Environmental Defense Fund

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SUBMITTED ONLINE

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Attention: Docket ID Nos. **EPA–HQ–OAR–2014–0827**
NHTSA–2014–0132

Re: Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles; Proposed Rule

Environmental Defense Fund (EDF) appreciates the opportunity to submit comments on EPA and the NHTSA's ("the Agencies") proposed rule to adopt greenhouse gas (GHG) emissions standards and fuel efficiency standards for new medium- and heavy-duty engines and vehicles. EDF is a non-profit, non-partisan, non-governmental environmental organization that combines law, policy, science, and economics to find solutions to today's most pressing environmental problems. We respectfully submit these comments on behalf of our more than one million members who support cleaner air and climate security. All of the documents cited to and relied on in these comments are hereby incorporated as part of the administrative record. EDF is also submitting separate joint comments on the Social Cost of Carbon and the Social Cost of Methane to this docket and they are hereby incorporated.

In a June 2013 speech about the pressing need to address climate change, President Obama acknowledged the importance of building on the first-ever standards for heavy-duty trucks and committed to strengthening fuel economy and greenhouse gas emission standards for post-2018 vehicles, stating: "in the coming months we'll partner with truck makers to do it again for the next generation of vehicle."[1] The President's Climate Action Plan calls for standards that continue to reduce fuel consumption through cost-effective technologies that will increase the

[1] The White House, *Remarks by the President on Climate Change*, Georgetown University (June 25, 2013), *available at* http://www.whitehouse.gov/the-press-office/2013/06/25/remarks-president-climate-change.

efficiency of shipping goods across the United States.[2] And the President reiterated his commitment in a U.S.-China Joint Presidential Statement on Climate Change: "The United States commits to finalize its next-stage, world-class fuel efficiency standards for heavy-duty vehicles in 2016 and implement them in 2019."[3]

EDF likewise recognizes the importance of a rigorous second phase of standards to reduce greenhouse gas emissions and improve fuel efficiency for medium- and heavy-duty vehicles ("Phase 2 Standards"). Accordingly, we respectfully urge EPA to strengthen the proposed Phase 2 Standards to reflect the full suite of existing and emerging cost-effective technologies. The nation's fleet of trucks and buses consumes more than 135 million gallons of fuel every day and emits more than 450 million metric tons of climate pollution annually.[4] And freight movement is one of the fastest growing sources of greenhouse gas emissions and fuel consumption in the United States – despite historic first-ever fuel economy and greenhouse gas standards finalized by the Obama Administration in 2011.[5] Reducing fuel consumption and GHG emissions from these vehicles is one of the most consequential actions we can take to lessen our dependence on oil, improve our energy security and help mitigate climate change. But only robust and timely Phase 2 standards will drive the innovative technologies needed to secure these benefits. We urge the Agencies not to delay in finalizing strong standards to protect our communities and families.

In summary, our comments:

- Discuss the harms associated with climate change;
- Identify rigorous aspects of the proposal that we support;
- Recommend improvements to the economic impacts analysis;
- Make specific recommendations for areas of the proposal that should be strengthened, including the engine standard and requirements for natural gas vehicles;
- Request the agencies provide transparent emissions and fuel economy information to consumers through window labels and online tools;
- Urge the agencies to establish protective particulate emissions standards for APUs and strengthen NOx standards for heavy-duty vehicles

[2] The White House, *The President's Climate Action Plan,* (June 2013), *available at* http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.
[3] White House press release, *US-China Joint Presidential Statement on Climate Change*, (September 25, 2015), *available at* https://www.whitehouse.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change.
[4] Energy Information Agency (EIA), *Annual Energy Outlook* (2015), Tables A-7 and A-19.
[5] EIA, *Annual Energy Outlook* (2015), Table 19.

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Attachments

Attachment 1: Jonathan Camuzeaux, Ramón A. Alvarez, Susanne A. Brooks, Joshua B. Browne and Thomas Sterner, "Influence of Methane Emissions and Vehicle Efficiency on the Climate

Implications of Heavy-Duty Natural Gas Trucks," Environmental Science & Technology 49: 6402-6410 (May 19, 2015).

Attachment 2: Eastern Research Group, "Options to Account for Upstream Emissions in Phase 2 Heavy-duty GHG Standards," prepared for Environmental Defense Fund (September 2015).

Attachment 3: Letter from NHTSA Administrator David Strickland to Senator Diane Feinstein re: window labels for heavy-duty trucks (Date unknown).

I. Harms Associated with Climate Change

As EPA has properly concluded, the scientific record demonstrating that "elevated concentrations of greenhouse gases in the atmosphere may reasonably be anticipated to endanger the public health and welfare of current and future U.S. generations is robust, voluminous, and compelling."[6] The transportation sector is the second largest source of domestic greenhouse gas emissions and heavy-duty trucks and buses are responsible for nearly a quarter of the sector's GHG emissions. Significantly reducing these emissions from new heavy-duty vehicles is necessary to mitigate the serious harms associated with climate change in the United States.

The proposal's Regulatory Impact Analysis ("RIA") provides an overview of the pressing threats posed by greenhouse gas emissions and a summary of EPA's 2009 Endangerment Finding. It also incorporates major assessments by the U.S. Global Change Research Program (USGCRP), the Intergovernmental Panel on Climate Change ("IPCC"), the National Academies' National Research Council (NRC), and more recent assessments that support the endangerment finding.[7] Climate research and assessment reports published since 2009 (and cited in the heavy-duty RIA) further emphasize the urgency of climate change and the need to mitigate greenhouse gas emissions.[8] The climate science that forms the basis of the Endangerment Finding provides a legally sufficient and scientifically compelling justification for curbing greenhouse gas emissions from heavy-duty vehicles.

A. Direct threats to public health and welfare from climate change

Climate change is threatening, and will continue to threaten, public health in many regards. It is expected to increase the incidence and severity of heat waves, for instance, which are particularly dangerous to the elderly, the very young, and the infirm.[9] Warmer days lead to enhanced ozone (or smog) formation, which can exacerbate respiratory illnesses, contribute to asthma attacks and hospitalizations, and heighten the risk of premature death among affected populations.[10] Because a warmer atmosphere retains more moisture, climate change will produce heavier precipitation events, stronger tropical cyclones, and associated flooding, spreading toxins and diseases and

[6] 75 Fed. Reg. 49,556, 49,557 (Aug. 13, 2010) (Endangerment Reconsideration Denial)**;** *see also* 74 Fed. Reg. 66,496, 66,523 (Dec. 15, 2009) (Endangerment Finding)*; Coalition for Responsible Regulation, Inc. v. EPA*, 684 F.3d 102, 122—28 (D.C. Cir. 2012) (upholding Endangerment Finding in its entirety).
[7] EPA and NHTSA, Proposed Rulemaking for Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles–Phase 2: Draft Regulatory Impact Analysis (June 2015) at 6-40 to 6-42. (Hereinafter "RIA").
[8] *See* HD RIA at 6-41.
[9] EGU RIA at 3-1—3-2.
[10] *Id.* at 3-2—3-3, 5-39—5-40; G. G. Pfister et al., *Projections of Future Summertime Ozone Over the U.S.* (2014), (higher temperatures increase smog formation in already polluted areas).

causing severe infrastructure damage, social upheaval, and widespread injury and death.[11] Pathogens and pests are expected to disseminate among susceptible populations due to changes in those species' survival, persistence, habitat range, and transmission under changing climate conditions, further endangering the public.[12]

As EPA has attested at length, climate change also threatens public welfare. Sea level rise is well documented and is very likely to accelerate over the coming decades.[13] Rising seas, amplified by storm surges and stronger tropical cyclones, will threaten our coastal homes, cities, and infrastructure, forcing expensive efforts to protect or relocate critical resources.[14] Millions of U.S. citizens will be affected and many will be displaced. Further inland, shrinking snowpack and early spring melts will increase flood risks early in the melt season and will cause water shortages throughout much of the western United States, which now depends on snowpack as a reliable water source.[15] Droughts, especially in the western and southern United States, are expected to occur more frequently, and the extent of drought-limited ecosystems is projected to grow by 11 percent for every degree Celsius of warming.[16] This phenomenon will exacerbate the water scarcity already affecting numerous regions of the country.[17] Furthermore, the combination of changing atmospheric chemistry and shifting, more violent weather patterns will likely cause crop damage and crop failure, with corresponding increases in food prices and declines in availability.[18] On forested lands, the same changes will instigate more severe fires, as seen in California this summer, pest outbreaks, and higher tree mortality, which will likely disrupt timber production.[19]

B. Climate change threatens the ecosystems upon which society depends

Natural environments and biodiversity provide humans with a wide range of benefits, or "ecosystem services," including fresh water supplies, fertile soil for agriculture, fisheries, climate regulation, and aesthetic, cultural, and recreational benefits.[20] However, climate change will have major implications for wildlife, biodiversity, and the fundamental ecosystem services upon which we depend. Observed changes in our climate are already shifting habitat ranges, altering migration patterns, and affecting reproductive timing and behavior.[21] At anticipated levels of increased global temperature, many terrestrial, freshwater, and marine species are at far greater

[11] *Id.* at 3-3.
[12] *Id.*
[13] *Id.* at 3-6.
[14] *Id.* at 3-3, 3-6—3-7.
[15] *Id.* at 3-5.
[16] *Id.* at 3-5, 3-8; USGCRP at 33, 44.
[17] RIA at 3-5.
[18] *Id.* at 3-4.
[19] *Id.* at 3-4—3-5.
[20] US Climate Change Science Program, *Abrupt Climate Change*, at 291 (2008).
[21] EGU RIA at 3-7.

risk of extinction than in the past.[22] The situation is particularly dire for Arctic wildlife, as climate change causes significant loss of sea ice and a dramatic reduction in marine habitat for polar bears, ice-inhabiting seals, and other animals.[23] And the resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification), and other global change drivers (e.g., land use change, pollution, fragmentation of natural systems, overexploitation of resources).[24]

The footprint of humans on the planet is now straining ecosystems more than at any time in history. Terrestrial, freshwater, and marine environments have already undergone extensive transformation and deterioration.[25] More than 75 percent of Earth's ice-free land has been altered by human activity.[26] Nine of the world's fourteen biomes (each of which designates a broad ecological land category) have been converted into cropland at factors ranging from 20 to 50 percent.[27] Over 40 percent of the world's oceans, including two-thirds of the ocean waters within the United States Exclusive Economic Zone, are designated as having an anthropogenic impact rating of at least "medium high."[28]

Together with these stressors, climate change is having a major effect on ecosystems. For example, research indicates that climate change and other anthropogenic factors are causing the sixth mass extinction of global biodiversity in the last 600 million years of life on Earth, with current extinction rates 100 to 1,000 times greater than historical rates.[29] In 2007, the IPCC concluded that by the mid-21st century, 15 to 37 percent of plant and animal species worldwide would be committed to extinction if temperatures increase 1.6 to 1.8° C above late 20th century levels.[30] "Specialist" species—those with a narrow tolerance for changes in habitat, diet, or other

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[22] *Id.* at 3-7.
[23] *Id.* at 3-7.
[24] *Climate Change 2007: Synthesis Report* (2007) by the IPCC at 48.
[25] *See generally id.* at 291-313; Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Biodiversity Synthesis* (2005), Chapters 4 and 28; Brook, *et al.*, *Synergies among extinction drivers under global change,* 23 Trends in Ecology and Evolution 453 (2008); Butchart, *et al.*, *Global Biodiversity: Indicators of Recent Declines*, 328 Science 1164 (2010).
[26] Ellis and Ramankutty, *Putting people in the map: anthropogenic biomes of the world*, 6 Frontiers in Ecology and the Environment 439, 439 (2008).
[27] Millennium Ecosystem Assessment at 79.
[28] Halpern, *et al.*, *A Global Map of Human Impact on Marine Ecosystems,* 319 Science 948, 949 (2008); Kappel, *et al.*, *In the Zone: Comprehensive Ocean Protection*, 25 Issues in Science and Technology 33, 38 (2009).
[29] Pimm, *et al.*, *The Future of Biodiversity*, 269 Science 347, 347 (1995); Dirzo and Raven, *Global State of Biodiversity and Loss*, 28 Annual Review of Environment and Resources 137, 137 (2003); Barnosky, *et al.*, *Has the Earth's sixth mass extinction already arrived?*, 471 Nature 51 (2011); Pereira, *et al.*, *Scenarios for Global Biodiversity in the 21st Century*, 330 Science 1496, 1497 (2010); *see also* Pimm, *Biodiversity: Climate Change or Habitat Loss—Which Will Kill More Species?*, 18 Current Biology R117 (2008).
[30] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: Impacts, Adaptation, and Vulnerability* (2007) at 243, *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter4.pdf.

environmental conditions—are particularly vulnerable to the threat of extinction due to climate change.[31]

Even species that do not go extinct will have to contend with ecological conditions they have not previously faced. Many terrestrial species are shifting their geographical ranges in response to a changing climate. Plants and animals have moved to higher elevations at a median rate of 0.011 kilometers per decade and to higher latitudes at a median rate of 16.9 kilometers per decade, two to three times faster than previously reported.[32] For example, of the 305 bird species tracked in annual Christmas bird counts during the last four decades, 177 species (58 percent) had significant northward range shifts, with more than 60 species moving 100 miles or farther.[33] These range shifts are likely to cause unprecedented interactions among species.

Shifts in seasons, especially in the duration and intensity of winter, are also having significant impacts on ecosystems. One consequence of shifting seasons is the increased likelihood of mismatches between interdependent species (e.g., predator and prey, insects and flowers).[34] A striking example is found in western forests, where warmer winters and longer growing seasons have triggered more intense and extensive forest fires, promoting mountain pine beetle outbreaks that kill millions of trees across millions of hectares of forest.[35] In turn, the decreased availability of whitebark pine nuts as a food source for grizzly bears has been tied to lower cub birth rates, lower over-winter survival rates, and increased conflicts between bears and humans.[36]

In the coming decades, climate-related disturbances (such as altered precipitation regimes and extremes in weather and temperature) will continue to have marked impacts on ecosystems. In some cases, these phenomena will cause ecosystems to transition to significantly different

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[31] *See generally* Clavel, *et al.*, *Worldwide decline of specialist species: toward a global functional homogenization?,* 9 Frontiers in Ecology and the Environment 222 (2011).
[32] Chen, *et al.*, *Rapid Range Shifts of Species Associated with High Levels of Climate Warming*, 333 Science 1024 (2011).
[33] National Audubon Society, *Birds and Climate Change: Ecological Disruption in Motion* at 3 (2009).
[34] *See generally, e.g.*, Miller-Rushing, *et al., The effects of phenological mismatches on demography*, 365 Philosophical Transactions of the Royal Society B: Biological Sciences 3177 (2010); Thackeray, *et al.*, *Trophic level asynchrony in rates of phenological change for marine, freshwater and terrestrial environments*, 16 Global Change Biology 3304 (2010); Yang, *et al.*, *Phenology, ontogeny and the effects of climate change on the timing of species interactions*, 13 Ecology Letters 1 (2010).
[35] Westerling, *et al.*, *Continued warming could transform Greater Yellowstone fire regimes by mid-21st century*, 108 Proceedings of the National Academies of Science, U.S.A. 13165 (2011); Westerling, *et al.*, *Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity*, 313 Science 940 (2006); U.S. Forest Service, Climate Change Resource Center, *Western U.S. Bark Beetles and Climate Change* (2008), *available at* http://www.fs.fed.us/ccrc/topics/insect-disturbance/bark-beetles.shtml.
[36] Gunther, *et al.*, *Grizzly bear–human conflicts in the Greater Yellowstone ecosystem, 1992—2000*, 15 Ursus 10 (2004); USGCRP, *Impacts of Climate Change on Biodiversity, Ecosystems, and Ecosystem Services: Technical Input to the 2013 National Climate Assessment* (2012) at 3-13—3-14, *available at* http://downloads.usgcrp.gov/NCA/Activities/Biodiversity-Ecosystems-and-Ecosystem-Services-Technical-Input.pdf.

community types.[37] For example, more arid ecosystems and river habitat areas will likely be particularly sensitive to changes in precipitation and water supply caused by climate change.[38] Reduced river flow and longer droughts in these regions are projected to diminish native cottonwood and willow populations and render them more susceptible to livestock grazing and encroachment from upland species and invasive weeds.[39] Such changes in ecosystem composition and function will pose critical adaptation challenges for affected human communities.

In short, greenhouse gas emissions are fundamentally destabilizing global ecosystems. Because human society depends upon the goods and services these ecosystems provide, this ecological crisis is a pressing threat to public welfare.

