No. 18-1190

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

ENVIRONMENTAL DEFENSE FUND, CENTER FOR BIOLOGICAL DIVERSITY, and SIERRA CLUB,

Petitioners,

v.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,

Respondent.

APPENDIX TO EMERGENCY MOTION OF JULY 17, 2018
VOLUME II (pages 317–693)

MATTHEW LITTLETON
Donahue, Goldberg & Weaver, LLP
1111 14th St NW, Suite 510A
Washington, DC 20005
Telephone: (202) 683-6895
matt@donahuegoldberg.com

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XX.
EPA Documents Relating to Current Regulation of Gliders

1. Excerpts from Final Rule: U.S. EPA & NHTSA, *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2*, 81 Fed. Reg. 73,478 (October 25, 2016)

Segments of the Heavy-Duty Phase 2 rule relevant to this litigation, as listed below, are included in this appendix.

Section of HDP2 Rule	**Federal Register page numbers**	**Starts at Appendix page number**
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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 9, 22, 85, 86, 600, 1033, 1036, 1037, 1039, 1042, 1043, 1065, 1066, and 1068

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Parts 523, 534, 535, and 538

[EPA–HQ–OAR–2014–0827; NHTSA–2014–0132; FRL–9950–25–OAR]

RIN 2060–AS16; RIN 2127–AL52

Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2

AGENCY: Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: EPA and NHTSA, on behalf of the Department of Transportation, are establishing rules for a comprehensive Phase 2 Heavy-Duty (HD) National Program that will reduce greenhouse gas (GHG) emissions and fuel consumption from new on-road medium- and heavy-duty vehicles and engines. NHTSA's fuel consumption standards and EPA's carbon dioxide (CO_2) emission standards are tailored to each of four regulatory categories of heavy-duty vehicles: Combination tractors; trailers used in combination with those tractors; heavy-duty pickup trucks and vans; and vocational vehicles. The rule also includes separate standards for the engines that power combination tractors and vocational vehicles. Certain requirements for control of GHG emissions are exclusive to the EPA program. These include EPA's hydrofluorocarbon standards to control leakage from air conditioning systems in vocational vehicles and EPA's nitrous oxide (N_2O) and methane (CH_4) standards for heavy-duty engines. Additionally, NHTSA is addressing misalignment between the Phase 1 EPA GHG standards and the NHTSA fuel efficiency standards to virtually eliminate the differences. This action also includes certain EPA-specific provisions relating to control of emissions of pollutants other than GHGs. EPA is finalizing non-GHG emission standards relating to the use of diesel auxiliary power units installed in new tractors. In addition, EPA is clarifying the classification of natural gas engines and other gaseous-fueled heavy-duty engines. EPA is also finalizing technical amendments to EPA rules that apply to emissions of non-GHG pollutants from light-duty motor vehicles, marine diesel engines, and other nonroad engines and equipment. Finally, EPA is requiring that engines from donor vehicles installed in new glider vehicles meet the emission standards applicable in the year of assembly of the new glider vehicle, including all applicable standards for criteria pollutants, with limited exceptions for small businesses and for other special circumstances.

DATES: This final rule is effective on December 27, 2016. The incorporation by reference of certain publications listed in this regulation is approved by the Director of the Federal Register as of December 27, 2016.

ADDRESSES: EPA and NHTSA have established dockets for this action under Docket ID No. EPA–HQ–OAR–2014–0827 (for EPA's docket) and NHTSA–2014–0132 (for NHTSA's docket). All documents in the docket are listed on the *https://www.regulations.gov* Web site. Although listed in the index, some information is not publicly available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically in *https://www.regulations.gov* or in hard copy at the following locations:

EPA: Air and Radiation Docket and Information Center, EPA Docket Center, EPA/DC, EPA WJC West Building, 1301 Constitution Ave. NW., Room 3334, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air Docket is (202) 566–1742.

NHTSA: Docket Management Facility, M–30, U.S. Department of Transportation, West Building, Ground Floor, Rm. W12–140, 1200 New Jersey Avenue SE., Washington, DC 20590. The telephone number for the docket management facility is (202) 366–9324. The docket management facility is open between 9 a.m. and 5 p.m. Eastern Time, Monday through Friday, except Federal Holidays.

FOR FURTHER INFORMATION CONTACT:

EPA: Tad Wysor, Office of Transportation and Air Quality, Assessment and Standards Division (ASD), Environmental Protection Agency, 2000 Traverwood Drive, Ann Arbor, MI 48105; telephone number: (734) 214–4332; email address: *wysor.tad@epa.gov.*

NHTSA: Ryan Hagen, Office of Chief Counsel, National Highway Traffic Safety Administration, 1200 New Jersey Avenue SE., Washington, DC 20590. Telephone: (202) 366–2992; *ryan.hagen@dot.gov.*

SUPPLEMENTARY INFORMATION:

A. Does this action apply to me?

This action will affect companies that manufacture, sell, or import into the United States new heavy-duty engines and new Class 2b through 8 trucks, including combination tractors, all types of buses, vocational vehicles including municipal, commercial, recreational vehicles, and commercial trailers as well as ¾-ton and 1-ton pickup trucks and vans. The heavy-duty category incorporates all motor vehicles with a gross vehicle weight rating of 8,500 lbs. or greater, and the engines that power them, except for medium-duty passenger vehicles already covered by the greenhouse gas standards and corporate average fuel economy standards issued for light-duty model year 2017–2025 vehicles.[1] Regulated categories and entities include the following:

Category	NAICS code [a]	Examples of potentially affected entities
Industry	336111 336112 333618 336120 336212	Motor Vehicle Manufacturers, Engine Manufacturers, Truck Manufacturers, Truck Trailer Manufacturers.
Industry	541514 811112	Commercial Importers of Vehicles and Vehicle Components.

[1] As discussed in Section I.A, the term heavy-duty is generally used in this rulemaking to refer to all vehicles with a gross vehicle weight rating above 8,500 lbs, including vehicles that are sometimes otherwise known as medium-duty vehicles.

Category	NAICS code [a]	Examples of potentially affected entities
Industry	811198 336111 336112 422720 454312 541514 541690 811198	Alternative Fuel Vehicle Converters.

Note:
[a] North American Industry Classification System (NAICS).

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely covered by these rules. This table lists the types of entities that the agencies are aware may be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your activities are regulated by this action, you should carefully examine the applicability criteria in the referenced regulations. You may direct questions regarding the applicability of this action to the persons listed in the preceding **FOR FURTHER INFORMATION CONTACT** section.

B. Did EPA conduct a peer review before issuing this document?

This regulatory action is supported by influential scientific information. Therefore, EPA conducted a peer review consistent with OMB's Final Information Quality Bulletin for Peer Review. As described in Section II.C, a peer review of updates to the vehicle simulation model (GEM) for the Phase 2 standards has been completed. This version of GEM is based on the model used for the Phase 1 rule, which was peer reviewed by a panel of four independent subject matter experts. The peer review report and EPA's response to the peer review comments are available in Docket ID No. EPA–HQ–OAR–2014–0827. We note that this rulemaking is based on a vast body of existing peer-reviewed work, *i.e.,* work that was peer-reviewed outside of this action, as noted in the references throughout this Preamble, the Regulatory Impacts Analysis, and the rulemaking docket. EPA also notified the SAB of its plans for this rulemaking and on June 11, 2014, the chartered SAB discussed the recommendations of its work group on the planned action and agreed that no further SAB consideration of the supporting science was merited.

C. Executive Summary

(1) Commitment to Greenhouse Gas Emission Reductions and Vehicle Fuel Efficiency

In June 2013, the President announced a comprehensive Climate Action Plan for the United States to reduce carbon pollution, prepare for the impacts of climate change, and lead international efforts to address global climate change.[2] In this plan, President Obama reaffirmed his commitment to reduce U.S. greenhouse gas emissions in the range of 17 percent below 2005 levels by 2020. More recently, in December 2015, the U.S. was one of over 190 signatories to the Paris Climate Agreement, widely regarded as the most ambitious climate change agreement in history. The Paris agreement reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, and for the first time urged efforts to limit the temperature increase to 1.5 degrees Celsius. The U.S. submitted a non-binding intended nationally determined contribution (NDC) target of reducing economy-wide GHG emissions by 26–28 percent below its 2005 level in 2025 and to make best efforts to reduce emissions by 28 percent.[3] This pace would keep the U.S. on a trajectory to achieve deep economy-wide reductions on the order of 80 percent by 2050.

As part of his Climate Action plan, the President specifically directed the Environmental Protection Agency (EPA) and the Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) to set the next round of standards to reduce greenhouse gas (GHG) emissions and improve fuel efficiency for heavy-duty vehicles pursuant to and consistent with the agencies' existing statutory authorities.[4] More than 70 percent of the oil used in the United States and 26 percent of GHG emissions come from the transportation sector, and since 2009 EPA and NHTSA have worked with industry, states, and other stakeholders to develop ambitious, flexible standards for both the fuel economy and GHG emissions of light-duty vehicles and the fuel efficiency and GHG emissions of heavy-duty vehicles.[5] [6] The standards here (referred to as Phase 2) will build on the light-duty vehicle standards spanning model years 2012 to 2025 and on the initial phase of standards (referred to as Phase 1) for new medium and heavy-duty vehicles (MDVs and HDVs) and engines in model years 2014 to 2018. Throughout every stage of development for these programs, EPA and NHTSA (collectively, the agencies, or ''we'') have worked in close partnership not only with one another, but also with the vehicle manufacturing industry, environmental community leaders, and the State of California among other entities to create a single, effective set of national standards.

Through two previous rulemakings, EPA and NHTSA have worked with the auto industry to develop new fuel economy and GHG emission standards for light-duty vehicles. Taken together with NHTSA's 2011 CAFE standards, the light-duty vehicle standards span model years 2011 to 2025 and are the first significant improvement in fuel economy in approximately two decades. Under the final program, average new car and light truck fuel economy is expected to nearly double by 2025

[2] The White House, The President's Climate Action Plan (June, 2013). *http://www.whitehouse.gov/share/climate-action-plan.*

[3] United States of America, Intended Nationally Determined Contribution, March 31, 2015, *http://www4.unfccc.int/submissions/INDC/Published%20Documents/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf.*

[4] EPA's HD Phase 2 GHG emission standards are authorized under the Clean Air Act, and NHTSA's HD Phase 2 fuel consumption standards are authorized under the Energy Independence and Security Act of 2007.

[5] The White House, Improving the Fuel Efficiency of American Trucks—Bolstering Energy Security, Cutting Carbon Pollution, Saving Money and Supporting Manufacturing Innovation (Feb. 2014), 2.

[6] U.S. Environmental Protection Agency. April 2016. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2012. EPA 430–R–16–002. Mobile sources emitted 28 percent of all U.S. GHG emissions in 2012. Available at *https://www3.epa.gov/climatechange/Downloads/ghgemissions/US–GHG-Inventory-2016-Main-Text.pdf.*

compared to 2010 vehicles.[7] In the 2012 rule, the agencies projected the standards would save consumers $1.7 trillion at the pump—roughly $8,200 per vehicle for a MY 2025 vehicle—reducing oil consumption by 2.2 million barrels a day in 2025 and slashing GHG emissions by 6 billion metric tons over the lifetime of the vehicles sold during this period.[8] These fuel economy standards are already delivering savings for American drivers. Between model years 2008 and 2013, the unadjusted average test fuel economy of new passenger cars and light trucks sold in the United States has increased by about four miles per gallon. Altogether, light-duty vehicle fuel economy standards finalized after 2008 have already saved nearly one billion gallons of fuel and avoided more than 10 million tons of carbon dioxide emissions.[9]

Similarly, EPA and NHTSA have previously developed joint GHG emission and fuel efficiency standards for MDVs and HDVs. Prior to these Phase 1 standards, heavy-duty trucks and buses—from delivery vans to the largest tractor-trailers—were required to meet pollution standards for soot and smog-causing air pollutants, but no requirements existed for the fuel efficiency or carbon pollution from these vehicles.[10] By 2010, total fuel consumption and GHG emissions from MDVs and HDVs had been growing, and these vehicles accounted for 23 percent of total U.S. transportation-related GHG emissions [11] and about 20 percent of U.S. transportation-related energy use. In August 2011, the agencies finalized the groundbreaking Phase 1 standards for new MDVs and HDVs in model years 2014 through 2018. This program, developed with support from the trucking and engine industries, the State of California, Environment and Climate Change Canada, and leaders from the environmental community, set standards based on the use of off-the-shelf technologies. These standards are expected to save a projected 530 million barrels of oil and reduce carbon emissions by about 270 million metric tons, representing one of the most significant programs available to reduce domestic fuel consumption and emissions of GHGs.[12] The Phase 1 program, as well as the many additional actions called for in the President's 2013 Climate Action Plan [13] including this Phase 2 rulemaking, not only result in meaningful decreases in GHG emissions and fuel consumption, but also support—indeed are critical for—United States leadership to encourage other countries to also achieve meaningful GHG reductions and fuel conservation.

This rule builds on our commitment to robust collaboration with stakeholders and the public. It follows an expansive and thorough outreach effort in which the agencies gathered input, data and views from many interested stakeholders, involving over 400 meetings with heavy-duty vehicle and engine manufacturers, technology suppliers, trucking fleets, truck drivers, dealerships, environmental organizations, and state agencies.[14] As with the previous light-duty rules and the heavy-duty Phase 1 rule, the agencies have consulted frequently with the California Air Resources Board (CARB) staff during the development of this rule, given California's unique ability among the states to adopt their own GHG standards for on-highway engines and vehicles. Through this close coordination, the agencies are finalizing a Phase 2 program that will be fully aligned between EPA and NHTSA, while providing CARB with the opportunity to adopt a Phase 2 program that will allow manufacturers to continue to build a single fleet of vehicles and engines.

(2) Overview of Phase 1 Medium- and Heavy-Duty Vehicle Standards

The Phase 1 program covers new trucks and heavy vehicles in model years 2014 and later. That program includes specific standards for combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles and includes separate standards for both vehicles and engines. The program offers extensive flexibility, allowing manufacturers to reach standards through average fleet calculations, a mix of technologies, and the use of various credit and banking programs.

The Phase 1 program was developed by the agencies through close consultation with industry and other stakeholders, resulting in standards tailored to the specifics of each different class of vehicles and engines.

- *Heavy-duty combination tractors.* Combination tractors—semi trucks that typically pull trailers—are regulated under nine subcategories based on weight class, cab type, and roof height. These vehicles represent approximately 60 percent of the fuel consumption and GHG emissions from MDVs and HDVs.
- *Heavy-duty pickup trucks and vans.* Heavy-duty pickup and van standards are based on a ''work factor'' attribute that combines a vehicle's payload, towing capabilities, and the presence of 4-wheel drive. These vehicles represent about 23 percent of the fuel consumption and GHG emissions from MDVs and HDVs.
- *Vocational vehicles.* Specialized vocational vehicles, which consist of a very wide variety of truck and bus types (*e.g.,* delivery, refuse, utility, dump, cement, transit bus, shuttle bus, school bus, emergency vehicles, and recreational vehicles) are regulated in three subcategories based on engine classification. These vehicles represent approximately 17 percent of the fuel consumption and GHG emissions from MDVs and HDVs. The Phase 1 program includes EPA GHG standards for recreational vehicles, but not NHTSA fuel efficiency standards.[15]
- *Heavy-duty engines.* The Phase 1 rule has independent standards for heavy-duty engines to assure they contribute to reducing GHG emissions and fuel consumption because the Phase 1 tractor and vocational vehicle standards do not account for the contributions of engine improvements to reducing fuel consumption and GHG emissions.

The Phase 1 standards were premised on utilization of technologies that were already in production on some vehicles at the time of the Phase 1 FRM and are adaptable to the broader fleet. The Phase 1 program provides flexibilities that facilitate compliance. These flexibilities help provide sufficient lead time for manufacturers to make necessary technological improvements and reduce the overall cost of the program, without compromising overall environmental and fuel consumption objectives. The primary flexibility provisions are an engine averaging, banking, and trading (ABT) program and a vehicle ABT program. These ABT programs allow for emission and/or fuel consumption credits to be averaged, banked, or traded within each of the averaging sets.

The Phase 1 program was projected to save 530 million barrels of oil and avoid 270 million metric tons of GHG emissions.[16] At the same time, the

[7] The White House, Improving the Fuel Efficiency of American Trucks—Bolstering Energy Security, Cutting Carbon Pollution, Saving Money and Supporting Manufacturing Innovation (Feb. 2014), 2.

[8] *Id.*

[9] *Id.* at 3.

[10] *Id.*

[11] *Id.*

[12] *Id.* at 4.

[13] The President's Climate Action Plan calls for GHG-cutting actions including, for example, reducing carbon emissions from power plants and curbing hydrofluorocarbon and methane emissions.

[14] ''Heavy-Duty Phase 2 Stakeholder Meeting Log'', August 2016.

[15] The Phase 2 program will also include NHTSA recreational vehicle fuel efficiency standards.

[16] The White House, Improving the Fuel Efficiency of American Trucks—Bolstering Energy

program was projected to produce $50 billion in fuel savings and $49 billion of net societal benefits. Today, the Phase 1 fuel efficiency and GHG reduction standards are already reducing GHG emissions and U.S. oil consumption, and producing fuel savings for America's trucking industry. The market appears to be very accepting of the Phase 1 technologies.

(3) Overview of Phase 2 Medium- and Heavy-Duty Vehicle Standards

The Phase 2 GHG and fuel efficiency standards for MDVs and HDVs are a critical next step in improving fuel efficiency and reducing GHG emissions. The Phase 2 national program carries forward our commitment to meaningful collaboration with stakeholders and the public, as they build on more than 400 meetings with manufacturers, suppliers, trucking fleets, dealerships, state air quality agencies, non-governmental organizations (NGOs), and other stakeholders; over 200,000 public comments; and two public hearings to identify and understand the opportunities and challenges involved with this next level of fuel-saving technology. These meetings and public feedback, in addition to close coordination with CARB, have been invaluable to the agencies, enabling the development of a program that appropriately balances all potential impacts, effectively minimizes the possibility of unintended consequences, and allows manufacturers to continue to build a single fleet of vehicles and engines.

Phase 2 will include technology-advancing standards that will phase in over the long-term (through model year 2027) to result in an ambitious, yet achievable program that will allow manufacturers to meet standards through a mix of different technologies at reasonable cost. The terminal requirements go into effect in 2027, and would apply to MY 2027 and subsequent model year vehicles, unless modified by future rulemaking. The Phase 2 standards will maintain the underlying regulatory structure developed in the Phase 1 program, such as the general categorization of MDVs and HDVs and the separate standards for vehicles and engines. However, the Phase 2 program will build on and advance Phase 1 in a number of important ways including the following: basing standards not only on currently available technologies but also on utilization of technologies now under development or not yet widely deployed while providing significant lead time to assure adequate time to develop, test, and phase in these controls; developing first-time GHG and fuel efficiency standards for trailers; further encouraging innovation and providing flexibility; including vehicles produced by small business manufacturers with appropriate flexibilities for these companies; incorporating enhanced test procedures that (among other things) allow individual drivetrain and powertrain performance to be reflected in the vehicle certification process; and using an expanded and improved compliance simulation model.

The Phase 2 program will provide significant GHG reductions and save fuel by:

• *Strengthening standards to account for ongoing technological advancements.* Relative to the baseline as of the end of Phase 1, these final standards are projected to achieve vehicle fuel savings as high as 25 percent, depending on the vehicle category. While costs are higher than for Phase 1, benefits greatly exceed costs, and payback periods are short, meaning that consumers will see substantial net savings over the vehicle lifetime. Payback is estimated at about two years for tractors and trailers, about four years for vocational vehicles, and about three years for heavy-duty pickups and vans. The agencies are finalizing a program that phases in the MY 2027 standards with interim standards for model years 2021 and 2024 (and for certain types of trailers, EPA is finalizing model year 2018 phase-in standards as well). The final program includes both significant strengthening of certain standards from the NPRM as well as adjustments to better align other standards with new data, analysis, and stakeholder and public feedback received since the time of the proposal.

• *Setting standards for trailers for the first time.* In addition to retaining the vehicle and engine categories covered in the Phase 1 program, the Phase 2 standards include fuel efficiency and GHG emission standards for trailers used in combination with tractors. Although the agencies are not finalizing standards for all trailer types, the majority of new trailers will be covered.

• *Encouraging technological innovation while providing flexibility and options for manufacturers.* For each category of HDVs, the standards will set performance targets that allow manufacturers to achieve reductions through a mix of different technologies and generally leave manufacturers free to choose any means of compliance. For tractor standards, for example, different combinations of improvements like advanced aerodynamics, engine improvements and waste-heat recovery, automated transmission, lower rolling resistance tires, and automatic tire inflation can be used to meet standards. For tractors and vocational vehicles, enhanced test procedures and an expanded and improved compliance simulation model enable the vehicle standards to encompass more of the complete vehicle than the Phase 1 program and to account for engine, transmission and driveline improvements. With the addition of the powertrain and driveline to the compliance model, representative drive cycles and vehicle baseline configurations become critically important to assure the standards promote technologies that improve real world fuel efficiency and GHG emissions. This rule updates drive cycles and vehicle configurations to better reflect real world operation. The final program includes adjustments to technical elements of the proposed compliance program, *e.g.,* test procedures, reflecting the significant amount of stakeholder and public comment the agencies received on the program. Additionally, the agencies' analyses indicate that this rule should have no adverse impact on vehicle or engine safety.

• *Providing flexibilities to help minimize effect on small businesses.* All small businesses are exempt from the Phase 1 standards. The agencies are regulating small business entities under Phase 2 (notably certain trailer manufacturers), but we have conducted extensive proceedings pursuant to section 609 of the Regulatory Flexibility Act, and engaged in extensive consultation with stakeholders, and developed an approach to provide targeted flexibilities geared toward helping small businesses comply with the Phase 2 standards. Specifically, the agencies are delaying the initial implementation of the Phase 2 standards by one year and simplifying certification requirements for small businesses. We are also adopting additional flexibilities and exemptions adapted to particular vehicle categories.

The following tables summarize the impacts of the Heavy-Duty Phase 2 rule.

Security, Cutting Carbon Pollution, Saving Money and Supporting Manufacturing Innovation (Feb. 2014), 4.

SUMMARY OF THE PHASE 2 MEDIUM- AND HEAVY-DUTY VEHICLE RULE IMPACTS TO FUEL CONSUMPTION, GHG EMISSIONS, BENEFITS AND COSTS OVER THE LIFETIME OF MODEL YEARS 2018–2029 [a] [b]

	3%	7%
Fuel Reductions (billion gallons)	71–82	
GHG Reductions (MMT, CO_2eq)	959–1098	
Pre-Tax Fuel Savings ($billion)	149–169	80–87
Discounted Technology Costs ($billion)	24–27	16–18
Value of reduced emissions ($billion)	60–69	48–52
Total Costs ($billion)	29–31	19–20
Total Benefits ($billion)	225–260	136–151
Net Benefits ($billion)	197–229	117–131

Notes:
[a] Ranges reflect two analysis methods: Method A with the 1b baseline and Method B with the la baseline. For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the ‘‘flat’’ baseline, 1a, and the ‘‘dynamic’’ baseline, 1b, please see Section X.A.1.
[b] Benefits and net benefits (including those in the 7% discount rate column) use the 3 percent average Social Cost of CO_2, the Social Cost of CH_4, and the Social Cost of N_2O.

SUMMARY OF THE PHASE 2 MEDIUM- AND HEAVY-DUTY VEHICLE ANNUAL FUEL AND GHG REDUCTIONS, PROGRAM COSTS, BENEFITS AND NET BENEFITS IN CALENDAR YEARS 2040 AND 2050 [a]

	2040	2050
Fuel Reductions (Billion Gallons)	10.8	13.0
GHG Reduction (MMT, CO_2eq)	166.8	199.3
Vehicle Program Costs (including Maintenance; Billions of 2013$)	−$6.5	−$7.5
Fuel Savings (Pre-Tax; Billions of 2013$)	$53.1	$63.4
Benefits (Billions of 2013$)	$24.8	$31.7
Net Benefits (Billions of 2013$)	$71.4	$87.6

Note:
[a] Benefits and net benefits (including those in the 7% discount rate column) use the 3 percent average Social Cost of CO_2, the Social Cost of CH_4, and the Social Cost of N_2O. Values reflect the final program using Method B relative to the flat baseline (a reference case that projects very little improvement in new vehicle fuel economy absent new standards).

SUMMARY OF THE PHASE 2 MEDIUM- AND HEAVY-DUTY VEHICLE PROGRAM EXPECTED PER-VEHICLE FUEL SAVINGS, GHG EMISSION REDUCTIONS, AND COST FOR KEY VEHICLE CATEGORIES

	MY 2021	MY 2024	MY 2027
Maximum Vehicle Fuel Savings and Tailpipe GHG Reduction (%):			
Tractors [b]	13	20	25
Trailers [a]	5	7	9
Vocational Vehicles [b]	12	20	24
Pickups/Vans	2.5	10	16
Per Vehicle Cost ($) [c] [d] (% Increase in Typical Vehicle Price):			
Tractors	$6,400–$6,480 (6%)	$9,920–$10,100 (10%)	$12,160–$12,440 (12%)
Trailers	$850–$870 (3%)	$1,000–$1,030 (4%)	$1,070–$1,110 (4%)
Vocational Vehicles	$1,110–$1,160 (1%)	$1,980–$2,020 (2%)	$2,660–$2,700 (3%)
Pickups/Vans	$520–$750 (1%)	$760–$960 (2%)	$1,340–$1,360 (3%)

Notes:
[a] Note that the EPA standards for trailers begin in model year 2018
[b] All engine costs are included
[c] Please refer to Preamble Chapters 6 and 10 for additional information on the reference fleet used to analyze costs and benefits of the rule. Please also refer to these chapters for impacts of the rule under more dynamic baseline assumptions for pickups and vans.
[d] Ranges reflect two analysis methods: Method A with the 1b baseline and Method B with the la baseline. For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the ‘‘flat’’ baseline, 1a, and the ‘‘dynamic’’ baseline, 1b, please see Section X.A.1.
[e] For this table, we use an approximate minimum vehicle price today of $100,000 for tractors, $25,000 for trailers, $100,000 for vocational vehicles and $40,000 for HD pickups/vans.

PAYBACK PERIODS FOR MY 2027 VEHICLES UNDER THE FINAL STANDARDS, BASED ON BOTH ANALYSIS METHODS A AND B

[Payback occurs in the year shown; using 7% discounting]

	Final standards
Tractors/Trailers	2nd.
Vocational Vehicles	4th.
Pickups/Vans [a]	3rd.

Note:
[a] Please refer to Preamble Chapters 6 and 10 for additional information on the reference fleet used to analyze costs and benefits of the rule. Please also refer to these chapters for impacts of the rule under more dynamic baseline assumptions for pickups and vans.

(4) Issues Addressed in This Final Rule

This Preamble contains extensive discussion of the background, elements, and implications of the Phase 2 program, as well as updates made to the final program from the proposal based on new data, analysis, stakeholder feedback and public comments. Section I includes information on the MDV and HDV industry, related regulatory and non-regulatory programs, summaries of Phase 1 and Phase 2 programs, costs and benefits of the final standards, and relevant statutory authority for EPA and NHTSA. Section II discusses vehicle simulation, engine standards, and test procedures. Sections III, IV, V, and VI detail the final standards for combination tractors, trailers, vocational vehicles, and heavy-duty pickup trucks and vans. Sections VII and VIII discuss aggregate GHG impacts, fuel consumption impacts, climate impacts, and impacts on non-GHG emissions. Section IX evaluates the economic impacts of the final program. Sections X and XI present the alternatives analyses and consideration of natural gas vehicles. Finally, Sections XII and XIII discuss the changes that the Phase 2 rules will have on Phase 1 standards and other regulatory provisions. In addition to this Preamble, the Regulatory Impact Analysis (RIA),[17] provides additional data, analysis and discussion of the standards, and the Response to Comments Document for Joint Rulemaking (RTC) provides responses to comments received on the Phase 2 rulemaking through the public comment process.[18]

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[18] Available on EPA's Web site and in the public docket for this rulemaking.

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I. Overview

The agencies issued a Notice of Proposed Rulemaking (NPRM) on July 13, 2015, that proposed Phase 2 GHG and fuel efficiency standards for heavy-duty engines and vehicles.[19] The agencies also issued a Notice of Data Availability (NODA) on March 2, 2016, to solicit comment on new material not available at the time of the NPRM.[20] The agencies have revised the proposed standards and related requirements to address issues raised in public comments. Nevertheless, the final rules being adopted today remain fundamentally similar to the proposed rules.

Although the agencies describe the final requirements in this document, readers are encouraged to also read supporting materials that have been place into the public dockets for these rules. In particular, the agencies note:

- The Final Regulatory Impact Analysis (RIA), provides additional technical information and analysis
- The Response to Comments Document for Joint Rulemaking (RTC), provides a detailed summary and analysis of public comments, including comments received in response to the NODA
- The NHTSA Final Environmental Impact Statement (FEIS)

This overview of the final Phase 2 GHG emissions and fuel efficiency standards includes a description of the heavy-duty truck industry and related regulatory and non-regulatory programs, a summary of the Phase 1 GHG emissions and fuel efficiency program, a summary of the Phase 2 standards and requirements being finalized, a summary of the costs and benefits of the Phase 2 standards, discussion of EPA and NHTSA statutory authorities, and other issues.

A. Background

For purposes of this Preamble (and consistent with all terminology used at proposal), the terms ''heavy-duty'' or ''HD'' are used to apply to all highway vehicles and engines that are not within the range of light-duty passenger cars, light-duty trucks, and medium-duty passenger vehicles (MDPV) covered by separate GHG and Corporate Average Fuel Economy (CAFE) standards.[21] (The terms also do not include motorcycles). Thus, in this rulemaking, unless specified otherwise, the heavy-duty category incorporates all vehicles with a gross vehicle weight rating above 8,500 lbs, and the engines that power them, except for MDPVs.[22 23 24] Note also that the terms heavy-duty truck and heavy-duty vehicle are sometimes used interchangeably, even though commercially the term heavy-duty truck can have a narrower meaning.

Consistent with the President's direction, over the past three years as we have developed this rulemaking, the agencies have met on an on-going basis with a very large number of diverse stakeholders. This includes meetings, and in many cases site visits, with truck, trailer, and engine manufacturers; technology supplier companies and their trade associations (*e.g.,* transmissions, drivelines, fuel systems, turbochargers, tires, catalysts, and many others); line haul and vocational trucking firms and trucking associations; the trucking industries owner-operator association; truck dealerships and dealers associations; trailer manufacturers and their trade association; non-governmental organizations (NGOs, including environmental NGOs, national security NGOs, and consumer advocacy NGOs); state air quality agencies; manufacturing labor unions; and many other stakeholders. In addition, EPA and NHTSA have consulted on an on-going basis with the California Air Resources Board (CARB) over the past three years as we developed the Phase 2 rule. CARB staff and managers have also participated with EPA and NHTSA in meetings with many external stakeholders, including those with vehicle OEMs and technology suppliers.[25]

EPA and NHTSA staff also participated in a large number of technical and policy conferences over the past three years related to the technological, economic, and environmental aspects of the heavy-duty trucking industry. The agencies also met with regulatory counterparts from several other nations who either have already or are considering establishing fuel consumption or GHG requirements, including outreach with representatives from the governments of Canada, the European Commission, Japan, and China.

These comprehensive outreach actions by the agencies provided us with information to assist in our identification of potential technologies that can be used to reduce heavy-duty GHG emissions and improve fuel efficiency. The outreach has also helped the agencies to identify and understand the opportunities and challenges involved with these standards for the heavy-duty trucks, trailers, and engines detailed in this Preamble, including time needed for implementation of various technologies and potential costs and fuel savings. The scope of this outreach effort to gather input for the proposal and final rulemaking included well over 400 meetings with stakeholders. These meetings and conferences have been invaluable to the agencies. We believe they enabled us to refine the proposal in such a way as to appropriately consider all of the potential impacts and to minimize the possibility of unintended consequences in the final rules.

[19] 80 FR 40137.

[20] 81 FR 10824.

[21] 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule, 77 FR 62623, October 15, 2012.

[22] The CAA defines heavy-duty as a truck, bus or other motor vehicles with a gross vehicle weight rating exceeding 6,000 lbs (CAA section 202(b)(3)). The term HD as used in this action refers to a subset of these vehicles and engines.

[23] The Energy Independence and Security Act of 2007 requires NHTSA to set standards for commercial medium- and heavy-duty on-highway vehicles, defined as on-highway vehicles with a GVWR of 10,000 lbs or more, and work trucks, defined as vehicles with a GVWR between 8,500 and 10,000 lbs and excluding medium duty passenger vehicles.

[24] The term ''medium-duty'' is sometimes used to refer to the lighter end of this range of vehicles. This is typically in the context of statutes or reports that use the term ''medium-duty.'' For example, because the term medium-duty is used in EISA, the term is also used in much of the discussion of NHTSA's statutory authority.

[25] Vehicle chassis manufacturers are known in this industry as original equipment manufacturers or OEMs.

(1) Brief Overview of the Heavy-Duty Truck Industry

The heavy-duty sector is diverse in several respects, including the types of manufacturing companies involved, the range of sizes of trucks and engines they produce, the types of work for which the trucks are designed, and the regulatory history of different subcategories of vehicles and engines. The current heavy-duty fleet encompasses vehicles from the ''18-wheeler'' combination tractor-trailers one sees on the highway to the largest pickup trucks and vans, as well as vocational vehicles covering the range between these extremes. Together, the HD sector spans a wide range of vehicles with often specialized form and function. A primary indicator of the diversity among heavy-duty trucks is the range of load-carrying capability across the industry. The heavy-duty truck sector is often subdivided by vehicle weight classifications, as defined by the vehicle's gross vehicle weight rating (GVWR), which is a measure of the combined curb (empty) weight and cargo carrying capacity of the truck.[26] Table I–1 below outlines the vehicle weight classifications commonly used for many years for a variety of purposes by businesses and by several Federal agencies, including the Department of Transportation, the Environmental Protection Agency, the Department of Commerce, and the Internal Revenue Service.

TABLE I–1—VEHICLE WEIGHT CLASSIFICATION

Class	2b	3	4	5	6	7	8
GVWR (lb.)	8,501–10,000	10,001–14,000	14,001–16,000	16,001–19,500	19,501–26,000	26,001–33,000	>33,000

In the framework of these vehicle weight classifications, the heavy-duty truck sector refers to ''Class 2b'' through ''Class 8'' vehicles and the engines that power those vehicles.[27]

Unlike light-duty vehicles, which are primarily used for transporting passengers for personal travel, heavy-duty vehicles fill much more diverse operator needs. Heavy-duty pickup trucks and vans (Classes 2b and 3) are used chiefly as work trucks and vans, and as shuttle vans, as well as for personal transportation, with an average annual mileage in the range of 15,000 miles. The rest of the heavy-duty sector is used for carrying cargo and/or performing specialized tasks. ''Vocational'' vehicles, which span Classes 2b through 8, vary widely in size, including smaller and larger van trucks, utility ''bucket'' trucks, tank trucks, refuse trucks, urban and over-the-road buses, fire trucks, flat-bed trucks, and dump trucks, among others. The annual mileage of these vehicles is as varied as their uses, but for the most part tends to fall in between heavy-duty pickups/vans and the large combination tractors, typically from 15,000 to 150,000 miles per year.

Class 7 and 8 combination tractor-trailers—some equipped with sleeper cabs and some not—are primarily used for freight transportation. They are sold as tractors and operate with one or more trailers that can carry up to 50,000 lbs or more of payload, consuming significant quantities of fuel and producing significant amounts of GHG emissions. Together, Class 7 and 8 tractors and trailers account for approximately 60 percent of the heavy-duty sector's total CO_2 emissions and fuel consumption. Trailer designs vary significantly, reflecting the wide variety of cargo types. However, the most common types of trailers are box vans (dry and refrigerated), which are a focus of this Phase 2 rulemaking. The tractor-trailers used in combination applications can and frequently do travel more than 150,000 miles per year and can operate for 20–30 years.

Heavy-duty vehicles differ significantly from light-duty vehicles in other ways. In particular, we note that heavy-duty engines are much more likely to be rebuilt. In fact, it is common for Class 8 engines to be rebuilt multiple times. Commercial heavy-duty vehicles are often resold after a few years and may be repurposed by the second or third owner. Thus issues of resale value and adaptability have historically been key concerns for purchasers.

EPA and NHTSA have designed our respective standards in careful consideration of the diversity and complexity of the heavy-duty truck industry, as discussed in Section I.C.

(2) Related Regulatory and Non-Regulatory Programs

(a) History of EPA's Heavy-Duty Regulatory Program and Assessments of the Impacts of Greenhouse Gases on Climate Change

To provide a context for EPA's program to reduce greenhouse gas emissions from motor vehicles, this subsection provides an overview of two important related areas. First, we summarize the history of EPA's heavy-duty regulatory program, which provides a basis for the compliance structure of this rulemaking. Next we summarize EPA prior assessments of the impacts of greenhouse gases on climate change, which provides a basis for much of the analysis of the environmental benefits of this rulemaking.

(i) History of EPA's Heavy-Duty Regulatory Program

Since the 1980s, EPA has acted several times to address tailpipe emissions of criteria pollutants and air toxics from heavy-duty vehicles and engines. During the last two decades these programs have primarily addressed emissions of particulate matter (PM) and the primary ozone precursors, hydrocarbons (HC) and oxides of nitrogen (NO_X). These programs, which have successfully achieved significant and cost-effective reductions in emissions and associated health and welfare benefits to the nation, were an important basis of the Phase 1 program. See *e.g.* 66 FR 5002, 5008, and 5011–5012 (January 18, 2001) (detailing substantial public health benefits of controls of criteria pollutants from heavy-duty diesel engines, including bringing areas into attainment with primary (public health) PM NAAQS, or contributing substantially to such attainment); *National Petrochemical Refiners Association* v. *EPA,* 287 F. 3d 1130, 1134 (D.C. Cir. 2002) (referring to the ''dramatic reductions'' in criteria pollutant emissions resulting from the EPA on-

[26] GVWR describes the maximum load that can be carried by a vehicle, including the weight of the vehicle itself. Heavy-duty vehicles (including those designed for primary purposes other than towing) also have a gross combined weight rating (GCWR), which describes the maximum load that the vehicle can haul, including the weight of a loaded trailer and the vehicle itself.

[27] Class 2b vehicles manufactured as passenger vehicles (Medium Duty Passenger Vehicles, MDPVs) are covered by the light-duty GHG and fuel economy standards and therefore are not addressed in this rulemaking.

highway heavy-duty engine standards, and upholding all of the standards).

As required by the Clean Air Act (CAA), the emission standards implemented by these programs include standards that apply at the time that the vehicle or engine is sold and continue to apply in actual use. EPA's overall program goal has always been to achieve emissions reductions from the complete vehicles that operate on our roads. The agency has often accomplished this goal for many heavy-duty truck categories by regulating heavy-duty engine emissions. A key part of this success has been the development over many years of a well-established, representative, and robust set of engine test procedures that industry and EPA now use routinely to measure emissions and determine compliance with emission standards. These test procedures in turn serve the overall compliance program that EPA implements to help ensure that emissions reductions are being achieved. By isolating the engine from the many variables involved when the engine is installed and operated in a HD vehicle, EPA has been able to accurately address the contribution of the engine alone to overall emissions.

(ii) EPA Assessment of the Impacts of Greenhouse Gases on Climate Change

In 2009, the EPA Administrator issued the document known as the Endangerment Finding under CAA section 202(a)(1).[28] In the Endangerment Finding, which focused on public health and public welfare impacts within the United States, the Administrator found that elevated concentrations of GHG emissions in the atmosphere may reasonably be anticipated to endanger public health and welfare of current and future generations. See also *Coalition for Responsible Regulation* v. *EPA,* 684 F. 3d 102, 117–123 (D.C. Cir. 2012) (upholding the endangerment finding in all respects). The following sections summarize the key information included in the Endangerment Finding.

Climate change caused by human emissions of GHGs threatens public health in multiple ways. By raising average temperatures, climate change increases the likelihood of heat waves, which are associated with increased deaths and illnesses. While climate change also decreases the likelihood of cold-related mortality, evidence indicates that the increases in heat mortality will be larger than the decreases in cold mortality in the United States. Compared to a future without climate change, climate change is expected to increase ozone pollution over broad areas of the U.S., including in the largest metropolitan areas with the worst ozone problems, and thereby increase the risk of morbidity and mortality. Other public health threats also stem from projected increases in intensity or frequency of extreme weather associated with climate change, such as increased hurricane intensity, increased frequency of intense storms and heavy precipitation. Increased coastal storms and storm surges due to rising sea levels are expected to cause increased drownings and other adverse health impacts. Children, the elderly, and the poor are among the most vulnerable to these climate-related health effects. See also 79 FR 75242 (December 17, 2014) (climate change, and temperature increases in particular, likely to increase O_3 (ozone) pollution ''over broad areas of the U.S., including the largest metropolitan areas with the worst O_3 problems, increas[ing] the risk of morbidity and mortality'').

Climate change caused by human emissions of GHGs also threatens public welfare in multiple ways. Climate changes are expected to place large areas of the country at serious risk of reduced water supplies, increased water pollution, and increased occurrence of extreme events such as floods and droughts. Coastal areas are expected to face increased risks from storm and flooding damage to property, as well as adverse impacts from rising sea level, such as land loss due to inundation, erosion, wetland submergence and habitat loss. Climate change is expected to result in an increase in peak electricity demand, and extreme weather from climate change threatens energy, transportation, and water resource infrastructure. Climate change may exacerbate ongoing environmental pressures in certain settlements, particularly in Alaskan indigenous communities. Climate change also is very likely to fundamentally rearrange U.S. ecosystems over the 21st century. Though some benefits may balance adverse effects on agriculture and forestry in the next few decades, the body of evidence points towards increasing risks of net adverse impacts on U.S. food production, agriculture and forest productivity as temperature continues to rise. These impacts are global and may exacerbate problems outside the U.S. that raise humanitarian, trade, and national security issues for the U.S. See also 79 FR 75382 (December 17, 2014) (welfare effects of O_3 increases due to climate change, with emphasis on increased wildfires).

As outlined in Section VIII.A of the 2009 Endangerment Finding, EPA's approach to providing the technical and scientific information to inform the Administrator's judgment regarding the question of whether GHGs endanger public health and welfare was to rely primarily upon the recent, major assessments by the U.S. Global Change Research Program (USGCRP), the Intergovernmental Panel on Climate Change (IPCC), and the National Research Council (NRC) of the National Academies. These assessments addressed the scientific issues that EPA was required to examine, were comprehensive in their coverage of the GHG and climate change issues, and underwent rigorous and exacting peer review by the expert community, as well as rigorous levels of U.S. government review. Since the administrative record concerning the Endangerment Finding closed following EPA's 2010 Reconsideration Denial, a number of new major, peer-reviewed scientific assessments have been released. These include the IPCC's 2012 ''Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation'' (SREX) and the 2013–2014 Fifth Assessment Report (AR5), the USGCRP's 2014 ''Climate Change Impacts in the United States'' (Climate Change Impacts), and the NRC's 2010 ''Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean'' (Ocean Acidification), 2011 ''Report on Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia'' (Climate Stabilization Targets), 2011 ''National Security Implications for U.S. Naval Forces'' (National Security Implications), 2011 ''Understanding Earth's Deep Past: Lessons for Our Climate Future'' (Understanding Earth's Deep Past), 2012 ''Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future,'' 2012 ''Climate and Social Stress: Implications for Security Analysis'' (Climate and Social Stress), and 2013 ''Abrupt Impacts of Climate Change'' (Abrupt Impacts) assessments.

EPA has reviewed these new assessments and finds that the improved understanding of the climate system they present further strengthens the case that GHG emissions endanger public health and welfare.

In addition, these assessments highlight the urgency of the situation as the concentration of CO_2 in the atmosphere continues to rise. Absent a reduction in emissions, a recent

[28] ''Endangerment and Cause or Contribute Findings for Greenhouse Gases Under section 202(a) of the Clean Air Act,'' 74 FR 66496 (December 15, 2009) (''Endangerment Finding'').

National Research Council assessment projected that concentrations by the end of the century would increase to levels that the Earth has not experienced for millions of years.[29] In fact, that assessment stated that ''the magnitude and rate of the present greenhouse gas increase place the climate system in what could be one of the most severe increases in radiative forcing of the global climate system in Earth history.'' [30] What this means, as stated in another NRC assessment, is that:

> Emissions of carbon dioxide from the burning of fossil fuels have ushered in a new epoch where human activities will largely determine the evolution of Earth's climate. Because carbon dioxide in the atmosphere is long lived, it can effectively lock Earth and future generations into a range of impacts, some of which could become very severe. Therefore, emission reductions choices made today matter in determining impacts experienced not just over the next few decades, but in the coming centuries and millennia.[31]

Moreover, due to the time-lags inherent in the Earth's climate, the Climate Stabilization Targets assessment notes that the full warming from any given concentration of CO_2 reached will not be realized for several centuries.

The most recent USGCRP ''National Climate Assessment'' [32] emphasizes that climate change is already happening now and is happening in the United States. The assessment documents the increases in some extreme weather and climate events in recent decades, as well as the resulting damage and disruption to infrastructure and agriculture, and projects continued increases in impacts across a wide range of peoples, sectors, and ecosystems.

These assessments underscore the urgency of reducing emissions now. Today's emissions will otherwise lead to raised atmospheric concentrations for thousands of years, and raised Earth system temperatures for even longer. Emission reductions today will benefit the public health and public welfare of current and future generations.

Finally, it should be noted that the concentration of carbon dioxide in the atmosphere continues to rise dramatically. In 2009, the year of the Endangerment Finding, the average concentration of carbon dioxide as measured on top of Mauna Loa was 387 parts per million.[33] The average concentration in 2015 was 401 parts per million, the first time an annual average has exceeded 400 parts per million since record keeping began at Mauna Loa in 1958, and for at least the past 800,000 years according to ice core records.[34] Moreover, 2015 was the warmest year globally in the modern global surface temperature record, going back to 1880, breaking the record previously held by 2014; this now means that the last 15 years have been 15 of the 16 warmest years on record.[35]

(b) The EPA and NHTSA Light-Duty National GHG and Fuel Economy Program

On May 7, 2010, EPA and NHTSA finalized the first-ever National Program for light-duty cars and trucks, which set GHG emissions and fuel economy standards for model years 2012–2016 (see 75 FR 25324). More recently, the agencies adopted even stricter standards for model years 2017 and later (77 FR 62624, October 15, 2012). The agencies have used the light-duty National Program as a model for the HD National Program in several respects. This is most apparent in the case of heavy-duty pickups and vans, which are similar to the light-duty trucks addressed in the light-duty National Program both technologically as well as in terms of how they are manufactured (*i.e.,* the same company often makes both the vehicle and the engine, and several light-duty manufacturers also manufacture HD pickups and vans).[36] For HD pickups and vans, there are close parallels to the light-duty program in how the agencies have developed our respective heavy-duty standards and compliance structures. However, HD pickups and vans are true work vehicles that are designed for much higher towing and payload capabilities than are light-duty pickups and vans. The technologies applied to light-duty trucks are not all applicable to heavy-duty pickups and vans at the same adoption rates, and the technologies often produce a lower percent reduction in CO_2 emissions and fuel consumption when used in heavy-duty vehicles. Another difference between the light-duty and the heavy-duty standards is that each agency adopts heavy-duty standards based on attributes other than vehicle footprint, as discussed below.

