions through leakage from within its infrastructure system throughout the various lifecycle stages (e.g., storage, refueling, and transportation stages). According to a 2022 study on the climate consequences of hydrogen leakage, hydrogen leakage may significantly diminish the climate benefits linked to hydrogen. In fact, if leaks are high …fossil-derived hydrogen may initially yield more warming than would the use of the fossil fuel system it replaces.[92] There was a study by the International Council on Clean Transportation (ICCT) that analyzed the life cycle greenhouse gas emissions of hydrogen across eleven hydrogen pathways. This study found that a wide range of carbon intensities exist and also found that some methods have an even greater carbon intensity than diesel fuel (e.g., coal gasification).[93]

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[90] Rachel's Democracy & Health News (formerly Rachel's Environment & Health News). #770 -- Environmental Justice and Precaution, May 29, 2003. (July 31, 2003). http://web.archive.org/web/20071219020722/http://www.rachel.org:80/bulletin/index.cfm?issue_ID=2359 any discussion must include specific parameters.

[91] Sasan Sadaat and Sara Gersen. Reclaiming Hydrogen for a Renewable Future. (August 2021). p. 21-30. https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice_2021.pdf.

[92] Ilissa B. Ocko and Steven P. Hamburg. Climate consequences of hydrogen emissions. Atmos. Chem. Phys. V. 22. Iss. 14. p. 9349–9368. (2022). https://doi.org/10.5194/acp-22-9349-2022

[93] ICCT. Life Cycle Analysis of Greenhouse Gas Emissions of Hydrogen, and Recommendations for China. (October 19, 2022). https://theicct.org/publication/china-fuels-lca-ghgs-hydrogen-oct22/

EPA should apply the precautionary principle when thinking about compliance pathways and structure this regulation to provide certainty that alternative, safer, and more environmentally friendly and truly zero-emissions options for transportation are applied. A pathway to ensure this could be by incentivization of EVs powered by increasingly renewable electricity. Another such regulatory design strategy is a multipollutant rule which would set vehicle emissions standards not just for greenhouse gas emissions, as proposed, but for NO_X and $PM_{2.5}$ as well. This is the strategy currently deployed by the administration for light- and medium-duty vehicles (88 FR 29184-446), and a design for a heavy-duty program easily integrated into the agency's current regulatory structure was presented to EPA as part of the EO 12866 process for the Phase 3 GHG rule.[94]

Regardless of the hydrogen fuel type (green, blue, or otherwise), it is clear that combustion-based hydrogen technology allows for direct and unintended consequences and harm to environmental justice communities as a heavy-duty vehicle fuel source.

In addition, it appears that EPA did not account for emissions from petroleum refineries in analyzing the scenarios due to potential uncertainty about refinery behavior due to reduced diesel demand. However, leaving out the potential benefits from reduced demand for diesel (and reduced refining of petroleum producers needed) undercuts the overall emission reduction benefits (and climate and public health benefits) from switching to battery electric trucks on an increasingly cleaner grid. In contrast, emissions from hydrogen that may largely be produced by SMR technologies at refineries (even with the Inflation Reduction Act investments) would also not be captured in EPA's analysis. EPA's assumptions that the historical investments from Congress will lead to a shift to cleaner hydrogen production pathways as well as manufacturer compliance through ZEVs is insufficient, especially since the proposed rule structure doesn't include upstream emissions accounting - which would provide increased certainty that compliance would occur through truly clean technologies. The basis for this assumption alone is wholly insufficient, and the Agency must finalize a version of the rule that appropriately addresses this and discourages compliance by using technologies that will continue to pollute communities and harm the public.

EPA's current, ill-conceived crediting of H_2ICEVs as 0 g/ton-mile is inconsistent with these vehicles' climate and public health impact, as noted in Section 7.3.2. When fueled by today's dominant source of hydrogen (as identified by EPA, DRIA Figure 1-11), H_2ICEVs have virtually no climate benefit over a Phase 2 diesel vehicle, and there is no public health benefit regardless of the source of the fuel. This suggests that EPA's current regulatory approach to H_2ICEVs is misguided and misaligned with the Agency's requirement under the Clean Air Act to "establish emission standards for air pollutants from new motor vehicles or new motor vehicle engines, which, in the Administrator's judgment, cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare."

[94] Union of Concerned Scientists. EO 12866 Meeting 2060-AV50. UCS - Multipollutant HDV proposal - 2023-03-15.pdf. (March 15, 2023). https://www.reginfo.gov/public/do/eoDownloadDocument?pubId=&eodoc=true&documentID=213242.

While we do not support using natural gas as a fuel source, we note that EPA acknowledged the need for an assessment process that could better account for lifecycle impacts. To assess the path forward for H_2ICEVs, the Agency should consider its approach to natural gas vehicles in Phase 2. In that case, the Agency conducted a thorough lifecycle analysis of CNGVs and LNGVs to assess the full lifecycle harms compared to diesel (Phase 2 FRIA, Chapter 13). EPA then adopted specific test procedures for CNGVs and LNGVs to mitigate the upstream harms from the vehicles (81 FR 73931). Finally, EPA adopted standards that "in essence, applies a one-to-one relationship between fuel efficiency and tailpipe CO_2 emissions for all vehicles, including natural gas vehicles" (81 FR 73524). In the case of hydrogen combustion, EPA is now proposing to break with its prior approach. Given the evidence on the lifecycle impacts of H_2ICEVs, EPA should instead hew to a model that treats energy efficiency of the gaseous fuel equivalently for combustion vehicles. In this way, manufacturers could still submit a fuel map (g/s), and then for certification purposes, the g/s hydrogen would be converted to an energy-equivalent consumption of gasoline or diesel, depending on the intended service class and engine cycle (40 CFR § 1036.140). The CO_2 rates for certification would then be based on the rates for the diesel- or gasoline-equivalent engine, using the respective CO_2 rates for diesel or gasoline.

EPA already allows manufacturers to use fuel flow rate as a determinant in establishing CO_2 measurements, so this alteration fits within EPA's well-established Phase 2 test procedures. This would simply adopt a corrective factor for use within GEM for vehicle certification to more accurately reflect the relative emissions impacts of H_2ICEVs with other combustion-powered vehicles.

7. Proper Consideration of Life-Cycle Emissions Shows that EPA's Weak Proposal Could Provide No Benefits and that A Strong Zero-Emission Rule Is Necessary

Given the impacts of freight pollution on local communities, the elimination of tailpipe emissions by replacing diesel trucks with zero-emission trucks is an opportunity for significant improvements in air quality. However, those benefits come from not just eliminating greenhouse gas emissions, which EPA's proposed Phase 3 directly regulates, but from eliminating the direct emissions of other pollutants like particulate matter ($PM_{2.5}$) and nitrogen oxides (NO_X). Moreover, reducing greenhouse gas emissions from trucks will have specific benefits for EJ communities living in the country's most polluted air basins. GHGs also contribute to ozone pollution through a warming climate.

A recent report from the American Lung Association (ALA) shows the tremendous benefits that could be achieved through 2050 by accelerating the deployment of electric trucks.[95] ALA's analysis shows that electric trucks could result in $735 billion in public health benefits over the next 30 years and a more equitable future.[96] It also found that in U.S. counties with major trucking routes, this transition would result in up to 66,800 avoided deaths, 1.75 million avoided

[95] American Lung Association. Delivering Clean Air: Health Benefits of Zero Emission Trucks and Electricity. (October 2022). https://www.lung.org/clean-air/electric-vehicle-report.
[96] *Id.* p. 1.

asthma attacks, and 8.5 million avoided lost workdays.[97] ALA's analysis predates EPA's recent NO_X rule, and it assumes that all of these electric trucks will be powered by a renewable grid; however, even with more conservative assumptions, electric trucks provide significant benefits compared to other technology options considered by the Agency in the proposed rule.

Below is a detailed comparative analysis of different technologies based on different assumptions about the current and future emissions from trucks and the electric grid. While many of the key assumptions are detailed in the text, the attached appendix provides a full methodological explanation of the assumptions.

7.1. Summary of Methodology for Assessing the Impact of Different Technologies

As noted throughout this comment, tailpipe emissions from trucks are not their only impact—communities are also impacted by the direct emissions of $PM_{2.5}$ associated with tire and brake wear as well as indirect emissions associated with the source of energy powering the trucks, including the extraction of oil and gas, refining of liquid and gaseous fuels, and emissions from the electricity sector. As in the case of truck traffic, which the Agency's near-roadway analysis makes clear is inequitably distributed, the siting of fossil fuel extraction and refining, as well as the siting of combustion power plants, all disproportionately impact communities of color and low-income communities. It is critical to consider impacts beyond the tailpipe when assessing the full impact of any technological solution to the current harm of diesel trucks.[98]

This analysis considers upstream as well as tailpipe emissions, not just of greenhouse gases but also of nitrogen oxides (NO_X), particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), and volatile organic compounds (VOCs), all of which are criteria pollutants or precursors regulated by EPA under the Clean Air Act. To aggregate the total public health impacts from a given technology based on all of these emissions, we have used EPA's COBRA model, aggregated at the grid subregion level to assign different mortality/ton values to the given pollutants based on their source (e.g., diesel trucks, power plants, oil refineries, fossil fuel extraction). This approach means that the health impacts may not be felt by precisely the same groups of people; however, because inequity is at play across all these industries, it is important not to simply shift the burdens from one community to another but to reduce the harms for all.

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[97] *Id.*

[98] Cushing, L.J., et al. Historical red-lining is associated with fossil fuel power plant siting and present-day inequalities in air pollutant emissions. Nat. Energy. V. 8. (2023). p. 52-61. https://doi.org/10.1038/s41560-022-01162-y; Gonzalez, J.X., et al. Historic redlining and the siting of oil and gas wells in the United States. J. Exp. Sci. & Env. Epi. V. 33. (2023). p. 76-83. https://doi.org/10.1038/s41370-022-00434-9; Carpenter, A., and M. Wagner. Environmental justice in the oil refinery industry: A panel analysis across United States counties. J. Ecol. Econ. V. 159 (2019). p.101-109. https://doi.org/10.1016/j.ecolecon.2019.01.020; Mohai, P., et al. Racial and socioeconomic disparities in residential proximity to polluting industrial facilities: Evidence from the Americans' Changing Lives study. Am. J. Pub. Health. V. 99. (2009). p. S649-S656. https://doi.org/10.2105/AJPH.2007.131383.

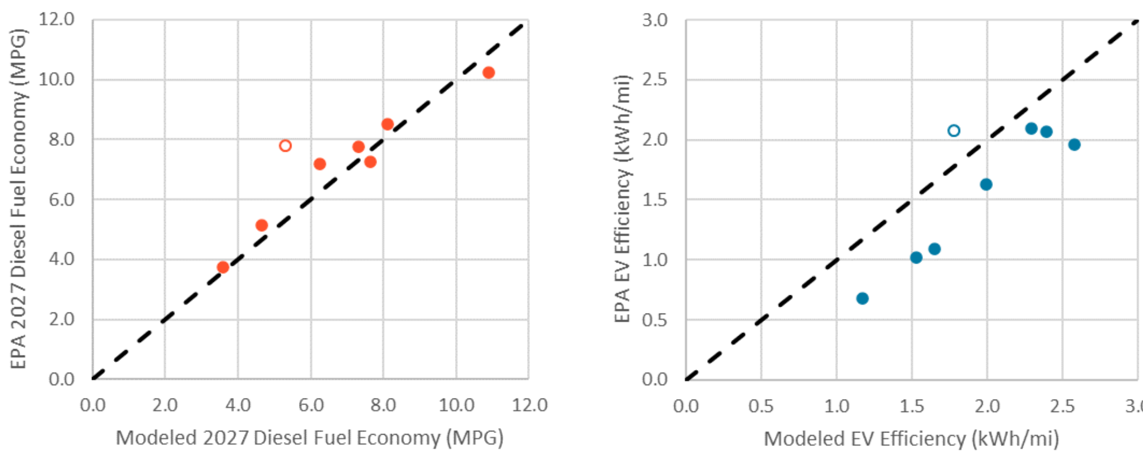
To summarize the health impacts, we have aggregated the total premature mortality caused by each truck over its lifetime. We have then scaled this to an effective $PM_{2.5}$ concentration, with today's diesel trucks representing 103 mg/m^3, a level corresponding to the middle of the "Unhealthy" range in the air quality index (AQI = 175). While these "Public Health Scores" are correlated with air quality, they do not directly represent the AQI associated with pollution from trucks: 1) trucks are generally not the only component in a community's air quality; 2) to the extent they are, that impact is dependent upon the relative volume of trucks in a given community; 3) generally, the concentration of pollutants is dependent upon complex mixing of air and location relative to any pollutant source. However, we have scored it in a parallel system to AQI because, unfortunately, AQI levels are something that many communities dealing with truck pollution have developed an intuitive understanding of, and so assessing the proportional differences in pollution compared to the "unhealthy" diesel trucks currently inundating those communities allows for a more intuitive understanding of the relative public health benefits provided. The scale and relative impacts of this public health score are shown in Table 1.

Table 1. Public health score, lifetime mortality, and relative impact compared to today's diesel trucks

	Public Health Category	**Category Score Range (Today's Diesel = 175)**	**Difference in Mortality Compared to Today's Diesel**
	Hazardous	300 or higher	> 140% increase
	Very Unhealthy	201-300	46% to 143% increase
	Unhealthy	151-200	46% decrease to 46% increase
	Unhealthy for Sensitive Populations	101-150	66% decrease to 46% decrease
	Moderate	51-100	88% decrease to 66% decrease
	Good	0-50	100% decrease to 88% decrease

The fuel economy and efficiency of the trucks are based on EPA's Phase 2 requirements for diesel-powered vehicles, as simulated for representative duty cycles in a modified version of EPA's GEM model designed in MATLAB. Because the model is not designed for electric powertrains, electric efficiency was determined via an observed energy-efficiency relationship between diesel and electric powertrains observed in real-world testing.[99] A comparison between the modeled efficiencies and EPA's assumptions in its HD TRUCS model are shown in Figure 3 to ground this work in the assumptions used in the proposal.

Figure 3. Comparison between EPA truck efficiency and trucks modeled in this analysis



Diesel truck efficiency modeled in this analysis (red circles) is largely equivalent to EPA's modeling, with a notable exception for drayage operation (open data points), which is related to the agency's assumption on much greater high-speed operation. In contrast, the modeled electric trucks (blue circles) are generally less efficient than EPA's analysis, making these results conservative compared to the agency's assumptions.

To account for tailpipe pollution from combustion vehicles, we have used data traces from the GEM-modeled truck runs to obtain information about engine loads. For today's diesel vehicles, we have largely relied upon the updated MOVES model to reflect the latest real-world information for levels of pollution at different engine operating conditions. For future combustion vehicles, we have accounted for the real-world emissions required under the in-use standards for EPA's latest emissions standards for heavy-duty engines, including additional emissions allowance under the temperature adjustment and interim adjustment. These tailpipe emissions are considered over the average lifetime of the vehicle, accounting for differences in warranty and lifetime requirements for emissions controls but acknowledging, as EPA's MOVES model does, that emissions control equipment is susceptible to tampering and mal-maintenance, particularly outside the mandated warranty period. Obviously, for electric trucks, tailpipe emissions remain zero throughout the vehicle's entire lifetime.To assess upstream emissions from the grid, we use the latest version of EPA's eGRID model (eGRID2021). For future grid

[99] Liu, X., *et al*. Well-to-wheels analysis of zero-emission plug-in battery electric vehicle technology for medium- and heavy-duty trucks, *Environ. Sci. Technol. V.* 55. (2021). p. 538-546. https://doi.org/10.1021/acs.est.0c02931; Hunter, C., *et al.* Spatial and temporal analysis of the total cost of ownership for class 8 tractors and class 4 parcel delivery trucks. Technical Report NREL/TP-5400-71796. (2021). https://www.nrel.gov/docs/fy21osti/71796.pdf; California Air Resources Board. Battery Electric Truck and Bus Energy Efficiency Compared to Conventional Diesel Vehicles. (May 2018). https://ww2.arb.ca.gov/sites/default/files/2018-11/180124hdbevefficiency.pdf.

emissions, we rely primarily on modeling done by the National Renewable Energy Laboratory (NREL) for its Cambium project.[100] For all sources of energy, we use the latest version of the GREET model to estimate the upstream emissions of all pollutants of concern.[101]

7.2. The ability of electric trucks to reduce emissions compared to diesel vehicles

The benefits of an electric drayage truck compared to its diesel-powered equivalent change between today and 2035 based predominantly on the improvement in the electric grid. Figure 4 shows the relative greenhouse gas emissions benefits resulting from the two different timeframes. Figure 5 shows the relative public health impact, as indicated by the Public Health Score defined earlier through aggregated mortality. While today's diesel vehicles are the benchmark for the public health scores, the 2035 diesel truck public health score in Figure 5 reflects a Phase 2 diesel truck meeting the 2027 NO_X and $PM_{2.5}$ standards finalized last year.

Electric trucks powered by electricity supplied from the U.S. grid production average today would lead to more than a two-thirds reduction in greenhouse gas emissions compared to their diesel counterpart. By 2035, under a scenario consistent with the administration's goals for the power sector and analysis of what is needed to decarbonize by 2050, that achieves a 95 percent reduction compared to diesel.

However, the story is more complicated when it comes to public health impacts. It underscores the tremendous importance of eliminating fossil fuels across the electricity sector and in transportation.[102] On average, an electric drayage truck powered by today's grid would reduce premature deaths by nearly 57 percent compared with current diesel trucks. Nearly all regional electricity grids, covering 97 percent of the U.S. population, result in net benefits today. However, there are some subregions where, if the average grid powered the truck, an electric truck could lead to more net harm as the result of substantial particulate emissions from fossil fuel power: in Alaska, diesel generators continue to be utilized in remote areas, especially as a backup source to hydropower, and make up more than one-quarter of generation in the AKMS subregion and 10 percent of generation in the AKGD subregion; in Hawaii (HIOA and HIMS subregions), while there has been significant growth in both rooftop and utility-scale solar power, more than two-thirds of grid-supplied electricity in the state comes from petroleum power plants; and in rural Missouri/Illinois (SRMW subregion), approximately two-thirds of the grid remains coal-powered.[103]

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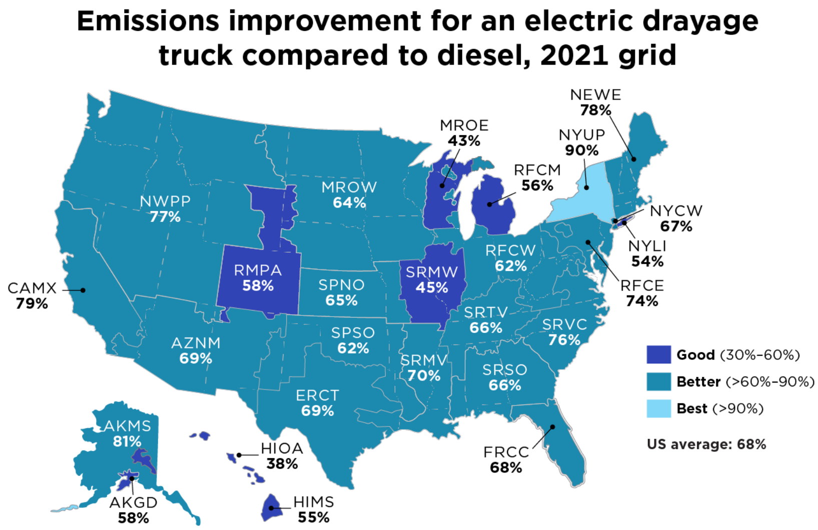
[100] Gagnon, P., *et al*. Cambium Documentation: Version 2021. Technical Report NREL/TP-6A40-81611. (2021). https://www.nrel.gov/docs/fy22osti/81611.pdf.

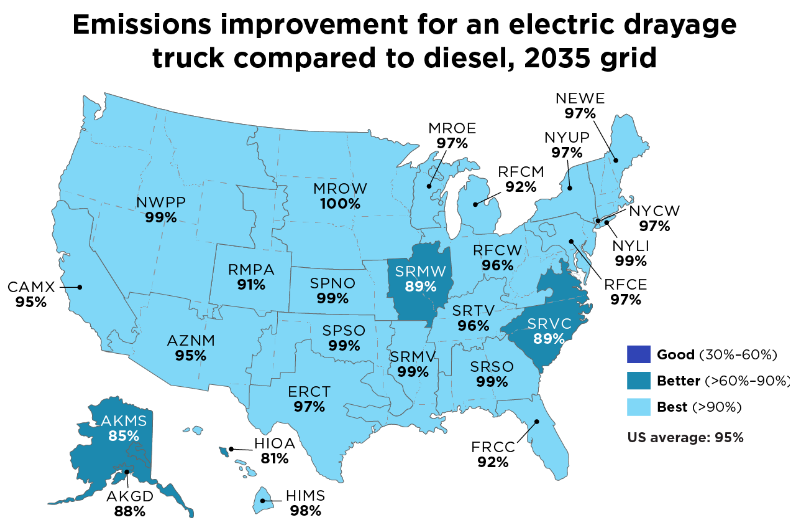
[101] Argonne National Laboratory. The Greenhouse Gases, Regulated Emissions, and Energy use in Technologies (GREET) Model. Version 2022 rev 1. (2022). https://greet.es.anl.gov/.

[102] See footnote 7. An electric truck is not inherently a zero emission vehicle (ZEV)–zero-emission solutions must minimize impacts when accounting for upstream and downstream impacts. If the full lifecycle is not considered, we risk trading pollution for more pollution, and the same frontline and fenceline communities are left to suffer.

[103] All current values come from EPA's eGRID 2021 dataset, the most recent available. It is worth noting, however, that this dataset excludes net metered, distributed solar production (i.e. it only reflects utility-delivered electricity).

Figure 4. Greenhouse gas emissions reductions for an electric drayage truck compared to a diesel drayage truck

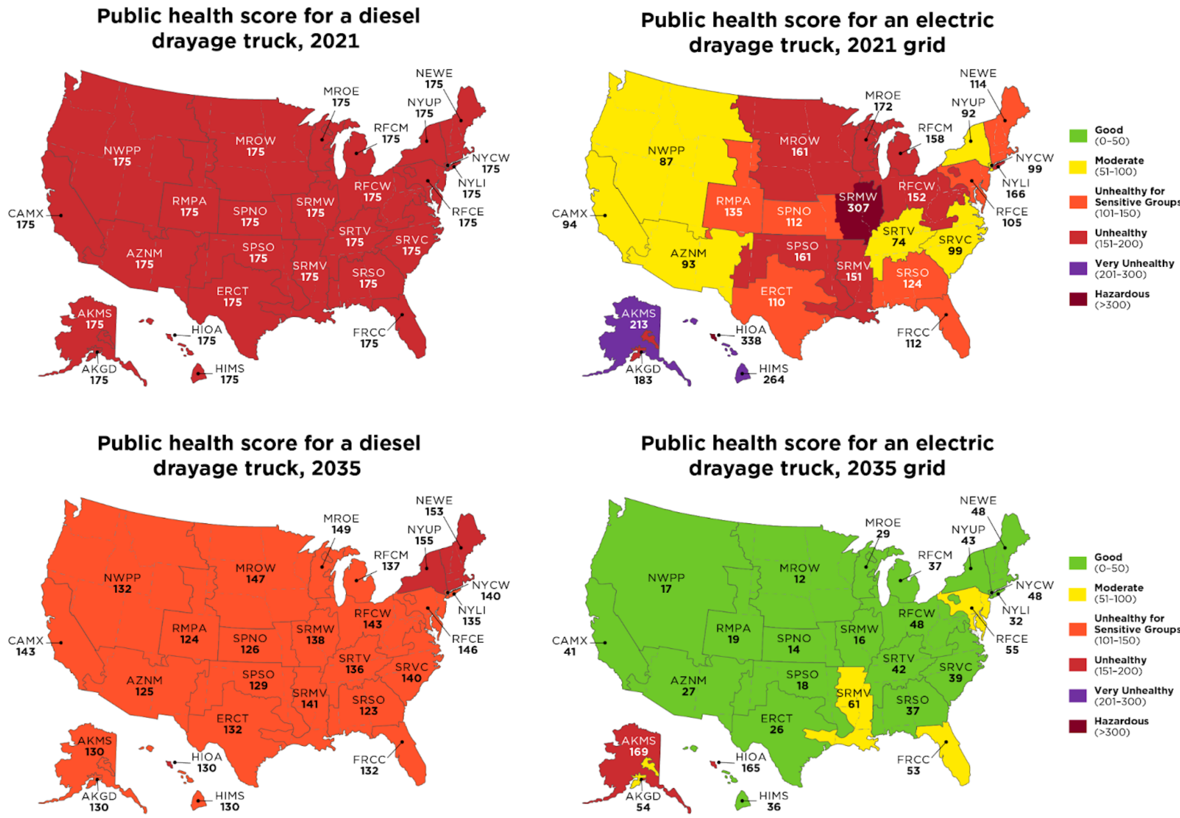




Powered by today's average electric grid, an electric drayage truck would reduce greenhouse gas emissions by 68 percent. By 2035, this would shift to 96 percent reductions if the grid continues getting cleaner, consistent with what is needed to address climate change. Even on today's grid the total greenhouse gas reductions from electric trucks far surpass the benefits presumed by the agency for a diesel truck.

NOTE: While MROW indicates a 100 percent reduction in emissions, this is an artifact of rounding, as there still are some greenhouse gas emissions associated with trucks powered by the 2035 MROW subgrid.

Figure 5. Public health impact for an electric drayage truck compared to a diesel drayage truck



Powered by today's average electric grid, an electric drayage truck would cut public health impacts by 57 percent. By 2035, this would improve to an 84 percent reduction in public health consequences if the grid continues getting cleaner, consistent with what is needed to address climate change. While there are some regional differences, particularly in regions of the country with large shares of coal, oil, and/or diesel power, even in these regions in 2035, electric trucks offer benefits beyond the current emissions requirements for combustion trucks. Even with new diesel tailpipe regulations taking effect, electric trucks offer far greater improvements in public health, on average, in 2035.

By 2035, an electric truck would have public health benefits compared to today's diesel everywhere, even when powered by the average grid. In the country's most remote areas, where petroleum and diesel power is expected to remain a significant share of the grid, electric trucks may continue to have unhealthy public health impacts. However, it is unlikely that such a grid would be used to fuel electric trucks given the high cost of fossil power in this instance, so it is more probable that electric trucks would accelerate the adoption of cleaner energy sources to augment the renewable energy in the Alaskan and Hawaiian grids and/or be preferentially charged on more renewable sources than the average grid in such a future.

Importantly, the difference in time for the two grids is short enough to be within the anticipated lifespan of a given truck—any electric truck sold today is still likely to be on the road in 2035. Unlike a combustion vehicle, which gets dirtier over time due to aging of emissions controls, mal-maintenance, and tampering, electric trucks get cleaner over the vehicle's lifespan as the grid continues to incorporate more renewable sources of electricity.

7.3. Emissions of gaseous-fuel powered trucks

BEVs are not the only non-diesel technology considered by EPA in the proposed rule—hydrogen is identified as a potential alternative fuel, either through vehicles powered by hydrogen internal combustion engines (H_2ICEVs) or through fuel cell electric vehicles (FCEVs). Additionally, combustion vehicles powered by compressed methane (compressed natural gas vehicles, or CNGVs) are an alternative considered in the Agency's Phase 2 and Phase 3 rulemakings.

7.3.1. Assessing the impact of CNGVs

There is no clean or safe natural gas fuel source. Natural gas based options are false solutions, with upstream and downstream pollution impacts for frontline and fenceline communities from production, distribution, etc., and the ensuing infrastructure required for the fuel. To assess the harms from these vehicles, we rely upon data from EPA's heavy-duty in-use test program and required emissions tests. For fuel efficiency, we assume that these vehicles are just as energy-efficient as their diesel-fueled alternatives. This is an optimistic assessment, as EPA notes that CNGVs can be expected to be 5-15 percent less efficient (81 FR 73925), but differences in required emissions control to meet newly finalized federal standards could reduce this efficiency gap in the future.

To assess the impacts of NGVs, we utilize the default values in GREET to assess the upstream emissions associated with the production and distribution of methane. EPA's HDIUT shows that CNGVs today emit lower levels of NO_X but significantly higher levels of VOCs than modern diesel trucks. There are also modest increases in $PM_{2.5}$ emissions since CNGVs can meet current particulate matter standards without the need for particulate filters found on modern diesel vehicles. We anticipate little improvement to current CNGVs to meet future NO_X standards; therefore, we assumed that emissions would be the lesser of current values or the future in-use requirements for NO_X, $PM_{2.5}$, and VOC.

We also used data from the HDIUT program to correct for the direct emissions of greenhouse gases—while EPA intended for CNGVs to reduce excess methane emissions beginning with the Phase 1 program, manufacturers have instead been taking advantage of the credit program to offset these additional methane reductions with CO_2 credits (81 FR 73925). We assume this trend will continue and use hydrocarbon speciation data to assign a relationship between direct VOC and CH_4 emissions,[104] converting CH_4 into CO_2-equivalent greenhouse gas emissions consistent with the global warming potentials used in GREET.

7.3.2. Assessing the impact of hydrogen-powered vehicles

While there are no direct tailpipe emissions from FCEVs, H_2ICEVs emit both NO_X and $PM_{2.5}$ directly. The available data indicate that such engines will need emissions controls (at the very least, exhaust gas recirculation[105]) to achieve the required level of emissions for combustion engines finalized last year, just as their diesel counterparts. Thus we assume, as in the case for future diesel vehicles, that direct emissions will exactly achieve the real-world requirements of those standards.

There are additional impacts from hydrogen throughout its life cycle–from creation, storage, transportation, and waste–and those impacts remain uncertain. The infrastructure for developing this fuel is likely to put already overburdened communities at risk based on the historical precedent of other fueling infrastructure. To assess the impacts of hydrogen-fueled trucks, we utilize the default values in GREET, as above, to assess the upstream emissions associated with the production and distribution of hydrogen.

In order to assess the potential harms or benefits of hydrogen-powered trucks, we consider two different possible sources for hydrogen representing the predominant source of hydrogen today, produced from cracked methane gas and a more sustainable form of hydrogen, produced from electrolysis and powered by solar energy. For both of these cases, we have assumed the hydrogen is produced in central plants, which is the dominant method of producing hydrogen today. This hydrogen must then also be compressed and transported for sale.