C. Harm associated with ocean acidification

Some of the carbon dioxide emitted by fossil fuel combustion is subsequently absorbed by the world's oceans. Because carbonic acid forms when carbon dioxide dissolves in water, rising CO_2 emissions are causing the seas to become more acidic. Independent of climate change, ocean acidification alone demonstrates that greenhouse gases endanger public welfare. The National Research Council has reported that ocean acidity has increased approximately 30 percent since pre-industrial times, and could intensify by three to four times this amount by the end of the century if carbon emissions remain uncurbed.[40] Furthermore, increasing rates of ocean acidification may hamper the oceans' ability to absorb more CO_2, resulting in more atmospheric carbon and, in turn, intensified climate change.[41]

Increased acidification poses a significant threat to the ocean's critical food webs. For instance, it will sharply reduce the underwater area suitable for coral reefs, which function as fish nurseries.[42] Similarly, planktonic animals, which are an important food supply for many underwater species, may be unable to tolerate more acidic waters.[43] By disrupting the delicate balance of oceanic ecosystems, acidification could have devastating impacts on coastal communities that rely heavily on the sustained health of their fisheries.

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[37] *See generally* Peters, *et al*., *Directional climate change and potential reversal of desertification in arid and semiarid ecosystems*, 18 Global Change Biology 151 (2012); Rood, *et al.*, *Declining summer flows of Rocky Mountain rivers: Changing seasonal hydrology and probable impacts on floodplain forests*, 439 Journal of Hydrology 397 (2008).
[38] Rood at 405.
[39] *Id.* at 409; *see also* Stromberg, *et al.*, *Effects of Stream Flow Patterns on Riparian Vegetation of a Semiarid River: Implications for a Changing Climate*, 26 River Research and Applications 712 (2010).
[40] National Research Council (NRC), *Advancing the Science of Climate Change* (2010) at 55.
[41] *Id.*
[42] *Id.* at 55-56, 59-60; NRC, *Abrupt Climate Change, Inevitable Surprises,* (2002) at 209-210.
[43] NRC, *Advancing the Science of Climate Change* (2010) at 55-56, 59-60; NRC, *Abrupt Climate Change, Inevitable Surprises* (2002) at 209-210.

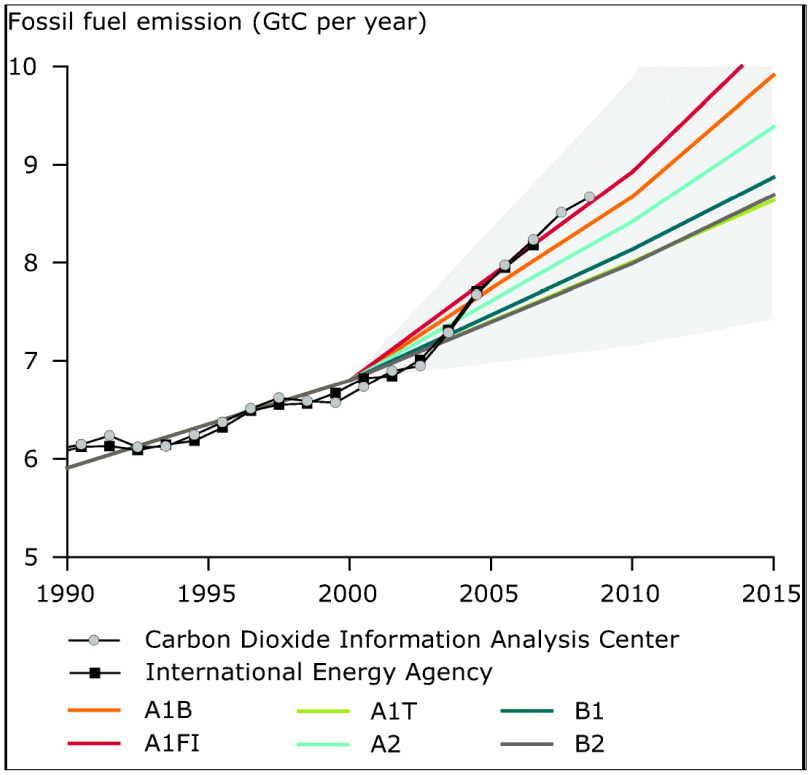
Ocean acidification is taking place with extraordinary rapidity. According to a 2012 study that surveyed hundreds of millions of years of ocean chemistry, the current rate of CO_2 release into the oceans (and hence the rate of acidification) "stands out as capable of driving a combination and magnitude of ocean geochemical changes potentially unparalleled in at least the last ~300 [million years] of Earth history."[44] Based on future projections of atmospheric carbon concentration, ocean acidity can be expected to increase by 100 to 150 percent by the end of this century.[45] Troublingly, this upward shift in acidity will be accompanied by increasing surface stratification of the ocean on account of warmer surface waters. As a result, phytoplankton will experience both heightened acidity and more intense exposure to light. Together, these two phenomena have been shown to dramatically reduce the photosynthesis and growth of diatoms, currently responsible for approximately 40 percent of total primary production in the oceans.[46] Accordingly, the combination of heightened acidification and ocean stratification may result in a "widespread decline in marine primary production," doing great damage to the base of the oceanic food chain with potentially devastating effects on the food supply for many regions around the globe.[47]

D. New research, reports, and assessments show increasing severity of harm

Greenhouse gas emissions and atmospheric carbon concentrations have continued to rise in the years since EPA made its Endangerment Finding. As EPA moves forward with the truck standards, the evidence of an intensifying threat reflects the importance of selecting the most protective standards possible in this rule, as well as the need for continued efforts to control emissions from other sectors.

Global greenhouse gas emissions are now rising faster than the IPCC's highest emissions scenario from 2007, as illustrated in the figure below, compiled by the European Environment Agency.[48]

[44] Barbel Hönsich, *et al.*, *The Geological Record of Ocean Acidification*, 335 Science 1058, 1058 (2012).
[45] Gao, *et al.*, *Rising CO_2 and Increased Light Exposure Synergistically Reduce Marine Primary Productivity*, 2 Nature Climate Change 519, 519 (2012).
[46] *Id.* at 519-522.
[47] *Id.* at 519.
[48] "Observed global fossil fuel CO_2 emissions compared with six scenarios from IPCC", European Environment Agency (September 30, 2015), *available at* http://www.eea.europa.eu/data-and-maps/figures/observed-global-fossil-fuel-co2/ccs102_fig2-3.eps.



The graph shows six IPCC emissions scenarios (labeled A1B to B2), compared with actual atmospheric carbon measurements from two sources. The highest scenario, A1F1, which assumes a "world of very rapid economic growth" with "fossil-intensive" energy systems,[49] is the most aggressive scenario generally modeled. The graph demonstrates that, in the last decade, global emissions have rapidly increased to match, or even slightly outpace, the A1F1 scenario. Hence, in the absence of swift emissions reductions, we can expect harms even greater than those projected under the IPCC's highest emissions scenarios in the Fourth Assessment Report (AR4).

Recent modeling results project that by mid-century, warming may be significantly greater than scientists had previously forecast. According to this research, by 2050, average global temperatures could warm by 1.4 to 3°C relative to the 1961-1990 period, even under mid-range emissions scenarios (which current emissions figures significantly exceed).[50] Numerous large-scale reports and assessments further attest that threats to public health and welfare from carbon emissions are even more pressing than anticipated just a few years ago. For instance, it is now clear that the IPCC's sea level rise projections in AR4 were overly conservative. A recent IPCC report notes that "satellite-measured sea levels continue to rise at a rate closer to that of the upper range of [earlier] projections" and that "the contribution to sea level due to [ice] mass loss from

[49] IPCC, *Climate Change 2007: Synthesis Report* (2007), at 44.
[50] *See* abstract for Rowlands, *et al.*, *Broad range of 2050 warming from an observationally constrained large climate model ensemble*, 5 Nature Geoscience 256 (2012).

Greenland and Antarctica is accelerating."[51] Similarly, in the Fifth Assessment Report (AR5), the IPCC's Working Group 1 predicts that sea levels could increase by as much as 0.82 meters by the late 21st century and 0.98 meters by 2100.[52] By contrast, the AR4's upper bound estimate for sea level rise was just 0.59 meters by the late 21st century.[53]

More broadly, Working Group 1 emphasizes that "[s]ubstantial advancements in the availability, acquisition, quality and analysis of observational data sets in atmosphere, land surface, ocean, and cryosphere have occurred since the AR4."[54] These advancements point primarily toward increased estimates of the severity of the harm that will result from climate change. The report for AR5, for instance, asserts that "[m]easurements of glacier change have increased substantially in number since AR4," and that, with regard to the Greenland Ice Sheet, "large rates of mass loss have spread to wider regions than reported in AR4."[55] The report also increases AR4's estimates of the radiative forcing (or heat-trapping) potential of current and predicted atmospheric greenhouse gas concentrations,[56] and expresses increased confidence since AR4 in its determinations regarding upper-ocean warming,[57] the link between climate change and precipitation patterns,[58] and the human influence on global surface temperature increases,[59] water cycle variations,[60] daily temperature maxima,[61] extreme precipitation events,[62] and droughts,[63] to name just a few examples.

The USGCRP's Third Climate Assessment reflects a similar pattern. Describing changes from the Second Climate Assessment, the authors explain that "[c]ontinued warming and an increased understanding of the U.S. temperature record, as well as multiple other sources of evidence, have strengthened our confidence in the conclusions that the warming trend is clear and primarily the result of human activities."[64] For example, the authors emphasize that "[h]eavy precipitation and extreme heat events are increasing in a manner consistent with model projections; the risks of such extreme events will rise in the future," and that "[a] longer and better-quality history of sea

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[51] IPCC, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (2012), at 178-79.
[52] IPCC, *Climate Change 2013: The Physical Science Basis*. *Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, *Technical Summary* (United Kingdom: Cambridge University Press and USA: New York, 2013).
[53] IPCC, *Climate Change 2007: Synthesis Report* (2007), at 47.
[54] IPCC, *Climate Change 2013*: *The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Technical Summary* (2013), at TS-37.
[55] *Id.* at TS-41.
[56] *Id.* at TS-51.
[57] *Id.* at TS-68.
[58] *Id.* at TS-72.
[59] *Id.* at TS-73.
[60] *Id.* at TS-72.
[61] *Id.* at TS-73.
[62] *Id.*
[63] *Id.*
[64] US Global Change Research Program (USGCRP), *Highlights of Climate Change Impacts in the United States: The Third National Climate Assessment* (2014), at 27.

level rise has increased confidence that recent trends are unusual and human-induced. Limited knowledge of ice sheet dynamics leads to a broad range of potential increases over this century."[65]

Finally, in May 2013, the Interagency Working Group on the Social Cost of Carbon (IWG) published an updated assessment that increases the predicted threat that climate change poses and will continue to pose into the future. The IWG's original estimate in 2010 provided four potential values to represent the cost that each metric ton of CO_2 emissions will impose on society for the year 2020: $7, $26, $42, and $81.[66] The 2013 estimate increases those values to $12, $43, $65, and $129, respectively.[67] While the Joint Environmental Commenters believe that these updated figures fundamentally underestimate the true cost of carbon emissions, they nonetheless reflect the same trend as seen in the scientific literature: not only does the potential harm from carbon emissions increase with each additional ton released into the atmosphere, but the severity of the predicted harm increases as our understanding of climate change grows.

These new studies, reports, and assessments indicate that the urgency of acting to curb greenhouse gas emissions has, if anything, grown since the 2009 Endangerment Finding. Emission trajectories are already at or beyond what was anticipated in the 2007 IPCC reports, and are causing severe effects on an accelerated timeline. In the absence of substantial emissions reductions, the harms to public health and welfare from climate change may well prove catastrophic. While robust actions are needed in every sector of our economy to mitigate the greenhouse gas emissions that contribute to public health and environmental harms, improving the efficiency of the heavy-duty fleet is one of the most impactful things we can do to stem climate pollution in the United States.

II. The Proposed Rule: an Important First Step

EDF fully supports a comprehensive and robust heavy-duty program. We applaud the Agencies for finalizing the first ever GHG and fuel economy standards for the heavy-duty sector in 2011. The first phase of the program was met with broad support from manufacturers, labor, states, security, health, environmental and science-based groups. The success of the first phase of the program is already being demonstrated by the demand for more efficient trucks – model year

[65] *Id.*
[66] Interagency Working Group on the Social Cost of Carbon (IWG), *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866* (2013), at 2.
[67] *Id.*

2014 heavy-duty trucks saw the highest sales since 2005[68] and Class 8 sales this summer are up 23% over the same time last year.[69]

The Phase 1 rule established an effective structure and many key components to a successful program that have been carried over to the Phase 2 proposal, and in some cases improved upon. While we believe the final standards should go much farther in driving technology and providing benefits to our families and communities, the Agencies' proposed structure can help secure these reductions.

A. EDF supports a separate engine standard as a key element of a strong rule

EDF fully supports the proposed inclusion of a separate engine performance standard and full vehicle performance standard. An engine performance standard for each vehicle class is an essential element of a well-designed heavy-duty fuel efficiency program for several reasons. First, engine standards provide proven, measureable and durable real-world emissions reductions. Engine standards also help to drive development of advanced engine technologies, which can provide a significant proportion of total vehicle fuel efficiency potential. An engine standard also allows EPA and manufacturers to simultaneously evaluate oxides of nitrogen (NOx) and carbon dioxide (CO2) emissions, ensuring efficiency improvements do not result in higher NOx emissions and vice versa. We encourage the agencies to finalize a robust separate engine standard (see Section VI below). In addition to an engine standard, EDF supports a rigorous full vehicle standard to drive technology advancements across the rest of the vehicle, including the transmission, aerodynamic improvements, idle reduction, and more.

A. EDF supports the inclusion of standards for trailers

EDF fully supports the agencies proposal to establish standards for trailers. Trailers are the primary vehicles for moving freight in the U.S.[70] In 2010, there were nearly 5.8 million commercial trailers registered in the U.S.,[71] and production of trailers by the top 25 manufacturers was up 9.4 percent in 2012, over the year before.[72] Trailers impact the fuel efficiency of trucks through aerodynamic drag, tire rolling resistance and additional weight.

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[68] "Healthy Demand Overall for Trucks in September", Heavy Duty Trucking, *available at* http://www.truckinginfo.com/channel/fleet-management/news/story/2014/10/healthy-demand-overall-for-trucks-in-september.aspx?ref=rel-recommended, (last accessed November 5, 2014).

[69] "Medium and Heavy Truck Sales Up 7% in July", Trailer Body Builders, (September 30, 2015), *available at* http://trailer-bodybuilders.com/chassis/medium-and-heavy-truck-sales-7-july.

[70] 76 Fed. Reg. 57,106, Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles; Final Rule at 57,362 (September 15, 2011) [hereinafter "Medium- and Heavy Duty I; Final Rule"].

[71] US Department of Transportation (USDOT), Federal Highway Administration, *Highway Statistics Series: Trailer and Semi-trailer registrations – 2010*, (December 2011), *available at* http://www.fhwa.dot.gov/policyinformation/statistics/2010/mv11.cfm.

[72] "Trailer output up 9.4% in 2012", Trailer-Body Builders, (February 1, 2013), *available at* http://trailer-bodybuilders.com/trailer-output/output/trailer-output-up-2012/.

Trailer efficiency measures would garner much-needed additional GHG and fuel consumption reductions in the tractor-trailer fleet by promoting the development and deployment of new trailer technologies. Such measures would also address market barriers like split incentives and consumers' lack of confidence in technology performance. The technologies needed to make significant efficiency improvements are incredibly cost-effective, well-tested and on trailers today. We request that the agencies finalize robust standards for all trailers that reflect the leading efficiency technology for each trailer type. See Section VI below for specific recommendations on strengthening the trailer program.

B. EDF supports accounting for upstream methane emissions from natural gas

The Agencies have requested comment on accounting for upstream emissions in the standards for natural gas and other trucks, and we urge the agencies to finalize a rule that includes such accounting. Reducing upstream emissions from natural gas trucks is integral to ensure the final program delivers on its climate protection goals. A recent ICCT study found that "inadequate attention to technologies designed to limit methane leakage … would diminish the program benefits by as much as 38 percent."[73] By including the upstream emissions from natural gas trucks in the final program, the agencies will strengthen the integrity of the program. We provide recommendations for improving the methodology in Section VII below.

C. EDF supports closing the loophole for dirty glider kits

EDF fully supports EPA's proposal to establish GHG and criteria emissions standards for engines in glider kits and NHTSA's proposal to include glider kits under its Phase 2 standards. These provisions are important to close the current loophole for glider kit manufacturers – which currently allows an older dirtier engine to be installed in a new body and certified as a new vehicle. EPA estimates significant growth in glider kit production.[74] And glider vehicles using pre-2007 engines have in-use NOx and PM emissions tenfold the emissions from equivalent vehicles being produced with new engines. This combination could result in a significant increase in criteria emissions from in-use trucks if the current loophole is not addressed.

