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# SUBMITTED ONLINE

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# Attention: Docket ID No. EPA-HQ-OAR-2019-0055

# **Re.:** Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, 87 Fed. Reg. 17414 (Mar. 28, 2022)

Environmental Defense Fund (EDF) respectfully submits the following comments in support of Environmental Protection Agency's (EPA) Proposed Rule, *Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards*, 87 Fed. Reg. 17414 (Mar. 28, 2022) ("Proposal" or "Proposed Standards"). EDF supports substantially strengthening the heavy-duty vehicle emissions standards and respectfully urges EPA to strengthen the Proposal in key respects. These comments highlight the importance and urgency of finalizing health protective standards that achieve deep reductions in pollution from diesel vehicles and that ensure greater pollution reductions through meaningful deployment of zero-emission technologies. Near-term emissions reductions are vital to mitigating the effects of climate change and to protecting public health, especially the health of low-income communities and communities of color disproportionately impacted by transportation air pollution.

EDF supports EPA's and the Administration's vision to "lead the world on clean and efficient cars and trucks" in order to "improve our economy and public health, boost energy security, secure consumer savings, advance environmental justice, and address the climate crisis."<sup>1</sup> As both the Proposal and President Biden's August 5, 2021 Executive Order 14037 recognize, the substantial deployment of zero-emission vehicles ("ZEVs") will play an important role in achieving this goal.<sup>2</sup>

This Proposal is a critical piece of that overall vision, and indeed in his August 2021 Executive Order, the President expressly directed EPA to consider the role ZEVs can play in EPA standards for model years 2027-2029. However, the Proposal must be substantially strengthened to deliver critical climate reductions, protect public health, achieve the administration's above-described commitments, and provide a strong foundation for next generation standards that drive even deeper pollution reductions from these vehicles.

<sup>&</sup>lt;sup>1</sup> Executive Order 14037, Strengthening American Leadership in Clean Cars and Trucks, 86 Fed. Reg. 43583, 43583 (Aug. 10, 2021).

 $<sup>^{2}</sup>$  See id.

Accordingly, we urge EPA to substantially increase its ZEV baseline projections, which, as proposed, fail to account for state and federal policies along with manufacturer and fleet commitments and investments, and to finalize performance-based pollution standards that substantially increase ZEV deployment beyond the baseline for model years (MY) 2027-2029. In particular, these performance-based standards must help to ensure 80 percent of new school and transit buses are ZEVs by MY 2029, which will protect America's children and transit riders and mobilize the billions of dollars invested in buses through the Bipartisan Infrastructure Law. To protect the millions of people afflicted by freight pollution we similarly encourage EPA to ensure its standards achieve 40 percent of new Class 4-7 vehicles and Class 8 short-haul tractors are ZEVs by 2029.

Protective multipollutant standards that ensure these levels of ZEV deployment are likewise critically important to provide a strong foundation for future Phase 3 standards that achieve 100 percent ZEV sales by 2035. To that end, we likewise urge EPA to commit to a swift and clear timeline for completing those critical next-generation standards. Though, to be clear, those Phase 3 standards cannot substitute for the progress we must make now to deploy available, cost-effective, and life-saving ZEV technologies to reduce medium- and heavy-duty vehicle pollution.

A rapid transition to ZEVs is critical to reduce climate pollution and protect public health, and this must be paired with the strongest possible NOx standards for diesel vehicles that achieve reductions consistent with the reductions that will be achieved by California's NOx Omnibus rule. To ensure maximum possible NOx reductions, we identify several areas where EPA's proposal must be strengthened, including recommending substantial adjustment to the credit provisions for NOx, updating the ZEV sales baseline to reflect current expert projections, and strengthening of the idle standards for NOx.

In support of these recommendations, we include several detailed analyses submitted as attachments or appendices along with these comments:

 <u>EDF White Paper, "The Opportunity for Electrification of Medium- and Heavy-Duty</u> <u>Vehicles."</u> EDF completed a white paper documenting the reasonableness and feasibility of performance-based standards that ensure 40 percent of new class 4-7 and class 8 short haul tractors and 80 percent of school and transit buses are ZEVs by 2029. The paper analyzes the climate, health, and economic benefits of standards that achieve these goals. It finds, such standards would avoid more than 1.6 billion tons of GHG emissions and 840,000 - 2.2 million tons of ozone-forming NOx pollution through 2050.<sup>3</sup> This pollution reduction would prevent 7,500 - 9,600 premature deaths through 2050, and ultimately provide the nation with up to \$34 billion in economic benefits annually in 2040, with a cumulative savings of \$650-680 billion through 2050.<sup>4</sup> At the same time, transitioning to ZEVs will grow domestic, well-paying jobs in states across the nation.<sup>5</sup> (Attachment A)

<sup>&</sup>lt;sup>3</sup> Environmental Defense Fund, The Opportunity for Near-Term Electrification of Medium- and Heavy-Duty Vehicles (May 2022). (Attachment A).

<sup>&</sup>lt;sup>4</sup> *Id*.

<sup>&</sup>lt;sup>5</sup> Id.

- <u>ERM ZEV Baseline Technical Memo</u>. ERM evaluated aspects of the ZEV sales baseline EPA failed to consider, including current state policies as well as federal funding programs, falling costs, and manufacturer and fleet commitments to transition fleets to ZEVs. The analysis included a range of scenarios, from very conservative to more optimistic, with midpoint scenarios projecting medium- and heavy-duty ZEV deployment in excess of 20 percent in 2029 and more optimistic scenarios projecting M/HD ZEV sales of over 33 percent of all class 4-8 single unit trucks, short-haul tractor trailers and school and transit buses in 2029. (Attachment B)
- <u>Case Study of Health and Air Quality Benefits of Deploying ZEVs in New York City</u>. Analysis by EDF, Harvard Chan School of Public Health and University of North Carolina, using state of the art fine scale air quality modeling and health impact assessment methods, underscores the disproportionate burdens of medium- and heavyduty diesel pollution and the significant benefits electrification would have in New York City at a census tract scale. (Attachment D)
- EDF NOx Credit Analysis. EDF performed detailed analysis of the impacts of EPA's proposed ZEV NOx credits and found, by 2030, nearly 90 percent of school buses, 90 percent of transit buses, 35 percent of Class 4-8 single unit trucks and a quarter of all Class 8 tractors could be certified to a level of 115 mg/bhp-hr instead of meeting the proposed NOx standard of 35 mg/bhp-hr. And by 2035, more than half of all school buses, 45 percent of Class 4-8 single unit trucks and a quarter of all tractors would still be emitting NOx at 115 mg/bhp-hr nearly six times higher than the emissions standard of 20 mg/bhp-hr for 2031 and beyond. The increase in lifetime NOx emissions from EPA's proposed approach would be up to 213,000 metric tons through 2035 or over a third of the 559,000 U.S. ton reduction in NOx emissions that EPA projects for the Option 1 NOx standards in 2045. (Attachment H)

We urge EPA to move forward swiftly with standards that protect human health and the environment for all people and all communities, by reducing harmful diesel pollution and ensuring greater deployment of ZEVs. We respectfully urge EPA to consider all available tools to achieve deep pollution reductions and rapid ZEV deployment as quickly as possible. These actions will save money for truckers and fleets, strengthen our energy security, and help to support and grow domestic jobs.

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- I. Near-term Electrification of Heavy-Duty Vehicles is Urgently Needed to Help Address the Climate Crisis and Protect Public Health
  - A. Near-term Deployment of Zero-emission Vehicles is Needed to Protect the Health of All Communities

The health burden from truck and bus pollution is substantial, causing adverse health impacts in utero, in infants and children, and in adults and the elderly – with those who live closest to our nation's roads and highways, ports, distribution centers, freight depots, and other well-known sources of truck pollution facing the greatest harms.<sup>6</sup> EPA has estimated that 72 million people live within 200 meters of a truck freight route, and relative to the rest of the population, people of color and those with lower incomes are more likely to live near truck routes.<sup>7</sup>

Despite making up only about 4 percent of vehicles on the road,<sup>8</sup> the buses, trucks, and tractor trailers that distribute our people and goods are the largest contributor to ozone-forming oxides of nitrogen (NOx) emissions from all highway vehicles and will be one of the largest mobile source contributors to ozone in 2025.<sup>9</sup> They are also responsible for a significant amount of health-harming fine particulate matter (PM<sub>2.5</sub>) and more than 420 million tons of climate pollution – nearly a quarter of all transportation sector emissions and more than the entire country of Australia.<sup>10</sup>

https://www.tandfonline.com/doi/full/10.1080/10962247.2018.1454357

<sup>&</sup>lt;sup>6</sup> See, e.g., Riley, S., Wallace, J., & Nair, P. 2012. Proximity to Major Roadways is a Risk Factor for Airway Hyper-Responsiveness in Adults. *Can. Respir. J., 19*(2):89-95. McConnell, R. et al. 2010. Childhood Incident Asthma and Traffic-Related Air Pollution at Home and School<u>. *Envtl. Health Perspect., 118*(7):1021-6. Huynh, P. et al. 2010. Residential Proximity to Freeways is Associated with Uncontrolled Asthma in Inner-City Hispanic Children and Adolescents. *J. Allergy (Cairo)*. Chang, J. et al. 2009. Repeated Respiratory Hospital Encounters Among Children with Asthma and Residential Proximity to Traffic. *Occup. Envtl. Med., 66*(2):90-8. Salam, M.T., Islam, T, & Gilliland, F.D. 2008. Recent Evidence for Adverse Effects of Residential Proximity to Traffic Sources on Asthma. *Curr. Opin. Pulm. Med., 14*(1):3-8.</u>

<sup>&</sup>lt;sup>7</sup> 87 Fed. Reg. 17451 (March 28, 2022).

<sup>&</sup>lt;sup>8</sup> H. Christopher Frey. 2018. Trends in onroad transportation energy and emissions. *Journal of the Air & Waste Management Assoc.* Vol. 68, No. 6, 514–563, Table 1.