Due to the diversity of the remaining HD vehicles, there are fewer parallels with the structure of the light-duty program. However, the agencies have maintained the same collaboration and coordination that characterized the development of the light-duty program throughout the Phase 1 rulemaking and the continued efforts for Phase 2. Most notably, as with the light-duty program, manufacturers will continue to be able to design and build vehicles to meet a closely coordinated, harmonized national program, and to avoid unnecessarily duplicative testing and compliance burdens. In addition, the averaging, banking, and trading provisions in the HD program, although structurally different from those of the light-duty program, serve the same purpose, which is to allow manufacturers to achieve large reductions in fuel consumption and emissions while providing a broad mix of products to their customers. The agencies have also worked closely with CARB to provide harmonized national standards.

(c) EPA's SmartWay Program

EPA's voluntary SmartWay Transport Partnership program encourages businesses to take actions that reduce fuel consumption and CO_2 emissions while cutting costs by working with the shipping, logistics, and carrier communities to identify low carbon strategies and technologies across their transportation supply chains. SmartWay provides technical information, benchmarking and tracking tools, market incentives, and partner recognition to facilitate and accelerate the adoption of these strategies. Through the SmartWay program and its related technology assessment center, EPA has worked closely with truck and trailer manufacturers and truck fleets over the past 12 years to develop test procedures to evaluate vehicle and component performance in reducing fuel consumption and has conducted testing and has established test programs to verify technologies that can achieve these reductions. SmartWay partners have demonstrated these new and emerging technologies in their business operations, adding to the body of technical data and information that EPA can disseminate to industry, researchers and other stakeholders. Over the last several years, EPA has developed hands-on experience testing the largest heavy-duty trucks and trailers and evaluating improvements in tire and vehicle aerodynamic performance. In developing the Phase 1

[29] National Research Council, Understanding Earth's Deep Past, p. 1.

[30] Id., p.138.

[31] National Research Council, Climate Stabilization Targets, p. 3.

[32] U.S. Global Change Research Program, Climate Change Impacts in the United States: The Third National Climate Assessment, May 2014 Available at *http://nca2014.globalchange.gov/.*

[33] *ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2_annmean_mlo.txt.*

[34] *http://www.esrl.noaa.gov/gmd/ccgg/trends/.*

[35] *http://www.ncdc.noaa.gov/sotc/global/201513.*

[36] This is more broadly true for heavy-duty pickup trucks than vans because every manufacturer of heavy-duty pickup trucks also makes light-duty pickup trucks, while only some heavy-duty van manufacturers also make light-duty vans.

program, the agencies drew from this testing and from the SmartWay experience. In the same way, the agencies benefitted from SmartWay in developing the Phase 2 trailer program.

(d) DOE's SuperTruck Initiative

The U.S. Department of Energy launched its SuperTruck I initiative in 2009. SuperTruck I was a DOE partnership with four industry teams, who at this point have either met the SuperTruck I 50 percent fuel efficiency improvement goal (relative to a 2009 best-in-class truck) or have laid the groundwork to succeed. Teams from Cummins/Peterbilt, Daimler, and Volvo exceeded the 50 percent efficiency improvement goal, with Navistar on track to exceed this target later this year. Research vehicles developed under SuperTruck I are Class 8 combination tractor-trailers that have dramatically increased fuel and freight efficiency through the use of advanced technologies. These technologies include tractor and trailer aerodynamic devices, engine waste heat recovery systems, hybrids, automated transmissions and lightweight materials. In March 2016 DOE announced SuperTruck II, which is an $80M follow-on to SuperTruck I, where DOE will continue to partner with industry teams to collaboratively fund new projects to research, develop, and demonstrate technologies to further improve heavy-truck freight efficiency—by more than 100 percent, relative to a manufacturer's best-in-class 2009 truck. Achieving these kinds of Class 8 truck efficiency increases will require an integrated systems approach to ensure that the various components of the vehicle work well together. SuperTruck II projects will utilize a wide variety of truck and trailer technology approaches to achieve performance targets, such as further improvements in engine efficiency, drivetrain efficiency, aerodynamic drag, tire rolling resistance, and vehicle weight.

The agencies leveraged the outcomes of SuperTruck I by projecting how these tractor and trailer technologies could continue to advance from this early developmental stage toward the prototype and production stages. For a number of the SuperTruck technologies, the agencies are projecting advancement into production, given appropriate lead time. For example, a number of the aerodynamic and transmission technologies are projected to be in widespread production by 2021, and the agencies are finalizing 2021 standards based in part on performance of these SuperTruck technologies. For other more advanced SuperTruck technologies, such as organic Rankine cycle waste heat recovery systems, the agencies are projecting that additional lead time is needed to ensure that these technologies will be effective and reliable in production. For these technologies, the agencies are finalizing 2027 standards whose stringency reflects a significant market adoption rate of advanced technologies, including waste heat recovery systems. Furthermore, the agencies are encouraged by DOE's announcement of SuperTruck II. We believe that the combination of HD Phase 2 and SuperTruck II will provide both a strong motivation and a proven means for manufacturers to fully develop these technologies within the lead times we have projected.

(e) The State of California

California has established ambitious goals for reducing GHG emissions from heavy-duty vehicles and engines as part of an overall plan to reduce GHG emissions from the transportation sector in California.[37] Heavy-duty vehicles are responsible for one-fifth of the total GHG emissions from transportation sources in California. In the past several years, the California Air Resources Board (CARB) has taken a number of actions to reduce GHG emissions from heavy-duty vehicles and engines. For example, in 2008, CARB adopted regulations to reduce GHG emissions from heavy-duty tractors that pull box-type trailers through improvements in tractor and trailer aerodynamics and the use of low rolling resistance tires.[38] The tractor–trailer operators subject to the CARB regulation are required to use SmartWay-certified tractors and trailers, or retrofit their existing fleet with SmartWay-verified technologies, consistent with California's state authority to regulate both new and in-use vehicles. In December 2013, CARB adopted regulations that establish its own parallel Phase 1 program with standards consistent with EPA Phase 1 standards. On December 5, 2014, California's Office of Administrative Law approved CARB's adoption of the Phase 1 standards, with an effective date of December 5, 2014.[39] Complementary to its regulatory efforts, CARB and other California agencies are investing significant public capital through various incentive programs to accelerate fleet turnover and stimulate technology innovation within the heavy-duty vehicle market (*e.g.,* Air Quality Improvement, Carl Moyer, Loan Incentives, Lower-Emission School Bus and Goods Movement Emission Reduction Programs).[40] Recently, California Governor Jerry Brown established a target of up to 50 percent petroleum reduction by 2030.

California has long had the unique ability among states to adopt its own separate new motor vehicle standards per section 209 of the Clean Air Act (CAA). Although section 209(a) of the CAA expressly preempts states from adopting and enforcing standards relating to the control of emissions from new motor vehicles or new motor vehicle engines (such as state controls for new heavy-duty engines and vehicles), CAA section 209(b) directs EPA to waive this preemption under certain conditions. Under the waiver process set out in CAA section 209(b), EPA has granted CARB a waiver for its initial heavy-duty vehicle GHG regulation.[41] Even with California's ability under the CAA to establish its own emission standards, EPA and CARB have worked closely together over the past several decades to largely harmonize new vehicle criteria pollutant standard programs for heavy-duty engines and heavy-duty vehicles. In the past several years EPA and NHTSA also consulted with CARB in the development of the Federal light-duty vehicle GHG and CAFE rulemakings for the 2012–2016 and 2017–2025 model years.

As discussed above, California operates under state authority to establish its own new heavy-duty vehicle and engine emission standards, including standards for CO_2, methane, N_2O, and hydrofluorocarbons. EPA recognizes this independent authority, and we also recognize the potential benefits for the regulated industry if the Federal Phase 2 standards could result

[37] See *http://www.arb.ca.gov/cc/cc.htm* for details on the California Air Resources Board climate change actions, including a discussion of Assembly Bill 32, and the Climate Change Scoping Plan developed by CARB, which includes details regarding CARB's future goals for reducing GHG emissions from heavy-duty vehicles.

[38] See *http://www.arb.ca.gov/msprog/truckstop/trailers/trailers.htm* for a summary of CARB's ''Tractor-Trailer Greenhouse Gas Regulation.''

[39] See *http://www.arb.ca.gov/regact/2013/hdghg2013/hdghg2013.htm* for details regarding CARB's adoption of the Phase 1 standards.

[40] See *http://www.arb.ca.gov/ba/fininfo.htm* for detailed descriptions of CARB's mobile source incentive programs. Note that EPA works to support CARB's heavy-duty incentive programs through the West Coast Collaborative (*http://westcoastcollaborative.org/*) and the Clean Air Technology Initiative (*https://www.epa.gov/cati*).

[41] *See* EPA's waiver of CARB's heavy-duty tractor-trailer greenhouse gas regulation applicable to new 2011 through 2013 model year Class 8 tractors equipped with integrated sleeper berths (sleeper-cab tractors) and 2011 and subsequent model year dry-can and refrigerated-van trailers that are pulled by such tractors on California highways at 79 FR 46256 (August 7, 2014).

in a single, National Program that would meet the EPA and NHTSA's statutory requirements to set appropriate and maximum feasible standards, and also be equivalent to potential future new heavy-duty vehicle and engine GHG standards established by CARB (addressing the same model years as addressed by the final Federal Phase 2 program and requiring the same technologies). In order to further the opportunity for maintaining coordinated Federal and California standards in the Phase 2 timeframe (as well as to benefit from different technical expertise and perspective), EPA and NHTSA consulted frequently with CARB while developing the Phase 2 rule. Prior to the proposal, the agencies' technical staff shared information on technology cost, technology effectiveness, and feasibility with the CARB staff. We also received information from CARB on these same topics. In addition, CARB staff and managers participated with EPA and NHTSA in meetings with many external stakeholders, in particular with vehicle OEMs and technology suppliers. The agencies continued significant consultation during the development of the final rules.

EPA and NHTSA believe that through this information sharing and dialog we have enhanced the potential for the Phase 2 program to result in a National Program that can be adopted not only by the Federal agencies, but also by the State of California, given the strong interest from the regulated industry for a harmonized State and Federal program. In its public comments, California reiterated its support for a harmonized State and Federal program, although it identified several areas in which it believed the proposed program needed to be strengthened.

(f) Environment and Climate Change Canada

On March 13, 2013, Environment and Climate Change Canada (ECCC), which is EPA's Canadian counterpart, published its own regulations to control GHG emissions from heavy-duty vehicles and engines, beginning with MY 2014. These regulations are closely aligned with EPA's Phase 1 program to achieve a common set of North American standards. ECCC has expressed its intention to amend these regulations to further limit emissions of greenhouse gases from new on-road heavy-duty vehicles and their engines for post-2018 MYs. As with the development of the current regulations, ECCC is committed to continuing to work closely with EPA to maintain a common Canada–United States approach to regulating GHG emissions for post-2018 MY vehicles and engines. This approach will build on the long history of regulatory alignment between the two countries on vehicle emissions pursuant to the Canada–United States Air Quality Agreement.[42] In furtherance of this coordination, EPA participated in a workshop hosted by ECCC on March 3, 2016 to discuss Canada's Phase 2 program.[43]

The Government of Canada, including ECCC and Transport Canada, has also been of great assistance during the development of this Phase 2 rule. In particular, the Government of Canada supported aerodynamic testing, and conducted chassis dynamometer emissions testing.

(g) Recommendations of the National Academy of Sciences

In April 2010, as mandated by Congress in the EISA, the National Research Council (NRC) under the National Academy of Sciences (NAS) issued a report to NHTSA and to Congress evaluating medium- and heavy-duty truck fuel efficiency improvement opportunities, titled ''Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-duty Vehicles.'' That NAS report was far reaching in its review of the technologies that were available and that might become available in the future to reduce fuel consumption from medium- and heavy-duty vehicles. In presenting the full range of technical opportunities, the report included technologies that may not be available until 2020 or even further into the future. The report provided not only a valuable list of off-the-shelf technologies from which the agencies drew in developing the Phase 1 program, but also provided useful information the agencies have considered when developing this second phase of regulations.

In April 2014, the NAS issued another report: ''Reducing the Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two, First Report.''[44] This study outlines a number of recommendations to the U.S. Department of Transportation and NHTSA on technical and policy matters to consider when addressing the fuel efficiency of our nation's medium- and heavy-duty vehicles. In particular, this report provided recommendations with respect to:

- The Greenhouse Gas Emission Model (GEM) simulation tool used by the agencies to assess compliance with vehicle standards
- Regulation of trailers
- Natural gas-fueled engines and vehicles
- Data collection on in-use operation

The agencies are adopting many of these recommendations into the Phase 2 program, including recommendations relating to the GEM simulation tool and to trailers.

B. Summary of Phase 1 Program

(1) EPA Phase 1 GHG Emission Standards and NHTSA Phase 1 Fuel Consumption Standards

The EPA Phase 1 mandatory GHG emission standards commenced in MY 2014 and include increased stringency for standards applicable to MY 2017 and later MY vehicles and engines. NHTSA's fuel consumption standards were voluntary for MYs 2014 and 2015, due to lead time requirements in EISA, and apply on a mandatory basis thereafter. They also increase in stringency for MY 2017. Both agencies allowed voluntary early compliance starting in MY 2013 and encouraged manufacturers' participation through credit incentives.

Given the complexity of the heavy-duty industry, the agencies divided the industry into three discrete categories for purposes of setting our respective Phase 1 standards—combination tractors, heavy-duty pickups and vans, and vocational vehicles—based on the relative degree of homogeneity among trucks within each category. The Phase 1 rules also include separate standards for the engines that power combination tractors and vocational vehicles. For each regulatory category, the agencies adopted related but distinct program approaches reflecting the specific challenges in these segments. In the following paragraphs, we briefly summarize EPA's Phase 1 GHG emission standards and NHTSA's Phase 1 fuel consumption standards for the three regulatory categories of heavy-duty vehicles and for the engines powering vocational vehicles and

[42] *http://www.ijc.org/en_/Air_Quality__Agreement.*

[43] ''Phase 2 of the Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations; Pre-Consultation Session,'' March 3, 2016.

[44] National Research Council ''Reducing the Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two.'' Washington, DC, The National Academies Press. Cooperative Agreement DTNH22–12–00389. Available electronically from the National Academy Press Web site at *http://www.nap.edu/catalog/18736/reducing-the-fuel-consumption-and-greenhouse-gas-emissions-of-medium-and-heavy-duty-vehicles-phase-two* (last accessed May 18, 2016). On September 24, 2016, NAS will release an update report, consistent with Congress' quinquennial update requirement.

stringent standards were feasible because many cost effective technologies exist for future vehicle designs. While the agencies agree that many cost effective technologies exist, and indeed, we reflect the potential for many of those technologies to be applied in our analysis for today's final rule, commenters who focused on the cost-effectiveness of technologies did not consistently recognize certain real-world constraints on technology implementation. Manufacturers and suppliers have limited research and development capacities, and although they have some ability to expand (by adding staff or building new facilities), the process of developing and applying new technologies is inherently constrained by time. Adequate lead time is also necessary to complete durability, reliability, and safety testing and ramp up production to levels that might be necessary to meet future standards. If the agencies fail to account for lead time needs in determining the stringency of the standards, we could create unintended consequences, such as technologies that are applied before they are ready and lead to maintenance and repair problems. In addition to cost-effectiveness, then, lead time constraints can also be highly relevant to feasibility of more stringent standards.

E. EPA and NHTSA Statutory Authorities

This section briefly summarizes the respective statutory authority for EPA and NHTSA to promulgate the Phase 1 and Phase 2 programs. For additional details of the agencies' authority, see Section XV of this document as well as the Phase 1 rule.[80]

(1) EPA Authority

Statutory authority for the emission standards in this rule is found in CAA section 202(a)(1) and (2) (which requires EPA to establish standards for emissions of pollutants from new motor vehicles and engines which emissions cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare), and in CAA sections 202(a)(3), 202(d), 203–209, 216, and 301 (42 U.S.C. 7521 (a)(1) and (2), 7521(d), 7522–7543, 7550, and 7601).

Title II of the CAA provides for comprehensive regulation of mobile sources, authorizing EPA to regulate emissions of air pollutants from all mobile source categories. When acting under Title II of the CAA, EPA considers such issues as technology effectiveness, its cost (both per vehicle, per manufacturer, and per consumer), the lead time necessary to implement the technology, and based on this the feasibility and practicability of potential standards; the impacts of potential standards on emissions reductions of both GHGs and non-GHG emissions; the impacts of standards on oil conservation and energy security; the impacts of standards on fuel savings by customers; the impacts of standards on the truck industry; other energy impacts; as well as other relevant factors such as impacts on safety.

This action implements a specific provision from Title II, section 202(a). Section 202(a)(1) of the CAA states that "the Administrator shall by regulation prescribe (and from time to time revise) . . . standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles . . ., which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." With EPA's December 2009 final findings that certain greenhouse gases may reasonably be anticipated to endanger public health and welfare and that emissions of GHGs from section 202(a) sources cause or contribute to that endangerment, section 202(a) requires EPA to issue standards applicable to emissions of those pollutants from new motor vehicles. See *Coalition for Responsible Regulation* v. *EPA,* 684 F. 3d at 116–125, 126–27 cert. granted by, in part *Util. Air Regulatory Group* v. *EPA,* 134 S. Ct. 418 (2013), affirmed in part and reversed in part on unrelated grounds by *Util. Air Regulatory Group* v. *EPA,* 134 S. Ct. 2427 (2014) (upholding EPA's endangerment and cause and contribute findings, and further affirming EPA's conclusion that it is legally compelled to issue standards under section 202(a) to address emission of the pollutant which endangers after making the endangerment and cause or contribute findings); see also id. at 127–29 (upholding EPA's light-duty GHG emission standards for MYs 2012–2016 in their entirety).

Other aspects of EPA's legal authority, including its authority under section 202(a), its testing authority under section 203 of the Act, and its enforcement authorities under sections 205 and 207 of the Act are discussed fully in the Phase 1 rule, and need not be repeated here. See 76 FR 57129–57130.

In this final rule, EPA is establishing first-time CO_2 emission standards for trailers hauled by tractors. 80 FR 40170. Certain commenters, notably the Truck Trailer Manufacturers Association (TTMA), maintained that EPA lacks authority to adopt requirements for trailer manufacturers, and that emission standards for trailers could be implemented, if at all, by requirements applicable to the entity assembling a tractor-trailer combination. The argument is that trailers by themselves are not "motor vehicles" as defined in section 216(2) of the Act, that trailer manufacturers therefore do not manufacture motor vehicles, and that standards for trailers can be imposed, if at all, only on "the party that joined the trailer to the tractor." Comments of TTMA, p. 4; Comments of TTMA (March 31, 2016) p. 2.

EPA also proposed a number of changes and clarifications for rules respecting glider kits and glider vehicles. 80 FR 40527–40530. As shown in Figure I.1, a glider kit is a tractor chassis with frame, front axle, interior and exterior cab, and brakes.

[80] 76 FR 57106–57129, September 15, 2011.

Figure I.1 Typical Incomplete Glider Kit Configuration

It is intended for self-propelled highway use, and becomes a glider vehicle when an engine, transmission, and rear axle are added. Engines are often salvaged from earlier model year vehicles, remanufactured, and installed in the glider kit. The final manufacturer of the glider vehicle, *i.e.* the entity that installs an engine, is typically a different manufacturer than the original manufacturer of the glider kit. The final rule contains emission standards for glider vehicles, but does not contain separate standards for glider kits.[81]

Many commenters to both the proposed rule and the NODA supported EPA's interpretation. However, a number of commenters, including Daimler, argued that glider kits are not motor vehicles and so EPA lacks the authority to impose any rules respecting their sale or configuration. Comments of Daimler, pp. 122–23; Comments of Daimler Trucks (April 1, 2016) pp. 2–3. We respond to these comments below, with a more detailed response appearing in RTC Section 1.3.1 and 14.2.

Under the Act, ''motor vehicle'' is defined as ''any self-propelled vehicle designed for transporting persons or property on a street or highway.'' CAA section 216(2). At proposal, EPA maintained that tractor-trailers are motor vehicles and that EPA therefore has the authority to promulgate emission standards for complete and incomplete vehicles—both the tractor and the trailer. 80 FR 40170. The same proposition holds for glider kits and glider vehicles. Id. at 80 FR 40528. The argument that a trailer, or a glider kit, standing alone, is not self-propelled, and therefore is not a motor vehicle, misses the key issues of authority under the Clean Air Act to promulgate emission standards for motor vehicles produced in discrete segments, and the further issue of the entities—namely ''manufacturers''—to which standards and certification requirements apply. Simply put, EPA is authorized to set emission standards for complete and incomplete motor vehicles, manufacturers of complete and incomplete motor vehicles can be required to certify to those emission standards, and there can be multiple manufacturers of a motor vehicle, each of which can be required to certify.

(a) Standards for Complete Vehicles—Tractor-Trailers and Glider Vehicles

Section 202(a)(1) authorizes EPA to set standards ''applicable to the emission of any air pollutant from any . . . new motor vehicles.'' There is no question that EPA is authorized to establish emission standards under this provision for complete new motor vehicles, and thus can promulgate emission standards for air pollutants emitted by tractor-trailers and by glider vehicles.

Daimler maintained in its comments that although a glider vehicle is a motor vehicle, it is not a ''new'' motor vehicle because ''glider vehicles, when constructed retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not 'new' under the CAA.'' Daimler Comments p. 121; see also the similar argument in Daimler Truck Comments (April 1, 2016), p. 4. Daimler maintains that because title to the powertrain from the donor vehicle has already been transferred, the glider vehicle to which the powertrain is added cannot be ''new.'' Comments of April 1, 2016 p. 4. Daimler also notes that NHTSA considers a truck to be ''newly manufactured'' and subject to Federal Motor Vehicle Safety Standards when a new cab is used in its assembly, ''unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle.'' 49 CFR 571.7(e). Daimler urges EPA to adopt a parallel provision here.

First, this argument appears to be untimely. In Phase 1, EPA already indicated that glider vehicles are new motor vehicles, at least implicitly, by

[81] As discussed in sections (c) and (d) below, however, manufacturers of glider kits can, and typically are, responsible for obtaining a certificate of conformity before shipping a glider kit. This is because they are manufacturers of motor vehicles, in this case, an incomplete vehicle.

adopting an interim exemption for them. See 76 FR 57407 (adopting 40 CFR 1037.150(j) indicating that the general prohibition against introducing a vehicle not subject to current model year standards does not apply to MY 2013 or earlier engines). Assuming the argument that glider vehicles are not new can be raised in this rulemaking, EPA notes that the Clean Air Act defines ''new motor vehicle'' as ''a motor vehicle the equitable or legal title to which has never been transferred to an ultimate purchaser'' (section 216(3)). Glider vehicles are typically marketed and sold as ''brand new'' trucks. Indeed, one prominent assembler of glider kits and glider vehicles advertises that ''Fitzgerald Glider Kits offers customers the option to purchase a *brand new 2016 tractor,* in any configuration offered by the manufacturer . . . Fitzgerald Glider Kits has mastered the process of taking the 'Glider Kit' and installing the components to work seamlessly *with the new truck.*'' [82] The purchaser of a ''new truck'' necessarily takes initial title to that truck.[83] Daimler would have it that this 'new truck' terminology is a mere marketing ploy, but it obviously reflects reality. As shown in Figure I.1 above, the glider kit constitutes the major parts of the vehicle, lacking only the engine, transmission, and rear axle. The EPA sees nothing in the Act that compels the result that adding a used component to an otherwise new motor vehicle necessarily vitiates classification of the motor vehicle as ''new.'' See 80 FR 40528. Rather, reasonable judgments must be made, and in this case, the agency believes it reasonable that the tail need not wag the dog: Adding the engine and transmission to the otherwise-complete vehicle does not prevent the glider vehicle from being ''new''—as marketed. The fact that this approach is reasonable, if not mandated, is confirmed by the language of the Act's definition of ''new motor vehicle engine,'' which includes any ''engine in a new motor vehicle'' without regard to whether or not the engine was previously used. EPA has also previously addressed the issue of used components in new engines and vehicles explicitly in regulations in the context of locomotives and locomotive engines in 40 CFR part 1033. There we defined remanufactured locomotives and locomotive engines to be ''new'' locomotives and locomotive engines. See 63 FR 18980; see also Summary and Analysis of Comments on Notice of Proposed Rulemaking for Emission Standards for Locomotives and Locomotive Engines (EPA–420–R–97–101 (December 1997)) at pp. 10–14. This is a further reason that the model year of the engine is not determinative of whether a glider vehicle is ''new.'' As to the suggestion to adopt a provision parallel to the NHTSA definition, EPA notes that the NHTSA definition was developed for different purposes using statutory authority which differs from the Clean Air Act in language and intent. There consequently is no basis for requiring EPA to adopt such a definition, and doing so would impede meaningful control of both GHG emissions and criteria pollutant emissions from glider vehicles.

(b) Standards for Incomplete Vehicles

Section 202(a)(1) not only authorizes EPA to set standards ''applicable to the emission of any air pollutant from any . . . new motor vehicles,'' but states further that these standards are applicable ''whether such vehicles . . . are designed as complete systems or incorporate devices to prevent or control such pollution.'' The Act in fact thus not only contemplates, but in some instances, directly commands that EPA establish standards for incomplete vehicles and vehicle components. See CAA section 202(a)(6) (standards for onboard vapor recovery systems on ''new light-duty vehicles,'' and requiring installation of such systems); section 202(a)(5)(A) (standards to control emissions from refueling motor vehicles, and requiring consideration of, and possible design standards for, fueling system components); 202(k) (standards to control evaporative emissions from gasoline-fueled motor vehicles). Both TTMA and Daimler argued, in effect, that these provisions are the exceptions that prove the rule and that without this type of enumerated exception, only entire, complete vehicles can be considered to be ''motor vehicles.'' This argument is not persuasive. Congress did not indicate that these incomplete vehicle provisions were exceptions to the definition of motor vehicle. Just the opposite. Without amending the new motor vehicle definition, or otherwise indicating that these provisions were not already encompassed within Title II authority over ''new motor vehicles'', Congress required EPA to set standards for evaporative emissions from a portion of a motor vehicle. Congress thus indicated in these provisions: (1) That standards should apply to ''vehicles'' whether or not the ''vehicles'' were designed as complete systems; (2) that some standards should explicitly apply only to certain components of a vehicle that are plainly not self-propelled. Congress thus necessarily was of the view that incomplete vehicles can be motor vehicles.

Emission standards EPA sets pursuant to this authority thus can be, and often are focused on emissions from the new motor vehicle, and from portions, systems, parts, or components of the vehicle. Standards thus apply not just to exhaust emissions, but to emissions from non-exhaust portions of a vehicle, or from specific vehicle components or parts. See the various evaporative emission standards for light duty vehicles in 40 CFR part 86, subpart B (*e.g.,* 40 CFR 86.146–96 and 86.150–98 (refueling spitback and refueling test procedures); 40 CFR 1060.101–103 and 73 FR 59114–59115 (various evaporative emission standards for small spark ignition equipment); 40 CFR 86.1813–17(a)(2)(iii) (canister bleed evaporative emission test procedure, where testing is solely of fuel tank and evaporative canister); see also 79 FR 23507 (April 28, 2014) (incomplete heavy duty gasoline vehicles could be subject to, and required to certify compliance with, evaporative emission standards)). These standards are implemented by testing the particular vehicle component, not by whole vehicle testing, notwithstanding that the component may not be self-propelled until it is installed in the vehicle or (in the case of non-road equipment), propelled by an engine.[84]

EPA thus can set standards for all or just a portion of the motor vehicle notwithstanding that an incomplete motor vehicle may not yet be self-propelled. This is not to say that the Act authorizes emission standards for any part of a motor vehicle, however insignificant. Under the Act it is reasonable to consider both the significance of the components in comparison to the entire vehicle and the significance of the components for achieving emissions reductions. A vehicle that is complete except for an ignition switch can be subject to standards even though it is not self-

[82] Advertisement for Fitzgerald Glider kits in Overdrive magazine (December 2015) (emphasis added).

[83] Fitzgerald states ''All Fitzgerald glider kits will be titled in the state of Tennessee and you will receive a title to transfer to your state.'' *https://www.fitzgeraldgliderkits.com/frequently-asked-questions.* Last accessed July 9, 2016.

[84] ''Non-road vehicles'' are defined differently than ''motor vehicles'' under the Act, but the difference does not appear relevant here. Non-road vehicles, like motor vehicles, must be propelled by an engine. See CAA section 216(11) (''nonroad vehicle' means a vehicle that is powered by a nonroad engine''). Pursuant to this authority, EPA has promulgated many emission standards applicable to components of engineless non-road equipment, for which the equipment manufacturer must certify.

propelled. Likewise, as just noted, vehicle components that are significant for controlling evaporative emissions can be subject to standards even though in isolation the components are not self-propelled. However, not every individual component of a complete vehicle can be subjected to standards as an incomplete vehicle. To reflect these considerations, EPA is adopting provisions stating that a trailer is a vehicle ''when it has a frame with one or more axles attached,'' and a glider kit becomes a vehicle when ''it includes a passenger compartment attached to a frame with one or more axles.'' Section 1037.801 definition of ''vehicle,'' paragraphs (1)(ii) and (iii); see also Section XIII.B below.

TTMA and Daimler each maintained that this claim of authority is open-ended, and can be extended to the least significant vehicle part. As noted above, EPA acknowledges that lines need to be drawn, but whether looking at the relation between the incomplete vehicle and the complete vehicle, or looking at the relation between the incomplete vehicle and the emissions control requirements, it is evident that trailers and glider kits should properly be treated as vehicles, albeit incomplete ones.[85] They properly fall on the vehicle side of the line. When one finishes assembling a whole aggregation of parts to make a finished section of the vehicle (*e.g.* the trailer), that is sufficient. You have an entire, complete section made up of assembled parts. Everything needed to be a trailer is complete. This is not an engine block, a wheel, or a headlight. Similarly, glider kits comprise the largely assembled tractor chassis with front axles, frame, interior and exterior cab, and brakes. This is not a few assembled components; rather, it is an assembled truck with a few components missing. See CAA section 216(9) of the Act, which defines ''motor vehicle or engine part manufacturer'' as ''any person engaged in the manufacturing, assembling or rebuilding of any device, system, part, component or element of design which is installed in or on motor vehicles or motor vehicle engines.'' Trailers and glider kits are not ''installed in or on'' a motor vehicle. A trailer is half of the tractor-trailer, not some component installed on the tractor. And one would more naturally refer to the donor drivetrain being installed on the glider kit than vice versa. See Figure I.1 above. Furthermore, as discussed below, the trailer and the glider kit are significant for purposes of controlling emissions from the completed vehicle.

Incomplete vehicle standards must, of course, be reasonably designed to control emissions caused by that particular vehicle segment. The standards for trailers would do so and account for the tractor-trailer combination by using a reference tractor in the trailer test procedure (and, conversely, by use of a reference trailer in the tractor test procedure). The Phase 2 rule contains no emission standards for glider kits in isolation, but the standards for glider vehicles necessarily reflect the contribution of the glider kit.

(c) Application of Emission Standards to Manufacturers

In some ways, the critical issue is to whom these emission standards apply. As explained in this section, the emission standards apply to manufacturers of motor vehicles, and manufacturers thus are required to test and to certify compliance to those standards. Moreover, the Act contemplates that a motor vehicle can have multiple manufacturers. With respect to the further question of which manufacturer certifies and tests in multiple manufacturer situations, EPA rules have long contained provisions establishing responsibilities where a vehicle has multiple manufacturers. We are applying those principles in the Phase 2 rules. The overarching principle is that the entity with most control over the particular vehicle segment due to producing it is usually the most appropriate entity to test and certify.[86] EPA is implementing the trailer and glider vehicle emission standards in accord with this principle, so that the entities required to test and certify are the trailer manufacturer and, for glider kits and glider vehicles, either the manufacturer of the glider kit or glider vehicle, depending on which is more appropriate in individual circumstances.

(i) Definition of Manufacturer

Emission standards are implemented through regulation of the manufacturer of the new motor vehicle. See, *e.g.* section 206(a)(1) (certification testing of motor vehicle submitted by ''a manufacturer''); 203(a)(1) (manufacturer of new motor vehicle prohibited from introducing uncertified motor vehicles into commerce); 207(a)(1) (manufacturer of motor vehicle to provide warranty to ultimate purchaser of compliance with applicable emission standards); 207(c) (recall authority); 208(a) (recordkeeping and testing can be required of every manufacturer of new motor vehicle).

The Act further distinguishes between manufacturers of motor vehicles and manufacturers of motor vehicle parts. See, *e.g.* section 206(a)(2) (voluntary emission control system verification testing); 203(a)(3)(B) (prohibition on parts manufacturers and other persons relating to defeat devices); 207(a)(2) (parts manufacturer may provide warranty certification regarding use of parts); 208(a) (recordkeeping and testing requirements for manufacturers of vehicle and engine ''parts or components'').

Thus, the question here is whether a trailer manufacturer or glider kit manufacturer can be a manufacturer of a new motor vehicle and thereby become subject to the certification and related requirements for manufacturers, or must necessarily be classified as a manufacturer of a motor vehicle part or component. EPA may reasonably classify trailer manufacturers and glider kit manufacturers as motor vehicle manufacturers.

Section 216(1) defines a ''manufacturer'' as ''any person engaged in the manufacturing or assembling of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, or importing such vehicles or engines for resale, or who acts for and is under the control of any such person in connection with the distribution of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, but shall not include any dealer with respect to new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines received by him in commerce.''

It appears plain that this definition was not intended to restrict the definition of ''manufacturer'' to a single person per vehicle. The use of the conjunctive, specifying that a manufacturer is ''*any* person engaged in the manufacturing or assembling of new motor vehicles . . . *or* who acts for and is under the control of any such person

[85] Cf. *Marine Shale Processors* v. *EPA,* 81 F. 3d 1371, 1383 (5th Cir. 1996) (''[w]e make no comment on this argument: This is simply not a thimbleful case'').

[86] See discussion of standards applicable to small SI equipment fuel systems, implemented by standards for the manufacturers of that equipment at 73 FR 59115 (''In most cases, nonroad standards apply to the manufacturer of the engine or the manufacturer of the nonroad equipment. Here, the products subject to the standards (fuel lines and fuel tanks) are typically manufactured by a different manufacturer. In most cases the engine manufacturers do not produce complete fuel systems and therefore are not in a position to do all the testing and certification work necessary to cover the whole range of products that will be used. We are therefore providing an arrangement in which manufacturers of fuel-system components are in most cases subject to the standards and are subject to certification and other compliance requirements associated with the applicable standards'').

. . .'' (emphasis added) indicates that Congress anticipated that motor vehicles could have more than one manufacturer, since in at least some cases those will plainly be different people. The capacious reference to ''any person engaged in the manufacturing of motor vehicles'' likewise allows the natural inference that it could apply to multiple entities engaged in manufacturing.[87]

The provision also applies both to entities that manufacture and entities that assemble, and does so in such a way as to encompass multiple parties: Manufacturers ''or'' (rather than 'and') assemblers are included. Nor is there any obvious reason that only one person can be engaged in vehicle manufacture or vehicle assembling.

Reading the Act to provide for multiple motor vehicle manufacturers reasonably reflects industry realities, and achieves important goals of the CAA. Since title II requirements are generally imposed on ''manufacturers'' it is important that the appropriate parties be included within the definition of manufacturer—''any person engaged in the manufacturing or assembling of new motor vehicles.'' Indeed, as set out in Chapter 1 of the RIA, most heavy duty vehicles are manufactured or assembled by multiple entities; see also Comments of Daimler (October 1, 2015) p. 103.[88] One entity produces a chassis; a different entity manufactures the engine; specialized components (*e.g.* garbage compactors, cement mixers) are produced by still different entities. For tractor-trailers, one person manufactures the tractor, another the trailer, a third the engine, and another typically assembles the trailer to the tractor. Installation of various vehicle components occurs at different and varied points and by different entities, depending on ultimate desired configurations. See, *e.g.* Comments of Navistar (October 1, 2015), pp. 12–13. The heavy duty sector thus differs markedly from the light duty sector (and from manufacturing of light duty pickups and vans), where a single company designs the vehicle and engine (and many of the parts), and does all assembling of components into the finished motor vehicle.

(ii) Controls on Manufacturers of Trailers

It is reasonable to view the trailer manufacturer as ''engaged in'' (section 216(1)) the manufacturing or assembling of the tractor-trailer. The trailer manufacturer designs, builds, and assembles a complete and finished portion of the tractor-trailer. All components of the trailer—the tires, axles, flat bed, outsider cover, aerodynamics—are within its control and are part of its assembling process. The trailer manufacturer sets the design specifications that affect the GHG emissions attributable to pulling the trailer. It commences all work on the trailer, and when that work is complete, nothing more is to be done. The trailer is a finished product. With respect to the trailer, the trailer manufacturer is analogous to the manufacturer of the light duty vehicle, specifying, controlling, and assembling all aspects of the product from inception to completion. GHG emissions attributable to the trailer are a substantial portion of the total GHG emissions from the tractor-trailer.[89] Moreover, the trailer manufacturer is not analogous to the manufacturer of a vehicle part or component, like a tire manufacturer, or to the manufacturer of a side skirt. The trailer is a significant, integral part of the finished motor vehicle, and is essential for the tractor-trailer to carry out its commercial purpose. See 80 FR 40170. Although it is true that another person may ultimately hitch the trailer to a tractor (which might be viewed as completing assembly of the tractor-trailer), as noted above, EPA does not believe that the fact that one person might qualify as a manufacturer, due to ''assembling'' the motor vehicle, precludes another person from qualifying as a manufacturer, due to ''manufacturing'' the motor vehicle. Given that section 216(1) does not restrict motor vehicle manufacturers to a single entity, it appears to be consistent with the facts and the Act to consider trailer manufacturers as persons engaged in the manufacture of a motor vehicle.

This interpretation of section 216(1) is also reasonable in light of the various provisions noted above relating to implementation of the emissions standards—certification under section 206, prohibitions on entry into commerce under section 203, warranty and recall under section 207, and recordkeeping/reporting under section 208. All of these provisions are naturally applied to the entity responsible for manufacturing the trailer, which manufacturer is likewise responsible for its GHG emissions.

TTMA maintains that if a tractor-trailer is a motor vehicle, then only the entity connecting the trailer to the tractor could be subject to regulation.[90] This is not a necessary interpretation of section 216(1), as explained above. TTMA does not discuss that provision, but notes that other provisions refer to ''a'' manufacturer (or, in one instance, ''the'' manufacturer), and maintains that this shows that only a single entity can be a manufacturer. See TTMA Comment pp. 4–5, citing to sections 206(a)(1), 206(b), 207, and 203(a). This reading is not compelled by the statutory text. First, the term ''manufacturer'' in all of these provisions necessarily reflects the underlying definition in section 216(1), and therefore is not limited to a single entity, as just discussed. Second, the interpretation makes no practical sense. An end assembler of a tractor-trailer is not in a position to certify and warrant performance of the trailer, given that the end-assembler has no control over how trailers are designed, constructed, or even which trailers are attached to the tractor. It makes little sense for the entity least able to control the outcome to be responsible for that outcome. The EPA doubts that Congress compelled such an ungainly implementation mechanism, especially given that it is well known that vehicle manufacture responsibility in the heavy duty vehicle sector is divided, and given further that title II includes requirements for EPA to promulgate emission standards for portions of vehicles.

(iii) Controls on Manufacturers of Glider Kits

Application of these same principles indicate that a glider kit manufacturer is a manufacturer of a motor vehicle and, as an entity responsible for assuring that glider vehicles meet the Phase 2 vehicle emission standards, can be a party in the certification process as either the certificate holder or the entity which provides essential test information to the glider vehicle manufacturer. As noted above, glider kits include the entire tractor chassis, cab, tires, body, and brakes. Glider kit manufacturers thus control critical elements of the

[87] See *United States* v. *Gonzales,* 520 U.S. 1, 5, (1997) (''Read naturally the word 'any' has an expansive meaning, that is, 'one or some indiscriminately of whatever kind'); *New York* v. *EPA,* 443 F.3d 880, 884–87 (D.C. Cir. 2006).

[88] ''The EPA should understand that vehicle manufacturing is a multi-stage process (regardless of the technologies on the vehicles) and that each stage of manufacturer has the incentive to properly complete manufacturing . . . [T]he EPA should continue the longstanding industry practice of allowing primary manufacturers to pass incomplete vehicles with incomplete vehicle documents to secondary manufacturers who complete the installation.''

[89] The relative contribution of trailer controls depends on the types of tractors and trailers, as well as the tier of standards applicable; however, it can be approximately one-third of the total reduction achievable for the tractor-trailer.

[90] Consequently, the essential issue here is not whether EPA can issue and implement emission standards for trailers, but at what point in the implementation process those standards apply.

ultimate vehicle's greenhouse gas emissions, in particular, all aerodynamic features and all emissions related to steer tire type. Glider kit manufacturers would therefore be the entity generating critical GEM inputs—at the least, those for aerodynamics and tires. Glider kit manufacturers also often know the final configuration of the glider vehicle, *i.e.* the type of engine and transmission which the final assembler will add to the glider kit.[91] This is because the typical glider kit contains all necessary wiring, and it is necessary, in turn, for the glider kit manufacturer to know the end configuration in order to wire the kit properly. Thus, a manufacturer of a glider kit can reasonably be viewed as a manufacturer of a motor vehicle under the same logic as above: There can be multiple manufacturers of a motor vehicle; the glider kit manufacturer designs, builds, and assembles a substantial, complete and finished portion of the motor vehicle; and that portion contributes substantially to the GHG emissions from the ultimate glider vehicle. A glider kit is not a vehicle part; rather, it is an assembled truck with a few components missing.

EPA rules have long provided provisions establishing responsibilities where there are multiple manufacturers of motor vehicles. See 40 CFR 1037.620 (responsibilities for multiple manufacturers), 40 CFR 1037.621 (delegated assembly), and 40 CFR 1037.622 (shipment of incomplete vehicles to secondary vehicle manufacturers). These provisions, in essence, allow manufacturers to determine among themselves as to which should be the certificate holder, and then assign respective responsibilities depending on that decision. The end result is that incomplete vehicles cannot be introduced into commerce without one of the manufacturers being the certificate holder.

Under the Phase 1 rules, glider kits are considered to be incomplete vehicles which may be introduced into commerce to a secondary manufacturer for final assembly. See 40 CFR 1037.622(b)(1)(i) and 1037.801 (definition of ''vehicle'' and ''incomplete vehicle'') of the Phase 1 regulations (76 FR 57421). Note that 40 CFR 1037.622(b)(1)(i) was originally codified as 40 CFR 1037.620(b)(1)(i). EPA is expanding somewhat on these provisions, but in essence, as under Phase 1, glider kit and glider vehicle manufacturers could operate under delegated assembly provisions whereby the glider kit manufacturer would be the certificate holder. See 40 CFR 1037.621 of the final regulations. Glider kit manufacturers would also continue to be able to ship uncertified kits to secondary manufacturers, and the secondary manufacturer must assemble the vehicle into certifiable condition. 40 CFR 1037.622.[92]

(d) Additional Authorities Supporting EPA's Actions

Even if, against our view, trailers and glider kits are not considered to be ''motor vehicles,'' and the entities engaged in assembling trailers and glider kits are not considered to be manufacturers of motor vehicles, the Clean Air Act still provides authority for the testing requirements adopted here. Section 208 (a) of the Act authorizes EPA to require ''every manufacturer of new motor vehicle or engine parts or components'' to ''perform tests where such testing is not otherwise reasonably available.'' This testing can be required to ''provide information the Administrator may reasonably require to determine whether the manufacturer . . . has acted or is acting in compliance with this part,'' which includes showing whether or not the parts manufacturer is engaged in conduct which can cause a prohibited act. Testing would be required to show that the trailer will conform to the vehicle emission standards. In addition, testing for trailer manufacturers would be necessary here to show that the trailer manufacturer is not causing a violation of the combined tractor-trailer GHG emission standard either by manufacturing a trailer which fails to comply with the trailer emission standards, or by furnishing a trailer to the entity assembling tractor-trailers inconsistent with tractor-trailer certified condition. Testing for glider kit manufacturers is necessary to prevent a glider kit manufacturer furnishing a glider kit inconsistent with the tractor's certified condition. In this regard, we note that section 203 (a)(1) of the Act not only prohibits certain acts, but also prohibits ''the causing'' of those acts. Furnishing a trailer not meeting the trailer standard would cause a violation of that standard, and the trailer manufacturer would be liable under section 203 (a)(1) for causing the prohibited act to occur. Similarly, a glider kit supplied in a condition inconsistent with the tractor standard would cause the manufacturer of the glider vehicle to violate the GHG emission standard, so the glider kit manufacturer would be similarly liable under section 203 (a)(1) for causing that prohibited act to occur.

In addition, section 203 (a)(3)(B) prohibits use of 'defeat devices'—which include ''any part or component intended for use with, or as part of, any motor vehicle . . . where a principal effect of the part or component is to . . . defeat . . . any . . . element of design installed . . . in a motor vehicle'' otherwise in compliance with emission standards. Manufacturing or installing a trailer not meeting the trailer emission standard could thus be a defeat device causing a violation of the emission standard. Similarly, a glider kit manufacturer furnishing a glider kit in a configuration that would not meet the tractor standard when the specified engine, transmission, and axle are installed would likewise cause a violation of the tractor emission standard. For example, providing a tractor with a coefficient of drag or tire rolling resistance level inconsistent with tractor certified condition would be a violation of the Act because it would cause the glider vehicle assembler to introduce into commerce a new tractor that is not covered by a *valid* certificate of conformity. Daimler argued in its comments that a glider kit would not be a defeat device because glider vehicles use older engines which are more fuel efficient since they are not meeting the more rigorous standards for criteria pollutant emissions. (Daimler Truck Comment, April 1, 2016, p. 5). However, the glider kit would be a defeat device with respect to the tractor *vehicle* standard, not the separate engine standard. A non-conforming glider kit would adversely affect compliance with the vehicle standard, as just explained. Furthermore, as explained in RTC Section 14.2, Daimler is incorrect that glider vehicles are more fuel efficient than Phase 1 2017 and later vehicles, much less Phase 2 vehicles.