The proposal does not limit the use of glider kits or rebuilt engines – it simply requires that engines be certified to the same standards (for both GHG and criteria standards) as apply for the calendar year of the glider vehicle assembly. As noted in the preamble, there has been adequate time for glider manufacturers to transition to a compliance regime. And the agencies have determined that removing the exemption for these glider vehicles will be cost-effective. The agencies should finalize these important provisions to level the playing field and bring glider kits in line with all new truck standards.

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[73] Delgado and Muncrief, *Assessment of Heavy-Duty Natural Gas Vehicle Emissions: Implications and Policy Recommendations*, International Council for Clean Transportation (July 2015).

[74] 80 Fed. Reg. (July 13, 2015) Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2: Proposed Rule at 40529. (Hereinafter "Preamble").

III. A More Rigorous Final Rule Will Deliver Important Benefits

In order to deliver the climate, health and economic benefits needed to protect Americans, the agencies must finalize a stronger rule.

A. A stronger rule is necessary for broader climate and health benefits

A rigorous Phase 2 program could fundamentally alter the path of medium- and heavy-duty GHG emissions – reducing fuel consumed by the entire on-road truck fleet to below today's levels, while helping the freight economy grow. To achieve this, however, the Phase 2 program *must fully mobilize all existing modern technologies and drive the development and deployment of advanced technologies*.

A joint analysis by EDF, NRDC, UCS, ACEEE and the Sierra Club in 2014 found that by 2025, the first and second phases of standards together could cut fuel consumption of new trucks by at least 40 percent compared to 2010 levels.[75] The analysis – based on a broad set of analyses by the National Research Council, research by Southwest Research Institute ("SwRI")and results from the Department of Energy ("DOE")'s SuperTruck program – also found that the technologies to improve fuel efficiency are cost-effective in the 2025 timeframe.

While the proposal is an important step in this direction, it does not drive these technologies to their full potential. The Agencies estimate that the proposed standards would cut climate pollution by 1 billion tons and reduce fuel consumption by 1.8 billion barrels of oil over the life of the vehicles subject to the rule. These are necessary and significant reductions. However, finalizing standards that are consistent with a 40 percent reduction in fuel consumption by 2015, as outlined by EDF and others, would save an additional 200,000 barrels of oil per day in 2035 and reduce 40 million addition tons of GHG emissions annually.[76] A more protective rule would also hasten and possibly enhance NOx reductions– 2.4 million tons reduced over the life of the program. Our comments in Section VI below provide more detailed recommendations on how these improvements can be achieved.

B. Increased efficiency provides savings across the supply chain

A more robust final rule will also deliver greater economic benefits. More efficient heavy-duty trucks secure cost savings across the entire supply chain – from the fuel cost savings by independent drivers and fleets who purchase the vehicles, to shippers who deliver goods, to the American consumers who buy those goods.

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[75] EDF *et al*., *Big Fuel Savings Available in New Trucks*, (2014), *available at* http://www.edf.org/sites/default/files/content/trucksavingsfactsheet-2014-06-11.pdf .

[76] Union of Concerned Scientists (UCS), *Newly Proposed Heavy-duty Truck Efficiency Standards for 2018-2029*, (July 2015), *available at* http://www.ucsusa.org/sites/default/files/attach/2015/07/proposed-heavy-duty-vehicles-standards.pdf.

The average semi truck today burns 20,000 gallons of diesel fuel a year – the same volume of fuel used by 50 new passenger cars.[77] Accordingly, fuel has been the largest single cost for trucking fleets, accounting for 39% of the cost of ownership in 2013.[78] More efficient trucks drive down the fuel costs for drivers and fleets. An analysis by EDF and others found that a robust rule that reduces fuel consumption by 40 percent over 2010 levels could save average tractor-trailer owners and drivers about $30,000 per year in fuel.[79]

EDF and CERES examined how strong standards would affect the cost of moving freight by trucks, finding that strong standards will save companies nearly $10 billion dollars in 2030, as the cost-per-mile to move freight would decrease by $0.06 per mile.

By 2040, these savings could grow to $34 billion annually, as the net effect of the second phase of the standard alone could reduce the per-mile cost of moving freight by 21 cents.[80]

Consumers also stand to benefit from a strong rule. The average United States household pays more than $1,100 a year to fuel heavy trucks as companies pass some of their fuel costs on to customers.[81] The Consumer Federation of America found that more robust Phase 2 standards could deliver as much as $400 in savings to an average household annually on services and goods by 2035.[82]

C. Comprehensive, rigorous program is needed to address market barriers

Robust Phase 2 standards are needed to deliver the full benefits available from existing and developing efficiency technology. There is clear evidence, as summarized in the proposal, that market barriers exist preventing consumers from investing in efficiency technology that will save them money in the long term. For example, consumers may not have complete or reliable information about the effectiveness and durability of the technology or vehicle they are

[77] Assumes Class 8 truck VMT of 120,000 miles and average fuel economy of 6.1 MPG, and sedan VMT of 11,318 and average fuel economy of 31 MPG. Energy Information Agency (EIA), *Annual Energy Outlook 2014*, Table 68; Freight Transportation Energy Use. Heavy Duty Fuel Efficiency, Existing Trucks by Size Class. University of Michigan Eco-Driving Index *available at* www.umich.edu/~umtriswt/data/UMTRI_sales-weighted-CAFE_April-2015.xls; and Federal Highway Administration, Table VM-1 American Public Transit Association's Public Transportation Fact Book Tables 8, 16, and 21.

[78] American Transportation Research Institute, *An Analysis of the Operational Costs of Trucking,* (September 2013), *available at* http://truckexec.typepad.com/files/atri-operational-costs-of-trucking-2013-final.pdf.

[79] EDF *et al.*, *Big Fuel Savings Available in New Trucks*, (2014), *available at* http://www.edf.org/sites/default/files/content/trucksavingsfactsheet-2014-06-11.pdf.

[80] EDF and CERES, *EPA/NHTSA Phase 2 Fuel Efficiency and Greenhouse Gas Standards for Heavy-Duty Trucks: Projected Effect on Freight Costs,* (May 2015), *available at* http://business.edf.org/files/2015/06/EDF-Ceres-Report-Truck-Rule-Phase-2-Effect-on-Freight-Rate.pdf.

[81] Consumer Federation of America (CFA), *Paying the Freight: The consumer benefits of increasing the fuel economy of medium and heavy-duty trucks*, (2014), *available at* http://www.consumerfed.org/pdfs/Paying-the-Freight.pdf.

[82] *Id*.

interested in – both in the new vehicle market and the resale market. An additional barrier in the heavy-duty market is a split incentive where the party paying the upfront cost may be different from the party realizing the fuel cost savings. These barriers impede the development and uptake of the full array of modern technologies. As the Agencies stated in the preamble, "a significant number of fuel efficiency improving technologies would remain far less widely adopted in the absence of these proposed standards."[83] This is true. However, a weak final rule would also leave certain advanced technologies on table. Therefore, it is imperative that the agencies finalize more robust fuel economy and greenhouse gas standards to realize the full potential of efficiency improvements from the heavy-duty sector. Doing so "would provide regulatory certainty and generate important economic benefits in addition to reducing externalities."[84]

IV. Legal Authority

EPA has manifest legal authority to adopt greenhouse gas emission standards for new medium- and heavy-duty vehicles.[85] Below, we discuss two particular features of this authority: the technology-forcing nature of section 202 of the Clean Air Act ("CAA") and EPA's authority to address trailers.

A. EPA has clear authority to establish technology-forcing standards

EPA has clear authority to establish technology-forcing emission standards under section 202(a) of the CAA, which provides that standards established under section 202(a)(1) "shall take effect *after such period as the Administrator finds necessary to permit the development and application of the requisite technology*."[86]

Related provisions of section 202— including those governing heavy-duty vehicle criteria pollutant emissions—are expressly technology forcing, providing that regulations "shall contain *standards which reflect the greatest degree of emission reduction achievable through the application of technology which the Administrator determines will be available* for the model year to which such standards apply . . ."[87]

As the nation's highest court has recognized, the legislative history of the CAA underscores that Congress did not intend for EPA to be "'limited by what is or appears to be technologically or economically feasible,' but 'to establish what the public interest requires to protect the health of persons,' even if that means that 'industries will be asked to do what seems to be impossible at

[83] Preamble at 40435.
[84] Preamble at 40436.
[85] *See, e.g., Mass. v. Envtl. Prot. Agency, 127 S.Ct. 1438 (2007); see also Coal. for Responsible Regulation, Inc. v. Envtl. Prot. Agency, 684 F.3d 102 (D.C. Cir. 2012).*
[86] 42 U.S.C. § 7521 (emphasis added).
[87] *Id*.

the present time.'"[88] With respect to section 202(a)(1) and (a)(2), Congress intended that EPA "press for the development and application of improved technology rather than be limited by that which exists today.'"[89]

EPA has a long history of establishing 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.[90] Particulate standards for heavy-duty vehicles also resulted in the development of the diesel particulate filter.[91]

Courts have consistently affirmed EPA's authority to establish technology-forcing standards under section 202, in some cases holding that only a technology-forcing standard would be compliant with the statute.[92] In adopting such standards, EPA is empowered to make projections about future technology "subject" only "to the restraints of reasonableness."[93]

In 1980, for example, EPA promulgated PM emission standards for light-duty diesel vehicles and trucks, requiring that emissions decrease to 0.20 grams per mile in the 1985 model year. EPA determined that the standard would be achievable in 1985 with the perfection of a particle trapping device, which at the time, had achieved only partial success in a prototype stage.[94] The D.C. Circuit affirmed these standards, holding that EPA "will have demonstrated the reasonableness of its basis for prediction if it answers any theoretical objections to the . . .

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[88] *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457, 490-91 (2001)(quoting 116 Cong. Rec. 32901-32902 (1970), 1 *Legislative History of the Clean Air Amendments of 1970* (Committee Report compiled for the Senate Committee on Public Works by the Library of Congress), Ser. No. 93-18, p. 227 (1974)(emphasis in original).

[89] *Natural Res. Def. Council, Inc. v. Envtl. Prot. Agency*, 655 F.2d 318, 328 (D.C. Cir. 1981)(citing S. Rep. No.1196, 91st Cong., 2d Sess. 24 (1970), reprinted in 1 Legislative History 424; H.R. Rep. No.294, 95th Cong., 1st Sess. 273 (1977), reprinted in (1977) U.S. Code Cong. & Ad. News 1077, 1352, 4 Legislative History 2740).

[90] *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/.

[91] *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.

[92] *See Natural Res. Def. Council v. Envtl. Prot. Agency*, 655 F.2d at 328 (upholding EPA's technology-forcing standards under Section 202(a)(2)); *Natural Res. Def. Council v. Thomas*, 805 F.2d 410 (D.C. Cir. 1986))(affirming authority under Section 202(a)(3)(A)(iii), which authorized regulations for PM emissions now authorized under (a)(3)(A)(i)); *Natural Res. Def. Council v. Reilly*, 983 F.2d 259 (D.C. Cir. 1993)(holding that Section 202(a)(3)(A)(6) is a technology-forcing provision and mandating issuance of a regulation after consideration of developing technologies); *Nat'l Petrochemicals & Refiners Ass'n v. EPA*, 287 F.3d 1130 (D.C. Cir. 2002)(affirming authority under Section 202(a)(3)(A)(i)); *Sierra Club v. EPA*, 325 F.3d 374 (D.C. Cir. 2003)(affirming authority under Section 202(l)(2)); *Crete Carrier Corp. v. Envtl. Prot. Agency*, 363 F.3d 490 (D.C. Cir. 2004)(holding that Section 202(a)(3)(A)(i) is a technology-forcing provision).

[93] *Natural Res. Def. Council, Inc. v. Envtl. Prot. Agency*, 655 F.2d at 328 (citing *International Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 629 (D.C.Cir.1973)).

[94] *Natural Res. Def. Council, Inc. v. Envtl. Prot. Agency*, 655 F.2d at 331.

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."[95]

Likewise, in 2001, EPA established diesel PM and NOx emissions standards for heavy-duty trucks and buses that required substantial reductions and relied on studies suggesting that technologies currently being tested could collectively overcome then-existing obstacles.[96] The D.C. Circuit upheld these standards, affirming EPA's technological predictions and noting that "the rule c[ould] stand so long as there was one solution as to which EPA's prediction was not arbitrary."[97]

EPA describes its Phase 2 proposal as technology forcing, in line with this long and successful history.[98] As we set forth more fully below, however, certain key aspects of the agency's proposal—including the engine standards—are based almost entirely on today's technologies and conservative assumptions about the development of those technologies. EPA must strengthen these provisions to be consistent with the technology-forcing history of section 202 and the agency's own stated intention in the Phase 2 proposal.

B. EPA has clear authority to regulate trailers

EPA and NHTSA have proposed standards for trailers that are used in combination with two different classes of tractors.[99] EPA's authority to adopt these proposed standards rests on firm legal footing, reflects a reasonable interpretation of the relevant Clean Air Act provisions, and is consistent with the agency's past regulatory practice.

Section 202(a)(1) of the Act authorizes EPA to regulate "the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines . . ."[100] 'Motor vehicle,' as it is used in Section 202(a)(1), is defined under Section 216 as "any self-propelled vehicle *designed for transporting persons or property* on a street or highway."[101]

EPA has interpreted this statutory definition to enable the agency to adopt standards addressing emissions from the Class 7 and 8 combination tractor-trailers, which "consist of a cab and engine

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[95] *Id*. at 331-32.
[96] 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 (2001).
[97] *Nat'l Petrochemicals & Refiners Ass'n v. EPA*, 287 F.3d 1130 (D.C. Cir. 2002) at 1140.
[98] *E.g.*, 80 Fed. Reg. 40154 ("The proposed Phase 2 standards would represent a more technology forcing approach than the Phase 1 approach, predicated on use of both off the-shelf technologies and emerging technologies that are not yet in widespread use. The agencies are proposing standards for MY 2027 that would likely require manufacturers to make extensive use of these technologies.")
[99] 80 Fed. Reg. 40146.
[100] *Id*.
[101] 42 U.S.C. § 7550 (emphasis added).

(tractor or combination tractor) and a detachable trailer."[102] The statutory definition of 'motor vehicle' in section 216 expressly defines that term in light of the vehicle's intended use: "transporting persons or property on a road or highway." EPA has reasonably interpreted 'motor vehicle' to encompass all of the components of Class 7 and 8 tractor-trailers (including the trailer), which are needed to accomplish that objective.

In particular, Class 7 and 8 tractor-trailers are designed and used to transport large quantities of goods. To perform this task, the vehicle must have three components: an engine, a tractor, and a trailer. These three components are inextricably linked; no one part can successfully transport goods without the other two. And the trailers addressed in the proposal are designed and engineered to operate in tandem with tractors.[103]

As their design features would suggest, these tractors and trailers are operated together almost exclusively.[104] The height of the tractor is designed to correspond to the height of the trailer, achieving optimal aerodynamic performance and minimal air-resistance only when the two are coordinated.[105] Moreover, as the primary load-carrying device, trailers account for a substantial percentage of the engine load and therefore contribute significantly to the vehicle's emissions. Accordingly, the use of improved aerodynamic and tire technologies on the trailer will reduce the vehicle's emissions.[106] [107] EPA's interpretation of 'motor vehicle' as consisting of the engine, tractor, and trailer in the heavy-duty context is therefore a reasonable interpretation of the statute.[108]

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[102] 80 Fed. Reg. 40151.

[103] The proposed standards are applicable to "trailers specifically designed to be drawn by Class 7 and 8 tractors when coupled to the tractor's fifth wheel. The agencies are not proposing standards for trailers designed to be drawn by vehicles other than tractors, and those that are coupled to vehicles with pintle hooks or hitches instead of a fifth wheel." 80 Fed. Reg. 40253.

[104] Trucking companies do not provide insurance protection for truckers when operating a truck-tractor without an attached trailer; it is considered a non-business activity. Truckers must separately purchase 'bobtail insurance' to be covered between dropping off one trailer load and picking up the next one. *See, e.g.* Insure My Rig, http://www.insuremyrig.com/what-is-bobtail-insurance.html (last visited Sept. 29, 2015); *Understanding the Difference Between Bobtail and Non-Trucking Liability Insurance*,

[105] 76 Fed. Reg. 57138-39 (Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 1).