 <sup>&</sup>lt;sup>9</sup> https://www.epa.gov/sites/default/files/2019-08/documents/cti-sae-govt-ind-2019-04-04.pdf
 <sup>10</sup> EPA. 2020. Fast Facts: U.S. Transportation Sector Greenhouse Gas Emissions 1990-2019. https://www.epa.gov/ghgemissions/draft-inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019
 International Energy Agency, Atlas of Energy. 2020. http://energyatlas.iea.org/#!/tellmap/1378539487

It is estimated that more than 15,000 Americans die prematurely every year as a result of the motor vehicle pollution on our roads and highways.<sup>11</sup> As a result of housing discrimination and other unjust policies, communities of color and low-income communities constitute a higher percentage of the population near our roads and highways and therefore suffer disproportionately from this harmful pollution.<sup>12</sup> According to the American Lung Association's 2022 State of the Air report, people of color are more than three and a half times more likely to breathe the most polluted air when compared to white people.<sup>13</sup> A report by Moving Forward Network found that, on average, Asian and Black Americans are exposed to PM2.5 pollution that is 56 and 44 percent higher, respectively, than white Americans.<sup>14</sup> And an EDF analysis of the Bay Area in California found that neighborhoods with higher percentages of residents of color experienced double the rate of asthma from nitrogen dioxide (NO2) –a pollutant often used as a marker for transportation-related pollution.<sup>15</sup>

Heavy-duty diesel vehicle emissions are often identified as among the largest source of disparity, disproportionally affecting racial-ethnic minorities across geographies and demographics.<sup>16</sup> A recent analysis by The Real Urban Emissions (TRUE) Initiative finds that people of color living in New York City are exposed to 5 percent more PM<sub>2.5</sub> attributable to diesel trucks operating in the city than average, while non-Latino white residents are exposed to 10 percent less.<sup>17</sup> TRUE concludes, "[t]hese inequities in air pollution exposure contribute to racial disparities in health outcomes."<sup>18</sup>

Recent work using satellite data to assess the health burdens from NO2 pollution in 52 cities found diesel traffic is the dominant source of disparities—across race, ethnicity, and income—and that a 62 percent reduction in on-road diesel traffic would decrease these inequalities by 37

<sup>&</sup>lt;sup>11</sup> Kenneth F Davidson et al. 2020. The recent and future health burden of the U.S. mobile sector apportioned by source. *Environ. Res. Lett.* 15 (7). <u>https://iopscience.iop.org/article/10.1088/1748-9326/ab83a8/pdf</u> Estimate of "over 20,000" derived using the medians of the upper bound of Krewski and Lepeule's 2011 and 2025 onroad health burden estimates in Table 3 and 4 and assuming a linear reduction over time.

<sup>&</sup>lt;sup>12</sup> Gregory M. Rowangould. 2013. A census of the US near-roadway population: Public health and environmental justice considerations. *Transportation Research Part D* 25, 59–67. <u>https://www.sciencedirect.com/science/article/pii/S1361920913001107</u>.

<sup>&</sup>lt;sup>13</sup> American Lung Association. 2022. State of the Air. <u>https://www.lung.org/getmedia/74b3d3d3-88d1-4335-95d8-</u> c4e47d0282c1/sota-2022.pdf

<sup>&</sup>lt;sup>14</sup> Jimmy O'dea. 2020. Zero-Emissions Technology for Freight: Heavy-Duty Trucks, Tools to Advocate for Zero-Emissions Technology. Moving Forward Network. <u>http://www.movingforwardnetwork.com/wp-</u> content/uploads/2020/10/MFN\_ZeroEmissionToolkit-1.pdf

<sup>&</sup>lt;sup>15</sup> EDF. 2021. Air pollution's unequal impacts in the Bay Area. <u>https://www.edf.org/airqualitymaps/oakland/health-disparities</u>

<sup>&</sup>lt;sup>16</sup> Tessum, C. W., Paolella, D. A., Chambliss, S. E., Apte, J. S., Hill, J. D., Marhsall, J. D. PM<sub>2.5</sub> polluters disproportionately and systemically affect people of color in the United States. *Sci. Adv.* 7, eabf4491 (2021). <sup>17</sup> Meyer, M. and Dallman, T., (April 2022). *Air quality and health impacts of diesel truck emissions in New York* 

<sup>&</sup>lt;sup>17</sup> Meyer, M. and Dallman, T., (April 2022). Air quality and health impacts of diesel truck emissions in New York City and policy implications. The Real Urban Emissions (TRUE) Initiative.

https://www.trueinitiative.org/media/792240/true-nyc-report-fv.pdf <sup>18</sup> *Id.* 

percent, noting that heavy-duty diesel vehicle emissions, specifically, contribute to the majority of these NO2 inequalities.<sup>19</sup>

Analysis by scientists at EDF, Harvard Chan School of Public Health and University of North Carolina, using state of the art fine scale air quality modeling and health impact assessment methods, found that electrification of medium- and heavy-duty diesel vehicles will have significant benefits in New York City at a census tract scale.<sup>20</sup> Full electrification of the sector in New York area would **prevent \$2.4 billion in health damages** every year by 2040 (248 deaths, 173 childhood asthma emergency department (ED) visits), much of it directly due to the nitrogen dioxide (NO2) reduction health benefits. Many minority and low-income neighborhoods with high baseline asthma ED visits also have elevated diesel truck and bus traffic and pollution and therefore face disproportionate impacts. Census tracts with 97 percent minority populations bear > 35 percent of total childhood asthma ED visits attributable to medium- and heavy-duty vehicles, despite being only 19 percent of the population.

This also means that these communities in New York City will potentially experience significant benefits of medium- and heavy-duty electrification. Up to 68 percent of childhood asthma ED visits reduced will be accrued in census tracts with >85 percent minority populations if full electrification takes place by 2040. (See Attachment D for full details of the analysis and results)

Heavy-duty vehicles are also responsible for significant NOx, PM<sub>2.5</sub>, and black carbon emissions around ports, railyards, distribution centers, airports, and other places where trucks congregate and idle.<sup>21</sup> Warehouses and distribution centers where trucks pull in and out, and often idle, are also concentrated sources of risk. Again, many discriminatory policies have led to the siting of these facilities near communities of color who face higher rates of underlying health conditions as a result of the cumulative burden from air pollution and other factors.<sup>22</sup> In Houston's Fifth Ward, diesel trucks that come and go from the cluster of metal recyclers and concrete processing plants, drive up NO<sub>2</sub> levels by 48 percent relative to the rest of the city. Residents are largely people of color (more than 90 percent), 40 percent live below the federal poverty line and life expectancy is almost a decade lower than the rest of the region (69 compared to 78 years).<sup>23</sup>

<sup>&</sup>lt;sup>19</sup> Demetillo, M. A. G., Harkins, C., McDonald, B. C., Chodrow, P. S., Sun, K., & Pusede, S. E. (2021). Space-based observational constraints on NO2 air pollution inequality from diesel traffic in major US cities. *Geophysical Research Letters*, *48*, e2021GL09433. <u>https://doi.org/10.1029/2021GL094333</u>

<sup>&</sup>lt;sup>20</sup> Presentation by Jonathan Buonocore, Chet France, Rick Rykowski, Brian Naess, Komal Shukla, Catherine Seppanen, Dylan Morgan, Frederica Perera, Katie Coomes, Ananya Roy, Sarav Arunachalam. 2022. "Distribution of Air Quality Health Benefits of MHEV policies: New York," University of North Carolina, Harvard Chan School of Public Health, Columbia University Mailman School of Public Health and Environmental Defense Fund.
<sup>21</sup> *E.g.*, MJB Ports of Newark and Elizabeth.

<sup>&</sup>lt;sup>22</sup> Nardone A, Casey JA, Morello-Frosch R, Mujahid M, Balmes JR, Thakur N. 2020. Associations between historical residential redlining and current age-adjusted rates of emergency department visits due to asthma across eight cities in California: an ecological study. *Lancet Planet Health*. 4(1):e24-e31. Miranda ML, Edwards SE, Keating MH, Paul CJ. 2011. Making the environmental justice grade: The relative burden of air pollution exposure in the United States. *Int J Environ Res Public Health*. 8: 1755-1771. Ihab Mikati, Adam F. Benson, Thomas J. Luben, Jason D. Sacks, Jennifer Richmond-Bryant. April 2018. Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status, *American Journal of Public Health* 108, no. 4: pp. 480-485. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5844406/

<sup>&</sup>lt;sup>23</sup> <u>https://www.edf.org/airqualitymaps/houston/findings</u>

Commercial diesel trucks also take an especially heavy toll on neighborhoods along their routes. A years-long study in Canada confirms large trucks to be the greatest contributors to black carbon emissions near major roadways.<sup>24</sup> A study in Oakland, California found that transportation-related air pollution (*e.g.*, black carbon and NOx) was much higher—in some cases double—on a freeway that is a designated truck route (I-880) compared to another freeway in the same city where trucks are prohibited (I-580).<sup>25</sup> Another study near the Port of Oakland also found that black carbon levels measured along truck routes were higher compared to measurements at most other sites, including those near industrial facilities, other highways and on residential streets.<sup>26</sup> Studies have combined these fine scale assessments with electronic health records in the health care systems serving the population in Oakland (Sutter Health and Kaiser Permanente) and find that these elevated levels of NO2 and black carbon are associated with higher rates of cardiovascular events,<sup>27</sup> asthma emergency room visits and hospitalizations,<sup>28</sup> as well as adverse pregnancy outcomes.<sup>29</sup> Estimated effects of NO2 and black carbon and hospitalizations,<sup>28</sup> as well as adverse pregnancy outcomes.<sup>29</sup> Estimated effects of NO2 and black carbon on preeclampsia were highest among non-Latina Black mothers.

The actual health burden from truck pollution may be larger still, as analyses often do not account for the potential impact from after-market defeat devices on medium- and heavy-duty trucks. The EPA believes the use of aftermarket defeat devices "occurs within most or all categories of vehicles and engines, including commercial trucks..."<sup>30</sup> A zero-emitting truck and bus fleet would avoid this problem of emission control tampering. Zero emitting vehicles would also protect against unanticipated excess in-use emissions deterioration not properly accounted for during EPA's engine/vehicle certification process.

A shift to zero emitting medium- and heavy-duty vehicles – including rapid deployment in communities long overburdened by this pollution – is critically important to save lives and bring cleaner air to neighborhoods across the nation.

B. Overwhelming Data Supports Significant Deployment of ZEVs in the Near Term

Momentum for electric vehicle development and production is accelerating rapidly, both globally and in the United States. Numerous recent studies highlight key automaker commitments and

California." Environmental Science & Technology 55.21 (2021): 14710-14719.

<sup>&</sup>lt;sup>24</sup> Wang, J.M., Jeong, C-H., Hillker, N., Shairsingh, K. K., Healy, R. M., Sofowote, U., Debosz, J., Su, Y., McGaughey, M., Doerksen, G., Munoz, T., White, L., Herod, D., Evans, G. J. Near-road air pollution measurements: Accounting for inter-site variability using emission factors. *Environmental Science & Technology*, 2018; 52(16): 9495. DOI: <u>10.1021/acs.est.8b01914</u>

 <sup>&</sup>lt;sup>25</sup> Joshua S. Apte et. al. 2017. High-Resolution Air Pollution Mapping with Google Street View Cars: Exploiting Big Data. *Environ. Sci. Technol.* 51, 12, 6999-7008. <u>https://pubs.acs.org/doi/10.1021/acs.est.7b00891</u>
 <sup>26</sup> Julien J. Caubel et. at. 2019. A Distributed Network of 100 Black Carbon Sensors for 100 Days of Air Quality

<sup>&</sup>lt;sup>26</sup> Julien J. Caubel et. at. 2019. A Distributed Network of 100 Black Carbon Sensors for 100 Days of Air Quality Monitoring in West Oakland, California. *Environ. Sci. Technol.* 53, 13, 7564-7573. https://pubs.acs.org/doi/10.1021/acs.est.9b00282

<sup>&</sup>lt;sup>27</sup> Alexeeff, Stacey E., et al. "High-resolution mapping of traffic related air pollution with Google street view cars and incidence of cardiovascular events within neighborhoods in Oakland, CA." *Environmental Health* 17.1 (2018): 1-13.