For efficiency, we assume that H_2ICEVs will achieve the same level of energy efficiency as a Phase 2 diesel truck—while this may be optimistic since the thermal efficiency of an Otto-cycle engine is significantly less than a compressed-ignition engine, the limited data on H_2ICEVs does seem to indicate this as reasonable.[106] For the efficiency of the fuel cell, we use the vehicle-level efficiency of the BEV (i.e., excluding charger-related losses) and assume a fuel cell efficiency of 60 percent based on data from light-duty FCEVs.[107]

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[104] Section 3.6 in EPA. Speciation of total organic gas and particulate matter emissions from onroad vehicles in MOVES3. EPA-420-R-22-017. (2022). https://www.epa.gov/system/files/documents/2022-07/420r22017.pdf.

[105] Section 7.1.1 in North American Council for Freight Efficiency (NACFE). Hydrogen trucks: Long haul's future? (2023). https://nacfe.org/research/electric-trucks/hydrogen/.

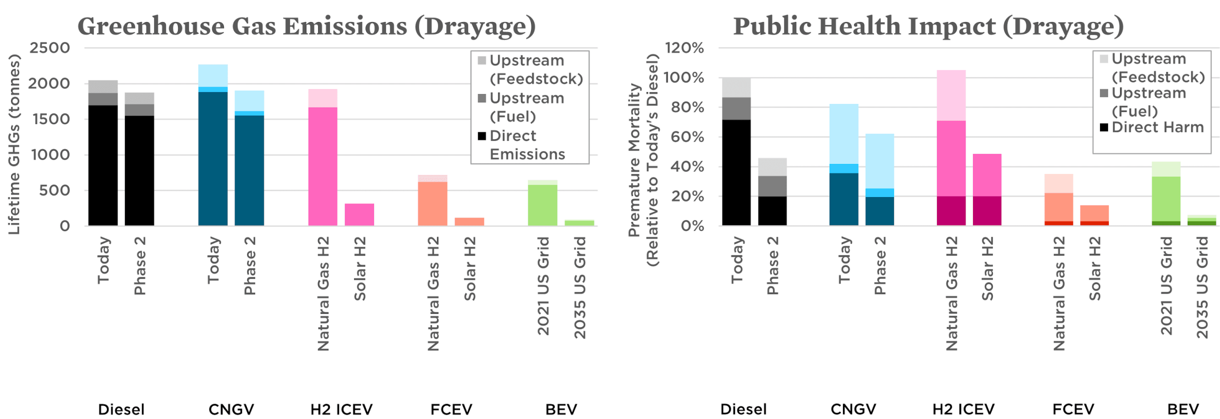
[106] Section 7.1.1 in NACFE. (2023).

[107] Kurts, J. *et al*. Fuel cell electric vehicle durability and fuel cell performance. Technical report NREL/TP-5400-73011. (2019). https://www.nrel.gov/docs/fy19osti/73011.pdf.

7.3.3. Summary of impacts

Greenhouse gas emissions and public health impacts for drayage trucks are summarized in Figure 6. These data make clear that not only does the production method of hydrogen matter, but the type of vehicle in which it is deployed is critical in determining the harms of that fuel. Most importantly, if H_2ICEVs are fueled on hydrogen from natural gas, they would provide virtually no benefit to the climate over a Phase 2-compliant diesel vehicle, and the public health impacts from such a vehicle could actually be worse. Consistent with EPA's approach in Phase 2, CNGVs are found to be roughly comparable to diesel trucks in terms of greenhouse gas emissions.

Figure 6. Comparison of drayage trucks powered by different fuels



Using fossil fuels to generate electricity or hydrogen diminishes the benefits of alternative fuel vehicles to both climate and public health. However, regardless of fuel, the inefficiency of combusting hydrogen combined with the harm from fossil fuel extraction and fuel distribution make hydrogen combustion engine vehicles (H_2ICEVs) just as harmful as their diesel and methane-powered counterparts.

When it comes to the greenhouse gas emissions from hydrogen-powered trucks, today's dominant form of hydrogen is virtually indistinguishable from diesel: the only climate benefit from FCEVs comes as the result of the substantial improvement in efficiency resulting from an electric powertrain, and for H_2ICEVs there is almost no climate benefit whatsoever over Phase 2. Regarding public health, the adverse impacts of fossil fuel extraction are notable—for H_2ICEVs powered by hydrogen generated from methane, the public health outcomes are actually worse than diesel. Even if hydrogen for these vehicles were made from electrolysis powered by solar energy, the processing steps involved in compressing and distributing the fuel would still yield significant harm such that for an H_2ICEV the direct impacts would be just as harmful as a future diesel truck. The lack of tailpipe emissions and more efficient use of hydrogen mitigate some of these factors in an FCEV, which shows an emissions profile more comparable to a BEV. However, even in an FCEV there is a more than a two-fold increase in harm if the hydrogen is generated from methane as opposed to solar-powered electrolysis.

It is clear from this analysis that H_2ICEVs are no better than diesel trucks when it comes to public health and has no climate benefits over Phase 2 vehicles when fueled by the dominant source of hydrogen today. Their treatment under the Phase 3 program should be comparable to other combustion vehicles rather than vehicles that lack tailpipe emissions (see Section 6.4).

8. Even Using EPA's Flawed Impact Assumptions, MFN's 100% by 2035 Recommendation Would Deliver Over Three Times the GHG Emission Reductions, Greater Public Health Benefits and Economic Benefits Compared to EPA's Main Proposal

Environmental Resources Management, Inc (ERM), one of the largest sustainability consultancies globally, was commissioned by NRDC as part of the Moving Forward Network to provide independent, third-party analysis of the Agency's proposed Phase 3 HDV standards and alternative proposals, as well as the MFN recommended alternative proposal. The methodology, assumptions, and results are described throughout this section.

8.1. EPA's Proposal Does Not Actually Project ZEVs

This analysis uses EPA's assumptions about the grid, which does not reflect the grid being cleaned up to the degree necessary for truly zero-emissions technologies to be used for compliance. Accordingly, no ZEVs as defined by MFN are actually deployed under any aspect of the policy scenarios explored in this section. Also, for the purpose of this data, the MFN approach focuses on only the electric truck market share and thus only a portion of our 100% ZEV by 2035 recommendation, neglecting both the focus on EJ deployment and prioritization and the deployment of complementary policies to ensure that electric trucks are truly zero-emission vehicles.

8.2. EPA's "No Action Baseline"

ERM's analysis employed a modeling framework that leveraged EPA's tools to inform and develop inputs to ERM's Benefit-Cost Analysis (BCA) framework. It is important to note that while this analysis is based on EPA's "baseline" scenario, we believe this "baseline" is ultimately not an accurate reflection of a "No Action" scenario and is erroneous and overly conservative. For example, EPA's *"Baseline"* fails to reflect the Advanced Clean Trucks rule and related EV adoption expectations, commitments from industry, key critical and historic public and private investments, and other actions underway that will lead to a higher EV sales share than what EPA's analysis is assuming (see Sections 9.2 and 9.3).

As a result, all the projected benefits from *EPA's Main Proposal* and all projected benefits associated with the various alternative policy scenarios modeled in this section are overinflated and should only be viewed in comparison to each other or viewed in comparison to a more accurate business as usual baseline, which *EPA's Main Proposal* more accurately reflects. Even still, as noted above, the benefits associated with each policy scenario will be overinflated since the rule structure doesn't account for upstream emissions, leaving room in each policy scenario for technologies that are not truly clean (like hydrogen combustion technology).

8.3. Methodology

ERM adopted EPA's methodology to keep the approach to this analysis and resultant comparisons consistent with EPA's approach in the proposed rule and to allow for an apples-to-apples comparison. MFN believes that EPA's analytical approach is inherently incorrect and flawed, especially since it involves overly conservative assumptions and does not reflect the grid being cleaned up to the degree necessary for truly zero-emissions technologies to be used for compliance, among other concerns. In other words, this fleetwide analysis should be considered independently of the technology-focused analysis of Section 7, as it was completed with different assumptions and for a different purpose.

EPA's updated MOVES model (MOVES3.R3) was utilized to model EV adoption rates (sales and in-use), vehicle miles traveled (VMT), and pollutant emissions by vehicle type. Although EPA's HD TRUCS tool was not explicitly used to generate EV adoption scenarios, cost assumptions (battery costs, incremental vehicle costs, EVSE costs, etc.) and vehicle classification/identification information and sales shares were incorporated into both ERM's BCA framework and its modification and application of MOVES3.R3 data outputs. ERM's BCA framework was applied to compare and evaluate the impacts across several scenarios, including:

- **EPA's Baseline**: EPA's "no action" scenario that, as explained above, MFN believes is erroneous and overly conservative. This involves EV adoption rates defined in MOVES3.R3 associated with EPA's No Action scenario, as provided by EPA.
- **EPA's Main Proposal (EPA's Preferred Scenario)**: EPA's preferred scenario that MFN believes is a more accurate reflection of a "no action" baseline. This includes EV adoption rates developed in HD TRUCS and MOVES3.R3 outputs associated with EPA's Proposal scenario, as provided by EPA.
- **Industry Commitments (Alternative Proposal)**: Represents an alternative set of assumptions to incorporate stated OEM goals of 50-67% EV sales share by 2030. This scenario assumed 50% EV sales share by 2030 for combination trucks and 55% EV sales for all other HDVs by 2030, with all HDV sales increasing to 90% EV sales share by 2040 (to align with longer-term carbon-neutral and/or net zero targets of manufacturers).
- **MFN Recommendation (100% by 2035)**: Consistent with MFN's recommended scenario of achieving 100% ZEV sales share by 2035.[108] Vehicle-specific adoption rates

[108] As noted elsewhere, because the grid is not being cleaned up, this is not identical to MFN's recommendation but merely the most consistent given constraints related to a comparison to EPA's modeling.

are informed by an HDV EV adoption scenario recommended by the International Council on Clean Transportation (ICCT).

ERM utilized EPA's CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool to assess the public health benefits of the scenarios versus what EPA views as the baseline if no action occurs.

ERM's BCA model looks at five interconnected analyses:

- **Fuel Use and Emissions**: Specifically, it looks at changes in fuel consumption (for diesel, gasoline, and electricity) and the tailpipe and upstream emissions associated with each fuel change for GHGs (CO_2, CH_4, N_2O) and criteria pollutants (NOx and PM) for the various policy scenarios. Reductions in emissions are then monetized using EPA's COBRA model and IPCC's Social Cost of GHGs. Because EPA's analysis, which this is meant to mirror, does not reflect any policies to clean up the grid nor a future grid consistent with the administration's climate goals, this likely understates disparities between scenarios with differing electric truck deployment.

- **Health Impacts**: This analysis takes reductions in NOx and PM under the various policy scenarios to understand the resulting public health implications associated with reducing these emissions and calculates changes in premature deaths, hospital visits, and lost workdays. The analysis also monetizes these net health benefits. As above, these impacts are inherently understated in an effort to mirror EPA's work.

- **Economic Analysis**: This analysis looks at changes in vehicle purchasing behaviors and costs, fuel costs, and maintenance practices and how that could change from a more electrified fleet. This analysis also examines capital expenditures for charging infrastructure investments (i.e., purchase, installation, and maintenance).

- **Utility Impacts Analysis**: This analysis looks at impacts on utilities and their customers, including an analysis of electricity used to charge vehicles and the incremental load to the grid. The analysis also calculates utility net revenue (revenue minus costs) and potential reduction in electric bills for all utility customers that results from this net revenue. The gap analysis shows the infrastructure needs and associated costs under the different policy scenarios.

8.4. Over-Inclusion of Medium-Duty EVs in EPA's Benefit Cost Analysis

MFN believes that Class 2b-3 vehicles (a majority of which are regulated under the agency's light- and medium-duty rulemaking)[109] are overrepresented in EPA's HD TRUCS model. The benefits attributed to such EV adoption levels are, therefore, likely overstated in the agency's preferred proposal. ERM's benefit-cost analyses accounted for this by adjusting Class 2b-3 vehicle populations, as they are interpreted to be covered by the scope of EPA's heavy-duty rulemaking.

As noted in more detail in Figure 7, Class 2b-3 vocational vehicles included in the heavy-duty Phase 3 standards correspond only with "incomplete" Class 2b-3 HD vehicles that are relevant to HD vocational vehicle standards. These "incomplete vehicles" represent approximately 5 percent[110] of all Class 2b-3 vehicle sales. The remaining ~95 percent of Class 2b-3 vehicles are covered by EPA's Light- and Medium-Duty Vehicle rules. Consequently, ERM isolated relevant Class 2b-3 vehicles within MOVES3.R3 for all subsequent EV adoption analyses, sales and in-use calculations, and VMT and emissions assessments.[111]

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[109] U.S. EPA. Proposed Rule: Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles. (2023). https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-multi-pollutant-emissions-standards-model

[110] Table 3-1 of Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles Draft Regulatory Impact Analysis. (2023). https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-multi-pollutant-emissions-standards-model

[111] MOVES3.R3 class 2b-3 vehicles covered by HD vocational standards calculated using assumption that 4.6% of total annual class 2b-3 vehicle sales (MOVES regulatory class 41) are of MOVES source categories 52 (single unit short-haul truck) and 53 (single unit long-haul truck); annual in-use vehicle populations estimated using MOVES source/regulatory class-specific survival rates.

Figure 7: National Heavy-Duty Vehicle Fleet: 2026 Forecast

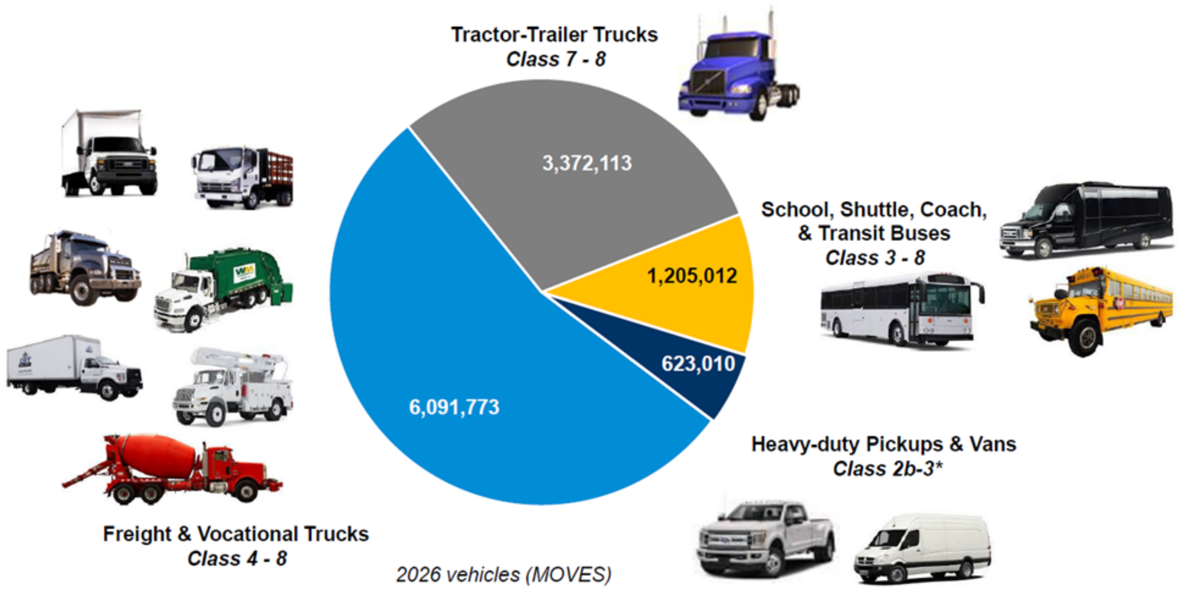
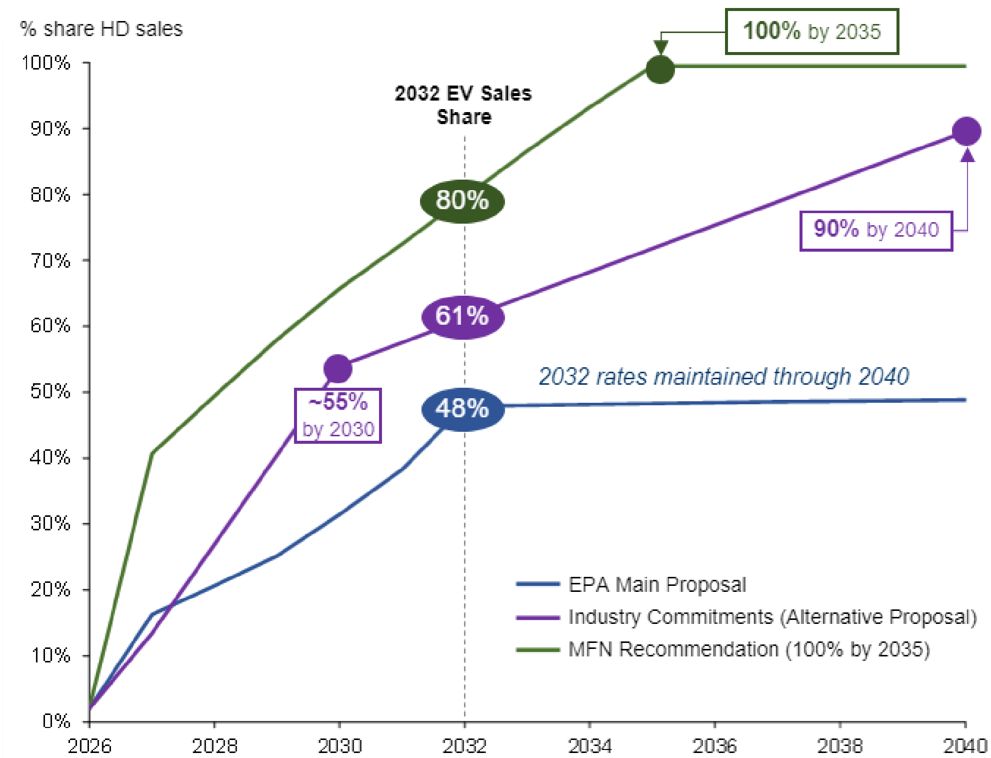


Figure 7 represents only "incomplete" class 2b-3 HDVs applicable to EPA vocational standards.

8.5. ERM Sales Share, In-Use Fleet Share, and In-Use Fleet Population

The EV adoption sale shares assumed over time for the various scenarios are shown below in Figure 8 and 9; the corresponding *in-use* fleet EV share and populations are also shown in Figure 10 and 11 respectively.

Figure 8: Comparison of EV Adoption Rate Scenarios[112]



112 Note that motor home sales were not included in EV count or share calculations (Figures 8, 9, 10, and 11).

Figure 9: Comparison of EV Adoption Rate Scenarios (by Technology Type)

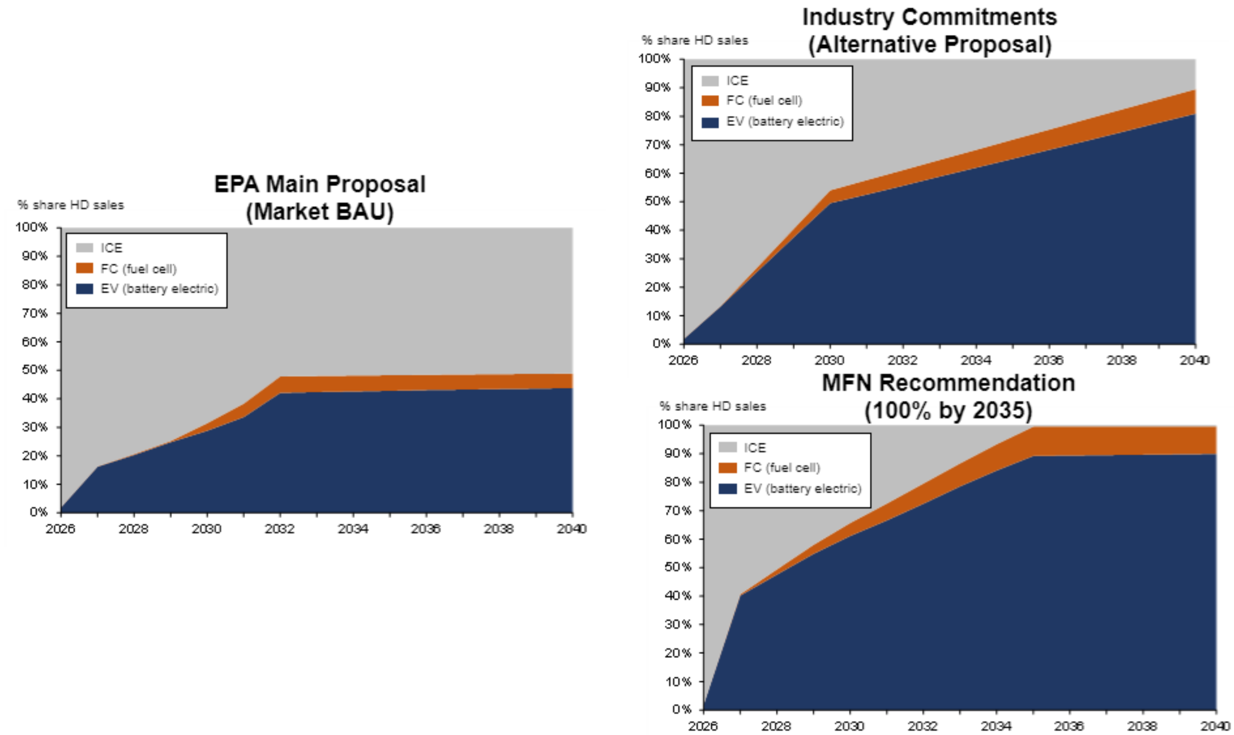


Figure 9 depicts the distribution of different vehicle types that make up the unused vehicles in the new data sets. This figure shows that the EV sales share will be 80 percent in 2032 to ensure that we are on a path to 100 percent zero emissions from all new heavy-duty trucks by 2035. The EV penetration projections in *EPA's Main Proposal (Market BAU)* (the Agency's preferred approach) are projected to only reach 48 percent[113] by 2032, leaving necessary emissions benefits on the table compared to the MFN recommended approach. This is worsened by the fact that all of these projections are overstated since there is no certainty that electric trucks will be used as a form of compliance. Additionally, even if EPA finalized the *Industry Commitments Alternative Proposal* version of the rule, there would still be a delay in life-saving reductions, but less of a delay (5 years) compared to the delay that would be experienced through *EPA's Main Proposal (Market BAU)* when compared to the MFN recommended approach. This, too, is unacceptable, and EPA should work to finalize a version of the rule that sets us on a path to achieving 100 percent zero emissions by 2035.

[113] 42 percent if motorhomes included in calculation.

Figure 10: EV Share of In-Use Fleet, by Scenario[114]

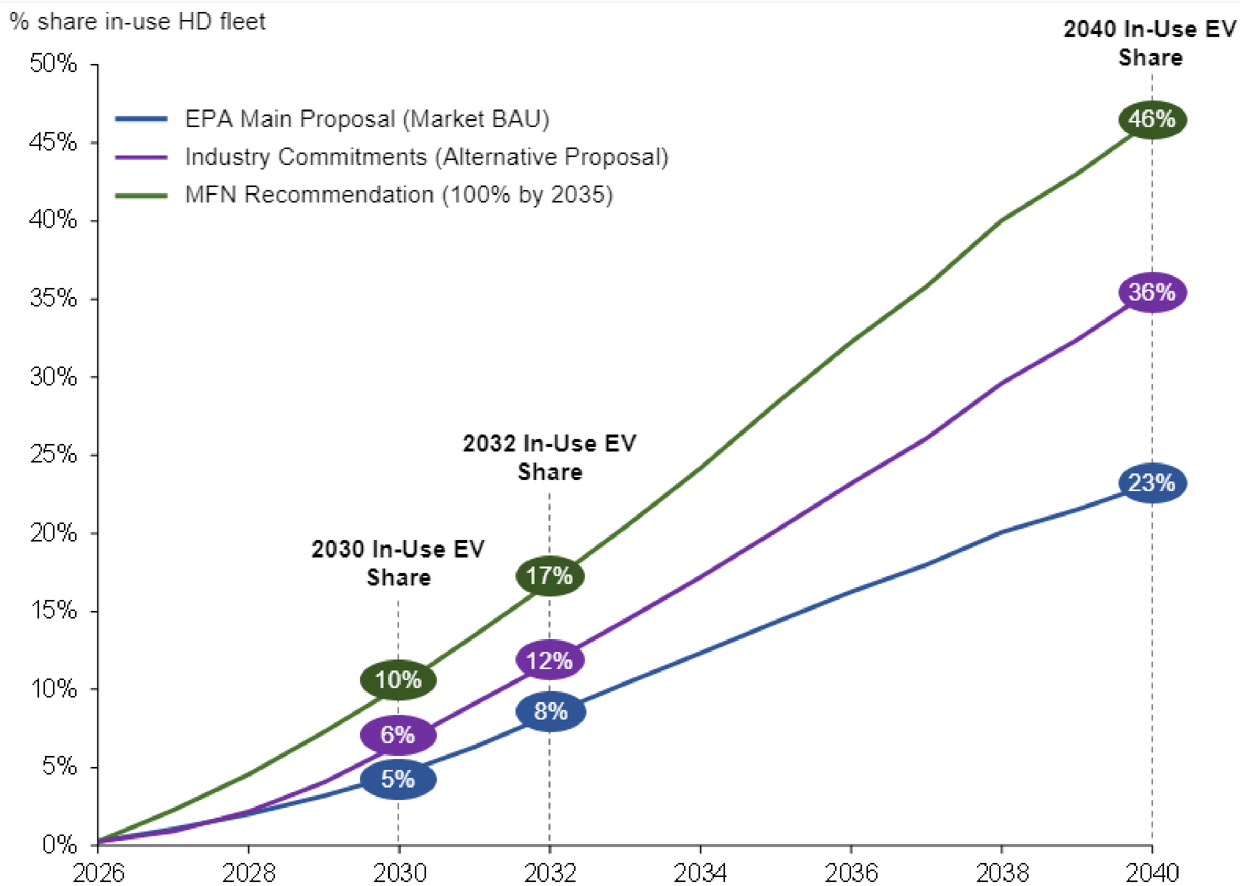
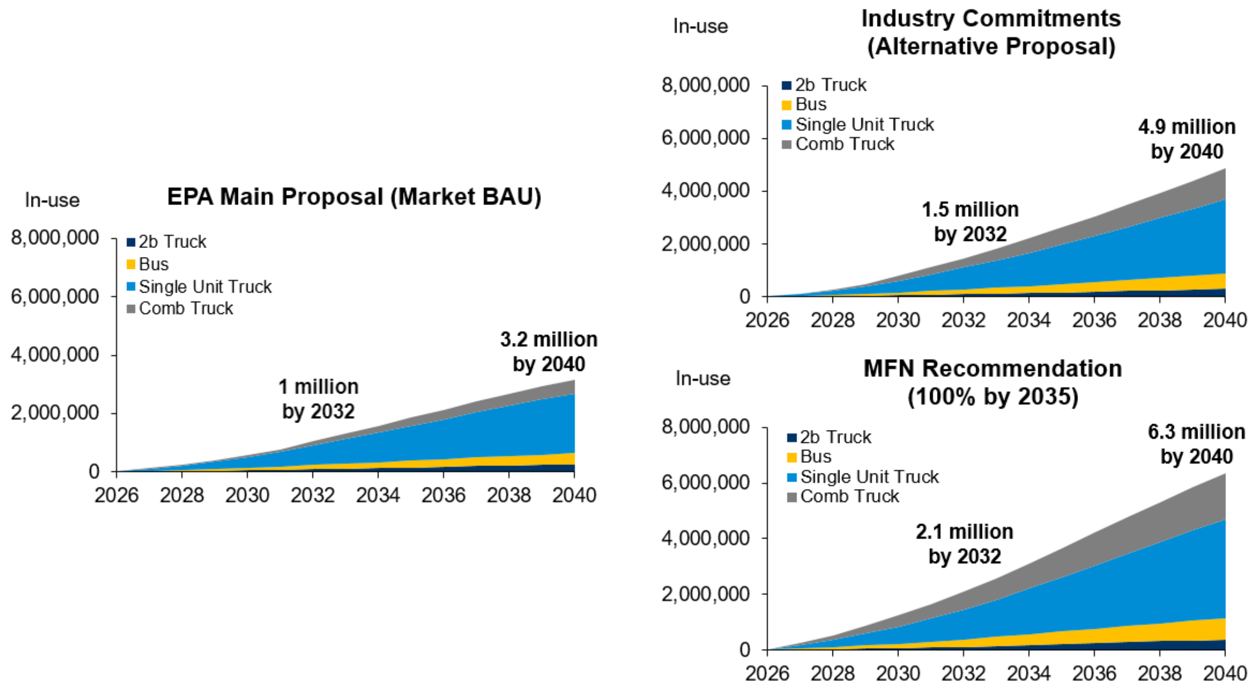


Figure 10 shows how the in-use fleet is impacted by the different EV adoption scenarios. Compared with EPA's erroneous no action baseline, *EPA's Main Proposal (Market BAU)* results in a 6-percentage point increase in EV sales by 2032, while the *Industry Commitments Alternative Proposal* sees greater penetration of EVs and reaches 12 percent by 2032. These scenarios are compared to the levels achieved if EPA were to take a stronger and more impactful approach and finalize a rule that reflects the MFN recommended approach for 100 percent new vehicles sales being zero emissions by 2035, which results in 17 percent EV in-use share by 2032 and 46 percent in-use vehicles by 2040, twice as much as projected under *EPA's Main Proposal (Market BAU)*.

[114] Note that motorhome sales were not included in ZEV share calculations.

Figure 11: In-Use EVs by Vehicle Type



The graphs in Figure 11 provide the actual number of EVs in use broken down by vehicle type, rather than just the percentage of the in-use EV fleet (as shown in Figure 10).