[106] EPA notes in the proposed rule that the trailers that are pulled by Class 7 and 8 tractors account for two-thirds of the heavy-duty sector's total CO_2 emissions and fuel consumption. 80 Fed. Reg. 40253.

[107] As a result of studies undertaken as part of initiatives such as the Department of Energy's SuperTruck program and EPA's SmartWay program, design and operational practices have already been developed to cost-effectively reduce those emissions.

[108] The fact that the trailer does not itself 'emit,' does not exclude it from EPA's regulatory authority. Section 202(a)(1) authorizes EPA to adopt standards "applicable to the emission of any air pollutant" from new motor vehicles and motor vehicle engines. This statutory grant of authority clearly encompasses standards like those EPA has previously adopted for vehicle attributes that effect emissions, including low-rolling-resistance tires, low-drag brakes, and more aerodynamic vehicle shapes. 75 Fed. Reg. 25374 (2010 Light Duty Vehicle Greenhouse Gas Emission Standards). EPA has likewise interpreted this authority to allow the agency to adopt compliance approaches that reflect upstream emissions. *See id.* *See also* Response to Comments ("[Section 202(a)] does not directly address what the "standards applicable to" the emissions must be, or how those standards are to be measured. It does not specify how or what mechanisms EPA may reasonably use in applying a standard to vehicle

EPA's interpretation is likewise consistent with other provisions of the CAA and EPA implementing regulations addressing heavy-duty vehicles. Section 202(b), which authorizes EPA to adopt criteria pollutant standards for heavy-duty vehicles, defines a 'heavy duty vehicle' as, among other things, having "a gross vehicle weight (as determined under regulations promulgated by the Administrator) in excess of six thousand pounds."[109] EPA regulations confirm that a vehicle's 'gross vehicle weight' can be measured by "the maximum weight of a loaded vehicle and trailer," or by "the maximum design loaded weight of a single vehicle."[110] These provisions are both tied to the way in which the vehicles are operated and contemplate the load carried by the trailer. As EPA notes in the proposal, its determination of its authority as to trailers is also consistent with a prior interpretation of the heavy-duty vehicle as being incomplete unless a trailer is attached. [111] EPA must strengthen these provisions to be consistent with **its delegated responsibility to establish technology-forcing standards under section 202** and the Agency's own stated intention in the Phase 2 proposal.

V. Assessment of Benefits

A. Social cost of carbon and social cost of methane

Please see separate comments submitted jointly to the docket by EDF, Institute for Policy Integrity, Union of Concerned Scientists and the Natural Resources Defense Council.

B. Rebound

1. New studies should be used to inform final rebound values

The agencies have proposed to maintain the same rebound values finalized in the Phase 1 program – 5% for tractor trailers, 15% for vocational and 10% for pickups and vans – stating they had "insufficient evidence to justify revising the rebound effect values that were used in the Phase 1 analysis."[112] New analyses by Winebrake et. al., however, indicate that these Phase 1 values may be too high.

A 2015 paper by Winebrake *et. al*. looks at fuel price elasticity estimates for single-unit truck activity (vocational trucks), as measured in VMT, and concludes they "cannot reject a null

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emissions. This leaves EPA with discretion to develop both elements of the standards and the means of measuring compliance with them.").

[109] 42 U.S.C. § 7521.

[110] 40 CFR 86.1803-01.

[111] 40 CFR 86.1803–01 defines a 'complete heavy-duty vehicle' as a heavy-duty vehicle "that has the primary load carrying device or container attached," while a heavy-duty truck without a load-carrying device is considered an 'incomplete vehicle.' Because trailers are 'load carrying devices,' they are implicitly part of the vehicle.

[112] Preamble at 40453.

hypothesis that fuel price elasticities for single-unit truck VMT is zero."[113] The authors state that the elasticities in their paper may be used as a proxy for rebound in certain cases – and, at the very least, to inform the choice of a rebound estimate for the vocational sector.

Similarly, another 2015 paper by Winebrake *et al*. looks at fuel price elasticities of combination trucking operations in the U.S. between 1970 and 2012 and concludes that "we are in a period of time where fuel price elasticities for US combination trucking VMT and fuel consumption are near zero."[114] Again, the authors argue that their results may be used as a proxy for rebound under certain circumstances but at the very least should be used to inform the rebound values chosen for tractor trailers.

EDF asks the agencies to consider these two new studies by Winebrake *et al*. in finalizing rebound values for vocational vehicles and tractor-trailers and, at minimum, include sensitivities reflecting lower rebound values.

2. EDF supports inclusion of welfare benefits of rebound effect

To the extent the Agencies retain some positive rebound value, it is important to estimate the beneficial impacts of that rebound effect. As discussed in a 2014 Resources for the Future discussion paper on "The Rebound Effect and Energy Efficiency Policy," rebound often has a misconceived 'evil' connotation because policymakers tend to focus solely on energy minimization (in this case, fuel consumption reduction) and ignore welfare maximization.[115] However, this does not capture the entire impact of rebound because any time a consumer changes his or her behavior (for example, by buying a more efficient truck), it means that there is some inherent welfare benefit to that consumer (relative to no change in behavior). It is therefore important that "[r]ather than consider[ing] the rebound effect as a deterrent from passing energy efficiency policies, policymakers should include these welfare gains in the tally of benefits of a policy."[116] For this reason, we support the Agencies' decision to estimate the benefits of increased travel associated with rebound driving.[117]

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[113] Winebrake *et al.*, *Fuel price elasticities for single unit truck operations in the United States*. Transport. Res. Part D, (2015), *available at* http://www.sciencedirect.com/science/article/pii/S1361920915000711.
[114] Winebrake, *et al.*, *Fuel price elasticities in the U.S. combination trucking sector*, Transport. Res. Part D, (2015), *available at* http://www.sciencedirect.com/science/article/pii/S1361920915000383.
[115] Gillingham, *et al.*, *The Rebound Effect and Energy Efficiency Policy, Resources for the Future Discussion Paper,* 2014 RFF DP 14-39, forthcoming in the Review of Environmental Economics and Policy, (in press).
[116] *Id.*
[117] Preamble at 40474.

C. Fuel efficiency standards have positive impact on truck industry and employment

EDF preformed an extensive market analysis of heavy-duty vehicle purchases between 1992 and 2014 matched with the 2007 and 2010 engine standards.[118] Appropriately controlling for macroeconomic trends, our analysis showed that there was smooth growth in vehicle demand prior to, and during, implementation of the 2014 Phase 1 fuel efficiency standards. As further evidence, model year 2014 heavy-duty trucks saw the highest sales since 2005.[119] The results of our analysis support the premise that fuel savings provide an advantage in the competitive market. Lower freight costs drive higher demand for freight transport and demand for freight transport drives demand for new vehicles.

Our analysis also concluded that fuel efficiency standards insulate the heavy truck market from fuel price shocks – and that market stability translates into employment stability. In a marketplace without standards, not all manufacturers produce fuel-efficient models (e.g., the light-duty vehicle market pre-CAFE standards). When fuel prices spike, more fuel-efficient vehicles are in greater demand, shifting demand across manufacturers and disrupting sales and employment. Analysis by MIT and Northwestern economists found that for manufacturers on which CAFE standards are binding, marketing more fuel-efficient models reduces the impact of fuel-price shocks on aggregate new-vehicle demand and dampening the cross manufacturer impacts of fuel price shocks.[120] Consistent with their results, we found that demand for heavy-duty vehicles becomes less sensitive to fuel price changes as fuel economy of new heavy-duty vehicles increases – and lower variability in demand for heavy-duty vehicles means steadier sales and employment. Combining employment and wage with fuel prices and vehicle standards over the last 35 years, we found that over time fuel efficiency standards are associated with declining impacts of fuel price shocks on employment and wages in light-duty and heavy-duty vehicle manufacturing.

Despite these findings with respect to the Phase I program, some have suggested that previous criteria pollutant standards have resulted in "boom and bust" purchasing. This comparison is inappropriate, however,[121] and, in any event, our analysis shows that there was no meaningful adjustment in market purchasing due to those standards.[122]

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[118] Rittenhouse and Zaragoza-Watkins, *Strategic Response to Environmental Regulation: Evidence from U.S. Heavy-Duty Vehicle Air Pollution Regulations*, MIT CEEPR Working Paper, (2015).
[119] "Healthy Demand Overall for Trucks in September", Heavy Duty Trucking, *available at* http://www.truckinginfo.com/channel/fleet-management/news/story/2014/10/healthy-demand-overall-for-trucks-in-september.aspx?ref=rel-recommended (last accessed November 5, 2014).
[120] Busse, *et al*., W*ho is Exposed to Gas Prices? How Gasoline Prices Affect Automobile Manufacturers and Dealerships*, No. w18610, National Bureau of Economic Research (2012).
[121] Fuel economy standards are not likely to impact new-vehicle sales, because, unlike criteria pollutant standards, the benefits of improved fuel-economy accrue directly to the vehicle purchaser. While improving the fuel-economy of new vehicles won't be costless, fuel-savings will provide offsetting benefits directly to the consumer. They

VI. EPA and NHTSA Must Finalize Standards that Reflect the Full Range of Existing and Advanced Technologies

EDF provides extensive comments and recommendations below on how the Agencies can improve and strengthen the final standards to reflect today's available technologies and drive adoption of more advanced technologies. Making these important improvements to the final standards will deliver additional emissions reductions and fuel savings while saving customers and businesses money and providing certainty for manufacturers investing in innovative solutions. As examined in detail below, the Agencies' proposed engine standards are unlawful in failing to carry out the Agencies' delegated statutory responsibilities, in proposing standards that are unreasonable in light of the body of evidence indicating that far more protective standards are available, and in proposing resulting emission standards that are fundamentally irrational in relying on decision criteria and conclusions that break the bond of reasoned decision-making, severing the facts available in the record before the Agencies from the proposed choices made by the agencies. This is contrary to law. See Motor Veh. Mfrs. Ass'n v. State Farm Ins., 463 U.S. 29 (1983).

A. Overarching principles

Our technical comments support two overarching recommendations:

1. The proposed 2027 standards—and more—should be accelerated to model year 2024

We recommend that the proposed 2027 standards be strengthened and accelerated to 2024. More protective standards can be met in 2024 by technologies that are already proven and mature – no advanced technologies are needed to go meaningfully beyond the proposed standards.[123] Moreover, the technologies needed are already in use today and manufacturers have indicated that they plan to further deploy them to meet anticipated standards.[124] In addition, these technologies are extremely cost effective and have short payback periods that present a very attractive market proposition for truckers.[125] Nine years provides a feasible lead-time for manufacturers to adopt these available technologies.

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quickly pay back the up-front investment cost, lower the long-run cost of operating the vehicle, and provide a critical advantage in the highly competitive freight industry.

[122] Rittenhouse and Zaragoza-Watkins, *Strategic Response to Environmental Regulation: Evidence from U.S. Heavy-Duty Vehicle Air Pollution Regulations*, MIT CEEPR Working Paper, (2015).

[123] See ACEEE comments submitted to this docket.

[124] See ICCT comments submitted to this docket.

[125] Meszler, *et al.*. *Cost effectiveness of advanced efficiency technologies for long-haul tractor-trailers in the 2020–2030 timeframe*, (2015), *available at* http://www.theicct.org/us-tractor-trailer-tech-cost-effectiveness.

2. *Standards in 2027 must drive advanced technologies*

If the program is extended to 2027, those standards must go well beyond what is currently proposed to truly force technology development. Doing so would be consistent with EPA's CAA technology-forcing authority and NHTSA's maximum feasible mandate in EISA. A crucial function of motor vehicle emissions standards is to promote the further development and foster the deployment of promising technologies whose pathway to market acceptance is less clear. The proposed rule recognizes this, and includes technologies such as advanced aerodynamics and vocational hybrids in the compliance scenario for this reason. However, the proposed standards can be met without even drawing on these technologies; to promote the development of these and other advanced technologies the 2027 standards must be substantially strengthened..[126] With many previous rulemakings, EPA has set a precedent for establishing standards based on a reasonable projection that technology still in the research stages of development when the rules were adopted would be available at the time the standard went into effect.[127]

B. Engine standards must be strengthened

As stated above, engine standards provide proven, measureable and durable real-world emissions reductions. Engine technologies can also provide a significant portion of total vehicle fuel efficiency potential. And because combination tractors and vocational trucks account for about 85 percent of fuel use in the medium and heavy-duty sector,[128] establishing a robust engine standard to drive technologies in those classes is critical.

Unfortunately, the Agencies have proposed a 4.1 percent engine efficiency improvement over Phase 1 for diesel engines, which falls far short of what is technologically feasible. These proposed standards are not technology forcing considering the current state of advanced engine technology development, nor do they reflect the full potential of available technologies on the shelf today. It is clear that the proposed engine standards do not meet the Agencies' statutory requirements for appropriate and maximum feasible standards.

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[126] Walsh and Charlton, *Feasibility Assessment of Future Efficiency Improvement for Class 8 Diesel Tractor Engines*, Consultant Report, (September 2015). See also ICCT comments submitted to this docket, UCS comments submitted to this docket and ACEEE comments submitted to this docket.

[127] For example, the 2007/10 heavy-duty NOx and PM standards that EPA finalized in 2001 required the application of both NOx and PM aftertreatment to HD trucks for the first time. These aftertreatment technologies had existed in research laboratories before the rule was finalized, but system- and component-level development and demonstration had not taken place. EPA projected that with 6 to 9 years lead-time manufacturers could continue the development of these technologies and successfully deploy them commercially beginning in 2007. In fact, the industry was able to successfully deploy PM aftertreatment (traps) to their entire 2007 truck fleet. Again in 2010, the industry successfully deployed NOx aftertreatment (selective reduction catalysts (SCR)) to their entire fleet. The Agency had projected NOx adsorbers would be the system of choice for 2010, but instead the industry utilized SCR, a technology not even relied upon by EPA. This rule demonstrates the successful application of the CAA technology forcing authority and the ingenuity of industry in meeting those requirements.

[128] Preamble at 40160.

The administrative record does not support the Agencies conclusion in the Preamble that they have taken "a more technology-forcing approach than in Phase 1, predicated on use of both off-the-shelf technologies and emerging technologies that are not yet in widespread use."[129] The proposed standards can be met with today's technologies – manufacturers need not rely on any advanced technologies;[130] by definition, they are not technology forcing. The Agencies finalized a 9 percent engine improvement in the Phase 1 rule to be implemented between 2014 and 2018. In comparison, the proposed 4.1 percent improvement is less than half of the improvement required under Phase 1, and the Agencies are proposing to give manufacturers more than twice as long. And because the proposed standards will not be fully implemented until 2027, they preclude the opportunity to set more meaningful standards until 2030 under NHTSA's statutory requirements for lead-time.

A recent report by Walsh *et. al*. performed an exhaustive literature review, and critiqued the methodology and assumptions used by the Agencies in their determination of stringency.[131] The study found "the Agencies to be overly conservative in their assessment of technology effectiveness, cost/retail price and adoption rates, which is reflected in the relaxed HD tractor engine standards proposed."[132] Based on the recommendations of the report, EDF requests that the Agencies set significantly more stringent Phase 2 engine standards that are consistent with the Clean Air Act's 202(a) technology forcing authority.

1. Proposed engine standards are weaker in the real-world than rulemaking documents claim

Although the proposed engine standards will nominally achieve a 4.1 percent emission and fuel consumption reduction, in reality they are equivalent to a 2.1 to 3.1 percent reduction because of the effects of the proposed test procedure changes.[133]

The Supplemental Engine Test (SET) was adopted as the sole test cycle for GHG compliance determinations in EPA's medium- and heavy-duty Phase 1 GHG rule finalized in September 2011. In Phase 2, the Agencies are proposing to revise the cycle weighting for CO2 compliance testing purposes, based on the belief that the revised weighting would make the SET more representative. The proposed cycle re-weighting is shown in Figure 1 below.[134] The Agencies increased the weighting of the A speed from 23% to 45% and reduced the C speed from 23% to 5%. The B speed weighting remained essentially unchanged.