 <sup>&</sup>lt;sup>28</sup> Alexeeff, S., et al. "Google Street View car measurements of traffic related air pollution within neighborhoods and asthma-related emergency department visits and hospitalizations." *Environmental Epidemiology* 3 (2019): 406-407.
 <sup>29</sup> Goin, Dana E., et al. "Hyperlocalized Measures of Air Pollution and Preeclampsia in Oakland,

<sup>&</sup>lt;sup>30</sup> <u>https://int.nyt.com/data/documenttools/epa-on-tampered-diesel-pickups-11-20/6d70536b06182ad2/full.pdf</u>

deployments, the dynamic and growing market for ZEVs, decreasing battery costs and the opportunity for new American jobs. States and business coalitions are taking the lead in supporting the industry in its transition to electrification.

# Vehicle manufacturers and fleets are making substantial economic and employment investments in a ZEV future

ERM recently released its fifth *Electric Vehicle Market Update*, which tracks the current status and projected growth of the U.S. electric vehicle industry.<sup>31</sup> The April 2022 report found robust growth indicators for the electric vehicle sector just since the last update was published one year prior. Medium- and heavy-duty vehicle manufacturers and fleets are making substantial commitments to zero-emitting vehicles. Daimler Trucks North America, the leading manufacturer of class 8 trucks in the U.S., has committed to offering only carbon-neutral trucks in the U.S. by 2039,<sup>32</sup> and expects that by 2030, as much as 60 percent of its sales will be ZEVs.<sup>33</sup> Volvo Group, owner of the Mack truck brand, has set a goal of having 100 percent of its truck and bus sales be zero-emission by 2040.<sup>34</sup> Navistar recently announced its goal of having 50 percent sale of its sales volume be ZEVs by 2030, its commitment to achieve 100 percent zero emissions by 2040 across all operations and carbon-neutrality by 2050.<sup>35</sup> Both FedEx and Walmart have committed to transition their entire global truck fleets to ZEVs by 2040.<sup>36</sup>

According to ERM, the labor market is also benefiting from the transition to electrification. Manufacturers have announced new investments in the United States of almost \$2 billion in medium and heavy-duty assembly plants, investments that will support approximately 15,000 new direct U.S. jobs over the next decade.<sup>37</sup>

The numbers of electric trucks and buses already on the roads is growing, in part because of the increased selection of model availability. According to CALSTART, as of December 2021, 1,215 Class 2b through Class 8 ZEVs have been deployed in the United States across over 163

<sup>32</sup> David Cullen, "Daimler to Offer Carbon Neutral Trucks by 2039," (October 25, 2019).

https://www.truckinginfo.com/343243/daimler-aims-to-offer-only-co2-neutral-trucks-by-2039-in-key-markets <sup>33</sup> Deborah Lockridge, "What Does Daimler Truck Spin-off Mean for North America?," Trucking Info (November

<sup>&</sup>lt;sup>31</sup> Rachel MacIntosh, Sophie Tolomiczenko, Grace Van Horn. April 2022. *Electric Vehicle Market Update: Manufacturer Commitments and Public Policy Initiatives Supporting Electric Mobility in the U.S. and Worldwide*, ERM for EDF, Version 6.

http://blogs.edf.org/climate411/files/2022/04/electric vehicle market report v6 april2022.pdf The original report was released in May of 2019.

<sup>11, 2021). &</sup>lt;u>https://www.truckinginfo.com/10155922/what-does-daimler-truck-spin-off-mean-for-north-america</u> <sup>34</sup> <u>https://www.oemoffhighway.com/trends/electrification/press-release/21203695/volvo-group-global-volvo-group-focuses-on-electrification-and-emissions-reduction-strategy</u>

 <sup>&</sup>lt;sup>35</sup> Navistar presentation at the Advanced Clean Transportation (ACT) Expo, Long Beach, CA (May 9-11, 2022).
 <sup>36</sup> Fed Ex Newsroom, "FedEx Commits to Carbon-Neutral Operations by 2040," March 3, 2021.

https://newsroom.fedex.com/newsroom/Sustainability2021 Doug McMillon, President & CEO, Walmart, "Walmart's Regenerative Approach: Going Beyond Sustainability," September 21, 2020.

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

<sup>&</sup>lt;sup>37</sup> Rachel MacIntosh, Sophie Tolomiczenko, Grace Van Horn. April 2022. *Electric Vehicle Market Update: Manufacturer Commitments and Public Policy Initiatives Supporting Electric Mobility in the U.S. and Worldwide*, ERM for EDF, Version 6.

http://blogs.edf.org/climate411/files/2022/04/electric\_vehicle\_market\_report\_v6\_april2022.pdf

fleets.<sup>38</sup> CALSTART has developed an interactive online tool that tracks available and soon-tobe-available medium- and heavy-duty zero-emission trucks (ZETs).<sup>39</sup> In 2019, there were only 20 models of Class 2b-8 ZETs available for purchase in the United States. Today there are more than 400 models available across all classes and CALSTART estimates that could increase to 544 total models by the end of 2022. EPA also conducted an analysis of the manufacturersupplied end-of-year production reports and found that out of the 380 BEVs certified in MY 2020, a total of 177 unique makes and models were available for purchase by 52 producers in classes 3-8.<sup>40</sup> For example, General Motors launched a new business unit, BrightDrop, in January 2021 that focuses on electric first-to-last-mile delivery trucks. FedEx signed an agreement reserving 2,500 delivery vans and is working with BrightDrop to add up to 20,000 more vehicles in coming years.<sup>41</sup> UPS and DHL ordered 950 electric trucks and 63 delivery vans, respectively, from Workhorse<sup>42</sup> and Amazon has ordered 100,000 zero-emitting vehicles from Rivian.<sup>43</sup>

Leading businesses have also recognized the importance of pollution standards and complementary policies in hastening ZEV deployment. The Zero Emission Transportation Association (ZETA) – a coalition of major businesses including electric vehicle manufacturers, power companies, and many others – has urged adoption of ambitious policies to support medium- and heavy-duty electrification, including multi pollutant standards under the Clean Air Act.<sup>44</sup> The National Zero-Emission Truck (ZET) Coalition is a group of America's biggest truck equipment manufacturers, suppliers and key stakeholders, such as Cummins, Daimler, PACCAR, Eaton, Tesla and Rivian, advocating for federal charging and refueling infrastructure and increased federal investments and incentive programs to help drive the near-term production of ZEV trucks and buses in the United States.<sup>45</sup> And the European Automobile Manufacturers Association – which includes Scania, Daimler Truck AG, Ford Trucks and Volvo Group, among

<sup>&</sup>lt;sup>38</sup> Baha, Al-Alawi, et al. "The Advanced Technology Truck Index: A U.S. ZET Inventory Report." CALSTART. Jan 2022. <u>https://calstart.org/wp-content/uploads/2022/02/ZIO-ZETs-Report\_Updated-Final-II.pdf</u>.

<sup>&</sup>lt;sup>39</sup> CALSTART's Zero Emission Technology Inventory (ZETI) tool. <u>https://globaldrivetozero.org/tools/zero-emission-technology-inventory/</u>

<sup>&</sup>lt;sup>40</sup> EPA memorandum from Angela Cullen, Center Director, Assessment and Standards Division to Docket EPA-HQ-OAR-2019-0055, "HD2027 Proposed Changes to Heavy-Duty Greenhouse Gas Emissions," (November 2021).
<sup>41</sup> "BrightDrop Announces Walmart as New EV Customer and Expands Collaboration with FedEx at CES." 5 Jan.
2022. <u>https://media.gm.com/media/us/en/gm/home.detail.html/content/Pages/news/us/en/2022/jan/ces/0105-</u> brightdrop.html

<sup>&</sup>lt;sup>42</sup> Hanley, Steve, "UPS Places Order For 950 Workhorse N-GEN Electric Delivery Vans." CleanTechnica, 20 June 2018, <u>https://cleantechnica.com/2018/06/20/ups-places-order-for-950-workhorse-ngen-electric-delivery-</u>vans/#:~:text=UPS% 20Places% 20Order% 20For% 20950% 20Workhorse% 20N-

<sup>&</sup>lt;u>GEN%20Electric,to%20UPS%2C%20bringing%20the%20total%20order%20to%201%2C000</u>; DHL. "DHL Expands Green Fleet with Addition of New Electric Delivery Vans." 7 Feb 2019, <u>https://www.dhl.com/us-</u> en/home/press/pressarchive/2019/dhl-expands-green-fleet-with-addition-of-new-electric-delivery-vans.html

 <sup>&</sup>lt;sup>43</sup> Andrew J. Hawkins, "Amazon unveils its new electric delivery vans built by Rivian," *The Verge* (Oct. 8, 2020).
 <u>https://www.theverge.com/2020/10/8/21507495/amazon-electric-delivery-van-rivian-date-specs</u>
 <sup>44</sup> https://www.zeta2030.org/

<sup>&</sup>lt;sup>45</sup> Calstart. 2020. National Zero-Emission Truck Coalition Statement of Principles.

https://calstart.org/zet-statement-of-principles-6-17-20/

others – together with the Potsdam Institute for Climate Impact Research, has pledged that by 2040 all new commercial vehicles sold must be fossil free.<sup>46</sup>

# ZEV costs are nearing parity with diesel vehicles

Many commercial truck and bus segments are primed for a near term transition to electrification – the technology has been proven and the benefits outweigh the costs now or in the very near term. A recent study conducted by Roush Industries for Environmental Defense Fund evaluated both the upfront and ongoing costs of electrifying several types of medium and heavy-duty vehicles that are commonly used in urban areas, including transit buses, school buses, garbage trucks, shuttle buses and delivery trucks.<sup>47</sup> These vehicles tend to be concentrated in urban areas where average trip distances are shorter and health and pollution impacts are of most concern, making them particularly important opportunities for early electrification deployment. The study found that, when considering upfront purchase price alone, by 2027 electric freight trucks and buses will be less expensive than their combustion engine counterparts in nearly all categories. Electric vehicles will also be less expensive on a total cost of ownership basis in *all* categories in the same timeframe.

The Roush study developed projections for upfront costs and total cost of ownership for electric vehicles in years 2027 to 2030 and compared those costs to equivalent internal combustion vehicles that meet EPA Greenhouse Gas Phase 1 and 2 rules, as well as California Low NOx regulations. The study determined the total cost of ownership for all financial aspects of ownership, including vehicle purchase cost of either an internal combustion engine or electric freight truck or bus, fuel or energy costs, charging or fueling infrastructure costs, maintenance costs, and vehicle mid-life refresh if applicable. It focused exclusively on the direct financial costs and savings related to vehicle ownership and did not include the substantial health and welfare benefits associated with switching to electric trucks.

The study found decreasing upfront costs for electric freight trucks and buses, driven largely by steeply decreasing battery costs. It also concluded that in 2027, electric vehicle costs will be less than internal combustion vehicles costs over the life of the vehicle, largely because maintenance and energy costs will be lower. Total cost of ownership parity will occur immediately for some segments evaluated and very quickly for the rest.