In the memorandum accompanying the Notice of Data Availability, EPA solicited comment on adopting additional regulations based on these principles. EPA has decided not to adopt those provisions, but again notes

[91] PACCAR indicated in its comments that manufacturers of glider kits may not know all details of final assembly. Provisions on delegated assembly, shipment of incomplete vehicles to secondary manufacturers, and assembly instructions for secondary vehicle manufacturers allow manufacturers of glider kits and glider vehicles to apportion responsibilities, as appropriate, including responsibility as to which entity shall be the certificate holder. See 40 CFR 1037.130, 1037.621, and 1037.622. Our point here is that both of these entities are manufacturers of the glider motor vehicle and therefore that both are within the Act's requirements for certification and testing.

[92] Under this provision in the Phase 2 regulations, the glider kit manufacturer would still have some responsibility to ensure that products they introduce into U.S. commerce will conform with the regulations when delivered to the ultimate purchasers.

that the authorities in CAA sections 208 and 203 support the actions EPA is taking here with respect to trailer and glider kit testing.

(e) Standards for Glider Vehicles and Lead Time for Those Standards

At proposal, EPA indicated that engines used in glider vehicles are to be certified to standards for the model year in which these vehicles are assembled. 80 FR 40528. This action is well within the agency's legal authority. As noted above, the Act's definition of ''new motor vehicle engine,'' includes any ''engine in a new motor vehicle'' without regard to whether or not the engine was previously used. Given the Act's purpose of controlling emissions of air pollutants from motor vehicle engines, with special concern for pollutant emissions from heavy-duty engines (see, *e.g.,* section 202(a)(3)(A) and (B)), it is reasonable to require engines placed in newly-assembled vehicles to meet the same standards as all other engines in new motor vehicles. Put another way, it is both consistent with the plain language of the Act and reasonable and equitable for the engines in ''new trucks'' (see Section I.E.(1)(a) above) to meet the emission standards for all other engines installed in new trucks.

Daimler challenged this aspect of EPA's proposal, maintaining that it amounted to regulation of vehicle rebuilding, which (according to the commenter) is beyond EPA's authority. Comments of Daimler, p. 123; Comments of Daimler Trucks (April 1, 2016) p. 3. This comment is misplaced. The EPA has authority to regulate emissions of pollutants from engines installed in new motor vehicles. As explained in subsection (a) above, glider vehicles are new motor vehicles. As also explained above, the Act's definition of ''new motor vehicle engine'' includes any ''engine in a new motor vehicle'' without regard to whether or not the engine was previously used. CAA section 216(3). Consequently, a previously used engine installed in a glider vehicle is within EPA's multiple authorities. See CAA sections 202(a)(1) (GHGs), 202(a)(3)(A) and (B)(ii) (hydrocarbon, CO, PM and NO_X from heavy-duty vehicles or engines), and 202(a)(3)(D) (pollutants from rebuilt heavy duty engines).[93]

As explained in more detail in Section XIII.B, the final rule requires that as of January 1, 2017, glider kit and glider vehicle production involving engines not meeting criteria pollutant standards corresponding to the year of glider vehicle assembly be allowed at the highest annual production for any year from 2010 to 2014. See section 1037.150(t)(3). (Certain exceptions to this are explained in Section XIII.B.) The rule further requires that as of January 1, 2018, engines in glider vehicles meet criteria pollutant standards and GHG standards corresponding to the year of the glider vehicle assembly, but allowing certain small businesses to introduce into commerce vehicles with engines meeting criteria pollutant standards corresponding to the year of the engine for up to 300 vehicles per year, or up to the highest annual production volume for calendar years 2010 to 2014, whichever is less. Section 1037.150(t)(1)(ii) (again subject to various exceptions explained in Section XIII.B). Glider vehicles using these exempted engines will not be subject to the Phase 1 GHG *vehicle* standards, but will be subject to the Phase 2 vehicle standards beginning with MY 2021. As explained in Section XIII.B, there are compelling environmental reasons for taking these actions in this time frame.

With regard to the issue of lead time, EPA indicated at proposal that the agency has long since justified the criteria pollutant standards for engines installed in glider kits. 80 FR 40528. EPA further proposed that engines installed in glider vehicles meet the emission standard for the year of glider vehicle assembly, as of January 1, 2018 and solicited comment on an earlier effective date. Id. at 40529. The agency noted that CAA section 202(a)(3)(D)[94] requires that standards for rebuilt heavy-duty engines take effect ''after a period . . . necessary to permit the development and application of the requisite control measures.'' Here, no time is needed to develop and apply requisite control measures for criteria pollutants because compliant engines are immediately available. In fact, manufacturers of compliant engines, and dealers of trucks containing those compliant engines, commented that they are disadvantaged by manufacturing more costly compliant engines while glider vehicles avoid using those engines. Not only are compliant engines immediately available, but (as commenters warned) there can be risk of massive pre-buys. Moreover, EPA does not envision that glider manufacturers will actually modify the older engines to meet the applicable standards. Rather, they will either choose from the many compliant engines available today, or they will seek to qualify under other flexibilities provided in the final rule. See Section XIII.B. Given that compliant engines are immediately available, the flexibilities provided in the final rule for continued use of donor engines for traditional glider vehicle functions and by small businesses, and the need to expeditiously prevent further perpetuation of use of heavily polluting engines, EPA sees a need to begin constraining this practice on January 1, 2017. However, the final rule is merely capping glider production using higher-polluting engines in 2017 at 2010–2014 production levels, which would allow for the production of thousands of glider vehicles using these higher polluting engines, and unlimited production of glider vehicles using less polluting engines.

Various commenters, however, argued that the EPA must provide four years lead-time and three-year stability pursuant to section 202(a)(3)(C) of the Act, which applies to regulations for criteria pollutant emissions from heavy duty vehicles or engines. For criteria pollutant standards, CAA section 202(a)(3)(C) establishes lead time and stability requirements for ''[a]ny standard promulgated or revised under this paragraph and applicable to classes or categories of heavy duty vehicles or engines.'' In this rule, EPA is generally requiring large manufacturers of glider vehicles to use engines that meet the standards for the model year in which a vehicle is manufactured. EPA is not promulgating new criteria pollutant standards. The NO_X and PM standards that apply to heavy duty engines were promulgated in 2001.

We are not amending these provisions or promulgating new criteria pollutant standards for heavy duty engines here. EPA interprets the phrase ''classes or categories of heavy duty vehicles or engines'' in CAA section 202(a)(3)(C) to refer to categories of vehicles established according to features such as their weight, functional type, (*e.g.* tractor, vocational vehicle, or pickup truck) or engine cycle (spark-ignition or compression-ignition), or weight class of the vehicle into which an engine is installed (LHD, MHD, or HHD). EPA has established several different categories

[93] Comments from, *e.g.* Mondial and MEMA made clear that all of the donor engines installed in glider vehicles are rebuilt. See also *http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx* (''1999 to 2002-model diesels were known for reliability, longevity and good fuel mileage. Fitzgerald favors Detroit's 12.7-liter Series 60 from that era, but also installs pre-EGR 14-liter Cummins and 15-liter Caterpillar diesels. All are rebuilt. . . .'').

[94] The engine rebuilding authority of section 202(a)(3)(D) includes removal of an engine from the donor vehicle. See 40 CFR 86.004–40 and 62 FR 54702 (Oct. 21, 1997). EPA interprets this language as including installation of the removed engine into a glider kit, thereby assembling a glider vehicle.

of heavy duty vehicles (distinguished by gross vehicle weight, engine-cycle, and other criteria related to the vehicles' intended purpose) and is establishing in this rule GHG standards applicable to each category.[95] By contrast, a ''glider vehicle'' is defined not by its weight or function but by its method of manufacture. A Class 8 tractor glider vehicle serves exactly the same function and market as a Class 8 tractor manufactured by another manufacturer. Similarly, rebuilt engines installed in glider vehicles (*i.e.* donor engines) are not distinguished by engine cycle, but rather serve the same function and market as any other HHD or MHD engine. Thus, EPA considers ''glider vehicles'' to be a description of a method of manufacturing new motor vehicles, not a description of a separate ''class or category'' of heavy duty vehicles or engines. Consequently, EPA is not adopting new standards for a class or category of heavy duty engines within the meaning of section 202(a)(3)(C) of the Act.

EPA believes this approach is most consistent with the statutory language and the goals of the Clean Air Act. The date of promulgation of the criteria pollutant standards was 2001. There has been plenty of lead time for the criteria pollutant standards and as a result, manufacturers of glider vehicles have many options for compliant engines that are available on the market today—just as manufacturers of other new heavy-duty vehicles do. We are even providing additional compliance flexibilities to glider manufacturers in recognition of the historic practice of salvaging a small number of engines from vehicles involved in crashes. See Section XIII.B. We do not believe that Congress intended to allow changes in how motor vehicles are manufactured to be a means of avoiding existing, applicable engine standards. Obviously, any industry attempts to avoid or circumvent standards will not become apparent until the standards begin to apply. The commenters' interpretation would effectively preclude EPA from curbing many types of avoidance, however dangerous, until at least four years from detection.

As to Daimler's further argument that the lead time provisions in section 202(3)(C) not only apply but also must trump those specifically applicable to heavy duty engine rebuilding, the usual rule of construction is that the more specific provision controls. See, *e.g. HCSC-Laundry* v. *U.S.,* 450 U.S.1, 6 (1981). Daimler's further argument that section 202(a)(3)(C) lead time provisions also apply to engine rebuilding because those provisions fall within the same paragraph would render the separate lead time provisions for engine rebuilding a virtual nullity. The sense of the provision is that Congress intended there to be independent lead time consideration for the distinct practice of engine rebuilding. In any case, as just explained, it is EPA's view that section 202(a)(3)(C) does not apply here.

(2) NHTSA Authority

The Energy Policy and Conservation Act (EPCA) of 1975 mandates a regulatory program for motor vehicle fuel economy to meet the various facets of the need to conserve energy. In December 2007, Congress enacted the Energy Independence and Security Act (EISA), amending EPCA to require, among other things, the creation of a medium- and heavy-duty fuel efficiency program for the first time.

Statutory authority for the fuel consumption standards in this final rule is found in EISA section 103, 49 U.S.C. 32902(k). This section authorizes a fuel efficiency improvement program, designed to achieve the maximum feasible improvement to be created for commercial medium- and heavy-duty on-highway vehicles and work trucks, to include appropriate test methods, measurement metrics, standards, and compliance and enforcement protocols that are appropriate, cost-effective and technologically feasible.

NHTSA has responsibility for fuel economy and consumption standards, and assures compliance with EISA through rulemaking, including standard-setting; technical reviews, audits and studies; investigations; and enforcement of implementing regulations including penalty actions. This rule continues to fulfill the requirements of section 103 of EISA, which instructs NHTSA to create a fuel efficiency improvement program for ''commercial medium- and heavy-duty on-highway vehicles and work trucks'' by rulemaking, which is to include standards, test methods, measurement metrics, and enforcement protocols. See 49 U.S.C. 32902(k)(2).

Congress directed that the standards, test methods, measurement metrics, and compliance and enforcement protocols be ''appropriate, cost-effective, and technologically feasible'' for the vehicles to be regulated, while achieving the ''maximum feasible improvement'' in fuel efficiency. NHTSA has broad discretion to balance the statutory factors in section 103 in developing fuel consumption standards to achieve the maximum feasible improvement.

As discussed in the Phase 1 final rule, NHTSA has determined that the five year statutory limit on average fuel economy standards that applies to passengers and light trucks is not applicable to the HD vehicle and engine standards. As a result, the Phase 1 HD engine and vehicle standards remain in effect indefinitely at their 2018 or 2019 MY levels until amended by a future rulemaking action. As was contemplated in that rule, NHTSA is finalizing a Phase 2 rulemaking action. Therefore, the Phase 1 standards will not remain in effect at their 2018 or 2019 MY levels indefinitely; they will remain in effect until the MY Phase 2 standards begin. In accordance with section 103 of EISA, NHTSA will ensure that not less than four full MYs of regulatory lead-time and three full MYs of regulatory stability are provided for in the Phase 2 standards.

With respect to the proposal, many stakeholders opined in their comments as to NHTSA's legal authority to issue the Phase 2 medium- and heavy-duty standards (Phase 2 standards), in whole or in part. NHTSA addresses these comments in the following discussion.

Allison Transmission, Inc. (Allison) questioned NHTSA's authority to issue the Phase 2 Standards. Allison stated that the Energy Independence and Security Act of 2007 (EISA)[96] directs NHTSA to undertake ''*a* rulemaking proceeding,'' (emphasis added) predicated on a study by the National Academy of Sciences (NAS). Allison and the Truck Trailer Manufacturers Association (TTMA) asserted that because NAS has published a study on medium- and heavy duty vehicles and NHTSA promulgated the Phase 1 medium- and heavy-duty vehicle standards (Phase 1 standards), NAS and NHTSA have fulfilled their statutory duties under EISA. Thus, Allison stated, NHTSA has no authority to issue standards beyond the Phase 1 standards.

NHTSA maintains that EISA allows the agency to promulgate medium- and heavy duty fuel efficiency standards beyond the Phase 1 standards. EISA states that NHTSA:[97]

> by regulation, shall determine in a rulemaking proceeding how to implement a commercial medium- and heavy-duty on-highway vehicle and work truck fuel

[95] Note, however, the Phase 2 GHG standards for tractors and vocational vehicles do not apply until MY 2021.

[96] Public Law 110–140, 121 Stat. 1492. (December 19, 2007).

[97] By delegation at 49 CFR 1.95(a). For purposes of this NPRM, grants of authority from EISA to the Secretary of Transportation regarding fuel efficiency will be referred to as grants of authority to NHTSA, as NHTSA has been delegated the authority to implement these programs.

efficiency program designed to achieve the maximum feasible improvement, and shall adopt and implement appropriate test methods, measurement metrics, fuel economy standards, and compliance and enforcement protocols . . . for commercial medium- and heavy-duty on-highway vehicles and work trucks.[98]

Allison equates the process by which Congress specified NHTSA promulgate standards—a rulemaking proceeding—to mean a limitation or constraint on NHTSA's ability to create, amend, or update the medium- and heavy duty fuel efficiency program. NHTSA believes the charge in 49 U.S.C. 32902(k)(2) discusses ''a rulemaking proceeding'' only insofar as the statute specifies the process by which NHTSA would create a medium- and heavy-duty on-highway vehicle and work truck fuel efficiency improvement program and its associated standards.

Allison and TTMA commented that EISA only refers to an initial NAS study, meaning EISA only specified that NHTSA issue one set of standards based on that study. As NHTSA stated in the NPRM, EISA requires NAS to issue updates to the initial report every five years through 2025.[99] With that in mind, NAS issued an interim version of its first update to inform the Phase 2 NPRM. EISA's requirement that NAS update its initial report, which examines existing and potential fuel efficiency technologies that can practically be integrated into medium- and heavy-duty vehicles, is consistent with the conclusion that EISA intended the medium- and heavy-duty standards to function as part of an ongoing program [100] and not a single rulemaking.

Allison also noted that the language in EISA discussing lead time and stability refers to a single medium- and heavy-duty on-highway vehicle and work truck fuel economy standard.[101] NHTSA believes the language highlighted by Allison serves the purpose of noting that each medium- and heavy-duty segment standard included in its program shall have the requisite amount of lead-time and stability. As discussed in 49 U.S.C. 32902(k)(2), ''[t]he Secretary may prescribe separate standards for different classes of vehicles . . .'' Since NHTSA has elected to set standards for particular classes of vehicles, this language ensures each particular standard shall have the appropriate lead-time and stability required by EISA.

TTMA asserted that NHTSA has no more than 24 months from the completion of the NAS study to issue regulations related to the medium- and heavy-duty program and therefore regulations issued after 2013 ''lack congressional authorization.'' This argument significantly misinterprets the Congressional purpose of this provision. Section 32902(k)(2) requires that, 24 months after the completion of the NAS study, NHTSA begin implementing through a rulemaking proceeding a commercial medium- and heavy-duty on-highway vehicle and work truck fuel efficiency improvement *program.* Congress therefore authorized NHTSA to implement through rulemaking a ''program,'' which the dictionary defines as ''a plan of things that are done in order to achieve a specific result.'' [102] Contrary to TTMA's assertion, Congress did not limit NHTSA to the establishment of one set of regulations, nor did it in any way limit NHTSA's ability to update and revise this program. The purpose of the 24 month period was simply to ensure that NHTSA exercised this authority expeditiously after the NAS study, which NHTSA accomplished by implementing the first phase of its fuel efficiency program in 2011.[103] Today's rulemaking merely continues this program and clearly comports with the statutory language in 49 U.S.C. 32902(k). Further, the specific result sought by Congress in establishing the medium- and heavy-duty fuel efficiency program was a program focused on continuing fuel efficiency improvements. Specifically, Congress emphasized that the fuel efficiency program created by NHTSA be ''designed to achieve the maximum feasible improvement,'' allowing NHTSA to ensure the regulations implemented throughout the program encourage regulated entities to achieve the maximum feasible improvements. Congress did not limit, restrict, or otherwise suggest that the phrase ''designed to achieve the maximum feasible improvement'' be confined to the issuance of one set of standards. NHTSA actions are, therefore, clearly consistent with the authority conferred upon it in 49 U.S.C. 32902(k).

POP Diesel stated that the word ''fuel'' has not been defined by Congress, and therefore NHTSA should use its authority to define the term ''fuel'' as ''fossil fuel,'' allowing the agencies to assess fuel efficiency based on the carbon content of the fuels used in an engine or vehicle. Congress has already defined the term ''fuel'' in 49 U.S.C. 32901(a)(10) as gasoline, diesel oil, or other liquid or gaseous fuel that the Secretary decides to include. As Congress has already spoken to the definition of fuel, it would be inappropriate for the agency to redefine ''fuel'' as ''fossil fuel.''

Additionally, POP Diesel asserted that NHTSA's metric for measuring fuel efficiency is contrary to the mandate in EISA. Specifically, POP Diesel stated that many dictionaries define ''efficiency'' as a ratio of work performed to the amount of energy used, and NHTSA's load specific fuel consumption metric runs afoul of the plain meaning of statute the Phase 2 program implements. POP Diesel noted that Congressional debate surrounding what is now codified at 49 U.S.C. 32902(k)(2) included a discussion that envisioned NHTSA and EPA having separate regulations, despite having overlapping jurisdiction.

NHTSA continues to believe its use of load specific fuel consumption is an appropriate metric for assessing fuel efficiency as mandated by Congress. 49 U.S.C. 32902(k)(2) states, as POP Diesel noted, that NHTSA shall develop a medium- and heavy-duty fuel efficiency program. The section further states that NHTSA ''. . . shall adopt and implement appropriate test methods [and] measurement metrics . . . for commercial medium- and heavy-duty on-highway vehicles and work trucks.'' In the Phase 1 rulemaking, NHTSA, aided by the National Academies of Sciences (NAS) report, assessed potential metrics for evaluating fuel efficiency. NHTSA found that fuel economy would not be an appropriate metric for medium- and heavy-duty vehicles. Instead, NHTSA chose a metric that considers the amount of fuel consumed when moving a ton of freight (*i.e.,* performing work).[104] This metric, delegated by Congress to NHTSA to formulate, is not precluded by the text of the statute. It is a reasonable way by which to measure fuel efficiency for a program designed to reduce fuel consumption.

[98] Public Law 110–140, 121 Stat. 1492, Section 108. Codified at 49 U.S.C. 32902(k)(2).

[99] 80 FR 40512 (July 13, 2015).

[100] ''. . . the Secretary . . . shall determine in a rulemaking proceeding how to implement a commercial medium- and heavy-duty on-highway vehicle and work truck fuel efficiency program designed to achieve the maximum feasible improvement . . .'' 49 U.S.C. 42902(k)(2).

[101] 49 U.S.C. 32902(k)(3) states that, ''The commercial medium- and heavy-duty on-highway vehicle and work truck fuel economy standard adopted pursuant to this subsection shall provide not less than—(A) 4 full model years of regulatory lead-time; and (B) 3 full model years of regulatory stability.''

[102] ''Program.'' Merriam-Webster (2016 *http://www.merriam-webster.com/dictionary/program* (last accessed July 19, 2016).

[103] 76 FR 57016 (September 15, 2011).

[104] See: 75 FR 74180 (November 30, 2010).

(a) NHTSA's Authority To Regulate Trailers

As contemplated in the Phase 1 proposed and final rules, the agencies proposed standards for trailers in the Phase 2 rulemaking. Because Phase 1 did not include standards for trailers, NHTSA did not discuss its authority for regulating them in the proposed or final rules; that authority is described here.

NHTSA is finalizing fuel efficiency standards applicable to heavy-duty trailers as part of the Phase 2 program. NHTSA received several comments on the proposal relating to the agency's statutory authority to issue standards for trailers as part of the Phase 2 program. In particular, TTMA commented that NHTSA does not have the authority to regulate trailers as part of the medium- and heavy-duty standards. TTMA took issue with NHTSA's use of the National Traffic and Motor Vehicle Safety Act as an aid in defining an undefined term in EISA. Additionally, TTMA stated that EISA's use of GVWR instead of gross combination weight rating (GCWR) to define the vehicles subject to these regulations was intended to exclude trailers from the regulation.

As stated in the proposal, EISA directs NHTSA to ''determine in a rulemaking proceeding how to implement a commercial medium- and heavy-duty on-highway vehicle and work truck fuel efficiency improvement program designed to achieve the maximum feasible improvement . . . .'' [105] EISA defines a commercial medium- and heavy-duty on-highway vehicle to mean ''an on-highway vehicle with a GVWR of 10,000 lbs or more.'' A ''work truck'' is defined as a vehicle between 8,500 and 10,000 lbs GVWR that is not an MDPV. These definitions do not explicitly exclude trailers, in contrast to MDPVs. Because Congress did not act to exclude trailers when defining these terms by GVWRs, despite demonstrating the ability to exclude MDPVs, it is reasonable to interpret the provision to include them.

Both the tractor and the trailer are vehicles subject to regulation by NHTSA in the Phase 2 program. Although EISA does not define the term ''vehicle,'' NHTSA's authority to regulate motor vehicles under its organic statute, the Motor Vehicle Safety Act (''Safety Act''), does. The Safety Act defines a motor vehicle as ''a vehicle driven or drawn by mechanical power and manufactured primarily for use on public streets, roads, and highways. . . .'' [106] NHTSA clearly has authority to regulate trailers under this Act as they are vehicles that are drawn by mechanical power—in this instance, a tractor engine—and NHTSA has exercised that authority numerous times.[107] Given the absence of any apparent contrary intent on the part of Congress in EISA, NHTSA believes it is reasonable to interpret the term ''vehicle'' as used in the EISA definitions to have a similar meaning that includes trailers.

Additionally, it is worth noting that the dictionary definition of ''vehicle'' is ''a machine used to transport goods or persons from one location to another.'' [108] A trailer is a machine designed for the purpose of transporting goods. With these foregoing considerations in mind, NHTSA interprets its authority to regulate commercial medium- and heavy-duty on-highway vehicles, including trailers.

TTMA pointed to language in the Phase 1 NPRM where the agencies stated that GCWR included the weight of a loaded trailer and the vehicle itself. TTMA interprets this language to mean that standards applicable to vehicles defined by GVWR must inherently exclude trailers. The language TTMA cited is a clarification from a footnote in an introductory section describing the heavy-duty trucking industry. This statement was not a statement of NHTSA's legal authority over medium- and heavy-duty vehicles. NHTSA continues to believe a trailer is a vehicle under EISA if its GVWR fits within the definitions in 49 U.S.C. 32901(a), and is therefore subject to NHTSA's applicable fuel efficiency regulations.

Finally, in a comment on the Notice of Data Availability, TTMA stated that because NHTSA's statutory authority instructs the agency to develop a fuel efficiency program for medium- and heavy-duty on-highway vehicles, and trailers themselves do not consume fuel, trailers cannot be regulated for fuel efficiency. The agency disagrees with this assertion. A tractor-trailer is designed for the purpose of holding and transporting goods. While heavy-duty trailers themselves do not consume fuel, they are immobile and inoperative without a tractor providing motive power. Inherently, trailers are designed to be pulled by a tractor, which in turn affects the fuel efficiency of the tractor-trailer as a whole. As previously discussed, both a tractor and trailer are motor vehicles under NHTSA's authority. Therefore it is reasonable to consider all of a tractor-trailer's parts—the engine, the cab-chassis, and the trailer—as parts of a whole. As such they are all parts of a vehicle, and are captured within the scope of NHTSA's statutory authority. As EPA describes above, the tractor and trailer are both incomplete without the other. Neither can fulfill the function of the vehicle without the other. For this reason, and the other reasons stated above, NHTSA interprets its authority to regulate commercial medium- and heavy-duty on-highway vehicles, including tractor-trailers, as encompassing both tractors and trailers.

(b) NHTSA's Authority To Regulate Recreational Vehicles

NHTSA did not regulate recreational vehicles as part of the Phase 1 medium- and heavy-duty fuel efficiency standards, although EPA did regulate them as vocational vehicles for GHG emissions. In the Phase 1 NPRM, NHTSA interpreted ''commercial medium- and heavy duty on-road vehicle'' to mean that recreational vehicles, such as motor homes, were not to be included within the program because recreational vehicles are not commercial. Following comments to the Phase 1 proposal, NHTSA reevaluated its statutory authority and proposed that recreational vehicles be included in the Phase 2 standards, and that early compliance be allowed for manufacturers who want to certify during the Phase 1 period.

The Recreational Vehicle Industry Association (RVIA) and Newell Coach Corporation (Newell) asserted that NHTSA does not have the authority to regulate recreational vehicles (RVs). RVIA and Newell stated that NHTSA's authority under EISA is limited to commercial medium- and heavy-duty vehicles and that RVs are not commercial. RVIA pointed to the fact that EISA gives NHTSA fuel efficiency authority over ''commercial medium- and heavy-duty vehicles'' and ''work trucks,'' the latter of which is not prefaced with the word ''commercial.'' Because of this difference, RVIA argued that NHTSA is ignoring a limitation on its authority—that is, that NHTSA only has authority over medium- and heavy-duty vehicles that are commercial in nature. RVIA stated that RVs are not used for commercial purposes, and are therefore not subject to Phase 2.

NHTSA's authority to regulate medium- and heavy-duty vehicles under EISA extends to ''commercial medium- and heavy-duty on-highway vehicles''

[105] 49 U.S.C. 42902(k)(2).

[106] 49 U.S.C. 30102(a)(6).

[107] See, *e.g.,* 49 CFR 571.106 (Standard No. 106; Brake hoses); 49 CFR 571.108 (Standard No. 108; Lamps, reflective devices, and associated equipment); 49 CFR 571.121 (Standard No. 121; Air brake systems); 49 CFR 571.223 (Standard No. 223; Rear impact guards).

[108] ''Vehicle.'' Merriam-Webster (2016). *http://www.merriam-webster.com/dictionary/vehicle* (last accessed May 20, 2016).

and ''work truck[s].'' [109] If terms in the statute are defined, NHTSA must apply those definitions. Both terms highlighted by RVIA have been defined in EISA, therefore, NHTSA will use their defined meanings. ''Work truck'' means a vehicle that is rated between 8,500 and 10,000 pounds GVWR and is not an MDPV.[110] ''Commercial medium- and heavy-duty on-road highway vehicle'' means an on-highway vehicle with a gross vehicle weight rating (GVWR) of 10,000 pounds or more.[111] Based on the definitions in EISA, recreational vehicles would be regulated as class 2b–8 vocational vehicles. Neither statutory definition requires that those vehicles encompassed be commercial in nature, instead dividing the medium- and heavy-duty segments based on weight. The definitions of ''work truck'' and ''commercial medium- and heavy-duty on-highway vehicles'' collectively encompass the on-highway motor vehicles not covered in the light duty CAFE standards.

RVIA further stated that NHTSA's current fuel efficiency regulations are not consistent with EISA and do not purport to grant NHTSA authority to regulate vehicles simply based on weight. NHTSA's regulations at 49 CFR 523.6 define, by cross-reference the language in 49 U.S.C. 32901(a)(7) and (19), and consistent with the discussion above, include recreational vehicles.

Finally, NHTSA notes that excluding recreational vehicles in Phase 2 could create illogical results, including treating similar vehicles differently, as determinations over whether a given vehicle would be covered by the program would be based upon either its intended or actual use, rather than the actual characteristics of the vehicle. Moreover, including recreational vehicles under NHTSA regulations furthers the agencies' goal of one national program, as EPA regulations will continue to regulate recreational vehicles. NHTSA will allow early compliance for manufacturers that want to certify during the Phase 1 period.

F. Other Issues

In addition to establishing new Phase 2 standards, this document addresses several other issues related to those standards. The agencies are adopting some regulatory provisions related to the Phase 1 program, as well as amendments related to other EPA and NHTSA regulations. These other issues are summarized briefly here and discussed in greater detail in later sections.

(1) Opportunities for Further Oxides of Nitrogen (NO_X) Reductions From Heavy-Duty On-Highway Engines and Vehicles

The EPA has the authority under section 202 of the Clean Air Act to establish, and from time to time revise, emission standards for certain air pollutants emitted from heavy-duty on-highway engines and vehicles. The emission standards that EPA has developed for heavy-duty on-highway engines have become progressively more stringent over the past 40 years, with the most recent NO_X standards for new heavy-duty on-highway engines fully phased in with the 2010 model year. NO_X emissions standards for heavy-duty on-highway engines have contributed significantly to the overall reduction in the national NO_X emissions inventory. Nevertheless, a need for additional NO_X reductions remains, particularly in areas of the country with elevated levels of air pollution. As discussed further below, in response to EPA's responsibilities under the Clean Air Act, the significant comments we received on this topic during the public comment period, the recent publication by the California Air Resources Board (CARB) of its May 2016 Mobile Source Strategy report and Proposed 2016 Strategy for the State implementation Plan [112] and a recent Petition for Rulemaking,[113] EPA plans to further engage with stakeholders after the publication of this Final Rule to discuss the opportunities for developing more stringent federal standards to further reduce the level of NO_X emissions from heavy-duty on-highway engines through a coordinated effort with CARB.

NO_X is one of the major precursors of tropospheric ozone (ozone), exposure to which is associated with a number of adverse respiratory and cardiovascular effects, as described in Section VIII.A.2 below. These effects are particularly pronounced among children, the elderly, and among people with lung disease such as asthma. NO_X is also a major contributor to secondary $PM_{2.5}$ formation, and exposure to $PM_{2.5}$ itself has been linked to a number of adverse health effects (see Section VIII.A.1), such as heart attacks and premature mortality. In addition, NO_2 exposure is linked to asthma exacerbation and possibly to asthma development in children (see Section VIII.A.3). EPA has already adopted many emission control programs that are expected to reduce ambient ozone levels. However, the U.S. Energy Information Administration's AEO 2015 predicts that vehicles miles travelled (VMT) for heavy-duty trucks will increase in the coming years,[114] and even with the implementation of all current state and federal regulations, some of the most populous counties in the United States are expected to have ozone air quality that exceeds the National Ambient Air Quality Standards (NAAQS) into the future. As of April 22, 2016, there were 44 ozone nonattainment areas for the 2008 ozone NAAQS composed of 216 full or partial counties, with a population of more than 120 million. These nonattainment areas are dispersed across the country, with counties in the west, northeastern United States, Texas, and several Great Lakes states. The geographic diversity of this problem necessitates action at the national level. In California, the San Joaquin Valley and the South Coast Air Basin are highly-populated areas classified as ''extreme nonattainment'' for the 2008 8-hour ozone standard, with an attainment demonstration deadline of 2031 (one year in advance of the actual 2032 attainment date). In addition, EPA lowered the level of the primary and secondary NAAQS for the 8-hour standards from 75 ppb to 70 ppb in 2015 (2015 ozone NAAQS),[115] with plans to finalize nonattainment designations for the 2015 ozone NAAQS in October 2017. Further NO_X reductions would provide reductions in ambient ozone levels, helping to prevent adverse health impacts associated with ozone exposure and assisting states and local areas in attaining and maintaining the applicable ozone NAAQS. Reductions in NO_X emissions would also improve air quality and provide

[109] 49 U.S.C. 42902(k)(2).

[110] 49 U.S.C. 42901(a)(19).

[111] 49 U.S.C. 42901(a)(7).

[112] See ''Mobile Source Strategy,'' May 16, 2016 from CARB. Available at: *http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm* and ''Proposed 2016 State Strategy for the State Implementation Plan,'' May 17, 2016 from CARB. Available at *http://www.arb.ca.gov/planning/sip/2016sip/2016sip.htm*.

[113] EPA received a Petition for Rulemaking to adopt new NO_X emission standards for on-road heavy-duty trucks and engines on June 3, 2016 from the South Coast Air Quality Management District, the Arizona Pima County Department of Environmental Quality, the Bay Area Air Quality Management District, the Connecticut Department of Energy and Environmental Protection Agency, the Delaware Department of Energy and Environmental Protection, the Nevada Washoe County Health District, the New Hampshire Department of Environmental Services, the New York City Department of Environmental Protection, the Akron Regional Air Quality Management District of Akron, Ohio, the Washington State Department of Ecology, and the Puget Sound Clean Air Agency.

[114] US Energy Information Administration. Annual Energy Outlook 2015. April 2015. Page E–8. *http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf*.

[115] 80 FR 65292 (Oct. 26, 2015).

public health and welfare benefits throughout the country by (1) reducing PM formed by reactions of NO_X in the atmosphere; (2) reducing concentrations of the criteria pollutant NO_2; (3) reducing nitrogen deposition to sensitive environments; and (4) improving visibility.

In the past year, EPA has received requests from several state and local air quality districts and other organizations asking that EPA establish more stringent NO_X standards for heavy-duty on-highway engines to help reduce the public's exposure to air pollution. In its comments, CARB estimated that heavy-duty on-highway vehicles currently contribute about one-third of all NO_X emissions in California. In order to achieve the 2008 ozone NAAQS, California has estimated that the state's South Coast Air Basin will need an 80 percent reduction in NO_X emissions by 2031. California has the unique ability among states to adopt its own separate new motor engine and vehicle emission standards under section 209 of the CAA; however, CARB commented that EPA action to establish a new federal low-NO_X standard for heavy-duty trucks is critical, since California standards alone are not sufficient to demonstrate compliance with either the 2008 ozone NAAQS or the 2015, even more stringent ozone NAAQS. CARB has developed a comprehensive mobile source strategy which for heavy-duty on-highway vehicles includes: Lowering the emissions from the in-use fleet; establishing more stringent NO_X standards for new engines; and accelerating the deployment of zero and near-zero emissions technology.[116] In September of 2015, CARB published a draft of this strategy, *Mobile Source Strategy Discussion Draft,* after which CARB held a public workshop and provided opportunity for public comment. On May 16, 2016, CARB issued a final *Mobile Source Strategy* report.[117] In this report, CARB provides a comprehensive strategy plan for the future of mobile sources and goods movement in the State of California for how mobile sources in California can meet air quality and climate goals over the next fifteen years. Among the many programs discussed are plans for a future on-highway heavy-duty engine and vehicle NO_X control regulatory program for new products with implementation beginning in 2024. CARB states ''*The need for timely action by U.S. EPA to establish more stringent engine performance standards in collaboration with California efforts is essential. About 60 percent of total heavy-duty truck VMT in the South Coast on any given day is accrued by trucks purchased outside of California, and are exempt from California standards. U.S. EPA action to establish a federal low-NO_X standard for trucks is critical.*'' CARB lays out a time line for a California specific action for new highway heavy-duty NO_X standards with CARB action in 2017–2019 that would lead to new standards that could begin with the model year 2023. CARB also requests that the U.S. EPA work on a Federal rulemaking action in the 2017–2019 time frame which could result in standards that could begin with the model year 2024. The CARB Mobile Source Strategy document also states ''Due to the preponderance of interstate trucking's contribution to in-state VMT, federal action would be far more effective at reducing in-state emissions than a California-only standard. However, California is prepared to develop a California-only standard, if needed, to meet federal attainment targets.'' CARB goes on to state ''[C]ARB will begin development of new heavy-duty low NO_X emission standard in 2017 with Board action expected in 2019. ARB may also petition U.S. EPA in 2016 to establish new federal heavy-duty engine emission standards . . . . If U.S. EPA begins the regulatory development process for a new federal heavy-duty emission standard by 2017, ARB will coordinate its regulatory development efforts with the federal regulation.'' On May 17, 2016, CARB published its ''Proposed 2016 State Strategy for the State Implementation Plan.'' [118] This document contains CARB staff's proposed strategy to attain the health-based federal air quality standards over the next fifteen years. With respect to future on-highway heavy-duty NO_X standards, the proposed State Implementation Plan is fully consistent with the information published by CARB in the Mobile Source Strategy report. EPA intends to work with CARB to consider the development of a new harmonized Federal and California program that would apply lower NO_X emissions standards at the national level to heavy-duty on-highway engines and vehicles.

In addition to CARB, EPA received compelling letters and comments from the National Association of Clean Air Agencies, the Northeast States for Coordinated Air Use Management, the Ozone Transport Commission, and the South Coast Air Quality Management District explaining the critical and urgent need to reduce NO_X emissions that significantly contribute to ozone and fine particulate air quality problems in their represented areas. The comments describe the challenges many areas face in meeting both the 2008 and recently strengthened 2015 ozone NAAQS. These organizations point to the significant contribution of heavy-duty vehicles to NO_X emissions in their areas, and call upon EPA to begin a rulemaking to require further NO_X controls for the heavy-duty sector as soon as possible. Commenters such as the American Lung Association, Environmental Defense Fund, Union of Concerned Scientists, the California Interfaith Power and Light, Coalition for Clean Air/California Cleaner Freight Coalition, and the Moving Forward Network similarly describe the air quality and public health need for NO_X reductions and request EPA to lower NO_X emissions standards for heavy-duty vehicles. Taken as a whole, the numerous comments, the expected increase in heavy-duty truck VMT, and the fact that ozone challenges will remain across the country demonstrate the critical need for more stringent nationwide NO_X emissions standards. Such standards are vital to improving air quality nationwide and reducing public health effects associated with exposure to ozone and secondary $PM_{2.5}$, especially for vulnerable populations and in highly impacted regions.

On June 3, 2016, the EPA received a Petition for Rulemaking from the South Coast Air Quality Management District (California), the Pima County Department of Environmental Quality (Arizona), the Bay Area Air Quality Management District (California), the Connecticut Department of Energy and Environmental Protection Agency, the Delaware Department of Energy and Environmental Protection, the Washoe County Health District (Nevada), the New Hampshire Department of Environmental Services, the New York City Department of Environmental Protection, the Akron Regional Air Quality Management District (Ohio), the Washington State Department of Ecology, and the Puget Sound Clean Air

[116] To foster the development of the next generation of lower NO_X engines, in 2013, CARB adopted optional low-NO_X heavy-duty engine standards ranging from 0.10 down to 0.02 grams per brake horsepower-hour (g/bhp-hr). CARB also funded over $1 million to a low-$NO_X$ engine research and demonstration project at Southwest Research Institute (SwRI).

[117] See ''Mobile Source Strategy,'' May 16, 2016 from CARB. Available at: *http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm.*

[118] See ''Proposed 2016 State Strategy for the State Implementation Plan,'' May 17, 2016 from CARB. Available at *http://www.arb.ca.gov/planning/sip/2016sip/2016sip.htm.*

Agency (Washington).[119] [120] In a June 15, 2016 letter to EPA, the Commonwealth of Massachusetts also joined this petition. On June 22, 2016, the San Joaquin Valley Air Pollution Control District (California) also submitted a petition for rulemaking to EPA.[121] In these Petitions, the Petitioners request that EPA establish a new, lower NO_X emission standard for on-road heavy-duty engines. The Petitioners request that EPA implement a new standard by January 1, 2022, and that EPA establish this new standard through a Final Rulemaking issued by December 31, 2017. EPA is not formally responding to this Petition in this Final Rule, but we will do so in a future action. In the petitions, the Petitioners include a detailed discussion of their views and underlying data regarding the need for large scale reduction in NO_X emissions from heavy-duty engines, why they believe new standards can be achieved, and their legal views on EPA's responsibilities under the Clean Air Act.

Since the establishment of the current heavy-duty on-highway standards in January of 2001,[122] there has been continued progress in emissions control technology. EPA and CARB are currently investing in research to evaluate opportunities for further NO_X reductions from heavy-duty on-highway vehicles and engines. Programs and research underway at CARB, as well as a significant body of work in the technical literature, indicate that reducing NO_X emissions significantly below the current on-highway standard of 0.20 grams per brake horsepower-hour (g/bhp-hr) is potentially feasible.[123] [124] Opportunities for additional NO_X reductions include reducing emissions over cold start operation as well as low-speed, low-load off-cycle operation. Reductions are being accomplished through the use of improved engine management, advanced aftertreatment technologies (improvements in SCR catalyst design/formulation), catalyst positioning, aftertreatment thermal management, and heated diesel exhaust fluid dosing. At the same time, the effect of these new technologies on cost and GHG emissions is being carefully evaluated,[124] since it is important that any future NO_X control technologies be considered in the context of the final Phase 2 GHG standards. During the Phase 2 program public comment period, EPA received some comments stressing the need for careful evaluation of emerging NO_X control technologies and urging EPA to consider the relationship between CO_2 and NO_X before setting lower NO_X standards (commenters include American Trucking Association, Caterpillar, Daimler Trucks North America, Navistar Inc., PACCAR Inc., Volvo Group, Truck and Engine Manufacturers Association, Diesel Technology Forum, National Association of Manufacturers, and National Automobile Dealers Association). EPA also received comments pointing to advances in NO_X emission control technologies that would lower NO_X without reducing engine efficiency (commenters include Advanced Engine Systems Institute, Clean Energy, Manufacturers of Emission Controls Association, and Union of Concerned Scientists). EPA will continue to evaluate both opportunities and challenges associated with lowering NO_X emissions from the current standards, and over the coming months we intend to engage with many stakeholders as we develop our response to the June 2016 Petitions for Rulemaking discussed above.

EPA believes the opportunity exists to develop, in close coordination with CARB and other stakeholders, a new, harmonized national NO_X reduction strategy for heavy-duty on-highway engines which could include the following:

- Substantially lower NO_X emission standards;
- Improvements to emissions warranties;
- Consideration of longer useful life, reflecting actual in-use activity;
- Consideration of rebuilding/remanufacturing practices;
- Updated certification and in-use testing protocols;
- Incentives to encourage the transition to next-generation cleaner technologies as soon as possible;
- Improvements to test procedures and test cycles to ensure emission reductions occur in the real-world, not only over the applicable certification test cycles.

Based on the air quality need, the requests described above, the continued progress in emissions control technology, and the June 2016 petitions for rulemaking, EPA plans to engage with a range of stakeholders to discuss the opportunities for developing more stringent federal standards to further reduce the level of NO_X emissions from heavy-duty on-highway engines, after the publication of this Final Rule. Recognizing the benefits of a nationally harmonized program and given California's unique ability under CAA section 209 to be allowed to regulate new motor vehicle and engine emission standards if certain criteria are met, EPA intends to work closely with CARB on this effort. EPA also intends to engage with truck and engine manufacturers, suppliers, state air quality agencies, NGOs, labor, the trucking industry, and the Petitioners over the next several months as we develop our formal response to the June 2016 Petitions for Rulemaking.

(2) Issues Related to Phase 2

(a) Natural Gas Engines and Vehicles

This combined rulemaking by EPA and NHTSA is designed to regulate two separate characteristics of heavy duty vehicles and engines: GHGs and fuel consumption. In the case of diesel or gasoline powered vehicles, there is a one-to-one relationship between these two characteristics. For alternatively fueled vehicles, which use no petroleum, the situation is different. For example, a natural gas vehicle that achieves approximately the same fuel efficiency as a diesel powered vehicle will emit 20 percent less CO_2; and a natural gas vehicle with the same fuel efficiency as a gasoline vehicle will emit 30 percent less CO_2. Yet natural gas vehicles consume no petroleum. The agencies are continuing Phase 1 approach, which the agencies have previously concluded balances these facts by applying the gasoline and diesel CO_2 standards to natural gas engines based on the engine type of the natural gas engine. Fuel consumption for these vehicles is then calculated according to their tailpipe CO_2 emissions. In essence, this applies a one-to-one relationship between fuel efficiency and tailpipe CO_2 emissions for all vehicles, including natural gas vehicles. The agencies determined that this approach will likely create a small balanced incentive for natural gas use. In other words, it created a small incentive for the use of natural gas engines that appropriately balanced concerns about the climate impact methane emissions against other factors such as the energy security

[119] *http://4cleanair.org/sites/default/files/resources/HD_Ultra-Low-NO$_X$_Petition_to_EPA-060316.pdf.*

[120] *http://4cleanair.org/sites/default/files/resources/Petition_Attachments-Ultra-Low-NO$_X$_Petition_to_EPA-060316_0.pdf.*

[121] *http://www.valleyair.org/recent_news/Media_releases/2016/PR-District-Petitions-Federal-Government-06-22-16.pdf.*

[122] 66 FR 5002 (January 18, 2001).

[123] See CARB's September 2015 *Draft Technology Assessment: Lower NO_X Heavy-Duty Diesel Engines,* and *Draft Technology Assessment: Low Emission Natural Gas and Other Alternative Fuel Heavy-Duty Engines.*

[124] *http://www.arb.ca.gov/research/veh-emissions/low-nox/low-nox.htm*, 4/26/16. This low NO_X study is in the process of selecting the emission reduction systems for final testing and it is expected that this demonstration program will be complete by the end of 2016.

benefits of using domestic natural gas. See 76 FR 57123.

(b) Alternative Refrigerants

In addition to use of low-leak components in air conditioning system design, manufacturers can also decrease the global warming impact of any refrigerant leakage emissions by adopting systems that use alternative, lower global warming potential (GWP) refrigerants, to replace the refrigerant most commonly used today, HFC–134a (R–134a). HFC–134a is a potent greenhouse gas with a GWP 1,430 times greater than that of CO_2.