[129] Preamble at 40154.
[130] See comments submitted to this docket by ACEEE and UCS.
[131] Walsh and Charlton, *Feasibility Assessment of Future Efficiency Improvement for Class 8 Diesel Tractor Engines*, Consultant Report, (September 2015).
[132] Walsh and Charlton (2015) at 10.
[133] *Id.*
[134] *Id.*

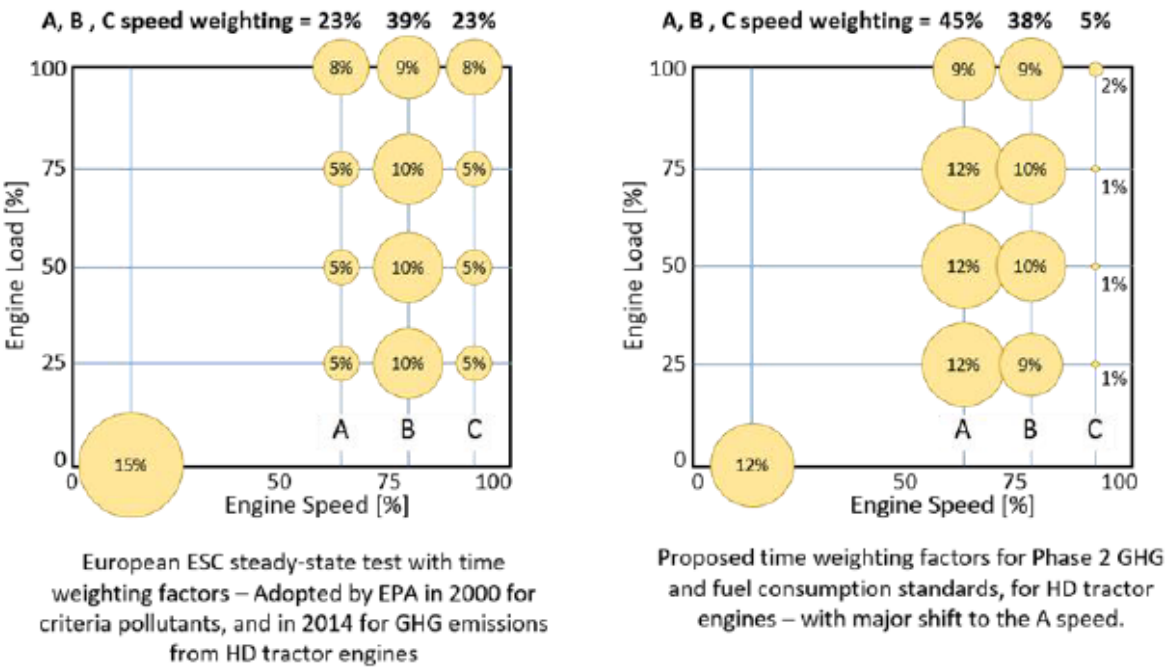

Figure 1: Comparison of current and proposed SET cycles used to certify GHG emissions from HD tractor engines[135]

The fuel consumption of a heavy-duty tractor engine would usually be lower at the A speed than the B or C speeds. Consequently, an engine tested on the re-weighted cycle would have approximately 1 to 2% lower CO2 emissions as compared to levels measured on the existing cycle.[136] The proposed cycle re-weighting therefore relaxes the standards, and the Agencies should account for this effect in the setting of the engine standards.

2. Proposed engine standards do not reflect the compliance potential of existing and emerging technologies

In summary, the Walsh *et. al*. study found that EPA and NHTSA's proposed standards do not reflect the current state of existing and emerging engine technology development. The analysis found that significant progress in improving engine fuel efficiency has already been demonstrated by all manufacturers participating in the DOE SuperTruck Program. In fact, manufacturers have demonstrated with on-the-road trucks the potential to reduce CO2 emissions from the engine by 15 to 20%.[137] A wide range of heavy-duty engine technologies have been improved upon or developed, and applied successfully to demonstration trucks in the SuperTruck Program. These technologies include combustion/closed cycle efficiency improvements, air handling/open cycle efficiency improvements, friction and parasitic loss reduction,

[135] *Id.*
[136] *Id.*
[137] *Id.;* Review of the 21st Century Truck Partnership: Third Report; The National Academies of Sciences, Engineering, and Medicine, (September 11, 2015).

downspeeding, and waste heat recovery. And both Volvo and Cummins have already demonstrated at least 48% BTE on their demonstration vehicles without advanced technologies like waste heat recovery ("WHR"),[138] compared to the proposed standard of 44.6% BTE (441gCO2/bhp-hr).

Furthermore, the most recent NAS report,[139] which conducted an in-depth progress assessment of the SuperTruck program, concluded "the engine systems Goal 1 of a 50% brake thermal efficiency (BTE) for an emissions compliant engine has been achieved."[140] A 50% BTE level implies an engine CO2 standard of 390 g/bhp-hr or a 15% emissions reduction compared to 2017 levels. NAS also concluded "a pathway to achieve 55% is being developed."[141] Figure 2 below graphically shows the Phase 1 and proposed Phase 2 emission standards (expressed as BTE) and, for reference, the assessments of NAS, SwRI, and the results of the SuperTruck program.[142]

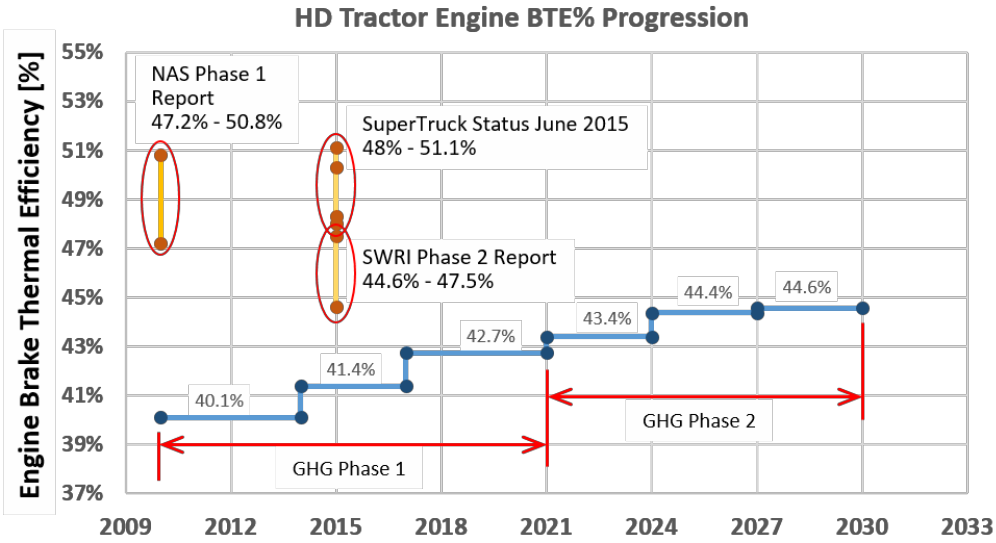

Figure 2: Progression of GHG standards and technology assessments expressed as engine BTE%, showing Phase 1, Phase 2, SuperTruck status and SwRI findings[143]

As can be seen from Figure 1, the proposed engine standards fall significantly short of what is projected as possible by NAS and is already being demonstrated within the SuperTruck program. Data from the SuperTruck teams from Daimler, Navistar, Volvo, and Cummins/Peterbilt is

[138] Amar, P., *"Volvo SuperTruck - Powertrain Technologies for Efficiency Improvement*, 2015 Annual Merit Review, Washington, DC, (June 12, 2015); Koeberlein, D., *Cummins SuperTruck Program Technology and System Level Demonstration of Highly Efficient and Clean, Diesel Powered Class 8 Trucks*, DOE Merit Review, (May 16, 2013), Project ID: ACE057.
[139] Review of the 21st Century Truck Partnership: Third Report; The National Academies of Sciences, Engineering, and Medicine, (September 11, 2015).
[140] *Id.* at S-2.
[141] *Id.* at S-2.
[142] Walsh and Charlton, *Feasibility Assessment of Future Efficiency Improvement for Class 8 Diesel Tractor Engines*, Consultant Report, (September 2015).
[143] *Id.*

highly relevant to the development of the engine standard and the Agencies must appropriately consider this information in developing final engine standards.[144] The DOE program has resulted in more than $375 million dollars being invested in research, development, and demonstration vehicles, and was specifically designed to integrate emerging advanced technologies into over-the-road line-haul trucks, in order to demonstrate significant reductions in GHG and fuel consumption in real-world freight operations.[145, 146] The freight efficiency results obtained to date over mixed drive cycles clearly indicate that a significantly stronger engine standard is feasible.

3. Technology feasibility assessment is overly conservative

As discussed above, the proposed standards will not facilitate development of advanced technologies. The weak standards proposed by the Agencies are the result of an analysis that is overly conservative in its assessment of technology effectiveness, technology penetration rates, cost projections, and the application of a "dis-synergy" factor to discount technology effectiveness.

Nearly all of the engine technology effectiveness values used by the Agencies were underestimated. In some cases, the Agencies used lower effectiveness estimates than SwRI's research study projected. (The SwRI study was funded by NHTSA and was a key technical support reference for the proposal.) In other cases, the effectiveness values assigned were lower than publically available industry estimates. For example, the Agencies estimated that friction and parasitic loss reductions would result in a 1.4% efficiency improvement. In contrast, the SwRI study estimates more than a 4% improvement and some industry estimates are even higher. As another example, the Agencies projected a 3.6% efficiency improvement for WHR, whereas the latest information reported by Cummins shows that an improvement of 5 to 6.5% is

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[144] Koeberlein, D., *Cummins SuperTruck Program Technology and System Level Demonstration of Highly Efficient and Clean, Diesel Powered Class 8 Trucks*, DOE Merit Review, (16 May, 2013), Project ID: ACE057; Koeberlein, D., *Cummins SuperTruck Program Technology and System Level Demonstration of Highly Efficient and Clean, Diesel Powered Class 8 Trucks*, DOE Merit Review, (12 June, 2015), Project ID: ACE057; Rotz and Ziegler, *Daimler SuperTruck - Recovery Act –Class 8 Truck Freight Efficiency Improvement Project*, Super Truck Program: Vehicle Project Review, DOE Merit Review, (11 June, 2015), Project ID: ARRAVT080; Singh, S., *SuperTruck Program: Engine Project Review, Recovery Act – Class 8 Truck Freight Efficiency Improvement Project*, Detroit Diesel Corporation, Project: ACE 058, (June 12, 2015); Amar, P., *Volvo SuperTruck - Powertrain Technologies for Efficiency Improvement*, 2015 Annual Merit Review, Washington, DC, (June 12, 2015); Zukouski, R., *Navistar SuperTruck – Development and Demonstration of a Fuel-Efficient Class 8 Tractor & Trailer - Engine Systems*, DOE Merit Review, (12 June, 2015), Project ID: ACE05; Reinhart, T. E., *Commercial medium- and heavy-duty truck fuel efficiency technology study - Report #1*, (Report No. DOT HS 812 146), Washington, DC: National Highway Traffic Safety Administration, (June 2015); Reinhart, T., *Commercial Medium- and Heavy-Duty Truck Fuel Efficiency Technology Study – Report #2,* Washington, DC: National Highway Traffic Safety Administration, (June 2015).

[145] "DOE SuperTruck Program Benefits Analysis," Final Report, prepared for U.S, Department of Energy, Office of Vehicle Technologies and Argonne National Laboratory, (December 20, 2012).

[146] Gravel, R., *SuperTruck: An opportunity to reduce GHG emissions while meeting service demands,* Asilomar Conference, (August, 2013), *available at* www.its.ucdavis.edu/fies/general/pdf/2013-08-21_Asilomar-2013-Gravel.pdf.

possible.[147] The Agencies fail to adequately justify the use of lower estimates in the rulemaking record.

The Agencies also assumed constant effectiveness for all of the individual technologies between 2021 and 2030. This assumption means that no performance improvements are projected during the 9-year period over which the standards are being phased in. In contrast, real world experience would suggest that manufacturers and suppliers would continue developing and refining their engine technologies and therefore effectiveness would improve. We recommend that the Agencies properly account for these expected real-world effectiveness improvements in their feasibility assessment.

The Agencies' technology penetration assumptions are also problematic. As mentioned above and demonstrated in Table II-6 below from the Preamble, the Agencies are relying substantially on existing engine technologies. Because many of these technologies are already on the road and have proven to be cost effective, the Agencies should accelerate the penetration of existing technologies earlier than 2024.

The last column in the table shows the very small penetration rates assigned for more advanced technologies, such as WHR and turbo compounding. These minimal penetration rates combined with weak standards do not drive the technologies. Moreover, other advanced combustion technologies are not included on the list. Between 2024 and 2027, the Agencies are only requiring an additional 5% penetration for existing technologies, no additional penetration for turbo compounding, and a 10% increase for WHR. As a consequence, a negligible increase of only 0.5% in stringency is added in 2027. It is critical that the Agencies assume a much more realistic deployment of advanced technologies to finalize a rule that is truly technology forcing. Beyond 2024, there is a tremendous opportunity for the Agencies to set transformational standards that will result in significant additional CO2 reductions compared to those projected for the proposal.

TABLE II–6—PROJECTED TRACTOR ENGINE TECHNOLOGIES AND REDUCTION

SET mode	SET weighted reduction (%) 2020–2027	Market penetration (2021) %	Market penetration (2024) %	Market penetration (2027) %
Turbo compound with clutch	1.8	5	10	10
WHR (Rankine cycle)	3.6	1	5	15
Parasitic/Friction (Cyl Kits, pumps, FIE), lubrication	1.4	45	95	100
Aftertreatment (lower dP)	0.6	45	95	100
EGR/Intake & exhaust manifolds/Turbo/VVT/Ports	1.1	45	95	100
Combustion/FI/Control	1.1	45	95	100
Downsizing	0.3	10	20	30
Weighted reduction (%)		1.5	3.7	4.2

[147] Koeberlein, D., *Cummins SuperTruck Program Technology and System Level Demonstration of Highly Efficient and Clean, Diesel Powered Class 8 Trucks*, DOE Merit Review, (June 12, 2015), Project ID: ACE057.

Another example of the conservative nature of the Agencies' analysis is the derivation of cost for WHR systems. NHTSA hired Tetra Tech, Inc. ("TTI") to work with SwRI to study the cost of the key technologies for reducing CO2 and fuel consumption. TTI relied on existing literature for cost information: a 2009 NESCAFF/ICCT study[148] and a 2009 TIAX study.[149] Other secondary sources (NAS and NHTSA) were referenced. However, these sources also heavily relied on the NESCAFF/ICCT and TIAX studies. Not only are the data sources dated, the costs were created for a 2009 WHR system that has little in common with the state-of-the-art systems demonstrated today by the SuperTruck program.

In addition, the Agencies assumed that WHR was on the flat portion of the cost learning curve, an inappropriate assumption for this emerging technology. The Agencies' explanation for this assumption is as follows:

> *"We consider this technology to be on the flat portion of the learning curve (curve 12) because although waste heat recovery is a new technology and in the 2015 to 2017 timeframe remains, perhaps, on the steeper portion of the learning curve, applying such rapid learning effects to the cost estimate we have would result in costs too low in the MY2024 to 2027 timeframe."*[150]

The agencies have not provided a reasonable explanation for declining to apply the cost curve in the way that they themselves recognized was appropriate. As a consequence, EPA and NHTSA's technology cost estimates are biased on the high side, reducing the stringency of the standard.

The agencies use of a "dis-synergy" factor is likewise not well supported. Theoretically, a dis-synergy factor is intended to account for the fact that some technologies may negatively impact the performance of other technologies. However, a positive – or synergistic – effect can also occur. And for some technologies such as friction reduction and turbo efficiency improvements, one would expect no effect. Therefore, it is not appropriate to apply a dis-synergistic value across the board.

When determining synergistic and dis-synergistic effects, it is important to account for the specific combination of technologies under consideration, and apply values for each situation. Instead, the Agencies applied a uniform 25% discount in 2021 and a 15% discount in 2024 and 2027 across all technologies. This fails to credit efficiency benefits of some technology combinations. Furthermore, the Agencies provide no explanation for the derivation or

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[148] Northeast States Center for a Clean Air Future (NESCCAF), ICCT International Council on Clean Transportation, Southwest Research Institute, and TIAX, LLC, *Reducing Heavy-Duty Long Haul Combination Truck Fuel Consumption and CO_2 Emissions*, Final Report (October, 2009).
[149] TIAX, *Assessment of Fuel Economy Technologies for Medium- and Heavy Duty Vehicles - Final Report*, Case D0506, (November 19, 2009).
[150] RIA at 2-221.

justification for the use of the dis-synergy factors in the rulemaking record. Nor do they provide any evidence to support their proposed approach, which EDF considers inappropriate given that many of the technologies on EPA's list may not even have dis-synergistic effects.

In summary, EPA and NHTSA made overly conservative assumptions on almost every critical input that went into the derivation of the proposed engine standards. This results in standards that provide minor incremental improvement over 2017 engine designs despite cost-effective available technologies and more than 12 years of lead time. We respectfully urge the Agencies to correct these deficiencies in their analysis, which would more that double the stringency of the proposed standards.