<sup>&</sup>lt;sup>46</sup> Joint statement, ACEA and Potsdam Institute for Climate Impact Research, "The Transition to Zero-emission Road Freight Transport," December 2020. <u>https://www.acea.be/uploads/publications/acea-pik-joint-statement-the-transition-to-zero-emission-road-freight-trans.pdf</u>

<sup>&</sup>lt;sup>47</sup> Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. *Medium and Heavy-Duty Electrification Costs for MY 2027- 2030*, Roush Industries for Environmental Defense Fund. See http://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6 20220209.pdf

TABLE 1–TOTAL COST OF OWNERSHIP (TCO) PARITY (VEHICLE PURCHASED IN 2027)			
CLASS	SEGMENT	BATTERY SIZE	TIME TO TCO PARITY
		kWh	
CLASS 8	REFUSE HAULER	200	IMMEDIATE
CLASS 8	TRANSIT BUS	400	1 YEAR
CLASS 7	SCHOOL BUS	60	IMMEDIATE
CLASS 7	DELIVERY TRUCK	100	3 YEARS
CLASS 5	DELIVERY TRUCK	150	IMMEDIATE
CLASS 3–5	SHUTTLE BUS	200	2 YEARS
CLASS 3	DELIVERY VAN	100	2 YEARS

Source: EDF from Roush Industries

Roush's findings have been confirmed in other recently released reports. The National Renewable Energy Lab (NREL) looked at all classes and segments of medium- and heavy-duty vehicles and concluded that with continued improvements in vehicle and fuel technologies, ZEVs can reach TCO parity with diesel vehicles as early as 2026 for some applications and no later than 2035 for all segments, including long-haul trucks.<sup>48</sup> The study also concludes that 42 percent of all medium- and heavy-duty truck sales and 100 percent of bus sales will be ZEVs by 2030.

While Roush did not study Class 8 short haul (day cab) tractors, this segment is also ripe for near-term electrification. These tractors pull trailers and typically drive less than 250 miles per day, returning to a hub each night where they could charge. NREL estimates that these tractors will reach TCO parity with their diesel counterparts by 2025.<sup>49</sup> And a recent study by the North American Council for Freight Efficiency (NACFE) concluded that a BEV short haul tractor purchased today will save more than \$9,000 annually on fuel costs compared to a diesel truck.<sup>50</sup>

Cost parity projections are also being confirmed by leading heavy-duty truck and bus manufacturers. Navistar noted recently that long haul trucks will reach cost parity with diesel by 2027 with all other heavy-duty vehicles reaching cost parity before 2025.<sup>51</sup> Daimler anticipates total cost of ownership of its BEVs to reach parity with traditional diesel vehicles by 2025.<sup>52</sup>

<sup>&</sup>lt;sup>48</sup> Muratori, Matteo et al. "Decarbonizing Medium- and Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis." NREL Transforming Energy. March 2022. <u>https://www.nrel.gov/docs/fy22osti/82081.pdf</u>.

<sup>&</sup>lt;sup>49</sup> Chad Hunter, Michael Penev, Evan Reznicek, Jason Lustbader, Alicia Birky, and Chen Zhang. 2021. Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks, Nation Renewable Energy Lab, Technical Report. <u>https://www.nrel.gov/docs/fy21osti/71796.pdf</u>

<sup>&</sup>lt;sup>50</sup> North American Council for Freight Efficiency. 2022. Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors. <u>https://nacfe.org/heavy-duty-regional-haul-tractors/</u>

<sup>&</sup>lt;sup>51</sup> Navistar President and CEO, Mathias Carlbaum, presentation at the Advanced Clean Transportation (ACT) Expo, Long Beach, CA (May 9-11, 2022).

<sup>&</sup>lt;sup>52</sup> Deborah Lockridge, "What Does Daimler Truck Spin-off Mean for North America?," Trucking Info (November 11, 2021). <u>https://www.truckinginfo.com/10155922/what-does-daimler-truck-spin-off-mean-for-north-america</u>

Another report developed by M.J. Bradley & Associates for Environmental Defense Fund shows a large and growing opportunity to expand America's zero-emission freight trucks and buses. The report evaluates four factors in assessing the readiness of zero-emitting medium and heavyduty vehicles in different applications – the availability of electric models from manufacturers, the requirements for charging, the ability of electric models to meet operating requirements, and the business case for zero-emitting vehicles. It finds that a large number of market segments have favorable ratings across at least three of these categories, which indicates strong potential for near-term zero-emitting vehicle deployment. These market segments, which represent about 66% of the current in-use fleet, include heavy-duty pickups and vans, local delivery and service trucks and vans, transit and school buses, class 3 to 5 box trucks, class 3 to 7 stake trucks, dump trucks and garbage trucks.

Market sources clearly show that the medium- and heavy-duty industry has embraced zeroemitting vehicle technology and momentum is growing. Strong and durable federal emissions standards are needed to signal our nation's steadfast commitment to reducing truck emissions and support the industry in its transition to ZEVs.

# State policies are further accelerating ZEV deployment

California and other states around the nation are paving the way for ZEVs and creating a strong foundation for the federal government to move forward with protective emissions standards. In September 2020, California Governor Gavin Newsom announced a bold plan for the state to achieve 100 percent zero emitting passenger vehicle sales by 2035 and 100 percent zero emitting freight trucks and buses for all feasible operations by 2045, while accelerating mobilization of zero emitting vehicles in urban and community applications to address environmental injustice.<sup>53</sup>

In June 2020, California adopted the world's first zero-emission truck rule. The Advanced Clean Truck (ACT) rule will require manufacturers to start selling new heavy-duty ZEVs by 2024 and require 55 percent of class 2b - 3 truck sales, 75 percent of class 4 - 8 straight truck sales, and 40 percent of truck tractor sales to be zero-emission by 2035 at the latest.<sup>54</sup> This landmark rule is expected to prevent more than 900 premature deaths, save the state economy up to \$12 billion over the next 20 years and create thousands of new jobs by 2035.<sup>55</sup>

Importantly, California also adopted more protective heavy-duty low NO<sub>x</sub> emissions standards to help the state meet national ambient air quality standards and vital state public health and environmental justice goals. In August 2020, California adopted the Heavy-Duty Engine and Vehicle Omnibus Regulation, which substantially tightens the NOx emission standard for onroad heavy-duty engines by 75 percent beginning in 2024 and ramping up to 90 percent in

<sup>&</sup>lt;sup>53</sup> State of California, Executive Order N-79-20 (September 23, 2020). <u>https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf</u>

<sup>&</sup>lt;sup>54</sup> ARB press release, "California takes bold step to reduce truck pollution," (June 25, 2020). <u>https://ww2.arb.ca.gov/news/california-takes-bold-step-reduce-truck-pollution</u>

<sup>&</sup>lt;sup>55</sup> Jamie Fine, "Report: California's clean truck rule will save the economy billions, eliminate vast amounts of pollution," EDF blog (June 17, 2020). <u>http://blogs.edf.org/energyexchange/2020/06/17/report-californias-clean-truck-rule-will-save-the-economy-billions-eliminate-vast-amounts-of-pollution/#more-20253</u>

 $2027.^{56}$  Once fully phased in by 2031, the rule is expected to reduce harmful NOx emissions in California by more than 23 tons per day – the equivalent of taking 16 million light-duty cars off the road in 2031. The emissions reductions will result in 3,900 avoided premature deaths and 3,150 avoided hospitalizations statewide over the life of the rule (2024 – 2050), and lead to estimated statewide health benefits of approximately \$36.8 billion.<sup>57</sup>

In November 2021, Oregon became the first state outside of California to adopt both the ACT rule and the Heavy-Duty Omnibus rule, which will apply to model years 2025 and beyond.<sup>58</sup> Four other states – New Jersey, New York, Washington and Massachusetts – have all adopted the Advanced Clean Trucks rule.<sup>59</sup> These states, together with California and Oregon are estimated to contain more than 20-percent of the national fleet of medium- and heavy-duty trucks.<sup>60</sup> And many other states, including Connecticut,<sup>61</sup> Colorado and Maine are currently contemplating adoption of the ACT rule.

As part of its statewide strategy to reduce transportation emissions, California is also developing the Advanced Clean Fleets regulation, which aims to accelerate the market for zero-emission trucks and buses by requiring fleets that are well suited for electrification to transition to ZEVs.<sup>62</sup> The regulation would set requirements for new ZEV sales as well as in-use fleet composition, and would apply to fleets performing drayage operations, public agencies, federal governments, and high-priority fleets.

The draft regulation includes setting a requirement that all new medium- and heavy-duty vehicle sales be ZEVs starting in 2040 – a target that is faster than that finalized in the ACT rule – and proposed to help contribute to the state's goal of carbon neutrality by 2045 and the Governor's executive order that 100 percent of medium- and heavy-duty vehicles where feasible be ZEVs by 2045. Under the draft regulation, public fleets would be required to purchase 100 percent ZEVs by 2027; all new drayage trucks would be ZEVs beginning in 2024 and by 2035 every drayage

<sup>&</sup>lt;sup>56</sup> ARB press release, "California adopts strong new regulation to further reduce smog-forming pollution from heavy-duty diesel trucks," (August 28, 2020). <u>https://ww2.arb.ca.gov/news/california-adopts-strong-new-regulation-further-reduce-smog-forming-pollution-heavy-duty</u>

<sup>&</sup>lt;sup>57</sup> Id.

<sup>&</sup>lt;sup>58</sup> Work Truck staff, "Oregon Adopts Clean-Trucks Rules; Other States May Follow," Work Truck (November 18, 2021). <u>https://www.worktruckonline.com/10156330/oregon-leads-convoy-of-states-toward-cleaner-trucks</u> Oregon will see a projected \$21.2 billion in net societal benefits, including saving fleet owners over \$1 billion annually, preventing 160 premature deaths and avoiding 84,000 respiratory illnesses by 2050 with the adoption of these two rules. Dana Lowell et. al. 2021. Oregon Clean Trucks Program: An Analysis of the Impacts of Zero-Emission Medium- and Heavy-Duty Trucks on the Environment, Public Health, Industry, and the Economy, M.J. Bradley & Associates for the Natural Resources Defense Council and the Union of Concerned Scientists.

https://static1.squarespace.com/static/613127fc91a6b76873be6446/t/61561514cf312212c5dceee6/1633031446406/ MJ+Bradley MHD+Clean+Trucks+Report Oregon+2021.pdf

<sup>&</sup>lt;sup>59</sup> Laura Bliss, "How Six States Could Transform the U.S. Trucking Industry," Bloomberg (January 26, 2022). https://www.bloomberg.com/news/articles/2022-01-06/how-zero-emission-laws-will-reshape-u-s-trucking

<sup>&</sup>lt;sup>60</sup> Federal Highway Administration, Highway Statistics 2019, Truck and Truck-Tractor Registrations (2019). <u>https://www.fhwa.dot.gov/policyinformation/statistics/2019/mv9.cfm</u>

<sup>&</sup>lt;sup>61</sup> With passage of Connecticut Senate Bill 4 in May 2022, which authorizes the state's Department of Energy and Environmental Protection to adopt California medium and heavy-duty motor vehicle standards, Connecticut is expected to join these states soon.