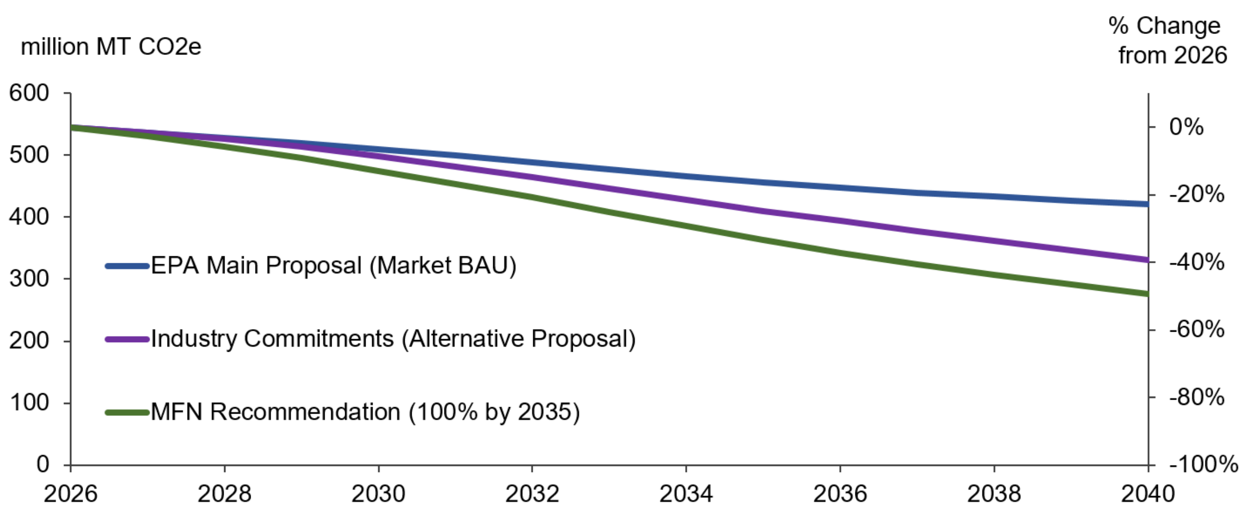
2.1 million EVs are expected to be on the road by 2032 under MFN's recommended approach (which gets the nation to 100 percent of new heavy-duty vehicles sold being zero emissions by 2035). This is approximately 640,000 more EVs than would be possible under the *Industry Commitments Alternative Proposal* and over 1.05 million more EVs than is projected to occur under *EPA's Main Proposal (Market BAU)* within the same timeframe.

8.6. Emissions and Public Health Impacts

The ERM modeling results on GHG tailpipe and upstream emissions, shown below in Figure 12, show the emissions reductions possible from achieving 100 percent of new HDV sales being EVs by 2035 from 2026-2040, consistent with MFN's recommended, as well as the cumulative reductions from the other policy scenarios and the monetized value of these reductions. These benefits are compared to the EPA baseline and do not reflect actual net benefits, since EPA's baseline is not actually reflective of what market conditions are expected to be in a no action scenario.

A final rule aligned with MFN's recommendation would be expected to achieve over a 50 percent reduction in emissions of CO_2 by 2040 compared to 2026 and result in nearly $115 billion in climate benefits by 2040 – approximately $81 billion more than would be possible from *EPA's Main Proposal (Market BAU)* during the same timeframe. In comparison, *EPA's Main Proposal (Market BAU)* would only result in approximately a 20 percent reduction in emissions of CO_2 by 2040 compared to 2026. Additionally, the *Industry Commitments Alternative Proposal*, while not as strong as the targets called for by MFN, would certainly be more impactful than *EPA's Main Proposal (Market BAU)* and would be expected to achieve just under a 40 percent reduction in emissions in 2040 compared to 2026 and over $53 billion more in climate benefits than EPA expects from its preferred approach. Accordingly, EPA's failure to finalize a rule that aligns with our recommended approach would be unnecessarily leaving significant climate benefits on the table. Again, all of these projections are overstated since EPA uses an erroneously conservative baseline and since EPA has failed to do a comprehensive analysis on how this regulation would impact frontline and fence-line communities. Accordingly, even under the strongest action taken of the proposed options, EPA has failed to predict what benefits could occur for these impacted communities.

Figure 12: Comparison of Possible Climate Benefits[115]



[115] Note: The grid mix was modeled using the light-duty and medium-duty draft regulatory impact analysis (DRIA), since the DRIA for this Phase 3 rule did not include the identified grid factors. This analysis assumes that EPA is using consistent heavy-duty analyses (since the agency did not provide the heavy-duty IMP modeling data). Again, this ERM analysis makes use of the very conservative EPA numbers, assumptions, and baseline, which differs from other analyses explored in this comment letter (in particular the analysis on the relative benefits of different truck technologies) and do not actually reflect fully MFN's recommendations.

Table 2: Possible Cumulative Reduction and Monetized Value (per Policy Scenario)

Policy Scenario	Cumulative Reduction (million MT CO2e)		Monetized Value (2021$ bill)	
	2026 - 2032	2026 - 2040	2026 - 2032	2026 - 2040
EPA Main Proposal (Market BAU)	56.4	433.7	$4.0	$34.0
Industry Commitments	117.8	967.0	$16.7	$87.0
MFN (100% by 2035)	237.8	1,484.4	$16.8	$114.8

COMPARED TO EPA's BASELINE

8.7. Comparison of Criteria Emissions and Possible Health Benefits

As touched on earlier in this section, ERM adopted EPA's methodology to keep the approach to this analysis consistent with EPA's approach and allow for an apples-to-apples comparison. MFN believes that this approach is inherently incorrect and flawed and does not reflect the grid being cleaned up to the degree necessary for truly ZEV technologies to be used for compliance, among other concerns. In particular, ERM utilized EPA's COBRA model to estimate the public health benefits associated with all the scenarios. ERM's analysis shows that with stricter standards and increased deployment of battery electric trucks, there are greater gains in terms of consumer savings and avoided public health impacts (such as premature death, hospital admissions and emergency room visits, respiratory symptoms, and reduced activity and lost workdays). The scenario aligned with MFN's recommendations achieves the most reductions, followed by the

8.8. Industry Commitments Alternative Proposal

ERM's analysis incorporates EPA's assumed changes in tailpipe emission reductions, EPA's upstream assumptions that rely upon the Integrated Planning Model (IPM) for electricity generated units, and ERM assumptions on changes from reduced demand on refining of finished products for diesel (and gasoline) based on the use of Argonne National Laboratory's Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model.

Table 3 shows the various scenario criteria emissions (NOx and PM) aggregated from 2026-2040 for each of the policy scenarios, possible reduced health incidences, and the monetized value of these reductions (if realized) compared to EPA's erroneous "no action" baseline. To assess more realistic net benefits of these proposals, they would be compared to a scenario closely reflecting *EPA's Main Proposal (Market BAU).*

If electric trucks were deployed according to the market levels consistent with EPA's HD TRUCS model, *EPA's Main Proposal (Market BAU)* could result in about a 64 percent NOx reduction and a 60 percent reduction in PM relative to the agency's erroneous baseline. The possible reductions associated with the *Industry Commitment Alternative Proposal* scenario could be just under an 80 percent NOx reduction and a 58 percent reduction in $PM_{2.5}$, while wholly electrifying new vehicle sales by 2035, consistent with MFN's recommendations, would result in the highest reductions achieved of the policy scenarios offered for comment, especially if EPA combined that policy approach with policies to provide certainty that only truly clean, EVs were used for compliance (not modeled). EPA must not hesitate to finalize MFN's recommended approach for the rule if the agency and the Biden Administration truly wants to live up to its commitment to provide relief to frontline and fence-line communities.

Table 3: Comparison of Possible Health Benefits

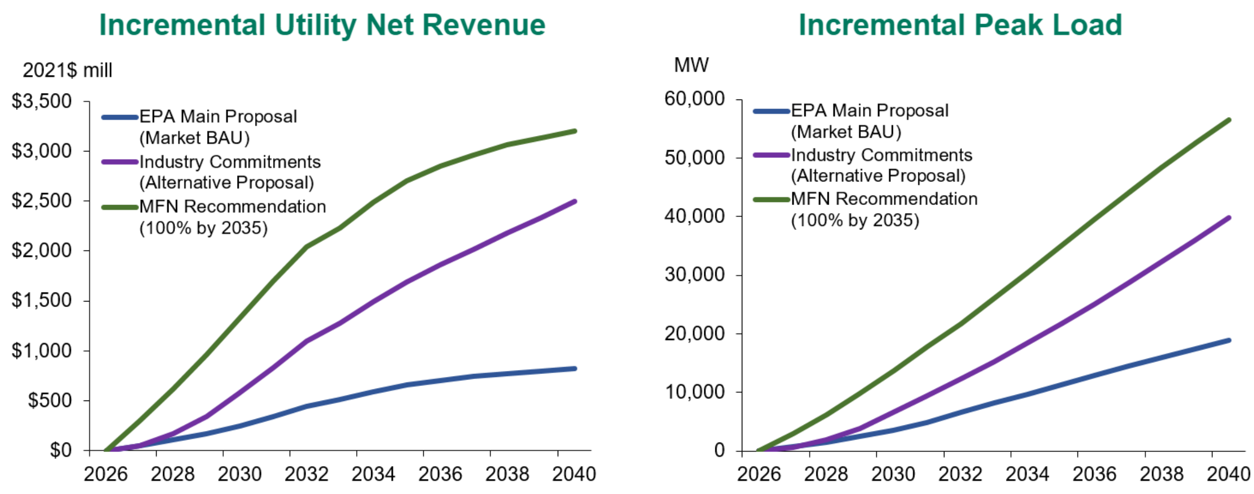
Policy Scenario	2026 - 2040 Cumulative Reduction (MT)		Cumulative Reduced Incidents			2026 – 2040 Monetized Value (2021$ bill)
	NOx	PM	Mortality	Hospital	Minor	
EPA Main Proposal (Market BAU)	519,921	2,286	1,616	1,516	957,137	$18.9
Industry Commitments	1,111,388	4,796	3,445	3,131	2,041,008	$41.2
MFN (100% by 2035)	1,846,244	5,842	5,328	4,998	3,154,463	$63.8
	COMPARED TO EPA's BASELINE					

8.9. Comparison of Utility Impacts

ERM's results also point to the potential for utilities to receive net revenue from the electrification of heavy-duty trucks (see Figure 12). Specifically, this analysis looks at all of the costs associated with providing and distributing electricity, as well as any revenue based on the identified utility rate from HD TRUCS (which is approximately 10.5 cents per kilowatt hour). The portion of the figure focused on peak load is based on peak energy charging demand for each of the vehicles summed up for each of the policy scenarios.

As required by public utility commissions, additional revenues in excess of authorized revenue requirements generally must be returned to all utility customers, so this would help put downward pressure on rates. Accordingly, electrifying heavy-duty trucks could lead to up to $2.2 billion in net utility revenue under the MFN recommended approach and a slight reduction in the electricity bills of the average U.S. household, below what the bills would otherwise be without truck electrification, by up to $12 per year and up to $86 per year for the average commercial customer.

Figure 13: Incremental Utility Net Revenue and Peak Load from M/HDV ZEV Charging

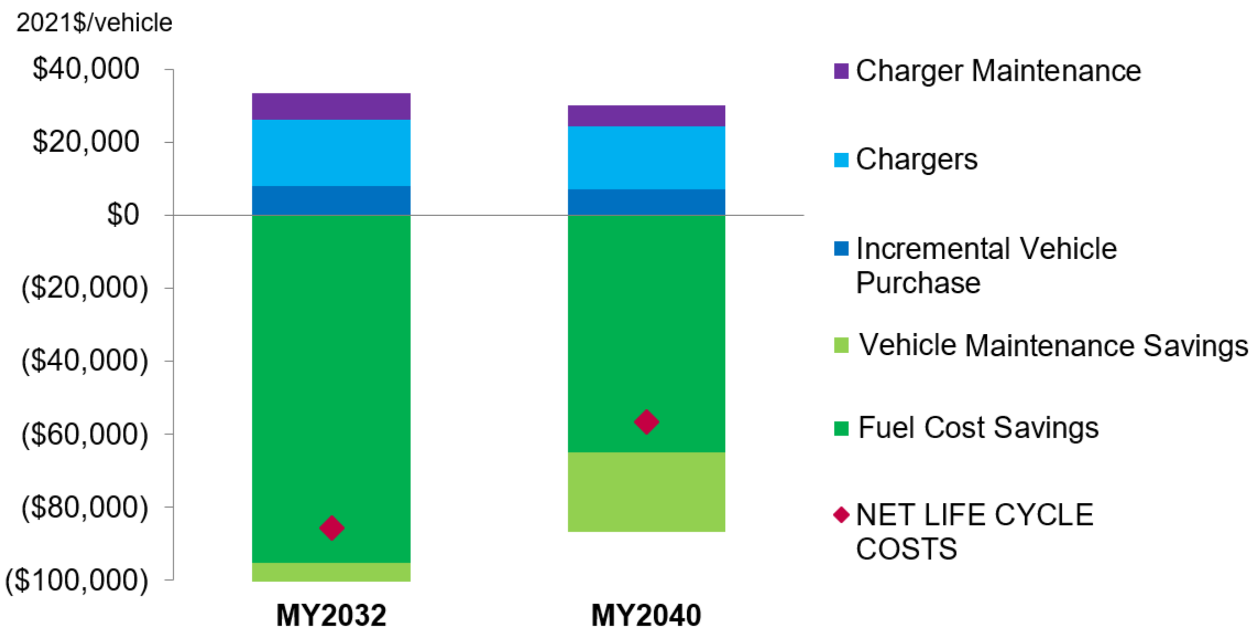


8.10. Comparison of Incremental Fleet Costs and Savings

The analysis depicted in Figure 14 incorporates several different cost categories (including purchasing chargers, charger maintenance, incremental purchase price between ICE and BEVs, vehicle maintenance savings associated with EVs, and the difference in fuel costs between purchasing gasoline and diesel fuel versus electricity).

We note that numerous manufacturers have raised concerns about the costs associated with shifting to zero-emission trucks, however, the ERM analysis overall shows that the average ZEV reaches life-cycle cost parity with diesel and gasoline vehicles before model year 2027. Additionally, from a cost and savings perspective for fleets, purchasing an average MY2032 EV would save its owner nearly $86,000 over the life of the vehicle. The results are shown in Figure 14.

Figure 14: Possible net lifecycle costs of a battery electric truck (EV) versus the comparable diesel or gasoline alternative



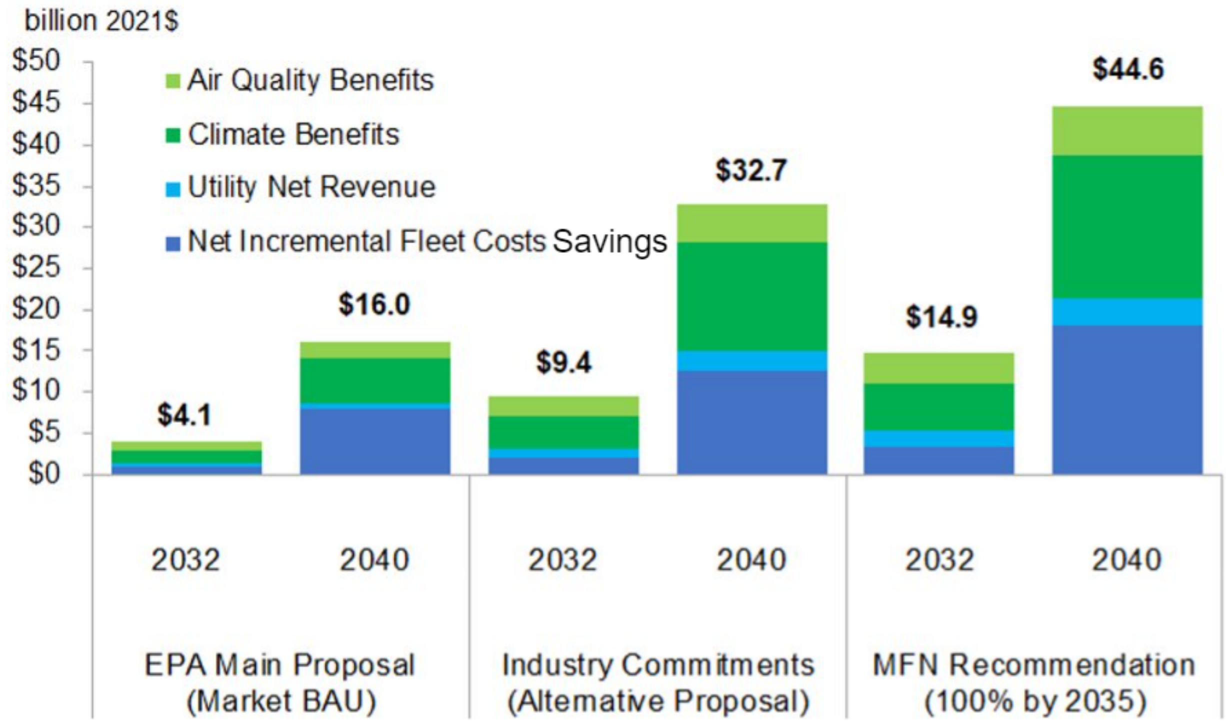
8.11. Comparison of Overall Societal Benefits

Due to EPA's failure to ensure that truly clean, zero emissions trucks will be used by manufacturers for compliance, the market share projected for EPA's rule is likely overstated. The only way EPA can truly prove that the rule will be beneficial to frontline and fence-line communities (as well as society at large) would be to have structured the rule to account for upstream emissions and to provide certainty that projected levels of ZEVs will actually occur as a part of industry compliance.

The results from ERM's analysis (depicted in Figure 15) show that on a net societal basis – inclusive of the benefits and costs to fleets, air quality benefits, climate benefits, net utility revenues that would be returned back to all utility customers in the form of lower bills – the MFN recommended alternative would achieve two-and-a-half times the benefits of EPA's *Main Proposal (Market BAU)* by 2040. The *Industry Commitments Alternative Proposal* would achieve nearly twice as many benefits as *EPA's Main Proposal (Market BAU)* in 2040.

Over the entire period of the analysis (2026 - 2040), the cumulative net societal benefits discounted at a 3% rate could achieve $225 billion under MFN's recommended approach compared to $166 billion with the *Industry Commitments Alternative Proposal*, and only $87 billion with *EPA's Main Proposal* if compliance was done through EVs.

Figure 15: Possible Annual Net Societal Benefits for Various Scenarios



9. EPA's Weak Proposal is Built On Flawed Assumptions Around Feasibility

The discussion above demonstrates that EPA's preferred alternative is not a rational choice based on the need for emission reductions to address identified impacts. Stronger standards are necessary to meet emission reduction goals and would be cost-beneficial. The following sections demonstrate that EPA's weak preferred alternative also cannot be justified based on claims that these necessary more protective standards are not feasible.

9.1. *EPA's Analysis Fails to Account for Feasible Improvements in Combustion Technologies*

EPA notes that "in developing the Phase 2 CO_2 emission standards, we developed technology packages that were premised on technology adoption rates of less than 100 percent. There may be an opportunity for further improvements and increased adoption through MY 2032 for many of these technologies included in the HD GHG Phase 2 technology package used to set the existing MY 2027 standards." 88 Fed. Reg. at 25960. Yet despite identifying technologies for internal combustion engine powered trucks that could exceed the Phase 2 standards, it did not base its Phase 3 standards on any such additional deployment.

Below we walk through a number of the technologies that the EPA should assume will be deployed by truck manufacturers in the timeframe of the Phase 3 proposal.

9.1.1. Compression-ignition engine technologies (diesel)

EPA appropriately identifies manufacturers' plans to deploy new engines in order to meet the 2027 NO_X standards finalized last year. 88 Fed. Reg. at 25958. However, in its analysis, the Agency inappropriately freezes the progress of diesel engines at the bare minimum requirements on the books today, with no improvement required beyond the 2027 Phase 2 diesel engine standards and no assumed improvement in any truck technology beyond 2027 Phase 2 ICE vehicle requirements. This is inconsistent with both the literature and the Agency's own analysis of what is possible in the 2027-2032 time period.

In its Phase 2 regulation, EPA identified multiple pathways and approaches to achieving the Phase 2 diesel engine regulations (Phase 2 FRIA 2.7.10 and 2.7.11). In assessing what is achievable, the Agency relied significantly upon manufacturer-submitted data from the SuperTruck research program in partnership with the Department of Energy (Phase 2 FRIA 2.7.5). However, the second phase of the SuperTruck program has far exceeded the level of efficiency deployed in the data EPA relied upon, particularly for engines: the Navistar and Cummins/Peterbilt teams were able to demonstrate 55 percent brake-thermal efficiency (BTE), compared to the 50 percent target for the first phase, while Daimler, Volvo, and PACCAR all demonstrated over 50 percent BTE, with a clear pathway towards the 55 percent target.[116] The PACCAR team's progress is particularly illuminating, as they undertook an additional challenge to meet "ultra low NO_X" targets consistent with EPA's recent regulation as part of their overall efficiency effort, indicating that these levels of thermal efficiency are not incompatible with achieving the 2027 standards.

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[116] Zukouski, R. Navistar. SuperTruck II: Development and demonstration of a fuel-efficient class 8 tractor & trailer. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace103_%20Zukouski_2022_o_4-29_1232pm_ML.pdf; Mielke, D. 2022 Annual Merit Review: Cummins/Peterbilt SuperTruck II. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace102_dickson_2022_o_rev2%20-%20TrailLife-GCCC%20IN0110%20REVISED.pdf; Bashir, M. Daimler: Improving transportation efficiency through integrated vehicle, engine, and powertrain research - SuperTruck 2. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace100_Villeneuve_2022_o_4-30_1116am_ML.pdf; Bond, E. Volvo SuperTruck 2: Pathway to cost-effective commercialized freight efficiency. Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace101_bond_2022_o_5-1_129pm_ML.pdf; Meijer, M. Development and demonstration of advanced engine and vehicle technologies for class 8 heavy-duty vehicle ([PACCAR] SuperTruck II). Presentation, DOE 2022 Annual Merit Review, June 21-23. (2022). https://www1.eere.energy.gov/vehiclesandfuels/downloads/2022_AMR/ace124_Meijer_2022_o_4-29_1056pm_KF.pdf

Eaton partnered with the PACCAR team in the development of its SuperTruck II truck, and they have demonstrated that it is possible to outperform simultaneously the 2027 NO_X standards and the Phase 2 CO_2 standards through a number of different aftertreatment and powertrain combinations.[117] A recent research paper by Eaton demonstrates various combinations of control technologies manufacturers can tune CO_2 and NO_X emissions over different regulatory cycles to develop a technology package that is suitable for compliance, including packages that can achieve CO_2 reductions beyond Phase 2 while meeting EPA's future 2027 standards.[118]

One of the strategies deployed by Eaton is a 48V electric heater, which could be deployed easily with a 48V mild hybrid powertrain, again illustrating the complementary technology packages available to manufacturers. The 48V mild hybrid powertrain can not just power accessories, including those related to emissions control, but it can also help reduce engine-out NO_X. This was also demonstrated through testing by FEV as a strategy particularly relevant to MHDVs, whose engines are required to meet tighter NO_X standards than those of HHDVs.[119]

9.1.2. Spark-ignition technologies (gasoline)

A significant opportunity for increased improvement lies in spark-ignition (SI) engines, for which Phase 2 required no engine improvements beyond the 2016 SI engine standard. The weakness in EPA's Phase 2 targets for SI engines and vehicles is apparent in looking at the compliance credits to-date, particularly for Ford Motor Company, the largest SI engine supplier. Ford has run a credit surplus in every year of the vocational engine program, but this surplus exploded in MY2020 with the release of its latest 7.3L V8 engine, codenamed "Godzilla."[120] Even though the engine platform is relatively low-tech (naturally aspirated, pushrod V8), utilizing variable cam timing and a variable-displacement oil pump, it's a significant improvement in efficiency. The engine was also designed with fuel economy at load in mind for applications like towing. A smaller engine built on the same platform replaced the older base engine in 2023, no doubt increasing Ford's over compliance.

General Motors is not standing still, either—their fifth-generation small-block V8 platform is getting a next-generation update to a 5 percent improvement over the current generation,[121] and

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[117] Dorobantu, M. Eaton considerations on MD/HD GHG Phase 3. Presentation, OIRA-Eaton meeting, March 23. (2023). https://www.reginfo.gov/public/do/eoDownloadDocument?pubId=&eodoc=true&documentID=215442

[118] McCarthy, J., *et al*. Technology levers for meeting 2027 NO_X and CO_2 regulations. SAE Technical Paper 2023-01-0354. (2023). https://doi.org/10.4271/2023-01-0354.

[119] Fnu, D., *et al*. Application of 48V mild-hybrid technology for meeting GHG and low NO_X regulation for MHD vehicles. SAE Technical Paper 2023-01-0484. (2023). https://doi.org/10.4271/2023-01-0484.

[120] EPA. Final Phase 1 EPA Heavy-Duty Vehicle and Engine Greenhouse Gas Emissions Compliance Report (Model Years 2014-2020). (2022). Appendix B: Individual Manufacturer Detailed Credit Summaries. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1016962.PDF?Dockey=P1016962.pdf.

[121] Wren, W. This is why GM is launching a new small block V8. Autoweek (online). (February 3, 2023). https://www.autoweek.com/news/industry-news/a42746723/why-gm-is-launching-a-new-small-block-v8/.

the current generation is already a credit generator for its heavy-duty vehicles under the Phase 2 program.[122] No further details are available about the heir to the current iron-block direct-injection L8T variant found in its heavy-duty offerings, but again this underscores the significant amount of fuel efficiency still available from heavy-duty gasoline engines.

9.1.3. Hydrogen combustion engines

EPA has acknowledged the existence of vehicles powered by hydrogen combustion engines (H_2ICEVs), but the agency has misstated the emissions impacts of these vehicles. As noted earlier, H_2ICEVs emit $PM_{2.5}$, contrary to the Agency's assertion.[123] This is a critical oversight because of the importance of particulate matter with respect to public health. While gaseous H_2 fuel lacks hydrocarbons, there is a significant body of research on hydrogen combustion showing that particulate matter is generated in the combustion process, most likely from the lubricants.[124] In fact, in-cylinder direct injection of hydrogen, which avoids the substantial power losses of pre-cylinder injection and enhances the efficiency of the engine, can lead to even greater $PM_{2.5}$ emissions than a gasoline engine.[125]

Cummins, the largest engine manufacturer in the United States, has announced plans to bring a direct-injection engine to market in the timeframe of EPA's proposed rule.[126] Yet, the Agency has excluded them from its analysis. As the Agency astutely acknowledges, manufacturers have a predilection towards the deployment of H_2ICEVs: they take advantage of assets that are already being utilized for the production of diesel engines. 88 Fed. Reg. at 25960. As a recent ICCT report shows, H_2ICEVs have a total cost of ownership advantage over FCEVs under low hydrogen prices. Given the clear incumbency advantage for the combustion platform vis-à-vis manufacturers' investments, it is likely that, even under a hydrogen price where FCEVs offered a theoretical TCO advantage, manufacturers may neglect to give purchasers such a choice, particularly when there is no regulatory advantage.

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[122] U.S. EPA. Final Rule for Phase 2 Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles. (2022). https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-phase-2-greenhouse-gas-emissions-standards

[123] H2–ICE is a technology that produces zero hydrocarbon (HC), carbon monoxide (CO), and CO2 engine-out emissions. 88 Fed. Reg. at 25960.

[124] Miller, A.L., et al. Role of lubrication oil in particulate emissions from a hydrogen-powered internal combustion engine. Environ. Sci. Technol. V. 41. No. 19. (2007). p. 6828-6835. https://doi.org/10.1021/es070999r.

[125] Thawko, A., and L. Tartakovsky. The mechanism of particle formation in non-premixed hydrogen combustion in a direct-injection internal combustion engine. J. Fuel. V. 327. (2022). p. 125187. https://doi.org/10.1016/j.fuel.2022.125187.

[126] Wolfe, M. Hitting the gas on hydrogen tech for commercial trucks. SAE International. (May 3, 2022). https://www.sae.org/news/2022/05/hydrogen-technology-commercial-trucks.

9.1.4. Non-powertrain technologies

In the Phase 2 regulation, EPA identified numerous improvements to every class of heavy-duty vehicle which could be applied in the timeframe of the rule (through 2029), including non-engine technologies to reduce road load regardless of the propulsion source. Most of these technologies were not exhausted in setting the standards. Given the longer timeframe of this rule (through 2032) and the steady increase from 2021-2029 for which EPA applied these technologies, EPA should naturally have continued to assume a steady increase in such technology adoption over the course of the Phase 3 rule, particularly since they are largely powertrain agnostic and thus affected neither by the 2027 NO_X rule nor a transition to electric trucks.

As EPA identified in Phase 2, many of these are evolutionary technologies that have gradually improved over time: aerodynamics, rolling resistance, weight reduction, accessory load reduction, etc. There are also technologies which have seen a gradual increase in market share that is likely to continue, such as 6x2 axles and neutral idling.

Below, we've summarized a simple extrapolation of EPA's Phase 2 GEM analysis, wherein we assume no changes to the 2027 engine or transmission but have simply extrapolated the continuous evolution of improvements to vehicles from 2021-2029, through 2032, for each regulatory class at the pace EPA adopted in finalizing the Phase 2 regulation, and run these technology deployment scenarios through EPA's GEM Compliance model. As can be seen by Tables 4 and 5, even without the improvements identified above or any wholesale shifts in the market, ICE-powered trucks would be expected to improve by up to 8.4 percent by 2032 just by continuing the same pace of improvement from Phase 2 with already-identified technologies. This is the barest of minimal level of improvement EPA should assume ICEVs are capable of in Phase 3 because it doesn't reflect synergies with improvements identified above for gasoline- and diesel-powered vehicles that would be deployed to achieve 2027 NO_X standards such as 48V hybridization and cylinder deactivation.

Any improvement in ICEVs not considered by EPA in setting its standards is a one-to-one decrease in the market share of ZEVs needed for compliance. If manufacturers continue at the pace set by the Phase 2 program, with no additional changes to reflect the increase in available technology, EPA's Phase 3 proposal would yield at least 7 percent fewer electric trucks in the regulatory timeframe (27.0 percent compared to 29.2 percent for 2027-2032). Since these technologies were already identified by EPA in setting the Phase 2 standards, they are all available at scale by 2027—if manufacturers instead accelerated the pace to the 2032 levels identified, this alone would lead to a 16.9 percent reduction in electric trucks required (24.3 percent compared to 29.2 percent for 2027-2032). For comparison, EPA's weaker alternative is based on a 21.3 percent reduction (23.0 percent compared to 29.2 percent for 2027-2032). Thus, just by ignoring its own Phase 2 analysis, EPA's rule could lead to electric truck deployment comparable to the proposed weaker alternative.[127]

[127] It is crucial to emphasize that this exercise ignores other aspects of EPA's rule which will also lead to a reduced share of electric trucks, including the current, inappropriate treatment of H_2ICEVs as 0 g/ton-mile vehicles.