Under EPA's Significant New Alternatives Policy (SNAP) Program,[125] EPA has found acceptable, subject to use conditions, three alternative refrigerants that have significantly lower GWPs than HFC–134a for use in A/C systems in newly manufactured *light-duty vehicles:* HFC–152a, CO_2 (R–744), and HFO–1234yf.[126] HFC–152a has a GWP of 124, HFO–1234yf has a GWP of 4, and CO_2 (by definition) has a GWP of 1, as compared to HFC–134a which has a GWP of 1,430.[127] CO_2 is nonflammable, while HFO–1234yf and HFC–152a are flammable. All three are subject to use conditions requiring labeling and the use of unique fittings, and where appropriate, mitigating flammability and toxicity. Currently, the SNAP listing for HFO–1234yf is limited to newly manufactured A/C systems in light-duty vehicles, whereas HFC–152a and CO_2 have been found acceptable for all motor vehicle air conditioning applications, including heavy-duty vehicles.

None of these alternative refrigerants can simply be ''dropped'' into existing HFC–134a air conditioning systems. In order to account for the unique properties of each refrigerant and address use conditions required under SNAP, changes to the systems will be necessary. Typically these changes will need to occur during a vehicle redesign cycle but can also occur during a refresh. For example, because CO_2, when used as a refrigerant, is physically and thermodynamically very different from HFC–134a and operates at much higher pressures, a transition to this refrigerant would require significant hardware changes. A transition to A/C systems designed for HFO–1234yf, which is more thermodynamically similar to HFC–134a than is CO_2, requires less significant hardware changes that typically include installation of a thermal expansion valve and can potentially require resized condensers and evaporators, as well as changes in other components. In addition, vehicle assembly plants require re-tooling in order to handle new refrigerants safely. Thus a change in A/C refrigerants requires significant engineering, planning, and manufacturing investments.

EPA is not aware of any significant development of A/C systems designed to use alternative refrigerants in heavy-duty vehicles.[128] However, all three lower GWP alternatives are in use or under various stages of development for use in LD vehicles. Of these three refrigerants, most manufacturers of LD vehicles have identified HFO–1234yf as the most likely refrigerant to be used in that application. For that reason, EPA anticipates that HFO–1234yf will be a primary candidate for refrigerant substitution in the HD market in the future if it is listed as an acceptable substitute under SNAP for HD A/C applications.

As mentioned above, EPA has listed as acceptable, subject to use conditions, two lower-GWP refrigerants, R–744 (CO_2) and HFC–152a, for use in HD vehicles. On April 18, 2016, EPA also proposed to list HFO–1234yf as acceptable, subject to use conditions, in A/C systems for newly manufactured MDPVs, HD pickup trucks, and complete HD vans (81 FR 22810). In that action, EPA proposed to list HFO–1234yf as acceptable, subject to use conditions, for those vehicle types for which human health and environmental risk could be assessed using the currently available risk assessments and analysis on LD vehicles. Also in that action, EPA requested ''information on development of HFO–1234yf MVAC systems for other HD vehicle types or off-road vehicles, or plans to develop these systems in the future.'' EPA also stated ''This information may be used to inform a future listing'' (81 FR 22868).

In another rulemaking action under the SNAP program, on July 20, 2015, EPA published a final rule (80 FR 42870) that will change the listing status of HFC–134a to unacceptable for use in newly manufactured LD motor vehicles beginning in MY 2021 (except as allowed under a narrowed use limit for use in newly manufactured LD vehicles destined for use in countries that do not have infrastructure in place for servicing with other acceptable refrigerants through MY 2025). In that same rule, EPA listed the refrigerant blends SP34E, R–426A, R–416A, R–406A, R–414A, R–414B, HCFC Blend Delta, Freeze 12, GHG–X5, and HCFC Blend Lambda as unacceptable for use in newly manufactured light-duty vehicles beginning in MY 2017. EPA's decisions were based on the availability of other substitutes that pose less overall risk to human health and the environment, when used in accordance with required use conditions. Neither the April 2016 proposed rule nor the July 2015 final rule consider a change of listing status for HFC–134a in HD vehicles.

LD vehicle manufacturers are currently making investments in systems designed for lower-GWP refrigerants, both domestically and on a global basis. In support of the LD GHG rule, EPA projected a full transition of LD vehicles to lower-GWP alternatives in the United States by MY 2021. We expect the costs of transitioning to decrease over time as alternative refrigerants are adopted across all LD vehicles and trucks, in part due to increased availability of components and the continuing increases in refrigerant production capacity, as well as knowledge gained through experience. As lower-GWP alternatives become widely used in LD vehicles, some HD vehicle manufacturers may wish to also transition their vehicles. Transitioning could be advantageous for a variety of reasons, including platform standardization and company environmental stewardship policies.

In the proposal for this Phase 2 HD rule, EPA proposed another action related to alternative refrigerants. EPA proposed to allow a manufacturer to be ''deemed to comply'' with the leakage standard if its A/C system used a refrigerant other than HFC–134a that was both listed as an acceptable substitute refrigerant for heavy-duty A/C systems under SNAP, and was identified in the LD GHG regulations at 40 CFR 86.1867–12(e). 80 FR 40172. By slightly reducing the regulatory burden of compliance with the leakage standard for a manufacturer that used an alternative refrigerant, the ''deemed to comply'' provision was intended to provide a modest incentive for the use of such refrigerants. There were comments in support of this approach,

[125] Section 612(c) of the Clean Air Act requires EPA to review substitutes for class I and class II ozone-depleting substances and to determine whether such substitutes pose lower risk than other available alternatives. EPA is also required to publish lists of substitutes that it determines are acceptable and those it determines are unacceptable. See *http://www3.epa.gov/ozone/snap/refrigerants/lists/index.html*, last accessed on March 5, 2015.

[126] Listed at 40 CFR part 82, subpart G.

[127] GWP values cited in this final action are from the IPCC Fourth Assessment Report (AR4) unless stated otherwise. Where no GWP is listed in AR4, GWP values are determined consistent with the calculations and analysis presented in AR4 and referenced materials.

[128] To the extent that some manufacturers produce HD pickups and vans on the same production lines or in the same facilities as LD vehicles, some A/C system technology commonality between the two vehicle classes may be developing.

including from Honeywell and Chemours, both of which manufacture HFO–1234yf.

For several reasons, EPA has reconsidered the proposed ''deemed to comply'' provision for this rule, and instead, the Phase 2 program retains the Phase 1 requirement that manufacturers attest that they are using low-leak components, regardless of the refrigerant they use. CARB and several NGO commenters expressed concerns about the proposed ''deemed to comply'' provision, primarily citing the potential for manufacturers to revert to less leak-tight components if they were no longer required to attest to the use of low-leak A/C system components because they used a lower-GWP refrigerant. In general, we expect that the progress LD vehicle manufacturers are making toward more leak-tight A/C systems will continue and that this progress will transfer to HD A/C systems. Still, we agree that continued improvements in low-leak performance HD vehicles is an important goal, and that continuing the Phase 1 leakage requirements in the Phase 2 program should discourage manufacturers from reverting to higher-leak and potentially less expensive components. It is also important to note that there is no ''deemed to comply'' option in the parallel LD–GHG program—manufacturers must attest to meeting the leakage standard. There is no compelling reason to have a different regime for heavy duty applications.

Although leakage of lower-GWP refrigerants is of less concern from a climate perspective than leakage of higher GWP refrigerants, we also agree with several commenters that expressed a concern related to the servicing of lower-GWP systems with higher-GWP refrigerants in the aftermarket. We agree that this could result due to factors such as price differentials between aftermarket refrigerants. However, as is the case for Phase 1, as a part of certification, HD manufacturers will attest both to the use of low-leak components as well as to the specific refrigerant used. Thus, in the future, a manufacturer wishing to certify a vehicle with an A/C system designed for an alternative refrigerant will attest to the use of that specific refrigerant. In that situation, any end-user servicing and recharging that A/C system with any other refrigerant would be considered tampering with an emission-related component under Title II of the CAA. For example, recharging an A/C system certified to use a lower-GWP refrigerant, such as HFO–1234yf, with any other refrigerant, including but not limited to HFC–134a, would be considered a violation of Title II tampering provisions.

At the same time, EPA does not believe that finalizing the ''deemed to comply'' provision would have had an impact on any future transition of the HD industry to alternative refrigerants. As discussed above, two lower-GWP refrigerants are already acceptable for use in HD vehicles, and EPA has proposed to list HFO–1234yf as acceptable, subject to use conditions, for limited HD vehicle types. As also discussed above, and especially in light of the rapid expansion of alternative refrigerants that has been occurring in the LD vehicle market, similar trends may develop in the HD vehicle market, regardless of EPA's action regarding leakage of alternative refrigerants in this final rule.

(c) Small Business Issues

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. See generally 5 U.S.C. 601–612. The RFA analysis is discussed in Section XIV.

Pursuant to section 609(b) of the RFA, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), EPA also conducted outreach to small entities and convened a Small Business Advocacy Review Panel to obtain advice and recommendations of representatives of the small entities that potentially will be subject to the rule's requirements. Consistent with the RFA/SBREFA requirements, the Panel evaluated the assembled materials and small-entity comments on issues related to elements of the Initial Regulatory Flexibility Analysis (IRFA). A copy of the Panel Report was included in the docket for this rule.

The agencies previously determined that the Phase 2 regulations could potentially have a significant economic impact on small entities. Specifically, the agencies identified four categories of directly regulated small businesses that could be impacted:

- Trailer Manufacturers
- Alternative Fuel Converters
- Vocational Chassis Manufacturers
- Glider Vehicle [129] Assemblers

To minimize these impacts the agencies are adopting certain regulatory flexibilities—both general and category-specific. In general, we are delaying new requirements for EPA GHG emission standards by one initial year and simplifying certification requirements for small businesses. Even with this one year delay, small businesses will be required to comply with EPA's standards before NHTSA's fuel efficiency standards are mandatory. Because of this timing, compliance with NHTSA's regulations will not be delayed, as small business manufacturers will be accommodated through EPA's initial one year delay. The agencies are also providing the following specific relief:

- *Trailers:* Adopting simpler requirements for non-box trailers, which are more likely to be manufactured by small businesses; reduced reliance on emission averaging; and making third-party testing easier for certification.
- *Alternative Fuel Converters:* Omitting recertification of a converted vehicle when the engine is converted and certified; reduced N_2O testing; and simplified onboard diagnostics and delaying required compliance with each new standard by one model year.
- *Vocational Chassis:* Less stringent standards for certain vehicle categories; opportunity to generate credits under the Phase 1 program.
- *Glider Vehicle Assemblers:* [130] Exempting existing small businesses, but limiting the small business exemption to a capped level of annual production (production in excess of the capped amount will be allowed, but subject to all otherwise applicable requirements including the Phase 2 standards). Providing additional flexibility for newer engines.

These flexibilities are described in more detail in Section XIV, in RIA Section 12 and in the Panel Report. Flexibilities specific to glider vehicle assemblers are described in Section XIII.

(d) Confidentiality of Test Results and GEM Inputs

The agencies received mixed comments regarding the question of whether GEM inputs should be made available to public. Some commenters supported making this information available, while others thought it should

[129] Vehicles produced by installing a used engine into a new chassis are commonly referred to as ''gliders,'' ''glider kits,'' or ''glider vehicles.'' See Section I.E.i and XIII.B.

[130] EPA is amending its rules applicable to engines installed in glider kits, which will affect emission standards not only for GHGs but for criteria pollutants as well. EPA is also clarifying its requirements for certification and revising its definitions for glider kit and glider vehicle manufacturers. NHTSA is not including glider vehicles under its Phase 2 fuel consumption standards. See Section XIII.B.

be protected as confidential business information (CBI). In accordance with Federal statutes, EPA does not release information from certification applications (or other compliance reports) that we determine to be CBI under 40 CFR part 2. Consistent with section 114(c) of the CAA, EPA does not consider emission test results to be CBI after introduction into commerce of the certified engine or vehicle. (However, we have generally treated test results as protected before the introduction into commerce date). EPA has not yet made a final determination for Phase 1 or Phase 2 certification test results. Nevertheless, at this time we expect to continue this policy and consider it likely that we would not treat any test results or other GEM inputs as CBI after the introduction into commerce date as identified by the manufacturer.

With regard to NHTSA's treatment of confidential business information, manufacturers must submit a request for confidentiality with each electronic submission specifying any part of the information or data in a report that it believes should be withheld from public disclosure as trade secret or other confidential business information. A form is available through the NHTSA Web site to request confidentiality. NHTSA does not consider manufacturers to continue to have a business case for protecting pre-model report data after the vehicles contained within that report have been introduced into commerce.

(e) Delegated Assembly and Secondary Manufacturers

In EPA's existing regulations (40 CFR 1068.261), we allow engine manufacturers to sell or ship engines that are missing certain emission-related components if those components will be installed by the vehicle manufacturer. These provisions already apply to Phase 1 vehicles as well, providing a similar allowance for *vehicle* manufacturers to sell or ship *vehicles* that are missing certain emission-related components if those components will be installed by a *secondary* vehicle manufacturer. See section 1037.620. EPA has found this provision to work well and is finalizing certain amendments in this rule. See 40 CFR 1037.621. Under the amended rule, as conditions of this allowance, manufacturers will be required to:

- Have a contractual obligation with the secondary manufacturer to complete the assembly properly and provide instructions about how to do so
- Keep records to demonstrate compliance
- Apply a temporary label to the incomplete vehicles
- Take other reasonable steps to ensure the assembly is completed properly
- Describe in its application for certification how it will use this allowance

Under delegated assembly, it is the upstream manufacturer that holds the certificate and assumes primary responsibility for all compliance requirements. Our experience applying this approach has shown that holding the upstream manufacturer responsible ensures that they will exercise due diligence throughout the process.

EPA proposed to apply this new section broadly. However, commenters raised valid questions about whether it is necessary to apply this formal process as broadly as proposed. In response, we have reconsidered the proposed approach and have determined that it would be appropriate to allow a less formal process with components for which market forces will make it unlikely that a secondary manufacturer would not complete assembly properly. In those cases, the certifying manufacturers will be required to provide sufficiently detailed installation instructions to the secondary manufacturers, who would then be obligated to complete assembly properly before the vehicles are delivered to the ultimate purchasers.

One example of a case for which market forces could ensure that assembly is completed properly would be air conditioning leakage requirements. Purchasers will have the expectation that the systems will not leak, and a secondary manufacturer should have no incentive to not follow the certifying manufacturer's instructions.

As revised, § 1037.621 will require the formal delegated assembly process for the following technologies if they are part of the OEM's certified configuration but not shipped with the vehicle:

- Auxiliary power units
- Aerodynamic devices
- Hybrid components
- Natural gas fuel tanks

Certificate holders will remain responsible for other certified components, but will not automatically be required to comply with the formal delegated assembly requirements. That determination will be made case-by-case as part of the certification process. We are also explicitly making the flexibility in 40 CFR 1037.621 available for HD pickups and vans certified to the standards in 40 CFR part 86. As is currently specified in 40 CFR 1068.261, EPA will retain the authority to apply additional necessary conditions (at the time of certification) to the allowance to delegate assembly of emission to secondary manufacturers (when emission control equipment is not shipped with the vehicle to the secondary manufacturer, as just noted). In particular, we would likely apply such additional conditions for manufacturers that we determine to have previously not completed assembly properly. Issues of delegated assembly are addressed in more detail in Section 1.4.4 of the RTC.

(f) Engine/Vehicle Useful Life

We received comment on what policies we should adopt to address the situation where the engine and the vehicle are subject to emission standards over different useful-life periods. For example, a medium heavy-duty engine may power vehicles in weight classes ranging from 2b to 8, with correspondingly different regulatory useful lives for those vehicles. As provided in 40 CFR 1037.140 of the final regulations, we have structured the vehicle regulations to generally apply the same useful life for the vehicle that applies for the engines. However, these regulations also allow vehicle manufacturers to certify their vehicles to longer useful lives. The agencies see no problem with allowing vehicles to have longer useful lives than the engines.

(g) Compliance Reports

The agencies received comment on the NPRM from two environmental organizations requesting that the agencies make available to the public data and information that would enable the public to track trends in technology sales over time, as well as track company-specific compliance data. The commenters suggested that this should include an agency publication of an annual compliance report for the Heavy-duty Phase 2 program. The commenters requested this information to allow all stakeholders to see how individual companies, as well as the industry overall, were performing relative to their compliance obligations (see comments from ACEEE and NRDC).

The agencies agree with this comment. In the context of the light-duty vehicle GHG standards, EPA has already published four annual compliance reports which has made available to the public detailed information regarding both how individual light-duty vehicle companies have been meeting their compliance obligations, as well as summary information at the light-duty fleet level. NHTSA makes the up-to-date information on the light-duty fuel economy program available through its

CAFE Public Information Center (*http://www.nhtsa.gov/CAFE_PIC/CAFE_PIC_Home.htm*). Information includes manufacturer and overall fleet standards and CAFE performance, credit status, and civil penalty status. This information has been helpful to increase transparency to all stakeholders and to allow the public to see how companies are progressing from one year to the next with respect to their compliance requirements. It is EPA's intention to publish a similar annual compliance report for the heavy duty GHG program, covering both the existing Phase 1 program, as well as the Phase 2 standards contained in this final rule. It is NHTSA's intention to expand the Public Information Center to include the medium- and heavy-duty fuel efficiency program and to make up-to-date information collected in the heavy-duty fuel efficiency compliance process available publicly. Both the EPA and NHTSA compliance reports will provide available information at the vehicle subclass level for each of the four vehicle categories (*i.e.* Tractors, Trailers, Vocational, and Heavy-Duty Pickups and Vans), and EPA will provide available information for the other GHG standards, such as N_2O and refrigerant leak detection standards. Prior to issuing the compliance reports, EPA and NHTSA will work with regulated manufacturers to reconcile concerns over the release of claimed confidential business information, consistent with 40 CFR part 2 and 49 CFR 512.

(3) Life Cycle Emissions

The agencies received many comments expressing concerns about establishing the GHG and fuel consumption standards as tailpipe standards that do not account for upstream emissions or other life cycle impacts. However, many other commenters supported this approach. Comments specifically related to alternative fuels or electric vehicles are addressed in Section I.C.(1)(d) and in Section XI.B. This section addresses the issue more broadly.

As discussed below, the agencies do not see how we could accurately account for life cycle emissions in our vehicle standards, nor have commenters shown that such an accounting is needed. In addition, NHTSA has already noted that the fuel efficiency standards are necessarily tailpipe-based, and that a lifecycle approach would likely render it impossible to harmonize the fuel efficiency and GHG emission standards, to the great detriment of our goal of achieving a national, harmonized program. See 76 FR 57125.

It is also worth noting that EPA's engine and vehicle emission standards and NHTSA's vehicle fuel consumption standards (including those for light-duty vehicles) have been in place for decades as tailpipe standards. The agencies find no reasonable basis in the comments or elsewhere to change fundamentally from this longstanding approach.

Although the final standards do not account for life cycle emissions, the agencies have estimated the upstream emission impact of reducing fuel consumption for heavy-duty vehicles. As shown in Section VII and VIII, these upstream emission reductions are significant and worth estimating, even with some uncertainty. However, this analysis would not be a sufficient basis for inclusion in the standards themselves.

(a) Challenges for Addressing Life Cycle Emissions With Vehicle Standards

Commenters supporting accounting for life cycle emissions generally did so in the context of one or more specific technologies. However, the agencies cannot accurately address life-cycle emissions on a technology specific basis at this time for two reasons:

- We lack data to address each technology, and see no path to selectively apply a life cycle analysis to some technologies, but not to others.
- Actual life cycle emissions are dependent on factors outside the scope of the rulemaking that may change in the future.

With respect to the first reason, even if we were able to accurately and fully account for life cycle impacts of one technology (such as weight reduction), this would not allow us to address life cycle emissions for other technologies. For example, how would the agencies address potential differences in life cycle emissions for shifting from a manual transmission to and AMT, or the life cycle emissions of aerodynamic fairings? If we cannot factor in life cycle impacts for all technologies, how would we do it for weight reductions? Given the complexity of these rules and the number of different technologies involved, we see no way to treat the technologies equitably. Commenters do not provide the information necessary to address this challenge, nor are the agencies aware of such information.

The second reason is just as problematic. This rulemaking is setting standards for vehicles under specific statutory provisions. It is not regulating manufacturing processes, distribution practices, or the locations of manufacturing facilities. And yet each of these factors could impact life cycle emissions. So while we could take a snapshot of life cycle emissions at this point in time for specific manufacturers, it may or may not have any relation to life cycle emissions in 2027, or for other manufacturers. Consider, for example, two component manufacturers: One that produces its components near the vehicle assembly plant, and relies on natural gas to power its factory; and a second that is located overseas and relies on coal-fired power. How would the agencies equitably (or even non-arbitrarily) factor in these differences without regulating these processes? To the extent commenters provided any information on life cycle impacts, they did not address this challenge.

(b) Need for Life Cycle Consideration in the Standards

The agencies acknowledge that a full and accurate accounting of life cycle emissions (if it were possible) could potentially make the Phase 2 program marginally better. However, we do not agree that this is an issue of fundamental importance. While some commenters submitted estimates of the importance of life cycle emissions for light-duty vehicles, life cycle emissions are less important for heavy-duty vehicles. Consider, for example, the difference between a passenger car and a heavy-duty tractor. If the passenger car achieves 40 mile per gallon and travels 150,000 miles in its life, it would consume less than 4,000 gallons of fuel in its life. On the other hand, a tractor that achieves 8 miles per gallon and travels 1,000,000 miles would consume 125,000 gallons of fuel in its life, or more than 30 times the fuel of the passenger car. Commenters provide no basis to assume the energy consumption associated with tractor production would be 30 times that of the production of a passenger car.

(4) Amendments to the Phase 1 Program

The agencies are revising some test procedures and compliance provisions used for Phase 1. These changes are described in Section XII. This includes both amendments specific to Phase 1, as well as amendments that apply more broadly than Phase 1, such as the revisions to the delegated assembly provisions. As a drafting matter, EPA notes that we are moving the GHG standards for Class 2b and 3 pickups and vans from 40 CFR 1037.104 to 40 CFR 86.1819–14.

NHTSA is also amending 49 CFR part 535 to make technical corrections to its Phase 1 program to better align with EPA's compliance approach, standards and CO_2 performance results. In general, these changes are intended to improve the regulatory experience for regulated parties and also reduce agency administrative burden. More specifically, NHTSA is changing the rounding of its standards and performance values to have more significant digits. Increasing the number of significant digits for values used for compliance with NHTSA standards reduces differences in credits generated and overall credit balances for the EPA and NHTSA programs. NHTSA is also removing the petitioning process for off-road vehicles, clarifying requirements for the documentation needed for submitting innovative technology requests in accordance with 40 CFR 1037.610 and 49 CFR 535.7, and adding further detail to requirements for submitting credit allocation plans as specified in 49 CFR 535.9. Finally, NHTSA is adding the same recordkeeping requirements that EPA currently requires to facilitate in-use compliance inspections. These changes are intended to improve the regulatory experience for regulated parties and also reduce agency administrative burden.

The agencies received few comments on these changes, with most supporting the proposed changes or suggesting improvements. These comments as well as the few comments opposing any of these changes are discussed in Section XII and in the RTC.

(5) Other Amendments to EPA Regulations

EPA is finalizing certain other changes to regulations that we proposed, which are not directly related to the HD Phase 1 or Phase 2 programs, as detailed in Section XIII. For these amendments, there are no corresponding changes in NHTSA regulations. Some of these amendments relate directly to heavy-duty highway engines, but not to the GHG programs. Others relate to nonroad engines. This latter category reflects the regulatory structure EPA uses for its mobile source regulations, in which regulatory provisions applying broadly to different types of mobile sources are codified in common regulatory parts such as 40 CFR part 1068. This approach creates a broad regulatory structure that regulates highway and nonroad engines, vehicles, and equipment collectively in a common program. Thus, it is appropriate to include some amendments to nonroad regulations in addition to the changes applicable only for highway engines and vehicles.

Except as noted below, the agencies received relatively few significant comments on these issues. All comments are discussed in more detail in Section XIII and in the RTC. One area, for which we did receive significant comment was the issue of competition vehicles. As described in Section XIII, EPA is not finalizing the proposed clarification related to highway vehicles used for competition.

(a) Standards for Engines Installed In Glider Kits

EPA regulations currently allow used pre-2013 engines to be installed into new glider kits without meeting currently applicable standards. As described in Section XIII.B, EPA is amending its regulations to allow only engines that have been certified to meet standards for the model year in which the glider vehicle is assembled (*i.e.* current model year engine standards) to be installed in new glider kits, with certain exceptions. First, engines certified to earlier MY standards that are identical to the current model year standards may be used. Second, engines still within their useful life (and certain similar engines) may be used. Note that this would not allow use of the pre-2002 engines that are currently being used in most glider vehicles because they all would be outside of the 10-year useful life period. Finally, the interim small manufacturer allowance for glider vehicles will also apply for the engines used in the exempted glider kits. Comments on this issue are summarized and addressed in Section XIII.B and in RTC Section 14.2.

(b) Nonconformance Penalty Process Changes

Nonconformance penalties (NCPs) are monetary penalties established by regulation that allow a vehicle or engine manufacturer to sell engines that do not meet the emission standards. Manufacturers unable to comply with the applicable standard pay penalties, which are assessed on a per-engine basis.

On September 5, 2012, EPA adopted final NCPs for heavy heavy-duty diesel engines that could be used by manufacturers of heavy-duty diesel engines unable to meet the current oxides of nitrogen (NO_X) emission standard. On December 11, 2013 the U.S. Court of Appeals for the District of Columbia Circuit issued an opinion vacating that Final Rule. It issued its mandate for this decision on April 16, 2014, ending the availability of the NCPs for the current NO_X standard, as well as vacating certain amendments to the NCP regulations due to concerns about inadequate notice. In particular, the amendments revise the text explaining how EPA determines when NCP should be made available. In the Phase 2 NPRM, EPA re-proposed most of these amendments to provide fuller notice and additional opportunity for public comment. As discussed in Section XIII, although EPA received one comment opposing these amendments, they are being finalized as proposed.

(c) Updates to Heavy-Duty Engine Manufacturer In-Use Testing Requirements

EPA and manufacturers have gained substantial experience with in-use testing over the last four or five years. This has led to important insights in ways that the test protocol can be adjusted to be more effective. We are accordingly making changes to the regulations in 40 CFR part 86, subparts N and T.

(d) Extension of Certain 40 CFR Part 1068 Provisions to Highway Vehicles and Engines

As part of the Phase 1 GHG standards, we applied the exemption and importation provisions from 40 CFR part 1068, subparts C and D, to heavy-duty highway engines and vehicles. We also specified that the defect reporting provisions of 40 CFR 1068.501 were optional. In an earlier rulemaking, we applied the selective enforcement auditing under 40 CFR part 1068, subpart E (75 FR 22896, April 30, 2010). We are adopting the rest of 40 CFR part 1068 for heavy-duty highway engines and vehicles, with certain exceptions and special provisions.

As described above, we are applying all the general compliance provisions of 40 CFR part 1068 to heavy-duty engines and vehicles subject to 40 CFR parts 1036 and 1037. We are also applying the recall provisions and the hearing procedures from 40 CFR part 1068 for highway motorcycles and for all vehicles subject to standards under 40 CFR part 86, subpart S.

EPA is updating and consolidating the regulations related to formal and informal hearings in 40 CFR part 1068, subpart G. This will allow us to rely on a single set of regulations for all the different categories of vehicles, engines, and equipment that are subject to emission standards. We also made an effort to write these regulations for improved readability.

We are also making a number of changes to part 1068 to correct errors, to add clarification, and to make adjustments based on lessons learned from implementing these regulatory provisions.

(e) Amendments to Engine and Vehicle Test Procedures in 40 CFR Parts 1065 and 1066

EPA is making several changes to our engine testing procedures specified in

40 CFR part 1065. None of these changes will significantly impact the stringency of any standards.

(f) Amendments Related to Marine Diesel Engines in 40 CFR Parts 1042 and 1043

EPA's emission standards and certification requirements for marine diesel engines under the Clean Air Act and the act to Prevent Pollution from Ships are identified in 40 CFR parts 1042 and 1043, respectively. EPA is amending these regulations with respect to continuous NO_X monitoring and auxiliary engines, as well as making several other minor revisions.

(g) Amendments Related to Locomotives in 40 CFR Part 1033

EPA's emission standards and certification requirements for locomotives under the Clean Air Act are identified in 40 CFR part 1033. EPA is making several minor revisions to these regulations.

(6) Other Amendments to NHTSA Regulations

NHTSA proposed to amend 49 CFR parts 512 and 537 to allow manufacturers to submit required compliance data for the Corporate Average Fuel Economy (CAFE) program electronically, rather than submitting some reports to NHTSA via paper and CDs and some reports to EPA through its VERIFY database system. NHTSA is not finalizing this proposal in this rulemaking and will consider electronic submission for CAFE reports in a future action.

II. Vehicle Simulation and Separate Engine Standards for Tractors and Vocational Chassis

A. Introduction

This Section II. describes two regulatory program elements that are *common* among tractors and vocational chassis. In contrast, Sections III and V respectively describe the regulatory program elements that are *unique* to tractors and to vocational chassis. The common elements described here are the vehicle simulation approach to vehicle certification and the separate standards for engines. Section II.B discusses the reasons for this Phase 2 regulatory approach; namely, requiring vehicle simulation for tractor and vocational chassis certification, maintaining separate engine standards, and expanding and updating their related mandatory and optional test procedures. Section II.C discusses in detail the evolution and final version of the vehicle simulation computer program, which is called the Greenhouse gas Emissions Model or ''GEM.'' Section II.C also discusses the evolution and final versions of the test procedures for determining the GEM inputs that are common for tractors and vocational chassis. Section II.D discusses in detail the separate engine standards for GHGs and fuel efficiency and their requisite test procedures.

In this final action, the agencies have built on the success of the Phase 1 GEM-based approach for the certification of tractors and vocational chassis. To better recognize the real-world impact of vehicle technologies, we have expanded the number of required and optional vehicle inputs into GEM. Inputting these additional details into GEM results in more accurate representations of vehicle performance and greater opportunities to demonstrate reductions in CO_2 emissions and fuel consumption. We are also finalizing revisions to the vehicle driving patterns that are programmed into GEM to better reflect real-world vehicle operation and the emissions reductions that result from applying GHG and fuel efficiency technologies to vehicles. As a result of these revisions, the final GEM-based vehicle certification approach necessitates new testing of engines and testing of some other vehicle components to generate the additional GEM inputs for Phase 2. More detail is provided in Section II.C.

Based on our assessments of the technological feasibility; cost effectiveness; requisite lead times for implementing new and additional tractor and vocational vehicle technologies; and based on comments we received in response to our notice of proposed rulemaking and in response to our more recent notice of additional data availability, the agencies are finalizing steadily increasing stringencies of the CO_2 and fuel consumption standards for tractors and vocational chassis for vehicle model years 2021, 2024 and 2027. See Section I or Sections III and V respectively for these numerical standards for tractors and vocational chassis. As part of our analytical process for determining the numerical values of these standards, the agencies utilized GEM. Using GEM as an integral part of our own standard-setting process helps ensure consistency between our technology assessments and the GEM-based certification process that we require for compliance with the Phase 2 standards. Our utilization of GEM in our standard-setting process is described further in Section II.C.

For Phase 2 we are finalizing, as proposed, the same Phase 1 certification approach for all of the GHG and fuel efficiency separate engine standards for those engines installed in tractors and vocational chassis. For the separate engine standards, we will continue to require the Phase 1 engine dynamometer certification test procedures, which were adopted substantially from EPA's existing heavy-duty engine emissions test procedures. In this action we are finalizing, as proposed, revisions to the weighting factors of the tractor engine 13-mode steady-state test cycle (*i.e.,* the Supplemental Engine Test cycle or ''SET''). The SET is required for determining tractor engine CO_2 emissions and fuel consumption. Consistent with the rationale we presented in our proposal and consistent with comments we received, these revised SET weighting factors better reflect the lower engine speed operation of modern engines, which frequently occurs at tractor cruise speeds. We used these revised weighting factors as part of our engine technology assessments of both current engine technology (*i.e.,* our ''baseline engine'' technology) and future engine technology.

Based on our assessments of the technological feasibility; cost effectiveness; requisite lead times for implementing new and additional engine technologies; and based on comments we received in response to our notice of proposed rulemaking and in response to our more recent notice of additional data availability, the agencies are finalizing steadily increasing stringencies of the CO_2 and fuel consumption separate engine standards for engine model years 2021, 2024 and 2027. In addition, for each of these model years, EPA is maintaining the Phase 1 separate engine standards for CH_4 and N_2O emissions—both at their Phase 1 numeric values. While EPA is not finalizing at this time more stringent N_2O emissions standards, as originally proposed, EPA may soon revisit these separate engine N_2O standards in a future rulemaking. All of the final Phase 2 separate engine standards are presented in Section II.D, along with our related assessments.

B. Phase 2 Regulatory Structure

As proposed, in this final action the agencies have built on the success of the Phase 1 GEM-based approach for the certification of tractors and vocational chassis, while also maintaining the Phase 1 separate engine standards approach to engine certification. While the regulatory structures of both Phase 1 and Phase 2 are quite similar, there are a number of new elements for Phase 2. Note that we are not applying these new to comments, as discussed below in Section III.C.4.

The agencies will retain much of the certification and compliance structure developed in Phase 1. The Phase 2 tractor CO_2 emissions and fuel consumption standards, as in Phase 1, will be aligned.[204] The agencies will also continue to have separate engine and vehicle standards to drive technology improvements in both areas. The reasoning behind maintaining separate standards is discussed above in Section II.B.2. As in Phase 1, the manufacturers will certify tractors using the GEM simulation tool and evaluate the performance of subsystems through testing (the results of this testing to be used as inputs to the GEM simulation tool). Other aspects of the HD Phase 2 certification and compliance program also mirror the Phase 1 program, such as maintaining a single reporting structure to satisfy both agencies, requiring limited data at the beginning of the model year for certification, and determining compliance based on end of year reports. In the Phase 1 program, manufacturers participating in the ABT program provided 90 day and 270 day reports after the end of the model year. For the Phase 2 program, the agencies proposed that manufacturers would only be required to submit one end of the year report, which would have simplified reporting. Manufacturers provided comments opposing this approach. After further consideration, the agencies are adopting an approach in Phase 2 that mirrors the Phase 1 approach with a 90 day preliminary report and a 270 day final report, with the manufacturer having the option to request a waiver of the 90 day report based on positive credit balances.

Even though many aspects of the HD Phase 2 program are similar to Phase 1, there are some key differences. While Phase 1 focused on reducing CO_2 emissions and fuel consumption in tractors through the application of existing (''off-the-shelf'') technologies, the HD Phase 2 standards seek additional reductions through increased use of existing technologies and the development and deployment of more advanced technologies. The agencies received numerous comments on the proposed Phase 2 technology assessments in terms of the baseline, the technology effectiveness, the market adoption rate projections, and the technology costs. The agencies have made changes reflecting our assessment of these comments, as described in Section III.D.

To evaluate the effectiveness of a more comprehensive set of technologies in Phase 2, the agencies are including several additional inputs to the Phase 2 GEM. The set of inputs includes the Phase 1 inputs plus parameters to assess the performance of the engine, transmission, and driveline. Specific inputs for, among others, predictive cruise control, automatic tire inflation systems, and 6x2 axles will now be required. The final Phase 2 program includes some changes to the proposed Phase 2 technology inputs to GEM. These changes from proposal include the use of cycle-averaged fuel maps for use when evaluating a vehicle over the transient cycle, optional transmission efficiency inputs, optional axle efficiency inputs, an increase in the types of idle reduction technologies recognized in GEM, and the ability to recognize the effectiveness of tire pressure monitoring systems, neutral coast, and neutral idle. As in Phase 1, in Phase 2 manufacturers will conduct component testing to obtain the values for these technologies (should they choose to use them), then the testing values will be input into the GEM simulation tool. See Section III.D.1 below. To effectively assess performance of the technologies, the agencies are adopting a revised version of the road grade profiles proposed for Phase 2. Finally, the agencies are adopting Phase 2 regulations with clarified selective enforcement and confirmatory testing requirements for the GEM inputs that differ from the Phase 2 NPRM based on the comments received.

The key aerodynamic assessment areas that the agencies proposed to change in Phase 2 relative to Phase 1 were the use of a more aerodynamic reference trailer, the inclusion of the impact of wind on the tractor, and changes to the aerodynamic test procedures. We are adopting these changes in Phase 2 with some further revisions from those proposed for Phase 2 based on comments. To reflect the evolving trailer market, the agencies are adopting as proposed the addition of trailer skirts (an aerodynamic improving device) to the reference trailer (*i.e.* the trailer used during testing to determine the relative aerodynamic performance of the tractor). The agencies are also adopting the proposed aerodynamic certification test procedure that captures the impact of wind average drag on tractor aerodynamic performance. However, the agencies are specifying in the final rule the use of a single surrogate yaw angle instead of a full yaw sweep to reduce the aerodynamic testing burden based on further assessment of the EPA aerodynamic data and comments received on the NPRM. Finally, the agencies are adopting aerodynamic test procedure and data analysis changes from the Phase 2 proposal to further reduce the variability of aerodynamic test results. Detailed discussion of the aerodynamic test procedures is included in Section III.E.2.

Another key change to the final rule is the adoption of more stringent particulate matter (PM) standards for auxiliary power units (APU) installed in new tractors.[205] In the Phase 2 NPRM, EPA sought comment on the need for and feasibility of new PM standards for these engines because APUs can be used in lieu of operating the main engine during extended idle operations to provide climate control and power to the driver. See 80 FR 40213. APUs can reduce fuel consumption, NO_X, HC, CH_4, and CO_2 emissions when compared to main engine idling.[206] However, a potential unintended consequence of reducing CO_2 emissions from combination tractors through the use of APUs during extended idle operation is an increase in PM emissions. EPA is adopting requirements for APUs installed in new tractors to meet lower PM standards starting in 2018, with a more stringent PM standard starting in 2024. Please see Section III.C.3 for more details.

The agencies are also ending some of the interim provisions developed in Phase 1 to reflect the maturity of the program and the reduced need and justification for some of the Phase 1 flexibilities. Further discussions on all of these matters are covered in the following sections.

C. Phase 2 Tractor Standards

EPA is adopting CO_2 standards and NHTSA is adopting fuel consumption standards for new Class 7 and 8 combination tractors in Phase 2 that are more stringent than Phase 1. In addition, EPA is continuing the HFC standards for the air conditioning systems that were adopted in Phase 1. EPA is also adopting new standards to further control emissions of particulate matter (PM) from auxiliary power units (APU) installed in new tractors that will prevent an unintended consequence of

[204] Fuel consumption is calculated from CO_2 using the conversion factor of 10,180 grams of CO_2 per gallon for diesel fuel.

[205] This is necessarily an EPA-only provision since it relates to control of criteria pollutant emissions from a type of non-road engine, not to fuel efficiency.

[206] U.S. EPA. Development of Emission Rates for Heavy-Duty Vehicles in the Motor Vehicle Emissions Simulator MOVES 2010. EPA–420–B–12–049. August 2012.

increasing PM emissions during long duration idling.

This section describes these standards in detail.

(1) Final Fuel Consumption and CO_2 Standards

The Phase 2 fuel consumption and CO_2 standards for the tractor cab are shown below in Table III–1. These standards will achieve reductions of up to 25 percent compared to the 2017 model year baseline level when fully phased in for the 2027 MY.[207] The standards for Class 7 are described as ''Day Cabs'' because we are not aware of any Class 7 sleeper cabs in the market today; however, the agencies require any Class 7 tractor, regardless of cab configuration, meet the standards described as ''Class 7 Day Cab.''

The agencies' analyses, as discussed briefly below and in more detail later in this Preamble and in the RIA Chapter 2.4 and 2.8, indicate that these standards are the maximum feasible (within the meaning of 49 U.S.C. 32902(k)) and are appropriate under each agency's respective statutory authorities.

TABLE III–1—PHASE 2 HEAVY-DUTY COMBINATION TRACTOR EPA EMISSIONS STANDARDS (g CO_2/TON-MILE) AND NHTSA FUEL CONSUMPTION STANDARDS (GAL/1,000 TON-MILE)

	Day cab		Sleeper cab	Heavy-haul
	Class 7	Class 8	Class 8	Class 8
2021 Model Year CO_2 Grams per Ton-Mile				
Low Roof	105.5	80.5	72.3	52.4
Mid Roof	113.2	85.4	78.0	
High Roof	113.5	85.6	75.7	
2021 Model Year Gallons of Fuel per 1,000 Ton-Mile				
Low Roof	10.36346	7.90766	7.10216	5.14735
Mid Roof	11.11984	8.38900	7.66208	
High Roof	11.14931	8.40864	7.43615	
2024 Model Year CO_2 Grams per Ton-Mile				
Low Roof	99.8	76.2	68.0	50.2
Mid Roof	107.1	80.9	73.5	
High Roof	106.6	80.4	70.7	
2024 Model Year and Later Gallons of Fuel per 1,000 Ton-Mile				
Low Roof	9.80354	7.48527	6.67976	4.93124
Mid Roof	10.52063	7.94695	7.22004	
High Roof	10.47151	7.89784	6.94499	
2027 Model Year CO_2 Grams per Ton-Mile [a]				
Low Roof	96.2	73.4	64.1	48.3
Mid Roof	103.4	78.0	69.6	
High Roof	100.0	75.7	64.3	
2027 Model Year and Later Gallons of Fuel per 1,000 Ton-Mile				
Low Roof	9.44990	7.21022	6.29666	4.74460
Mid Roof	10.15717	7.66208	6.83694	
High Roof	9.82318	7.43615	6.31631	

Note:
[a] The 2027 MY high roof tractor standards include a 0.3 m^2 reduction in CdA as described in Section III.E.2.a.vii.

As the agencies noted in the Preamble to the proposed standards, the HD Phase 2 CO_2 and fuel consumption standards are not directly comparable to the Phase 1 standards. 80 FR 40212. This is because the agencies are adopting several test procedure changes to more accurately reflect real world operation. With respect to tractors, these changes will result in the following differences. First, the same vehicle evaluated using the HD Phase 2 version of GEM will obtain higher (*i.e.* less favorable) CO_2 and fuel consumption values because the Phase 2 drive cycles include road grade. Road grade, which (of course) exists in the real-world, requires the engine to operate at higher horsepower levels to maintain speed while climbing a hill. Even though the engine saves fuel on a downhill section, the overall impact increases CO_2 emissions and fuel consumption. The second of the key differences between the CO_2 and fuel consumption values in Phase 1 and Phase 2 is due to changes in the evaluation of aerodynamics. Vehicles are exposed to wind when in use which increases the drag of the vehicle and in turn increases the power required to move the vehicle down the road. To more appropriately reflect the in-use aerodynamic performance of tractor-

[207] Since the HD Phase 1 tractor standards fully phase-in by the MY 2017, this is the logical baseline year.

trailers, the agencies are adopting a wind averaged coefficient of drag instead of the no-wind (zero yaw) value used in Phase 1. The final key difference between Phase 1 and the Phase 2 program includes a more realistic and improved simulation of the transmission in GEM, which could increase CO_2 and fuel consumption relative to Phase 1.

The agencies are adopting Phase 2 CO_2 emissions and fuel consumption standards for the combination tractors that reflect reductions that can be achieved through improvements in the tractor's powertrain, aerodynamics, tires, and other vehicle systems. The agencies have analyzed the feasibility of achieving the CO_2 and fuel consumption standards, and have identified means of achieving these standards that are technically feasible in the lead time afforded, economically practicable and cost-effective. EPA and NHTSA present the estimated costs and benefits of these standards in Section III.D.1. In developing these standards for Class 7 and 8 tractors, the agencies have evaluated the following:

- The current levels of emissions and fuel consumption
- the types of technologies that could be utilized by tractor and engine manufacturers to reduce emissions and fuel consumption from tractors and associated engines
- the necessary lead time
- the associated costs for the industry
- fuel savings for the consumer
- the magnitude of the CO_2 and fuel savings that may be achieved

The technologies on whose performance the final tractor standards are predicated include: improvements in the engine, transmission, driveline, aerodynamic design, tire rolling resistance, other accessories of the tractor, and extended idle reduction technologies. These technologies, and other accessories of the tractor, are described in RIA Chapter 2.4 and 2.8. The agencies' evaluation shows that some of these technologies are available today, but have very low adoption rates on current vehicles, while others will require some lead time for development. EPA and NHTSA also present the estimated costs and benefits of the Class 7 and 8 combination tractor standards in RIA Chapter 2.8 and 2.12, explaining as well the basis for the agencies' stringency level.

As explained below in Section III.D, EPA and NHTSA have determined that there will be sufficient lead time to introduce various tractor and engine technologies into the fleet starting in the 2021 model year and fully phasing in by the 2027 model year. This is consistent with NHTSA's statutory requirement to provide four full model years of regulatory lead time for standards. As was adopted in Phase 1, the agencies are adopting provisions for Phase 2 that allow manufacturers to generate and use credits from Class 7 and 8 combination tractors to show compliance with the standards. This is discussed further in Section III.F.

Based on our analysis, the 2027 model year standards for combination tractors and engines represent up to a 25 percent reduction in CO_2 emissions and fuel consumption over a 2017 model year baseline tractor, as detailed in Section III.D.1. In considering the feasibility of vehicles to comply with these standards over their useful lives, EPA also considered the potential for CO_2 emissions to increase during the regulatory useful life of the product. As we discuss in Phase 1 and separately in the context of deterioration factor (DF) testing, we have concluded that CO_2 emissions are likely to stay the same or actually decrease in-use compared to new certified configurations for the projected technologies. In general, engine and vehicle friction decreases as products wear, leading to reduced parasitic losses and consequent lower CO_2 emissions. Similarly, tire rolling resistance falls as tires wear due to the reduction in tread depth. In the case of aerodynamic components, we project no change in performance through the regulatory life of the vehicle since there is essentially no change in their physical form as vehicles age. Similarly, weight reduction elements such as aluminum wheels are not projected to increase in mass through time, and hence, we can conclude will not deteriorate with regard to CO_2 emissions performance in-use. Given all of these considerations, the agencies are confident in projecting that the tractor standards today will be technically feasible throughout the regulatory useful life of the program.

(2) Non-CO_2 GHG Emission Standards for Tractors

EPA is also continuing the Phase 1 standards to control non-CO_2 GHG emissions from Class 7 and 8 combination tractors.

(a) N_2O and CH_4 Emissions

The final Phase 2 heavy-duty engine standards for both N_2O and CH_4 as well as details of these standards are included in the discussion in Section II.D.3 and II.D.4. EPA requested comment, but did not receive any comments (or otherwise obtain any new information) indicating that there were appropriate controls for these non-CO_2 GHG emissions for the tractors manufacturers. Nor does EPA believe there are any technologies available to set vehicle standards. Therefore, EPA is not adopting any additional controls for N_2O or CH_4 emissions beyond those in the HD Phase 2 engine standards for the tractor category.