<sup>&</sup>lt;sup>62</sup> ARB fact sheet, "Advanced Clean Fleets: Accelerating Zero-Emission Truck Markets," (March 3, 2022). https://ww2.arb.ca.gov/sites/default/files/2022-03/ACF%20Fact%20Sheet\_ADA.pdf

truck on the road would be a ZEV; and high priority and federal fleets would be required to meet ZEV targets as a proportion of their total fleet. The Air Resources Board (ARB) will hold additional public workshops on the draft regulation in May 2022 and it is scheduled to go to the Board for final action in late Summer 2022.<sup>63</sup>

In addition to state rulemakings, a diverse collection of seventeen states and the District of Columbia joined a multi-state initiative to advance and accelerate the market for electric medium- and heavy-duty vehicles.<sup>64</sup> Together, the signatories account for 35 percent of the nation's medium- and heavy-duty fleet.<sup>65</sup> The voluntary initiative set a target of 30 percent of new truck and bus sales being ZEV by 2030 and 100 percent ZEV sales by 2050 with an emphasis on the need to accelerate and prioritize deployment in disadvantaged communities. The agreement could result in an estimated reduction of up to 740 million barrels of oil by 2045, which is equivalent to more than 300 million metric tons of CO<sub>2</sub> pollution.<sup>66</sup> A more recent report from ICCT estimates a cumulative emissions reduction of 646 million metric tons of CO<sub>2</sub> from 2020-2050.<sup>67</sup>

Moreover, states have adopted policies and already made significant investments related to charging infrastructure to support their adoption of the Advanced Clean Truck (ACT) regulation and accelerate ZEV deployment. For instance, Massachusetts, New Jersey, New York, Oregon, and Washington have all developed, or are developing, complementary policies and investments to support the rule.<sup>68</sup> In addition, charging infrastructure costs are rapidly declining and utilities and fleets are innovating to help further reduce charging costs and more immediately unlock the substantial fuel saving benefits of ZEVs. EDF has developed and plans to separately submit more detailed information on these solutions.

All of these state initiatives are critical drivers for the adoption of ZEV technology and help alleviate statewide pollution burdens. However, heavy-duty vehicles and their pollution do not always stay within state borders. For example, over half of the heavy-duty vehicle miles traveled in California are by federally certified vehicles that are not required to meet California's more

<sup>64</sup> The current signatories are California, Colorado, Connecticut, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, Nevada, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, and the District of Columbia. "Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding," (July 14, 2020), <u>https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf/</u>

<sup>&</sup>lt;sup>63</sup> ARB website, "Advanced Clean Fleets – Meetings and Events," (last accessed May 11, 2022). https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets/advanced-clean-fleets-meetings-events

<sup>&</sup>lt;sup>65</sup> Arijit Sen, Ray Minjares, Josh Miller, and Caleb Braun. April 2022. "Benefits of the 2020 Multi-State Mediumand Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding," ICCT Briefing. <u>https://theicct.org/wpcontent/uploads/2022/04/md-hd-mou-benefits-apr22.pdf</u>

<sup>&</sup>lt;sup>66</sup> Emily Wimberger, Hannah Pitt, Kate Larsen, and Maggie Young. 2020. States Pave the Way for a Zero-Emission Vehicle Future, Rhodium Group. <u>https://rhg.com/research/states-zero-emission-vehicles/</u>

<sup>&</sup>lt;sup>67</sup> Arijit Sen, Ray Minjares, Josh Miller, and Caleb Braun. April 2022. "Benefits of the 2020 Multi-State Mediumand Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding," ICCT Briefing. <u>https://theicct.org/wpcontent/uploads/2022/04/md-hd-mou-benefits-apr22.pdf</u>

<sup>&</sup>lt;sup>68</sup> With passage of Connecticut Senate Bill 4 in May, which authorizes the state's Department of Energy and Environmental Protection to adopt California medium and heavy-duty motor vehicle standards, Connecticut is expected to join these states soon.

protective standards.<sup>69</sup> A durable EPA medium- and heavy-duty greenhouse gas and NOx rule will further encourage the investments needed to transition to a fully zero-emitting medium- and heavy-duty fleet.

EDF Analysis Finds Significant Benefits From Near-term Electrification of Most II. Medium- and Heavy-duty Segments

EDF conducted an analysis examining the climate, air pollution, health and monetized impacts that would result from electrifying 40 percent of new Class 4-8 single unit trucks, 40 percent of new Class 8 short haul (day cab) tractors, and 80 percent of all transit and school buses, in the 2027-2029 timeframe.<sup>70</sup>

We have attached this analysis to our comments and summarize the key results here. As stated above, numerous recent studies confirm that eliminating tailpipe emissions from these segments is both technically feasible and cost-saving.<sup>71</sup> EDF analysis shows that advancing ZEVs at this rate would:

- Avoid 85 million metric tons of greenhouse gas (GHG) emissions every year by 2040 and more than 1.6 billion tons of GHG emissions through 2050, eliminating 46 percent of emissions from those segments by 2050.
- Significantly reduce ozone forming nitrogen oxide  $(NO_x)$  pollution by nearly 45,000 tons annually in 2040 and 840,000 -2.2 million tons through 2050 - pollution that disproportionately impacts people of color and lower income neighborhoods.
- Prevent as many as 7,500 9,600 premature deaths through 2050.
- Provide our nation with up to \$34 billion in economic benefits annually in 2040 with a cumulative savings of \$650-680 billion by 2050.

<sup>&</sup>lt;sup>69</sup> Letter from Richard W. Corey, ARB Executive Officer to Liane Randolph, ARB Board Chair, "Accelerating California's Transition to Zero-Emission Trucks," (January 10, 2022). https://ww2.arb.ca.gov/sites/default/files/2022-02/ZE%20Trucks%20Board%20Memo\_ADA.pdf

<sup>&</sup>lt;sup>70</sup> EDF. 2022. The Opportunity for Near-Term Electrification of Medium- and Heavy-Duty Vehicles. <sup>71</sup> See eg. Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. Medium and Heavy-Duty Electrification Costs for MY 2027- 2030, Roush Industries for Environmental Defense Fund.

http://blogs.edf.org/climate411/files/2022/02/EDF-MDHD-Electrification-v1.6 20220209.pdf; Muratori, Matteo et al. "Decarbonizing Medium- and Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis." NREL Transforming Energy. March 2022. https://www.nrel.gov/docs/fy22osti/82081.pdf.



Source: EDF, The Opportunity for Near-Term Electrification of Medium- and Heavy-Duty Vehicles (May 2022)

While these segments present the most cost-effective near-term opportunity for reductions, it will be equally important for other segments, including long-haul tractors, to transition to electrification as soon as possible because of their significantly high emissions, high vehicle miles traveled and lower fuel economy. The dramatic economic and health savings shown above are the result of just a portion of the medium- and heavy-duty fleet starting to electrify over the next 7 years. The impact of 100 percent new ZEV sales across all vehicle segments would push these benefits into the trillions of dollars. (See Attachment A for the full White Paper and a more extensive justification for the near-term electrification of the truck and bus segments modeled)

# III. GHG Standards Must Drive Near-term Uptake of ZEVs

EDF supports substantially strengthening the Phase 2 GHG standards. However, EPA's proposed adjustment to the standards not only dramatically underestimates the likely market penetration of ZEVs in the coming years; it fails to achieve any additional deployment of zero emission technologies. We urge the agency to set protective, performance-based GHG standards that more accurately reflect the likely baseline levels of ZEVs in the 2027 to 2029 time frame, and that also ensure greater deployment of zero-emissions technologies well beyond that baseline.

EPA has clear authority to set an emission standard at a level that ensures greater deployment of ZEVs. Doing so in this rule is critically important to ensure we are making needed progress prior to 2030, and accordingly, we urge EPA to ensure performance-based pollution standards help to achieve 80 percent sales for new school and transit buses by MY 2029 and 40 percent sale of new class 4-7 vehicles and class 8 short haul vehicles by that year. New analysis from ERM evaluated aspects of the ZEV sales baseline EPA failed to consider, including a range of scenarios, from very conservative to more optimistic, with midpoint scenarios projecting medium- and heavy-duty ZEV deployment in excess of 20 percent in 2029 and more optimistic

scenarios projecting M/HD ZEV sales of over 33 percent of all class 4-8 single unit trucks, shorthaul tractor trailers and school and transit buses in 2029.<sup>72</sup> These estimates far exceed EPA's assumption in the proposal, and underscore that standards achieving these levels of ZEV deployment are both feasible and reasonable. However, they also make clear that it is absolutely critical for EPA to establish protective, pollution standards in this rulemaking to achieve this level of pollution reductions.

A. EPA has Authority to Set Standards Under the Clean Air Act That Ensure Deep Reductions in Harmful Pollution Based on the Availability of ZEV Technologies.

EPA has manifest legal authority to adopt greenhouse gas emission standards for new medium and heavy-duty vehicles. Additionally, the authority established under Section 202(a)(1) and 202(a)(3) of the Clean Air Act (CAA) authorizes EPA to set protective standards that secure deep pollution reductions based on the increased deployment of available zero-emission technologies.

# EPA Has Clear Authority to Establish Technology-Forcing Standards Under Section 202(a)(1)

EPA has clear authority to establish technology-forcing emission standards for medium and heavyduty trucks under Section 202(a)(1). The text of Section 202(a)(1) directs EPA to promulgate "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines".<sup>73</sup> Such regulations are to "take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period."<sup>74</sup> Authority to regulate GHGs under this section was confirmed in 2007, with *Massachusetts v. EPA*.<sup>75</sup>

EPA has a long history of promulgating technology-forcing emission standards that have driven innovation and secured pollution reductions. For instance, EPA standards under section 202 resulted in the development and proliferation of the catalytic converter in 1975 and the three-way catalyst in 1981.<sup>76</sup> Particulate and NOx standards for heavy-duty vehicles also resulted in the development of the diesel particulate filter and NOx aftertreatment.<sup>77</sup>

Courts have consistently and specifically affirmed EPA's authority to establish technology-forcing standards under section  $202(a)(1)^{78}$  Section 202(a)(3), which addresses emissions of NOx and

<sup>&</sup>lt;sup>72</sup> Ellen Robo and Dave Seamonds, "Analysis of Alternative Medium- and Heavy-duty Zero-Emission Vehicle Baseline Scenarios," Technical memo by ERM for EDF (May 12, 2022).

<sup>&</sup>lt;sup>73</sup> 42 U.S.C. § 7521(a)(1).

<sup>&</sup>lt;sup>74</sup> *Id.* at § 7521(a)(2).

<sup>&</sup>lt;sup>75</sup> 549 U.S. 497 (2007).

<sup>&</sup>lt;sup>76</sup> See, e.g., David Gerard and Lester B. Lave, *Implementing technology-forcing policies: The 1970 Clean Air Act Amendments and the introduction of advanced automotive emissions controls in the United States*, 72 TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE 761 (2005), available at

http://repository.cmu.edu/tepper/1356/.

<sup>&</sup>lt;sup>77</sup> See, e.g., Chris Wold, *Climate Change, Presidential Power, and Leadership: We Can't Wait*, 45 CASE WESTERN RESERVE J. OF INT'L LAW 303, 346, available at

http://law.case.edu/journals/jil/Documents/45CaseWResJIntlL1&2.15.Article.Wold.pdf.