Table 4. Phase 2-based Tractor-Trailer Improvement

Regulatory Class	ICEV-only CO_2 g/ton-mile		% CO_2 reduction
	2027	2032	
Class 8 Sleeper Cab (High Roof)	64.3	59.4	7.6%
Class 8 Sleeper Cab (Med Roof)	69.7	65.8	5.6%
Class 8 Sleeper Cab (Low Roof)	64.1	60.4	5.8%
Class 8 Day Cab (High Roof)	75.7	71.2	5.9%
Class 8 Day Cab (Med Roof)	78.0	74.4	4.6%
Class 8 Day Cab (Low Roof)	73.4	70.0	4.6%
Class 7 Day Cab (High Roof)	100.0	93.8	6.2%
Class 7 Day Cab (Med Roof)	103.4	98.5	4.7%
Class 7 Day Cab (Low Roof)	96.2	91.6	4.8%
Class 8 Heavy Haul	48.3	45.0	6.8%
Class 8 Sleeper Cab (High Roof)	64.3	59.4	7.6%

Table 5. Phase 2-based Vocational Vehicle Improvement

Regulatory Class	ICEV-only CO_2 g/ton-mile		% CO_2 decrease
	2027	2032	
HHD Regional (CI)	189	183	3.2%
HHD Multipurpose (CI)	230	214	7.0%
HHD Urban (CI)	269	249	7.4%
MHD Regional (CI)	218	210	3.7%
MHD Multipurpose (CI)	235	219	6.8%
MHD Urban (CI)	258	237	8.1%
LHD Regional (CI)	291	283	2.7%
LHD Multipurpose (CI)	330	307	7.0%
LHD Urban (CI)	367	336	8.4%
MHD Regional (SI)	247	239	3.2%
MHD Multipurpose (SI)	268	251	6.3%
MHD Urban (SI)	297	276	7.1%
LHD Regional (SI)	319	311	2.5%
LHD Multipurpose (SI)	372	347	6.7%
LHD Urban (SI)	413	380	8.0%
Motor Home	226	225	0.4%
School Bus	271	257	5.2%
Coach Bus	205	203	1.0%
Emergency Vehicle	319	319	0.0%
Cement Mixer	316	316	0.0%
Transit Bus	286	279	2.4%
Refuse Truck	298	286	4.0%

9.2. *State Actions Support the Feasibility of More Protective Standards*

For Class 4-8 vehicles, EPA estimates their proposed rule would increase ZEV sales by about 44% nationally by 2032. This falls short of the Advanced Clean Trucks (ACT) rule, which will result in 60% ZEVs as a portion of new vehicle sales by 2032. States have demonstrated that more stringent truck standards are feasible and better prepared to safeguard public health.

One of the fundamental benefits of the ACT rule, that EPA's regulation lacks, is the fact that the rule mandates an increasing percentage of zero-emission trucks and buses be sold within a state, which creates a market and consistent supply of zero-emission trucks and buses, ensuring that states can meet their climate and air quality goals over the next two decades. This important ZEV sales component is incredibly effective because while alternative combustion technologies may reduce greenhouse emissions, they are not nearly as effective as ZEVs at reducing emissions. These technologies can still emit air pollution that threatens public health.

The eight states that have adopted the Advanced Clean Trucks rule have done so to significantly improve air quality and health, while doing their part to reduce greenhouse gas emissions. Collectively, these states represent over 20% of the medium and heavy-duty trucks market, and more states are joining this share of the overall M/HDV market. In fact, Rhode Island announced that the state will pursue ACT adoption on May 10, 2023.

A stronger EPA rule is technologically, legally, and economically feasible, and zero-emission trucks and buses are the fastest way to curb greenhouse gas emissions from the transportation sector. Additionally, truck manufacturers have shown they are capable of bringing ZEVs to the market. As of October 2020, there were 20 zero-emission models commercially available across all bus types and Class 2b-8 trucks. By the end of 2022, 544 total models were available across those vehicle classes. Based on manufacturer announcements, there will be multiple companies selling EVs in virtually all medium- and heavy-duty market segments by 2025, including 58 percent of the major OEMs.[128] Significant advancements in range and efficiency in the upcoming years can be expected, expanding suitability for a wider spectrum of zero-emission vehicle uses and classes. Combined with the historic federal investments under the Inflation Reduction Act and the Bipartisan Infrastructure Law, more stringent Phase 3 greenhouse standards for heavy-duty vehicles would accelerate this ongoing ZEV transition.

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[128] MJ Bradley & Associates, Medium- And Heavy-Duty Vehicles: Market Structure, Environmental Impact & EV Readiness at 22, Figure 10, (July 2021), available at http://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf

9.3. The Zero-Emission Heavy-Duty Vehicle Market Supports the Feasibility of Stronger Standards

9.3.1. Zero-Emission Heavy Duty Vehicle Market and Availability

EPA's proposal is inconsistent with its own comprehensive review of the current markets and technologies, OEM electrification commitments, related state regulations, and significant federal investments. Despite the vast literature and ample industry data on the subject, EPA chose to base the proposal on an original "physics-based tool" that was largely uninformed by the specifications of vehicles available on the market today.[129] We urge EPA to reconsider this decision and to review and emulate the methodologies in the current literature.

9.3.2. Zero-Emission Trucks are Available Today

In the US and Canada, over 180 models of zero-emission medium- and heavy-duty vehicles (ZE MHDVs) – including trucks and coach, school, and shuttle buses – are available on the market, according to CALSTART's Zero-Emission Technology Inventory (ZETI).[130] This represents significant growth in availability over the past few years, up around 30 percent from 2021 to 2023. EPA's review of the ZE MHDV market relied on data from MY2021, which may have limited the Agency's ability to capture a realistic review of the current market and outlook for future development.[131] Given the consistent and significant year-over-year growth in the market, we recommend that this analysis be revisited with more recent information.

Other nations are adopting ZE MHDVs at rates much higher than in the US. Model availability in China far outpaces that in the US, where over 260 models are available. Furthermore, the growth in availability in the Chinese market is more than double that in the US market over the past two years. The wide and growing availability of zero-emission trucks in China has affected a concentration of adoption there, where over 90 percent of the world's zero-emission trucks and buses were sold in 2021.[132] A more stringent Phase 3 regulation will help to accelerate the market for ZE MHDVs in the US.

While buses make up the lion's share of currently deployed ZE MHDVs in the US, the vehicle types with the most significant growth in availability are tractor trucks and cargo vans, which

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[129] U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 204. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

[130] Global Drive to Zero. Zero-Emission Technology Inventory. https://globaldrivetozero.org/tools/zeti/ (last accessed: May 2023).

[131] U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 5. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

[132] Mao, S. et al. Zero-emission bus and truck market in China: A 2021 update. The International Council on Clean Transportation. (January 2023). https://theicct.org/wp-content/uploads/2023/01/china-hvs-ze-bus-truck-market-2021-jan23.pdf

had a 75 percent and 230 percent increase, respectively from 2021 to 2023.[133] This is noteworthy given the significant and disproportionate amount of pollution created by tractor trucks and the strong ability for cargo vans to electrify today given their typical duty cycle.[134]

One of the key MFN demands is that the rule should **prioritize zero-emissions for freight trucks,** i.e., Class 7 and 8 (short-haul) drayage trucks. These trucks have never been prioritized in heavy-duty truck regulations, and are some of the oldest and most-polluting vehicles in frontline and fence-line communities. Electrifying our nation's fleet of tractor trucks is vital to addressing pollution from medium- and heavy-duty vehicles. Although they are less than one-third of the total fleet, they consume over 70 percent of fuel powering Class 4 through 8 trucks and buses on our roads and highways. While Tesla's 500-mile range Semi gets much of the attention, several legacy manufacturers, including Daimler and Volvo are producing and delivering zero-emission Class 8 tractors. These vehicles are well-primed for use in day cab duty cycles such as drayage runs and regional hauls. Focusing more strongly on Class 7 and 8 tractors will bring much-needed relief to communities adjacent to and downwind from ports, railyards, warehouses, and industrial corridors; tractor trucks emit at levels much greater than other MHDVs, and even more so when traveling at lower speeds through neighborhoods.

Truck manufacturers are taking note of this trend, and several of the largest players have committed to fully transitioning to electric trucks. Daimler, the largest Class 7 and 8 truck manufacturer in the US, committed to 100-percent zero-emission sales by 2040; two other major players – Volvo Trucks and Navistar – have similar goals set for 2040.[135,136,137] Today, 62 OEMs are producing ZE MHDVs for the US and Canadian markets, and more are joining each year. Since 2021, the number of OEMs producing ZE MHDVs has increased by over 40 percent.[138]

While the growing availability and adoption of ZE trucks along with these OEM commitments are noteworthy, the current pace of the market falls far short of what is needed to address historic

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[133] Global Drive to Zero. Zero-Emission Technology Inventory. https://globaldrivetozero.org/tools/zeti/. (Last accessed: May 2023).

[134] Union of Concerned Scientists. Ready for Work. (2019). https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf

[135] Nick Carey. Daimler Truck 'all in' on green energy as it targets costs. Reuters. (May 2021). https://www.reuters.com/business/autos-transportation/daimler-truck-all-in-green-energy-shift-targets-costs-2021-05-20

[136] Global Drive to Zero. Volvo Group Pledges to 'Drive to Zero' Program. (February 2022). https://globaldrivetozero.org/2022/02/15/volvo-group-pledges-to-drive-to-zero-program-2-15-22/

[137] Jason McDaniel. Navistar launches new truck with its 'last' internal combustion engine. Bulk Transporter. (August 2022). https://www.bulktransporter.com/equipment/trucks/article/21248846/navistar-launches-new-truck-last-ice-powertrain

[138] Global Drive to Zero. Zero-Emission Technology Inventory. https://globaldrivetozero.org/tools/zeti/. (last accessed: May 2023).

and ongoing inequities in access to healthy air and protection from the climate crisis. EPA has an opportunity through the Phase 3 standards to accelerate the transition towards zero-emission trucks and buses. A stronger Phase 3 rule that exceeds, rather than trails, current market projections would help to put us on a path towards addressing the most dire environmental crises our nation faces today.

9.3.3. ZE MHDV Adoption

EPA suggests that the proposal is expected to accelerate model availability and adoption.[139] However, a Phase 3 standard that trails current market expectations will do little to stimulate either (see Section 8.8). The Phase 3 GHG standard must recognize both the consistent and significant market growth for ZE MHDVs and the dire need to address climate change and air quality inequities – the current proposal accomplishes neither.

Chapter V of the proposal references several prominent studies on the projected adoption rates of ZE MHDVs, including those from ICCT, NREL, and EDF, and suggests that these studies did not include "several important real-world factors which would, in general, be expected to slow down or reduce ZEV sales" without further explanation.[140,141,142,143] Instead of relying on existing literature and previously used methods, EPA estimates the reference case ZEV adoption rate using novel methods. EPA correctly notes that this resulted in highly conservative results that do not align with the results of the existing literature.[144]

While we agree it was appropriate for EPA to consider the market and adoption influence of the ACT as well as the incentives and investments provided by the IRA and BIL, EPA's reference case is significantly out of alignment with the larger body of existing research.[145] This is

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[139] U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 417. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

[140] Claire Buysee, et al. Racing to Zero: The Ambition We Need for Zero-Emission Heavy-Duty Vehicles in the United States. (April 2022). https://theicct.org/racing-to-zero-hdv-us-apr22/ ICCT

[141] Catherine Ledna, et al. Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis. (March 2022). https://www.nrel.gov/docs/fy22osti/82081.pdf

[142] Ellen Robo and Dave Seamonds. Technical Memo to Environmental Defense Fund: Investment Reduction Act Supplemental Assessment: Analysis of Alternative Medium- and Heavy-Duty Zero-Emission Vehicle Business-As-Usual Scenarios. ERM. (August 2022). https://www.erm.com/contentassets/154d08e0d0674752925cd82c66b3e2b1/edf-zev-baseline-technical-memoaddendum.pdf.

[143] U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 360 https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

[144] *Id.* p. 361

[145] *Id.* p. 358

particularly meaningful given that a highly conservative reference case overinflates the environmental, human health, and economic benefits of the proposal. EPA notes the possibility of the reference case being "underestimated, and adoption of ZEVs, and other technologies will occur more rapidly than EPA predicts."[146] However, if the adoption moves faster than the proposed standards, as estimated by current literature, the standard will do little to accelerate the market as EPA predicts.[147]

In nearly every case, EPA's projected ZEV Adoption Rates trail ZE MHDV market assumptions in the scientific literature. This is particularly true in the near-term. Where the proposal is estimated to affect the adoption of 10 percent ZE day cab tractors for MY2027, a recent study by ICCT suggests adoption at 27 percent.[148] Similarly, the proposal estimates medium-heavy-duty vocational adoption rates of 27 percent in 2030, but ICCT's study estimates 55 percent adoption.

Adopting a standard that trails current market projections for ZEV adoption is unacceptable and could actually allow combustion trucks to get dirtier over time. EPA must review the current and updated literature, revisit its reference case, and adopt a rule that pushes the market forward meaningfully.

9.3.4. Zero-Emission Trucks are Affordable

At several points in the proposal and DRIA, EPA notes the significant total-cost savings offered by ZEVs, due in large part to reduced fuel, maintenance, and repair costs. Specifically, the DRIA states:

> *For the vehicle types for which we propose new CO2 emission standards, we expect that the ZEV will have a lower total cost of ownership when compared to a comparable ICE vehicle (even after considering the upfront cost of purchasing the associated EVSE for a BEV), due to the expected cost savings in fuel, maintenance, and repair over the life of the HD ZEV when compared to a comparable ICE vehicle.*[149]

EPA recognizes the positive economics of ZE MHDVs, but does not alter the stringency of the proposed standards accordingly. While clean air and climate change regulations are often viewed as inherently increasing the cost of doing business for regulated entities, this is not necessarily the case for commercial vehicle electrification. In fact, the opposite can be true. Although the current upfront costs associated with ZE MHDVs can be higher than their comparable ICE

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[146] U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 417. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

[147] *Id.* p. 418

[148] Slowik, P. et al. Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Update in the United States. The International Council on Clean Transportation. (January 2023). https://theicct.org/publication/ira-impact-evs-us-jan23/

[149] U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 417. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

models, several types of zero-emission trucks show preferable sticker prices today when considering IRA incentives.[150] What's more, multiple studies estimate that virtually all battery-electric MHDV models will have a preferred total cost of ownership by the end of the decade.[151,152]

Throughout the DRIA, EPA correctly asserts that the provisions in the BIL and IRA related to ZE MHDV markets, supply chains, and infrastructure will help to significantly reduce the purchase price and infrastructure development costs for these vehicles.[153,154] This novel and substantial funding will also serve to accelerate and further develop the market for ZE MHDVs and related charging infrastructure, as well as the domestic supply chain for these vehicles.

The IRA included a first-ever federal purchase incentive for ZE MHDVs, which helps to bridge the cost gap between ZEV and ICE models in many cases today. A recent study by ICCT examined the impact of IRA funding on the MHDV market.[155] The study found that, even before IRA incentives, ZE models are approaching upfront purchase price parity. By 2030, battery-electric Class 4-7 rigid trucks, refuse trucks, and transit buses will have favorable sticker prices, according to the study. When considering IRA incentives, this list grows substantially (see Table 6).

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[150] Slowik, P. et al. Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Update in the United States. The International Council on Clean Transportation. (January 2023). https://theicct.org/publication/ira-impact-evs-us-jan23/

[151] Basma, H. et al. Total Cost of Ownership of Alternative Technologies for Class 8 Trucks. The International Council on Clean Transportation. (April 2023). https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf

[152] California Air Resources Board. Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document. (September 2021). https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf

[153] H.R.3684. Infrastructure Investment and Jobs Act. 117th Congress. (2021-2022). www.congress.gov/bill/117th-congress/house-bill/3684/text

[154] H.R.5376. Inflation Reduction Act of 2022. 117th Congress. (2021-2022). www.congress.gov/bill/117th-congress/house-bill/5376/text

[155] Slowik, P. et al. Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Update in the United States. The International Council on Clean Transportation. (January 2023). https://theicct.org/publication/ira-impact-evs-us-jan23/

Table 6: Year of Retail Price Preference for HD BEV vs. ICE with IRA Qualified Commercial Clean Vehicles Tax Credit[156]

Type of Heavy-Duty Vehicle	Year
Rigid truck (Class 4-5)	Now
Rigid truck (Class 6-7)	Now
Rigid truck (Class 8)	2027
Short-haul tractor truck	2028
Refuse truck	Now
Small bus (Class 4-5)	2024
School bus (Class 6-8)	2025
Other bus (Class 6-8)	2028

Total cost is perhaps even more relevant when considering MHDVs, given that they are crucial capital assets to businesses and must provide a meaningful return on investment. Due in large part to the significant fuel and maintenance savings offered by ZEVs, many studies estimate a total-cost preference for ZEVs over ICE models in the coming years, if not today (See Table 7). Notably, much of the literature on ZE MHDV total cost was published pre-IRA, meaning that lifetime cost parity would be reached sooner in many cases. However, post-IRA studies on total cost are emerging. One from ICCT examined the total cost of ownership of various propulsion technologies for long-haul Class 8 tractor trucks in seven key freight states: Georgia, California, Florida, Illinois, New York, Texas, and Washington. The study estimated that battery-electric long-haul Class 8 tractors would have a preferred total cost of ownership before 2030 in each of

[156] *Id.*

these states, and in Texas as soon as 2027.[157] The most recent BloombergNEF Electric Vehicle Outlook corroborated ICCT's results, finding that all classes of ZE MHDVs – even long-haul tractors – would have a preferred total cost of ownership in the U.S. by 2030.[158] Our analysis on incremental savings to fleets in Section 8.8 of this letter further confirms these findings.

Table 7: Earliest TCO Advantage for BEV Trucks over Fossil-fueled Trucks

Vehicle Type	**CARB**[159]	**ICCT**[160]	**NREL**[161]	**Roush/EDF**[162]
Delivery/Cargo Van	2025	2023	2025	2022-2030
Refuse Truck	2025	-	-	2022
Day Cab Tractor	2025	-	2025	-
Sleeper Cab	2030	-	2025	-

Other clean air regulators are taking note of this. In April 2023, CARB adopted the Advanced Clean Fleet rule, which will require the largest truck fleets operating in California to begin

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[157] Basma, H. et al. Total Cost of Ownership of Alternative Technologies for Class 8 Trucks. The International Council on Clean Transportation. (April 2023). https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf

[158] BloombergNEF. Electric Vehicle Outlook 2023. Bloomberg Finance L.P. (June 2023). https://about.bnef.com/electric-vehicle-outlook/

[159] California Air Resources Board. Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document. (September 2021). https://ww2.arb.ca.gov/sites/default/files/2021-08/210909costdoc_ADA.pdf

[160] Eamonn Mulholland. Cost of electric commercial vans and pickup trucks in the United States through 2040. The International Council on Clean Transportation. (January 2022). https://theicct.org/wp-content/uploads/2022/01/cost-ev-vans-pickups-us-2040-jan22.pdf

[161] Hunter, C. et al. Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks. National Renewable Energy Laboratory. (2021). https://www.nrel.gov/docs/fy21osti/71796.pdf

[162] Nair, V. et al. Technical Review of: Medium and Heavy-Duty Electrification Costs for MY 2027- 2030. Prepared for Environmental Defense Fund by Roush Industries, Inc. (February 2022). https://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf

transitioning to ZE MHDVs in 2024. This rule is anticipated to *save California commercial fleets nearly $48 billion through 2050*.[163]

Although aspects of both upfront cost and total cost of ownership were considered in the proposal, we find it particularly arbitrary that the ZEV Adoption Rates in no way reflects recent economic projections in the literature.[164] For example, while battery-electric refuse haulers have both preferred upfront and total costs today, the current proposal would only affect a 36 percent market-wide ZEV adoption rate in 2032 – nearly a decade after purchase price parity. The same is true across the board for this proposal. EPA anticipates that the ZEV adoption rate under the proposal for daycab tractors, a truck type that bears significant responsibility for pollution in port- and warehouse-adjacent communities, would be *merely 12 percent* the year they are expected to reach purchase price parity.

When faced with the overwhelming economic upsides for ZE MHDVs, opponents of clean trucks often suggest that long-haul electric trucks will either have penalized revenue or increased fleetwide VMT due to payload capacity loss from battery weight. These arguments, however, are undercut by recent studies showing that advancements in battery efficiency and density will close the payload capacity gap in the coming years.[165]

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[163] California Air Resources Board. Appendix B: Updated Costs and Benefits Analysis. (2023). https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/acf15db.pdf

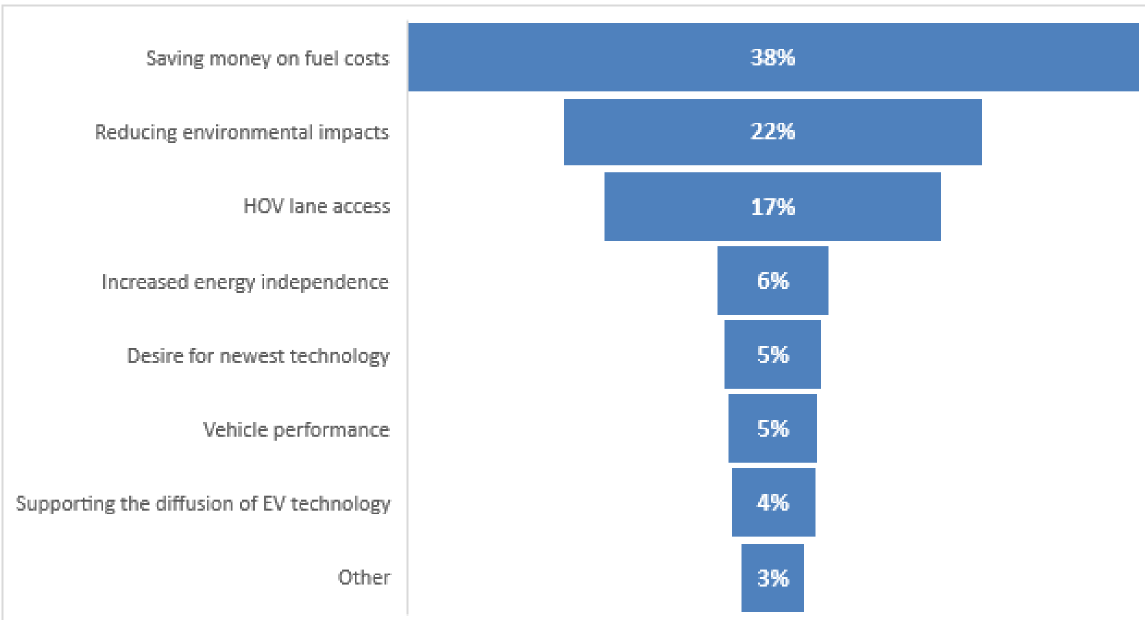
[164] U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. (2023). p. 210
https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

[165] Ricardo Strategic Consulting. E-Truck Virtual Teardown. Prepared for The International Council on Clean Transportation. (June 2022).
https://theicct.org/wp-content/uploads/2022/01/Final-Report-eTruck-Virtual-Teardown-Public-Version.pdf

9.4. *Stronger Zero-emission Truck Standards are Reasonable Because Purchasers and Fleets Will Be Attracted to the Fuel Cost Savings and Relief from the Volatility of the World Oil Market*

EPA requests comment on data related to consumer acceptance of HD ZEVs.[166] A survey of nearly 20,000 EV drivers reveals "Saving Money on Fuel Costs" is the single biggest motivator of EV purchase decisions as shown in Figure 16.

Figure 16: Most Important Reason to Acquire an EV[167]



And if that motivation holds for individual consumers, it would likely ring even more true for fleet managers who track operating costs more diligently than most households.

In addition to providing significant absolute fuel cost savings relative to gasoline or diesel, driving on electricity also provides a significant price-stability advantage. As shown in Figure 17, for more than the last two decades, driving a passenger EV on residential electricity prices

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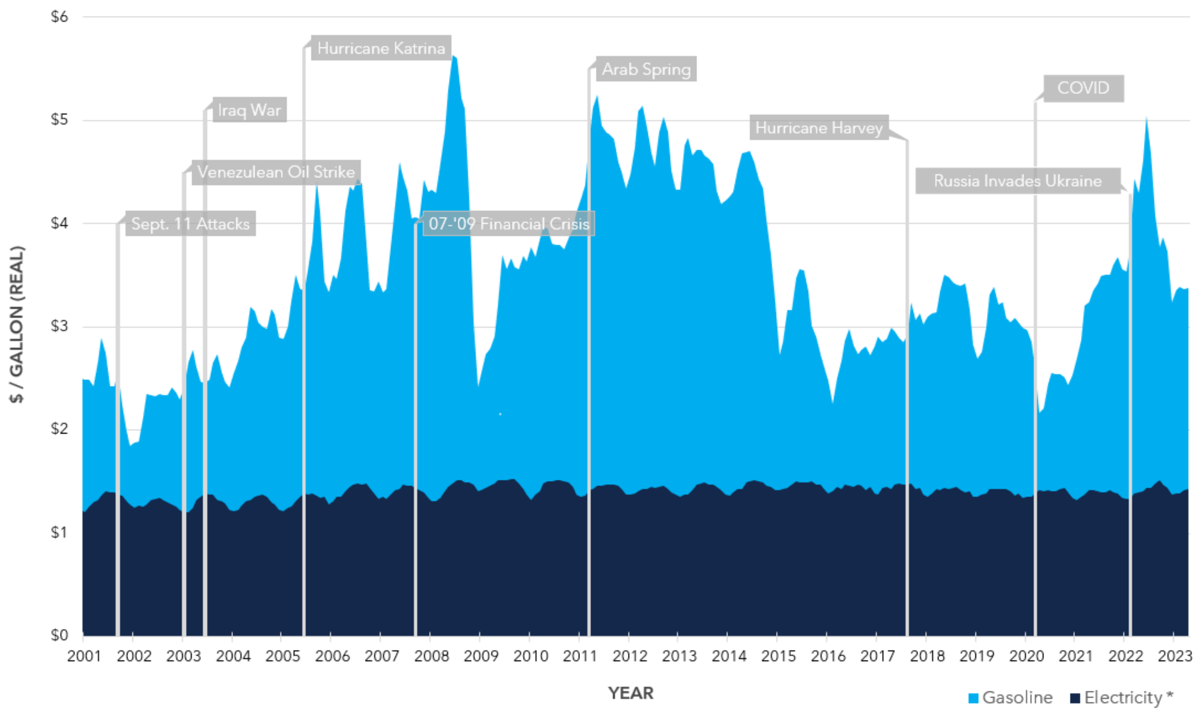
[166] U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. (2023). p. 462 https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

[167] California Clean Vehicle Rebate Project. EV Consumer Survey Dashboard, Q15. https://cleanvehiclerebate.org/sites/default/files/attachments/CVRPConsumerSurvey2013-15Reference.pdf. (last accessed: September 14, 2022)

has been the cost equivalent of driving on dollar-a-gallon gasoline, whereas the price of gasoline itself jumps up and down in response to world events beyond our control.[168]

Figure 17: Equivalent Electricity and Diesel Prices: January 2001-April 2023



The contrast is even more stark between electricity and diesel prices, as shown in Figure 18, which shows the cost of diesel compared to the "dollar-per-diesel-gallon-equivalent" cost of driving a Class 5 Step Van on electricity.[169]

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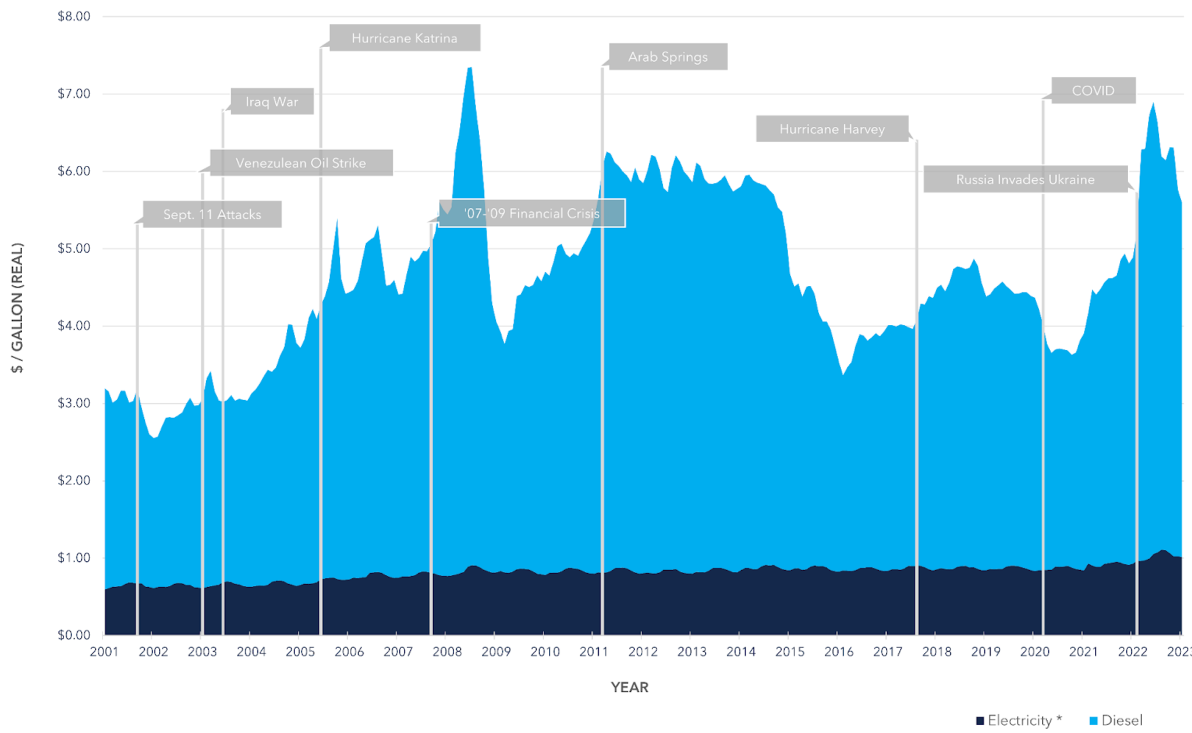
[168] Source data: EIA, *Short Term Energy Outlook*. Electricity prices shown in "eGallons" a Department of Energy metric that "represents the cost of driving an electric vehicle (EV) the same distance a gasoline powered vehicle could travel on one (1) gallon of gasoline." Methodology available at: https://www.energy.gov/articles/egallon-methodology

[169] Source data for fuel prices: EIA, *Short Term Energy Outlook*. In this instance the Department of Energy's "eGallon" methodology developed using the efficiencies of light-duty vehicles was adapted to reflect the fuel economy (mpg) and electricity consumption (kwh/mi) of a Class 5 Step Van, as documented by the California Air Resources Board, available at: https://ww2.arb.ca.gov/sites/default/files/2018-11/180124hdbevefficiency.pdf

Figure 18: Equivalent Commercial Electricity and Diesel Prices for Class 5 Step Van: January 2001-January 2023



The price stability advantage of electricity should further both consumer and fleet manager acceptance of EVs. In addition to saving money on fuel, fleet operators stand to benefit from no longer having to pay financial institutions hefty commissions and fees associated with hedging against fuel price volatility, and their customers will benefit from no longer being subject to "fuel surcharges" designed to reduce fleet exposure to the volatility of the world oil market.