(b) HFC Emissions

Manufacturers can reduce hydrofluorocarbon (HFC) emissions from air conditioning (A/C) leakage emissions in two ways. First, they can utilize leak-tight A/C system components. Second, manufacturers can largely eliminate the global warming impact of leakage emissions by adopting systems that use an alternative, low-Global Warming Potential (GWP) refrigerant, to replace the commonly used R–134a refrigerant. EPA is maintaining the A/C leakage standards adopted in HD Phase 1 (see 40 CFR 1037.115). EPA believes the Phase 1 use of leak-tight components is at an appropriate level of stringency while maintaining the flexibility to produce the wide variety of A/C system configurations required in the tractor category. Please see Section I.F.(1)(b) for a discussion related to alternative refrigerants.

(3) EPA's PM Emission Standards for APUs Installed in New Tractors

Auxiliary power units (APUs) can be used in lieu of operating the main engine during extended idle operations to provide climate control and additional hotel power for the driver. As noted above, APUs can reduce fuel consumption, NO_X, HC, CH_4, and CO_2 emissions by a meaningful amount when compared to main engine idling.[208] However, a potential unintended consequence of reducing CO_2 emissions from combination tractors through the use of APUs during extended idle operation is an increase in diesel PM emissions. Engines currently being used to power APUs have been subject to the Nonroad Tier 4 p.m. standards (40 CFR 1039.101), which are less stringent in this power category than the heavy-duty on-highway standards (40 CFR 86.007–11) on a brake-specific basis. In the NPRM, EPA sought comment on the need for and appropriateness of further reducing PM emissions from APUs used as part of a compliance strategy for Phase 2, and suggested the basis for possible new PM

[208] U.S. EPA. Development of Emission Rates for Heavy-Duty Vehicles in the Motor Vehicle Emissions Simulator MOVES 2010. EPA–420–B–12–049. August 2012.

standards to avoid these unintended consequence. 80 FR 40213.

After considering the numerous comments submitted on this issue and our consideration of feasibility of PM controls, EPA is adopting a new PM standard of 0.02 g/kW–hr that applies exclusively to APUs installed in MY 2024 and later new tractors. EPA is also amending the Phase 1 GHG standards to provide that as of January 1, 2018 and through MY 2020, a tractor can receive credit for use of an AESS with an APU installed at the factory only if the APU engine is certified under 40 CFR part 1039 with a deteriorated emission level for PM that is at or below 0.15 g/kW–hr. For MY 2021 through 2023, this same emission level applies as a standard for all new tractors with an APU installed. Starting in MY 2024, any APU installed in a new tractor must be certified to a PM emission standard of 0.02 g/kW–hr over the full useful life as specified in 40 CFR 1039.699. Engine manufacturers may alternatively meet the APU standard by certifying their engines under 40 CFR part 1039 with a Family Emission Limit for PM at or below 0.02 g/kW–hr. APUs installed on MY 2024 and later tractors must have a label stating that the APU meets the PM requirements of 40 CFR 1039.699. Tractor manufacturers will be subject to a prohibition against selling new MY 2024 and later tractors with APUs that are not certified to the specified standards, and manufacturers will similarly be subject to a prohibition against selling new MY 2021 through 2023 tractors with APUs that do not meet the specified emission levels. This applies for both new and used APUs installed in such new tractors. Manufacturers of new nonroad engines and new APUs may continue to produce and sell their products for uses other than installation in new tractors without violating these prohibitions. However, nonroad engine manufacturers and APU manufacturers would be liable if they are found to have caused a tractor manufacturer to violate this prohibition, such as by mislabeling an APU as compliant with this standard. Note also that the PM standard for APUs applies for new tractors, whether or not the engine and APU are new; conversely, the PM standard does not apply for APU retrofits on tractors that are no longer new, even if the engine and APU are new.

TABLE III–2—PM STANDARDS FOR TRACTORS USING APUS

Tractor MY	PM emission standard (g/kW–hr)	Expected control technology
MY 2021–2023[a]	0.15	In-cylinder PM control.
MY 2024 and later	0.02	Diesel Particulate Filter.

Note:
[a] APUs installed on new tractors built January 1, 2018 and later, through model year 2020, must have engines that meet the same 0.15 g/kW–hr emission level if they rely on AESS for demonstrating compliance with emission standards.

We discuss below the principal comments we received on whether to adopt a standard to control PM emissions from APUs used for tractor idle emission control, the basis for the amended standards, and how EPA envisions the standards operating in practice.

Among the comments we received were those from the American Lung Association, National Association of Clean Air Agencies, Northeast States for Coordinated Air Use Management, Environmental Defense Fund, Natural Resources Defense Council, Environmental Law and Policy Center, Coalition for Clean Air/California Cleaner Freight Coalition, Moving Forward Network, Ozone Transport Commission, and the Center for Biological Diversity that urged EPA to amend the standards for PM emissions from these engines in order to reduce PM emission increases resulting from increased APU use. Bendix commented that EPA should consider the full vehicle emissions and fuel consumption, including the APU, to create a more accurate comparison when considering alternatives to diesel powered APUs. California's ARB supported the development of a federal rule that requires DPFs on APUs, similar to the requirements already in place in California because diesel PM poses a large public health risk.

In contrast, EMA commented that EPA should not impose any new emission requirements on APU engines because they already meet the Tier 4 nonroad standards and argued further that this rulemaking is not the proper forum for amending nonroad engine emission standards. Ingersoll Rand commented that they have significant concerns with regard to a nationwide requirement for use of DPFs in diesel-powered APUs, and strongly urged EPA not to impose such a perceived burden on the trucking industry. Ingersoll Rand's concerns are that the additional cost would push owners away from diesel-powered APUs to battery-powered APUs that, according to Ingersoll Rand, are not yet mature enough to serve as a replacement for diesel-powered APUs. Ingersoll Rand believes that high-capacity battery-powered APUs will eventually become a commercially available and cost-effective alternative to diesel-powered APUs. Ingersoll Rand stated that, although Thermo King has been dedicating resources to research and development in this area for some time, mandating this technology today would significantly decrease consumer choice, competitiveness in the APU marketplace, and driver comfort and safety. ATA is concerned that efforts to place additional emissions controls, and therefore additional costs, on APUs by making PM standards more stringent will discourage the use of this fuel efficient technology. EPA considered Ingersoll Rand's comments in developing a phased-in approach to the new PM standards for new tractors using APUs to, having the principal standard apply commencing with MY 2024 tractors in order to provide sufficient lead time.

Following is discussion of our analysis of this issue in light of the information we received and of our decision to establish a new PM standard for these units.

(a) PM Emissions Impact Without Additional Controls

EPA conducted an analysis using MOVES, which evaluates the potential impact on PM emissions due to an increase in APU adoption rates. In this analysis, EPA assumed that PM emission rates from current technology APUs would be unchanged in the future. We estimated an average in-use APU emission rate of 0.96 grams PM per hour from three in-use APUs (model years 2006 and 2011), measured in different load conditions.[209] We determined that a typical 2010 model year or newer tractor that uses its main engine to idle emits 0.32 grams PM per hour, based on a similar analysis of in-use idling of emissions from 2010 model year and newer tractors.[12] Thus, the use of an APU would lead to a potential increase in PM of as much as 0.64 grams per hour.

The results from these MOVES runs are shown below in Table III–3. These results show that an increase in use of APUs could lead to an overall increase in PM emissions if no additional PM emission standards were put in place. Column three labeled ''Final Phase 2 GHG Program $PM_{2.5}$ Emission Impact without Further PM Control (tons)'' shows the incremental increase in $PM_{2.5}$ without further regulation of APU $PM_{2.5}$ emissions, assuming the rate of APU use on which the final CO_2 standard is premised. These PM emission impacts represent an increase of approximately three percent of the HD sector PM emissions. We note further that the pollutant at issue is diesel PM, which is associated with myriad serious health effects, including premature mortality. See Section VIII.A.6 below.

TABLE III–3—PROJECTED IMPACT OF INCREASED ADOPTION OF APUS IN PHASE 2

CY	Baseline HD vehicle $PM_{2.5}$ emissions (tons)	Final phase 2 GHG program $PM_{2.5}$ [a] emission impact without further PM control (tons) [b]
2040	20,939	464
2050	22,995	534

Note:

[a] Positive numbers mean emissions would increase from baseline to control case.

[b] The impacts shown include all $PM_{2.5}$ impacts from the rule including impacts from increased tire wear and brake wear that results from the slight increase in VMT projected as a result of this rule.

(b) Feasibility of PM Emission Reductions

As EPA discussed in the NPRM, there are DPFs in the marketplace today that can reduce PM emissions from APUs. 80 FR 40213. Since January 1, 2008, California ARB has restricted the idling of sleeper cab tractors during periods of sleep and rest.[210] The regulations apply additional requirements to diesel-fueled APUs on tractors equipped with 2007 model year or newer main engines. Truck owners in California must either: (1) Fit the APU with an ARB verified Level 3 particulate control device that achieves 85 percent reduction in particulate matter; or (2) have the APU exhaust plumbed into the vehicle's exhaust system upstream of the particulate matter aftertreatment device.[211] Currently ARB has identified four control devices that have been verified to meet the Level 3 p.m. requirements. These devices include HUSS Umwelttechnik GmbH's FS–MK Series Diesel Particulate filters, Impco Ecotrans Technologies' ClearSky Diesel Particulate Filter, Thermo King's Electric Regenerative Diesel Particulate Filter, and Proventia's Electronically Heated Diesel Particulate Filter. In addition, ARB has approved a Cummins integrated diesel-fueled APU and several fuel-fired heaters produced by Espar and Webasto.

EPA received comments from Daimler, Idle Smart, MECA, and Proventia addressing the feasibility of PM reductions from APU engines. Daimler stated that they supply APUs that currently meet ARB's PM emission requirements and encouraged EPA to simply adopt ARB's regulations. Proventia commented that they have produced an ARB-approved actively regenerating DPF to fit the Thermo King Tripac APU since 2012 and that it is proven, reliable, and commercially available. Idle Smart commented that their start-stop idle reduction solution emits less PM emissions than a diesel APU without a DPF. MECA commented that a particulate filter in this application would be a wall flow device and, due to the relatively cold exhaust temperature of these small engines, the filters would need to use either all active or a combination of passive and active regeneration to periodically clean the soot from the filter. MECA stated that active regeneration could be achieved through the use of a fuel burner or electric heather upstream of the filter. MECA also stated that ARB's regulations demonstrate that it is feasible to control PM from small APU engines and that the technology has been available since 2008.

California's Clean Idle program requires that diesel-powered APUs be fitted with a verified DPF. In some cases, limits are put on the PM emission level at the engine outlet (upstream of the DPF). For example, the ThermoKing APU approval utilizing a Yanmar engine requires that engine is certified to a PM level of 0.2 g/kW-hr or less (upstream of the DPF).[212] Implementation of the California program and the subsequent approval of Level 3 verified devices has led to the certification of engines utilized in APUs whose PM emissions at the engine outlet are well below the 0.4 g/kW-hr nonroad Tier 4 final standard for this size engine in 40 CFR part 1039. For example, the Yanmar TK270M engine that is used in combination with ThermoKing's electronic regenerative diesel particulate filter, which is certified under the EPA designated engine family GYDXL0.57NUA, is certified with a PM level of 0.09 g/kW-hr. The addition of a DPF affords at least an additional 85 percent reduction from the engine outlet certified value, or less than 0.014 g/kW-hr.

EPA believes that these comments confirm our discussion at proposal that PM standards reflecting performance of a diesel particulate filter are technically feasible.

[209] U.S. EPA. Updates to MOVES for Emissions Analysis of Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2 FRM. Docket Number EPA–HQ–OAR–2014–0827. July 2016.

[210] California Air Resources Board. Idle Reduction Technologies for Sleeper Berth Trucks. Last viewed on September 19, 2014 at *http://www.arb.ca.gov/msprog/cabcomfort/cabcomfort.htm*.

[211] California Air Resources Board. § 2485(c)(3)(A)(1).

[212] California Air Resources Board. Executive Order DE–12–006. Last viewed on June 21, 2016 at *http://www.arb.ca.gov/diesel/verdev/pdf/executive_orders/de-12-006.pdf*.

(c) Benefits of Further PM Controls

Using MOVES, EPA evaluated the impact of requiring further PM control from APUs nationwide. As shown in Table III–3 and Table III–4, EPA projects that the HD Phase 2 program without additional PM controls would increase $PM_{2.5}$ emissions by 464 tons in 2040 and 534 tons in 2050. The annual impact of the final program to further control PM is projected to lead to a reduction of $PM_{2.5}$ emissions nationwide by 927 tons in 2040 and by 1,114 tons in 2050, as shown in Table III–4 the column labeled ''Net Impact on National $PM_{2.5}$ Emission with Further PM Control of APUs (tons).'' Note that these requirements will reduce PM emissions from APUs assumed in the baseline for MY 2018 and later, as well as the additional APUs that are projected to be used as a result of the Phase 2 standards. This results in projected reductions that exceed the projected increase in PM emissions that would have occurred with the new Phase 2 GHG standards but without these newly promulgated APU standards.

TABLE III–4—PROJECTED IMPACT OF FURTHER CONTROL ON $PM_{2.5}$ EMISSIONS [a]

CY	Baseline national heavy-duty vehicle $PM_{2.5}$ emissions (tons)	HD Phase 2 program national $PM_{2.5}$ emissions without further PM control (tons)	HD Phase 2 program national $PM_{2.5}$ emissions with further PM control (tons)	Net impact on national $PM_{2.5}$ emission with further PM control of APUs (tons)
2040	20,939	21,403	20,476	−927
2050	22,995	23,529	22,416	−1,114

Note:
[a] The impacts shown include all $PM_{2.5}$ impacts from the rule including impacts from increased tire wear and brake wear that results from the slight increase in VMT projected as a result of this rule.

(d) PM Emission Reduction Technology Costs

EPA does not project any cost for meeting the requirement, commencing on January 1, 2018, that tractor manufacturers using APUs as part of a compliance path to meeting the Phase 1 GHG standards only receive credit in GEM for use of the APU if they use an APU with an engine with deteriorated PM emissions at or below 0.15 g/kW-hr. The same conclusion applies for MY 2021, when we adopt the PM emission level of 0.15 g/kW-hr as an emission standard, not only as a qualifying condition for using AESS for demonstrating compliance with the CO_2 standard. First, EPA projects that the 2018–2023 requirements can be achieved at zero cost because several engines are already meeting them today with in-cylinder controls. Second, this is only one of many potential compliance pathways for tractors meeting the Phase 1 standards. We nonetheless are providing extra lead time by tying this provision to calendar year 2018, rather than model year 2018, to allow manufacturers time for confirming emission levels and otherwise complying with administrative requirements.

PM emission reductions from APU engines beginning in MY 2024 would most likely be achieved through installation of a diesel particulate filter (DPF).[213] In the NPRM, EPA discussed several sources for DPF cost estimates. The three sources included the federal Nonroad Diesel Tier 4 rule, ARB, and Proventia. EPA developed long-term cost projections for catalyzed diesel particulate filters (DPF) as part of the Nonroad Diesel Tier 4 rulemaking. In that rulemaking, EPA estimated the DPF costs would add $580 to the cost of 150 horsepower engines (69 FR 39126, June 29, 2004). On the other hand, ARB estimated the cost of retrofitting a diesel powered APU with a PM trap to be $2,000 in 2005.[214] Proventia is charging customers $2,240 for electronically heated DPF for retrofitting existing APUs.[215]

EPA requested comment on DPF costs in the NPRM and received comments from MECA, Proventia, and Ingersoll Rand. MECA agreed with EPA's range of DPF costs discussed in the NPRM. Proventia stated that the $2,240 end user price cited in the NPRM is for an aftermarket retrofit device. Proventia estimated that the direct manufacturing cost of materials and manufacturing (which is less than the retail price equivalent) for quantities exceeding 10,000 annually would be $975 for an actively regenerating device. The basis for this estimate is Proventia's current production cost in the quantity of 50 units of $1069. Proventia stated that EPA's estimate of $580 for a 150hp engine is likely to be for a catalyzed passively regenerating DPF because those engines have higher exhaust temperatures. Proventia also stated that a cost of an actively regenerating DPF is significantly higher than for passively regenerating devices. Ingersoll Rand commented that Thermo King currently offers a DPF option on its line of diesel-powered APUs and the incremental price of the DPF option can be as high as $3,500. ATA commented that adding a DPF to an APU increases the cost of the device by up to 20 percent. Daimler provided DPF costs as CBI.

EPA considered the comments and more closely evaluated NHTSA's contracted TetraTech cost report which found the total retail price of a diesel-powered APU that includes a DPF to be $10,000.[216] Based on all of this information, EPA is projecting the retail price increment of an actively regenerating DPF installed in an APU to be $2,000. This cost is incremental to the diesel-powered APU technology costs beginning in 2024 MY.

EPA regards these costs as reasonable. First, the PM standard is necessary to avoid an unintended consequence of GHG idle control. The standard adopted is also appropriate for APUs used in on-highway applications, since it is comparable to the heavy-duty on-highway standard after considering rounding conventions (the PM standard for a tractor's main engine is 0.01 g/hp-hr as specified in 40 CFR 86.007–11(a)(1)(iv)). The standard is also voluntary in the sense that tractor

[213] As discussed below, a DPF could be installed by the APU manufacturer, the engine manufacturer, the tractor manufacturer, or a fourth entity, with certification and labelling responsibilities differing depending on which entity does the installation.

[214] California Air Resources Board. 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. September 1, 2005. Page 38. Last viewed on October 20, 2014 at *http://www.arb.ca.gov/regact/hdvidle/isor.pdf*.

[215] Proventia. Tripac Filter Kits. Last accessed on October 21, 2014 at *http://www.proventiafilters.com/purchase.html*.

[216] U.S. DOT/NHTSA. Commercial Medium- and Heavy-Duty Truck Fuel Efficiency Technology Cost Study. May 2015. Page 71.

manufacturers can use other types of idle reducing technologies, or choose a Phase 2 compliance path not involving idle control. The agencies have developed technology packages for determining the final Phase 2 tractor GHG and fuel consumption standards that are predicated on lower penetration rates of diesel APUs than in the NPRM and have included several additional idle reducing technologies, making it more likely that alternative compliance paths are readily available. APU manufacturers (and manufacturers of APU engines) also can market their product to any entities other than MY 2024 and later new tractors without meeting the DPF-based PM standard. Our review of the costs of these standards thus indicates that they will be reasonable.

It is also worth noting that the reductions also have monetized benefits far greater than the costs of the standard. Section IX.H.1 of this Preamble discusses the economic value of reductions in criteria pollutants. In this analysis, EPA estimates the economic value of the human health benefits associated with the resulting reductions in $PM_{2.5}$ exposure using what are known as ''benefit per ton'' values. The benefit per ton values estimate the benefits of reducing incidence of specific $PM_{2.5}$-related health impacts, including reduction in both premature mortality and premature morbidity from on-road mobile sources. The estimate of benefits from reducing one ton of direct $PM_{2.5}$ from on-road mobile sources in 2030 using a three percent discount rate range is between $490,000 and $1,100,000 (2013$) and is between $440,000 and $990,000 (2013$) using a seven percent discount rate.[217] The estimated cost per ton for the new APU standards in 2040 is $101,717.

(e) Other Considerations

EPA considered the lead time of the new PM standards for APUs installed in new tractors. The 2018 provision restricting GEM credit for use of APUs is not a new standard, but rather a compliance constraint. There should be ample time for tractor manufacturers to consider how to obtain APUs certified to the designated deteriorated PM emissions level should they wish to receive GEM credit for use of APUs. As noted in (d) above, we concluded that the reasonable feasible lead time is to implement these provisions on January 1, 2018 because the manufacturer's contemplating use of APUs in conjunction with a Phase 1 compliance strategy using AESS would need time to adapt their certification systems, which we believe requires lead time of at least several months.

In MY 2021, tractor manufacturers will be subject to a prohibition against selling new MY 2021 through 2023 tractors with APUs that do not meet those specified PM emission levels. For the reasons just given, there is ample time to meet this requirement.

The diesel particulate filter-based standard for APUs installed in new tractors begins in MY 2024. This allows several years for the development and application of diesel particulate filters to these APUs. We have concluded that, given the timing of the PM emission standards finalized in this document and the availability of the technologies, APUs can be designed to meet the new standards with the lead time provided (and, again, noting that tractor manufacturers have available compliance pathways available not involving APUs).

In terms of safety, EPA considered the fact that diesel particulate filters are a known technology. DPFs have been installed on a subset of diesel powered APUs since the beginning of the California requirements and have been used with on-highway diesel engines since the sale of MY 2007 engines. We are unaware of any safety issues with this technology. We are adopting these APU requirements because they allow for reduced fuel consumption; this also leads to a positive impact with respect to energy.

(f) Implementation of the Standard

EPA has a choice as to whether to adopt these provisions as a tractor vehicle standard or as a standard for the non-road engine in the APU. Under either approach, EPA is required to consider issues of technical feasibility, cost, safety, energy, and lead time. EPA has addressed all of these factors above, and finds the 2018, 2021, and 2024 provisions, and associated lead time, to be justified.[218]

The final rule applies most directly to tractor manufacturers. However, other entities potentially affected are the manufacturer of the APU, the manufacturer of the engine installed in the APU, and a different entity (if any) separately installing a DPF on the APU engine. At present, all engines used in APUs must certify to the PM standard in 40 CFR 1039.101, and must label the engine accordingly (see 40 CFR 1039.135). The provisions we are adopting for MY 2024 require that any APU engine being certified to the 0.02 g/kW-hr PM standard have a label indicating that the APU or engine is so certified. This puts any entity receiving that engine on notice that the APU (and its engine) can be used in a new tractor. Conversely, the absence of such a label indicates that the engine cannot be so used. Consequently, if a tractor manufacturer receives an APU without the supplemental label, it can only use the APU in a new tractor if it installs a DPF or otherwise retrofits the APU engine to meet the PM standard.

The APU certification provisions in 40 CFR 1039.699 are simplified to account for the fact that the APU manufacturer would generally be adding emission control hardware without modifying the engine from its certified configuration. Note that engine manufacturers, tractor manufacturers or others installing the emission control hardware may also certify to the 0.02 g/kW-hr standard. Since the prohibition applies to the tractor manufacturer, we would not expect the delegated assembly provisions of 40 CFR 1037.621 or the secondary vehicle manufacturer provisions of 40 CFR 1037.622 to apply for APU manufacturers.

As described above, we are aware that the PM standards as adopted would not prevent a situation in which tractors are retrofitted with diesel APUs after they are no longer new, without meeting the PM standards described above. We believe that vehicle manufacturers will strongly desire to apply the benefit of AESS with low-PM diesel APUs to help them meet CO_2 standards for any installations where a diesel APU is a viable or likely option for in-use tractors. We will consider addressing this possible gap in the program with a standard for *new* APUs installed on *new or used* tractors. Such a standard would be issued exclusively under our authority to regulate nonroad engines as described in Clean Air Act section 213 (a)(4). If we adopt such a standard, we will also consider whether to adopt that same requirement for new APUs installed in other motor vehicles, and for other nonroad installations generally.

[217] This valuation is undoubtedly conservative because it reflects exposure to $PM_{2.5}$ generally, rather than to the form of PM here: Diesel exhaust particulate, a likely human carcinogen. See section VIII.A.6.b. Due to underlying analytical limitations, $PM_{2.5}$-related benefit per ton values are only estimated out to the year 2030. For the criteria pollutant benefits analysis in this rulemaking, we make a conservative assumption that 2030 values apply to all emission reductions in years that extend beyond 2030. We assume benefit-per-ton values grow larger in the future due to income growth and a larger future population.

[218] As noted above, the 2018 provision is a compliance constraint, not a standard.

(4) Special Purpose Tractors and Heavy-Haul Tractors

The agencies proposed and are adopting provisions in Phase 2 to set standards for a new subcategory of heavy-haul tractors. In addition and as noted above, in Phase 1 the agencies adopted provisions to allow tractor manufacturers to reclassify certain tractors as vocational vehicles, also called Special Purpose Tractors.[219] The agencies proposed and are adopting provisions in Phase 2 to continue to allow manufacturers to exclude certain vocational-types of tractors (Special Purpose Tractors) from the combination tractor standards and instead be subject to the vocational vehicle standards. However, the agencies are making changes to the proposed Phase 2 Special Purpose Tractors and heavy-haul tractors in response to comments, as discussed below.

(a) Heavy-Haul Tractors

For Phase 2, the agencies proposed and are adopting an additional subcategory to the tractor category for heavy-haul tractors that are designed to haul much heavier loads than conventional tractors. The agencies recognize the need for manufacturers to build these types of vehicles for specific applications and also recognize that such heavy-haul tractors are not fully represented by the way GEM simulates conventional tractors. We believe the appropriate way to prevent effectively penalizing these vehicles is to set separate standards recognizing a heavy-haul vehicle's unique needs, which include the need for a higher horsepower engine and different transmissions. In addition drivetrain technologies such as 6x2 axles, may not be capable of handling the heavier loads. The agencies are adopting this change in Phase 2 because, unlike in Phase 1, the engine, transmission, and drivetrain technologies are included in the technology packages used to determine the stringency of the tractor standards and are included as manufacturer inputs in GEM. The agencies also recognize that certain technologies used to determine the stringency of the Phase 2 tractor standards are less applicable to the heavy-haul tractors designed for the U.S. market. For example, heavy-haul tractors in the U.S. are not typically used in the same manner as long-haul tractors with extended highway driving, and therefore will experience less benefit from aerodynamics. This means that the agencies are adopting a standard that reflects individualized performance of these technologies in particular applications, in this case, heavy-haul tractors, and further, have a means of reliably assessing individualized performance of these technologies at certification.

The typical tractor is designed in the U.S. with a Gross Combined Weight Rating (GCWR) of approximately 80,000 pounds due to the effective weight limit on the federal highway system, except in states with preexisting higher weight limits. The agencies proposed in Phase 2 to consider tractors with a GCWR over 120,000 pounds as heavy-haul tractors. Based on comments received during the development of HD Phase 1 (76 FR 57136–57138) and because we did not propose in Phase 2 a sales limit for heavy-haul as we have for the vocational tractors in Phase 1, the agencies also believed it would be appropriate to further define the heavy-haul vehicle characteristics to differentiate these vehicles from the vehicles in the other nine tractor subcategories. The two additional requirements in the Phase 2 proposal included a total gear reduction greater than or equal to 57:1 and a frame Resisting Bending Moment (RBM) greater than or equal to 2,000,000 in-lbs per rail or rail and liner combination. Heavy-haul tractors typically require the large gear reduction to provide the torque necessary to start the vehicle moving. These vehicles also typically require frame rails with extra strength to ensure the ability to haul heavy loads. We requested comment on the proposed heavy-haul tractor specifications, including whether Gross Vehicle Weight Rating (GVWR) or Gross Axle Weight Rating (GAWR) would be a more appropriate metric to differentiate between a heavy-haul tractor and a typical tractor.

We received comments from several manufacturers about the proposed heavy-haul subcategory. None of the commenters were averse to creating such a subcategory, and many manufacturers directly supported such an action. Navistar supported creating a new heavy-haul subcategory maintaining that this type of vehicle is specified uniquely and is not designed for standard trailers. Volvo supported this addition since heavy-haul tractors require large engines and increased cooling capacity and most heavy-haul rigs have some requirement for off-road access to pick up machinery, bulk goods, and unusual loads.

We received comments from several manufacturers about the criteria proposed to define the heavy-haul tractor subcategory. Allison commented that for heavy-haul tractors equipped with an automatic transmission, the gear reduction ratio should be greater than or equal to 24.9:1 because an automatic transmission with a torque converter provides a torque multiplying effect and better launch capability. EMA and other manufacturers commented that the proposed specifications for heavy-haul tractors do not allow the relevant vehicles to meet the proposed total gear reduction ratio of 57:1 or greater. EMA commented that the Allison 7-speed 4700 transmission and the Eaton 9LL products both are specifically designed for heavy-haul operations, could meet a 53:1 specification, but not a 57:1 ratio. PACCAR also commented that an automatic transmission torque converter ratio should be included in the Total Reduction ratio calculation to properly incorporate the slip and first gear ratio combination that is inherent in an automatic transmission. EMA, PACCAR, and Volvo recommended that the agencies should change the rear axle ratio for the baseline vehicle to attain the 53:1 total reduction ratio because the proposed baseline heavy-haul vehicle did not meet the proposed total reduction ratio. Daimler commented that the agencies should remove both the frame resistance bending moment requirement and the gear reduction requirement.

EMA and some of the manufacturers commented that the agencies should revise the definition of heavy-haul tractor to be ''equal to or greater than 120,000 pounds GCWR'' rather than ''greater than 120,000 pounds GCWR.'' They stated that the specifications for the heavy-haul market start with and include 120,000 pounds GCWR. Daimler suggested that the minimum GCWR be set at 105,000 pounds to better catch the large number of Canadian vehicles that are heavy-haul. Daimler stated that this broader weight definition catches a very small number of US vehicles (0.1 to 0.9 percent of the vehicles, depending on other factors) but catches the large number of Canadian vehicles that Daimler considers to be heavy-haul.

Volvo commented that there are multiple types of heavy-haul tractors, each with their own specific characteristics based on operational considerations: High-roof highway sleeper tractors pulling box vans at or above 120,000 pounds GCWR (*e.g.* long combination vehicles) that run regional and long-haul operations and can benefit from the same technologies as high-roof sleepers with 80,000 pound GCWR and should be credited for the higher payload; low- and mid-roof sleepers that primarily run long-haul routes (*e.g.* pulling low-boy trailers and

[219] See 40 CFR 1037.630.

heavy equipment); low-roof day cab tractors running regional and shorter routes (*e.g.* bulk haul); and then what the industry typically refers to as heavy-haul that are extremely high GCWR and can haul above 300 metric tons and sometimes run in multiple tractor configurations that provide for one or more tractor(s) pulling and one or more tractor(s) pushing.

In part to follow up on the comments made by manufacturers, EPA held discussions with Environment and Climate Change Canada (ECCC) after the NPRM was released regarding the Special Purpose tractors and heavy-haul tractors.[220] In our discussions, ECCC emphasized that the highway weight limitations in Canada are much greater than those in the U.S. Where the U.S. federal highways have limits of 80,000 pounds GCW, Canadian provinces have weight limits up to 140,000 pounds. This difference could potentially limit emission reductions that could be achieved if ECCC were to fully harmonize with the U.S.'s HD Phase 2 standards because a significant portion of the tractors sold in Canada have GCWR greater than 120,000 pounds, the proposed limit for heavy-haul tractors.

For the FRM, EPA and NHTSA are revising the heavy-haul tractor provisions to balance the certainty that vehicles are regulated in an appropriate subcategory along with the potential to better harmonize the U.S. and Canadian regulations. Based on our assessment, the tractors with GCWR greater than or equal to 120,000 pounds truly represent heavy-haul applications in the U.S. Therefore, we are adopting criteria only based on GCWR, not the proposed RBM or total gear reduction ratios. The agencies are adopting Phase 2 heavy-haul standards for this subset of vehicles, similar to the standards proposed for Phase 2 and detailed below in Section III.D.1.

In Canada, due to their differences in weight and dimension requirements, it is primarily tractors with a GCWR of equal to or greater than 140,000 pounds that are truly heavy-haul vehicles. This leaves a set of tractors sold in Canada with a GCWR between 120,000 and 140,000 pounds that are used in ways that are similar to the way tractors with a GCWR less than 120,000 pounds (the typical Class 8 tractor) are used in the U.S. These tractors sold in Canada could benefit from the deployment of additional GHG-reducing technologies beyond what is being required for heavy-haul tractors in the U.S., such as aerodynamic and idle reduction improvements. Most manufacturers tend to rely on U.S. certificates as their evidence of conformity for products sold into Canada to reduce compliance burden. Therefore, in Phase 2 the agencies are adopting provisions that allow the manufacturers the option to meet standards that reflect the appropriate technology improvements, along with the powertrain requirements that go along with higher GCWR. While these heavy Class 8 tractor standards will be optional for tractors sold into the U.S. market, we expect that Canada will consider adopting these as mandatory requirements as part of their regulatory development and consultation process. Given the unique circumstances in the Canadian fleet, we believe that there is a reasonable basis for considering such an approach for Canadian tractors. As such, the agencies have coordinated these requirements with ECCC. The agencies are only adopting optional heavy Class 8 standards for MY 2021 at this time. The expectation is that ECCC will develop their own heavy-duty GHG regulations to harmonize with this Phase 2 rulemaking through its own domestic regulatory process. We expect that ECCC will include a mandate that heavy Class 8 tractors be certified to the MY 2021 heavy Class 8 tractor standards, but could also specify more stringent standards for later years for these vehicles. We plan to coordinate with ECCC to incorporate any needed future changes in a timely manner. Details of these optional standards are included in Section III.D.1.

(b) Special Purpose Tractors

During the development of Phase 1, the agencies received comments from several stakeholders supporting an approach for an alternative treatment of a subset of tractors because they were designed to operate at lower speeds, in stop and go traffic, and sometimes operate off-road or at higher weights than the typical line-haul tractor. These types of applications have limited potential for improvements in aerodynamic performance to reduce CO_2 emissions and fuel consumption. Therefore, we adopted provisions to allow these special purpose tractors to certify as vocational vehicles (or vocational tractors). Consistent with our approach in Phase 1, the agencies still believe that these vocational tractors are operated differently than line-haul tractors and therefore fit more appropriately into the vocational vehicle category. However, we need to continue to ensure that only tractors that are *truly* vocational tractors are classified as such.[221] As adopted in Phase 1, a Phase 2 vehicle determined by the manufacturer to be a HHD vocational tractor will fall into one of the HHD vocational vehicle subcategories and be regulated as a vocational vehicle. Similarly, MHD tractors which the manufacturer chooses to reclassify as vocational tractors will be regulated as MHD vocational vehicles. Specifically, the agencies adopted in Phase 1 provisions in EPA's 40 CFR 1037.630 and NHTSA's regulation at 49 CFR 523.2 to only allow the following three types of vocational tractors to be eligible for reclassification by the manufacturer: Low-roof tractors intended for intra-city pickup and delivery, such as those that deliver bottled beverages to retail stores; tractors intended for off-road operation (including mixed service operation), such as those with reinforced frames and increased ground clearance; and tractors with a GCWR over 120,000 pounds.[222]

In the Phase 2 proposal, the agencies proposed to remove the third type of vocational tractors, heavy-haul tractors with a GCWR over 120,000 pounds, from the Phase 2 Special Purpose Tractor category and set unique standard for heavy-haul tractors. 80 FR 40214. The agencies requested comment on the Special Purpose Tractor criteria and received comments from the manufacturers. EMA and PACCAR commented there is a group of special purpose tractors with a gross combination weight rating over 120,000 pounds that fall in between the proposed regulatory categories for heavy-haul tractors and Class 8 tractors that need to be accounted for in a separate and distinct manner. They stated that such vehicles are still appropriately categorized as Special Purpose Tractors and should be included at the manufacturer's option in the vocational tractor family, even though they may not meet the proposed total gear reduction requirement or the frame rail requirements. PACCAR and Volvo also requested a modification to the definition to include ''equal to 120,000 GCWR.''

Volvo provided a list of recommended Special Purpose Tractor criteria. Volvo stated that these characteristics differentiate these vehicles from line haul operation, especially in terms of fuel economy as well as the significant added costs for these features. Volvo's

[220] Memo to Docket. Heavy Class 8 Discussion with Environment and Climate Change Canada. July 2016. Docket EPA–HQ–OAR–2014–0827.

[221] As a part of the end of the year compliance process, EPA and NHTSA verify manufacturer's production reports to avoid any abuse of the vocational tractor allowance.

[222] See existing 40 CFR 1037.630 (a)(1)(i) through (iii).

recommended criteria included GCWR greater than 120,000 pounds or any three of the following vehicles specifications: Configuration other than 4x2, 6x2, or 6x4; greater than 14,600 pounds front axle load rating; greater than 46,000 pounds rear axle load rating; greater than or equal to 3.00:1 overall axle reduction in transmission high range; greater than 57.00:1 overall axle reduction in transmission low range; frame rails with a resistance bending moment greater than or equal to 2,000,000 in-lbs., greater than or equal to 20 degree approach angle; or greater than or equal to 14 inch ground clearance.

The heavy-haul tractor standards that the agencies are adopting in Phase 2 apply to tractors with a GCWR greater than or equal to 120,000 pounds. As stated above, the agencies are adopting heavy-haul tractor criteria based only on GCWR, and are not adopting the proposed criteria of RBM or total gear reduction. With these Phase 2 changes to the proposed heavy-haul tractor definition, all tractors that would have been considered as Special Purpose Tractors in Phase 1 due to the GCWR criteria listed in EPA's 40 CFR 1037.630 and NHTSA's regulation at 49 CFR 523.2 will now qualify as heavy-haul tractors in Phase 2. Therefore, we no longer believe that it is necessary for heavy-haul tractors to be treated as Special Purpose Tractors. The agencies also reviewed Volvo's suggested criteria and concluded that the Phase 1 approach and Special Purpose Tractor criteria are working well; therefore, we do not see the need to adopt more restrictive criteria. Consequently, the agencies are adopting in Phase 2 provisions in EPA's 40 CFR 1037.630 and NHTSA's regulation at 49 CFR 523.2 to only allow the following two types of vocational tractors to be eligible for reclassification to Special Purpose Tractors by the manufacturer:

(1) Low-roof tractors intended for intra-city pickup and delivery, such as those that deliver bottled beverages to retail stores.

(2) Tractors intended for off-road operation (including mixed service operation), such as those with reinforced frames and increased ground clearance.

These provisions apply only for purposes of Phase 2. The agencies are not amending the Phase 1 provisions for special purposes tractors.

Volvo also requested that the agencies add a Vocational Heavy-Haul Tractor subcategory that allows for a heavy-haul tractor which benefits from the utilization of a powertrain optimized to meet the vocational operational requirements of this segment, a technology package corresponding to those operational characteristics, and with a corresponding duty cycle and, most importantly, a payload representative of heavy-haul operation. The agencies considered this request and analyzed the expected technology package differences between the vocational and tractor program. As described in Section III.D.1, the agencies are only adopting technologies in the heavy-haul tractor category that would be applicable to the operation of these vehicles. For example, we are not adopting standards that are premised on any improvements to aerodynamics or extended idle reduction. Therefore, we concluded that there is no need to develop another vocational subcategory to account for heavy-haul tractors.

Because the difference between some vocational tractors and line-haul tractors is potentially somewhat subjective, and because of concerns about relative stringency, we also adopted in Phase 1 and proposed to continue in Phase 2 a rolling three year sales limit of 21,000 vocational tractors per manufacturer consistent with past production volumes of such vehicles to limit the use of this provision. We proposed in Phase 2 to carry-over the existing three year sales limit with the recognition that heavy-haul tractors would no longer be permitted to be treated as vocational vehicles (suggesting a lower volume cap could be appropriate) but that the heavy-duty market has improved since the development of the HD Phase 1 rule (suggesting the need for a higher sales cap). The agencies requested comment on whether the proposed sales volume limit is set at an appropriate level looking into the future. 80 FR 40214.

Several of the manufacturers commented that it would be reasonable to remove the sales cap limit. Allison stated that this limitation may have been reasonable in the initial years of the program as a precaution against unreasonably assigning too many tractors to the vocational vehicle category. However in Phase 2, Allison recommended that the agencies should remove the cap for three reasons: (1) Vehicle configurations change over time; (2) the Phase 2 vocational program drives technology improvements of powertrains; and (3) Phase 2 better represents the diversity of vocational vehicle uses that would allow for better alignment of vehicles with duty cycles that most represent their real world operation. Daimler stated that they think that with the addition of heavy-haul tractor standards, there will be less need for a sales volume limit on special purpose tractors. In Volvo Group's opinion, the proposed volume limit is overly constraining and burdensome and should be removed. Volvo stated that given the recent product lineup overhauls across the industry they do not believe that there are many models still on the market that are sold in large numbers into both highway tractor and vocational tractor segments, nor is there sufficient reason that any OEM cannot identify specific vehicle attributes in order to classify a tractor as suitable solely for highway use, or for on/off-road use. Volvo Group suggested that the agencies remove the vocational tractor volume restrictions and employ a guideline based on specific vehicle characteristics.

The agencies evaluated the sales cap limit proposed for special purpose tractors and the comments addressing the issue of a sales cap. EPA calculated the number of vocational tractors certified in MY 2014 and MY 2015. The number of tractors ranged between approximately 2,600 and 6,200 per year per manufacturer that certified special purpose tractors, but one manufacturer did not use this provision at all.[223] It is apparent that none of the manufacturers are utilizing this provision near the maximum allowable level in Phase 1 (a rolling three year sales limit of 21,000). We also believe that there is more incentive for manufacturers to use the special purpose tractor provisions in Phase 1 because the relative difference in stringency between the tractor and vocational programs is much greater in Phase 1 than it will be in Phase 2. Upon further consideration, we concluded that there is significantly less incentive for the manufacturers to reclassify tractors that are not truly special purpose tractors as vocational vehicles as a pathway to a less stringent standard in Phase 2 primarily since the Phase 2 vocational vehicle program stringency is similar to the stringency of the tractor program. In addition, the Phase 2 vocational vehicle compliance program and standards better represent the duty cycles expected of these vehicles and are predicated on performance of similar sets of vehicle technologies, except for aerodynamic technologies, as the primary tractor program. Therefore, we are adopting Phase 2 special purpose tractor provisions without a sales cap, but will continue to monitor during the Phase 2 implementation.

[223] U.S. EPA. Memo to Docket: Special Purpose Tractor Production Volumes. Docket EPA–HQ–OAR–2014–0827.

(5) Small Tractor Manufacturer Provisions

In Phase 1, EPA determined that manufacturers that met the small business criteria specified in 13 CFR 121.201 for ''Heavy Duty Truck Manufacturing'' should not be subject to the initial phase of greenhouse gas emissions standards in 40 CFR 1037.106.[224] The regulations required that qualifying manufacturers notify the Designated Compliance Officer each model year before introducing the exempted vehicles into commerce. The manufacturers are also required to label the vehicles to identify them as excluded vehicles. EPA and NHTSA proposed to eliminate this small business provision for tractor manufacturers in the Phase 2 program. As stated in the NPRM, the agencies are aware of two second stage manufacturers building custom sleeper cab tractors. In the proposal we stated that we could treat these vehicles in one of two ways. First, the vehicles may be considered as dromedary vehicles and therefore treated as vocational vehicles.[225] Or the agencies could provide provisions that stated if a manufacturer changed the cab, but not the frontal area of the vehicle, then it could retain the aerodynamic bin of the original tractor. 80 FR 40214.

The agencies received comments on the second stage manufacturer options for small manufacturers discussed in the proposal. American Reliance Industries (ARI) raised concerns related to the proposed alternative methods for excluding or exempting second stage manufacturers performing cab sleeper modifications. ARI is concerned that treating these vehicles as vocational vehicles may mean that other regulations related to vocational vehicles would become applicable and have unanticipated adverse results and that the vehicles would not be certified as vocational vehicles when originally certified by an OEM. ARI commented that if EPA and NHTSA adopt a frontal area approach for second stage manufacturers making cab sleeper modifications, that the section be revised to ensure greater clarity as to the intention and effect of this section. In building a custom sleeper cab, ARI stated that they may use wind fairings, fuel tank fairings, roof fairings, and side extenders that can modify the frontal area of the tractor in height and width as compared to the frontal area of the vehicle used to obtain the original certification. ARI also commented that depending on the custom cab sleeper modification, ARI may replace an aerodynamic fairing from the tractor in order to provide better aerodynamic results in light of the cab sleeper modification. ARI does not want to be precluded from continuing to provide these benefits to clients. ARI encourages the agencies to take a similar approach to small business exemption under the Phase 1 regulation in the Phase 2 regulation.

Daimler commented on the agencies' two proposed approaches for second stage manufacturers that build custom sleepers. Daimler's main concern is to clarify that where the primary manufacturer has certified a vehicle as a day cab, the second stage manufacturer's actions do not draw the primary manufacturer into noncompliance. Daimler stated that in many cases, they do not know that a vehicle will be altered by a second stage manufacturer. Daimler did not have a preference on the way that the agencies proposed to regulate these secondary vehicle manufacturers, as long as the primary vehicle manufacturers could continue to sell vehicles with the expectation that anyone changing them from the compliant state in which it was built would certify those changes.

In response to these comments, EPA is clarifying in 40 CFR 1037.622 that small businesses may modify tractors as long as they do not modify the front of the vehicle and so long as the sleeper compartment is no more than 102 inches wide or 162 inches in height. As an interim provision, to allow for a better transition to Phase 2, EPA is finalizing a more flexible compliance path in 40 CFR 1037.150(r). This option allows small manufacturers to convert a low or mid roof tractor to a high roof configuration without recertification, provided it is for the purpose of building a custom sleeper tractor or for conversion to a natural gas tractor. Although this more flexible allowance to convert low and mid roof tractors to high roof tractors is being adopted as an interim provision, we have not established an end date at this time. We expect to reevaluate as manufacturers begin to make use of and may decide to revise it in the future, potentially deciding to make it a permanent allowance. To be eligible for this option, the secondary manufacturer must be a small manufacturer and the original low or mid roof tractor must be covered by a valid certificate of conformity. The modifications may not increase the frontal area of the tractor beyond the frontal area of the equivalent high roof tractor paired with a standard box van. With respect to Daimler's comment, 40 CFR 1037.130 only applies to vehicles sold in an uncertified condition and does not apply to vehicles sold in a certified condition.

(6) Glider Vehicles

As described in Section XIII.B, EPA is adopting new provisions related to glider vehicles, including glider tractors.[226] NHTSA did not propose such changes. Glider vehicles and glider kits were also treated differently under NHTSA and EPA regulations prior to this rulemaking. They are exempt from NHTSA's Phase 1 fuel consumption standards. For EPA purposes, the CO_2 provisions of Phase 1 exempted glider vehicles and glider kits produced by small businesses but did not include such a blanket exemption for other glider kits. Thus, some gliders and glider kits are already subject to the Phase 1 requirement to obtain a vehicle certificate prior to introduction into commerce as a new vehicle. 80 FR 40528.

In the NPRM, EPA proposed to revise the provisions applicable to glider vehicles so that the engines used in these vehicles would need to meet the standards for the year of the new glider vehicle. EPA's resolution of issues relating to glider vehicles, including glider tractors, and glider kits, is discussed fully in Section XIII.B and RTC Section 14.2.