<sup>&</sup>lt;sup>78</sup> See, e.g., Natural Res. Def. Council v. Envtl. Prot. Agency, 655 F.2d 318, 328 (D.C. Cir. 1981) (upholding EPA's technology-forcing standards under Section 202(a)(1)-(2) authority); Natural Res. Def. Council, Inc. v. Reilly, 983

certain other pollutants, but not GHGs, from medium and heavy duty vehicles, directs EPA to promulgate standards "reflect[ing] the *greatest degree of emission reduction achievable* through the application of technology which the Administrator determines will be available for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology."<sup>79</sup> Courts have interpreted this to mean that section 202(a)(3) authorizes EPA to force the development of new technology that does not yet exist.<sup>80</sup> EPA's authority under section 202(a)(1) is similar: in promulgating standards under 202(a)(1) EPA may make projections about future technology "subject" only "to the restraints of reasonableness,"<sup>81</sup> and a "finding that the requisite technology exists or may be feasibly developed".<sup>82</sup>

In 1980, for example, EPA promulgated PM emission standards for light-duty diesel vehicles and trucks under Section 202(a)(1) authority, requiring that emissions decrease to 0.20 grams per mile in the 1985 model year.<sup>83</sup> EPA determined that the standard would be achievable in 1985 with the perfection of a particle trapping device (a "trap oxidizer"), which at the time had achieved only partial success in a prototype stage.<sup>84</sup> In *NRDC v. EPA*, the D.C. Circuit upheld these standards, holding that EPA "will have demonstrated the reasonableness of its basis for prediction if it answers any theoretical objections to the . . . method, identifies the major steps necessary in refinement of the device, and offers plausible reasons for believing that each of those steps can be completed in the time available."<sup>85</sup> Further, although EPA had identified a number of other technological strategies in addition to the trap oxidizer, the court acknowledged that the standard had been "set in reliance on [that] one preferred method."<sup>86</sup> In upholding the rule, therefore, the court established that the existence and utility of the trap-oxidizer alone was sufficient for the rule to survive.<sup>87</sup>

#### B. EPA Must Establish Standards that Ensure Increased ZEV Deployment

<sup>79</sup> 42 U.S.C. § 7521(a)(3)(A)(i) (emphasis added).

<sup>81</sup> 655 F.2d at 328 (citing International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 629 (D.C.Cir.1973)).

F.2d 259, 268 (D.C. Cir. 1993) (referencing *Natural Res. Def. Council v. Envtl. Protection Agency*, 655 F.2d at 322 and affirming EPA's technology-forcing authority under Section 202(a)(1)-(2)).

<sup>&</sup>lt;sup>80</sup> For an example of the D.C. Circuit upholding 202(a)(3) regulations which forced the development of new technology, see *Nat. Res. Def. Council v. Thomas*, 805 F.2d 410 (1986). In that case, the D.C. Circuit upheld EPA's 1985 regulations for PM emissions from heavy-duty vehicles, and emphasized that Section 202(a)(3) authorizes EPA to force development of new technology to meet EPA's standards. *Id.* at 429. The "PM standards provision, on its face, does not constrict the agency to technology that is "now" available," wrote the court. *Id.* Further, it was "impossible for [the court] to conclude that Congress clearly intended to restrict PM standards to adequately demonstrated technology." *Id.* at 430. Instead, noting that "Congress intended the EPA in promulgating standards with an adequate lead period to engage in reasonable predictions and projections in order to force technology," the court "recognize[d] a Congress concerned with promoting advances in emissions control technology for PM as well as other substances." *Id*; *See also Nat'l Petrochemicals & Refiners Ass'n v. EPA*, 287 F.3d 1130, 1136 (D.C. Cir. 2002) (upholding EPA's MY 2007 PM and NOx emissions standards against industry challenge because "EPA is authorized to adopt 'technology-forcing' regulations, [and] a petitioner's evidence that current technology is inadequate is not enough to show that the EPA was arbitrary in predicting future success.").

<sup>&</sup>lt;sup>82</sup> Natural Res. Def. Council, Inc. v. Reilly, 983 F.2d 259, 268 (D.C. Cir. 1993).

 $<sup>^{83}</sup>$  655 F.2d at 328. The regulation was promulgated by the agency under 202(a)(3)(iii), but the court held that the agency should have cited Section 202(a)(1).

<sup>&</sup>lt;sup>84</sup> 655 F.2d at 328 (citing International Harvester Co. v. Ruckelshaus, 478 F.2d at 629).

<sup>85 655</sup> F.2d at 331.

<sup>&</sup>lt;sup>86</sup> *Id.* at 332.

<sup>&</sup>lt;sup>87</sup> *Id.* at 332 n.25.

As demonstrated above, EPA has clear authority under Section 202(a)(1) to establish standards that drive the uptake of technology that currently exists, or can feasibly be developed. It follows that EPA has authority under 202(a)(1) to promulgate standards that ensure the increased uptake and development of ZEV technology. As established above, EPA may set technology-forcing standards under 202(a)(1) driving the uptake of a particular existing technology; and zero-emission technologies are not only clearly established but are increasing in popularity and development across the vehicle market.<sup>88</sup> Consistent with the technology-forcing history of Section 202, EPA can and should establish protective performance standards requiring GHG emissions reductions sufficient to drive increased development of ZEVs.

1. Protective Standards that Ensure Increased ZEV Deployment are Feasible

Numerous recent cost studies, clear market trends, recent federal investments, and strong state actions all support the feasibility of significant near-term deployment of ZEVs.<sup>89</sup> Analysis from ERM projects Class 4-8 ZEV sales as high as 34 percent in 2029. GHG standards must both incorporate adjustments to the baseline and likewise strengthen standards to secure reductions beyond business as usual levels. The attached EDF White Paper shows the significant environmental and health benefits and the broad economic savings that would accrue from ensuring some new ZEV sales by 2029.

2. ZEV Baseline Must Be Updated to Reflect Industry Projections

Establishing an accurate ZEV sales baseline is critical to the efficacy of EPA's NOx and GHG standards. EPA's proposal assumes a ZEV uptake of only 1.5 percent in several early-adopting market segments in MY 2027–2029. This estimate is far below the pace projected by industry experts. As cited extensively above, manufacturer, municipal, and federal electrification commitments together with state leadership and IIJA funding will continue to drive demand for purchase of new Class 4-8 electric trucks and buses between now and 2029.

EDF commissioned a study from ERM to evaluate baseline sales of medium- and heavy-duty BEVs over the next 10 years given these trends.<sup>90</sup> ERM evaluated five different scenarios encompassing different assumptions about how many states would ultimately adopt ACT regulations (the current six or a total of thirteen), as well as different assumptions for EV market growth in non-ACT states. Low growth assumptions were based on BEV sales projections in EIA's 2022 Annual Energy Outlook<sup>91</sup> and high growth assumptions were based on a recent report from the National Renewable Energy Laboratory (NREL), which projects significantly higher annual sales due to most BEV trucks reaching cost parity with ICE vehicles by 2035.<sup>92</sup>

<sup>&</sup>lt;sup>88</sup> See supra Section I.B

<sup>&</sup>lt;sup>89</sup> See supra Section I.B.

<sup>&</sup>lt;sup>90</sup> E. Robo and D. Seamonds, *Technical Memo: Analysis on Alternative Medium- and Heavy-Duty ZEV Baseline*, ERM for EDF, May 10, 2022.

<sup>&</sup>lt;sup>91</sup> Annual Energy Outlook 2021," Reference Case Projections Tables, US Energy Information Administration (EIA), table 49, <u>https://www.eia.gov/outlooks/aeo/tables\_ref.php</u>.

<sup>&</sup>lt;sup>92</sup> Ledna et al., *Decarbonizing Medium- and Heavy-Duty On-road Vehicles: Zero-Emission Vehicles Cost Analysis*, National Renewable Energy Laboratory, March 2022.

The ERM analysis indicates that for all new medium- and heavy-duty vehicles sold in 2029, midpoint scenarios project medium- and heavy-duty ZEV deployment in excess of 20 percent and more optimistic scenarios project ZEV sales of over 33 percent of all class 4-8 single unit trucks, short-haul tractor trailers and school and transit buses. These estimates far exceed EPA's assumption in the proposal. EPA must use the most current data and projections to update its ZEV sales baseline for the final rulemaking. Failure to establish an accurate baseline will significantly undermine the Agency's proposed standards.

Zero-emission vehicles are already available and cost-effective. Deploying zero-emitting medium and heavy-duty vehicles is critical to reach our health and climate goals. EPA must seize this opportunity to protect human health and the environment for all people and all communities by setting standards that ensure greater deployment of zero-emission vehicles.

3. EPA Must Adopt Standards that Ensure ZEV Deployment Beyond the Baseline

The White Paper EDF is submitting along with these comments documents in detail issues surrounding cost, feasibility, and lead-time supporting the feasibility and reasonableness of EPA establishing performance-based pollution standards that help to ensure 40 percent of new class 4-7 and class 80 short haul vehicles are ZEVs by 2029 and 80 percent of new school and transit buses are ZEVs by that year.<sup>93</sup> We don't reiterate those findings here, but note only that it provides extensive and well-documented evidence that, in the M/HDV market ZEV cost reductions, technology advancements, company ESG commitments, state goals and regulations, and federal funding under IIJA are all causing ZEV demand to increase. The increased ZEV demand has, in turn, resulted in major manufacturers of gasoline and diesel vehicles introducing ZEV models and making investments to increase ZEV production to meet the increased demand. While starting a few years later, this is the same positive feedback loop that is happening in the light-duty vehicle market. The light-duty ZEV market has dramatically accelerated in the past few years, and there are strong signs that similar acceleration will happen in the M/HDV market in the next few years.

However, it is critical that EPA establish pollution standards to support and reinforce these trends, consistent with its statutory mandate. As ERM's baseline analysis makes clear, there are a wide range of potential baseline values that might occur absent protective EPA standards, and accordingly, EPA must act to provide a strong, clear, and realistic market signal to secure urgently needed pollution reductions, ensure ZEV deployment levels consistent with what is needed to protective communities and the climate, and provide a strong foundation for protective Phase III standards going forward. Finally, while we have not included specific recommendations for standards in model years 2027 and 2028, we would respectfully recommend that EPA establish standards in those model years consistent with the above-describe lead time and feasibility considerations.

4. EPA Should Not Include Credit Multipliers in Vehicle Segments Targeted for Increased ZEV Deployment

<sup>&</sup>lt;sup>93</sup> EDF, "Medium- and heavy-duty ZEV market readiness summary," (May 16, 2022). (Attachment I)

In the Proposal, EPA sought comment on how to treat Advanced Technology Credits produced by EVs for the Phase 2 standards.<sup>94</sup> While EDF supports programs that incentivize increased ZEV deployment, EPA should not allow credit multipliers in the vehicle segments targeted for increased ZEV deployment. As the agency correctly notes in the Proposal, multiplier credits allow for "backsliding of emission reductions expected from internal combustion engine vehicles."<sup>95</sup> In the Proposal, EPA notes that at 8.5 percent ZEV penetration credits would result in the loss of all of the projected reductions from Phase 2.<sup>96</sup> The path to ZEV deployment levels of 80 percent ZEV sales of school and transit buses by 2029 and 40 percent ZEV sales by 2029 for new Classes 4-7 vehicles and Class 8 short-haul tractors in 2029 will result in high levels of ZEV deployment in MY 2024-2027 – indeed, even in its most conservative scenario, ERM projects over 6 percent ZEVs in 2024.