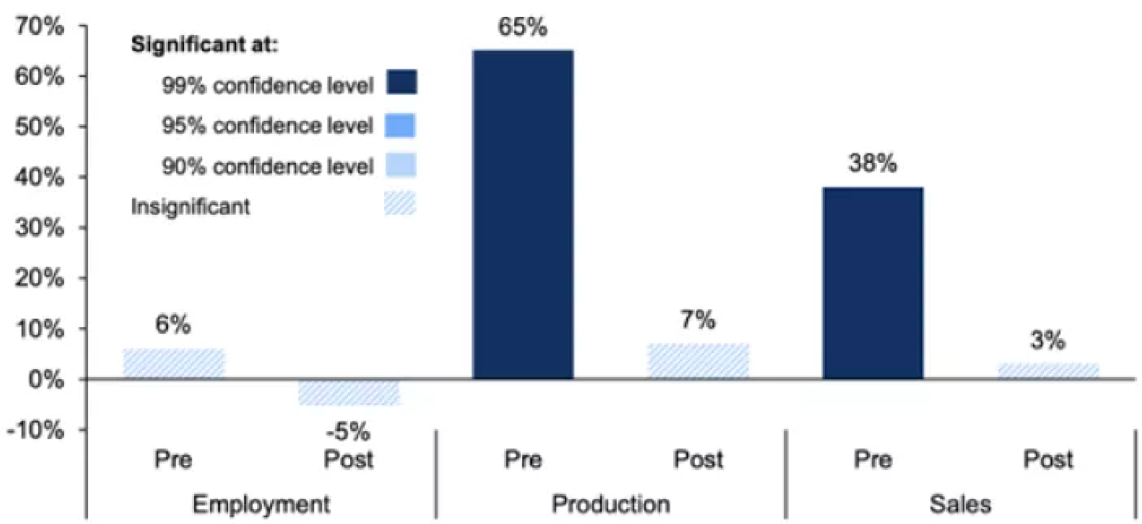
10. EPA Should Reject Feasibility Challenges Based on the Pre-Buy/Low-Buy Myth

As EPA evaluates the possible effects of this regulation on the sale of heavy-duty ICE and ZEV vehicles, including potential impacts associated with a "pre-buy and low-buy" scenario, it is important that the Agency refer to reputable analyses and literature reviews that have been conducted on this topic, including an analysis conducted by ERM in 2022 to evaluate the connection between the implementation of heavy-duty engine emission regulations and changes in the heavy-duty vehicle (HDV) manufacturing employment, production, and sales. The review found that there was no firm basis for concluding that there is a material pre-buy/low-buy impact on sales, production, or employment as a result of the EPA HDV engine regulations for 2004, 2007, 2010, and 2014.[170]

In particular, this study scrutinized the "pre-buy/low-buy" claim by analyzing prior federal truck regulations to see whether they impacted employment, production, and sales. To test the thesis, ERM compared sales of heavy-duty trucks subject to new regulations to sales of cars and light-duty trucks (LDVs) not subject to new regulations during the same time period. After analyzing four HDV regulations (2004, 2007, 2010, and 2014), the report found no significant impact on employment, production, or sales in any instance and concludes there is no firm basis to claim that truck emissions standards impact sales or employment.

The 2007 HDV standards, which required large technology changes, are often cited by truck manufacturers as displaying pre-buy/low-buy patterns. But the ERM analysis refutes this claim using a difference-in-difference (DiD) econometric model informed with federal, monthly datasets for sales, production, and manufacturing employment of heavy-duty vehicles, automobiles, and light trucks to assess whether past engine regulations impacted the heavy-duty vehicle manufacturing industry. The analysis results found no significant pre-buy/low-buy pattern occurred and determined that demand fluctuations were likely due to factors other than the regulation. As the figure below shows, if a pre-buy/low-buy phenomenon occurred, there would be a significant increase in employment, production, and sales before the regulation came into effect ("Pre"), followed by a commensurate significant decrease in employment, production, and sales once the regulation was implemented ("Post"). That did not occur.

Figure 19: DiD Model Coefficients for 2007 Regulation



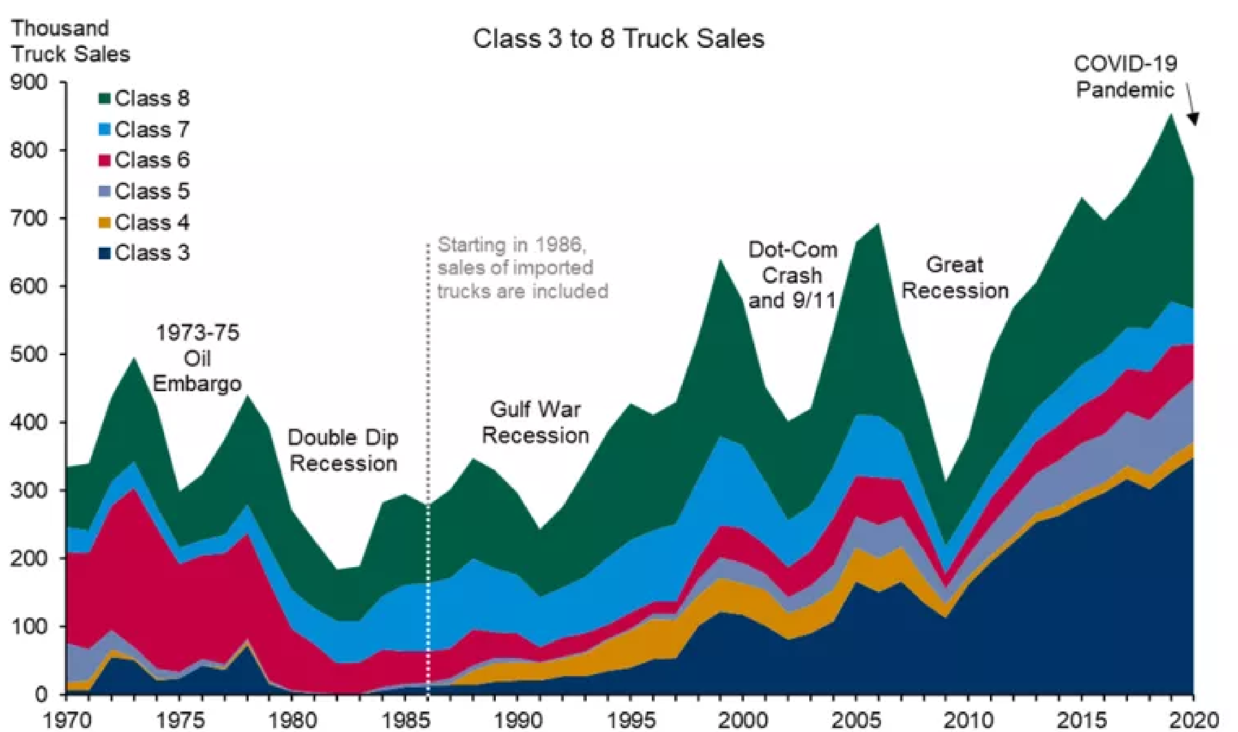
[170] ERM. ERM Report: Impact of Engine Regulations on Heavy-Duty Vehicle Manufacturing Employment, Production, and Sales. (2022). https://www.erm.com/hdv-prebuy-report-oct2022/

Additionally, a key finding from the report is that a decline in HDV sales appears to be a leading indicator of recessions. This is particularly salient to the 2007 HDV standard. In 2006, economic growth had slowed, and the federal reserve raised interest rates four times in an effort to control inflation. The rate hikes increased financing costs for companies, including truck purchasers. By the start of 2007, the economy was limping along at 1.3 percent growth. Then, in April of 2007, subprime mortgage lender leader New Century Financial Group filed for bankruptcy, precipitating an economic downturn that likely had a much more significant impact on HDV sales than did the 2007 HDV standards.

10.1. Macroeconomics Drives the Pace of Truck Sales

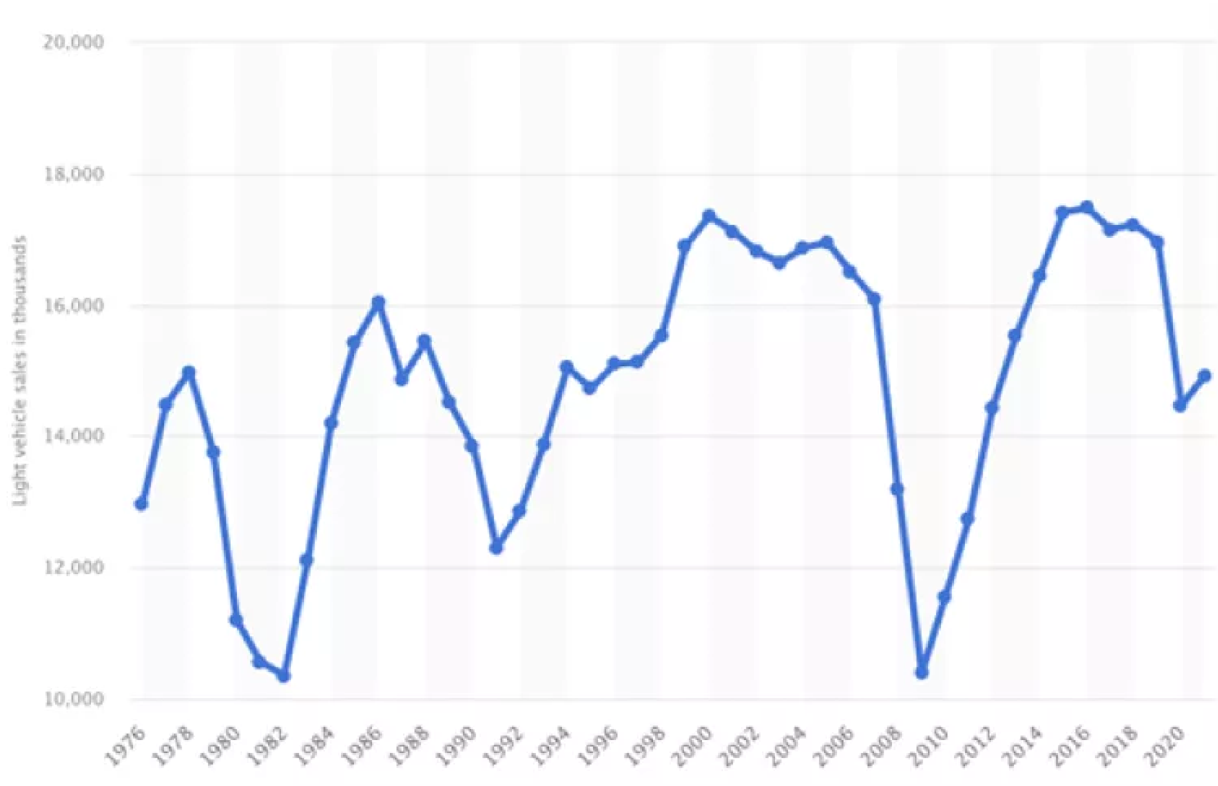
As Figure 20 illustrates, during years of a bad economic outlook, companies reduce their spending and investments, including in capital expenditures such as trucks, well before an official recession period begins. In other words, macroeconomics drives the pace of truck sales, not regulations. But regulations are essential to ensure trucks sold to meet exogenous demand pollute less. That being said, if we want to ensure that there is a zero-emission shift in sales and manufacturing, then we need regulations to ensure compliance, accountability, and, most importantly, justice.

Figure 20: History of Class 3 to 8 Truck Sales



And as Figure 21 illustrates, We also see that bad economic conditions impacted car sales similarly. The chart below highlights how the LDV sector experienced declining sales starting in 2006 and significantly dropped as economic conditions worsened. So, while trucks had new tailpipe emissions standards at this time, cars did not, but they both saw a similar slump in sales.

Figure 21: Historical LDV Sales (1976-2020)



10.2. Pre-Buy/Low-Buy is a False Narrative Used to Mislead Policymakers

Using the pre-buy/low-buy myth as a tool to persuade policymakers is part of an ongoing trend by truck manufacturers, especially since the critics pushing this argument suggest that truck regulations impact demand and therefore lead to manufacturing layoffs. Lawsuits filed and then withdrawn against zero-emission truck regulations, aggressive lobbying efforts by the Truck and Engine Manufacturers Association across the country to delay regulations, and misleading information on the state and cost of zero-emission truck technology have become part of an arsenal of tools critics are using to prioritize status quo over public health and the environment.

10.3. Pre-Buy/Low-Buy is Inapplicable to the Agency's Proposal

Even setting aside the above evidence against the existence of a pre-buy around previous tailpipe emissions standards, there is absolutely no reason to suggest that the agency's Phase 3 rulemaking could lead to a pre-buy because of the TCO benefits to fleet operators. As noted in this analysis and in the agency's own analysis, the trucks being put on the road as the result of the NPRM result in direct net benefits to the operator. Even the industry experts proclaiming the existence of pre-buy/low-buy scenarios, touted by manufacturers as part of their disinformation campaign against stronger, more protective emissions standards, acknowledge that greenhouse gas rules like the Phase 3 NPRM would not lead to any such effect.[171]

EPA should reject the pre-buy/low-buy myth and adopt the strongest possible Phase 3 standards to protect public health and curb greenhouse gas emissions.

11. EPA's Weak Proposal is Based on Flawed Assessments of Battery Technologies

11.1. There will be enough materials and battery supply chain production to electrify transportation

We agree with EPA's conclusion that vehicle electrification, including the electrification of heavy, medium, and light-duty fleets, will not lead to energy security risks or dependence on foreign imports in the U.S., but will instead provide the potential for a low impact and domestic energy supply. 88 Fed. Reg. at 25962. This section provides comments on the assessment of battery critical materials and battery production.

The lithium-ion batteries used to power electric vehicles include the following materials deemed critical by the United States Geological Survey: lithium, nickel, manganese, cobalt, graphite, and aluminum.[172] Of these materials, lithium is the only mineral that does not have a substitute currently on the market. Nickel, manganese, and cobalt are in the cathodes nickel-manganese-cobalt (NMC) and nickel-cobalt-aluminum (NCA). These are not the constraining materials because they are now substituted in a growing portion of EVs with the lithium-iron-phosphate cathode.[173] Graphite can also be substituted; synthetic graphite is a direct

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[171] "The way to avoid pre-buys ahead of regulations is to offer cost savings to the operators that would provide a net payback, as is the case with the step-up in fuel economy coming in 2027 under EPA's Phase 2 regulations. … The model did not detect any pre-buying ahead of the Phase 1 GHG regulations beginning in 2014, because improved fuel efficiency more than neutralized the higher upfront vehicle purchase price, ta, finance and insurance costs." in ACT Research. 2022. Pre-buy/Low-buy: Analysis of heavy-duty sector impacts from emissions regulations, prepared for Truck and Engine Manufacturers Association, April 29. EPA-HQ-OAR-2019-0055-1203, Exhibit D.

[172] U.S. Geological Survey. United States Geological Survey Releases List of 2022 Critical Minerals. (2022). https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals

[173] International Energy Agency. Global EV Outlook 2023. (2023). https://www.iea.org/reports/global-ev-outlook-2023/trends-in-batteries

substitution for mined graphite,[174] and research has also demonstrated the use of silicon mixed with or to replace graphite as the anode.[175]

Lithium is vital to manufacture lithium-ion batteries – the only type of EV battery used in all EVs purchased in the U.S.; therefore, the analysis correctly points to it as the constraining material for lithium-ion batteries. Yet, this is a slightly conservative estimation for future constraints because alternative battery types are beginning to be marketed globally. For example, sodium-ion batteries have recently been recognized as a potential lithium-ion battery substitute as Chinese automakers unveil their new technology.[176] This type of innovation is likely to reduce lithium demand globally and will be further discussed in the next section.

Furthermore, we know advocating for zero-emissions within the Phase 3 GHG Rule, which is an essential step to reducing fossil fuel emissions and addressing the climate crisis, will potentially include mining impacts impacting EJ communities, in particular indigenous communities. Electric vehicles (EVs) also eliminate tailpipe emissions of harmful air pollutants that cause asthma and respiratory diseases, especially among Black, Indigenous, and other communities of color. However, without adequate protections for workers, communities, and environments near mining and processing sites, we risk replicating the harms of fossil fuel extraction. Besides the details below, which talk about opportunities for EV batteries that will not rely on lithium, there are measures that EPA can and should be taking to address potential mining impacts.

EPA points to findings by several sources that concur with its assessment that there will be material and production able to meet EV uptake in the LDV, MDV, and HDV sectors.[177] These include: 1) a report by Li-Bridge that there is expected to be sufficient supplies of cathode active production globally until the date forecasted, of 2035;[178] 2) International Energy Agency (IEA) projections of global lithium carbonate until 2028;[179] and 3) Bloomberg New Energy Finance (BNEF) projection of lithium 2028.[180] The 2023 BNEF Electric Vehicle Outlook demonstrates

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[174] Jinrui Zhang, Chao Liang, and Jennifer B. Dunn. Graphite Flows in the U.S.: Insights into a Key Ingredient of Energy Transition. Environmental Science & Technology. V. 57. No.8. (2023). p. 3402-3414. https://pubs.acs.org/doi/10.1021/acs.est.2c08655

[175] Xiuxia Zuo, Jin Zhu, Peter Müller-Buschbaum, Ya-Jun Cheng. Silicon based lithium-ion battery anodes: A chronicle perspective review. Nano Energy. V. 31. No. 113-143. (2017). p. 2211-2855. http://dx.doi.org/10.1016/j.nanoen.2016.11.013

[176] BYD & Huaihai planning Na-ion battery factory in China, Electrive. (June 12, 2023). https://www.electrive.com/2023/06/12/byd-huaihai-planning-na-ion-battery-factory-in-china/

[177] NPRM pages 123-126 and 128-132.

[178] Slides 6 and 7 of presentation by Li-Bridge to Federal Consortium for Advanced Batteries (FCAB). (November 17, 2022).

[179] International Energy Agency. Committed mine production and primary demand for lithium, 2020–2030. (October 26, 2022). https://www.iea.org/data-and-statistics/ charts/committed-mine-production-and-primarydemand-for-lithium-2020-2030. (Last accessed: March 9, 2023).

[180] Sui, Lang. Memorandum to docket EPA–HQ– OAR–2022–0985. Based on subscription data available to BNEF subscribers at

the uptake in demand for minerals has incentivized continued expansion of the supply chain.[181] In addition, academic sources have demonstrated there are enough reserves and recycled content, such that demand for lithium will barely exceed a quarter of the available reserve by 2050 and about half by 2100.[182]

11.1.1. Federal investments have spurred private investments in domestic supply

Actions taken by the federal government have increased private investment in U.S. battery production. The impact of the Bipartisan Infrastructure Law and the Inflation Reduction Act on U.S.-based EV manufacturing, repurposing, and recycling growth demonstrates the influence US policy has on rapidly growing a domestically produced supply. Within six months of the Inflation Reduction Act's passage, automakers and battery manufacturers had announced a total of roughly $52 billion of planned investment in North America's EV supply chain with over 70 percent of those investments going towards battery supply chains and recycling.[183]

11.1.2. Recycled content can provide additional domestic mineral supply

The current oil-dependent system not only impacts the climate and health of the U.S. population, it also requires continual drilling, production, and importing of fuel. This is in stark contrast to the use of materials needed for electrified transportation, which can be continually recycled to produce the next generation of more efficient vehicles. This results in the continued growth of U.S. material stock even when importing minerals not mined domestically. As the Proposed Rule states, in 2050, 25 to 50 percent of lithium EV material demand can be met with recycled content.[184] This finding has been highly studied and documented by additional academics to the two listed in the report (Sun et al., 2022; Ziemann et al., 2018), including findings by Xu et al.[185] and Dunn et al.[186] Xu et al. demonstrate the material demand, which could be met by retiring and

https://www.bnef.com/interactive-datasets/2d5d59acd9000031?tab=DashboardDemand&view=8472b6c7-e8cc-467f-b4a4-fe854 68fba3a

[181] Bloomberg New Energy Finance. Electric Vehicle Outlook 2023. (2023). https://about.bnef.com/electric-vehicle-outlook/#download

[182] V.V. Klimenko, S.V. Ratner, A.G. Tereshin. Constraints imposed by key-material resources on renewable energy development. Renewable and Sustainable Energy Reviews. V. 144. No.111011. (2021). p. 1364-0321. https://www.sciencedirect.com/science/article/pii/S1364032121003014

[183] Cory Cantor. US Climate Law Fuels $52 Billion in New EV Investments. BloombergNEF. (March 13, 2023).

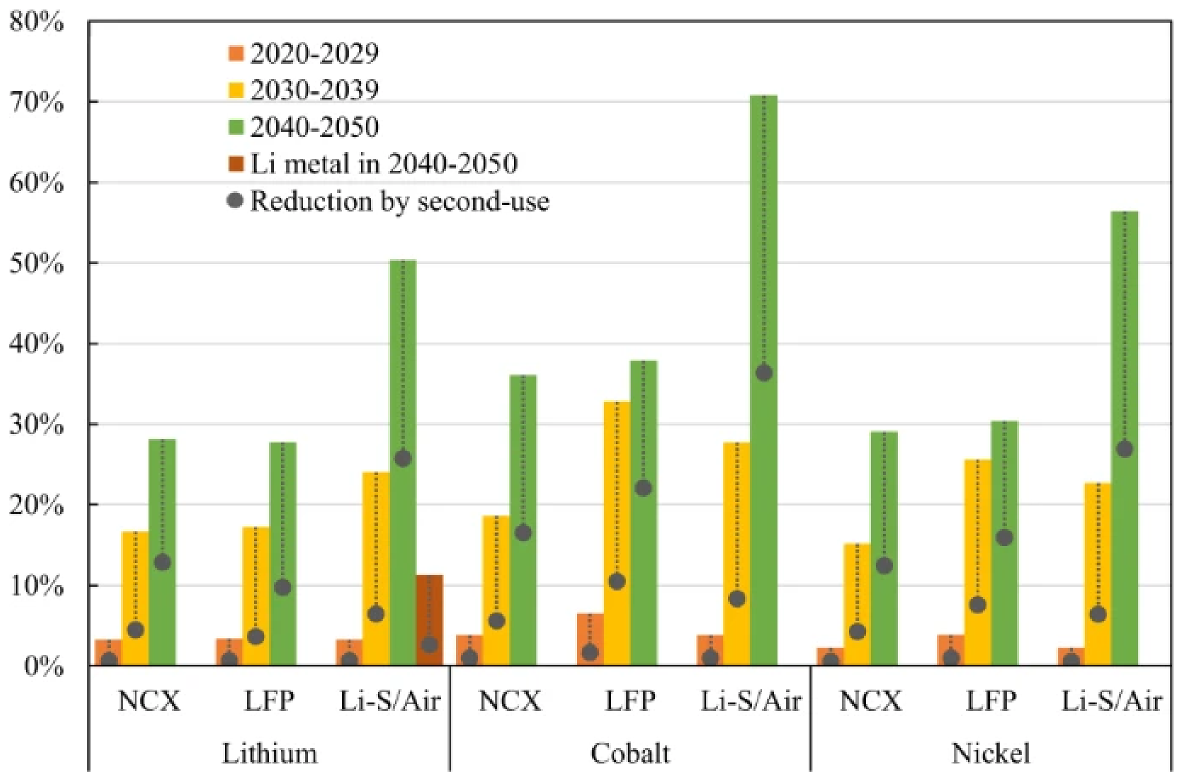
[184] Sun et al. Surging lithium price will not impede the electric vehicle boom. Joule. doi:10.1016/j.joule. 2022.06.028 (https://dx.doi.org/10.1016/j.joule.2022.06.028); Ziemann et al. Modeling the potential impact of lithium recycling from EV batteries on lithium demand: a dynamic MFA approach. Resour. Conserv. Recycl. V. 133. (2018). p. 76–85. https://doi.org/10.1016/j.resconrec.2018.01.031.

[185] Xu, C., Dai, Q., Gaines, L. et al. Future material demand for automotive lithium-based batteries. Commun Materials. V.1. No. 99. (2020). https://doi.org/10.1038/s43246-020-00095-x

[186] Jessica Dunn, Margaret Slattery, Alissa Kendall, Hanjiro Ambrose, and Shuhan Shen. Circularity of Lithium-Ion Battery Materials in Electric Vehicles. Environmental Science & Technology. V. 55. No.8. (2021). p. 5189-5198. DOI: 10.1021/acs.est.0c07030

recycled supply, is highly impacted by innovation and advancing energy density. As batteries become more advanced and energy-dense, either through innovation of chemistries used (e.g., the progress made in NMC), or through different chemistries (e.g., lithium-sulfur or lithium-air batteries), the mineral demand decreases to meet the same energy storage needs. This means that a high percentage of material demand can be met with the retiring supply of less material-efficient and lower density batteries, as is demonstrated in Figure 22 below.[187]

Figure 22: Closed-loop recycling potential of battery materials in a STEP scenario

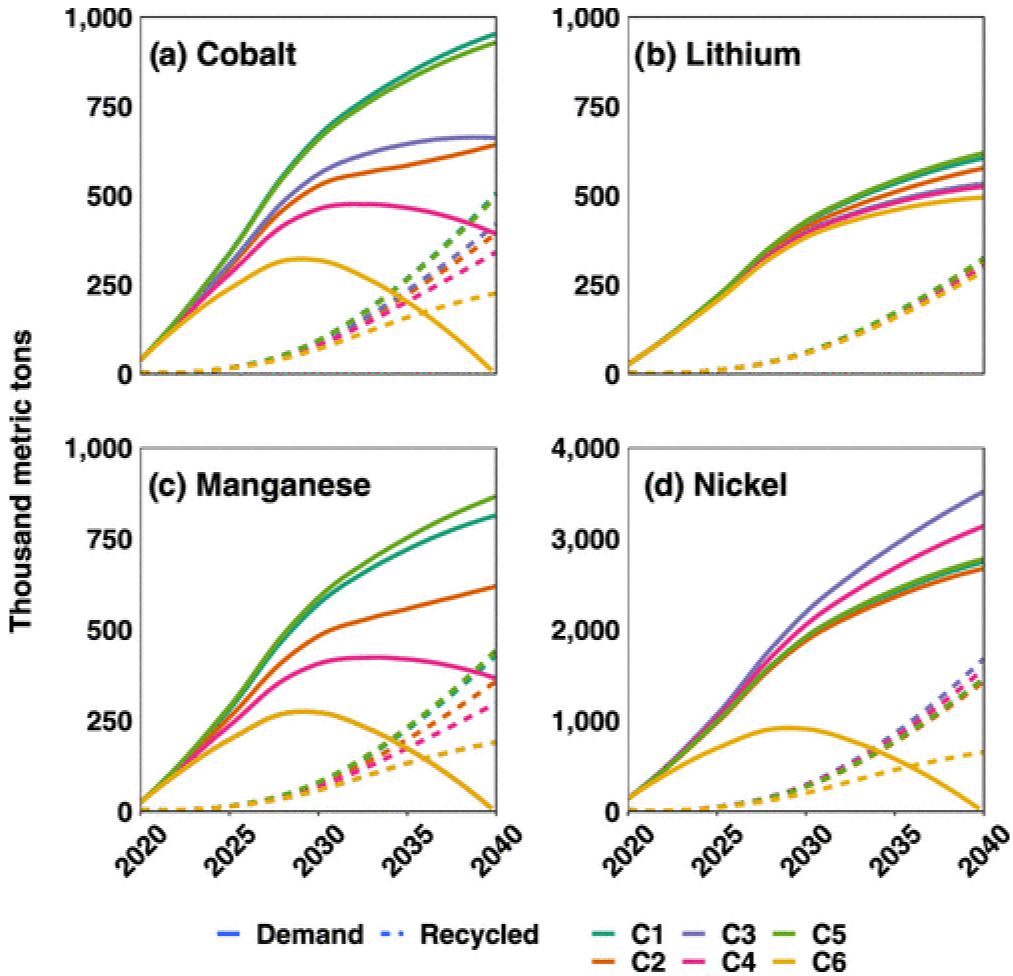


Dunn et al.[188] demonstrate that the choice of cathode materials can also highly increase potential circularity. Figure 23 below shows that a future with high lithium-iron-phosphate (LFP) market concentration can significantly increase the amount of lithium, cobalt, manganese, and nickel demand met with recycled content.