4. Recommended engine standards

Based on the literature review and analysis performed by Walsh et. al., and the extensive technology analyses performed by ACEEE,[151] UCS[152] and ICCT,[153] we are strongly recommending that the Agencies consider the following performance-based standards for line-haul and heavy-haul applications, which consume the majority of the fuel in the medium- and heavy-duty truck category:

a) Engine standards

- Model Year 2027 and beyond HD Tractor Engines 390 gCO2/bhp-hr (50.4% BTE)
- Model Year 2024-26 HD Tractor Engines 405 gCO2/bhp-hr (48.5% BTE)
- Model Year 2021-23 HD Tractor Engines 435 gCO2/bhp-hr (45.1% BTE)

Robust engine standards are needed to drive emissions and fuel consumption reductions across the entire vehicle. The technology is clearly available to meet these standards in the time frames suggested.

The 12-year lead-time the Agencies are providing for compliance is more than sufficient for manufacturers to develop and successfully deploy the advanced engine technologies needed to meet more stringent standards. In fact, the lead-time is extraordinarily long when compared to most past Agency actions over the last 40 years. At minimum, the Agencies could consider conducting a biennial review as was done for the 2007/2010 HD criteria pollutant rule.[154] These reviews were conducted biennially, and reviewed the development status of the advanced technologies that were in question, specifically diesel NOx adsorbers. At the end of each review

[151] See ACEEE comments submitted to this docket.
[152] See UCS comments submitted to this docket.
[153] See ICCT comments submitted to this docket.
[154] 66 Fed. Reg. "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements", (January 18, 2001).

cycle, EPA publically released a report that discussed the status of the technology development and any implications concerning rule implementation.

C. Agencies should restore the linkage between the GHG and criteria pollutant test cycles

The Supplemental Engine Test (SET) steady-state cycle is one of two test cycles that EPA uses to determine compliance with existing criteria pollutant emission standards. The SET was also adopted as the sole test cycle for GHG compliance determinations in EPA's medium- and heavy-duty Phase 1 GHG rule finalized in September 2011. By using the same SET cycle for both programs, manufacturers are prevented from trading off criteria pollutant control for CO2 control.

As explained above, however, the Agencies are proposing to revise the cycle weighting for CO2 compliance testing purposes only, based on the belief that the revised weighting would make the SET more representative. But by proposing the SET re-weighting for CO2 only, EPA breaks the linkage between criteria pollutants and CO2, because PM and NOx would continue to be measured on the existing SET cycle. Setting aside the merits of the revisions, this de-linkage is of serious concern because it creates a loophole in the regulations that could lead to increases in criteria pollutants. We strongly recommend that EPA maintain the same test cycle for CO2 and criteria pollutants in order to prevent these unintended consequences. One possible way to do this, if EPA decides to finalize the CO2 cycle re-weighting, is to apply the same revisions to the criteria pollutant program.

D. Trailer standards can be strengthened and achieved earlier

Trailers used with Class 7 and 8 tractors contribute significantly to the heavy-duty vehicle sector's total CO2 emissions and fuel consumption. We commend the Agencies for following through on their commitment in the Phase 1 rule to address trailers and proposing the first ever trailer standards. We support the Agencies' proposed framework, which will provide important GHG reductions.

We also encourage the Agencies to strengthen the standards by accelerating the compliance timelines and encouraging technology innovation. The proposed standards are based on off-the-shelf technologies that are in use on trailers today. In fact, there is already a significant market demand for these technologies in part because of California's existing trailer regulations, the SmartWay voluntary program and because of the very short payback periods for all of the trailer

technologies being considered.[155] Consequently, we believe the trailer program could be improved by accelerating the implementation schedule and requiring the broader deployment of more advanced aerodynamics and tire technologies. The Agencies themselves indicated in the Preamble that Alternative 4, which accelerates the program to 2024, "has the potential to be the maximum feasible alternative within the meaning of section 32902(k) of EISA, and appropriate under EPA's CAA authority."[156] Additionally, Alternative 5 indicates that there are other efficiency technologies the Agencies could include and additional types of trailers the program could be applied to. We encourage the Agencies to consider the stringency levels in Alternative 5 applied to the timeline suggested in Alternative 4.

We are also concerned that the decision to exempt container trailers from the standards would create a potential loophole that could erode the overall benefits of the trailer program. The number of container trailers is growing and becoming a larger percentage of total trailer miles, with containers being used for longer delivery routes, displacing the use of traditional trailers. We understand the challenges of including containers under the standards, but we encourage the Agencies to develop a workable solution to this problem.

E. Gasoline vocational engine standard should be more robust

The Agencies decided not to propose new more stringent standards for gasoline engines used in vocational vehicles because of concerns that the manufacturers do not have capital to invest in this segment of the heavy-duty sector. Yet, Navistar and General Motors just announced a joint venture to develop more class 4 and 5 trucks, many powered with gasoline engines.[157] The Agencies go on to conclude that some reduction will occur anyway because the engines used in this application are derived from engines used in pickups and vans. We do not support this rationale.

The assertion that multi-billion dollar manufacturers can not make these investments is not supported by the rulemaking record. Furthermore, these gas engines compete – albeit in small numbers – with diesel engines. By allowing weaker standards for gasoline engines, the Agencies are giving them a competitive advantage and incentivizing a shift to gasoline. Indeed, recent data shows there has been a significant increase gasoline engines in medium-duty trucks.[158]

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[155] Sharpe, B., *Recommendations for regulatory design, testing, and certification for integrating trailers into the Phase 2 U.S. heavy-duty vehicle fuel efficiency and greenhouse gas regulation*, (2014), *available at* http://www.theicct.org/integrating-trailers-us-phase-2-hdv-efficiency-rule.

[156] Preamble at 40255.

[157] Straight, B., "Navistar's Kozek: Deal strengthens International, expands GM portfolio," Fleet Owner, (September 30, 2015), *available at* http://fleetowner.com/equipment/navistars-kozek-deal-strengthens-international-expands-gm-portfolio.

[158] Berg, T., "Medium-Duty Update: Winners, Losers and Overall Steady Growth", HDT Truckinginfo, (August 2013), *available at* http://www.truckinginfo.com/article/story/2013/08/medium-duty-update.aspx?prestitial=1; NTEA_IHS Automotive Polk 2nd QTR CV Report_2014, (2014), *available at* http://www.ntea.com/Search/index.aspx?searchtext=automotive%20polk%202nd%20qtr.

Historically, EPA has preferred setting fuel neutral standards to maintain a level playing field – and we believe the Agencies should do so here. We recommend that the Agencies set the most feasible, fuel neutral standard based on the capabilities of the technological leader – in this case the diesel engine. If the Agencies decide not to do this, they should at the very least set a standard based on the most advanced gasoline engine technologies deployable in the timeframe the standards take effect. It is reasonable to expect that efficiency improvements made to gasoline engines used in heavy-duty pickups and vans will migrate to those used in vocational vehicles, and that shift should be encouraged by robust standards. A recent SwRI study funded by NHTSA projects that gasoline engines could improve fuel efficiency by up to 8%.[159] We urge the Agencies to set more rigorous standards for gasoline vocational engines based on this and other relevant analyses.

F. Vocational vehicle standards should drive advanced technologies

Class 2b-8 vocational trucks, which include a broad variety of trucks that have many different functions, consume about 20% of the fuel used by the heavy-duty vehicle sector.[160] EPA and NTSA proposed vehicle standards that would result in about a 16% fuel consumption reduction from diesel-powered trucks and about a13% reduction for gasoline-powered trucks, by 2027. The difference in stringency is explained by the fact that the Agencies did not update standards for gasoline engines. In addition to finalizing a fuel neutral engine standard, the vehicle standards can also be strengthened.

We recommend that the Agencies set more rigorous standards for vocational vehicles that meaningfully encourage advanced technologies like hybridization and electrification. Many vocational truck configurations are excellent candidates for these technologies, and are being applied on vocational trucks today. Odyne, a Wisconsin-based manufacturer of electric and hybrid electric propulsion systems for heavy trucks, currently produces a truck that promises annual fuel savings of up to 50% for class 7 trucks with extensive use of the power take-off mode. This currently available solution can cut fuel consumption by 1,750 gallons per year.[161] Wrightspeed currently has the capacity to convert diesel-and-automatic-transmission powertrain to a turbine-electric, plug-in series hybrid. These innovative trucks hold the potential- today- to "save 50% to 90% in fuel over a straight diesel powertrain."[162] XL Hybrid recently announced its XL3 Hybrid System for Ford Transit vans. The hybrid electric drive system offers fuel and greenhouse gas emission savings- today- of 20%.[163] Fully electric local delivery trucks are also

[159] Reinhart, T., *Commercial Medium- and Heavy-Duty Truck Fuel Efficiency Technology Study – Report #2*, Washington, DC: National Highway Traffic Safety Administration, (June 2015).
[160] Preable at 40152.
[161] *See* http://www.odyne.com/benefits/reduced-fuel-cost.html
[162] *See* http://www.truckinginfo.com/article/story/2015/06/tantalizing-turbine-electric.aspx
[163] *See* http://www.businesswire.com/news/home/20150504005280/en/XL-Hybrids-Introduces-Hybrid-Electric-Ford-Transit#.Vg1YKJf9moU

viable today. Pepsi operates more than 250 of these trucks,[164] including 176 Smith Electric trucks.[165]

The vehicle standard should be strengthened by reflecting the innovation of these manufacturers and including hybrid and electric power-take-off benefits, recognizing transmission improvements possible in the timeframe of the standards, setting more stringent diesel and gas engine standards (discussed above), and incorporating more appropriate advanced aerodynamic improvements on vehicles that travel at high speeds. If all of these technologies are combined, the standards could be improved by about 7%.[166] A robust vocational vehicle standard in 2027 would provide plenty of lead-time to develop and test these advanced technologies.

Weak standards for this segment send a negative signal to the emerging market for advanced technologies and discourage on-going investment and development. We strongly encourage the Agencies to finalize more protective standards for vocational vehicles that include a meaningful role for advanced technologies such as hybrid and electric vehicles, and promote innovative companies that can provide high quality jobs.

G. A level playing field is required for gasoline and diesel vehicles

Under Phase 1, EPA and NHTSA finalized weaker standards for gasoline pickups and vans than their diesel counterparts. As a result, the efficiency gap between gas and diesel trucks will grow over the timeframe of the Phase 1 rule (2014-2018). For Phase 2, the agencies have proposed standards for heavy-duty pickups and vans that require a 16% improvement beyond 2018 for both diesel and gasoline engines.[167] These standards fail to close the efficiency gap between the different engine types and will instead perpetuate and increase the gap.

The proposed standards are inconsistent with EPA's long-standing precedent of setting standards that are fuel neutral and based on the capabilities of the technological leader. By setting a weaker standard for gasoline vehicles, the Agencies have not established a level playing field and are creating incentives to shift from lower CO2 diesel vehicles to higher CO2 gasoline vehicles. Recent sales data for this vehicle class suggests that this shift is already occurring under the Phase 1 program and it will only be exacerbated under the Phase 2 program. This shift will put at risk the ability of the overall program to deliver the environmental results expected from the Phase 2 program. We recommend that the Agencies set strong performance-based fuel neutral standards based on the technological leader. At the very least, this final rule should begin to close the efficiency gap between gasoline and diesel pickups and vans.

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[164] National Renewable Energy Laboratory fact sheet, Project Startup: Evaluating the Performance of Frito Lay's Electric Delivery Trucks (April 2014). Available at: http://www.nrel.gov/docs/fy14osti/61455.pdf
[165] Smith Electric website at: http://www.smithelectric.com/customer-stories/fritolay/
[166] See UCS and ACEEE comments submitted to this docket.
[167] Preamble at 40338.

VII. Final rule must ensure fuel savings and greenhouse gas reductions from natural gas vehicles

Diesel is the current dominate fuel for heavy trucks. While it is likely to remain the most widely used fuel throughout the Phase 2 proposal, gasoline and natural gas are each making inroads in different market segments. EPA should ensure that these other technologies are likewise subject to rigorous environmental standards.

EDF is particularly concerned about the ability of natural gas trucks to deliver real-world greenhouse gas reductions. Given the significant impact of upstream methane emissions, a recent ICCT study found that "inadequate attention to technologies designed to limit methane leakage … would diminish the program benefits by as much as 38 percent."[168]

The finding from ICCT is consistent with other leading research. A recent study by Camuzeaux et al in *Environmental Science & Technology* found that switching heavy-duty truck fleets from diesel to natural gas could lead to worse climate impacts over the next 50 to 90 years than remaining with diesel because of the powerful effect that methane has on global warming in the near-term. [169] (Attachment 1)

While natural gas trucks lead to increased climate damage for decades compared to diesel trucks today, over the course of the Phase 2 program these vehicles have the potential to provide immediate, sizable climate benefits. Camuzeaux et al found that – with improvements to the vehicles and the natural gas supply chain – "fuel switches have the potential to produce climate benefits on all time frames." Similarly, ICCT found that natural gas trucks could "increase the Phase 2 regulatory program's 2040 benefits by 11 million tons of CO2e, or 7 percent"[170] if best practices to reduce methane emissions on-vehicle and across the supply chain are adopted. With improvements to the proposal, the final Phase 2 program could avoid an unintended consequence of additional climate damage from a switch to natural gas trucks and instead enhance the climate benefits of the program by enabling natural gas trucks to deliver on their climate potential.

A. A new, more comprehensive lifecycle analysis of NGVs is needed

The Agencies' attempt to quantify the climate impact of natural gas trucks should be strengthened in several ways. The Agencies relied exclusively on data from the Greenhouse Gas Inventory (GHGI), leading to a lifecycle analysis (LCA) that likely underrepresents the amount

[168] Delgado and Muncrief, *Assessment of Heavy-Duty Natural Gas Vehicle Emissions: Implications and Policy Recommendations*, International Council for Clean Transportation, (July 2015).
[169] Camuzeaux, *et al.*, *Influence of Methane Emissions and Vehicle Efficiency on the Climate Implications of Heavy-Duty Natural Gas Trucks*, Environmental Science & Technology, (May 2015).
[170] Delgado and Muncrief, *Assessment of Heavy-Duty Natural Gas Vehicle Emissions: Implications and Policy Recommendations*, International Council for Clean Transportation, (July 2015).

of methane emitted into the atmosphere across the natural gas supply chain. The Agencies also relied on outdated Global Warming Potentials (GWPs) for methane, which do not reflect the latest available science on methane's impact on the climate system.

The GHGI estimates U.S. natural gas methane emissions based mainly on bottom-up estimates of methane emissions. It is based heavily on data collected in the 1990s and recent data suggest that the Inventory likely underestimates actual emissions and does not fully include important sources like those found in the gathering and boosting segment. For example, new research conducted in Texas' Barnett Shale, one of the country's largest production areas, finds methane emissions are 50% higher than GHGI estimates.[171] Other recent studies have made similar conclusions, predicting the underestimation is in the range of 25-75% below actual emissions.[172, 173, 174]

In addition, the LCA in the proposal predicts that methane emissions will only rise by 4% from 2012 levels by the year 2025, while natural gas production is expected to increase by about 22%. However, the most recent GHGI, which was not available for this LCA, shows a 3% increase in methane emissions over 2012-2013, which suggests these projections may be understated. Accordingly, we recommend EPA develop a sensitivity analysis to the existing LCA using the numerous recent field studies conducted over the past few years aimed at better characterizing national methane emissions from the oil and natural gas sector.

EPA recognizes a number of other gaps in the LCA that have not been addressed. For compressed natural gas (CNG) trucks, due to lack of quantifiable data, EPA does not estimate emissions from refueling or small leaks in the CNG fuel storage system. The LCA also does not include estimations for fugitive emissions from fuel piping for either CNG or LNG trucks. Furthermore, there is a significant amount of uncertainty in the estimation for the quantity of boil-off and venting emissions from LNG trucks.

In the proposed Phase 2 standards, EPA takes critical steps in providing such an LCA. However, there are a number of areas for improvement, as highlighted in this paper, especially concerning sensitivity analyses related to upstream methane emissions, GWPs, and the carbon dioxide-credit program.

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[171] Hamburg, S., "New Research Finds Higher Methane Emissions Reduction Opportunities in Texas' Barnett Shale Region," EDF Blogs: Energy Exchange, (July 7, 2015), *available at* http://blogs.edf.org/energyexchange/2015/07/07/new-research-finds-higher-methane-emissions-reduction-opportunities-in-texas-barnett-shale-region/.

[172] Pétron, G. *et al*., *Hydrocarbon emissions characterization in the Colorado front range: A pilot study*, J. Geophys. Res.: Atmos., 117, (2012).