EPA should not allow credit multipliers for these segments, Classes 4-7 vehicles, and Class 8 short-haul tractors, that are targeted for increased ZEV deployment. ZEVs will continue to have 0 grams CO2 per ton-mile emissions, but additional multiplier credits are not necessary and will undermine the emissions reductions required to meet the standards. Additionally, there will be significant deployment of ZEVs as a result of the Advanced Clean Truck rule. California, Oregon, Washington, New York, New Jersey, and Massachusetts have adopted the rule and several other states are in the process or committed to adopting the rule.<sup>97</sup> ACT will require 9%, 11% and 13% ZEV sales of Class 4-8 vehicles for MYs 2024-2027 respectively.<sup>98</sup> Accordingly, it is critical that EPA not provide credit multipliers to ensure that the contemplated ZEV targets are actually achieved and the reductions from their deployment are assured.

# IV. EPA's NOx Standards Must be Strengthened to Protect Public Health

We urge EPA to strengthen its NOx standards to ensure they deliver the maximum possible reductions in harmful NOx pollution, consistent with reductions California and other states need to protect public health, and in a manner that ensures diesel vehicles are fully deploying available technologies to reduce harmful NOx pollution and that the standards drive adoption of ZEV technologies. EPA's standards must be strengthened in several important regards to achieve these goals. First, we urge EPA to adopt a multipollutant approach that considers the availability of ZEV technologies in reducing NOx pollution. We then discuss a series of critical improvements to EPA's proposed NOx standards for diesel vehicles, including recommended adjustments to the ZEV NOx credits, and the importance of strengthening the idle standards. Finally, we address and rebut claims by other stakeholders that protective NOx standards will result in a pre-buy of high-polluting diesel vehicles.

A. NOx Standards Should be Part of an Integrated, Multipollutant Approach

https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fro2.pdf.

<sup>&</sup>lt;sup>94</sup> 87 Fed. Reg 17,603.

<sup>&</sup>lt;sup>95</sup> *Id.* at 17,604.

<sup>&</sup>lt;sup>96</sup> Id.

<sup>&</sup>lt;sup>97</sup> See supra at fn 59.

<sup>&</sup>lt;sup>98</sup> CARB, Advanced Clean Trucks Regulation Final Regulation Order: ZEV Sales Percentage Schedule at 5, Table A-1 (March 15, 2021),

Current zero-emission technologies are capable of dramatically reducing NOx emissions. In fact, the White Paper EDF has submitted along with these comments finds that ZEV deployment in the 2027-2029 timeframe can deliver 840,000 tons of NOx reductions beyond EPA's proposed option 1 through 2050 and 2.2 million tons of NOx reductions beyond a 2026 baseline through 2050. Accordingly, in both these and future standards, we prefer that EPA adopt multipollutant standards that achieve reductions in both criteria and climate pollution and drive zero-emitting technologies. A multipollutant approach is firmly grounded in EPA's authorities under 202(a)(1), discussed above, and 202(a)(3), which, directs the Administrator to establish standards for NOx and particulate matter reflecting the "greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available for the model year to which such standards apply, giving appropriate consideration to cost, energy, and safety factors associated with the application of such technology."

Setting standards in this manner would allow both a heavy-duty NOx engine standard and a heavy-duty GHG standard to be set in a way that incorporates the dual criteria and climate benefits of zero-emission vehicles and ensure there are not pollution trade-offs between two different sets of standards and between ICE vehicles and ZEVs. As addressed in more detail in our comments on EPA's proposed adjustments to the Phase 2 GHG standards, it is clear that a rapid increase in the market share of zero emission vehicles has begun and will continue in the coming years. Neither EPA's proposed NOx nor GHG standard adequately account for this market shift. While EPA has estimated that ZEVs will comprise 1.5 percent of the fleet during the period of these standards, analysis conducted by ERM projects ZEV sales of up to 34 percent in 2027-29.<sup>99</sup>

If EPA relies on just the GHG standards to drive the deployment of ZEVs in its final rule, it must strengthen its proposed NOx standards for diesel vehicles to deliver the maximum possible NOx reductions, ensuring full technology development. EPA must strengthen its proposed NOx standards for diesel vehicles to deliver maximum possible NOx reductions, consistent with the needs of California and other section 177 states. In particular, EPA should adjust its approach to ZEV NOx credit generation. And regardless of whether EPA adopts multipollutant standards, we urge the agency to finalize stronger idle standards, consistent with those in the Omnibus Rule. We discuss each of these recommendations more fully below.

# B. EPA Must Strengthen its Approach to ZEV NOx Credits

As we discuss above, EPA should adopt multipollutant standards that consider the availability of ZEVs in establishing both NOx and greenhouse gas standards. EPA's proposal, however, does not consider ZEV technologies in setting NOx standards but does provide NOx credits for ZEVs in demonstrating compliance. In particular, NOx credits earned in MYs 2024-2026 can be carried over to MY 2027 and beyond if the credit earning vehicles meet the "other" requirements (useful life, warranty, low load NOx standard, etc.), which would begin in MY 2027. As a result of this approach, instead of delivering additional air pollution benefits, ZEVs will instead significantly dilute the efficacy of the standard and allow for higher-polluting diesel vehicles to be sold.

<sup>&</sup>lt;sup>99</sup> See supra fn 72.

EDF analyzed the impacts of these crediting provisions, including the number of MY 2027 and later heavy-duty vehicles that could be certified to the maximum family emission level (FEL) under EPA's proposal, as well as the total tons of additional NOx emissions allowed by the BEV averaging. (See Attachment H for the full analysis).

Our analysis used ERM BEV sales Scenario 2b (reflecting existing and reasonably foreseeable ACT adoption) to project baseline nationwide BEV sales likely to generate NOx credits. To calculate NOx credits earned by these BEVs, we used EPA's NOx credit calculation from the proposal, assuming a NOx standard of 200 mg/bhp-hr in MY 2024-2026 and EPA's Option 1 NOx standards of 35 mg/bhp-hr for MY 2027-2030 and 20 mg/bhp-hr for MYs 2031 and beyond. Applying the equation for NOx credits to the BEV sales, we estimated that the cumulative NOx credits earned by all BEVs through 2035 are 190,000 megagrams (metric tons).

In order to put these levels of NOx credits in perspective, we calculated the number of vehicles that can be certified to the FEL cap and the increase in NOx emissions. We assumed manufacturers would use the credits to allow some of their heavy-duty vehicles to avoid as much of the increased stringency of the MY 2027 and MY 2031 NOx standards as possible. We assumed that manufacturers would utilize their credits within the same vehicle type and regulatory class in which they were earned to avoid proposed limitations on the transfer of credits between classes. We also assumed credits earned in MYs 2024-2026 would be banked for use in MYs 2027-2030.

We calculated the number of vehicles that could be certified to the FEL cap of 115 mg/bhp-hr NOx and the percentage of national sales of vehicles in each category. By 2030, nearly 90 percent of school buses, 80 percent of transit buses, 35 percent of single unit trucks and a quarter of all tractors could be certified to a level of 115 mg/bhp-hr instead of meeting the proposed NOx standard of 35 mg/bhp-hr. And by 2035, nearly half of all school buses, 45 percent of Class 4-8 single unit trucks and a quarter of all tractors would still be emitting NOx at 115 mg/bhp-hr – nearly six times higher than the emissions standard of 20 mg/bhp-hr for 2031 and beyond.

The ability to certify vehicles at the FEL cap instead of the 35 or 20 mg/bhp-hr level increases onroad NOx emissions until all of these vehicles are retired. We estimate the impact of certifying to the FEL caps using lifetime NOx emissions from EPA's MOVES3. The increase in lifetime NOx emissions from FEL cap certified engines (in metric tons) would be 174,000-213,000 metric tons through 2035. This increase is over 33 percent of the 559,000 ton reduction in NOx emissions that EPA projects for the Option 1 standards in 2045. Appendix G describes the results of this analysis and the methodology we used to conduct it in more detail.

As these results demonstrate, EPA's proposal to allow ZEVs to generate NOx credits is damaging and would substantially erode the NOx benefits of the proposal. Accordingly, if EPA continues to establish NOx standards in a manner that does not consider ZEV technologies, EDF urges EPA to sunset the BEV and FCEV credits that are proposed at 87 Fed. Reg. 17561. However, if EPA retains these credits in any form, it is critically important that the agency not adopt any credit multipliers and that EPA substantially strengthen the FEL cap to help ensure remaining diesel vehicles are not able to certify to higher emission levels based on the availability of ZEV credits.

### C. EPA Must Adopt a Mandatory NOx Idle Standard

In addition to adopting the most rigorous engine NOx emissions standards, we urge EPA to adopt mandatory NOx idle emissions standards. Medium- and heavy-duty vehicles can spend 30-40 percent of their time at idle and NOx emissions at idle can represent up to 20 percent of an engine's total NOx emissions.<sup>100</sup> California adopted "clean idle" standards in 2008 that required new engines to equip a 5-minute non-programmable automatic engine shutdown system (AESS) or certify to a clean idle NOx standard of 30 grams per hour (g/hr).<sup>101</sup> EPA's in-use data, presented by ICCT, shows that the majority of diesel engines across most manufacturers were already meeting the 30 g/hr threshold in 2019.<sup>102</sup> In 2021, California adopted its Heavy-duty Engine and Vehicle Omnibus regulation that included updated NOx idling standards for all medium- and heavy-duty vehicles, including a 10 g/hr standard for MYs 2024-2026 and a 5 g/hr standard for MY 2027 and beyond.

EPA has proposed voluntary NOx idle emissions standards for medium- and heavy-duty vehicles beginning in MY2023 at 30 g/mi and ramping up to meet California's 5 g/mi standard for MYs 2027 and beyond. However, a voluntary standard misses the opportunity to make significant reductions in harmful diesel pollution that is often concentrated in urban areas where diesel emissions are already a serious burden on local communities. Accordingly, we urge EPA to finalize mandatory requirements to reduce idle emissions.

1. EPA Must Adopt Mandatory NOx Idle Emissions Standards At or Below ARB's Omnibus Standards

The Air Resources Board (ARB) staff concluded in its Initial Statement of Reason (ISOR) for the Heavy-duty Omnibus regulation that the 10 g/hr NOx idle emission standard for the 2024-2026 MYs is feasible, based primarily on a Southwest Research Institute (SwRI) Low NOx testing program that evaluated the emission reductions achievable by changing calibrations during idle.<sup>103</sup> SwRI demonstrated that reducing exhaust flow at idle can reduce NOx emissions during idle by almost 90 percent. In fact, with an auxiliary load, idle emissions were demonstrated as low as 1.6 g/hr, far below the 10 g/hr standard adopted for 2024 and the 5 g/hr standard adopted for MY2027 and beyond. ARB states that its 10 g/hr standard is indeed conservative.