Similarly, NHTSA considered including glider vehicles under its Phase 2 program. After assessing the impact glider vehicles have on the tractor segment, NHTSA has elected not to include glider vehicles in its Phase 2 program. NHTSA may reconsider fuel efficiency regulations for glider vehicles in a future rulemaking.

As discussed in the NPRM, NHTSA would like to reiterate its safety authority over gliders—notably, that it has become increasingly aware of potential noncompliance with its regulations applicable to gliders. While there are instances in which NHTSA regulations allow gliders to use a ''donor VIN'' from a ''donor tractor,'' NHTSA has learned of manufacturers that are creating glider vehicles that are new vehicles under 49 CFR 571.7(e); however, the manufacturers are not certifying them and obtaining a new VIN as required. NHTSA plans to pursue enforcement actions as applicable against noncompliant manufacturers. In addition to enforcement actions, NHTSA may

[224] See 40 CFR 1037.150(c).

[225] A dromedary is a box, deck, or plate mounted behind the tractor cab and forward of the fifth wheel on the frame of the power unit of a tractor-trailer combination to carry freight.

[226] See section I.E. 1 for descriptions of glider vehicles and glider kits.

consider amending 49 CFR 571.7(e) and related regulations as necessary. NHTSA believes manufacturers may not be using this regulation as originally intended.

We believe that the agencies having different policies for glider kits and glider vehicles under the Phase 2 program will not result in problematic disharmony between the NHTSA and EPA programs, because of the small number of vehicles that will be involved. EPA believes that its changes will result in the glider market returning to the pre-2007 levels, in which fewer than 1,000 glider vehicles will be produced in most years. Only non-exempt glider vehicles will be subject to different requirements under the NHTSA and EPA regulations. However, we believe that this is unlikely to exceed a few hundred vehicles in any year, which will be few enough not to result in any meaningful disharmony between the two agencies.

(7) Useful Life and Deterioration Factors

Section 202(a)(1) of the CAA specifies that EPA is to adopt emissions standards that are applicable for the useful life of the vehicle. The in-use Phase 2 standards that EPA is adopting will apply to individual vehicles and engines, just as EPA adopted for Phase 1. NHTSA is also adopting the same useful life mileage and years as EPA for Phase 2.

EPA is also not adopting any changes to the existing provisions that require that the useful life for tractors with respect to CO_2 emissions be equal to the respective useful life periods for criteria pollutants, as shown below in Table III–5. See 40 CFR 1037.106(e). EPA does not expect degradation of the technologies evaluated for Phase 2 in terms of CO_2 emissions, therefore we did not adopt any changes to the regulations describing compliance with GHG pollutants with regards to deterioration. See 40 CFR 1037.241.

TABLE III–5—TRACTOR USEFUL LIFE PERIODS

	Years	Miles
Class 7 Tractors	10	185,000
Class 8 Tractors	10	435,000

D. Feasibility of the Final Phase 2 Tractor Standards

This section describes the agencies' technical feasibility and cost analysis. Further detail on all of these technologies can be found in the RIA Chapter 2.

Class 7 and 8 tractors are used in combination with trailers to transport freight. The variation in the design of these tractors and their typical uses drive different technology solutions for each regulatory subcategory. As noted above, the agencies are continuing the Phase 1 provisions that treat vocational tractors as vocational vehicles instead of as combination tractors, as noted in Section III.C.4. The focus of this section is on the feasibility of final standards for combination tractors including the heavy-haul tractors, but not the vocational tractors.

EPA and NHTSA collected information on the cost and effectiveness of fuel consumption and CO_2 emission reducing technologies from several sources, including new information collected since the NPRM was promulgated. The primary sources of pre-proposal information were the Southwest Research Institute evaluation of heavy-duty vehicle fuel efficiency and costs for NHTSA,[227] the Department of Energy's SuperTruck Program,[228] 2010 National Academy of Sciences report of Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles,[229] TIAX's assessment of technologies to support the NAS panel report,[230] the analysis conducted by the Northeast States Center for a Clean Air Future, International Council on Clean Transportation, Southwest Research Institute and TIAX for reducing fuel consumption of heavy-duty long haul combination tractors (the NESCCAF/ICCT study),[231] and the technology cost analysis conducted by ICF for EPA.[232] Some additional information and data were also provided in comments.

Commenters generally supported the agencies' projection that manufacturers can reduce CO_2 emissions and fuel consumption of combination tractors through use of many technologies, including engine, drivetrain, aerodynamic, tire, extended idle, and weight reduction technologies. The agencies' determination of the feasibility of the final HD Phase 2 standards is based on our updated projection of the use of these technologies and an updated assessment of their effectiveness. We will also discuss other technologies that could potentially be used, such as vehicle speed limiters, although we are not basing the final standards on their use for the model years covered by this rule, for various reasons discussed below.

(1) Projected Technology Effectiveness and Cost

EPA and NHTSA project that CO_2 emissions and fuel consumption reductions can be feasibly and cost-effectively met through technological improvements in several areas. The agencies evaluated each technology and estimated the most appropriate adoption rate of technology into each tractor subcategory. The next sections describe the baseline vehicle configuration, the effectiveness of the individual technologies, the costs of the technologies, the projected adoption rates of the technologies into the regulatory subcategories, and finally the derivation of these standards.

Based on information available at the time of the NPRM, the agencies proposed Phase 2 standards that projected by 2027, all high-roof tractors would have aerodynamic performance equal to or better today's SmartWay performance—which represents the best of today's technology. This would equate to having 40 percent of new high roof sleeper cabs in 2027 complying with the current best practices and 60 percent of the new high-roof sleeper cab tractors sold in 2027 having better aerodynamic performance than the best tractors available today. For tire rolling resistance, we premised the proposed standards on the assumption that nearly all tires in 2027 would have rolling resistance equal to or superior to tires meeting today's SmartWay designation. At proposal, the agencies assumed the 2027 MY engines would achieve an additional 4 percent improvement over Phase 1 engines and we projected 15 percent adoption of waste heat recovery (WHR) and many other advanced engine technologies. In addition, we proposed standards that projected improvements to nearly all of today's transmissions, incorporation of extended idle reduction technologies on 90 percent of sleeper cabs, and significant adoption of

[227] Reinhart, T.E. (June 2015). *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.

[228] U.S. Department of Energy. SuperTruck Initiative. Information available at *http://energy.gov/eere/vehicles/vehicle-technologies-office.*

[229] Committee to Assess Fuel Economy Technologies for Medium- and Heavy-Duty Vehicles; National Research Council; Transportation Research Board (2010). Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles. (''The 2010 NAS Report'') Washington, DC, The National Academies Press.

[230] TIAX, LLC. ''Assessment of Fuel Economy Technologies for Medium- and Heavy-Duty Vehicles,'' Final Report to National Academy of Sciences, November 19, 2009.

[231] NESCCAF, ICCT, Southwest Research Institute, and TIAX. Reducing Heavy-Duty Long Haul Combination Truck Fuel Consumption and CO_2 Emissions. October 2009.

[232] ICF International. ''Investigation of Costs for Strategies to Reduce Greenhouse Gas Emissions for Heavy-Duty On-Road Vehicles.'' July 2010. Docket Number EPA–HQ–OAR–2010–0162–0283.

per metric ton is presented in the RIA Chapter 7 in Table 7–47. As shown in that table, without fuel savings the cost per metric ton of the final vocational vehicle standards in calendar year 2021 is $710, decreasing to $100 by 2030. The cost effectiveness estimated for heavy-duty pickup trucks and vans in this rulemaking is presented in Table 7–46 in that same chapter of the RIA. Those Phase 2 standards have an estimated annual cost per metric ton without fuel savings of $2,800 in 2020, decreasing to $110 (about the same as for vocational) by calendar year 2030. The annual cost per ton of the MY 2017–2025 light-duty greenhouse gas standards for pickup trucks as reported in 2010 dollars without fuel savings is $430 in calendar year 2020, decreasing to $142 in 2030.[446] The agencies have found these standards to be highly cost effective. In addition, the vocational vehicle standards are clearly effective from a net benefits perspective (see RIA Chapter 11.2). Therefore, the agencies regard the cost of the final standards as reasonable, even without considering that the costs are recovered due decreased fuel consumption.

The agencies note that while the projected costs are significantly greater than the costs projected for Phase 1, we still consider these costs to be reasonable, especially given that the first vehicle owner may see the technologies pay for themselves in many cases. As discussed above, the usual period of ownership for a vocational vehicle reflects a lengthy trade cycle that may often exceed seven years. For most vehicle types evaluated, the cost of these technologies, if passed on fully to customers, will likely be recovered within four years or less due to the associated fuel savings, as shown in the payback analysis included in Section IX.M and in the RIA Chapter 7.1. Specifically, in RIA Chapter 7.2.4, a summary is presented with estimated payback periods for each of the MOVES vocational vehicle types, using the annual vehicle miles traveled from the MOVES model for each vehicle type. As noted above, the cost analysis presented for this rulemaking assumes that all vocational vehicles are certified to the primary standard. Using this assumption, the vocational vehicle type with the shortest payback is intercity buses (less than one year), while most other vehicles (with the exception of school buses and motor homes) are projected to see paybacks in the fourth year or sooner. We expect that manufacturers will certify to the optional custom chassis standards where it is more cost-effective to do so; therefore, our analysis may be overly conservative where it indicates very long paybacks for some vocational vehicles.

The agencies note further that although the rules are technology-advancing (especially with respect to driveline improvements) and the estimated costs for each subcategory vary considerably (by a factor of five in some cases), these costs represent only one of many possible pathways to compliance for manufacturers. Manufacturers retain leeway to develop alternative compliance paths, increasing the likelihood of the standards' successful implementation. Based on available information, the agencies believe the final vocational vehicle standards are technically feasible within the lead time provided, are cost effective while accounting for the fuel savings (see RIA Chapter 7.1.4), and have no apparent adverse collateral potential impacts (*e.g.*, there are no projected negative impacts on safety or vehicle utility).

The final standards thus appear to represent a reasonable choice under section 202(a) of the CAA and are maximum feasible under NHTSA's EISA authority at 49 U.S.C. 32902(k)(2). The agencies believe that the final standards are consistent with their respective authorities.

(4) Alternative Vocational Vehicle Standards Considered

The agencies developed and considered other alternative levels of stringency for the Phase 2 program. The results of the analysis of these alternatives, and comments received on alternatives, are discussed below in Section X of the Preamble and the RIA Chapter 11. For vocational vehicles, the agencies developed alternatives as shown in Table V–31. The agencies are not adopting standards reflecting Alternative 2, because as already described, technically feasible standards are available that provide for greater emission reductions and reduced fuel consumption than provided under Alternative 2. The agencies are not adopting standards reflecting Alternative 4 or Alternative 5 because we do not believe these standards to be feasible considering lead time and other relevant factors. Nevertheless, we have reevaluated each of the technology projections proposed for Alternative 4 and have determined that some engine and tire reductions will be feasible on the Alternative 4 timeline.

TABLE V–31—SUMMARY OF ALTERNATIVES CONSIDERED FOR THE FINAL RULEMAKING

Alternative 1 and 1b	No action alternatives
Alternative 2	Less stringent than the preferred alternative in the proposal, applying off-the-shelf technologies.
Final HD Phase 2 program	Fully phased-in by MY 2027.
Alternative 4	Same stringency as preferred alternative in the proposal, phasing in by MY 2024.
Alternative 5	More stringent alternative, based on higher adoption rates of advanced technologies.

D. Compliance Provisions for Vocational Vehicles

We are adopting many changes in the compliance provisions for vocational vehicles compared with what we proposed, as described in this section.

(1) Application and Certification Process

The agencies are adopting changes in the final Phase 2 version of GEM, as described in Section II of this Preamble. Below we provide cross-references to test procedures either that are either required or optional, for generation of Phase 2 GEM input values. See Section II.D.1 for details of engine testing and GEM inputs for engines.

As described above in Section I, the agencies will continue the Phase 1 compliance process in terms of the manufacturer requirements prior to the effective model year, during the model year, and after the model year. The information that will be required to be submitted by manufacturers is set forth

[446] See Chapter 5.3 of the final RIA for the MY 2017–2025 Light-Duty GHG Rule, available at *http://www3.epa.gov/otaq/climate/documents/420r12016.pdf*.

in 40 CFR 1037.205, 49 CFR 537.6, and 49 CFR 537.7. EPA will continue to issue certificates upon approval based on information submitted through the VERIFY database (see 40 CFR 1037.255). End of year reports will continue to include the GEM results for all of the configurations built, along with credit/deficit balances, if applicable (see 40 CFR 1037.250 and 1037.730).

(a) GEM Inputs

In Phase 1, there were two inputs to GEM for vocational vehicles:

- Steer tire coefficient of rolling resistance, and
- Drive tire coefficient of rolling resistance

As discussed above in Section II and III.D, there are several additional inputs that we are adopting for Phase 2. In addition to the steer and drive tire CRR, the inputs include the following:

- Engine input file with fuel map, full-load torque curve, and motoring curve,
- Transmission input file including architecture type, gear number and ratios, and minimum lockup gear for transmissions with torque converters,
- Drive axle ratio,
- Axle configuration,
- Tire size in revs/mi for drive and steer tires,
- Idle Reduction,
- Weight Reduction,
- Vehicle Speed Limiter,
- Aerodynamic Drag Area, and
- Pre-defined technology inputs for Accessory Load and Tire Pressure Systems

(i) Driveline Inputs

As with tractors, for each engine family, engine fuel maps, full load torque curve, and motoring curve will be generated by engine manufacturers and supplied to chassis manufacturers in a format compatible with GEM. The test procedures for the torque and motoring curves are found in 40 CFR part 1065. Section II.D.1.b describes these procedures as well as the procedures for generating the engine fuel maps. We require the steady state map approach for the 55 and 65 mph cruise speed cycles, while the cycle average approach is required for the ARB transient cycle. As an option, the cycle average map may also be used for 55 and 65 mph cruise speed cycles. Also similar to tractors, transmission specifications will be input to GEM. Any number of gears may be entered with a numerical ratio for each, and transmission type must be entered as either a Manual, Automated Manual, or Automatic transmission.

As part of the driveline information needed to run GEM, drive axle ratio will be a user input. If a configuration has a two-speed axle, the agencies are adopting regulations to instruct a manufacturer to enter the ratio that is expected to be engaged for the greatest driving distance. We requested comment on whether the agencies should allow this choice, and what the GEM input instructions should be. Both Dana and Meritor commented that there should be an option to recognize two-speed axles, but neither axle supplier offered a preference for how the agencies should implement this. Two-speed axles are typically specified for heavy-haul vehicles, where the higher numerical ratio axle is engaged during transient driving conditions and to deliver performance needed on work sites, while the lower numerical ratio axle may be engaged during light-load highway driving.

Tire size is a Phase 2 input to GEM that is necessary for the model to simulate the performance of the vehicle. As a result of comment and further technical analysis, we are adopting the tire size input as measured in revs/mile, rather than the measure of loaded radius in meters, as was proposed. The RIA Chapter 3 includes a description of how to measure tire size. For each model and nominal size of a tire, there are numerous possible sizes that could be measured, depending on whether the tire is new or ‘‘grown,’’ meaning whether it has been broken in for at least 200 miles. Size can also vary based on load and inflation levels, air temperature, and tread depth. The agencies requested comment on aspects of measuring and reporting tire size. The revised test procedure is described in the RIA Chapter 3.3.4.

For manufacturers electing to certify a vocational vehicle to the optional custom chassis standards, none of the above driveline inputs are applicable. In this case manufacturers must input one of the custom chassis regulatory subcategory identifiers shown in Table V–32. After the remaining input fields are either completed with values or N/A, GEM will simulate the vehicle by calling the default engine and transmission files, tire size, and axle radius from the GEM library. The following subsections describe the required and optional inputs for custom chassis.

TABLE V–32—CUSTOM CHASSIS SUBCATEGORY NAMES

Vehicle type	Regulatory subcategory GEM identifier	Default weight class and duty cycle
Motor Home	MHD_CC_MH	MHD Regional.
School Bus	MHD_CC_SB	MHD Urban.
Coach Bus	HHD_CC_CB	HHD Regional.
Emergency Vehicle	HHD_CC_EM	HHD Urban.
Concrete Mixer	HHD_CC_CM	HHD Urban.
Transit and Other bus	HHD_CC_OB	HHD Urban.
Refuse Truck	HHD_CC_RF	HHD Urban.

The agencies requested comments on the merits of using an equation-based compliance approach for emergency vehicle manufacturers, similar to the approach for trailer manufacturers described in Section IV.F. CARB commented in support of an equation-based compliance approach, but in the same comment they also expressed support for using a Phase 1-style GEM interface with a default engine simulated in GEM as appropriate for the emergency vehicle category. We received adverse comment on the equation-based approach from Daimler, because they believed it would make the compliance process more complex if some vehicles needed to be tracked differently. Our intent in soliciting comment on an equation-based approach was to assess whether running GEM was a burden for non-diversified manufacturers of low-technology vehicles. Because we received sufficient support from non-diversified manufacturers that a simplified GEM would meet their needs, we did not pursue an equation-based approach.

The final certification approach is consistent with the approach recommended by the Small Business Advocacy Review Panel, which believed it will be feasible for small emergency vehicle manufacturers to install a Phase 2-compliant engine, but recommended a simplified certification approach to reduce the number of required GEM inputs.

(ii) Idle Reduction Inputs

The agencies proposed two different idle reduction inputs for vocational vehicles: Neutral idle and stop-start. Based on comment, we are adding a third type of idle reduction input: Automatic engine shutdown. Based on user inputs derived from engine testing described in Section II and RIA Chapter 3.1, GEM will calculate CO_2 emissions and fuel consumption at both zero torque (neutral idle) and with torque set to Curb-Idle Transmission Torque for automatic transmissions in ''drive'' (as described in the RIA Chapter 3.4.2.3) for use in the CO_2 emission calculation in 40 CFR 1037.510(b). At proposal, neutral idle and stop-start were not recognized during the ARB transient cycle, they were recognized only during the separate idle cycle. The agencies received comments requesting recognition of neutral idle during the ARB transient test cycle. We agree this is desirable and have adopted changes in GEM to accomplish this. Also, with the adoption of the alternative engine mapping procedure for the ARB transient cycle, the computation for idle reduction has changed. Please see RIA Chapter 4.4.1.7 for a description of how GEM recognizes idle reduction.

For vocational custom chassis certified to the optional standards, all three idle reduction inputs will be available, however, the computation will be based on the EPA default engine. As described in the GEM User Guide, users will enter Y or N, and GEM will return a predefined improvement.

(iii) Weight Reduction Inputs

In Phase 1, the agencies adopted tractor regulations that provided manufacturers with the ability to utilize high strength steel and aluminum components for weight reduction without the burden of entering the curb weight of every tractor produced. In Phase 2, the agencies are adopting a lookup table of lightweight components for use in certifying vocational vehicles, similar to the process for tractors. As noted above, the agencies will recognize weight reduction by allocating one half of the weight reduction to payload in the denominator, while one half of the weight reduction will be subtracted from the overall weight of the vehicle in GEM.

The agencies are adopting lookup values for components on vocational vehicles in all HD weight classes. Components available for vocational vehicle manufacturers to select for weight reduction are shown below in Table V–33, below. All of these weight reduction inputs will be available for manufacturers of custom chassis certifying to the optional standards. We received comments from Allison Transmission noting that aluminum transmission cases and clutch housings are standard for automatic transmissions so we agree it is inappropriate to include these components in the lookup table. We have revised the values in response to adverse comments from AISI, and after reevaluating information available at proposal. Although we are not projecting any adoption of permanent 6x2 axles for non-custom vocational vehicles, if a manufacturer chooses to apply this technology for class 8 vocational vehicles, users may enter an appropriate weight reduction compared to the traditional 6x4 axle configuration.[447] We received adverse comments on the proposal to assign a fixed weight increase to natural gas fueled vehicles to reflect the weight increase of natural gas fuel tanks versus gasoline or diesel tanks. Based on comments and further technical analysis, we have determined that to provide equitable treatment to technologies, we will not require a weight penalty for any technology applied to achieve certification in Phase 2. We accounted for adoption of weight-increasing technologies in our MOVES modeling.

TABLE V–33—PHASE 2 WEIGHT REDUCTION TECHNOLOGIES FOR VOCATIONAL VEHICLES

<table>
<tr><th rowspan="2">Component</th><th rowspan="2">Material</th><th colspan="3">Vocational vehicle class</th></tr>
<tr><th>Class 2b–5</th><th>Class 6–7</th><th>Class 8</th></tr>
<tr><td>Axle Hubs—Non-Drive</td><td>Aluminum</td><td colspan="2">40</td><td>40</td></tr>
<tr><td>Axle Hubs—Non-Drive</td><td>High Strength Steel</td><td colspan="2">5</td><td>5</td></tr>
<tr><td>Axle—Non-Drive</td><td>Aluminum</td><td colspan="2">60</td><td>60</td></tr>
<tr><td>Axle—Non-Drive</td><td>High Strength Steel</td><td colspan="2">15</td><td>15</td></tr>
<tr><td>Brake Drums—Non-Drive</td><td>Aluminum</td><td colspan="2">60</td><td>60</td></tr>
<tr><td>Brake Drums—Non-Drive</td><td>High Strength Steel</td><td colspan="2">42</td><td>42</td></tr>
<tr><td>Axle Hubs—Drive</td><td>Aluminum</td><td colspan="2">40</td><td>80</td></tr>
<tr><td>Axle Hubs—Drive</td><td>High Strength Steel</td><td colspan="2">10</td><td>20</td></tr>
<tr><td>Brake Drums—Drive</td><td>Aluminum</td><td colspan="2">70</td><td>140</td></tr>
<tr><td>Brake Drums—Drive</td><td>High Strength Steel</td><td colspan="2">37</td><td>74</td></tr>
<tr><td>Suspension Brackets, Hangers</td><td>Aluminum</td><td colspan="2">67</td><td>100</td></tr>
<tr><td>Suspension Brackets, Hangers</td><td>High Strength Steel</td><td colspan="2">20</td><td>30</td></tr>
<tr><td>Crossmember—Cab</td><td>Aluminum</td><td>10</td><td>15</td><td>15</td></tr>
<tr><td>Crossmember—Cab</td><td>High Strength Steel</td><td>2</td><td>5</td><td>5</td></tr>
<tr><td>Crossmember—Non-Suspension</td><td>Aluminum</td><td>15</td><td>15</td><td>15</td></tr>
<tr><td>Crossmember—Non-Suspension</td><td>High Strength Steel</td><td>5</td><td>5</td><td>5</td></tr>
<tr><td>Crossmember—Suspension</td><td>Aluminum</td><td>15</td><td>25</td><td>25</td></tr>
<tr><td>Crossmember—Suspension</td><td>High Strength Steel</td><td>6</td><td>6</td><td>6</td></tr>
<tr><td>Driveshaft</td><td>Aluminum</td><td>12</td><td>40</td><td>50</td></tr>
<tr><td>Driveshaft</td><td>High Strength Steel</td><td>5</td><td>10</td><td>12</td></tr>
<tr><td>Frame Rails</td><td>Aluminum</td><td>120</td><td>300</td><td>440</td></tr>
<tr><td>Frame Rails</td><td>High Strength Steel</td><td>40</td><td>40</td><td>87</td></tr>
<tr><td>Wheels—Dual</td><td>Aluminum</td><td>150</td><td>150</td><td>250</td></tr>
<tr><td>Wheels—Dual</td><td>High Strength Steel</td><td>48</td><td>48</td><td>80</td></tr>
<tr><td>Wheels—Wide Base Single</td><td>Aluminum</td><td>294</td><td>294</td><td>588</td></tr>
</table>

[447] See NACFE Confidence Findings on the Potential of 6x2 Axles.

TABLE V–33—PHASE 2 WEIGHT REDUCTION TECHNOLOGIES FOR VOCATIONAL VEHICLES—Continued

Component	Material	Vocational vehicle class		
		Class 2b–5	Class 6–7	Class 8
Wheels—Wide Base Single	High Strength Steel	168	168	336
Permanent 6x2 Axle Configuration	Multi	N/A	N/A	300

(iv) Other Inputs

Certifying manufacturers may enter values in GEM as applicable for vehicle speed limiters, fairings to reduce aerodynamic drag area, electrified accessories, and tire pressure systems where such features meet the criteria in the regulations at 40 CFR 1037.520.

(b) Test Procedures

Powertrain families are defined in Section II.C.3.b, and powertrain test procedures are discussed in the RIA Chapter 3.6. The results from testing a powertrain configuration using the matrix of tests described in RIA Chapter 3.6 can be applied broadly across all vocational vehicles in which that powertrain will be installed. Powertrain test results become a GEM input file that replaces both the engine input file and transmission input file.

As in Phase 1, the rolling resistance of each tire will be measured using the ISO 28850 test method for drive tires and steer tires planned for fitment to the vehicle being certified. Once the test CRR values are obtained, a manufacturer will declare TRRLs (which may be equal to or higher than the measured values) for the drive and steer tires separately to be input into the GEM. For Phase 2 vocational vehicles, GEM will distribute the vehicle load with 30 percent of the load over the steer tires and 70 percent of the load over the drive tires. With these data entered, the amount of GHG reduction attributed to tire rolling resistance will be incorporated into the overall vehicle compliance value.

The final Phase 2 GEM will accept as inputs results from a transmission efficiency test. A procedure for this was discussed in the NPRM, and received favorable comment. The transmission efficiency test will be optional, but will allow manufacturers to reduce the CO_2 emissions and fuel consumption by designing better transmissions with lower friction due to better gear design and/or mandatory use of better lubricants.

In lieu of a fixed value for low friction axle lubricants as was proposed, the agencies are adopting an axle efficiency test procedure, as was discussed in the NPRM. See 80 FR 40323. The axle efficiency test will be optional, but will allow manufacturers to reduce CO_2 emissions and fuel consumption through improved axle gear designs and/or mandatory use of low friction lubricants. The agencies are not finalizing any other paths to recognize low friction axle lubricants.

(c) Useful Life and In-Use Standards

Section 202(a)(1) of the CAA specifies that emission standards are to be applicable for the useful life of the vehicle. The standards that EPA and NHTSA are adopting will apply to individual vehicles and engines at production and in use. NHTSA is not adopting in-use standards for vehicles or engines.

Manufacturers may be required to submit, as part of the application for certification, an engineering analysis showing that emission control performance will not deteriorate during the useful life, with proper maintenance. If maintenance will be required to prevent or minimize deterioration, a demonstration may be required that this maintenance will be performed in use. See 40 CFR 1037.241.

EPA will continue the Phase 1 approach to adjustment factors and deterioration factors for vehicles. The technologies on which the Phase 1 vocational vehicle standards were predicated were not expected to have any deterioration of GHG effectiveness in use. However, the regulations provided a process for manufacturers to develop deterioration factors (DF) if they needed. We anticipate that some hybrid powertrain systems may experience some deterioration of effectiveness with age of the energy storage device. We believe the regulations in place currently provide adequate instructions to manufacturers for developing DF where needed. We received comments from Daimler on deterioration factors for engines and the process for extrapolating where DF's are nonlinear. See Section 3.7 of the RTC. Allison Transmission commented that the amount of credits generated for a hybrid system should be dependent, in part, on design limits of batteries. We do not believe any changes are needed because the regulations do account for this by basing the FELs on the highest emissions during the useful life, including any effects from deterioration.

As with engine certification, a chassis manufacturer must design their vehicles to be durable enough to maintain compliance through the regulatory useful life of the vehicle. Factors influencing vehicle-level GHG performance over the life of the vehicle fall into two basic categories: Vehicle attributes and maintenance items. Each category merits different treatment from the perspective of assessing useful life compliance, as each has varying degrees of manufacturer versus owner/operator responsibility. The agencies require manufacturers to explain how they meet these requirements as part of certification.

For vocational vehicles, attributes generally refers to components that are installed by the manufacturer to meet the standard, whose reduction properties are assessed at the time of certification, and which are expected to last the full life of the vehicle with effectiveness maintained as new for the life of the vehicle with no special maintenance requirements. To assess useful life compliance, we will follow a design-based approach that will ensure that the manufacturer has robustly designed these features so they can reasonably be expected to last the useful life of the vehicle.

For vocational vehicles, maintenance items generally refers to items that are replaced, renewed, cleaned, inspected, or otherwise addressed in the preventative maintenance schedule specified by the vehicle manufacturer. Replacement items that have a direct influence on GHG emissions are primarily tires and lubricants, but may also include hybrid system batteries. Synthetic engine oil may be used by vehicle manufacturers to reduce the GHG emissions of their vehicles. Manufacturers may specify that these fluids be changed throughout the useful life of the vehicle. If this is the case, the manufacturer should have a reasonable basis that the owner/operator will use fluids having the same properties. This may be accomplished by requiring (in service documentation, labeling, etc.) that only these fluids can be used as replacements. We received comments from EMA asking us to consider maintenance costs for hybrids. In these final rules, we have quantified maintenance costs for tire replacement, stop-start, axle lubrication, and hybrids, as described in Section IX.D and the RIA Chapter 7.1.

Aside from those technologies identified above, if the vehicle remains in its original certified condition throughout its useful life, it is not believed that GHG emissions will increase as a result of service accumulation. As in Phase 1, the agencies will therefore allow the use of an assigned deterioration factor of zero where appropriate in Phase 2; however this does not negate the responsibility of the manufacturer to ensure compliance with the emission standards throughout the useful life.[448] Under both Phase 1 and the new Phase program, manufacturers must apply good engineering judgment when considering deterioration and may not ignore any evidence that the emissions performance will decline during actual use. The agencies may require vehicle manufacturers to provide engineering analyses at the time of certification demonstrating that vehicle attributes will last for the full useful life of the vehicle. We anticipate this demonstration would often need only show that components are constructed of sufficiently robust materials and design practices so as not to become dysfunctional under normal operating conditions.

In Phase 1, EPA set the useful life for engines and vehicles with respect to GHG emissions equal to the respective useful life periods for criteria pollutants. In April 2014, as part of the Tier 3 light-duty vehicle final rule, EPA extended the regulatory useful life period for criteria pollutants to 150,000 miles or 15 years, whichever comes first, for Class 2b and 3 pickup trucks and vans and some light-duty trucks (79 FR 23414, April 28, 2014). Class 2 through Class 5 heavy-duty vehicles subject to the GHG standards described in this section for vocational applications generally use the same kinds of engines, transmissions, and emission controls as the Class 2b and 3 vehicles that are chassis-certified to the criteria standards under 40 CFR part 86, subpart S. In Phase 2, EPA and NHTSA are adopting a useful life of 150,000 miles or 15 years for vocational vehicles at or below 19,500 lbs GVWR. In many cases, this will result in aligned useful-life values for criteria and GHG standards. Where this longer useful life is not aligned with the useful life that applies for criteria standards (generally in the case of engine-based certification under 40 CFR part 86, subpart A), EPA may revisit the useful-life values for both criteria and GHG standards in a future rulemaking. For medium heavy-duty vehicles (19,500 to 33,000 lbs GVWR) and heavy heavy-duty vehicles (above 33,000 lbs GVWR) EPA will keep the useful-life values from Phase 1, which are 185,000 miles (or 10 years) and 435,000 miles (or 10 years), respectively. EPA received comments in support of this approach, including support for the numerical values and the overall process envisioned for achieving the long-term goal of adopting harmonized useful-life specifications for criteria pollutant and GHG standards that properly represent the manufacturers' obligation to meet emission standards over the expected service life of the vehicles.

We received comment on what policies we should adopt to address the situation where the engine and the vehicle are subject to emission standards over different useful-life periods. For example, a medium heavy-duty engine may power vehicles in weight classes ranging from 2b to 8, with correspondingly different regulatory useful lives for those vehicles. Please see Section I.F.2.f for a discussion of revisions made to the final regulations to address this situation. The Response to Comments also addresses this issue at Chapter 1.4.

(d) Definitions of Custom Chassis

Eligible emergency vehicles for Phase 2 purposes are ambulances and fire trucks. The agencies requested comment on aligning the definition of emergency vehicle for purposes of the Phase 2 program with the definition of emergency vehicle for purposes of the light-duty GHG provisions under 40 CFR 86.1818, which includes additional vehicles such as those used by law enforcement.[449] Daimler commented in support of aligning these definitions of emergency vehicle. Daimler further requested the agencies consider adopting the same definition as in 13 CCR 1956.8(a)(6), the California regulations. We are adopting the narrow definition as was proposed, with agency discretion to apply these provisions to similar vehicles.

RVIA commented in favor of adopting a motor home definition consistent with NHTSA's definition at 49 CFR 571.3: *Motor home* means a multipurpose passenger vehicle with motive power that is designed to provide temporary residential accommodations, as evidenced by the presence of at least four of the following facilities: Cooking; refrigeration or ice box; self-contained toilet; heating and/or air conditioning; a potable water supply system including a faucet and a sink; and a separate 110–125 volt electrical power supply and/or propane. The agencies are adopting a definition of motor home that is generally consistent with this, without specifying detailed features.

Since 2003, NHTSA has implemented a broad definition of school bus that includes multifunction school activity buses that don't have stop arms or flashing lights, need not be painted yellow, and do not have an upper weight limit. These are a category of school bus that must meet the school bus structural standards or the equivalent set forth in 49 Code of Federal Regulations Part 571, and the emergency exit requirements specified in FMVSS No. 217 for school buses, as well as FMVSS 222 for passenger seating and crash protection. This definition was created in part to allow for use of safe buses to transport school age children on trips other those than between home and school. The agencies are adopting Phase 2 provisions such that buses eligible to certify to the custom chassis school bus standards are those that meet NHTSA's definition of school bus, including multifunction school activity buses.[450]

The most definitive attribute we have identified to distinguish over-the-road coach buses from transit buses is whether passengers are permitted to stand while the vehicle is driving. Therefore the only buses permitted to certify to the final custom chassis coach bus standards are those subject to NHTSA's Occupant Crash Protection Rule.[451]

Allied Specialty Vehicles (aka Rev Group) commented on the need for a clear distinction between transit buses and school buses.[452] If the pupils transported are not K–12 students, such as may be the case for buses serving college campuses, then the chassis may not be easily distinguishable from transit buses. The agencies are adopting provisions in Phase 2 such that buses not qualifying as eligible to certify as coach buses or school buses must meet the custom chassis standards for transit

[448] For most technologies, manufacturers may presume zero deterioration unless good engineering judgment does not support such a presumption. For example, it would not be appropriate to presume no deterioration in hybrid battery performance.

[449] See 40 CFR 86.1803–01 for the applicable definition of emergency vehicle.

[450] See 68 FR 44892—Federal Motor Vehicle Safety Standards; Definition of Multifunction School Activity Bus; *https://www.govinfo.gov/content/pkg/FR-2003-07-31/pdf/03-19457.pdf*.

[451] *See* Occupant Crash Protection rule, November 25, 2013, 78 FR 70415, 49 CFR 571, FMVSS 208 *https://www.gpo.gov/fdsys/pkg/FR-2013-11-25/html/2013-28211.htm*, accessed February 2016.

[452] Phone conversation March 2016, see L. Steele phone log.

buses. Buses serving college campuses do not have the same design and safety restrictions as those intended to transport primary and secondary school children, and may apply the same technologies as general-purpose urban buses.

Therefore, we are requiring refuse trucks that do not compact waste to be certified to the primary vocational vehicle standards. Front-loading refuse collection vehicles tend to have a relatively low number of stops per day as they tend to collect waste from central locations such as commercial buildings and apartment complexes. Because these have a relatively low amount of PTO operation, we expect stop-start will be reasonably effective for these vehicles. Rear-loading and side-loading neighborhood waste and recycling collection trucks are the refuse trucks where the largest number of stop-start and neutral idle over-ride conditions are likely to be encountered. Because chassis manufacturers, even those with small production volumes and close customer relationships, do not always know whether a refuse truck will be a front-loader, rear-loader, or side loader, we are grouping these together in a subcategory.

We received comment on the need to clarify whether vehicles designed to pump and convey concrete at a job site, but which do not carry the wet mix concrete to the job site, would be included in the definition of cement mixers. Although we are not defining other vehicles as cement mixers, we are allowing miscellaneous vocational vehicles meeting some but not all of the eligibility criteria at 40 CFR 1037.631 to be certified under the custom chassis program, using technology equivalent to the cement mixer package, as described above in Section V.B.

(e) Assigning Vehicles to Subcategories

In the NPRM, the agencies proposed criteria by which a vehicle manufacturer would know in which vocational subcategory—Regional, Urban, or Multipurpose—the vehicle should be certified. These cut-points were defined using calculations relating engine speed to vehicle speed. 80 FR 40287–40288. Specifically, we proposed a cutpoint for the Urban duty cycle where a vehicle at 55 mph would have an engine working above 90 percent of maximum engine test speed for vocational vehicles powered by diesel engines and above 50 percent for vocational vehicles powered by gasoline engines. Similarly, we proposed a cutpoint for the Regional duty cycle where a vehicle at 65 mph would have an engine working below 75 percent of maximum engine test speed for vocational vehicles powered by diesel engines and below 45 percent for vocational vehicles powered by gasoline engines. We received several comments that identified weaknesses in that approach. Specifically, Allison explained that vehicles with two shift schedules would need clarification which top gear to use when calculating the applicable cut-point. Also, Daimler noted that, to the extent that downspeeding occurs in this sector over the next decade or more, cutpoints based on today's fleet may not be valid for a future fleet. Allison noted that the presence of additional top gears could strongly influence the subcategory placement of vocational vehicles. These comments highlight the possibility of misclassification, and the potential pitfalls in a mandated classification scheme.

Two commenters pointed out important weaknesses in this approach, namely that future trends in engine speeds, torque curves, and transmission gear ratio spreads may cause the vocational fleet of 2027 to have drivelines that are sufficiently different than those of the baseline fleet, so that segment cut-points based on the 2016 fleet may not be valid a decade or more into the future. For example, if data on today's fleet indicated an appropriate cut-point for Regional HHD diesel vehicles of 1,400 rpm engine speed with a vehicle speed of 65 mph, while a future fleet might show that Regional vehicles operated at 1,200 rpm at 65 mph, then having a cut-point set by rule at 1,400 rpm could result in an excess of future vehicles certifying as Regional. However, we have further assessed the impact of manufacturers shifting certification of chassis from Multipurpose to Regional subcategories, and we have concluded this is not an unacceptable outcome. As explained above in Section V.C.(2)(d), we are not particularly concerned that adopting final standards with unequal percent improvements poses a danger of losing environmental benefits from this program, as long as vehicle configurations are properly classified at the time of certification.

In a regulatory structure where baselines are equal but future standards for vehicles in different subcategories have different stringencies, the agencies would typically assign subcategorization based on regulatory criteria rather than allowing the manufacturers unconstrained choice because manufacturers would have a strong incentive to simply choose the least stringent standards. However, because the baseline performance levels of the different vocational vehicle regulatory subcategories widely differ, the agencies have determined that it is acceptable to adopt standards with unequal percent stringencies. Further discussion of our reasons for this determination is presented above in Section V.C.(2)(d). Another weakness in the proposed approach was that even though we have obtained a great deal of data thanks to manufacturer cooperation and NREL duty cycle analysis, the only one of the proposed regulatory cut-points in which we have a high degree of confidence is the cut-point between Regional and Multipurpose class 8 diesels. Any cut-points we could establish based on available data for lower weight class diesels or for gasoline powered vocational vehicles would be less robust. These weaknesses have led the agencies to take a different approach to assigning vehicles to subcategories. The agencies are adopting final regulations that generally allow manufacturers to choose a subcategory, with a revised set of constraints as well as a provision requiring use of good engineering judgment. The constraints discussed here are being adopted as interim provisions in response to manufacturers' concerns that some of them could present competitive disadvantages, where different manufacturers produce very different sales mixes of vehicles equipped with different transmission types, as discussed above in Section V.C.(2)(d).

Because the baseline configurations against which vehicles in the Urban subcategories will measure their future performance do not include any manual transmissions, we have determined that vocational vehicles with manual transmissions may not be certified as Urban. In the real world, we do not expect any vehicles intended to be used in urban driving patterns will be specified with manual transmissions. Driver fatigue and other performance problems make this an illogical choice of transmission, and thus it is appropriate for us to adopt this constraint. As described in Chapter 2.9.2 of the RIA, both the HHD Regional and HHD Multipurpose baselines have a blend of manual transmissions, although the majority of manuals are in the HHD Regional baseline. Further, by MY 2024, our adoption rate of transmission technology reflects zero manuals in HHD Multipurpose. Thus, beginning in MY 2024, any vocational vehicle certified with a manual transmission must be classified in a Regional subcategory, except a vehicle with a hybridized manual transmission may be certified in a Multipurpose subcategory beyond MY 2024.

We are not adopting constraints on vehicles with automated manual transmissions certifying in either Regional or Multipurpose subcategories, because we believe this is a technology that can provide real world benefits for vehicles with those driving patterns. However, we are adopting an interim constraint to prevent vehicles with AMT from being certified as Urban for a reason similar to one described above for manuals, namely that in the real world, we do not expect any vehicles intended to be used in urban driving patterns will be specified with transmissions that do not have powershifts. Lack of smooth shifting characteristics during low speed accelerations and decelerations make AMT an illogical choice of transmission for urban vehicles, and thus it is appropriate for us to adopt this constraint.

Dual clutch transmissions have very recently become available for medium heavy-duty vocational vehicles and very little data are available on their design or performance. We anticipate that in the future, some designs may have features that make them perform similarly to AMT's while others may have features that make them more similar to automatics with torque converters. Because we are not confident that we know in which duty cycle(s) they are best suited, we are adopting a partial constraint on these, namely that dual clutch transmissions without powershifting must also be constrained out of Urban. We are finalizing as proposed that any vehicle whose engine is exclusively certified over the SET must be certified in the Regional subcategory. Further, to the extent manufacturers of intercity coach buses and recreational vehicles certify these to the primary standards, these also must be certified as Regional vehicles.[453]

In the final regulatory structure, although the standards for vehicles in different subcategories have different percent stringencies from each baseline, the agencies can allow the manufacturers to choose without risking a loss of environmental benefits because a standard that may appear less stringent in terms of relative improvement from each respective baseline may also be numerically lower (and farther away from current model performance) due to a comparatively better-performing regulatory baseline. As explained above, the final standards described above in Section V.C.(2)(c) are derived directly from the technology packages without applying any assumptions about fleet averages. Thus, unlike at proposal, the final regulations will generally allow manufacturers to certify in the particular duty-cycle subcategory they believe to be most appropriate. Manufacturers may make this choice as part of the certification process and will not be allowed to change it after the vehicle has been introduced into commerce. Under this structure, the agencies expect manufacturers to choose a subcategory for each vehicle configuration that best represents the type of operation that vehicle will actually experience in use (presuming the manufacturer and customer would specify the technologies to reflect such operation).

(2) Other Compliance Provisions

(a) Emission Control Labels

As proposed, EPA is removing the requirement to include the emission control system identifiers required in 40 CFR 1037.135(c)(6) and in Appendix III to 40 CFR part 1037 from the emission control labels for vehicles certified to the Phase 2 standards. For vehicles certified to the optional custom chassis standards, the label should meet the requirements of 40 CFR 1037.105(h). Please see Section I.C.(1)(g) of this Preamble for additional discussion of labeling.

(b) End of Year Reports

In the Phase 1 program, manufacturers participating in the ABT program provided 90 day and 270 day reports to EPA and NHTSA after the end of the model year. The agencies adopted two reports for the initial program to help manufacturers become familiar with the reporting process. For the HD Phase 2 program, the agencies proposed to simplify reporting such that manufacturers would only be required to submit the final report 90 days after the end of the model year with the potential to obtain approval for a delay up to 30 days. We requested comments on this approach. EMA, PACCAR, Navistar, Daimler, and Cummins recommended keeping the 270 day report to allow sufficient time after the production period is completed. We are accordingly keeping both the 90 day and 270 day reports, with the ability of the agencies' to waive the 90 day report.

(c) Delegated Assembly

The final standards for vocational vehicles are based on the application of a wide range of technologies. Certifying vehicle manufacturers manage their compliance demonstration to reflect this range of technologies by describing their certified configurations in the application for certification. In most cases, these technologies are designed and assembled (or installed) directly by the certifying vehicle manufacturer, which is typically the chassis manufacturer. In these cases, it is straightforward to assign the responsibility to the certifying vehicle manufacturer for ensuring that vehicles are in their proper certified configuration before they are introduced into commerce. In Phase 1, the only vehicle technology available for certified vocational vehicles is LRR tires. Because these are generally installed by the chassis manufacturer, there is no need to rely on a second stage manufacturer for purposes of certification in Phase 1, unless innovative credits are sought. Thus, the Phase 1 regulations did not specify precise procedures for this.

In Phase 2, the agencies are projecting adoption of certain technologies where the certifying vehicle manufacturer may want or need to rely on a downstream manufacturing company (a secondary vehicle manufacturer) to take steps to assemble or install certain components or technologies to bring the vehicle into a certified configuration. A similar relationship between manufacturers applies with aftertreatment devices for certified engines. EPA previously adopted ''delegated assembly'' provisions for engines at 40 CFR 1068.261 to describe how manufacturers can share compliance responsibilities through these cooperative assembly procedures, and proposed to also apply it for vehicle-based GHG standards in 40 CFR part 1037, including the vocational vehicle standards.

The delegated assembly provisions being finalized for Phase 2 vehicle standards are only invoked if a certifying manufacturer includes in its certified configuration a technology that it does not install itself. Examples may include fairings to reduce aerodynamic drag, air conditioning systems, automatic tire inflation systems, or hybrid systems. We are clarifying this regulatory process to enable manufacturers to include technologies in their compliance plans that might otherwise not be considered on the basis of what they can install themselves. To the extent certifying manufacturers rely on secondary vehicle manufacturers to bring the vehicle into a certified configuration, the following provisions will apply:

[453] Based on NREL drive cycle analysis of the existing fleet, we imagine that HHD vehicles with a diesel engine rpm of 1,400 and below when the vehicle is at 65 mph would be appropriately certified as Regional vehicles. However, this is illustrative only, and the final rules do not include an engine speed cutpoint as a criterion in subcategory selection.

• The certifying manufacturer will describe its approach to delegated assembly in the application for certification.

• The certifying manufacturer will create installation instructions to describe how the secondary vehicle manufacturer will bring the vehicle into a certified configuration.

• The certifying manufacturer must take additional steps for certified configurations that include hybrid powertrain components, auxiliary power units, aerodynamic devices, or natural gas fuel tanks. In these cases, the certifying manufacturer must have a contractual agreement with each affected secondary vehicle manufacturer obligating the secondary vehicle manufacturer to build each vehicle into a certified configuration and to provide affidavits confirming proper assembly procedures, and to provide information regarding deployment of each type of technology (if there are technology options that relate to different GEM input values).