[173] Miller, *et al*., *Anthropogenic emissions of methane in the United States*, Proc. Natl. Acad. Sci. U.S.A., 110 (50), 20018−20022, (2013).

[174] Brandt, *et al*., *Methane leaks from North American natural gas systems*, Science, 343, 733-735, (2014).

B. Use the current and appropriate GWP values for methane emissions

Each greenhouse gas has its own potential to impact the climate, and those impacts can differ over time. To evaluate the climate impact of a non-CO2 greenhouse gas, such as methane, one methodology is to convert those emissions to a unit equivalent to CO2, using the GWP of the gas at issue. GWP is a measure of the climate forcing potential of a gas (such as methane) relative to CO2.

The most recent IPCC establishes the 100-year GWP for methane at a figure of at least 28, meaning that methane is 28 times more potent than CO2 over a 100-year period.[175] However, because methane causes greater climate damage over shorter rather than longer time frames, choosing a 100-year GWP will undervalue the short-term impacts of methane. Accordingly, the benefits of methane reductions should also be valued using the most recent 20-year GWP for methane, which is at least 84.

These GWP values for methane (28 over 100 years and 84 over 20 years) are conservative because they do not include climate-carbon ("cc") feedbacks (which are feedbacks between climate change and the carbon cycle). The latest IPCC report concludes that when cc is considered, methane has an even higher GWP on both 100- and 20-year timeframes of 34 and 86, respectively. Other scientific analyses have likewise determined that methane is an even more potent climate forcer.

While EPA does consider both 20-year and 100-year GWPs in its LCA, the GWP values it uses should be updated to the estimates referenced above from the latest IPCC report. In addition, the shorter-term impacts of methane are important when comparing emissions from natural gas vehicles to that of diesel vehicles. In recent research, Camuzeaux et al. have found that switching from diesel to natural gas heavy-duty fleets could create damages to the climate for 50 to 90 years before the fuel switch would create any climate benefits, due to the short term impact of methane emitted to the atmosphere across the natural gas value chain.

As a direct application of these considerations, we urge EPA to incorporate short-term GWPs when establishing the GHG equivalence value of methane within the rule's carbon dioxide credit program.

[175] Joussaume, *et al.,* eds., *Climate Change 2013: the Physical Science Basis, Contribution of Working Group I to the Fifth Assessment report of the Intergovernmental Panel on Climate Change,* Table 8.A.1 (2013), *available at* http://www.climatechange2013.org/images/uploads/WGIAR5_WGI-12Doc2b_FinalDraft_All.pdf.

C. Account for all on-vehicle methane and require efforts to reduce these emissions

Methane is emitted from natural gas trucks at the tailpipe and crankcase, and vented from liquefied natural gas (LNG) fuel tanks. The Phase 2 proposal makes important strides in reducing these emissions. EDF supports the close-crankcase requirement contained in the proposal.[176] This step can significantly reduce methane emissions, as evidenced by the recent CARB certification of the Cummins-Westport ISL G Near Zero engine.[177] With the closed-crankcase, methane emissions were cut 70% compared to the standard ISL G engine.[178]

The Agencies also took an important step to recognize the significant potential for methane emissions from LNG fuel tanks.[179] EDF supports the Agencies' decision to require a minimum hold time for these tanks. However, the proposed five-day requirement is insufficient. It reflects current industry practice, falling well short of the existing capacity of LNG tank technology. For example, Chart Industries, a leading producer of LNG tanks, brought to market a tank capable of a 10-day hold time in 2013.[180] Westport also claims a 10-day hold time with its existing Ice Pack tank.[181] Given that ten days is achievable today, the final rule should require at least this level of performance in 2021. The agency should consider further strengthening this standard in 2024 and 2027.

D. Modify the engine inputs in GEM to reflect all GHG emissions; not just CO2

As it is currently designed, the engine inputs into GEM only reflect emissions of carbon dioxide. This is a significant oversight when certifying alternative fueled vehicles. Methane emissions from natural gas trucks greatly exceed the proposed methane standard. As EPA noted in the proposed rule, "for the initial natural gas engine certifications that EPA received for 2014, the truck manufacturers chose to continue to emit high levels of methane."[182] The final standard must ensure GEM engine inputs accurately reflect emissions from NGVs and other vehicles.

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[176] Preamble at 163; 793.
[177] California Air Resources Board (CARB), On-Road Certification for Cummins-Westport ISLG 8.9L, (September 2015), *available at* http://www.arb.ca.gov/msprog/onroad/cert/mdehdehdv/2016/cummins_mhdd_a0210630_8d9_0d20-0d01_ng.pdf
[178] Piellisch, R., "CWI's ISLG Certified As 'Near Zero", Fleets and Fuels, (September 17, 2015), *available at* http://www.fleetsandfuels.com/fuels/ngvs/2015/09/cwis-isl-g-certified-as-near-zero/
[179] Preamble at 793-795; 817; 1020-1021.
[180] Lockridge, D., "Chart Improves LNG Truck Fuel System", Heavy Duty Trucking, (April 8, 2013), *available at* http://www.truckinginfo.com/channel/fuel-smarts/product/detail/2013/04/chart-improves-lng-truck-fuel-system.aspx
[181] Westport, "Leveraging the Benefits of Cold LNG", *available at* http://www.westport.com/products/fuel-storage-and-delivery/ice-pack-lng-tank-system/benefits (last accessed September 23, 2015).
[182] Preamble at 782.

E. Adopt a full fuel cycle accounting approach for alternative fuels

While on-vehicle methane emissions are an important factor, it is the methane emissions associated with the production, processing and distribution of natural gas that largely determine the amount of climate damage natural gas fleets cause compared to diesel fleets.[183] In order for the Phase 2 program to accurately reflect the climate impact of natural gas trucks, the final standards must reflect the full lifecycle impact of using these and other trucks. Therefore, an upstream emissions analysis should be incorporated into efficiency standards in some capacity.

The Agencies have used this approach before. In the historic light-duty standards, the Agencies developed an upstream compliance factor to reflect the upstream impact of electric vehicles. While these vehicles emit much less CO2 at the tailpipe, the compliance factor takes into account the generation or production of the fuel source upstream of the tailpipe.[184] This strategy could be applied in a parallel manner to NGVs to account for the full impact of their CO2 and methane emissions. An upstream compliance factor could be calculated given current estimates of the upstream impact for a respective NGV, and later adjusted accordingly based on improved GHGI estimates.

The Agencies asked for comments about including lifecycle emissions in the final program, as well as the feasibility of doing so while maintaining the linkage between the EPA standards and the NHTSA standards. Eastern Research Group has examined the options (Attachment 2), concluding "…upstream emissions can be accounted for in the Phase 2 rule, following the precedents established in the LD GHG rules. Concerns with the potential magnitude of GHG emissions in lifecycle emissions, especially for natural gas trucks, suggests that these emissions should be directly accounted for in some way in the Phase 2 rule." Given the viability of this pathway, EDF urges the Agencies to adopt full lifecycle accounting in the final standards.

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F. Revisit projected growth of natural gas vehicles in heavy-duty sector

The Agencies improperly characterize the potential use of natural gas trucks in its proposal and draft regulatory impact assessment. Specifically, the agencies concluded,

> *" … based on our review of the literature and external projections we believe that the use of natural gas is unlikely to become a major fuel source for medium and heavy-duty vehicles during the Phase 2 time frame. Thus, since we project natural gas vehicles to have little impact on both overall GHG emissions and fuel consumption during the Phase*

[183] Camuzeaux, *et al., Influence of Methane Emissions and Vehicle Efficiency on the Climate Implications of Heavy-Duty Natural Gas Trucks*, Environ. Sci. Technol., (2015).
[184] Center for Climate and Energy Solutions, Federal Vehicle Standards, Arlington, VA, (2015), *available at* www.c2es.org/federal/executive/vehicle-standards.

2 time frame, the agencies see no need to propose fundamental changes to the Phase 1 approach for natural gas engines and vehicles."[185]

Both findings are incorrect and could undermine the benefits of the final Phase 2 standards.

The Agencies' finding that "natural gas is unlikely to become a major fuel source for medium and heavy-duty vehicles during the Phase 2 time frame" is based on U.S. Energy Information Administration (EIA) market projections.[186] As EPA notes, the EIA projections are an outlier among other projections[187] and are flawed. Most significantly, the projections account only for high-pressure direct injection engines (HPDI).[188] Yet, in 2013, the only manufacturer of HPDI engines discontinued their production, citing high-costs compared to spark-ignited natural gas engines.[189]

Moreover, the EIA projections fail to accurately reflect current sales. The market for natural gas-fueled heavy-duty trucks expanded by 20% in 2014 with 10,480 units sold.[190] These trucks are Class 8 heavy trucks including tractor-trailers, transit buses, and refuse trucks. Transit buses and refuse trucks saw the highest levels of natural gas adoption at 30% and 43% respectfully.[191] The significant increase in market share for natural gas trucks is consistent with industry forecasts by ACT research[192] and the National Petroleum Council ("NPC").[193] Current sales volumes are 4.5 times greater than recent projections of sales from the EIA.[194]

The discrepancy between market data and EIA projections continue in 2015. Recent industry data suggest total sale volumes of on-highway applications are expected to be 3,300 units in 2015.[195] These numbers, which do not include the refuse trucks and transit buses units that are leading NGV sales, are triple EIA projections.[196]

The Agencies discount ACT, NPC and others by noting,

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[185] Preamble at 775.
[186] RIA at 955.
[187] RIA at 953.
[188] Chase, N. (U.S. Energy Information Administration), correspondence with EDF, (August 2015).
[189] Clevenger, S., "Westport to End 15-Liter LNG Engine, Citing High Cost of Building Power Plant," Transport Topics, (November 11, 2013).
[190] Tita, B., "Slow Going for Natural-Gas Powered Trucks", Wall Street Journal, (August 25, 2014), *available at* http://www.wsj.com/articles/natural-gas-trucks-struggle-to-gain-traction-1408995745.
[191] Act Research, "NG Reality Check: Moving from Infancy to Adolescence," (September 2014).
[192] *Id.*
[193] National Petroleum Council, *Advancing Technology for America's Transportation Future*, (August 2012).
[194] EIA, *Annual Energy Outlook 2014: Freight Transportation Energy Use*, Reference case, (May 2014).
[195] "Westport, Fuel Systems Announce Merger", Transport Topics, (September 1, 2015), *available at* http://www.ttnews.com/articles/basetemplate.aspx?storyid=39327&t=Westport-Fuel-Systems-Announce-Merger
[196] EIA, *Annual Energy Outlook 2015: Supertab 68, New Vehicle Sales, Heavy, Compressed/Liquefied Natural Gas,* (April 2015).

> *"[t]he first observation we can make about all these reports is that they start out assuming that natural gas use is 2 percent of the Class 8 heavy duty truck fleet in 2012. However, that level of natural gas vehicle penetration of the heavy-duty fleet is not supported by other data sources."*[197]

This is a misreading of the projections, which represent new vehicle sales and not total penetration of the existing fleet. As we note above, new trucks sales in 2014 were consistent with NPC projections.

The Agencies also claim that NGVs are likely to drive less than diesel trucks, citing dated information from the Vehicle Inventory and Use Survey (VIUS) comparing light and medium heavy-duty trucks with diesel heavy trucks.[198] Given the fact that the Agencies failed to break out low-mileage duty cycles, such as refuse trucks and transit buses that have significantly embraced natural gas engines, it is not surprising the Agencies found that NGVs travel fewer miles than heavy diesel trucks.

This conclusion is counter to how fleets operate over-the-road trucks. Palmer Trucks puts over 200,000 a year on its natural gas trucks.[199] In reference to its NGVs, Dillon Transport recently noted "we want to run those trucks 1,000 miles per day if we can."[200] Saddle Creek has run its NGV trucks 34 million miles since 2012 while growing fleet size from 40 to 175 trucks.[201] Companies that buy NGVs for over-the-road duty maximize the mileage on these vehicles. It is core to the business case for choosing these trucks.

The conservative EIA projections fail to account for another critical market development: new natural gas trucks are increasingly able to offer significant NOx reduction benefits compared to diesel trucks. The California Air Resources Board certified the Cummins-Westport 8.9-liter ISL G engine at 0.02 grams NOx per brake horsepower-hour.[202] Given the ability of this engine to

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[197] RIA at 952.
[198] RIA at 958.
[199] "Palmer Trucks CNG Industry Leaders", *available at* www.palmertrucks.com/cng/ (last accessed September 23, 2015).
[200] Crissey, J., "Natural gas reality check, Part 2: Early adopters are staying the course," Commercial Carrier Journal, (June 1, 2015), *available at* http://www.ccjdigital.com/natural-gas-reality-check-part-2-early-adopter-are-staying-the-course/#sthash.isB4oevF.8eerS1b9.dpuf.
[201] Saddle Creek Logistics, "Growth of CNG at Saddle Creek Fuels Interest in Natural Gas," (February 2015), *available at* http://www.sclogistics.com/news-resources/press-releases-news/growth-of-cng-at-saddle-creek-fuels-interest-in-natural-gas#sthash.wlOKaezV.wUjshuev.dpuf.
[202] California Air Resources Board, On-Road Certification for Cummins-Westport ISLG 8.9L, (September 2015), *available at* http://www.arb.ca.gov/msprog/onroad/cert/mdehdehdv/2016/cummins_mhdd_a0210630_8d9_0d20-0d01_ng.pdf.

deliver lower NOx, its adoption is likely to benefit from the deployment of public funds to mitigate local air pollution concerns.[203]

G. Require on-board monitoring to track boil-off events

The Agencies requested comment on the use of on-board monitoring to track boil-off events as well as other methane discharges. EDF believes that requiring this data collection will enhance the ability of manufacturers, fleets, and refueling station owners to quantify the magnitude of methane emissions and take steps to minimize these emissions. Additionally, this data will provide the Agencies with improved data quality on which to design effective future policies.

VIII. Transparency of emissions and fuel economy for consumers through labeling and online resources is critical

When faced with the decision of which new light-duty vehicle to buy, consumers are provided with valuable information including city and highway fuel economy, GHG rating, average annual cost and estimated cost savings over an average vehicle. This information is posted on the window of all new light-duty vehicles sold, and additional information is readily available from EPA's Fuel Economy Guide and other online tools. In contrast, consumers of medium-duty pickup trucks and utility vans are not offered any information on fuel economy, emissions or relative costs.

As discussed above, one of the many market barriers to the purchase of more efficient trucks is the lack of access to complete and reliable information. The agencies state in the preamble that, "One common theme that emerges from these [barrier] studies is the inability of HDV buyers to obtain reliable information about the fuel savings, reliability, and maintenance costs of technologies that improve fuel efficiency."[204] Yet the Agencies have yet to provide this information to consumers, despite repeated commitments to do so.

Indeed, in the Phase 1 rulemaking, the Agencies committed to consider window labels for pickups and vans in Phase 2 – "we do intend to consider this issue as we begin work on the next phase of regulations, as we recognize that a consumer label can play an important role in reducing fuel consumption and GHG emissions."[205] And this commitment was reiterated and reinforced by NHTSA in a letter to Senator Diane Feinstein last year, stating,

"NHTSA supports the concept that providing information to consumers on energy use and

[203] Nemec, R., "NGV Market Penetration Still Small Despite Bullish Advocates," Natural Gas Intelligence, (September 21, 2015), *available at* http://www.naturalgasintel.com/articles/103730-ngv-market-penetration-still-small-despite-bullish-advocates.
[204] Preamble at 40436.
[205] *See* 76 Fed. Reg. at 39478.

emissions can play an important role in raising awareness, improving transparency, and ultimately, reducing fuel consumption and greenhouse gas emissions through informed decision-making…NHTSA recognizes the importance of this issue and we currently believe that we could best and most thoroughly address all of these issues by conducting rulemaking for fuel economy labels, in collaboration with EPA, as part of the second phase of fuel efficiency and greenhouse gas standards for heavy-duty vehicles."[206] (Attachment 3)

Despite these commitments, there is no mention of window labels in the proposed rulemaking.

Improving the fuel consumption information on 2b and 3 vehicles would significantly foster the deployment of cost-effective efficiency technologies, leveraging the standards being finalized in this rulemaking. EDF urges the Agencies to conduct label design and education outreach for Class 2b and 3 vehicles, similar to that conducted as part of the light-duty labeling rule. We also request that EPA and DOT finalize comparable window label requirements for all new 2b and 3 vehicles and provide online information for buyers of all classes of heavy-duty vehicles.