[187] Xu, C., Dai, Q., Gaines, L. et al. Future material demand for automotive lithium-based batteries. Commun Materials. V.1. No. 99. (2020). https://doi.org/10.1038/s43246-020-00095-x

[188] Jessica Dunn, Margaret Slattery, Alissa Kendall, Hanjiro Ambrose, and Shuhan Shen. Circularity of Lithium-Ion Battery Materials in Electric Vehicles. Environmental Science & Technology. V. 55. No.8. (2021). p. 5189-5198. DOI: 10.1021/acs.est.0c07030

Figure 23: Circularity potential of materials as additional years are added to battery lifespan[189]



The recycled content also varies based on the collection rate and the material recovery rate. There is potential for high material recovery due to the 95 percent recovery rate of lithium, nickel, cobalt, and manganese by commercial-scale hydrometallurgical recyclers in the U.S. such as Lithion, Redwood Materials, Licycle, and Cirba Solutions. In addition, direct cathode recycling, which can recover a cathode without breaking it down into separate materials, is under development by several startups as well as the National Lab research group, ReCell. Direct recycling currently has a recovery rate of 40% for lithium, but increasing the lithium recovery rate is a priority area for ongoing research.[190] The Argonne National Lab model, BatPaC, lists the

[189] *Id.*

[190] Kendall, A., Slattery, M., Dunn, J. Lithium-ion car battery recycling advisory group report. (2022). https://calepa.ca.gov/lithium-ion-car-battery-recycling-advisory-group/

following recovery rates shown in Table 8.[191]

Table 8: Recovery Rates of Battery Materials from Different Recycling Processes

	Pyrometallurgical	Hydrometallurgical	Direct Physical
Copper	90%	90%	90%
Steel	90%	90%	90%
Aluminum		90%	90%
Graphite		90%	90%
Plastics		50%	50%
Li+ in product		90%	40%
LCO			90%
NMC(111)			90%
NMC(532)			90%
NMC(622)			90%
NMC(811)			90%
NCA			90%
LMO			90%
LFP			90%
Co2+ in product	98%	98%	
Ni2+ in product	98%	98%	
Mn2+ in product		98%	
Electrolyte Organics		50%	50%

Recycling facilities are operational and under development in the US. Table 9 from Atlas Public Policy attempts to capture all these developments.[192]

[191] Argonne National Laboratory. BatPaC: battery manufacturing cost estimation. (2022). https://www.anl.gov/partnerships/batpac-battery-manufacturing-cost-estimation
[192] Atlas Public Policy. The EV Transition: Key Market and Supply Chain Enablers. (2022). https://atlaspolicy.com/the-ev-transition-key-market-and-supply-chain-enablers/

Table 9: EV Battery Recycling Facilities in the U.S.

Site Name	State	Target Capacity (tons/year)	Facility Product	Year Operational	Company
St Louis Facility	IL	24,000	Battery Grade Materials	Operational	Interco
Spoke Facility	NY	5,000	Black Mass	Operational	Li-Cycle
Worcester, Pilot Plant	MA	15	Cathode materials	Operational	Ascend Elements
Fairfield County Facility	OH	NA	NA	Operational	Cirba Solutions
Wistron Greentech facility	TX	500	Direct Recycling	Operational	Princeton NuEnergy
Spoke Facility	AL	10,000	Black Mass	Operational	Li-Cycle
Spoke Facility	AZ	10,000	Black Mass	Operational	Li-Cycle
Recycling Facility	GA	30,000	Cathode materials	2022	Ascend Elements
Spoke Facility	OH	15,000	Black Mass	2023	Li-Cycle
Hub Facility	NY	35,000	Battery Grade Materials	2023	Li-Cycle
Apex 1	KY	NA	Battery Grade Materials	2023	Ascend Elements
SungEel Recycling Park	GA	50,000	NA	2024	SungEel Materials
Carson City facility	NV	20,000	Battery Grade Materials	NA	Redwood Materials
Lithium-Ion Battery Recycling Pilot Plant	NV	20,000	Battery Grade Materials	NA	American Battery

11.1.3. *Modeled heavy-duty BEV costs could potentially decrease based on battery-related modeling inputs*

EPA's HD TRUCS tool modeling and subsequent cost-benefit analysis for comparison to the No Action case are thorough, but likely overestimate the battery cost per heavy-duty BEV due to conservative technical assumptions made about the advancements of lithium-ion batteries that would replace materials, increase specific energy, or allow for the longer use of batteries through refurbishment or reuse. Therefore, the heavy-duty BEV sales forecasted through the HD TRUCS tool may be an underestimate if these assumptions had a significant impact on the total cost of ownership of BEVs. Additionally, although the mineral demand forecasts from Li-Bridge and other materials cited in the Proposed Rule's discussion of mineral demand are not directly related to HD TRUCS and EPA's cost analysis, the variables discussed below can also cause mineral demand forecasts to be higher than actual future material demand.

11.1.3.1. *Modeling oversized batteries results in higher than necessary BEV costs*

The battery size calculated by Equation 2-27 in the DRIA includes a 20% deterioration of the battery over its lifetime, and accounts for this by including a 20% larger battery at point of sale than necessary to cover the vehicle miles traveled of the desired route. The rationale stated for this increased battery size is that, at the end of the HDVs lifetime, it should cover the same route and go the same distance as needed when an HDV is new. This is a conservative estimate, considering the fleet owner would likely adjust mileage and routes to adjust for the declining capacity over the 15-year lifespan, as has been the case for diesel-powered trucks for decades via the secondary market, rather than pay for the large amount of unused capacity. This is especially true considering the batteries are also estimated to only use 80% of their capacity in order to increase the lifespan of the battery. It would be more appropriate to model the battery usage and mileage based on capacity fade, which has been demonstrated by Yang et al.[193] and Dunn et al.[194] These lifespan estimations of batteries are modeled as a linear decline over the 10-15 years until capacity reaches 70-80%.

Equation 2-27 shown in Figure 24 below, overestimates battery capacity, therefore increasing the cost of BEVs. Any material demand analysis that uses similar metrics would overestimate the amount of materials needed for electric truck batteries.

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[193] Yang, F., Wang, D., Zhao, Y., Tsui, K.-L., & Bae, S. J. A study of the relationship between coulombic efficiency and capacity degradation of commercial lithium-ion batteries. Energy. V. 145. (2018). p. 486– 495. https://doi.org/10.1016/j.energy.2017.12.144

[194] Jessica Dunn, Kabian Ritter, Jesús M. Velázquez, and Alissa Kendall. Should high-cobalt EV batteries be repurposed? Using LCA to assess the impact of technological innovation on the waste hierarchy. Journal of Industrial Ecology. (2023). https://onlinelibrary.wiley.com/doi/10.1111/jiec.13414?af=R

Figure 24: Battery Pack Sizing Equation[195]

$$kWh_{pack}\Big|_{BEV} = \frac{kWh_{Tot}}{mi}\Big|_{BEV}\left(\frac{1}{\eta_{DOD}}\right)(1+\eta_{DET}) * R_{size}$$

Where,

$\frac{kWh_{Tot}}{mi}\Big|_{BEV}$ = vehicle level energy consumption for each BEV

η_{DOD} = depth of discharge (80%)

η_{DET} = battery capacity deterioration over battery life (20%)

R_{size} = Vehicle 90th percentile VMT

11.1.3.2. Technological advancements resulting in decreased mineral demand can also further decrease battery costs

In addition to the substitution of lithium discussed above, advanced lithium-ion batteries, such as solid-state or lithium-air batteries, could decrease the amount of lithium required to provide the same kWh and miles. Innovation will increase battery specific energy and energy density, therefore reducing the amount of materials needed as well as battery cost.

Solid-state battery startups such as QuantumScape[196] are already partnering with automakers to ensure the technology is suitable for EVs. Quantumscape has partnered with Ford and BMW and begun shipping their batteries for trial in 2022.[197] Solid-state batteries have increased specific energy, with Quantumscape reporting their Li-Metal NMC batteries having up to 400 Wh/kg or 1,100 Wh/L depending on the anode. This increase is graphically represented in Figure 25 below, which was produced by QuantumScape.

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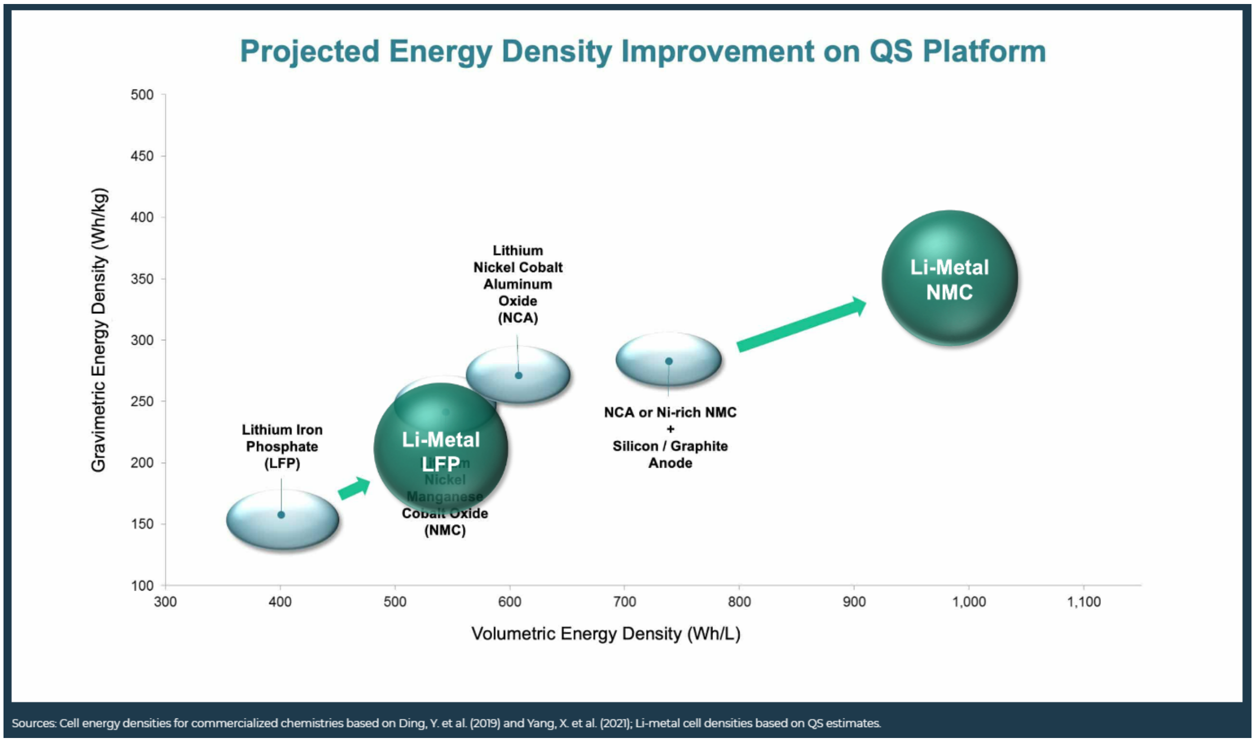
[195] EPA Phase 3 DRIA at 216-217.

[196] QuantumScape. Delivering on the promise of solid-state technology. (2023). https://www.quantumscape.com/technology/

[197] Steve Hanley. Solid Power & QuantumScape Begin Shipping Solid-State Batteries For Trials. CleanTechnica. (2022). https://cleantechnica.com/2022/12/22/solid-power-quantumscape-begin-shipping-solid-state-batteries-for-trials/

Figure 25: Energy Density Improvements as Projected by QuantumScape[198] [199]



Sodium-ion batteries are also making their way to the market and providing an alternative to lithium minerals and potentially reducing future lithium demand. CATL, the world's largest EV battery maker, invested in the technology in 2021[200] and in China the batteries go on sale later this year in the Chery iCAR. Globally there are 20 sodium battery factories under construction or planned around the world, demonstrating the uptake of this technology.[201]

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[198] Ding, Y., Cano, Z.P., Yu, A. et al. Automotive Li-Ion Batteries: Current Status and Future Perspectives. Electrochem. Energ. Rev. 2, 1–28 (2019). https://doi.org/10.1007/s41918-018-0022-z

[199] Yang, Xiaofei, et al. "Recent advances and perspectives on thin electrolytes for high-energy-density solid-state lithium batteries." Energy & Environmental Science 14.2 (2021). p. 643-671.

[200] Magdalena Petrova. Here's why sodium-ion batteries are shaping up to be a big technology breakthrough. CNBC. (2023). https://www.cnbc.com/2023/05/10/sodium-ion-batteries-shaping-up-to-be-big-technology-breakthrough.html#:~:text=The%20technology%20is%20now%20getting,supply%20chain%20by%20this%20year.

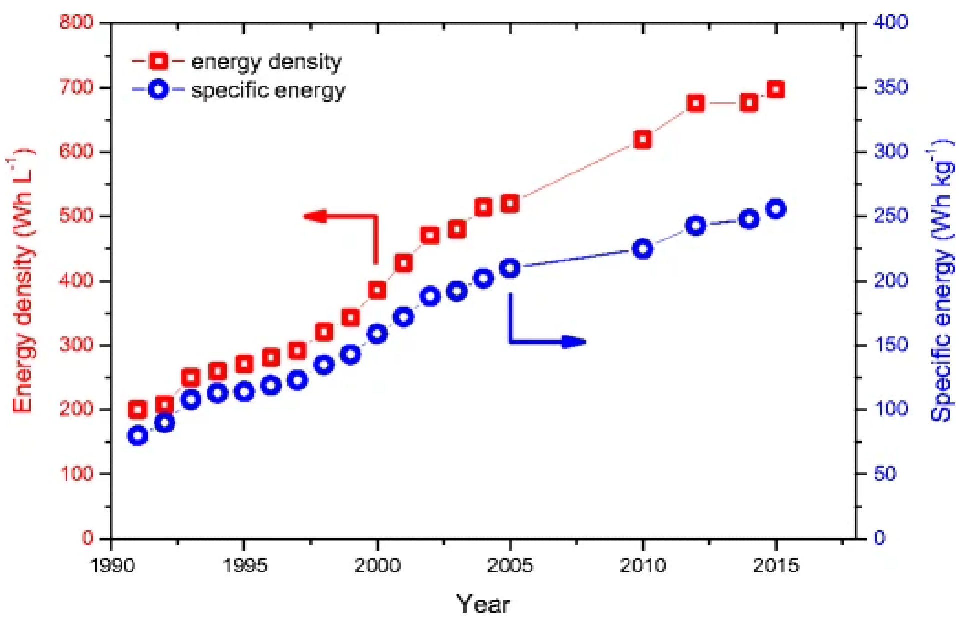
[201] Steve Hanley. The Sodium-Ion Battery Is Coming To Production Cars This Year. CleanTechnica. (2023). https://cleantechnica.com/2023/04/22/the-sodium-ion-battery-is-coming-to-production-cars-this-year/

11.1.3.3. Specific energy assumed in the model is lower than expected for HDVs

11.1.3.3.1. Specific energy improvements over time

"Specific energy" is the amount of energy a battery can store per unit of its weight, and "energy density" is the amount of energy a battery can store per unit of its volume. As shown in Figures 26 and 27 below, both of these metrics have increased dramatically over time for lithium-ion batteries. Improving battery-specific energy and energy density increases the amount of energy that can be stored using the same amount of materials, which is important not only for reducing demand for battery minerals but also for improving the range of electric vehicles. These increases are due to battery chemistry and design improvements. Battery chemistries have different specific energies; nickel and cobalt containing chemistries have higher specific energy than the LFP. For example, Tesla Model Y uses an NCA battery with a reported 276-333 Wh/kg. The Model S and X use a battery with slightly less at 250 Wh/kg.[202] While lower, this 250 Wh/kg is still a drastic increase from the beginning of Panasonic's production in 1990 when it was at about 150 Wh/kg.[203]

Figure 26: Specific energy and energy density of nickel-based lithium-ion batteries continue to increase[204]



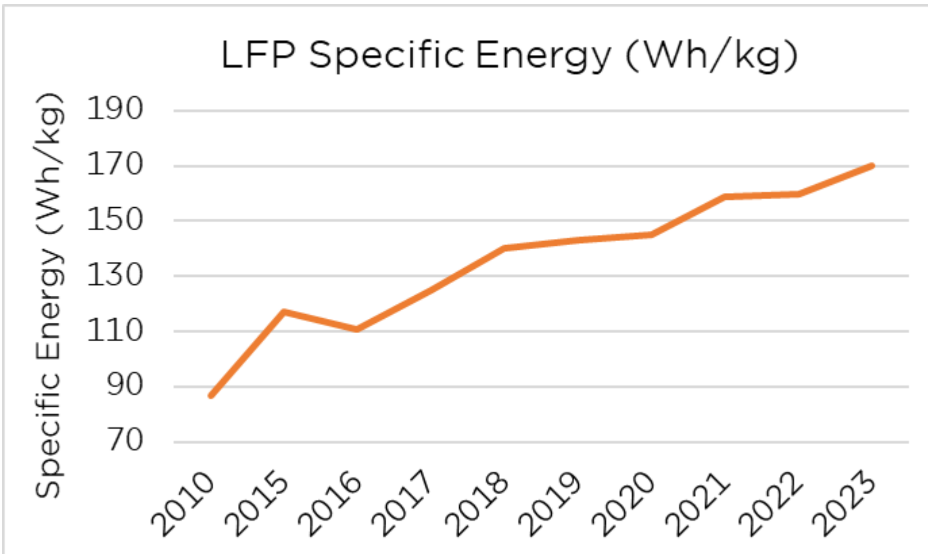
[202] Aditya Dhage. Cylindrical Cell Comparison 4680 vs 21700 vs 18650. V. I. (2023). https://www.batterydesign.net/cylindrical-cell-comparison-4680-vs-21700-vs-18650/

[203] Placke, T., Kloepsch, R., Dühnen, S. *et al.* Lithium ion, lithium metal, and alternative rechargeable battery technologies: the odyssey for high energy density. J Solid State Electrochem. V. 21. (2017). p. 1939–1964 https://doi.org/10.1007/s10008-017-3610-7

[204] *Id.*

LFP batteries have similarly seen advancements in their specific energy capacity, with below 90 Wh/kg in 2010 to current reports from Proterra of 170 Wh/kg[205] and BYD with 166 Wh/kg.[206] BYD has recently announced the blade LFP battery which is estimated to reach 180 Wh/kg[207] due to the use of "cell to pack" design, therefore not using the "cell to module to pack" design that has been historically seen.[208]

Figure 27: Specific energy of LFP lithium-ion batteries continues to increase[209]



11.1.3.3.2. Specific energy forecasts

About 40% of global commercial vehicle sales are expected to contain LFP batteries in 2023, and LFP batteries are more common in certain vehicle segments like electric buses and in certain

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[205] Proterra. Proterra battery pack features and specifications. (2020). https://www.proterra.com/wp-content/uploads/2020/08/Proterra-EV-Battery-Pack-Specs-2020.pdf

[206] BYD Blade. Battery Design from Chemistry to Pack. (2022). https://www.batterydesign.net/byd-blade/#:~:text=Weight%203.9%20kg%20%5B3%5D,Energy%20Density%20%3D%20166%20Wh%2Fkg

[207] BYD Blade. BYD'S new blade battery set to redefine EV safety Standards. (Nd). https://en.byd.com/news/byds-new-blade-battery-set-to-redefine-ev-safety-standards/

[208] International Energy Agency. Global EV Outlook 2022. (2022). https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf

[209] BloombergNEF. Electric Vehicle Outlook 2022. BloombergNEF. (2022). Subscription required. https://bnef.turtl.co/story/evo-2022/page/1

countries like China.[210] In the U.S., LFP batteries in heavy-duty BEVs are less common than nickel- and cobalt-based chemistries, and the use of LFP in commercial vehicles globally is expected to continue to decrease over time, reaching around 30% in 2032.[211] The relatively low pack-level specific energy in Table 2-41 of the DRIA shown in Table 10 below appears to only be taking into account the use of LFP, although this assumption cannot be checked because the cathode chemistry breakout/market share forecast was not provided. This is a conservative estimate of energy density considering nickel and cobalt containing cathodes are used in about a third of trucks, and recent advancements, such as the Blade Battery (10 Wh/kg increase), demonstrate density gains faster than historically seen. The EPA forecasts closely align with the lowest limit of specific energy forecasts by Bloomberg in Figure 27, although it would be more accurate to align with a medium forecast scenario considering the share of NMC chemistries used, especially in the U.S.

Table 10: Battery pack-level specific energy used by EPA in HD TRUCS[212]

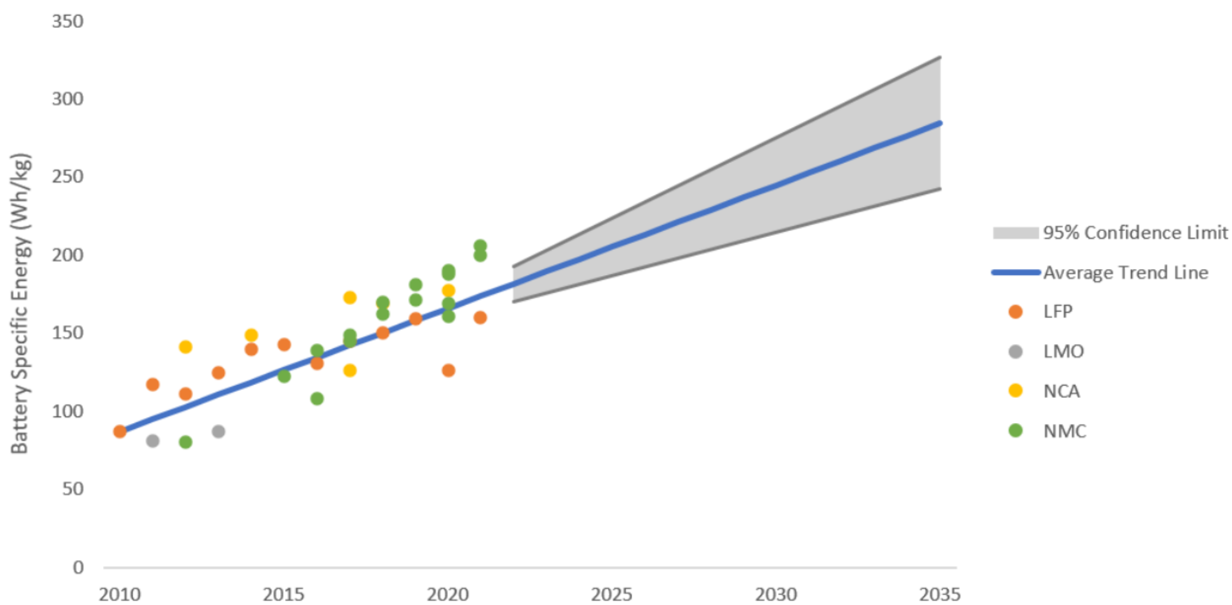
MY	2027	2028	2029	2030	2031	2032
Specific Energy (Wh/kg)	199	203	208	213	218	223

[210] Colin McKerracher et al. Electric Vehicle Outlook 2023. BloombergNEF. (June 8, 2023).

[211] *Id.*

[212] Phase 3 DRIA at 169.

Figure 28: Historic and Forecasted Specific Energy for Different Battery Chemistries[213]



In BloombergNEF's analysis, they used chemistry specific density and forecasted based on linear interpolation demonstrating that in 2027 the 95% confidence lower limit of specific energy is 198 Wh/kg, the same value used in the analysis shown above in Figure 28.[214] BloombergNEF's lower limit values continue to closely align with the forecast used in EPAs analysis. As previously stated, this is likely an underestimation of the average specific energy we will see in the future, considering the share of nickel and cobalt containing chemistries used in the analysis compared to likely real-world scenarios as well as advancements in battery design. In addition, the linear interpretation forecast does not account for material substitution and large specific energy gains expected from quickly advancing technology. For example, the use of silicon in the anode can increase specific energy as shown in Figure 29 below,[215] and while it is not yet used widely, startups are progressing the technology and constructing commercial-scale manufacturing facilities.[216]

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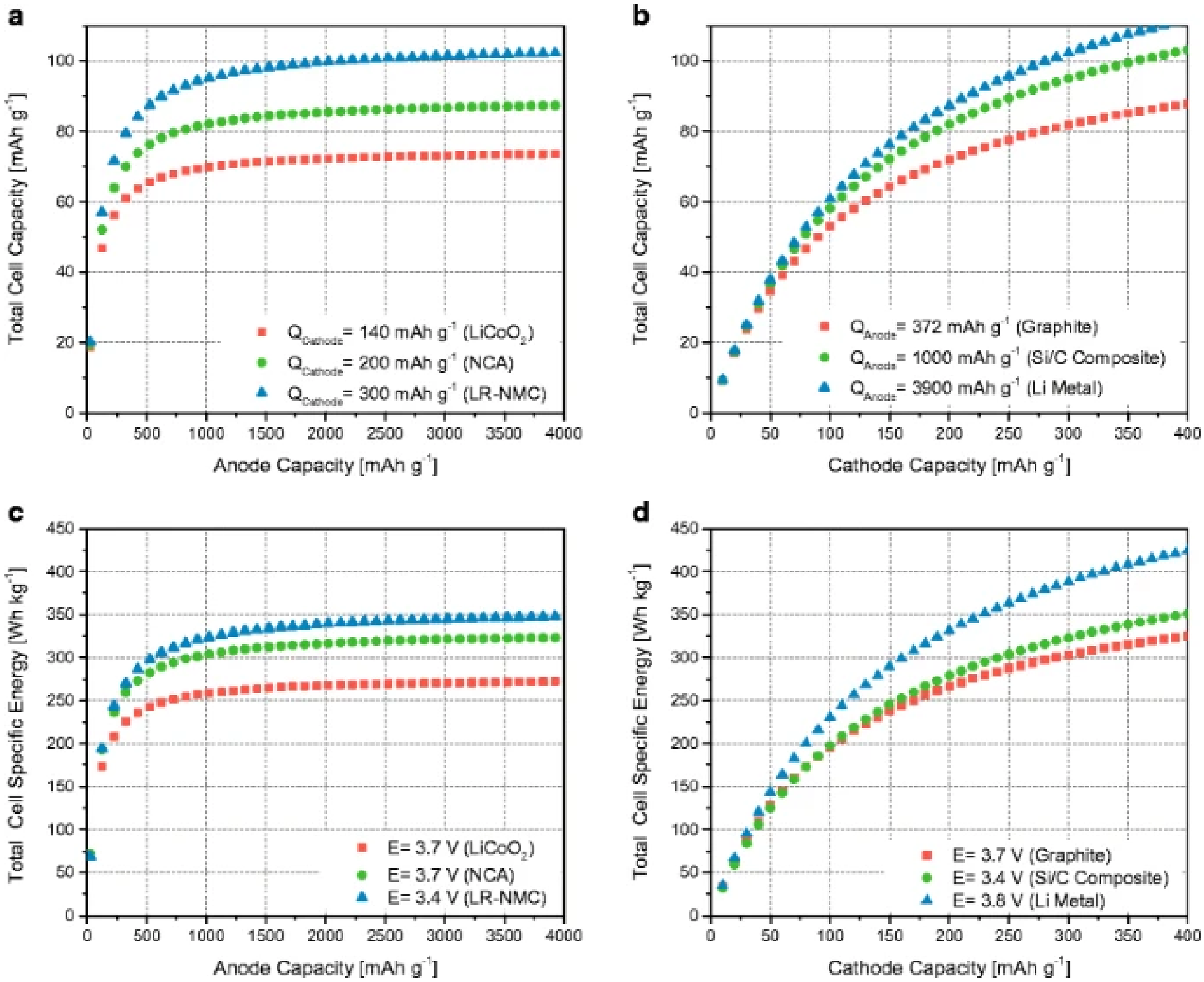
[213] BloombergNEF Electric Vehicle Outlook 2022 (subscription required).

[214] Andy Leach. Lithium-Ion Batteries: State of the Industry. BloombergNEF. (September 9, 2022).This data includes historical and forecasted energy density rates from 2010 - 2035, subscription required for full report.

[215] Placke, T., Kloepsch, R., Dühnen, S. et al. Lithium ion, lithium metal, and alternative rechargeable battery technologies: the odyssey for high energy density. J Solid State Electrochem. V. 21. (2017). 1939–1964. https://doi.org/10.1007/s10008-017-3610-7

[216] Matt Blois. Silicon anode battery companies get a major boost. Chemical and Engineering News. (2022). https://cen.acs.org/energy/energy-storage-/Silicon-anode-battery-companies-major/100/web/2022/12; Group14. Group14 Begins Construction of World's Largest Commercial Factory for Advanced Silicon Battery Materials. (April 4, 2023).

Figure 29: Specific energy and capacity for different anode and cathode compositions (silicon carbon composite anodes show higher metrics across the board than graphite alone)[217]



11.1.3.3.3. An updated specific energy forecast

Updating the specific energy forecast would likely lead to lower costs of heavy-duty BEVs, and therefore, increased feasibility of BEV technologies, thus justifying stronger standards even under EPA's current analytical approach. EPA's assumptions must be revised to reflect what is actually occurring in the market.

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https://group14.technology/en/news/group14-technologies-begins-construction-of-the-worlds-largest-commercial-factory-for-advanced-silicon-battery-materials-

[217] Placke et al.

Table 11 represents the specific energy for HDVs using the linear interpolation approach of the EPA, and including a 30% portion of NMC batteries.

Table 11: Estimated Specific Energy for Heavy-duty BEVs[218]

Year	Specific Energy (Wh/kg)
2027	214
2028	221
2029	229
2030	237
2031	244

Table 11 is calculated based on historical energy densities for LFP and cobalt-containing cathodes provided by BloombergNEF.[219] When specific energy for LFP and cobalt-containing cathodes are individually calculated based on linear interpolation, Table 12 are the results. If the ratio of 70% LFP and 30% cobalt-containing is kept, we get the average specific energy in Table 11.

[218] BloombergNEF Electric Vehicle Outlook 2022 (subscription required)

[219] Colin McKerracher et al. Electric Vehicle Outlook 2022. BloombergNEF. (June 1, 2022).

Table 12: Estimated Specific Energy for LFP and Cobalt-containing Battery Chemistries

	Specific energy (Wh/kg)	
Year	LFP	Cobalt-containing
2027	194	260
2028	201	270
2029	207	280
2030	214	290
2031	220	300

Data Source: BloombergNEF Electric Vehicle Outlook 2022 (subscription required)

Appropriately representing higher specific energies that align with today's technologies and forecasts also has implications for vehicle range and weight. Batteries with higher specific energies can provide the same amount of power while weighing less than batteries with lower specific energies. This means that vehicles with more efficient batteries can travel farther with the same amount of energy because the battery significantly impacts the weight, and therefore, efficiency of BEVs. Lower battery weight has additional implications for heavy-duty BEVs by allowing for additional freight per trip since the battery would contribute less weight towards the total vehicle weight allowance.

11.1.3.4. Design for disassembly

Battery design parameters discussed in the Proposed Rule include "considerations related to cost and performance including specific energy and power, energy density, temperature impact, durability, and safety."[220] A key design parameter not included in this is the design for disassembly (Dfd), also referred to as design for recycling or design for reuse. Dfd is the factoring in of the end of life into the design of the vehicle, meaning that the battery is designed to be taken apart so that cells and modules can be refurbished, reused, or replaced, or so that the battery can be more efficiently and safely disassembled for recycling.[221] This disassembly is typically a difficult, lengthy, and therefore expensive process because Dfd is not included in the design phase.[222]

As reuse and recycling become more prevalent and policies begin to require it, we expect that Dfd will also be more common. If Dfd occurs, it is assumed that more reuse, refurbishment, and replacement will occur. As a result, batteries will have a longer lifespan and the amount of new batteries necessary for electrification will be reduced.[223] The disassembly of a battery from a vehicle and down to the cell level currently represents approximately a third of light duty vehicle recycling costs.[224] If Dfd occurs, these recycling costs will also lessen, therefore leading to more prevalent recycling and more availability of recycled supply.