See Section I.F of this Preamble and Section 1.4.4 of the RTC for further discussion of the comments received on delegated assembly provisions.

The agencies have developed the delegated-assembly and other provisions in 40 CFR 1037.620—1037.622 to clarify how manufacturers have shared and separate responsibilities for complying with the regulations. Vocational vehicles are the most likely vehicle types to involve both primary and secondary manufacturers; however, other types of vehicles may also involve multiple manufacturers, so these regulatory provisions apply to all vehicles.

Secondary manufacturers (such as body builders) that build complete vehicles from certified chassis are obligated to comply with the emission-related installation instructions provided by the certifying manufacturer. Secondary manufacturers that build complete vehicles from exempted chassis are similarly obligated to comply with all of the regulatory provisions related to the exemption.

(d) Demonstrating Compliance With HFC Leakage Standards

EPA's requirements for vocational chassis manufacturers to demonstrate reductions in direct emissions of HFC in their A/C systems and components through a design-based method. The method for calculating A/C leakage is the same as was adopted in Phase 1 for tractors and HD pickups and vans. It is based closely on an industry-consensus leakage scoring method, described below. This leakage scoring method is correlated to experimentally-measured leakage rates from a number of vehicles using the different available A/C components. As is done currently for other HD vehicles, vocational chassis manufacturers will choose from a menu of A/C equipment and components used in their vehicles in order to establish leakage scores, to characterize their A/C system leakage performance. The percent leakage per year will then be calculated as this score divided by the system refrigerant capacity. We received comments from transit bus manufacturers with concerns that the air conditioning systems on their vehicles are much larger and more complex than systems on typical heavy-duty trucks. As such, they questioned whether our HFC leakage compliance process was valid for their vehicles. Based on information provided by suppliers of air conditioning systems for large buses, we believe some unusually large systems may include components not adequately represented by those listed in the standard compliance procedure, namely the hoses, fittings or seals may not be listed with realistic leakage rates. Therefore EPA is adopting in this final rule provisions allowing use of an alternate compliance procedure where an air conditioning system with refrigerant charge capacity greater than 3,000 grams is installed in a Phase 2 vocational vehicle.

Consistent with the light-duty rule and the Phase 1 program for other HD vehicles, vocational chassis manufacturers will compare the components of a vehicle's A/C system with a set of leakage-reduction technologies and actions that is based closely on that developed through the Improved Mobile Air Conditioning program and SAE International (as SAE Surface Vehicle Standard J2727, ''HFC–134a, Mobile Air Conditioning System Refrigerant Emission Chart,'' August 2008 version). *See* generally 75 FR 25426. The SAE J2727 approach was developed from laboratory testing of a variety of A/C related components, and EPA believes that the J2727 leakage scoring system generally represents a reasonable correlation with average real-world leakage in new vehicles. This approach associates each component with a specific leakage rate in grams per year that is identical to the values in J2727 and then sums together the component leakage values to develop the total A/C system leakage. Unlike the light-duty program, in the heavy-duty vehicle program, the total A/C leakage score is divided by the value of the total refrigerant system capacity to develop a percent leakage per year.

EPA concludes that the design-based approach results in estimates of likely leakage emissions reductions that are comparable to those that would result from performance-based testing. Where a manufacturer installs an air conditioning system in a vocational vehicle that has a working fluid consisting of an alternate refrigerant with a lower global warming potential than HFC–134a, compliance with the leakage standard is addressed in the regulations at 40 CFR 1037.115. Please see Section I.F.(2)(b) for a discussion related to alternative refrigerants.

Consistent with the HD Phase 1 program and the light-duty rule, where we require that manufacturers attest to the durability of components and systems used to meet the CO_2 standards (see 75 FR 25689), we are requiring that manufacturers of heavy-duty vocational vehicles attest to the durability of these systems, and provide an engineering analysis that demonstrates component and system durability.

(e) Glider Vehicles

EPA and NHTSA requested comment on gliders and received extensive comment. The main issues involve standards for rebuilt engines installed in new glider vehicles. These issues are fully addressed in Preamble Section XIII.B and RTC Section 14.2. Of relevance for the vocational vehicle sector, the final standards contain a number of provisions allowing donor engines that are still within their regulatory useful life to be used in new glider vehicles provided the engine meets all standards applicable to the year in which the engine was originally manufactured and also meets one of the following criteria:

• The engine is still within its original useful life in terms of both miles and years.

• The engine has less than 100,000 miles of engine operation.

• The engine is less than three years old.

Thus, if a donor engine meeting one of the above criteria was manufactured before the Phase 1 GHG standards, it would not be subject to those standards when installed in a glider vehicle. Similarly, if such an engine was manufactured before 2010, it would be subject to the pre-2010 criteria pollutant standards corresponding to its year of manufacture. EPA is adopting this provision consistent with the original purpose of glider vehicles as providing a means of salvaging of relatively new powertrains from vehicle chassis that have been damaged or have otherwise failed prematurely. See Section XIII.B of the Preamble.

(3) Compliance Flexibility Provisions

EPA and NHTSA are adopting several flexibility provisions in the Phase 2 program. Program-wide compliance flexibilities include an averaging, banking and trading program for CO_2 emissions and fuel consumption credits, provisions for off-cycle credits for technologies that are not included as inputs to the GEM, and advanced technology credits. These are described below as well as in Section I.B.3 to I.C.1. Provisions that are not program-wide include optional chassis certification and a revised interim loose engines provision, as described below.

(a) Averaging, Banking, and Trading (ABT) Program

Averaging, banking, and trading of emission credits have been an important part of many EPA mobile source programs under CAA Title II. ABT provisions provide manufacturers flexibilities that assist in the efficient development and implementation of new technologies and therefore enable new technologies to be implemented at a more aggressive pace than without ABT. NHTSA and EPA are carrying-over the Phase 1 ABT provisions for vocational vehicles into Phase 2, as it is an important way to achieve each agency's programmatic goals. ABT is also discussed in Section I and Section III.F.1.

Consistent with the Phase 1 averaging sets, the agencies are allowing chassis manufacturers to average SI-powered vocational vehicle chassis with CI-powered vocational vehicle chassis, within the same vehicle weight class group. In Phase 1, all vocational and tractor chassis within a vehicle weight class group were able to average with each other, regardless of whether they were powered by a CI or SI engine. The Phase 2 approach continues this. The only difference is that in Phase 2, there are different numerical standards set for the SI-powered and CI-powered vehicles, but that does not alter the basis for averaging. This is consistent with the Phase 1 approach where, for example, Class 8 day cab tractors, Class 8 sleeper cab tractors and Class 8 vocational vehicles each have different numerical standards, while they all belong to the same averaging set.

As discussed in V.D.(1)(c), EPA and NHTSA are adopting a revised useful life for LHD vocational vehicles for GHG emissions from the current 10 years/110,000 miles to 15 years/150,000 miles, to be consistent with the useful life of criteria pollutants recently updated in EPA's Tier 3 rule. For the same reasons, EPA and NHTSA are also adopting a useful life adjustment for HD pickups and vans, as described in Section VI.E.(1). According to the credits calculation formula at 40 CFR 1037.705 and 49 CFR 535.7, useful life in miles is a multiplicative factor included in the calculation of CO_2 and fuel consumption credits. In order to ensure that banked credits will maintain their value in the transition from Phase 1 to Phase 2, NHTSA and EPA are adopting an interim vocational vehicle adjustment factor of 1.36 for credits that are carried forward from Phase 1 to the MY 2021 and later Phase 2 standards.[454] Without this adjustment factor the change in useful life would effectively result in a discount of banked credits that are carried forward from Phase 1 to Phase 2, which is not the intent of the change in the useful life. The agencies do not believe that this adjustment will result in a loss of program benefits because there is little or no deterioration anticipated for CO_2 emissions and fuel consumption over the life of the vehicles. Also, the carry-forward of credits is an integral part of the program, helping to smooth the transition to the Phase 2 standards. The agencies believe that effectively discounting carry-forward credits from Phase 1 to Phase 2 is unnecessary and could negatively impact the feasibility of the Phase 2 standards. EPA and NHTSA requested comment on all aspects of the averaging, banking, and trading program. A complete discussion of the comments on credits and ABT can be found in the RTC Section 1.4.

(b) Innovative and Off-Cycle Technology Credits

In Phase 1, the agencies adopted an emissions and fuel consumption credit generating opportunity that applied to innovative technologies that reduce fuel consumption and CO_2 emissions. Eligible technologies were required to not be in common use with heavy-duty vehicles before the 2010MY and not reflected in the GEM simulation tool (*i.e.,* the benefits are ''off-cycle''). See 76 FR 57253. In Phase 2, the agencies are re-designating it as an off-cycle technology program. The agencies are maintaining the requirement that, in order for a manufacturer to receive credits for Phase 2, the off-cycle technology must not have been in common use prior to MY 2010.

The agencies recognize that there are emerging technologies today that are being developed, but will not be accounted for in the GEM tool, and therefore will be considered off-cycle. For vocational vehicles, this could include technologies whose scope and effectiveness surpass those defined and pre-approved in the HD Phase 2 program, such as aerodynamics and electrified accessories. Any credits for these technologies will need to be based on real-world fuel consumption and GHG reductions that can be measured with verifiable test methods using representative driving conditions typical of the engine or vehicle application. More information about off-cycle technology credits can be found at Section I.C.1.c.

As in Phase 1, the agencies will continue to provide two paths for approval of the test procedure to measure the CO_2 emissions and fuel consumption reductions of an off-cycle technology used in vocational vehicles. See 40 CFR 1037.610 and 49 CFR 535.7. The first path will not require a public approval process of the test method. A manufacturer may use ''pre-approved'' test methods for HD vehicles including the A-to-B chassis testing, powerpack testing or on-road testing. A manufacturer may also use any developed test procedure that has known quantifiable benefits. A test plan detailing the testing methodology will be required to be approved prior to collecting any test data. The agencies are also continuing the second path, which includes a public approval process of any testing method that could have questionable benefits (*i.e.,* an unknown usage rate for a technology). Furthermore, the agencies are adopting revisions to clarify what documentation must be submitted for approval, aligning them with provisions in 40 CFR 86.1869–12. NHTSA is prohibiting credits from technologies addressed by any of its crash avoidance safety rulemakings (*i.e.,* congestion management systems). See also 77 FR 62733 (discussion of similar issue in the light duty greenhouse gas/fuel economy regulations). We received extensive comment on the off-cycle technology approval process. In response to requests to develop a streamlined path for off-cycle technology approval, we are not making fundamental changes from the proposal at this time; however, we remain open to working with stakeholders to look for ways to simplify the process. For example, although we are including specific provisions to recognize certain electrified accessories, recognizing others would require the manufacturer to go through the off-cycle process. However, it is quite possible that the agencies could gather sufficient data to allow us to adopt specific provisions in a future rulemaking to recognize other accessories in a simpler

[454] See 40 CFR 1037.150(o) and 49 CFR 535.7.

manner. Please see Section I.C. of this Preamble for further discussion of off-cycle credits.

There are some technologies that are entering the market today, and although our model does not have the capability to simulate the effectiveness over the test cycles, there are reliable estimates of effectiveness available to the agencies. These will be recognized in our HD Phase 2 certification procedures as pre-defined technologies, and will not be considered off-cycle. Examples of such technologies for vocational vehicles include narrowly-defined types of electrified accessories or aerodynamic improvements. The agencies are specifying default effectiveness values to be used as valid inputs to GEM for each of these. The projected effectiveness of each vocational vehicle technology is discussed in the RIA Chapter 2.9.3.

The agencies' approval for Phase 1 innovative technology credits (approved prior to 2021 MY) will be carried into the Phase 2 program on a limited basis for those technologies where the benefit is not accounted for in the Phase 2 test procedure. Therefore, the manufacturers will not be required to request new approval for any innovative credits carried into the off-cycle program, but will have to demonstrate, as part of the MY 2021 certification, the extent to which the new cycle does not account for these improvements. The agencies believe this is appropriate because technologies, such as those related to the transmission or driveline, may no longer be ''off-cycle'' because of the addition of these technologies into the Phase 2 version of GEM.

(c) Advanced Technology Credits

As described above in Section I, the agencies proposed to discontinue advanced technology credits in Phase 2, which had been intended to promote the early implementation of advanced technologies that were not expected to be widely adopted in the market in the 2014 to 2018 time frame. These technologies were defined in Phase 1 as hybrid powertrains, Rankine cycle engines, all-electric vehicles, and fuel cell vehicles (see 40 CFR 1037.150(p)), at a 1.5 credit value. We requested and received comments on the need for such incentives, and as a result we are not only continuing these credits, we are adopting even greater multipliers than before. See Section I of this Preamble for further discussion of the comments received and the agencies' response regarding advanced technology credits.

(d) Optional Chassis Certification

In Phase 2, the agencies are continuing the Phase 1 option to chassis certify vehicles over 14,000 lbs GVWR, but only if there is a family with vehicles at or below 14,000 pounds GVWR that can properly accommodate the bigger vehicles as part of the same family. As adopted in this final rule, chassis-certified vehicles above 14,000 pounds GVWR may not rely on a work factor that is greater than the largest work factor that applies for vehicles at or below 14,000 pounds GVWR from the same family. Applying this work factor constraint avoids the need to set a specific upper GVWR limit on vehicles eligible to use this flexibility. See Section XIII.A.2 of this Preamble, and Section 14.3.2 of the RTC, for further discussion of this issue.

(e) Certifying Loose SI Engines in Vocational Vehicles in Phase 2

The agencies proposed not to continue the Phase 1 interim flexibility known as the ''loose engine'' provision, receiving favorable comment from Cummins and adverse comment on this from Isuzu and AAPC. 80 FR 40331. Under this provision, SI engines produced by manufacturers of HD pickup trucks and vans and sold to chassis manufacturers and intended for use in vocational vehicles need not meet the separate SI engine standard, and instead may be averaged with the manufacturer's HD pickup and van fleet (see 40 CFR 86.1819–14(k)(8)). The agencies are adopting a Phase 2 SI engine standard that is no more stringent than the MY 2016 SI engine standard adopted in Phase 1, while the Phase 2 standards for the HD pickup and van fleet is progressively more stringent through MY 2027. The primary certification path designed in the Phase 1 program for both CI and SI engines sold separately and intended for use in vocational vehicles is that they are engine certified while the vehicle is GEM certified under the GHG rules.

This provision was adopted primarily to address small volume sales of engines used in complete vehicles that are also sold to other manufacturers. The Phase 1 final rules explain that we set the effective date of the Phase 1 SI engine standard as MY 2016 because we projected by this time all manufacturers would have redesigned their gasoline engine offerings to adopt the technologies needed to reduce FTP-cycle emissions by five percent; technologies that cannot simply be bolted on to an existing engine but can only be effectively applied through an integrated design and development process (76 FR 57180, 57235). The Phase 1 final rules also explain that the compliance flexibility provided by the loose engine provision is technically appropriate because it provides manufacturers with an option to focus their energy on improving the GHG and fuel consumption performance of their complete vehicle products (including engine improvements), rather than on concurrently calibrating for both vehicle and engine test compliance (76 FR 57260). At proposal we noted that although gasoline engine manufacturers have accomplished extensive improvements to comply with HD pickup and vans standards as well as the light-duty vehicle standards, the agencies had not seen evidence of the engine redesigns that we had projected to occur by 2016, and we concluded that discontinuation of this flexibility by MY 2021 was appropriate to provide regulatory certainty on the date beyond which engine certification would be mandatory for HD SI engines.

However, in response to persuasive comments from a chassis manufacturer that purchases these engines, we are adopting a narrow extension of this interim flexibility, where for MYs 2021–2023, each SI engine manufacturer may sell an annual maximum of 10,000 SI engines certified under this provision.[455] We believe this three-year extension is needed to prevent market disruptions. We are concerned that SI engine manufacturers might not choose to certify any SI engines that can be sold to other vocational chassis manufacturers, which would significantly disrupt the market. With this limited extension, we are ensuring no loss of environmental benefits because any vehicle certified by a chassis manufacturer who obtains a high-emitting SI engine must apply additional technology as needed to meet the applicable vocational vehicle standard. We are generally not allowing custom chassis manufacturers to use SI engines that have been certified under this loose engine provision, if they are certifying using one of the custom chassis regulatory subcategories. However, manufacturers certifying motor homes or emergency vehicles to the optional standards may install engines certified through the interim loose engine provision. The typical annual miles driven by these vehicles is very low, usually between 2,000 and 5,000 miles for either motor homes or emergency vehicles, and thus their contribution to emissions and fuel consumption is very small. See Section II of this Preamble for a discussion of

[455] Meeting with Isuzu dated April 22, 2016.

the comments received and the agencies' response on the separate engine standard for SI engines intended for vocational vehicles.

(f) On-Board Diagnostics for Hybrid Vehicle Systems

In HD Phase 1, EPA adopted provisions to delay the onboard diagnostics (OBD) requirements for heavy-duty hybrid powertrains (see 40 CFR 86.010–18(q)). This provision delayed full OBD requirements for hybrids until MY 2016 and MY 2017. The agencies have received comments from hybrid manufacturers regarding their progress toward meeting the on-board diagnostic requirements for criteria pollutant engine certification related to hybrid systems. See Section XIII.A.1 for a discussion of comments received and EPA's response related to certification of engines paired with hybrid powertrain systems.

VI. Heavy-Duty Pickups and Vans

In the NPRM, the agencies conducted coordinated and complementary analyses using two analytical methods for the heavy-duty pickup and van segment, both of which used the same version of NHTSA's CAFE model to analyze technology. The agencies have also used two analytical methods for the joint final rule. However, unlike the NPRM, for the joint final rule, the agencies are using different versions of NHTSA's CAFE model to analyze technology. The Method B approach continues to use the same version of the model and inputs that was used for the NPRM. Method A uses an updated version of the CAFE model and some updated inputs.

A. Summary of Phase 1 HD Pickup and Van Standards

In the Phase 1 rule, EPA and NHTSA established GHG and fuel consumption standards and a program structure for complete Class 2b and 3 heavy-duty vehicles (referred to in these rules as ''HD pickups and vans''), as described below. The Phase 1 standards began to be phased-in in MY 2014 and the agencies believe the program is working well. The agencies are retaining most elements from the structure of the program established in the Phase 1 rule for the Phase 2 program while establishing more stringent Phase 2 standards for MY 2027, phased in over MYs 2021–2027, that will require additional GHG reductions and fuel consumption improvements. As discussed below, the agencies are adopting the Phase 2 standards as proposed. The MY 2027 standards will remain in place unless and until amended by the agencies.

Heavy-duty vehicles with GVWR between 8,501 and 10,000 lbs. are classified in the industry as Class 2b motor vehicles. Class 2b includes vehicles classified as medium-duty passenger vehicles (MDPVs) such as very large SUVs. Because MDPVs are frequently used like light-duty passenger vehicles, they are regulated by the agencies under the light-duty vehicle rules. Thus, the agencies did not adopt additional requirements for MDPVs in the Phase 1 rule and are not adopting additional requirements for MDPVs in this rulemaking. Heavy-duty vehicles with GVWR between 10,001 and 14,000 lbs are classified as Class 3 motor vehicles. Class 2b and Class 3 heavy-duty vehicles together emit about 23 percent of today's GHG emissions from the heavy-duty vehicle sector.

About 90 percent of HD pickups and vans are ¾-ton and 1-ton pickup trucks, 12- and 15-passenger vans, and large work vans that are sold by vehicle manufacturers as complete vehicles, with no secondary manufacturer making substantial modifications prior to registration and use. Most of these vehicles are produced by companies with major light-duty markets in the United States, primarily Ford, General Motors, and Fiat Chrysler. 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.

In the Phase 1 rule, EPA adopted GHG standards for HD pickups and vans based on the whole vehicle (including the engine), expressed as grams of CO_2 per mile, consistent with the way these vehicles are regulated by EPA today for criteria pollutants. NHTSA adopted corresponding gallons per 100 mile fuel consumption standards that are likewise based on the whole vehicle. This complete vehicle approach adopted by both agencies for HD pickups and vans was consistent with the recommendations of the NAS Committee in its 2010 Report. EPA and NHTSA adopted a structure for the Phase 1 HD pickup and van standards that in many respects paralleled long-standing NHTSA CAFE standards and more recent coordinated EPA GHG standards for manufacturers' fleets of new light-duty vehicles. These commonalities include a new vehicle fleet average standard for each manufacturer in each model year and the determination of these fleet average standards based on production volume-weighted targets for each model, with the targets varying based on a defined vehicle attribute. Vehicle testing for both the HD and light-duty vehicle programs is conducted on chassis dynamometers using the drive cycles from the EPA Federal Test Procedure (Light-duty FTP or ''city'' test) and Highway Fuel Economy Test (HFET or ''highway'' test).[456]

For the light-duty GHG and fuel economy[457] standards, the agencies factored in vehicle size by basing the emissions and fuel economy targets on vehicle footprint (the wheelbase times the average track width).[458] For those standards, passenger cars and light trucks with larger footprints are assigned higher GHG and lower fuel economy target levels in acknowledgement of their inherent tendency to consume more fuel and emit more GHGs per mile. EISA requires that NHTSA study ''the appropriate metric for measuring and expressing commercial medium- and heavy-duty vehicle and work truck fuel efficiency performance, taking into consideration, among other things, the work performed by such on-highway vehicles and work trucks . . .'' See 49 U.S.C. 32902(k)(1)(B).[459] For HD pickups and vans, the agencies also set standards based on a vehicle attribute, but used a work-based metric as the attribute rather than the footprint attribute utilized in the light-duty vehicle rulemaking. Work-based measures such as payload and towing capability are key among the parameters that characterize differences in the design of these vehicles, as well as differences in how the vehicles will be utilized. Buyers consider these utility-based attributes when purchasing a HD pickup or van. EPA and NHTSA therefore finalized Phase 1 standards for HD pickups and vans based on a ''work factor'' attribute that combines the vehicle's payload and towing capabilities, with an added adjustment

[456] The Light-duty FTP is a vehicle driving cycle that was originally developed for certifying light-duty vehicles and subsequently applied to HD chassis testing for criteria pollutants. This contrasts with the Heavy-duty FTP, which refers to the transient engine test cycles used for certifying heavy-duty engines (with separate cycles specified for diesel and spark-ignition engines).

[457] Light duty fuel *economy* standards are expressed as miles per gallon (mpg), which is inverse to the HD fuel *consumption* standards which are expressed as gallons per 100 miles.

[458] EISA requires CAFE standards for passenger cars and light trucks to be attribute-based; *See* 49 U.S.C. 32902(b)(3)(A).

[459] The NAS 2010 report likewise recommended standards recognizing the work function of HD vehicles. See 76 FR 57161.

VIII. How will these rules impact non-GHG emissions and their associated effects?

The heavy-duty vehicle standards are expected to influence the emissions of criteria air pollutants and several hazardous air pollutants (air toxics). This section describes the projected impacts of the final rules on non-GHG emissions and air quality and the health and environmental effects associated with these pollutants. NHTSA further analyzes these projected health and environmental effects resulting from its final rules and reasonable alternatives in Chapter 4 of its FEIS.

A. Health Effects of Non-GHG Pollutants

In this section, we discuss health effects associated with exposure to some of the criteria and air toxic pollutants impacted by the final heavy-duty vehicle standards.

(1) Particulate Matter

(a) Background

Particulate matter is a highly complex mixture of solid particles and liquid droplets distributed among numerous atmospheric gases which interact with solid and liquid phases. Particles range in size from those smaller than 1 nanometer (10^{-9} meter) to over 100 micrometers (µm, or 10^{-6} meter) in diameter (for reference, a typical strand of human hair is 70 µm in diameter and a grain of salt is about 100 µm). Atmospheric particles can be grouped into several classes according to their aerodynamic and physical sizes. Generally, the three broad classes of particles include ultrafine particles (UFPs, generally considered as particulates with a diameter less than or equal to 0.1 µm [typically based on physical size, thermal diffusivity or electrical mobility])), ''fine'' particles ($PM_{2.5}$; particles with a nominal mean aerodynamic diameter less than or equal to 2.5 µm), and ''thoracic'' particles (PM_{10}; particles with a nominal mean aerodynamic diameter less than or equal to 10 µm).[570] Particles that fall within the size range between $PM_{2.5}$ and PM_{10}, are referred to as ''thoracic coarse particles'' ($PM_{10-2.5}$, particles with a nominal mean aerodynamic diameter less than or equal to 10 µm and greater than 2.5 µm). EPA currently has standards that regulate $PM_{2.5}$ and PM_{10}.[571]

Particles span many sizes and shapes and may consist of hundreds of different chemicals. Particles are emitted directly from sources and are also formed through atmospheric chemical reactions; the former are often referred to as ''primary'' particles, and the latter as ''secondary'' particles. Particle concentration and composition varies by time of year and location, and, in addition to differences in source emissions, is affected by several weather-related factors, such as temperature, clouds, humidity, and wind. A further layer of complexity comes from particles' ability to shift between solid/liquid and gaseous phases, which is influenced by concentration and meteorology, especially temperature.

Fine particles are produced primarily by combustion processes and by transformations of gaseous emissions (*e.g.,* sulfur oxides (SO_X), oxides of nitrogen, and volatile organic compounds (VOC)) in the atmosphere. The chemical and physical properties of $PM_{2.5}$ may vary greatly with time, region, meteorology, and source category. Thus, $PM_{2.5}$ may include a complex mixture of different components including sulfates, nitrates, organic compounds, elemental carbon and metal compounds. These particles can remain in the atmosphere for days to weeks and travel hundreds to thousands of kilometers.

(b) Health Effects of PM

Scientific studies show exposure to ambient PM is associated with a broad range of health effects. These health effects are discussed in detail in the Integrated Science Assessment for Particulate Matter (PM ISA), which was finalized in December 2009.[572] The PM ISA summarizes health effects evidence for short- and long-term exposures to $PM_{2.5}$, $PM_{10-2.5}$, and ultrafine particles.[573] The PM ISA concludes that human exposures to ambient $PM_{2.5}$ are associated with a number of adverse health effects and characterizes the weight of evidence for broad health categories (*e.g.,* cardiovascular effects, respiratory effects, etc.).[574] The discussion below highlights the PM ISA's conclusions pertaining to health effects associated with both short- and long-term PM exposures. Further discussion of health effects associated with PM can also be found in the rulemaking documents for the most recent review of the PM NAAQS completed in 2012.[575] [576]

EPA has concluded that ''a causal relationship exists'' between both long- and short-term exposures to $PM_{2.5}$ and premature mortality and cardiovascular effects and that ''a causal relationship is likely to exist'' between long- and short-term $PM_{2.5}$ exposures and respiratory effects. Further, there is evidence ''suggestive of a causal relationship'' between long-term $PM_{2.5}$ exposures and other health effects, including developmental and reproductive effects (*e.g.,* low birth weight, infant mortality) and carcinogenic, mutagenic, and genotoxic effects (*e.g.,* lung cancer mortality).[577]

As summarized in the final rule resulting from the last review (2012) of the PM NAAQS, and discussed extensively in the 2009 p.m. ISA, the available scientific evidence significantly strengthens the link between long- and short-term exposure to $PM_{2.5}$ and mortality, while providing indications that the magnitude of the $PM_{2.5}$- mortality association with long-term exposures may be larger than previously estimated.[578] [579] The strongest evidence comes from recent

[570] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. Figure 3–1.

[571] Regulatory definitions of PM size fractions, and information on reference and equivalent methods for measuring PM in ambient air, are provided in 40 CFR parts 50, 53, and 58. With regard to national ambient air quality standards (NAAQS) which provide protection against health and welfare effects, the 24-hour PM_{10} standard provides protection against effects associated with short-term exposure to thoracic coarse particles (*i.e.,* $PM_{10-2.5}$).

[572] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F.

[573] The ISA also evaluated evidence for PM components but did not reach causal determinations for components.

[574] The causal framework draws upon the assessment and integration of evidence from across epidemiological, controlled human exposure, and toxicological studies, and the related uncertainties that ultimately influence our understanding of the evidence. This framework employs a five-level hierarchy that classifies the overall weight of evidence and causality using the following categorizations: causal relationship, likely to be causal relationship, suggestive of a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship (U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, Table 1–3).

[575] 78 FR 3103–3104, January 15, 2013.

[576] 77 FR 38906–38911, June 29, 2012.

[577] These causal inferences are based not only on the more expansive epidemiological evidence available in this review but also reflect consideration of important progress that has been made to advance our understanding of a number of potential biologic modes of action or pathways for PM-related cardiovascular and respiratory effects (U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, Chapter 5).

[578] 78 FR 3103–3104, January 15, 2013.

[579] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, Chapter 6 (Section 6.5) and Chapter 7 (Section 7.6).

studies investigating long-term exposure to $PM_{2.5}$ and cardiovascular-related mortality. The evidence supporting a causal relationship between long-term $PM_{2.5}$ exposure and mortality also includes consideration of studies that demonstrated an improvement in community health following reductions in ambient fine particles.

Several studies evaluated in the 2009 p.m. ISA have examined the association between cardiovascular effects and long-term $PM_{2.5}$ exposures in multi-city epidemiological studies conducted in the U.S. and Europe. These studies have provided new evidence linking long-term exposure to $PM_{2.5}$ with an array of cardiovascular effects such as heart attacks, congestive heart failure, stroke, and mortality. This evidence is coherent with studies of effects associated with short-term exposure to $PM_{2.5}$ that have observed associations with a continuum of effects ranging from subtle changes in indicators of cardiovascular health to serious clinical events, such as increased hospitalizations and emergency department visits due to cardiovascular disease and cardiovascular mortality.[580]

As detailed in the 2009 p.m. ISA, extended analyses of seminal epidemiological studies, as well as more recent epidemiological studies conducted in the U.S. and abroad, provide strong evidence of respiratory-related morbidity effects associated with long-term $PM_{2.5}$ exposure. The strongest evidence for respiratory-related effects is from studies that evaluated decrements in lung function growth (in children), increased respiratory symptoms, and asthma development. The strongest evidence from short-term $PM_{2.5}$ exposure studies has been observed for increased respiratory-related emergency department visits and hospital admissions for chronic obstructive pulmonary disease (COPD) and respiratory infections.[581]

The body of scientific evidence detailed in the 2009 PM ISA is still limited with respect to associations between long-term $PM_{2.5}$ exposures and developmental and reproductive effects as well as cancer, mutagenic, and genotoxic effects. The strongest evidence for an association between $PM_{2.5}$ and developmental and reproductive effects comes from epidemiological studies of low birth weight and infant mortality, especially due to respiratory causes during the post-neonatal period (*i.e.,* 1 month to 12 months of age).[582] With regard to cancer effects, ''[m]ultiple epidemiologic studies have shown a consistent positive association between $PM_{2.5}$ and lung cancer mortality, but studies have generally not reported associations between $PM_{2.5}$ and lung cancer incidence.'' [583]

In addition to evaluating the health effects attributed to short- and long-term exposure to $PM_{2.5}$, the 2009 PM ISA also evaluated whether specific components or sources of $PM_{2.5}$ are more strongly associated with specific health effects. An evaluation of those studies resulted in the 2009 PM ISA concluding that ''many [components] of PM can be linked with differing health effects and the evidence is not yet sufficient to allow differentiation of those [components] or sources that are more closely related to specific health outcomes.'' [584]

For $PM_{10-2.5}$, the 2009 PM ISA concluded that available evidence was ''suggestive of a causal relationship'' between short-term exposures to $PM_{10-2.5}$ and cardiovascular effects (*e.g.,* hospital admissions and Emergency Department (ED) visits, changes in cardiovascular function), respiratory effects (*e.g.,* ED visits and hospital admissions, increase in markers of pulmonary inflammation), and premature mortality. The scientific evidence was ''inadequate to infer a causal relationship'' between long-term exposure to $PM_{10-2.5}$ and various health effects.[585] [586] [587]

For UFPs, the 2009 PM ISA concluded that the evidence was ''suggestive of a causal relationship'' between short-term exposures and cardiovascular effects, including changes in heart rhythm and vasomotor function (the ability of blood vessels to expand and contract). It also concluded that there was evidence ''suggestive of a causal relationship'' between short-term exposure to UFPs and respiratory effects, including lung function and pulmonary inflammation, with limited and inconsistent evidence for increases in ED visits and hospital admissions. Scientific evidence was ''inadequate to infer a causal relationship'' between short-term exposure to UFPs and additional health effects including premature mortality as well as long-term exposure to UFPs and all health outcomes evaluated.[588] [589]

The 2009 PM ISA conducted an evaluation of specific groups within the general population potentially at increased risk for experiencing adverse health effects related to PM exposures.[590] [591] [592] [593] The evidence detailed in the 2009 PM ISA expands our understanding of previously identified at-risk populations and lifestages (*i.e.,* children, older adults, and individuals with pre-existing heart and lung disease) and supports the identification of additional at-risk populations (*e.g.,* persons with lower socioeconomic status, genetic differences). Additionally, there is emerging, though still limited, evidence for additional potentially at-risk populations and lifestages, such as those with diabetes, people who are obese, pregnant women, and the developing fetus.[594]

(2) Ozone

(a) Background

Ground-level ozone pollution is typically formed through reactions involving VOC and NO_X in the lower atmosphere in the presence of sunlight. These pollutants, often referred to as ozone precursors, are emitted by many types of pollution sources, such as highway and nonroad motor vehicles and engines, power plants, chemical

[580] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, Chapter 2 (Section 2.3.1 and 2.3.2) and Chapter 6.

[581] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, Chapter 2 (Section 2.3.1 and 2.3.2) and Chapter 6.

[582] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, Chapter 2 (Section 2.3.1 and 2.3.2) and Chapter 7.

[583] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. pg 2–13.

[584] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. pg 2–26.

[585] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. Section 2.3.4 and Table 2–6.

[586] 78 FR 3167–3168, January 15, 2013.

[587] 77 FR 38947–38951, June 29, 2012.

[588] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. Section 2.3.5 and Table 2–6.

[589] 78 FR 3121, January 15, 2013.

[590] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. Chapter 8 and Chapter 2.

[591] 77 FR 38890, June 29, 2012.

[592] 78 FR 3104, January 15, 2013.

[593] U.S. EPA. (2011). Policy Assessment for the Review of the PM NAAQS. U.S. Environmental Protection Agency, Washington, DC, EPA/452/R–11–003. Section 2.2.1.

[594] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F. Chapter 8 and Chapter 2 (Section 2.4.1).

plants, refineries, makers of consumer and commercial products, industrial facilities, and smaller area sources.

The science of ozone formation, transport, and accumulation is complex. Ground-level ozone is produced and destroyed in a cyclical set of chemical reactions, many of which are sensitive to temperature and sunlight. When ambient temperatures and sunlight levels remain high for several days and the air is relatively stagnant, ozone and its precursors can build up and result in more ozone than typically occurs on a single high-temperature day. Ozone and its precursors can be transported hundreds of miles downwind from precursor emissions, resulting in elevated ozone levels even in areas with low local VOC or NO_X emissions.

(b) Health Effects of Ozone

This section provides a summary of the health effects associated with exposure to ambient concentrations of ozone.[595] The information in this section is based on the information and conclusions in the February 2013 Integrated Science Assessment for Ozone (Ozone ISA), which formed the basis for EPA's revision to the primary and secondary standards in 2015.[596] The Ozone ISA concludes that human exposures to ambient concentrations of ozone are associated with a number of adverse health effects and characterizes the weight of evidence for these health effects.[597] The discussion below highlights the Ozone ISA's conclusions pertaining to health effects associated with both short-term and long-term periods of exposure to ozone.

For short-term exposure to ozone, the Ozone ISA concludes that respiratory effects, including lung function decrements, pulmonary inflammation, exacerbation of asthma, respiratory-related hospital admissions, and mortality, are causally associated with ozone exposure. It also concludes that cardiovascular effects, including decreased cardiac function and increased vascular disease, and total mortality are likely to be causally associated with short-term exposure to ozone and that evidence is suggestive of a causal relationship between central nervous system effects and short-term exposure to ozone.

For long-term exposure to ozone, the Ozone ISA concludes that respiratory effects, including new onset asthma, pulmonary inflammation and injury, are likely to be causally related with ozone exposure. The Ozone ISA characterizes the evidence as suggestive of a causal relationship for associations between long-term ozone exposure and cardiovascular effects, reproductive and developmental effects, central nervous system effects and total mortality. The evidence is inadequate to infer a causal relationship between chronic ozone exposure and increased risk of lung cancer.

Finally, inter-individual variation in human responses to ozone exposure can result in some groups being at increased risk for detrimental effects in response to exposure. In addition, some groups are at increased risk of exposure due to their activities, such as outdoor workers or children. The Ozone ISA identified several groups that are at increased risk for ozone-related health effects. These groups are people with asthma, children and older adults, individuals with reduced intake of certain nutrients (*i.e.,* Vitamins C and E), outdoor workers, and individuals having certain genetic variants related to oxidative metabolism or inflammation. Ozone exposure during childhood can have lasting effects through adulthood. Such effects include altered function of the respiratory and immune systems. Children absorb higher doses (normalized to lung surface area) of ambient ozone, compared to adults, due to their increased time spent outdoors, higher ventilation rates relative to body size, and a tendency to breathe a greater fraction of air through the mouth. Children also have a higher asthma prevalence compared to adults. Additional children's vulnerability and susceptibility factors are listed in Section XIV.

(3) Nitrogen Oxides

(a) Background

Oxides of nitrogen (NO_X) refers to nitric oxide and nitrogen dioxide (NO_2). For the NO_X NAAQS, NO_2 is the indicator. Most NO_2 is formed in the air through the oxidation of nitric oxide (NO) emitted when fuel is burned at a high temperature. NO_X is also a major contributor to secondary $PM_{2.5}$ formation. The health effects of ambient PM are discussed in Section VIII.A.1.b of this Preamble. NO_X and VOC are the two major precursors of ozone. The health effects of ozone are covered in Section VIII.A.2.b.

(b) Health Effects of Nitrogen Oxides

The most recent review of the health effects of oxides of nitrogen completed by EPA can be found in the 2016 Integrated Science Assessment for Oxides of Nitrogen—Health Criteria (Oxides of Nitrogen ISA).[598] The primary source of NO_2 is motor vehicle emissions, and ambient NO_2 concentrations tend to be highly correlated with other traffic-related pollutants. Thus, a key issue in characterizing the causality of NO_2-health effect relationships was evaluating the extent to which studies supported an effect of NO_2 that is independent of other traffic-related pollutants. EPA concluded that the findings for asthma exacerbation integrated from epidemiologic and controlled human exposure studies provided evidence that is sufficient to infer a causal relationship between respiratory effects and short-term NO_2 exposure. The strongest evidence supporting an independent effect of NO_2 exposure comes from controlled human exposure studies demonstrating increased airway responsiveness in individuals with asthma following ambient-relevant NO_2 exposures. The coherence of this evidence with epidemiologic findings for asthma hospital admissions and ED visits as well as lung function decrements and increased pulmonary inflammation in children with asthma describe a plausible pathway by which NO_2 exposure can cause an asthma exacerbation. The 2016 ISA for Oxides of Nitrogen also concluded that there is likely to be a causal relationship between long-term NO_2 exposure and respiratory effects. This conclusion is based on new epidemiologic evidence for associations of NO_2 with asthma development in children combined with biological plausibility from experimental studies.

In evaluating a broader range of health effects, the 2016 ISA for Oxides of Nitrogen concluded evidence is ''suggestive of, but not sufficient to infer, a causal relationship'' between

[595] Human exposure to ozone varies over time due to changes in ambient ozone concentration and because people move between locations which have notable different ozone concentrations. Also, the amount of ozone delivered to the lung is not only influenced by the ambient concentrations but also by the individuals breathing route and rate.

[596] U.S. EPA. Integrated Science Assessment of Ozone and Related Photochemical Oxidants (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–10/076F, 2013. The ISA is available at *http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492#Download.*

[597] The ISA evaluates evidence and draws conclusions on the causal nature of relationship between relevant pollutant exposures and health effects, assigning one of five ''weight of evidence'' determinations: causal relationship, likely to be a causal relationship, suggestive of, but not sufficient to infer, a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship. For more information on these levels of evidence, please refer to Table II in the Preamble of the ISA.

[598] U.S. EPA. Integrated Science Assessment for Oxides of Nitrogen—Health Criteria (2016 Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–15/068, 2016.

short-term NO_2 exposure and cardiovascular effects and mortality and between long-term NO_2 exposure and cardiovascular effects and diabetes, birth outcomes, and cancer. In addition, the scientific evidence is inadequate (insufficient consistency of epidemiologic and toxicological evidence) to infer a causal relationship for long-term NO_2 exposure with fertility, reproduction, and pregnancy, as well as with postnatal development. A key uncertainty in understanding the relationship between these non-respiratory health effects and short- or long-term exposure to NO_2 is copollutant confounding, particularly by other roadway pollutants. The available evidence for non-respiratory health effects does not adequately address whether NO_2 has an independent effect or whether it primarily represents effects related to other or a mixture of traffic-related pollutants.

The 2016 ISA for Oxides of Nitrogen concluded that people with asthma, children, and older adults are at increased risk for NO_2-related health effects. In these groups and lifestages, NO_2 is consistently related to larger effects on outcomes related to asthma exacerbation, for which there is confidence in the relationship with NO_2 exposure.

(4) Sulfur Oxides

(a) Background

Sulfur dioxide (SO_2), a member of the sulfur oxide (SO_X) family of gases, is formed from burning fuels containing sulfur (*e.g.,* coal or oil derived), extracting gasoline from oil, or extracting metals from ore. SO_2 and its gas phase oxidation products can dissolve in water droplets and further oxidize to form sulfuric acid which reacts with ammonia to form sulfates, which are important components of ambient PM. The health effects of ambient PM are discussed in Section VIII.A.1.b of this Preamble.

(b) Health Effects of SO_2

Information on the health effects of SO_2 can be found in the 2008 Integrated Science Assessment for Sulfur Oxides—Health Criteria (SO_X ISA).[599] Short-term peaks (5–10 minutes) of SO_2 have long been known to cause adverse respiratory health effects, particularly among individuals with asthma. In addition to those with asthma (both children and adults), potentially at-risk lifestages include all children and the elderly. During periods of elevated ventilation, asthmatics may experience symptomatic bronchoconstriction within minutes of exposure. Following an extensive evaluation of health evidence from epidemiologic and laboratory studies, EPA concluded that there is a causal relationship between respiratory health effects and short-term exposure to SO_2. Separately, based on an evaluation of the epidemiologic evidence of associations between short-term exposure to SO_2 and mortality, EPA concluded that the overall evidence is suggestive of a causal relationship between short-term exposure to SO_2 and mortality. Additional information on the health effects of SO_2 is available in Chapter 6.1.1.4.2 of the RIA.

(5) Carbon Monoxide

(a) Background

Carbon monoxide (CO) is a colorless, odorless gas emitted from combustion processes. Nationally, particularly in urban areas, the majority of CO emissions to ambient air come from mobile sources.[600]

(b) Health Effects of Carbon Monoxide

Information on the health effects of CO can be found in the January 2010 Integrated Science Assessment for Carbon Monoxide (CO ISA).[601] The CO ISA presents conclusions regarding the presence of causal relationships between CO exposure and categories of adverse health effects.[602] This section provides a summary of the health effects associated with exposure to ambient concentrations of CO, along with the ISA conclusions.[603]

Controlled human exposure studies of subjects with coronary artery disease show a decrease in the time to onset of exercise-induced angina (chest pain) and electrocardiogram changes following CO exposure. In addition, epidemiologic studies observed associations between short-term CO exposure and cardiovascular morbidity, particularly increased emergency room visits and hospital admissions for coronary heart disease (including ischemic heart disease, myocardial infarction, and angina). Some epidemiologic evidence is also available for increased hospital admissions and emergency room visits for congestive heart failure and cardiovascular disease as a whole. The CO ISA concludes that a causal relationship is likely to exist between short-term exposures to CO and cardiovascular morbidity. It also concludes that available data are inadequate to conclude that a causal relationship exists between long-term exposures to CO and cardiovascular morbidity.

Animal studies show various neurological effects with in-utero CO exposure. Controlled human exposure studies report central nervous system and behavioral effects following low-level CO exposures, although the findings have not been consistent across all studies. The CO ISA concludes the evidence is suggestive of a causal relationship with both short- and long-term exposure to CO and central nervous system effects.

A number of studies cited in the CO ISA have evaluated the role of CO exposure in birth outcomes such as preterm birth or cardiac birth defects. There is limited epidemiologic evidence of a CO-induced effect on preterm births and birth defects, with weak evidence for a decrease in birth weight. Animal toxicological studies have found perinatal CO exposure to affect birth weight, as well as other developmental outcomes. The CO ISA concludes the evidence is suggestive of a causal relationship between long-term exposures to CO and developmental effects and birth outcomes.

Epidemiologic studies provide evidence of associations between short-term CO concentrations and respiratory morbidity such as changes in pulmonary function, respiratory symptoms, and hospital admissions. A limited number of epidemiologic studies considered copollutants such as ozone, SO_2, and PM in two-pollutant models and found that CO risk estimates were generally robust, although this limited evidence makes it difficult to disentangle effects attributed to CO itself from those of the larger complex air pollution mixture. Controlled human exposure studies have not extensively

[599] U.S. EPA. (2008). *Integrated Science Assessment (ISA) for Sulfur Oxides—Health Criteria (Final Report).* EPA/600/R–08/047F. Washington, DC: U.S. Environmental Protection Agency.

[600] U.S. EPA, (2010). Integrated Science Assessment for Carbon Monoxide (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–09/019F, 2010. Available at *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=218686.* See Section 2.1.

[601] U.S. EPA, (2010). Integrated Science Assessment for Carbon Monoxide (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–09/019F, 2010. Available at *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=218686.*

[602] The ISA evaluates the health evidence associated with different health effects, assigning one of five ''weight of evidence'' determinations: causal relationship, likely to be a causal relationship, suggestive of a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship. For definitions of these levels of evidence, please refer to Section 1.6 of the ISA.

[603] Personal exposure includes contributions from many sources, and in many different environments. Total personal exposure to CO includes both ambient and nonambient components; and both components may contribute to adverse health effects.

evaluated the effect of CO on respiratory morbidity. Animal studies at levels of 50–100 ppm CO show preliminary evidence of altered pulmonary vascular remodeling and oxidative injury. The CO ISA concludes that the evidence is suggestive of a causal relationship between short-term CO exposure and respiratory morbidity, and inadequate to conclude that a causal relationship exists between long-term exposure and respiratory morbidity.