It is critical that EPA adopt mandatory NOx idle emissions standards that are at least as protective as California's Omnibus regulation. According to ARB, in 2019, there were already a number of engines certified with idle emissions below 10 g/hr and a number of the best performing engines already achieved the 5 g/hr standard.<sup>104</sup> Therefore, engines are already capable of the most protective standard a full 8 model years before it goes into effect. A

Heavy-duty Diesel Vehicles in the United States, ICCT, page 20, Figure 13.

<sup>&</sup>lt;sup>100</sup> Huzeifa Badshah, Francisco Posada, Rachel Muncrief. 2019. Current State of NOx Emissions from In-Use Heavy-duty Diesel Vehicles in the United States, ICCT, page 17, Figure 10; page 18, Figure 11.

 <sup>&</sup>lt;sup>101</sup> California Air Resources Board, "Proposed Heavy-duty Engines and Vehicle Omnibus Regulation and Associated Amendments. Staff Report: Initial Statement of Reasons," (June 23, 2020) ("ISOR"), page I-7.
 <sup>102</sup> Huzeifa Badshah, Francisco Posada, Rachel Muncrief. 2019. Current State of NOx Emissions from In-Use

<sup>&</sup>lt;sup>103</sup> ISOR, page III-14.

<sup>&</sup>lt;sup>104</sup> ISOR, page III-15.

voluntary standard would do little to compel action to reduce harmful NOx emissions at idle. A mandatory standard would cement the available emissions reductions experienced by California across the nation.

EDF also recommends that EPA adopt a mandatory NOx idle standard for 2027 and beyond that goes beyond California's 5 g/mi standard. SwRI conducted additional testing since the adoption of the Omnibus regulation.<sup>105</sup> Over a range of different duty cycles, SwRI demonstrates that, even at high mileage, engines can reduce NOx idle emissions to well below 1 g/mi. In fact, the highest idle emission rate they found was 1.4 g/mi. Engine manufacturers would still have a full 5 model years to achieve the more protective standards.

It is critical that EPA utilize the most recent research and testing and the clear demonstration of success in California to adopt mandatory and protective NOx idle standards based on the greatest emissions reductions achievable by today's engines.

2. Mandatory Idle Standards Should Apply to All Medium- and Heavy-Duty Vehicles

ARB has determined that all medium- and heavy-duty vehicles are capable of meeting the mandatory idle emissions standards. California's 2008 clean idle standards exempted all medium-duty vehicles as well as buses and recreational vehicles because it was assumed that most manufacturers would meet the idle standards by installing an AESS, and that technology did not make sense for those particular vehicle segments at the time the rule was adopted. However, all manufacturers have instead met the idle regulations by certifying to clean idle standards through the use of EGR and air-fuel ratios. Therefore, ARB determined in its 2020 ISOR that "EGR and air-fuel ratio controls are feasible for buses, recreational vehicles, medium-duty vehicles, armored vehicles, and workover rigs, just like for any heavy-duty vehicle, and so the rationale for exempting these vehicles that existed in 2005 no longer exists."<sup>106</sup> ARB also determined that other strategies for meeting the updated standards could include "raising the exhaust temperature to enable SCR operation using cylinder deactivation, mild hybrid systems, stop-start systems, or a combination of all of these strategies."<sup>107</sup> Therefore, it is clear that all medium- and heavy-duty engines must be subject to health-protecting NOx idle emissions standards that begin in MY 2024 and reflect the reductions

D. EPA Should Reject Pre-buy Arguments that Protective Standards Cause Sales Impacts

Certain companies continue to inaccurately make the argument that protective pollution standards disrupt the market for new trucks because of a pre-buy/low buy phenomenon. These arguments are based almost entirely on inflated cost projections for compliance with EPA Option

<sup>&</sup>lt;sup>105</sup> Presentation by Christopher Sharp, SwRI, "Update on Continuing Progress Towards 2027 Heavy-duty Low NOx Targets," 32<sup>nd</sup> CRC Real World Emissions Workshop (March 14, 2022). Presentation by Christopher Sharp et. al., SwRI, "An Update on Continuing Progress Towards Heavy-duty Low NOx and CO2 in 2027 and Beyond," WCX (April 5-7, 2022).

<sup>&</sup>lt;sup>106</sup> ISOR, page II-8.

<sup>&</sup>lt;sup>107</sup> ISOR, page III-15.

1, which aligns with the California Heavy-Duty Omnibus rule, including assumed substantial additional costs for replacing diesel NOx controls based on warranty and extended useful life provisions.

However, CARB's cost projections are reasonable and indeed, similar claims related to past standards have proven incorrect. For instance, some companies often incorrectly cite the 2006/2007 emissions standards as an example of standards that caused a pre-buy/low-buy effect. A prior analysis by EDF has shown that standards, including the 2007 standards, did not meaningfully result in "pre-buy" or "low-buy."<sup>108</sup> The study found that the net impact of the 2007 criteria standards on sales, and likely employment, was quite small.<sup>109</sup> Instead, GDP, the price of diesel fuel, and controls for annual and month-of-year differences described the vast majority of the variation in sales and employment, <sup>110</sup> Failing to control for these underlying economic trends biases analysis of the impact of regulation.<sup>111</sup> The study found that other previous criteria pollutant standards, in 1998, 2002, 2004, and 2010, also had no impact on new-vehicle sales.<sup>112</sup> The study concluded that the empirical evidence suggests that compliance with criteria pollutant standards has not generally caused a demand shift or net impact on new-vehicle sales.<sup>113</sup>

### V. EPA Should Consider a Voluntary Alternative Compliance Pathway

Finally, we encourage EPA to consider creation of a voluntary alternative compliance pathway that recognizes the significant investments manufacturers are making in ZEV technologies and affords a pathway to achieve even greater levels of emission reductions and ZEV deployment than would otherwise be incorporated in the standards. Such a pathway could pull forward reductions prior to 2027, given that many manufacturers are introducing ZEV technologies now and also planning for compliance with more protective NOx Omnibus requirements in 2024. It could also allow manufacturers to opt in to protective reductions post 2030, thereby providing manufacturers with added certainty as EPA is developing its Phase 3 program and also building strong momentum toward ensuring 100 percent of all new vehicles sold by 2035 are zero-emitting. Such a voluntary pathway could also be expressly multipollutant in nature, which, as we discuss above can help to accelerate ZEV deployment without sacrificing NOx or GHG emissions reductions from ICE vehicles.

A voluntary pathway could also provide EPA an opportunity to create needed incentives for manufacturers of electric drivetrains, which will not be subject to compliance certification obligations under the proposed adjustment to the Phase 2 GHG vehicle standards. Indeed, EPA

<sup>&</sup>lt;sup>108</sup> Analysis of Market Impacts of GHG and Fuel-Economy Standards for Heavy Duty Vehicles by Dr. Matthew Zaragoza-Watkins in comments of Environmental Defense Fund on Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2; Proposed Rule, 80 Fed. Reg. 40138 (July 13, 2015), EPA-HQ-OAR-2014-0827-1971, <u>https://www.regulations.gov/comment/EPA-HQ-OAR-2014-0827-1971; See also Katherine Rittenhouse and Matthew Zaragoza-Watkins, Anticipation and Environmental Regulation, Journal of Environmental Economics and Management 89, 255-277 (2018), https://doi.org/10.1016/j.jeem.2018.03.005.</u>

 $<sup>^{109}</sup>$  Id.

<sup>&</sup>lt;sup>110</sup> Id.

<sup>&</sup>lt;sup>111</sup> Id.

<sup>&</sup>lt;sup>112</sup> Id. <sup>113</sup> Id.

has adopted programs in past medium- and heavy-duty rules that have included similar mechanisms.<sup>114</sup>

Critically, however, such a voluntary program must achieve emissions benefits greater than would be achieved assuming manufacturer participation in the mandatory program.

Thank you for your consideration of these comments.

Respectfully submitted,

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<sup>&</sup>lt;sup>114</sup> See, e.g., Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, 66 Fed. Reg. 5002 (January, 18, 2001). See, e.g., Control of Air Pollution From New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements, 65 Fed. Reg. 6698 (February 10, 2000).

#### **Attachments**

Attachment A: Environmental Defense Fund, The Opportunity for Near-Term Electrification of Medium- and Heavy-Duty Vehicles (May 2022).

Attachment B: Ellen Robo and Dave Seamonds, "Analysis of Alternative Medium- and Heavyduty Zero-Emission Vehicle Baseline Scenarios," Technical memo by ERM for EDF (May 12, 2022).

Attachment C: Ellen Robo and Dave Seamonds, "Analysis of Alternative Medium- and Heavyduty Zero-Emission Vehicle Baseline Scenarios," Excel sheet by ERM for EDF (May 12, 2022).

Attachment D: Presentation by Jonathan Buonocore, Chet France, Rick Rykowski, Brian Naess, Komal Shukla, Catherine Seppanen, Dylan Morgan, Frederica Perera, Katie Coomes, Ananya Roy, Sarav Arunachalam. 2022. "Distribution of Air Quality Health Benefits of MHEV policies: New York," University of North Carolina, Harvard Chan School of Public Health, Columbia University Mailman School of Public Health and Environmental Defense Fund.

Attachment E: Muratori, Matteo et al. "Decarbonizing Medium- and Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis." NREL Transforming Energy. March 2022.

Attachment F: Chad Hunter, Michael Penev, Evan Reznicek, Jason Lustbader, Alicia Birky, and Chen Zhang. 2021. Spatial and Temporal Analysis of the Total Cost of Ownership for Class 8 Tractors and Class 4 Parcel Delivery Trucks, Nation Renewable Energy Lab, Technical Report.

Attachment G: Vishnu Nair, Sawyer Stone, Gary Rogers, Sajit Pillai. 2022. *Medium and Heavy-Duty Electrification Costs for MY 2027- 2030*, Roush Industries for Environmental Defense Fund.

Attachment H: EDF, "Impact of BEV Averaging on Proposed NOx Emission Standards and In-Use Emissions," (May 16, 2022).

Attachment I: EDF, "Medium- and heavy-duty ZEV market readiness summary," (May 16, 2022).

Attachment J: Katherine Rittenhouse and Matthew Zaragoza-Watkins, *Anticipation and Environmental Regulation*, Journal of Environmental Economics and Management 89, 255-277 (2018).

Attachment K: Analysis of Market Impacts of GHG and Fuel-Economy Standards for Heavy Duty Vehicles by Dr. Matthew Zaragoza-Watkins in comments of Environmental Defense Fund on Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2; Proposed Rule, 80 Fed. Reg. 40138 (July 13, 2015), EPA-HQ-OAR-2014-0827-1971.

Attachment K: Navistar President and CEO, Mathias Carlbaum, presentation at the Advanced Clean Transportation (ACT) Expo, Long Beach, CA (May 9-11, 2022).

Attachment M: Rachel MacIntosh, Sophie Tolomiczenko, Grace Van Horn. April 2022. *Electric Vehicle Market Update: Manufacturer Commitments and Public Policy Initiatives Supporting Electric Mobility in the U.S. and Worldwide*, ERM for EDF, Version 6.

Attachment N: Baha, Al-Alawi, et al. "The Advanced Technology Truck Index: A U.S. ZET Inventory Report." CALSTART. Jan 2022.

Attachment O: North American Council for Freight Efficiency. 2022. Electric Trucks Have Arrived: The Use Case for Heavy-Duty Regional Haul Tractors.