11.1.4. Battery costs per kWh will continue to decrease.

In its model, EPA uses an average HD battery cost (2021$/kWh at the pack-level) based on a literature review by ICCT as the input in the HD TRUCS model.[225] EPA also notes that according to BloombergNEF, global average pack prices were expected to reach $100/kWh by 2026 as the price increase in 2022 due to mineral price volatility will be resolved within a couple of years. We believe these costs are an appropriate representation of the market. Our own analysis, based on data available to BloombergNEF subscribers in their 2022 Lithium-ion Battery Price Survey,

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[220] U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). NPRM, *2.i Battery Design Parameters,* pg 112. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

[221] Kendall, A., Slattery, M., Dunn, J. Lithium-ion car battery recycling advisory group report. (2022). https://calepa.ca.gov/lithium-ion-car-battery-recycling-advisory-group/

[222] Baazouzi S, Rist FP, Weeber M, Birke KP. Optimization of Disassembly Strategies for Electric Vehicle Batteries. Batteries. V. 7. No.4. (2021). p. 74. https://doi.org/10.3390/batteries7040074

[223] Koroma MS, Costa D, Philippot M, Cardellini G, Hosen MS, Coosemans T, Messagie M. Life cycle assessment of battery electric vehicles: Implications of future electricity mix and different battery end-of-life management. Sci Total Environ. V. 20. (2022). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9171403/

[224] Jessica Dunn, Alissa Kendall, Margaret Slattery. Electric vehicle lithium-ion battery recycled content standards for the US – targets, costs, and environmental impacts. Resources, Conservation and Recyclin. V. 185 No. 106488. (2022). p. 0921-3449. https://doi.org/10.1016/j.resconrec.2022.106488

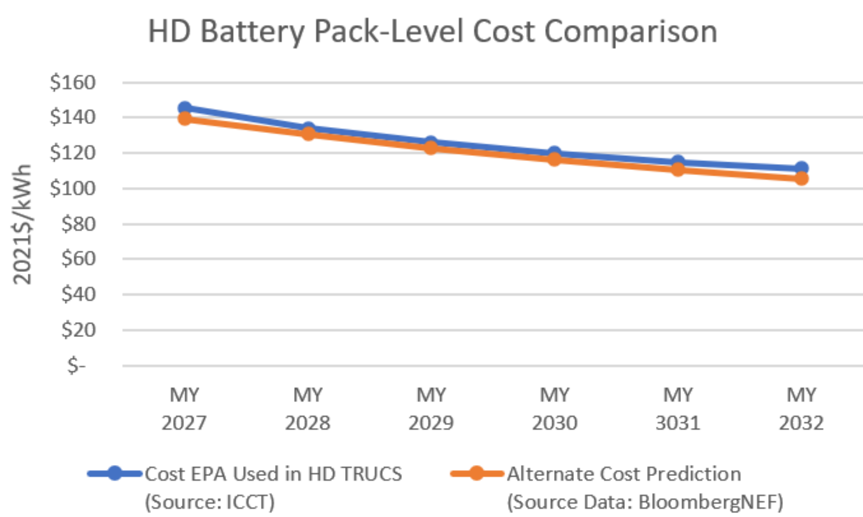
[225] Ben Sharpe, Hussein Basma. A meta-study of purchase costs for zero-emission trucks. The International Council on Clean Transportation. (February 2022). https://theicct.org/wp-content/uploads/2022/02/purchase-cost-ze-trucks-feb22.pdf

yields numbers just slightly below the costs EPA uses in its modeling as shown in Table 13 and Figure 29 below.

Table 13: ICCT's Average Battery Costs used by EPA and Alternate Cost Forecast[226]

Pack-Level Cost Comparison (2021$/kWh)						
	MY 2027	MY 2028	MY 2029	MY 2030	MY 3031	MY 2032
Cost EPA Used in HD TRUCS (Source: ICCT)	$ 145	$ 134	$ 126	$ 120	$ 115	$ 111
Alternate Cost Prediction (Source Data: BloombergNEF)	$ 139	$ 131	$ 123	$ 116	$ 111	$ 105

Figure 30: ICCT's Average Battery Cost Used by EPA is Similar to An Alternative Cost Forecast[227]



We used battery cost data (2022$/kWh) for e-buses and commercial vehicles, global battery demand forecasts, and the most updated learning rate used by BloombergNEF after the 2022 price increase, and a 7.02% inflation rate between June 2021 and June 2022 to convert the data back to 2021$/kWh.[228]

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[226] BloombergNEF 2022 Lithium-Ion Battery Price Survey (subscription required).

[227] BloombergNEF Electric Vehicle Outlook 2022 (subscription required).

[228] Evelina Stoikou et al. Lithium-Ion Battery Price Survey. BloombergNEF. (December 6, 2022). This data includes 2022 e-bus and commercial battery cost data and historical and forecasted global battery demand data from 2010 - 2035, subscription required for full report.

Lastly, as EPA notes, there are several tax credits from the Inflation Reduction Act (including the *§48C* Advanced Manufacturing and the *§45X* Advanced Manufacturing Production tax credits) available to battery manufacturers that will reduce costs below what is represented in EPA's and our own analyses.

11.2. EPA's forecast of factors related to battery technologies are behind current market and future trends

EPA's forecast of battery cost per unit of battery power output ($/kWh) aligns with the best available knowledge and prediction of the market at this time. However, EPA's forecast of some of the other factors related to battery technologies like specific energy are behind where the market is currently and is trending in the future. These inputs can therefore cause the full cost of a heavy-duty BEV to be modeled higher than the most likely real-world scenarios. Therefore, even though the cost per kWh input is appropriate, the cost per BEV is likely an overestimate which would have resulted in a lower ZEV penetration rate than is actually technologically and economically feasible even under EPA's approach.

12. Far from Undermining the Feasibility of Stronger Standards, Barriers to Additional Significant Infrastructure Investments Are Being Actively Removed and Justify Even Stronger Standards

12.1. *EPA Neglects to Account for Other Significant Sources of Federal Funding for ZEVs and Charging Infrastructure*

In the Proposed Rule, EPA rightly points to the historic funding for zero-emission vehicle charging and fueling infrastructure provided by the BIL, highlighting several key programs, including the Clean School Bus Program, Low or No Emission grant program, National Electric Vehicle Infrastructure formula program, Charging and Fueling Infrastructure grant program, and Congestion Mitigation and Air Quality Improvement Program.[229]

However, the BIL includes many other programs for which ZEVs and charging infrastructure are eligible expenses. Atlas Public Policy's inventory reveals there is a total of over $50 billion in BIL funding for which ZEVs and charging infrastructure are eligible expenses:[230]

Figure 31: ZEV Funding in the Bipartisan Infrastructure Law

[229] U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). p. 15-16. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

[230] Ellen Schweppe. Legacy of A Landmark: ISTEA After 10 Years. FHWA. (2022). https://highways.dot.gov/public-roads/novemberdecember-2001/legacy-landmark-istea-after-10-years

And even that inventory does not include the portion of significantly larger BIL-funded programs that could potentially be invested in charging infrastructure (or the significant funding the BIL provides for general electric grid upgrades which will help accommodate increasing levels of EV charging). To illustrate the point, consider the two largest programs funded by the BIL, the National Highway Performance Program ($148 billion over five years) and the Surface Transportation Block Grant program ($72 billion over five years). A portion of those funds could be invested in EV charging infrastructure and other investments that reduce emissions by reducing the need to drive. The block grant program is explicitly designed to be versatile — and is available for a wide range of uses. In fact, it was originally created in the 1991 transportation law to encourage states to move beyond the interstate highway-building era into investments in other improvements to our transportation system, and Congress has added more uses since then.[231] If, say, 20 percent of the funding provided by just those two programs were directed to EV charging infrastructure, it would provide $44 billion in additional federal funding.[232]

12.2. *A More Complete Inventory Reveals $67 billion in Announced Investments in Charging Infrastructure, Including $30 Billion Dedicated to Medium and Heavy-Duty Vehicles and $4 Billion that Could Support Medium and Heavy-Duty Vehicles*

The Proposed Rule's description of recently announced investments in charging infrastructure underscores the fact that significant progress is being made.[233] However, this narrative should be supplemented by a more comprehensive inventory of the public, private, and utility sectors. As of March 31, 2023, Atlas Public Policy (Atlas) estimates $67 billion dollars in charging infrastructure investments that have been announced by the public, private, and utility sectors but not yet installed as charging ports in the ground. Table 14 provides a summary of tallied investment amounts, which include:

- $33 billion in announced, unspent investments for light-duty vehicle (LDV) charging,
- $30 billion in announced, unspent investments for medium- and heavy-duty (MDHD) vehicle charging, and
- $4 billion in announced, unspent investments for use across any vehicle class.

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[231] *Id.*

[232] Deron Lovaas and Max Baumhefner. What if States Turn Pavement Into Charging Stations? (May 16, 2022). https://www.nrdc.org/bio/deron-lovaas/what-if-states-turn-pavement-charging-stations

[233] U.S. EPA. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. (November 2022). Chapter 1.6.2. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

Table 14: Estimated U.S. Charging Infrastructure Investments Announced but Not Yet In the Ground, as of March 31 2023

Investments Announced ($millions)				
Funding Sector	**Funding available only for light-duty vehicle charging**	**Funding available for light-duty, medium-duty or heavy-duty vehicle charging**	**Funding available only for medium- and heavy-duty vehicle charging**	**Total**
Public	$22,263	$4,360	$20,562	$47,186
Private (Non-Utility) [incomplete tally]	$6,254		$4,292	$10,546
Low Carbon Fuel Standard [2023 – 2032]	$2,941		$3,278	$6,219
Utility	$1,886		$1,402	$3,288
Grand Total	**$33,344**	**$4,360**	**$29,534**	**$67,239**

Public funding programs included are those that cover only EV charging infrastructure, or for which EV charging infrastructure is expected to comprise the vast majority of funding. This includes the federal National Electric Vehicle Infrastructure (NEVI) formula and Charging and Fueling Infrastructure (CFI) Discretionary Grant funding, state funding commitments, and modeled estimates of 26 U.S.C. § 30C tax credit payments consistent with an EV adoption trajectory that meets President Biden's goal of 50 percent ZEV sales share by 2030 (for LDVs) and an electric vehicles sales trajectory matching EPA's proposed emissions regulations for medium- and heavy-duty vehicles.[234]

[234] Note that these figures do not include any funding amounts for hydrogen fuel cell vehicles. Regarding the 30C tax credit, Atlas assumes that 1) all qualifying projects receive the tax credit, 2) on average, qualifying projects will receive tax credits worth 18% of covered costs, and 3) that the U.S. Department of the Treasury will classify a census tract as not urban if more than 10% of the blocks within the census tract are designated as rural census blocks (as recommended by Natural Resources Defense Council (NRDC), Alliance for Automotive Innovation, American Council on Renewable Energy (ACORE), Ample, CALSTART, ChargePoint, Clean Energy Works, Earthjustice, Elders Climate Action, Electrification Coalition, Environmental Defense Fund (EDF), EV Charging for All, EVBox, Forth Mobility, Green Latinos, International Brotherhood of Electrical Workers (IBEW),

Even Atlas's tally of private sector commitments is likely incomplete. Private sector actors often do not announce their investment plans, and are especially unlikely to do so if they are investing in home, depot, or workplace charging. Investments here include announced commitments to public charging network developments made after January 1, 2022, by companies including Tesla, Electrify America, BP, General Motors, Daimler, and Mercedes. For MDHD vehicles, private sector commitments are taken largely from Environmental Defense Fund's Electric Fleet Deployment & Commitment List.[235] Tallied private sector commitments *exclude* an estimated $3.0 billion in capital raised by charging companies (including ChargePoint, EVgo, Blink, and Volta), some percentage of which is expected still to be invested in charging hardware and installation. In sum, there are $34 billion in announced infrastructure investments not yet in the ground that could support strong HDV standards.

12.3. *Barriers to the installation of charging infrastructure identified in the Rule are being actively addressed*

The Proposed Rule identifies significant investments in charging infrastructure:

> *… we expect significant increases in HD charging infrastructure due to a combination of public and private investments. This includes Federal funding available through the BIL and the IRA. As discussed in DRIA Chapter 1.6.2.2, states, OEMs, utilities, EVSE providers and others are also investing in and supporting the deployment of charging infrastructure. For example, Daimler Trucks North America, Volvo Trucks, Navistar, and PACCAR are a few of the HD manufacturers investing in EVSE, sometimes packaging the sale of EVSE with the vehicle. Because of these projected increases and the funding available through the BIL and IRA, and as we are proposing more stringent standards that begin in MY 2027, our assessment supports that there is sufficient time for the infrastructure, especially for depot charging, to*

International Parking & Mobility Institute, Itselectric, League of Conservation Voters, National Association of Convenience Stores (NACS), National Consumer Law Center, NATSO, Navistar, Plug in America, Representing America's Travel Plazas and Truck Stops, Rivian, Sierra Club, SIGMA: America's Leading Fuel Marketers, TeraWatt, Transportation for America, Union of Concerned Scientists (UCS), Volvo Group North America).The estimated Low Carbon Fuel Standard value is based on modeling from Dean Taylor Consulting for California, Oregon, and Washington and does not include capacity credits. It uses a 2023 – 2032 EV adoption trajectory for those three states that meets President Biden's LDV goal of 50% ZEV sales share by 2030 (which is lower than the trajectory modeled in the EPA's proposed vehicle emission standards), an MDHD EV adoption curves modeled on the EPA's proposed emissions regulations for MD and HD vehicles, and modeling from Atlas's INSITE tool of MWh demanded by MDHD vehicles. Utility program investments include approved investor-owned utility programs with an EV charging element. Amounts are unspent program dollars as of the most recent program report available as of March 31, 2023. If no program report was available, Atlas used the percentage of time remaining in the approved program schedule to estimate the unspent proportion of program funding.

[235] Available at: https://docs.google.com/spreadsheets/d/1l0m2Do1mjSemrb_DT40YNGou4o2m2Ee-KLSvHC-5vAc/edit#gid=2049738669. MDHD fleet vehicle counts are multiplied by charging ports per vehicle and costs per port modeled in Atlas's Investment Needs of State Infrastructure for Transportation Electrification (INSITE) tool

gradually increase over the remainder of this decade to levels that support the stringency of the proposed standards for the timeframe they would apply.[236]

The Proposed Rule also states:

> *EPA has heard from some representatives from the heavy-duty vehicle manufacturing industry both optimism regarding the heavy-duty industry's ability to produce ZEV technologies in future years at high volume, but also concern that a slow growth in ZEV charging and refueling infrastructure can slow the growth of heavy-duty ZEV adoption, and that this may present challenges for vehicle manufacturers ability to comply with future EPA GHG standards.*[237]

Both the statement that identified significant investments warrants more stringent standards and the statement that the pace of installing charging infrastructure needs to accelerate are true. There are barriers to the timely installation of charging infrastructure that need to be removed to allow investments to be made at an even greater pace and scale, but those challenges are already being actively addressed.

Most of the challenges that vehicle manufacturers have raised associated with energizing charging infrastructure for HDVs in a timely manner are being faced in California, where most electric HDVs are currently being deployed. Thankfully, a state law enacted in 2022 provides California's investor- and publicly-owned utilities with data necessary to inform grid planning to accommodate high levels of EV charging, requires those utilities to propose proactive grid investments in their General Rate Cases to comply with ZEV regulations (as well as a long list of other laws, standards, and requirements), and directs the California Public Utilities Commission (CPUC) and local utility governing boards to ensure the proposed investments are consistent with achieving the state's goals and regulations.[238] In May 2023, Southern California Edison (SCE) filed its General Rate Case, which includes such proactive investments.[239] And the CPUC recently launched a "Zero-Emission Freight Infrastructure Planning" initiative designed to

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236 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 228. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

237 U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 28-29. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy.

238 California Assembly Bill 2700 Transportation electrification: electrical distribution grid upgrades. (2021-2022). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB2700

239 Southern California Edison. 2025 General Rate Case, WP SCE-02. V. 07. Bk. A, TEGR Forecast Development Workpaper.

address the mid- to long-term challenges associated with constructing necessary supporting grid infrastructure in a timely manner to accommodate electric HDVs.[240]

In addition, the California Senate recently voted 32-to-8 to advance new legislation (Senate Bill 410, "Powering Up Californians Act") that builds upon existing law to accelerate short-term energization timelines for EV charging and to ensure timely grid investments needed to electrify "light-duty, medium-duty, and heavy-duty vehicles and off-road vehicles, vessels, trains, and equipment" consistent with state law requiring economy-wide carbon neutrality by 2045, and "federal, state, regional, and local air quality and decarbonization standards, plans, and regulations."[241] The legislation also establishes a balancing account to recover associated costs, which would ensure Pacific Gas & Electric (PG&E) and San Diego Gas & Electric (SDG&E) do not have to wait several years for their next General Rate Cases to propose investments such as those recently proposed by SCE (and it would also allow SCE to propose subsequent investments before its next rate case that could not be predicted when its current rate case was filed).

Grid operators around the country are also beginning to incorporate EV planning into existing planning structures. For example, the Minnesota Public Utilities Commission has shifted investor-owned utility transportation electrification planning and reporting requirements to the integrated distribution planning process to account for increasing linkages between EV planning and distribution system planning.[242] Incorporating robust EV planning in existing planning structures can help ensure those processes account for EV adoption, even where the utility business units responsible for those areas of planning may be distinct. Furthermore, combined planning processes can create administrative efficiencies that help expedite time-sensitive planning needs. On the transmission planning side, regional grid operators, such as the Midcontinent Independent System Operator, have already begun to think about how transportation electrification will affect total energy needs and the timing of annual peaks in electricity demand.[243] Strong vehicle standards give grid operators a reliable EV forecast against which to plan in processes that are already underway.

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[240] California Public Utilities Commission. Draft Staff Proposal: Zero-Emissions Freight Infrastructure Planning. (2023). https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportation-electrification/freight-infrastructure-planning

[241] California Senate Bill 410. (2023). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB410

[242] Minnesota Public Utilities Commission ORDER. (December 8, 2022). *I*n the Matter of a Commission Inquiry into Electric Vehicle Charging and Infrastructure (Docket No. E999/CI-17-879), In the Matter of Minnesota Power's 2021 Integrated Distribution System Plan (Docket No. M-21-390), In the matter of Distribution System Planning for Otter Tail Power Company (Docket No. 21-612), In the matter of Xcel Energy's 2021 Integrated Distribution System Plan (Docket No. (21-694). https://www.edockets.state.mn.us/edockets/searchDocuments.do?method=showPoup&documentId={30E7F284-0000-C810-9E0A-266C1B8B4815}&documentTitle=202212-191192-01

[243] MISO Electrification Insights. (April 2021). https://cdn.misoenergy.org/Electrification%20Insights538860.pdf.

Fundamentally, the charging infrastructure challenges identified by vehicle manufacturers that caused EPA to solicit comment on this issue can be overcome, as evidenced by the progress described above. We are not starting from scratch and do not need to replicate the gas and diesel refueling network to electrify vehicles. The electric grid is already nearly ubiquitous; it only needs to be extended at the fringes. And because it benefits utility shareholders and customers alike to remove barriers to investment in charging infrastructure, we have reason to be optimistic. America's utilities have a long history of accommodating significant growth.

In sum, the private and federal infrastructure investments EPA has identified justify strong standards, and the challenges it has identified are being addressed. Furthermore, as noted above, the EPA's inventory of federal, public, and private investments that already justifies increasingly stringent vehicle standards is incomplete. Critical to the implementation of the infrastructure is the coordination with frontline/fenceline communities to ensure that infrastructure does not increase the burden in these communities.[244]

12.4. *EPA's Conclusion that HDV Charging Will Not Compromise the Reliability of the Electric Grid is Supported by Empirical Data*

EPA observes HDV charging is not anticipated to impact electric grid reliability adversely:

> *U.S. electric power utilities routinely upgrade the nation's electric power system to improve grid reliability and to meet new electric power demands. For example, when confronted with rapid adoption of air conditioners in the 1960s and 1970s, U.S. electric power utilities successfully met the new demand for electricity by planning and building upgrades to the electric power distribution system. Likewise, U.S. electric power utilities planned and built distribution system upgrades required to service the rapid growth of power-intensive data centers and server farms over the past two decades. U.S. electric power utilities have already successfully designed and built the distribution system infrastructure required for 1.4 million battery electric vehicles. Utilities have also successfully integrated 46.1 GW of new utility-scale electric generating capacity into the grid.*[245]

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[244] Moving Forward Network. Letter to Administrator Regan. (Oct 2021). https://www.movingforwardnetwork.com/wp-content/uploads/2021/11/MFN-Zero-Emission-in-Freight-Letter-to-EPA-10_26_21.pdf "Decisions on siting the new electricity infrastructure must be coordinated with environmental justice leaders, address cumulative impacts and support mandatory emissions reductions."

[245] 88 FR 25983

And:

> *Our assessment is that grid reliability is not expected to be adversely affected by the modest increase in electricity demand associated with HD BEV charging and thus was not considered to be a constraining consideration.*[246]

These conclusions are supported by empirical evidence from California, which already has more than 1.3 million EVs on the road. While some pundits have claimed EV charging is already straining the grid, triggering the need for service disruptions, those claims have been debunked.[247] And root cause analysis from the California Independent System Operator (California ISO) showed that EVs are not what has strained the grid.[248] Indeed, empirical evidence shows that EV charging has been accommodated with minimal required grid upgrades and that EV charging can be shifted to hours of the day when there is plenty of spare grid capacity. Since 2011, the California Public Utilities Commission has required the utilities it regulates to report annually on costs associated with accommodating EV charging and on the charging patterns of EVs on different utility rates.[249] While the vast majority of those EVs are passenger vehicles, the real-world data on charging patterns and associated grid impacts gathered by the largest utilities in the state is still relevant, especially considering that the "Level 2" equipment used to charge those passenger vehicles is the same equipment that is used to meet the daily charging needs of most of the categories of vehicles subject to the Proposed Rule. As summarized by Synapse Energy Economics, utility grid upgrades required to accommodate EV charging to this point in those service territories are essentially rounding errors compared to the costs of maintaining the electrical grid:

> *Even in the service territories with the most EVs of any, the observed costs have been minor. For instance, in California where EV adoption has been markedly higher than other states, EV-related distribution upgrade costs appear minor compared to total distribution costs. Despite the fact EVs are often more concentrated in many neighborhoods and distribution circuits, California utilities collectively spent less than 0.03% of their total*

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[246] 88 FR 26003.

[247] Dustin Gardiner. No, Newsom's push for electric cars isn't the cause of potential blackouts in California. San Francisco Chronicle. (Sep. 7, 2022). https://www.sfchronicle.com/politics/article/No-Newsom-s-push-for-electric-cars-isn-t-the-17426102.php.

[248] California ISO. Root Cause Analysis: Mid-August 2020 Extreme Heat Waive. (January 13, 2021). http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

[249] Alliance for Automotive Innovation. Electric Vehicle Sales Dashboard. https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard; *Joint IOU Electric Vehicle Load Research and Charging Infrastructure Cost Report 10th Report*, Filed on March 31, 2022, available at: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/10th-joint-iou-ev-load-report-mar-2022.pdf (Last accessed: May 30, 2023).

distribution-related expenses on distribution system upgrades associated with residential EV adoption.[250]

And costs associated with integrating both light- and heavy-duty EV charging onto the grid can also be minimized with effective load management programs, as described immediately below.

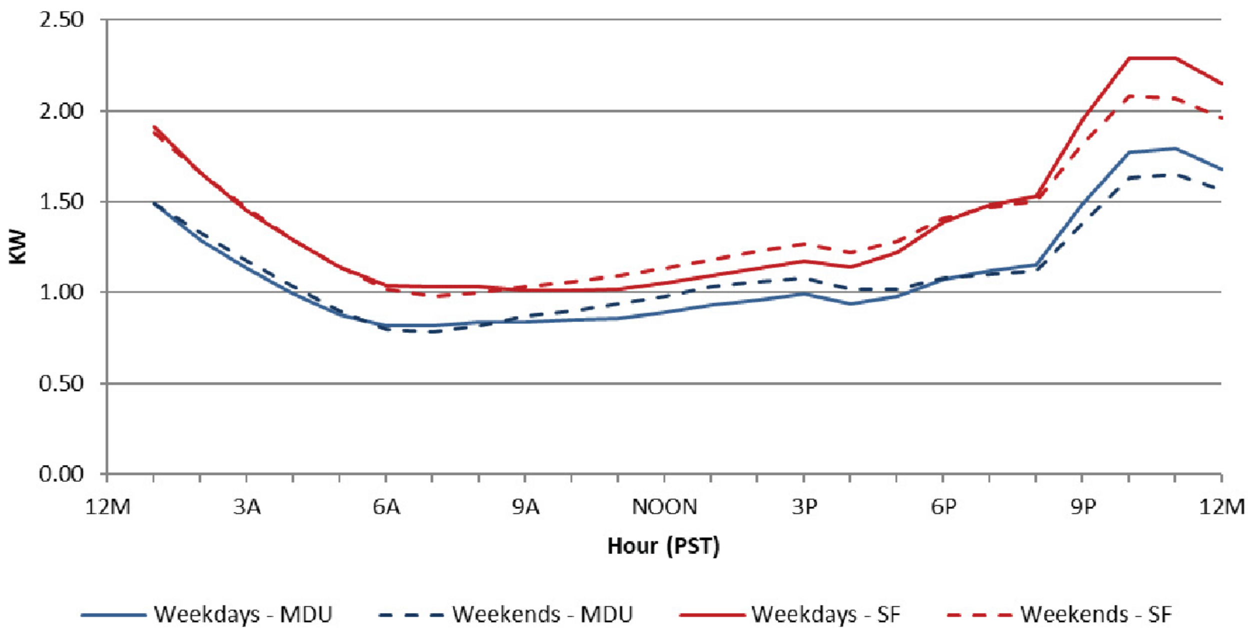
12.5. Time-of-Use Electric Rates Are Extremely Effective at Pushing EV Charging to Hours of the Day When there is Plenty of Spare Grid Capacity

Real-world data from hundreds of thousands of EVs reveals that time-of-use (TOU) electricity rates work. At the time the data described below was collected, SCE estimated there were 329,940 EVs in its service territory (through December 31, 2021).[251] Figure 32 shows the load profile of households in SCE territory with EVs, with a readily discernible uptick in electricity demand after 9PM (when the on-peak period ends on the time-of-use rates) as a result of EV charging that increases until just before midnight and trails off in the early morning hours as those EVs complete their charging.

[250] Melissa Whited, Tyler Fitch, Jason Frost, Eric Borden, Courtney Lane, Ben Havumaki Sarah Shenstone- Harris, and Elijah Sinclair. Electric Vehicles Are Driving Rates Down. (June 2023). https://www.synapse-energy.com/sites/default/files/Electric%20Vehicles%20Are%20Driving%20Rates%20Down%20Factsheet.pdf

[251] Joint IOU Electric Vehicle Load Research and Charging Infrastructure Cost Report 10th Report. Filed on March 31, 2022. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/10th-joint-iou-ev-load-report-mar-2022.pdf

Figure 32: Load Profile of Households with EVs on a TOU Rate in SCE Territory[252]



The impact of TOU rates is even more self-evident in Figure 33, which isolates EVs on separate meters, demonstrating that EVs charge almost exclusively after 9 PM on that TOU rate.

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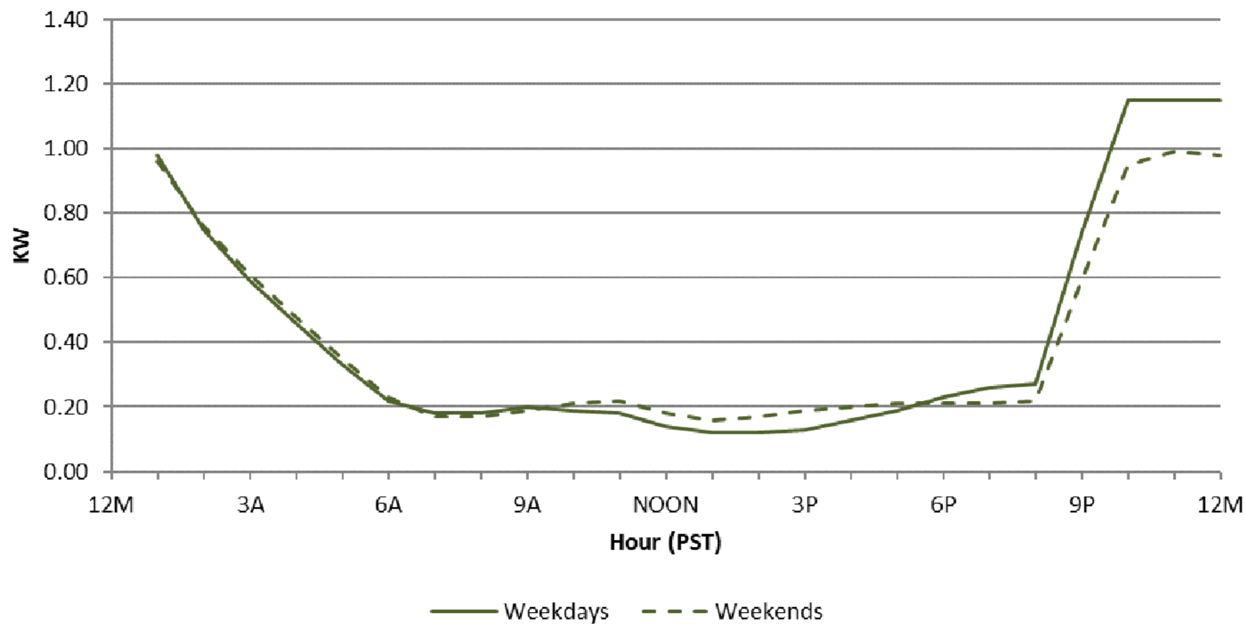
[252] *Id.*

Figure 33: Load Profile of EVs on a Separately Metered TOU Rate in SCE Territory[253]



The figures above represent real-world data collected from hundreds of thousands of households with EVs. There is no need to test the proposition that simple TOU rates designed for EVs work. If they work for LDVs parked at home for long periods of time, they should also work for HDVs parked at depots, homes, or other locations for long periods of time. Given EPA expects the vast majority of charging for the HD EVs contemplated in its Proposed Rule will occur at depots and other locations where EVs are typically parked for long periods of time, often overnight, the real-world data described above remains relevant. And TOU rates are often the default option for commercial and industrial customers in the U.S. (whereas residential customers typically need to opt-into a TOU rate), and commercial and industrial customers are generally more sensitive to price signals than residential customers.