A. Large population, annual sales and miles travelled of Class 2b and 3 vehicles call for informing consumer choice

While their CO_2 emissions are lower per vehicle than vocational trucks and tractor trailers, Class 2b and 3 pickup trucks and vans have the highest sales volumes in the heavy duty market and account for about 15-20 percent of all fuel use and GHG emissions in the truck market. In the Phase 1 RIA, EPA estimated 2b and 3 sales were 580,000 per year in 2010 and projected they would increase to between 700,000 and 800,000 per year for 2014-2021.[207] However, a recent report by ICCT found the number of new registered 2b and 3 vehicles was about 450,000 in 2010, and increased to 1 million in 2012 and 1.2 million vehicles per year in 2013, concluding that, "the sales are increasing at a significantly greater rate than the agencies had projected."[208] DOT estimates that 2b and 3 vehicles travel about 35 percent of total medium- and heavy-duty vehicle annual miles.

Because of their large population and large annual sales volume, providing window labels on 2b and 3 vehicles provides an important opportunity to reach a large portion of heavy-duty consumers. Providing these consumers with transparent information about efficiency, fuel savings and air pollution will help them make informed decisions. And because of the high number of miles traveled annually by 2b and 3 vehicles, when informed consumers buy more

[206] Letter from NHTSA Administrator David Strickland to Senator Diane Feinstein (date unknown). See Attachment 3.
[207] EPA, *Process for Determining the Standards for Class 2b and 3 Trucks,* 2008 model year pickup data submitted to 2010 HD rule docket, (2008), *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2010-0162-033.
[208] ICCT, *Regulatory Considerations for Advancing Commercial Pickup and Van Efficiency Technology in the United States*, (April 2015).

efficient vehicles, additional emissions reductions can be achieved, leveraging the standards being finalized under the fuel economy and GHG rulemaking.

B. Similar use and configuration to their light-duty counterparts make labels feasible

Despite the definition and regulatory split between light-duty trucks and 2b and 3 trucks, they are very similar in use patterns as well as engine and transmission configurations and emissions control technology. EPA regulates criteria emissions from 2b and 3 vehicles under the light-duty Tier 3 rulemakings because, "Most are built by companies with even larger light-duty truck markets, and as such they frequently share major design characteristics and potential emissions control technologies with their LDT counterparts."[209] In fact, many 2b trucks are simply larger versions of a manufacturer's 2a model with engines and transmissions that can be nearly identical in configuration. Like light-duty trucks, more than 90 percent of 2b and 3 vehicles are sold as 'complete' vehicles, as defined by EPA.[210] EPA also confirms that the "Often, the technologies available to reduce fuel consumption and GHG emissions from this segment are similar to the technologies used for the same purpose on light-duty pickup trucks and vans, including both engine efficiency improvements (for gasoline and diesel engines) and vehicle efficiency improvements."[211] These technologies include, but are not limited to, engine improvements such as friction reduction, cylinder deactivation, cam phasing, and gasoline direct injection; aerodynamic improvements; low rolling resistance tires; and transmission improvements. In addition to the same efficiency technologies, Class 2a and 2b trucks are both certified with chassis dynamometer testing.[212]

The use of class 2b and 3 vehicles can vary widely but many of the uses are the same as light-duty trucks: they can be strictly personal-use vehicles, vehicles that double for both work and personal use, or vehicles that are used solely for commercial purposes (cargo vans). Many are purchased to perform a certain work function, necessitating a specific workload and towing capacity. However, despite varying workloads and towing capacities of 2b trucks, their similarities outweigh their differences.

Based on these similarities, EPA and NHTSA should develop window labels for 2b and 3 vehicles that provide comparable information afforded to consumers of light-duty cars and

[209] 79 Fed. Reg. 23414, Control of Air Pollution From Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards (April 28, 2014).
[210] A 'complete vehicle' can be a chassis-cab (engine, chassis, wheels, and cab) or a rolling-chassis (engine, chassis and wheels), while an 'incomplete-chassis' could be sold as an engine and chassis only, without wheels. Final RIA, Page 1-9. Control of Air Pollution From Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards; Proposed Rule, 78 Fed. Reg. 29,816 (May 21, 2013) at 29874.
[211] Preamble at 40332.
[212] Class 2b and 3 diesel pickup trucks and vans have an option to certify using the chassis dynamometer test procedure. As an alternative, some engines used in 2b and 3 diesel trucks are certified as engines on an engine dynamometer. Final RIA, Page 1-9.

trucks. Given that these vehicles are often purchased to perform a certain work function, it may also be appropriate to provide payload and towing capacity on the label to allow for easy cross-vehicle comparisons in combination with fuel efficiency information.

C. Agencies should immediately begin rulemaking process for labels

The updated light-duty labeling rule was finalized with updated fuel economy and GHG standards for light-duty vehicles. That provided EPA and DOT the opportunity to develop labels that would reflect the increased fuel economy and cost savings from advanced technologies like plug-in hybrids and electric vehicles. It also allowed manufacturers to harmonize the development and roll out of new vehicles and new labels at the same time.
EPA should similarly develop window labels for 2b and 3 vehicles with the finalization of the Phase 2 fuel economy and GHG rule. This would provide manufacturers of 2b and 3 vehicles with integrated planning, similar to the issuance of light-duty labels and emissions standards, and provide important transparency for consumers.

D. Consider carrying out an expert assessment to inform 2b/3 label design and rely on pertinent findings from the development of light-duty labels

EISA 2007 required DOT and EPA to update light-duty label designs and include GHG information. It also required the Agencies conduct consumer education outreach. The label redesign process included the following:

- Literature review –examining vehicle buying process, information sources used by consumers as they shop for vehicles, the factors that influence consumer vehicle purchasing decisions, and the impact of the increasing availability of more efficient and lower emitting vehicles.
- Focus groups (in 3 phases) – 4 cities over 4 months, 32 focus groups including 257 people.
- Expert panel – included executives from Zappos, Unilever, Pandora, Craigslist, and Gates Foundation. It was an intensive one-day workshop to elicit ideas.
- National level online survey of new vehicle buyers – an Internet survey designed to elicit responses about new label ideas.
- The innovative ideas and information collected from the redesign process resulted in consumer-friendly window labels that reduce the market barrier to purchasing cleaner, more efficient light-duty vehicles. We recommend the agencies consider the pertinent findings from the light-duty process and engage in consumer and expert outreach to inform label design for 2b and 3 vehicles.

E. Develop an online tool for all medium and heavy-duty vehicles

In addition to the label redesign, the Agencies launched an online education campaign for light-duty vehicles. Window labels direct buyers to the EPA website www.fueleconomy.gov to see the full Fuel Economy Guide. The website also allows a user to personalize their fuel economy information by inputting their specific driving habits and fuel prices and tells the buyer the cost

to fill the tank, or the volume of the fuel tank, or how many miles could be driven on a tank. The information such as the miles per tank can be personalized to reflect a person's relative amount of city and highway driving. This information is helpful to a potential consumer, as more consumers are starting their buying research online.

Similar information could be provided to consumers of all types of medium- and heavy-duty vehicles. In addition to the labels, the Agencies could provide the same personalized online information for 2b and 3 consumers as the light-duty online tool.

For vehicle classes 4-8, EDF encourages EPA to use the data and information collected during the development of the Phase 2 rule to develop a user-friendly online calculator or tool that would allow consumers to conduct personalized research of various vehicle configurations. The tool would produce average fuel economy over select duty cycles. This tool would provide rigorous, reliable information on vehicle efficiency and emissions performance to inform consumer choices.

IX. EPA should promulgate more stringent PM emission standards for APUs to protect public health

Auxiliary power units (APUs) are among the technologies available today to reduce fuel use from sleeper cab tractors due to idling. We request the Agencies adopt more protective health-based diesel particulate matter (PM) emissions standards for these units to bring them in line with the truck engines they are relieving.

Reducing idling is an important step in reducing fuel consumption, GHG emissions and other airborne contaminants from diesel engines in sleeper cabs because they are estimated to idle 6-8 hours a day, as many as 250-300 days a year.[213] EPA estimates that every year long-duration idling of truck and locomotive engines consumes over one billion gallons of diesel fuel and emits 11 million tons of carbon dioxide, 200,000 tons of oxides of nitrogen, and 5,000 tons of particulate matter.[214] A truck owner can end up paying an extra $6000 or more per year in fuel costs.[215] Also, idling can increase engine maintenance costs, shorten engine life, harm driver well being, and elevate noise levels.

EPA has verified dozens of cost-effective technologies that can be applied to APUs to reduce fuel consumption and CO_2 emissions from these engines. EDF supports the inclusion of APUs as a technology option manufacturers can use to meet the proposed standards for sleeper cab trucks.

[213] EPA, "Idle reduction" tab, *available at* http://epa.gov/smartway/forpartners/technology.htm (last accessed August 14, 2015).
[214] *Id.*
[215] *Id.*

However, the PM standards for diesel APUs, established under the nonroad rule, are not as protective as the truck engine standards for MY 2007 and later trucks, which require the use of diesel particulate filters (DPFs) or comparable alternative. This disparity allows diesel APUs to emit more than 5 times as much harmful diesel PM as a MY 2007 or later diesel sleeper cab engine.[216] Indeed, EPA estimates in the proposal that without further controls on APUs, harmful particulate emissions will increase by 1,600 tons annually by 2035 and more than 2,200 tons annually in 2050. This increase in PM emissions will be particularly significant at idling "hotspots" like truck stops, travel centers, rest areas, distribution centers and port areas, creating high concentrations of harmful diesel PM, and threatening the health of drivers, area workers and neighboring communities, many of which are often low-income. In addition to the health impacts, diesel PM is made primarily of black carbon, which is a potent GHG. We therefore request that the Agencies promulgate more protective PM emissions standards for these units to protect public health and the environment from the harmful impacts of diesel PM.

To address these public health concerns, in 2008, California Air Resources Board established more protective standards for diesel APUs that require the use of diesel particulate filters or a comparable alternative, which reduce PM by as much as 85 percent and make APUs as clean as the truck engines they are attached to. CARB concluded that the technology to make these reductions is available and cost-effective.[217]

It is imperative that EPA follow California's leadership and protect the health of all Americans by adopting protective particulate matter standards for APUs. Such an action will allow cost-effective APU technology to be used to reduce unnecessary fuel consumption by idling trucks without increasing harmful particulate pollution.

X. Finalize HFC leakage provisions for vocational vehicles and incentive the use of lower GWP refrigerants

EDF fully supports EPA's proposal to apply A/C refrigerant leakage standards to Class 2b-8 vocational vehicles. Excluded in the Phase 1 rule, vocational vehicles have air conditioning systems similar to tractors and contribute to HFC emissions through leaks. We agree that vocational A/C systems should be subject to the same A/C provisions as tractors and 2b/3 vehicles as proposed.

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[216] CARB, *Staff Report: Initial Statement of Reasons Notice of Public Hearing to Consider Requirements to Reduce Idling Emissions from New and In-Use Trucks, Beginning in 2008* (2005). Table 3 and Table 5, page 44, *available at* http://www.arb.ca.gov/regact/hdvidle/isor.pdf.

[217] CARB, Heavy-Duty Idling Emissions Reduction Program, *available at* http://www.arb.ca.gov/msprog/truck-idling/truck-idling.htm.

At the same time, we encourage EPA to ensure that the proposed new "deemed to comply" provision does not result in backsliding of HFC emissions. EPA is proposing that if a manufacturer switches to a lower GWP refrigerant listed as acceptable under the SNAP program, it will be "deemed to comply" with the low leak standard – meaning that A/C system will not have to employ low leakage components as finalized in the Phase 1 rule. Without requirements for continued in-use compliance with a lower GWP refrigerant, we are concerned this proposed provision would allow manufacturers who choose a lower GWP refrigerant to switch back to higher leakage components at the time of manufacture and compliance. Subsequently, the consumer could immediately, or at the time of replacement, switch back to a high GWP refrigerant, seriously undercutting the benefits and flouting the intent of the program. We strongly encourage EPA to put in place in-use protocols to ensure that high GWP refrigerants are not used for recharge. If this cannot be ensured, we recommend EPA maintain the low leak requirement for all heavy-duty A/C systems at least until the SNAP listing for HFC-134a is changed to "unacceptable" for use in new heavy-duty vehicles.

At the same time, the final provisions should incentive the use of lower GWP refrigerants. Shifting the heavy-duty sector to low GWP refrigerants will result in far greater emissions reductions than leakage reductions alone. The light-duty sector has already begun such a shift, proving that the technology and refrigerants are available, cost-effective and successful. The Phase 2 rule should drive the heavy-duty sector toward lower GWP refrigerants.

Instead, EPA states in the preamble that it is not making any attempts to incentivize or require the use of lower GWP refrigerants because, "there is great uncertainty about when significant adoption of alternative refrigerants for HD vehicles might begin, on what timeline adoption might become widespread, and which refrigerants might be involved."[218] By waiting for industry members to take action, EPA is failing to fulfill its duty under the CAA. Indeed, EPA has authority, and the duty, to drive technology and promote the adoption of cleaner refrigerants. It is not necessary for EPA to "attempted to project any specific hypothetical scenarios of transition."[219] EPA's job is to protect human health by adopting provisions that reduce harmful emissions from the heavy-duty sector.

We urge EPA to accelerate the SNAP approval process for additional lower GWP refrigerants for use in heavy-duty applications. Simultaneously, EPA should finalize a rule prohibiting the use of HFC-134a in heavy-duty A/C systems. In the interim, EPA should take steps in this final rule to incentivize the adoption of low GWP refrigerants before high GWP ones are prohibited.

These actions would support the Obama Administration's Climate Action Plan call for EPA to use its authority under the Significant New Alternatives Policy (SNAP) Program to encourage

[218] Preamble at 40172.
[219] *Id.*

private sector investment in identifying and approving climate-friendly HFC alternatives and prohibiting the use of the most harmful chemical alternatives.[220]

XI. EPA should commit to strengthen NOx standards for heavy-duty trucks

Ozone pollution continues to threaten the health of millions Americans – 4 in 10 people live in areas with unhealthful levels of ozone.[221] Reducing emissions of nitrogen oxides (NOx) and volatile organic compound (VOC) – the precursors to ozone – is critical to providing cleaner air for communities and families across the nation. NOx emissions standards for heavy-duty vehicles were last issued in 2001 and implementation was completed in 2010. Those standards achieved significant reductions in NOx and particulate emissions through innovative technology and ingenuity by manufacturers.

It has been nearly 15 years since the last standards were promulgated, and technology has continued to advance. It is also clear that additional reductions in ozone forming NOx are needed from the heavy-duty sector. In places like California – where much of the state is hard hit by ozone pollution – heavy-duty trucks still make up 33% of statewide NOx emissions.[222] Developing technologies, together with the improvement of existing emissions controls can provide additional cost-effective, meaningful NOx reductions from the nation's heavy-duty fleet.[223] California has already begun research on the technologies needed to reduce NOx by another 90 percent.[224] EPA should collaborate with ARB to investigate the pathways to making NOx reductions.

We urge EPA, in the final rulemaking, to commit to strengthen NOx standards for heavy-duty trucks as soon as possible. By initiating a NOx rulemaking immediately, manufacturers will be able to integrate the planning and the technology for CO2 and NOx reductions, helping to ensure that one benefit is not traded for the other.

XII. Conclusion

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[220] The White House, *The President's Climate Action Plan*, (June 2013), *available at* http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.
[221] American Lung Association, *State of the Air 2015*, *Key Findings*, *available at* http://www.stateoftheair.org/2015/key-findings/ (last accessed September 14, 2015).
[222] CARB presentation at Board Hearing, "Update on the Proposed Federal Phase 2 GHG and Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles," Sacramento, (July 23, 2015), *available at* http://www.arb.ca.gov/board/books/2015/072315/15-6-6pres.pdf.
[223] CARB, upcoming "Draft Technology Assessment: Lower NOx Heavy-Duty Diesel Engines."
[224] Southwest Research Institute, "ARB Low NOx Program Advisory Group Update", (August 2015), *available at* http://www.arb.ca.gov/research/veh-emissions/low-nox/low-nox.htm.

A robust final Phase 2 program that puts heavy-duty trucks and buses on the trajectory toward net emissions and fuel consumption reductions is supported by a broad coalition of stakeholders, including engine and vehicle manufacturers, trailer manufacturers, fleets and shippers, advanced technology innovators, security groups, faith-based groups, moms, consumers, environmental groups and science-based organizations. These groups, including EDF, support strong standards that will improve our climate security, deliver cleaner air to communities, provide fuel cost savings to fleets and truckers, and save consumers money. We urge the Agencies to finalize a Phase 2 rule that delivers these benefits.

Thank you for the opportunity to submit these comments. If you have any questions, please contact Hilary Sinnamon at (208) 720-3218 or hilary@redmtngroup.com.

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