The combination of TOU rates and more active means of managing EV charging can yield even greater benefits. Researchers from NRDC, Lawrence Berkeley National Laboratory, and Pacific Gas & Electric found that well-designed TOU rates could allow the utility's system to accommodate universal light-duty EV adoption with minimal associated costs.[254] This peer-reviewed study used real-world data on the distribution grid and EVs to simulate what would happen if every household in a major metro area had an EV and found that, if just 30 percent of light-duty EVs were on TOU rates, the required grid upgrades were reduced by a factor of four and that more comprehensive load management could essentially prevent all

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253 *Id.*

254 Jonathan Coignard et al. Will Electric Vehicles Drive Distribution Grid Upgrades?: The Case of California. 7 IEEE 2. (June 5, 2019). p. 46-56

otherwise necessary grid upgrades.[255] The potential impacts of generally higher-powered HD EV charging, some of which may need to occur during hours when overall demand for electricity is greater, could be more extensive, but the demonstrated efficacy of TOU rates and other load management strategies is still relevant.

12.6. *EVs Can Lower the Cost of Managing an Increasingly Dynamic Electric Grid*

Researchers from Lawrence Berkeley National Laboratory estimate that using smart charging of light-duty EVs as a means to comply with California's energy storage procurement mandate (designed to facilitate the integration of renewable energy) would save utility customers $1.5 billion because it is cheaper to use batteries customers have already purchased on four wheels than it is to pay private companies to deploy standalone battery storage.[256] The same study also found enabling so-called "vehicle-to-grid" (V2G) technology, allowing EVs to supply power back to the grid during times of stress, could save $13-15 billion in stationary battery costs.[257] "By displacing the need for construction of new stationary grid storage, EVs can provide the dual benefit of decarbonizing transportation while lowering the capital costs for widespread renewables integration," the researchers concluded.[258]

Focusing on the Midwest to underscore the point, researchers conclude very high levels of renewable energy penetration in the Midcontinent Independent System Operator (MISO) region could result in "negative valleys" (requiring excess renewable energy to be exported or curtailed) but "[c]ontrolled (EV) charging (both smart charging and smart discharging back onto the grid) is able to reduce these negative valleys, and with sufficient numbers of EVs can eliminate them altogether, obviating the need for either export of excess renewable generation or curtailment."[259] This would provide both increased environmental benefits by facilitating the integration of high levels of renewable generation and significant customer benefits.

Put simply, it is cheaper to pay individual utility customers to use batteries on wheels they have already bought-and-paid-for than it is to pay corporations to buy big batteries and park them on the grid. And that simple proposition holds true for both individual passenger vehicle drivers and for fleet managers whose HD EVs have even bigger batteries and higher power intake and output

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[255] *Id*.

[256] Jonathan Coignard, Samveg Saxena, Jeffery Greenblatt, and Dai Wang. Clean Vehicles as an Enabler for a Clean Electricity Grid. Environmental Research Letters. V. 13, No. 5. (May 2018). http://iopscience.iop.org/article/10.1088/1748-9326/aabe97. (last checked September 14, 2022).

[257] *Id*.

[258] *Id*.

[259] Jeffery Greenblatt, Cong Zhang, Samveg Saxena. Quantifying the Potential of Electric Vehicles to Provide Electric Grid Benefits in the MISO Area: Final report to the Midcontinent Independent System Operators. Lawrence Berkeley National Laboratory. https://cdn.misoenergy.org/Quantifying%20the%20Potential%20of%20Electric%20Vehicles%20to%20Provide%20Electric%20Grid%20Benefits%20in%20the%20MISO%20Area354192.pdf. (last checked September 14, 2022).

potential (meaning they can potentially both absorb more excess renewable energy when available and put more power back onto the grid when needed).

Moreover, the revenues from participating in vehicle-grid integration programs and markets can create value streams that reduce the total cost of ownership of EVs for the driver or fleet operator. HD EVs have a variety of duty cycles and vehicle characteristics, including battery size and charging power. A particular vehicle segment or vocation may be better suited to providing power or other grid services than others. The California Joint Agencies Vehicle-Grid Integration Working Group found that a large number of vehicle use cases could provide value now in a variety of different vehicle-grid integration applications, including V2G applications.[260]

While many types of HD EVs could potentially provide V2G services, school buses are already doing so in the real world. They have defined duty-cycles during the school year that include significant portions of the day when they are sitting idle while solar generation peaks in the afternoon and when wind generation often peaks overnight. In the summer months, they can often be fully dedicated to providing energy storage and grid services. Many V2G school bus demonstration projects have been conducted or are in progress. A pair of early examples in California demonstrates how different approaches to power export can create revenue streams for school districts or school bus operators and support the grid in the process. A project in Torrance Unified School District uses energy stored in two electric school buses to power on-site electrical loads. This behind-the-meter solution saved the school district about $10,000 per year, by reducing power usage and demand charges.[261] A project in Rialto Unified School District is taking a different approach, using a front-of-the-meter grid interconnection to allow eight electric buses to generate revenue by participating as a distributed energy resource in the CAISO market.[262]

Dominion Energy in Virginia has the largest electric school bus V2G program in the country.[263] In 2020, the utility program already had 50 electric school buses on the road. To date, the program has tested and verified V2G functionality on one bus and is deploying and testing firmware capability on the balance of the 50 bus fleet.[264] Over time, the program is designed to

[260] Final Report of the California Joint Agencies Vehicle-Grid Integration Working Group. (June 30, 2020). https://gridworks.org/wp-content/uploads/2020/09/GW_VehicleGrid-Integration-Working-Group.pdf

[261] Nicole Schlosser. California district to receive first electric school bus in conversion project. (July 14, 2015). https://www.schoolbusfleet.com/10042977/california-district-to-receive-first-electric-school-bus-in-conversion-project; Kevin Matthews. V2B Background on EV V2G School Bus Demonstration Programs CEC Workshop on V2B for Resilient Backup Power. (January 2021). https://efiling.energy.ca.gov/getdocument.aspx?tn=236550

[262] Kuba Szczypiorski. Blue Bird Electric School Bus. (Nd). https://cleanairnortheast.epa.gov/pdf/v2g/blue-bird-electric-bus-k-szczypiorski.pdf

[263] Dominion Energy. Electric School Buses. Dominion Energy. https://www.dominionenergy.com/virginia/save-energy/electric-school-buses. (Last accessed: September 21, 2022).

[264] DISTRIBUTECH International Conference. Insights from the Nations Largest V2G Electric School Bus Pilot. (February 7, 2023). slide 18.

scale to 1,000 buses that will be able to provide 105 megawatt-hours of energy storage, enough to power 10,000 homes.[265]

12.7. *EV Charging is Already Putting Downward Pressure on Electric Rates to the Benefit of All Utility Customers*

Because much EV charging can be accomplished when there is spare capacity on the grid, charging can spread the costs of maintaining the system over a greater volume of electricity sales, reducing the per-kilowatt-hour price of electricity to the benefit of all customers. This has already been demonstrated in the real-world with light-duty EV charging and is expected to hold true for HD EV charging as well.

In fact, real-world data compiled by Synapse Energy Economics shows EV drivers are not being subsidized by other utility customers and, in fact, they are putting downward pressure on rates. Between 2011 and 2020, EV customers across the United States have contributed more than $1.7 billion in net-revenue to the body of utility customers.[266]

The results shown in Figure 34 compare the new revenue the utilities collected from EV drivers to the cost of the energy, capacity, transmission, and distribution system upgrades required to charge those vehicles, plus the costs of utility EV infrastructure programs that are deploying charging stations for EVs. In total, EV drivers contributed an estimated $1.7 billion more than associated costs. That net-revenue is returned to the body of utility customers in the form of electric bills that are lower than they otherwise would be.

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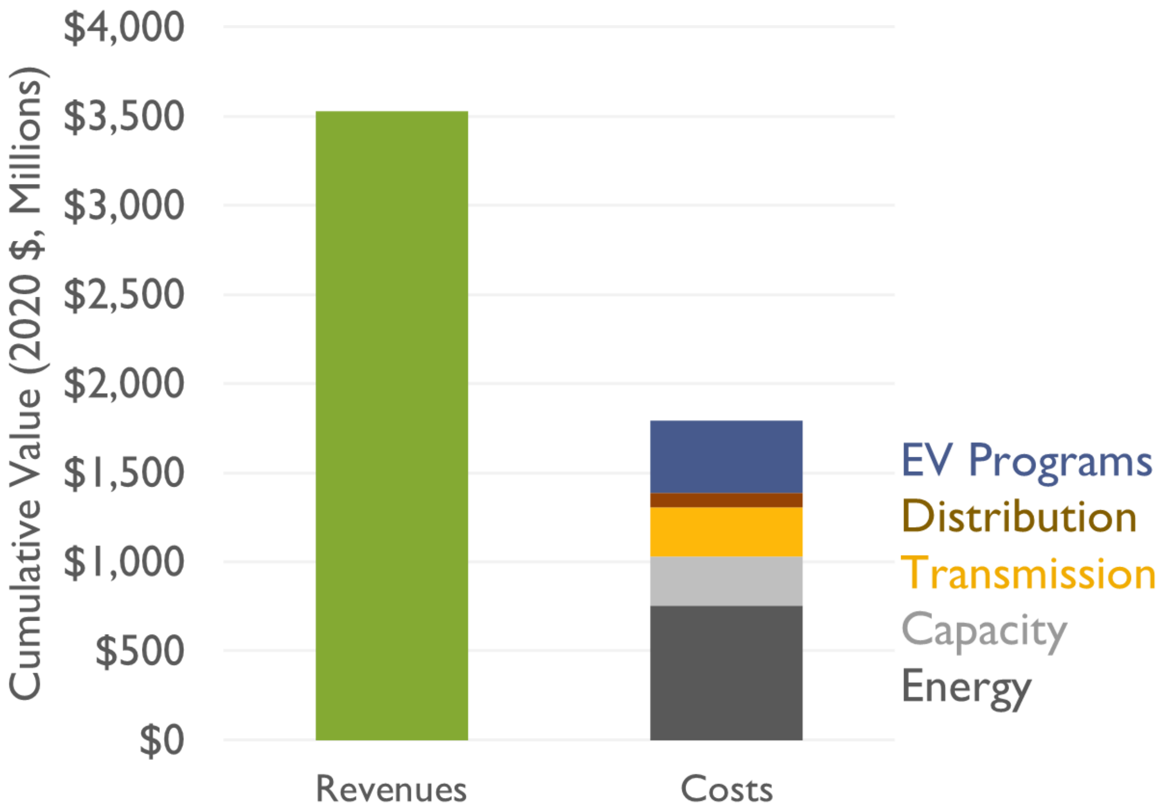
https://www.distributech.com/2023-distributech-international-conference-sessions/insights-from-the-nations-largest-v2g-electric-school-bus-pilot

[265] Dominion Energy. Dominion Energy moves forward with electric school bus program. Dominion Energy. (2020). https://news.dominionenergy.com/2020-01-16-Dominion-Energy-Moves-Forward-with-Electric-School-Bus-Program;PJM Inside Lines. V2G Hits the Big Time with Dominion Electric School Bus Project. PJM Inside Lines. (2019). https://insidelines.pjm.com/dominion-to-roll-out-largest-electric-school-bus-deployment-in-u-s/

[266] Melissa Whited, Tyler Fitch, Jason Frost, Eric Borden, Courtney Lane, Ben Havumaki Sarah Shenstone- Harris, and Elijah Sinclair. Electric Vehicles Are Driving Rates Down. (June 2023). https://www.synapse-energy.com/sites/default/files/Electric%20Vehicles%20Are%20Driving%20Rates%20Down%20Factsheet.pdf

Figure 34: Total Utility Revenues vs. Total Costs Associated with EVs (2011-2020)



While the costs associated with serving generally higher-powered HD EV charging could be more significant on a per-vehicle basis, there is still significant potential for HD EV charging (much of which can still be done during off-peak hours when there is plenty of spare grid capacity) to improve the utilization of the electric grid and put downward pressure on utility rates as a result. In fact, analysis conducted by ERM estimates that widespread medium and heavy-duty EV charging could result in $433 million in net-utility-revenue in 2030, rising to $2.4 billion in 2040, and $4.1 billion in 2050.[267]

12.8. *New Utility Rates Designed for EV Charging Increase the Fuel Cost Savings EVs Can Provide*

Gasoline, diesel, and electricity prices vary across the country, and electricity prices vary depending upon the particular characteristics of the utility rate on which a customer takes service. And many existing commercial and industrial utility rates have "demand charges" that

[267] ERM. 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. ERM. (2022). p. 23. https://www.erm.com/contentassets/f3d6061dd8a04147a3f38b7db256ae44/federal-clean-trucks-report.pdf

can reduce fuel cost savings for high-powered/low-utilization applications like some EV charging use-cases. Thankfully, the challenge such demand charges can pose for EV charging has long been recognized and across the nation, many utilities and regulators have already implemented solutions or are in the process of doing so.

In fact, the BIL amended the Public Utility Regulatory Policies Act (PURPA) Section 111(d) to require regulators and non-regulated utilities to consider new rates that:

> *promote affordable and equitable electric vehicle charging options for residential, commercial, and public electric vehicle charging infrastructure; improve the customer experience associated with electric vehicle charging; accelerate third-party investment in electric vehicle charging for light-, medium-, and heavy-duty vehicles; and appropriately recover the marginal costs of delivering electricity to electric vehicles and electric vehicle charging infrastructure*.[268]

This has spurred new regulatory proceedings across the country. But many utilities, regulators, and state legislatures were already acting to address this issue before the BIL became law.

As detailed in a publication of the National Association of Regulatory Utility Commissioners (NARUC) entitled "Best Practices for Sustainable Commercial EV Rates and PURPA 111(d) Implementation," rates designed for EV charging can deliver significant fuel cost savings without relying upon cross-subsidies from other utility customers.[269] For example, on a new Pacific Gas & Electric rate designed for commercial EV charging that still recovers all associated marginal costs, the San Joaquin Regional Transit District reduced its overall fuel cost per mile from $2.31 to $0.68 (in a utility service territory that has some of the higher underlying marginal costs in the nation).[270] The paper also details rates that take a similar approach that were approved for Southern California Edison, San Diego Gas & Electric, and Alabama Power.

Since the publication of that NARUC paper, many other utilities and regulators have either proposed or secured approval of new rates designed for EV charging. And by the time the HDV rule goes into effect in 2027, many more will have followed suit, increasing the fuel cost savings EVs can provide.

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[268] H.R.3684. Infrastructure Investment and Jobs Act. 117th Congress. (2021-2022). Section 40431 www.congress.gov/bill/117th-congress/house-bill/3684/text.

[269] Nancy Ryan, Alissa Burger, Jenifer Bosco, John Howat, and Miles Muller. Best Practices for Sustainable Commercial EV Rates and PURPA 111(d) Implementation. (2022). https://pubs.naruc.org/pub/55C47758-1866-DAAC-99FB-FFA9E6574C2B

[270] *Id.*

12.9. *EPA Should Expect Significant Employment Opportunities Associated with the Installation and Maintenance of Charging Infrastructure and Associated Grid Infrastructure*

EPA correctly observes:

> *As the share of ZEVs in the HD market increases, there may also be effects on employment in the associated BEV charging and hydrogen refueling infrastructure industries. These impacts may occur in several ways, including through greater demand for charging and fueling infrastructure to support more ZEVs, leading to more private and public charging and fueling facilities being constructed, or through greater use of existing facilities, which can lead to increased maintenance needs for those facilities. We request comment on data and methods that could be used to estimate the effect of this action on the HD BEV vehicle charging infrastructure industry.*[271]

Research conducted on behalf of *EV Infrastructure Strike Force* suggests that, if the Biden Administration's goal of deploying 500,000 EV charging stations is met with public fast charging stations, it will support about 30,000 job-years.[272] The work supported by HDV charging, which is generally higher-powered than LDV charging, could be even more extensive.

13. Concerns With EPA's Public Comment Process

EPA's ability to effectively regulate environmental harms and enforce critical legislation, such as the Clean Air Act, depends on a public engagement process (including public comment periods) that is accessible to all stakeholders impacted by proposed regulations. If limitations in access to the Phase 3 public engagement process like those described below are not remedied, it is likely the rule will not be informed by valuable analysis and guidance from communities that are disproportionately impacted by heavy-duty vehicle pollution. In 2021, the White House issued its "Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-based Policymaking" and the Scientific Integrity Framework that lays out requirements for federal agencies, including EPA, to develop scientifically robust policies.[273] The OSTP report

[271] U.S. EPA. Proposed Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3. 88 Fed. Reg. 25926, 26074 (Apr. 27, 2023). p. 469. https://www.epa.gov/regulations-emissions-vehicles-and-engines/proposed-rule-greenhouse-gas-emissions-standards-heavy

[272] Edward W. Carr, James J. Winebrake,Samuel G. Winebrake.Workforce Projections to Support Battery Electric Vehicle Charging Infrastructure Installation. Energy and Environmental Research Associates, LLC. (2021). https://etcommunity.org/assets/files/Workforce-ProjectionstoSupportBatteryElectricVehicleChargingInfrastructureInstallation-Final202106082.pdf

[273] Biden, J. Memorandum on restoring trust in government through scientific integrity and evidence-based policymaking. (January 27, 2021). https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-gov

stressing the need to advance equitable data collection was released around the same time,[274] and the Science Advisory Board also provided recommendations for strengthening the evaluation of environmental justice impacts of air pollution regulations in the same month the HD Truck proposal was finalized.[275] The Biden administration understands the need for scientifically robust and equitable policymaking, but these tools have yet to be implemented effectively.

Because public comment periods are less accessible to affected communities due to a number of factors including those captured below, business commenters tend to shape the final policy to a greater extent than nonbusiness commenters.[276] A Phase 3 public comment period that is less accessible to the frontline and fenceline communities limits EPA's ability to protect communities across the country from toxic diesel emissions produced by the freight system. It is critical that agencies, such as EPA, investigate strategies for proactively engaging communities, and evaluating and responding to public comments to ensure that stakeholder concerns are heard and understood in an equitable, efficient way.[277] The following are recommendations for beginning to improve the accessibility of the EPA's public engagement process and the effectiveness of public comment periods for shaping impactful and just regulation.

Collect Environmental Justice feedback and research earlier to inform proposals. Once a proposal is released and the public comment period begins, the range of changes to a rule the public can influence is significantly limited.[278] EPA took steps to increase engagement with

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ernment-through-scientific-integrity-and-evidence-based-policymaking/; National Science and Technology Council. 2023. A framework for federal scientific integrity policy and practice, guidance by the Scientific Integrity Framework Interagency Working Group. https://www.whitehouse.gov/wp-content/uploads/2023/01/01-2023-Framework-for-Federal-Scientific-Integrity-Policy-and-Practice.pdf. These actions are summarized in Borkowski, L. Roundup: A new scientific integrity framework and overstretched EPA staff. The Equation. (May 12, 2023). https://blog.ucsusa.org/science-blogger/roundup-a-new-scientific-integrity-framework-and-overstretched-epa-staff/.

[274] National Science and Technology Council. 2023. Progress on implementation of the recommendations of the equitable data working group. Report by the Subcommittee on Equitable Data, March. https://www.whitehouse.gov/wp-content/uploads/2023/03/Progress-on-Equitable-Data-Mar2023.pdf.

[275] Reilly, S. "EPA advisers urge overhaul of EJ accounting in air rules," Greenwire. (December 19, 2022). https://subscriber.politicopro.com/article/eenews/2022/12/19/epa-advisers-urge-overhaul-of-ej-accounting-in-air-rules-00074554.

[276] Yackee, J.W., and S.W. Yackee. A bias toward business? Assessing interest group influence on the U.S. bureaucracy. Journal of Politics. V. 68. No.1. (2006). p. 128–139. www-journals-uchicago-edu.ezproxy2.library.colostate.edu/doi/pdfplus/10.1111%2Fj.1468-2508.2006.00375.x.

[277] Small, D. Public participation in rulemaking in the age of mass comments. Washington, DC: Administrative Conference of the United States. Blog. (July 19, 2018). www.acus.gov/newsroom/administrativefix-blog/public-participation-rulemaking-age-mass-comments.

[278] Potter, R.A. Slow-rolling, fast-tracking, and the pace of bureaucratic decisions in rulemaking. Journal of Politics. V. 79. No. 3. (2017). p. 841–55. www-journals-uchicago-edu.ezproxy2.library.com

environmental justice communities the month before the Phase 3 rule was released. However, by that point, there was little time for the EPA to incorporate feedback and proposed solutions to resolve major air quality concerns related to the heavy reliance on hydrogen combustion in the rule before the proposal was submitted to the Office of Management and Budget Directives (OMB). Increased EJ engagement earlier in the proposal writing process would better inform the final rule.

Lengthen public comment periods beyond 50 days. The fifty-day public comment period has significantly limited the amount of outreach and community engagement possible for informing the public about the Phase 3 proposal and turning out comments and testimonies. The shorter public comment period favors better-resourced actors that can afford lobbyists that influence the rule at the expense of environmental justice. Public comment periods that are the maximum allowable by law are more equitable. Combined with longer comment periods, virtual hearings, and in-person public hearings in impacted communities, public hearings that take place outside of working hours, the ability to submit written and oral comments in non-English languages, virtual public hearings with active transcription services for people hard of hearing or with disabilities help to improve access to public comment periods.

Improve accessibility of relevant information shared in Spanish. In addition to increasing the length of public comment periods to improve access to information by environmental justice communities, improvements to language access is also crucial. EPA distributed materials and communication about Phase 3 in Spanish. However, in some cases, there was no indication that the information was also available in Spanish and required that a non-English speaker scrolls beyond the English sections of the communication before seeing information in Spanish. For documents that contain information in English and Spanish, including a sentence at the beginning of the document conveying that information in Spanish is available below would ensure the accessibility of information to Spanish-speakers - For example, “Para información en español, haga clic aquí”/ “Información en español abajo”.

Improve hearing registration and block scheduling process. EPA only provided the public with 13 business days (April 12-May 1) to register for the Phase 3 hearing, which limited the ability of environmental justice communities to register and provide testimony at the hearing. The fifty-day public comment period possibly exacerbated this challenge. Additionally, testifiers were notified of their assigned hearing block only 24 hours prior to the hearing. This does not give the working public enough time to notify their employers to take time away from their jobs.

Improve Spanish language access during hearings.

- More lead time before a hearing will make it more feasible to circulate hearing details and information in Spanish to allow for more participation from Spanish speaking communities.

- When you account for Spanish speakers having to slow down for translation, they receive less than the actual allotted time. It also creates challenges for interpreters to be able to translate accurately when testifiers are forced to speak too quickly. The time limits for testimonies create situations where an interpreter may not have enough time to fully translate a testimony to Spanish because it takes additional time to convey what was said in English. EPA should provide more time for those needing translation (e.g., meaning testimony time would be set, for example, at 3 minutes, but the scheduling for testimony would be that each person has 4 minutes to account for a slower pace for translation).

- Interpreters may need a more complete glossary to reference ahead of the hearing to improve the accuracy of translations.

- Testifiers speaking in Spanish may need more guidance to know which channel to use when providing testimony.

- More words are often needed to communicate the same point in Spanish than it takes in English. Equal time limits for giving testimony in English and Spanish are also less fair for Spanish speakers since it takes more time to convey a point in Spanish. For this reason, Spanish speakers do not have an equitable amount of time to give testimony relative to their English-speaking counterparts.

The voices not adequately heard in the public participation process call for the strongest possible standards.

14. Locomotives and Rail

Moving Forward Network is submitting detailed written comments on the EPA's inclusion of the rail and locomotive section in this rule-making. Below, we note some key points regarding our support for EPA's proposed revisions, and we urge EPA to take additional action to develop new life-saving, zero-emission regulations to address this major source of deadly pollution.

Many communities across the country live near rail yards and freight railroads, where some of the dirtiest switcher and line-haul locomotives operate, and they are belching dirty diesel particulate matter every single day, sometimes just feet from homes, schools, and workplaces. This has very negative and dramatic health consequences as well as air quality consequences. Switchers and line haul locomotives spew diesel particulate matter and other pollutants throughout communities where people live, work, learn, and play. This is unjust and unacceptable, especially when we have zero-emission technology to address these issues today.

We support EPA taking the critical action of revising its regulations to align with federal law, reinforcing states' rights to regulate emissions from locomotives and rail. EPA's 1998 regulations are overly broad and inconsistent with the Clean Air Act, claiming to preempt states from regulating locomotives during 133 percent of a locomotive's useful life, and inappropriately prescribing categories of preempted state action. These provisions in 40 CFR § 1074.12(b) extend beyond the Clean Air Act, and we strongly support EPA removing this language in this action. Please refer to our comments submitted under separate cover, which focus on the following:

- Locomotive pollution has a significant negative impact on frontline and fenceline communities' health, regional air quality, and climate.
- The Clean Air Act's cooperative federalism system requires the federal government and states to work together to control air pollution and improve air quality.
- States and local governments must reduce locomotive pollution to protect public health and attain federal air quality standards
- We support EPA's proposed changes to its regulatory language.
- EPA should adopt a Tier 5 zero-emission locomotive standard by the end of 2023. The turnover to Tier-5 zero-emission locomotives must include a scrap program to mandate that dirty diesel locomotives are no longer in use.

The rail industry remains one of the most significant sources of this environmental injustice for many communities, and the cumulative impacts of this industry are clear. Communities experience bright lights, noise, vibrations that feel like earthquakes, idling which can prevent emergency vehicles from getting people to lifesaving medical care, and disproportionate exposure to pollution that causes adverse health outcomes such as asthma, cardiovascular vascular disease, and dangerous diesel-related illnesses, which are also contributing to a shorter lifespan in our communities. Communities have the right to breathe clean air, and states and local governments must act to protect communities from this pollution. We also remain steadfast that EPA not only has authority but has the responsibility to regulate the rail and locomotive industry, which has been allowed to pollute our communities for far too long. This proposed action is only the beginning, and EPA must focus its efforts on taking strong action to address the cumulative impacts caused by locomotives and rail yards, including by developing a Tier 5 zero-emission locomotive standard.

15. Conclusion

> *"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*[279]

The above critical recommendations on how EPA needs to strengthen this rule and move in an intentional and significant way to zero-emission vehicles for ending a deadly diesel pollution

[279] mark! Lopez. East Yard Communities for Environmental Justice. (May 2021). https://eycej.org/

system. MFN's position and demands will ensure public health benefits, and are economically feasible given that zero-emission trucks are commercially available, economically compelling, and the single most effective solution for reducing freight emissions. EPA must:

- **Address the gaps from the 2022 Heavy Duty Engine and Vehicles Standards Rule (NOx).** This rule did not address the critical demands set forth by MFN members to ensure that there will be meaningful emission reductions within environmental justice communities from heavy-duty trucks and create a clear pathway for zero-emission vehicles.

- **Ensure a clear pathway to zero emission by mandating all new vehicles be zero emissions by 2035, including a sales mandate.** This mandate for zero-emission vehicles must include a scrapping program so that cumulative impacts from the increased number of trucks do not further burden environmental justice communities.

- **Prioritize zero emissions for *freight trucks,*** i.e., Class 7 and 8 (short-haul) drayage trucks. These trucks have never been prioritized in heavy-duty truck regulations, and are some of the oldest and most-polluting vehicles in frontline and fence-line communities.

- **Include environmental justice and public health analyses** to ensure a sufficiently stringent rule and its implementation.

- **Include a multi-pollutant standard** that regulates greenhouse gas emissions and additional pollutants, including nitrogen oxides (NOx), and particulate matter (PM), to prevent dangerous combustion-based fuel source alternatives and false solutions like natural gas from being considered as part of "zero-emission"

The current two options for emission 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. MFN is committed to working with EPA to ensure that the regulations around freight impacts does actually meet the intended call to action that these comments set forth. We need EPA to act as the leaders the President is referencing and prioritize solutions that 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 <u>every</u> rule, program, and incentive that comes from EPA to prioritize addressing environmental racism and promote 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 Molly Greenberg MFN Campaign Manager at greenberm@oxy.edu.

Air Alliance Houston, Backbone Campaign, Center for Community Action and Environmental Justice (CCAEJ), Central California Asthma Collaborative, Citizen for a Sustainable Future, CleanAirNow, Clean Water Action NJ, Coalition for a Safe Environment (CFASE), Comite Civico Del Valle, Inc., Duwamish River Community Coalition, EarthJustice, Paul Cort, Sasan

Saadat, Yasmine Agelidis, Adrian Martinez, East Yard Communities for Environmental Justice (EYCEJ), Environmental Health Coalition, Greater Frenchtown Revitalization Council, GreenLatinos, Groundwork Northeast Revitalization Group (Groundwork NRG), Harambee House/Citizen for Environmental Justice, Ironbound Community Corporation (ICC), Little Village Environmental Justice Organization (LVEJO), Lowcountry Alliance for Model Communities (LAMC), Mobile Environmental Justice Action Coalition (MEJAC), Natural Resources Defense Council (NRDC), New Jersey Environmental Justice Alliance (NJEJA), People's Collective for Environmental Justice, Regional Asthma Management and Prevention (RAMP), Respiratory Health Association (RHA), Rethink Energy Florida, Robert Laumbach M.D., Solutionary Rail, Southeast CARE Coalition Angela Harris, Raquel García - Southwest Detroit Environmental Vision (SDEV), South Ward Environmental Alliance (SWEA), Sustainability Action Network, Tallahassee Food Network (TFN), Warehouse Workers for Justice (WWJ), West Long Beach Neighborhood Association, Union of Concerned Scientists (UCS).

16. Appendix

- Appendix A: UCS Methodology for Assessing Truck Emissions Impacts
- Appendix B: Moving Forward Network-Docket ID EPA-HQ-OAR-2022-0985-Rail and Locomotive - June 16, 2023