Finally, the CO ISA concludes that the epidemiologic evidence is suggestive of a causal relationship between short-term concentrations of CO and mortality. Epidemiologic evidence suggests an association exists between short-term exposure to CO and mortality, but limited evidence is available to evaluate cause-specific mortality outcomes associated with CO exposure. In addition, the attenuation of CO risk estimates which was often observed in copollutant models contributes to the uncertainty as to whether CO is acting alone or as an indicator for other combustion-related pollutants. The CO ISA also concludes that there is not likely to be a causal relationship between relevant long-term exposures to CO and mortality.

(6) Diesel Exhaust

(a) Background

Diesel exhaust consists of a complex mixture composed of particulate matter, carbon dioxide, oxygen, nitrogen, water vapor, carbon monoxide, nitrogen compounds, sulfur compounds and numerous low-molecular-weight hydrocarbons. A number of these gaseous hydrocarbon components are individually known to be toxic, including aldehydes, benzene and 1,3-butadiene. The diesel particulate matter present in diesel exhaust consists mostly of fine particles (<2.5 µm), of which a significant fraction is ultrafine particles (<0.1 µm). These particles have a large surface area which makes them an excellent medium for adsorbing organics, and their small size makes them highly respirable. Many of the organic compounds present in the gases and on the particles, such as polycyclic organic matter, are individually known to have mutagenic and carcinogenic properties.

Diesel exhaust varies significantly in chemical composition and particle sizes between different engine types (heavy-duty, light-duty), engine operating conditions (idle, acceleration, deceleration), and fuel formulations (high/low sulfur fuel). Also, there are emissions differences between on-road and nonroad engines because the nonroad engines are generally of older technology. After being emitted in the engine exhaust, diesel exhaust undergoes dilution as well as chemical and physical changes in the atmosphere. The lifetime for some of the compounds present in diesel exhaust ranges from hours to days.

(b) Health Effects of Diesel Exhaust

In EPA's 2002 Diesel Health Assessment Document (Diesel HAD), exposure to diesel exhaust was classified as likely to be carcinogenic to humans by inhalation from environmental exposures, in accordance with the revised draft 1996/1999 EPA cancer guidelines.[604] [605] A number of other agencies (National Institute for Occupational Safety and Health, the International Agency for Research on Cancer, the World Health Organization, California EPA, and the U.S. Department of Health and Human Services) had made similar hazard classifications prior to 2002. EPA also concluded in the 2002 Diesel HAD that it was not possible to calculate a cancer unit risk for diesel exhaust due to limitations in the exposure data for the occupational groups or the absence of a dose-response relationship.

In the absence of a cancer unit risk, the Diesel HAD sought to provide additional insight into the significance of the diesel exhaust cancer hazard by estimating possible ranges of risk that might be present in the population. An exploratory analysis was used to characterize a range of possible lung cancer risk. The outcome was that environmental risks of cancer from long-term diesel exhaust exposures could plausibly range from as low as 10^{-5} to as high as 10^{-3}. Because of uncertainties, the analysis acknowledged that the risks could be lower than 10^{-5}, and a zero risk from diesel exhaust exposure could not be ruled out.

Non-cancer health effects of acute and chronic exposure to diesel exhaust emissions are also of concern to EPA. EPA derived a diesel exhaust reference concentration (RfC) from consideration of four well-conducted chronic rat inhalation studies showing adverse pulmonary effects. The RfC is 5 µg/m³ for diesel exhaust measured as diesel particulate matter. This RfC does not consider allergenic effects such as those associated with asthma or immunologic or the potential for cardiac effects. There was emerging evidence in 2002, discussed in the Diesel HAD, that exposure to diesel exhaust can exacerbate these effects, but the exposure-response data were lacking at that time to derive an RfC based on these then-emerging considerations. The EPA Diesel HAD states, ''With [diesel particulate matter] being a ubiquitous component of ambient PM, there is an uncertainty about the adequacy of the existing [diesel exhaust] noncancer database to identify all of the pertinent [diesel exhaust]-caused noncancer health hazards.'' The Diesel HAD also notes ''that acute exposure to [diesel exhaust] has been associated with irritation of the eye, nose, and throat, respiratory symptoms (cough and phlegm), and neurophysiological symptoms such as headache, lightheadedness, nausea, vomiting, and numbness or tingling of the extremities.'' The Diesel HAD noted that the cancer and noncancer hazard conclusions applied to the general use of diesel engines then on the market and as cleaner engines replace a substantial number of existing ones, the applicability of the conclusions would need to be reevaluated.

It is important to note that the Diesel HAD also briefly summarizes health effects associated with ambient PM and discusses EPA's then-annual $PM_{2.5}$ NAAQS of 15 µg/m³. In 2012, EPA revised the annual $PM_{2.5}$ NAAQS to 12 µg/m³. There is a large and extensive body of human data showing a wide spectrum of adverse health effects associated with exposure to ambient PM, of which diesel exhaust is an important component. The $PM_{2.5}$ NAAQS is designed to provide protection from the noncancer health effects and premature mortality attributed to exposure to $PM_{2.5}$. The contribution of diesel PM to total ambient PM varies in different regions of the country and also, within a region, from one area to another. The contribution can be high in near-roadway environments, for example, or in other locations where diesel engine use is concentrated.

Since 2002, several new studies have been published which continue to report increased lung cancer risk with occupational exposure to diesel exhaust from older engines. Of particular note since 2011 are three new epidemiology studies which have examined lung cancer in occupational populations, for example, truck drivers, underground nonmetal miners and other diesel

[604] U.S. EPA. (1999). *Guidelines for Carcinogen Risk Assessment.* Review Draft. NCEA–F–0644, July. Washington, DC: U.S. EPA. Retrieved on March 19, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=54932.*

[605] U.S. EPA (2002). *Health Assessment Document for Diesel Engine Exhaust.* EPA/600/8–90/057F Office of Research and Development, Washington DC. Retrieved on March 17, 2009 from *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.* pp. 1–1 1–2.

motor-related occupations. These studies reported increased risk of lung cancer with exposure to diesel exhaust with evidence of positive exposure-response relationships to varying degrees.[606 607 608] These newer studies (along with others that have appeared in the scientific literature) add to the evidence EPA evaluated in the 2002 Diesel HAD and further reinforces the concern that diesel exhaust exposure likely poses a lung cancer hazard. The findings from these newer studies do not necessarily apply to newer technology diesel engines since the newer engines have large reductions in the emission constituents compared to older technology diesel engines.

In light of the growing body of scientific literature evaluating the health effects of exposure to diesel exhaust, in June 2012 the World Health Organization's International Agency for Research on Cancer (IARC), a recognized international authority on the carcinogenic potential of chemicals and other agents, evaluated the full range of cancer-related health effects data for diesel engine exhaust. IARC concluded that diesel exhaust should be regarded as ''carcinogenic to humans.'' [609] This designation was an update from its 1988 evaluation that considered the evidence to be indicative of a ''probable human carcinogen.''

(7) Air Toxics

(a) Background

Heavy-duty vehicle emissions contribute to ambient levels of air toxics that are known or suspected human or animal carcinogens, or that have noncancer health effects. The population experiences an elevated risk of cancer and other noncancer health effects from exposure to the class of pollutants known collectively as ''air toxics.'' [610] These compounds include, but are not limited to, benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, polycyclic organic matter, and naphthalene. These compounds were identified as national or regional risk drivers or contributors in the 2011 National-scale Air Toxics Assessment and have significant inventory contributions from mobile sources.[611]

(b) Benzene

EPA's Integrated Risk Information System (IRIS) database lists benzene as a known human carcinogen (causing leukemia) by all routes of exposure, and concludes that exposure is associated with additional health effects, including genetic changes in both humans and animals and increased proliferation of bone marrow cells in mice.[612 613 614] EPA states in its IRIS database that data indicate a causal relationship between benzene exposure and acute lymphocytic leukemia and suggest a relationship between benzene exposure and chronic non-lymphocytic leukemia and chronic lymphocytic leukemia. EPA's IRIS documentation for benzene also lists a range of 2.2×10^{-6} to 7.8×10^{-6} per μg/m³ as the unit risk estimate (URE) for benzene.[615 616] The International Agency for Research on Cancer (IARC) has determined that benzene is a human carcinogen and the U.S. Department of Health and Human Services (DHHS) has characterized benzene as a known human carcinogen.[617 618]

A number of adverse noncancer health effects including blood disorders, such as pre- leukemia and aplastic anemia, have also been associated with long-term exposure to benzene.[619 620] The most sensitive noncancer effect observed in humans, based on current data, is the depression of the absolute lymphocyte count in blood.[621 622] EPA's inhalation reference concentration (RfC) for benzene is 30 μg/m³. The RfC is based on suppressed absolute lymphocyte counts seen in humans under occupational exposure conditions. In addition, recent work, including studies sponsored by the Health Effects Institute, provides evidence that biochemical responses are occurring at lower levels of benzene exposure than previously known.[623 624 625 626] EPA's IRIS program has not yet evaluated these new data. EPA does not currently have an acute reference concentration for benzene. The Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Level (MRL) for acute exposure to benzene is 29 μg/m³ for 1–14 days exposure.[627 628]

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628 A minimal risk level (MRL) is defined as an estimate of the daily human exposure to a

Continued

(c) 1,3-Butadiene

EPA has characterized 1,3-butadiene as carcinogenic to humans by inhalation.[629 630] The IARC has determined that 1,3-butadiene is a human carcinogen and the U.S. DHHS has characterized 1,3-butadiene as a known human carcinogen.[631 632 633] There are numerous studies consistently demonstrating that 1,3-butadiene is metabolized into genotoxic metabolites by experimental animals and humans. The specific mechanisms of 1,3-butadiene-induced carcinogenesis are unknown; however, the scientific evidence strongly suggests that the carcinogenic effects are mediated by genotoxic metabolites. Animal data suggest that females may be more sensitive than males for cancer effects associated with 1,3-butadiene exposure; there are insufficient data in humans from which to draw conclusions about sensitive subpopulations. The URE for 1,3-butadiene is 3×10^{-5} per µg/m^3.[634] 1,3-butadiene also causes a variety of reproductive and developmental effects in mice; no human data on these effects are available. The most sensitive effect was ovarian atrophy observed in a lifetime bioassay of female mice.[635] Based on this critical effect and the benchmark concentration methodology, an RfC for chronic health effects was calculated at 0.9 ppb (approximately 2 µg/m^3).

(d) Formaldehyde

In 1991, EPA concluded that formaldehyde is a carcinogen based on nasal tumors in animal bioassays.[636] An Inhalation URE for cancer and a Reference Dose for oral noncancer effects were developed by the agency and posted on the IRIS database. Since that time, the National Toxicology Program (NTP) and International Agency for Research on Cancer (IARC) have concluded that formaldehyde is a known human carcinogen.[637 638]

The conclusions by IARC and NTP reflect the results of epidemiologic research published since 1991 in combination with previous animal, human and mechanistic evidence. Research conducted by the National Cancer Institute reported an increased risk of nasopharyngeal cancer and specific lymph hematopoietic malignancies among workers exposed to formaldehyde.[639 640 641] A National Institute of Occupational Safety and Health study of garment workers also reported increased risk of death due to leukemia among workers exposed to formaldehyde.[642] Extended follow-up of a cohort of British chemical workers did not report evidence of an increase in nasopharyngeal or lymph hematopoietic cancers, but a continuing statistically significant excess in lung cancers was reported.[643] Finally, a study of embalmers reported formaldehyde exposures to be associated with an increased risk of myeloid leukemia but not brain cancer.[644]

Health effects of formaldehyde in addition to cancer were reviewed by the Agency for Toxics Substances and Disease Registry in 1999 [645], supplemented in 2010,[646] and by the World Health Organization.[647] These organizations reviewed the scientific literature concerning health effects linked to formaldehyde exposure to evaluate hazards and dose response relationships and defined exposure concentrations for minimal risk levels (MRLs). The health endpoints reviewed included sensory irritation of eyes and respiratory tract, reduced pulmonary function, nasal histopathology, and immune system effects. In addition, research on reproductive and developmental effects and neurological effects were discussed along with several studies that suggest that formaldehyde may increase the risk of asthma—particularly in the young.

EPA released a draft Toxicological Review of Formaldehyde—Inhalation Assessment through the IRIS program for peer review by the National Research Council (NRC) and public comment in June 2010.[648] The draft assessment reviewed more recent research from animal and human studies on cancer and other health effects. The NRC released their review report in April 2011.[649] EPA is currently developing a revised draft assessment in response to this review.

hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure.

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645 ATSDR. 1999. Toxicological Profile for Formaldehyde, U.S. Department of Health and Human Services (HHS), July 1999.

646 ATSDR. 2010. Addendum to the Toxicological Profile for Formaldehyde. U.S. Department of Health and Human Services (HHS), October 2010.

647 IPCS. 2002. Concise International Chemical Assessment Document 40. Formaldehyde. World Health Organization.

648 EPA (U.S. Environmental Protection Agency). 2010. Toxicological Review of Formaldehyde (CAS No. 50–00–0)—Inhalation Assessment: In Support of Summary Information on the Integrated Risk Information System (IRIS). External Review Draft. EPA/635/R–10/002A. U.S. Environmental Protection Agency, Washington DC [online]. Available: *http://cfpub.epa.gov/ncea/irs_drats/recordisplay.cfm?deid=223614*.

649 NRC (National Research Council). 2011. Review of the Environmental Protection Agency's Draft IRIS Assessment of Formaldehyde. Washington DC: National Academies Press. *http://books.nap.edu/openbook.php?record_id=13142*.

(e) Acetaldehyde

Acetaldehyde is classified in EPA's IRIS database as a probable human carcinogen, based on nasal tumors in rats, and is considered toxic by the inhalation, oral, and intravenous routes.[650] The URE in IRIS for acetaldehyde is 2.2×10^{-6} per µg/m³.[651] Acetaldehyde is reasonably anticipated to be a human carcinogen by the U.S. DHHS in the 13th Report on Carcinogens and is classified as possibly carcinogenic to humans (Group 2B) by the IARC.[652 653] Acetaldehyde is currently listed on the IRIS Program Multi-Year Agenda for reassessment within the next few years.

The primary noncancer effects of exposure to acetaldehyde vapors include irritation of the eyes, skin, and respiratory tract.[654] In short-term (4 week) rat studies, degeneration of olfactory epithelium was observed at various concentration levels of acetaldehyde exposure.[655 656] Data from these studies were used by EPA to develop an inhalation reference concentration of 9 µg/m³. Some asthmatics have been shown to be a sensitive subpopulation to decrements in functional expiratory volume (FEV1 test) and bronchoconstriction upon acetaldehyde inhalation.[657]

(f) Acrolein

EPA most recently evaluated the toxicological and health effects literature related to acrolein in 2003 and concluded that the human carcinogenic potential of acrolein could not be determined because the available data were inadequate. No information was available on the carcinogenic effects of acrolein in humans and the animal data provided inadequate evidence of carcinogenicity.[658] The IARC determined in 1995 that acrolein was not classifiable as to its carcinogenicity in humans.[659]

Lesions to the lungs and upper respiratory tract of rats, rabbits, and hamsters have been observed after subchronic exposure to acrolein.[660] The agency has developed an RfC for acrolein of 0.02 µg/m³ and an RfD of 0.5 µg/kg-day.[661]

Acrolein is extremely acrid and irritating to humans when inhaled, with acute exposure resulting in upper respiratory tract irritation, mucus hypersecretion and congestion. The intense irritancy of this carbonyl has been demonstrated during controlled tests in human subjects, who suffer intolerable eye and nasal mucosal sensory reactions within minutes of exposure.[662] These data and additional studies regarding acute effects of human exposure to acrolein are summarized in EPA's 2003 Toxicological Review of Acrolein.[663] Studies in humans indicate that levels as low as 0.09 ppm (0.21 mg/m³) for five minutes may elicit subjective complaints of eye irritation with increasing concentrations leading to more extensive eye, nose and respiratory symptoms. Acute exposures in animal studies report bronchial hyper-responsiveness. Based on animal data (more pronounced respiratory irritancy in mice with allergic airway disease in comparison to non-diseased mice)[664] and demonstration of similar effects in humans (*e.g.,* reduction in respiratory rate), individuals with compromised respiratory function (*e.g.,* emphysema, asthma) are expected to be at increased risk of developing adverse responses to strong respiratory irritants such as acrolein. EPA does not currently have an acute reference concentration for acrolein. The available health effect reference values for acrolein have been summarized by EPA and include an ATSDR MRL for acute exposure to acrolein of 7 µg/m³ for 1–14 days exposure; and Reference Exposure Level (REL) values from the California Office of Environmental Health Hazard Assessment (OEHHA) for one-hour and 8-hour exposures of 2.5 µg/m³ and 0.7 µg/m³, respectively.[665]

(g) Polycyclic Organic Matter

The term polycyclic organic matter (POM) defines a broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAHs). One of these compounds, naphthalene, is discussed separately below. POM compounds are formed primarily from combustion and are present in the atmosphere in gas and particulate form. Cancer is the major concern from exposure to POM. Epidemiologic studies have reported an increase in lung cancer in humans exposed to diesel exhaust, coke oven emissions, roofing tar emissions, and cigarette smoke; all of these mixtures contain POM compounds.[666 667] Animal studies have reported respiratory tract tumors from inhalation exposure to

650 U.S. EPA (1991). Integrated Risk Information System File of Acetaldehyde. Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www3.epa.gov/iris/subst/0290.htm.*

651 U.S. EPA (1991). Integrated Risk Information System File of Acetaldehyde. This material is available electronically at *http://www3.epa.gov/iris/subst/0290.htm.*

652 NTP. (2014). 13th Report on Carcinogens. Research Triangle Park, NC: U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program.

653 International Agency for Research on Cancer (IARC). (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemical to Humans, Vol 71. Lyon, France.

654 U.S. EPA (1991). Integrated Risk Information System File of Acetaldehyde. This material is available electronically at *http://www3.epa.gov/iris/subst/0290.htm.*

655 U.S. EPA. (2003). Integrated Risk Information System File of Acrolein. Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www3.epa.gov/iris/subst/0364.htm.*

656 Appleman, L.M., R.A. Woutersen, and V.J. Feron. (1982). Inhalation toxicity of acetaldehyde in rats. I. Acute and subacute studies. Toxicology. 23: 293–297.

657 Myou, S.; Fujimura, M.; Nishi K.; Ohka, T.; and Matsuda, T. (1993) Aerosolized acetaldehyde induces histamine-mediated bronchoconstriction in asthmatics. Am. Rev. Respir. Dis. 148(4 Pt 1): 940–943.

658 U.S. EPA. (2003). Integrated Risk Information System File of Acrolein. Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available at *http://www3.epa.gov/iris/subst/0364.htm.*

659 International Agency for Research on Cancer (IARC). (1995). Monographs on the evaluation of carcinogenic risk of chemicals to humans, Volume 63. Dry cleaning, some chlorinated solvents and other industrial chemicals, World Health Organization, Lyon, France.

660 U.S. EPA. (2003). Integrated Risk Information System File of Acrolein. Office of Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available at *http://www3.epa.gov/iris/subst/0364.htm.*

661 U.S. EPA. (2003). Integrated Risk Information System File of Acrolein. Office of Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available at *http://www3.epa.gov/iris/subst/0364.htm.*

662 U.S. EPA. (2003) Toxicological review of acrolein in support of summary information on Integrated Risk Information System (IRIS) National Center for Environmental Assessment, Washington, DC. EPA/635/R–03/003. p. 10. Available online at: *http://www3.epa.gov/ncea/iris/toxreviews/0364tr.pdf.*

663 U.S. EPA. (2003) Toxicological review of acrolein in support of summary information on Integrated Risk Information System (IRIS) National Center for Environmental Assessment, Washington, DC. EPA/635/R–03/003. Available online at: *http://www3.epa.gov/ncea/iris/toxreviews/0364tr.pdf.*

664 Morris JB, Symanowicz PT, Olsen JE, et al. (2003). Immediate sensory nerve-mediated respiratory responses to irritants in healthy and allergic airway-diseased mice. J Appl Physiol 94(4):1563–1571.

665 U.S. EPA. (2009). Graphical Arrays of Chemical-Specific Health Effect Reference Values for Inhalation Exposures (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–09/061, 2009. *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=211003.*

666 Agency for Toxic Substances and Disease Registry (ATSDR). (1995). Toxicological profile for Polycyclic Aromatic Hydrocarbons (PAHs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. Available electronically at *http://www.atsdr.cdc.gov/ToxProfiles/TP.asp?id=122&tid=25.*

667 U.S. EPA (2002). *Health Assessment Document for Diesel Engine Exhaust.* EPA/600/8–90/057F Office of Research and Development, Washington DC. *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.*

benzo[a]pyrene and alimentary tract and liver tumors from oral exposure to benzo[a]pyrene.[668] In 1997 EPA classified seven PAHs (benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) as Group B2, probable human carcinogens.[669] Since that time, studies have found that maternal exposures to PAHs in a population of pregnant women were associated with several adverse birth outcomes, including low birth weight and reduced length at birth, as well as impaired cognitive development in preschool children (3 years of age).[670] [671] These and similar studies are being evaluated as a part of the ongoing IRIS reassessment of health effects associated with exposure to benzo[a]pyrene.

(h) Naphthalene

Naphthalene is found in small quantities in gasoline and diesel fuels. Naphthalene emissions have been measured in larger quantities in both gasoline and diesel exhaust compared with evaporative emissions from mobile sources, indicating it is primarily a product of combustion. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, or dermal contact is associated with hemolytic anemia and damage to the liver and the nervous system.[672] Chronic (long term) exposure of workers and rodents to naphthalene has been reported to cause cataracts and retinal damage.[673] EPA released an external review draft of a reassessment of the inhalation carcinogenicity of naphthalene based on a number of recent animal carcinogenicity studies.[674] The draft reassessment completed external peer review.[675] Based on external peer review comments received, a revised draft assessment that considers all routes of exposure, as well as cancer and noncancer effects, is under development. The external review draft does not represent official agency opinion and was released solely for the purposes of external peer review and public comment. The National Toxicology Program listed naphthalene as ''reasonably anticipated to be a human carcinogen'' in 2004 on the basis of bioassays reporting clear evidence of carcinogenicity in rats and some evidence of carcinogenicity in mice.[676] California EPA has released a new risk assessment for naphthalene, and the IARC has reevaluated naphthalene and re-classified it as Group 2B: possibly carcinogenic to humans.[677]

Naphthalene also causes a number of chronic non-cancer effects in animals, including abnormal cell changes and growth in respiratory and nasal tissues.[678] The current EPA IRIS assessment includes noncancer data on hyperplasia and metaplasia in nasal tissue that form the basis of the inhalation RfC of 3 μg/m^3.[679] The ATSDR MRL for acute exposure to naphthalene is 0.6 mg/kg/day.

(i) Other Air Toxics

In addition to the compounds described above, other compounds in gaseous hydrocarbon and PM emissions from motor vehicles will be affected by this action. Mobile source air toxic compounds that will potentially be impacted include ethylbenzene, propionaldehyde, toluene, and xylene. Information regarding the health effects of these compounds can be found in EPA's IRIS database.[680]

(8) Exposure and Health Effects Associated With Traffic

Locations in close proximity to major roadways generally have elevated concentrations of many air pollutants emitted from motor vehicles. Hundreds of such studies have been published in peer-reviewed journals, concluding that concentrations of CO, NO, NO_2, benzene, aldehydes, particulate matter, black carbon, and many other compounds are elevated in ambient air within approximately 300–600 meters (about 1,000–2,000 feet) of major roadways. Highest concentrations of most pollutants emitted directly by motor vehicles are found at locations within 50 meters (about 165 feet) of the edge of a roadway's traffic lanes.

A large-scale review of air quality measurements in the vicinity of major roadways between 1978 and 2008 concluded that the pollutants with the steepest concentration gradients in vicinities of roadways were CO, ultrafine particles, metals, elemental carbon (EC), NO, NO_X, and several VOCs.[681] These pollutants showed a large reduction in concentrations within 100 meters downwind of the roadway. Pollutants that showed more gradual reductions with distance from roadways included benzene, NO_2, $PM_{2.5}$, and PM_{10}. In the review article, results varied based on the method of statistical analysis used to determine the trend.

For pollutants with relatively high background concentrations relative to near-road concentrations, detecting concentration gradients can be difficult. For example, many aldehydes have high background concentrations as a result of photochemical breakdown of precursors from many different organic compounds. This can make detection of gradients around roadways and other primary emission sources difficult.

[668] International Agency for Research on Cancer (IARC). (2012). Monographs on the Evaluation of the Carcinogenic Risk of Chemicals for Humans, Chemical Agents and Related Occupations. Vol. 100F. Lyon, France.

[669] U.S. EPA (1997). Integrated Risk Information System File of indeno (1,2,3-cd) pyrene. Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www3.epa.gov/ncea/iris/subst/0457.htm*.

[670] Perera, F.P.; Rauh, V.; Tsai, W–Y.; et al. (2002). Effect of transplacental exposure to environmental pollutants on birth outcomes in a multiethnic population. Environ Health Perspect. 111: 201–205.

[671] Perera, F.P.; Rauh, V.; Whyatt, R.M.; Tsai, W.Y.; Tang, D.; Diaz, D.; Hoepner, L.; Barr, D.; Tu, Y.H.; Camann, D.; Kinney, P. (2006). Effect of prenatal exposure to airborne polycyclic aromatic hydrocarbons on neurodevelopment in the first 3 years of life among inner-city children. Environ Health Perspect 114: 1287–1292.

[672] U. S. EPA. 1998. Toxicological Review of Naphthalene (Reassessment of the Inhalation Cancer Risk), Environmental Protection Agency, Integrated Risk Information System, Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www3.epa.gov/iris/subst/0436.htm*.

[673] U. S. EPA. 1998. Toxicological Review of Naphthalene (Reassessment of the Inhalation Cancer Risk), Environmental Protection Agency, Integrated Risk Information System, Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www3.epa.gov/iris/subst/0436.htm*.

[674] U. S. EPA. (1998). Toxicological Review of Naphthalene (Reassessment of the Inhalation Cancer Risk), Environmental Protection Agency, Integrated Risk Information System, Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www3.epa.gov/iris/subst/0436.htm*.

[675] Oak Ridge Institute for Science and Education. (2004). External Peer Review for the IRIS Reassessment of the Inhalation Carcinogenicity of Naphthalene. August 2004. *http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=84403*.

[676] NTP. (2014). 13th Report on Carcinogens. U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program.

[677] International Agency for Research on Cancer (IARC). (2002). Monographs on the Evaluation of the Carcinogenic Risk of Chemicals for Humans. Vol. 82. Lyon, France.

[678] U. S. EPA. (1998). Toxicological Review of Naphthalene, Environmental Protection Agency, Integrated Risk Information System, Research and Development, National Center for Environmental Assessment, Washington, DC. This material is available electronically at *http://www3.epa.gov/iris/subst/0436.htm*.

[679] U.S. EPA. (1998). Toxicological Review of Naphthalene. Environmental Protection Agency, Integrated Risk Information System (IRIS), Research and Development, National Center for Environmental Assessment, Washington, DC *http://www3.epa.gov/iris/subst/0436.htm*.

[680] U.S. EPA Integrated Risk Information System (IRIS) database is available at: *www3.epa.gov/iris*.

[681] Karner, A.A.; Eisinger, D.S.; Niemeier, D.A. (2010). Near-roadway air quality: synthesizing the findings from real-world data. Environ Sci Technol 44: 5334–5344.

However, several studies have measured aldehydes in multiple weather conditions and found higher concentrations of many carbonyls downwind of roadways.[682 683] These findings suggest a substantial roadway source of these carbonyls.

In the past 15 years, many studies have been published with results reporting that populations who live, work, or go to school near high-traffic roadways experience higher rates of numerous adverse health effects, compared to populations far away from major roads.[684] In addition, numerous studies have found adverse health effects associated with spending time in traffic, such as commuting or walking along high-traffic roadways.[685 686 687 688] The health outcomes with the strongest evidence linking them with traffic-associated air pollutants are respiratory effects, particularly in asthmatic children, and cardiovascular effects.

Numerous reviews of this body of health literature have been published as well. In 2010, an expert panel of the Health Effects Institute (HEI) published a review of hundreds of exposure, epidemiology, and toxicology studies.[689] The panel rated how the evidence for each type of health outcome supported a conclusion of a causal association with traffic-associated air pollution as either ''sufficient,'' ''suggestive but not sufficient,'' or ''inadequate and insufficient.'' The panel categorized evidence of a causal association for exacerbation of childhood asthma as ''sufficient.'' The panel categorized evidence of a causal association for new onset asthma as between ''sufficient'' and ''suggestive but not sufficient.'' ''Suggestive of a causal association'' was how the panel categorized evidence linking traffic-associated air pollutants with exacerbation of adult respiratory symptoms and lung function decrement. It categorized as ''inadequate and insufficient'' evidence of a causal relationship between traffic-related air pollution and health care utilization for respiratory problems, new onset adult asthma, chronic obstructive pulmonary disease (COPD), nonasthmatic respiratory allergy, and cancer in adults and children. Other literature reviews have been published with conclusions generally similar to the HEI panel's.[690 691 692 693] However, in 2014, researchers from the U.S. Centers for Disease Control and Prevention (CDC) published a systematic review and meta-analysis of studies evaluating the risk of childhood leukemia associated with traffic exposure and reported positive associations between ''postnatal'' proximity to traffic and leukemia risks, but no such association for ''prenatal'' exposures.[694]

Health outcomes with few publications suggest the possibility of other effects still lacking sufficient evidence to draw definitive conclusions. Among these outcomes with a small number of positive studies are neurological impacts (*e.g.,* autism and reduced cognitive function) and reproductive outcomes (*e.g.,* preterm birth, low birth weight).[695 696 697 698]

In addition to health outcomes, particularly cardiopulmonary effects, conclusions of numerous studies suggest mechanisms by which traffic-related air pollution affects health. Numerous studies indicate that near-roadway exposures may increase systemic inflammation, affecting organ systems, including blood vessels and lungs.[699 700 701 702] Long-term exposures in near-road environments have been associated with inflammation-associated conditions, such as atherosclerosis and asthma.[703 704 705]

Several studies suggest that some factors may increase susceptibility to the effects of traffic-associated air pollution. Several studies have found stronger respiratory associations in children experiencing chronic social stress, such as in violent neighborhoods or in homes with high family stress.[706 707 708]

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682 Liu, W.; Zhang, J.; Kwon, J.L.; et al. (2006). Concentrations and source characteristics of airborne carbonyl comlbs measured outside urban residences. J Air Waste Manage Assoc 56: 1196–1204.

683 Cahill, T.M.; Charles, M.J.; Seaman, V.Y. (2010). Development and application of a sensitive method to determine concentrations of acrolein and other carbonyls in ambient air. Health Effects Institute Research Report 149.Available at *http://dx.doi.org.*

684 In the widely-used PubMed database of health publications, between January 1, 1990 and August 18, 2011, 605 publications contained the keywords ''traffic, pollution, epidemiology,'' with approximately half the studies published after 2007.

685 Laden, F.; Hart, J.E.; Smith, T.J.; Davis, M.E.; Garshick, E. (2007) Cause-specific mortality in the unionized U.S. trucking industry. Environmental Health Perspect 115:1192–1196.

686 Peters, A.; von Klot, S.; Heier, M.; Trentinaglia, I.; Hörmann, A.; Wichmann, H.E.; Löwel, H. (2004) Exposure to traffic and the onset of myocardial infarction. New England J Med 351: 1721–1730.

687 Zanobetti, A.; Stone, P.H.; Spelzer, F.E.; Schwartz, J.D.; Coull, B.A.; Suh, H.H.; Nearling, B.D.; Mittleman, M.A.; Verrier, R.L.; Gold, D.R. (2009) T-wave alternans, air pollution and traffic in high-risk subjects. Am J Cardiol 104: 665–670.

688 Dubowsky Adar, S.; Adamkiewicz, G.; Gold, D.R.; Schwartz, J.; Coull, B.A.; Suh, H. (2007) Ambient and microenvironmental particles and exhaled nitric oxide before and after a group bus trip. Environ Health Perspect 115: 507–512.

689 Health Effects Institute Panel on the Health Effects of Traffic-Related Air Pollution. (2010). Traffic-related air pollution: a critical review of the literature on emissions, exposure, and health effects. HEI Special Report 17. Available at *http://www.healtheffects.org.*

690 Boothe, V.L.; Shendell, D.G. (2008). Potential health effects associated with residential proximity to freeways and primary roads: review of scientific literature, 1999–2006. J Environ Health 70: 33–41.

691 Salam, M.T.; Islam, T.; Gilliland, F.D. (2008). Recent evidence for adverse effects of residential proximity to traffic sources on asthma. Curr Opin Pulm Med 14: 3–8.

692 Sun, X.; Zhang, S.; Ma, X. (2014) No association between traffic density and risk of childhood leukemia: a meta-analysis. Asia Pac J Cancer Prev 15: 5229–5232.

693 Raaschou-Nielsen, O.; Reynolds, P. (2006). Air pollution and childhood cancer: a review of the epidemiological literature. Int J Cancer 118: 2920–9.

694 Boothe, VL.; Boehmer, T.K.; Wendel, A.M.; Yip, F.Y. (2014) Residential traffic exposure and childhood leukemia: a systematic review and meta-analysis. Am J Prev Med 46: 413–422.

695 Volk, H.E.; Hertz-Picciotto, I.; Delwiche, L.; et al. (2011). Residential proximity to freeways and autism in the CHARGE study. Environ Health Perspect 119: 873–877.

696 Franco-Suglia, S.; Gryparis, A.; Wright, R.O.; et al. (2007). Association of black carbon with cognition among children in a prospective birth cohort study. Am J Epidemiol. doi: 10.1093/aje/kwm308. [Online at *http://dx.doi.org*].

697 Power, M.C.; Weisskopf, M.G.; Alexeef, SE.; et al. (2011). Traffic-related air pollution and cognitive function in a cohort of older men. Environ Health Perspect 2011: 682–687.

698 Wu, J.; Wilhelm, M.; Chung, J.; et al. (2011). Comparing exposure assessment methods for traffic-related air pollution in and adverse pregnancy outcome study. Environ Res 111: 685–6692.

699 Riediker, M. (2007). Cardiovascular effects of fine particulate matter components in highway patrol officers. Inhal Toxicol 19: 99–105. doi: 10.1080/08958370701495238 Available at *http://dx.doi.org.*

700 Alexeef, SE.; Coull, B.A.; Gryparis, A.; et al. (2011). Medium-term exposure to traffic-related air pollution and markers of inflammation and endothelial function. Environ Health Perspect 119: 481–486. doi:10.1289/ehp.1002560 Available at *http://dx.doi.org.*

701 Eckel. S.P.; Berhane, K.; Salam, M.T.; et al. (2011). Traffic-related pollution exposure and exhaled nitric oxide in the Children's Health Study. Environ Health Perspect (IN PRESS). doi:10.1289/ehp.1103516. Available at *http://dx.doi.org.*

702 Zhang, J.; McCreanor, J.E.; Cullinan, P.; et al. (2009). Health effects of real-world exposure diesel exhaust in persons with asthma. Res Rep Health Effects Inst 138. [Online at *http://www.healtheffects.org*].

703 Adar, S.D.; Klein, R.; Klein, E.K.; et al. (2010). Air pollution and the microvasculatory: a cross-sectional assessment of in vivo retinal images in the population-based Multi-Ethnic Study of Atherosclerosis. PLoS Med 7(11): E1000372. doi:10.1371/journal.pmed.1000372. Available at *http://dx.doi.org.*

704 Kan, H.; Heiss, G.; Rose, K.M.; et al. (2008). Prospective analysis of traffic exposure as a risk factor for incident coronary heart disease: the Atherosclerosis Risk in Communities (ARIC) study. Environ Health Perspect 116: 1463–1468. doi:10.1289/ehp.11290. Available at *http://dx.doi.org.*

705 McConnell, R.; Islam, T.; Shankardass, K.; et al. (2010). Childhood incident asthma and traffic-related air pollution at home and school. Environ Health Perspect 1021–1026.

706 Islam, T.; Urban, R.; Gauderman, W.J.; et al. (2011). Parental stress increases the detrimental

Continued

The risks associated with residence, workplace, or schools near major roads are of potentially high public health significance due to the large population in such locations. According to the 2009 American Housing Survey, over 22 million homes (17.0 percent of all U.S. housing units) were located within 300 feet of an airport, railroad, or highway with four or more lanes. This corresponds to a population of more than 50 million U.S. residents in close proximity to high-traffic roadways or other transportation sources. Based on 2010 Census data, a 2013 publication estimated that 19 percent of the U.S. population (over 59 million people) lived within 500 meters of roads with at least 25,000 annual average daily traffic (AADT), while about 3.2 percent of the population lived within 100 meters (about 300 feet) of such roads.[709] Another 2013 study estimated that 3.7 percent of the U.S. population (about 11.3 million people) lived within 150 meters (about 500 feet) of interstate highways or other freeways and expressways.[710] As discussed in Section VIII.A.(9), on average, populations near major roads have higher fractions of minority residents and lower socioeconomic status. Furthermore, on average, Americans spend more than an hour traveling each day, bringing nearly all residents into a high-exposure microenvironment for part of the day.

In light of these concerns, EPA has required through the NAAQS process that air quality monitors be placed near high-traffic roadways for determining concentrations of CO, NO_2, and $PM_{2.5}$ (in addition to those existing monitors located in neighborhoods and other locations farther away from pollution sources). Near-roadway monitors for NO_2 begin operation between 2014 and 2017 in Core Based Statistical Areas (CBSAs) with population of at least 500,000. Monitors for CO and $PM_{2.5}$ begin operation between 2015 and 2017. These monitors will further our understanding of exposure in these locations.

EPA and DOT continue to research near-road air quality, including the types of pollutants found in high concentrations near major roads and health problems associated with the mixture of pollutants near roads.

(9) Environmental Justice

Environmental justice (EJ) is a principle asserting that all people deserve fair treatment and meaningful involvement with respect to environmental laws, regulations, and policies. EPA seeks to provide the same degree of protection from environmental health hazards for all people. DOT shares this goal and is informed about the potential environmental impacts of its rulemakings through its NEPA process (see NHTSA's DEIS). As referenced below, numerous studies have found that some environmental hazards are more prevalent in areas where racial/ethnic minorities and people with low socioeconomic status (SES) represent a higher fraction of the population compared with the general population. In addition, compared to non-Hispanic whites, some types of minorities may have greater levels of health problems during some life stages. For example, in 2014, about 13 percent of Black, non-Hispanic and 24 percent of Puerto Rican children were estimated to currently have asthma, compared with 8 percent of white, non-Hispanic children.[711]

As discussed in Section VIII.A.(8) of this document and NHTSA's FEIS, concentrations of many air pollutants are elevated near high-traffic roadways. If minority populations and low-income populations disproportionately live near such roads, then an issue of EJ may be present. We reviewed existing scholarly literature examining the potential for disproportionate exposure among minorities and people with low SES, and we conducted our own evaluation of two national datasets: The U.S. Census Bureau's American Housing Survey for calendar year 2009 and the U.S. Department of Education's database of school locations.

Publications that address EJ issues generally report that populations living near major roadways (and other types of transportation infrastructure) tend to be composed of larger fractions of nonwhite residents. People living in neighborhoods near such sources of air pollution also tend to be lower in income than people living elsewhere. Numerous studies evaluating the demographics and socioeconomic status of populations or schools near roadways have found that they include a greater percentage of minority residents, as well as lower SES (indicated by variables such as median household income). Locations in these studies include Los Angeles, CA; Seattle, WA; Wayne County, MI; Orange County, FL; and the State of California [712] [713] [714] [715] [716] [717] Such disparities may be due to multiple factors.[718]

People with low SES often live in neighborhoods with multiple stressors and health risk factors, including reduced health insurance coverage rates, higher smoking and drug use rates, limited access to fresh food, visible neighborhood violence, and elevated rates of obesity and some diseases such as asthma, diabetes, and ischemic heart disease. Although questions remain, several studies find stronger associations between air pollution and health in locations with such chronic neighborhood stress, suggesting that populations in these areas may be more susceptible to the effects of air pollution. [719] [720] [721] [722] Household-level

effect of traffic exposure on children's lung function. Am J Respir Crit Care Med (In press).

[707] Clougherty, J.E.; Levy, J.I.; Kubzansky, L.D.; et al. (2007). Synergistic effects of traffic-related air pollution and exposure to violence on urban asthma etiology. Environ Health Perspect 115: 1140–1146.

[708] Chen, E.; Schrier, H.M.; Strunk, R.C.; et al. (2008). Chronic traffic-related air pollution and stress interact to predict biologic and clinical outcomes in asthma. Environ Health Perspect 116: 970–5.

[709] Rowangould, G.M. (2013) A census of the U.S. near-roadway population: public health and environmental justice considerations. Transportation Research Part D 25: 59–67.

[710] Boehmer, T.K.; Foster, S.L.; Henry, J.R.; Woghiren-Akinnifesi, E.L.; Yip, F.Y. (2013) Residential proximity to major highways—United States, 2010. Morbidity and Mortality Weekly Report 62(3); 46–50.

[711] *http://www.cdc.gov/asthma/most_recent_data.htm.*

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[713] Su, J.G.; Larson, T.; Gould, T.; Cohen, M.; Buzzelli, M. (2010) Transboundary air pollution and environmental justice: Vancouver and Seattle compared. GeoJournal 57: 595–608. doi:10.1007/s10708–009–9269–6 [Online at *http://dx.doi.org*].

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[717] Su, J.G.; Jerrett, M.; de Nazelle, A.; Wolch, J. (2011) Does exposure to air pollution in urban parks have socioeconomic, racial, or ethnic gradients? Environ Res 111: 319–328.

[718] Depro, B.; Timmins, C. (2008) Mobility and environmental equity: do housing choices determine exposure to air pollution? North Caroline State University Center for Environmental and Resource Economic Policy.

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stressors such as parental smoking and relationship stress also may increase susceptibility to the adverse effects of air pollution.[723] [724]

More recently, three publications report nationwide analyses that compare the demographic patterns of people who do or do not live near major roadways.[725] [726] [727] All three of these studies found that people living near major roadways are more likely to be minorities or low in SES. They also found that the outcomes of their analyses varied between regions within the U.S. However, only one such study looked at whether such conclusions were confounded by living in a location with higher population density and how demographics differ between locations nationwide. In general, it found that higher density areas have higher proportions of low income and minority residents.

We analyzed two national databases that allowed us to evaluate whether homes and schools were located near a major road and whether disparities in exposure may be occurring in these environments. The American Housing Survey (AHS) includes descriptive statistics of over 70,000 housing units across the nation. The study survey is conducted every two years by the U.S. Census Bureau. The second database we analyzed was the U.S. Department of Education's Common Core of Data, which includes enrollment and location information for schools across the U.S.

In analyzing the 2009 AHS, we focused on whether or not a housing unit was located within 300 feet of "4-or-more lane highway, railroad, or airport." [728] We analyzed whether there were differences between households in such locations compared with those in locations farther from these transportation facilities.[729] We included other variables, such as land use category, region of country, and housing type. We found that homes with a nonwhite householder were 22–34 percent more likely to be located within 300 feet of these large transportation facilities than homes with white householders. Homes with a Hispanic householder were 17–33 percent more likely to be located within 300 feet of these large transportation facilities than homes with non-Hispanic householders. Households near large transportation facilities were, on average, lower in income and educational attainment, more likely to be a rental property and located in an urban area compared with households more distant from transportation facilities.

In examining schools near major roadways, we examined the Common Core of Data (CCD) from the U.S. Department of Education, which includes information on all public elementary and secondary schools and school districts nationwide.[730] To determine school proximities to major roadways, we used a geographic information system (GIS) to map each school and roadways based on the U.S. Census's TIGER roadway file.[731] We found that minority students were overrepresented at schools within 200 meters of the largest roadways, and that schools within 200 meters of the largest roadways also had higher than expected numbers of students eligible for free or reduced-price lunches. For example, Black students represent 22 percent of students at schools located within 200 meters of a primary road, whereas Black students represent 17 percent of students in all U.S. schools. Hispanic students represent 30 percent of students at schools located within 200 meters of a primary road, whereas Hispanic students represent 22 percent of students in all U.S. schools.

Overall, there is substantial evidence that people who live or attend school near major roadways are more likely to be of a minority race, Hispanic ethnicity, and/or low SES. The emission reductions from these final rules will likely result in widespread air quality improvements, but the impact on pollution levels in close proximity to roadways will be most direct. Thus, these final rules will likely help in mitigating the disparity in racial, ethnic, and economically based exposures.

B. Environmental Effects of Non-GHG Pollutants

(1) Visibility

Visibility can be defined as the degree to which the atmosphere is transparent to visible light.[732] Visibility impairment is caused by light scattering and absorption by suspended particles and gases. Visibility is important because it has direct significance to people's enjoyment of daily activities in all parts of the country. Individuals value good visibility for the well-being it provides them directly, where they live and work, and in places where they enjoy recreational opportunities. Visibility is also highly valued in significant natural areas, such as national parks and wilderness areas, and special emphasis is given to protecting visibility in these areas. For more information on visibility see the final 2009 p.m. ISA.[733]

EPA is working to address visibility impairment. Reductions in air pollution from implementation of various programs associated with the Clean Air Act Amendments of 1990 (CAAA) provisions have resulted in substantial improvements in visibility and will continue to do so in the future. Because trends in haze are closely associated with trends in particulate sulfate and nitrate due to the relationship between their concentration and light extinction, visibility trends have improved as emissions of SO_2 and NO_X have decreased over time due to air pollution

M.R. (2003) Relation between income, air pollution and mortality: a cohort study. Canadian Med Assn J 169: 397–402.

[722] Shankardass, K.; McConnell, R.; Jerrett, M.; Milam, J.; Richardson, J.; Berhane, K. (2009) Parental stress increases the effect of traffic-related air pollution on childhood asthma incidence. Proc Natl Acad Sci 106: 12406–12411. doi:10.1073/pnas.0812910106 [Online at *http://dx.doi.org*].

[723] Lewis, A.S.; Sax, S.N.; Wason, S.C.; Campleman, S.L (2011) Non-chemical stressors and cumulative risk assessment: an overview of current initiatives and potential air pollutant interactions. Int J Environ Res Public Health 8: 2020–2073. Doi:10.3390/ijerph8062020 [Online at *http://dx.doi.org*].

[724] Rosa, M.J.; Jung, K.H.; Perzanowski, M.S.; Kelvin, E.A.; Darling, K.W.; Camann, D.E.; Chillrud, S.N.; Whyatt, R.M.; Kinney, P.L.; Perera, F.P.; Miller, R.L (2010) Prenatal exposure to polycyclic aromatic hydrocarbons, environmental tobacco smoke and asthma. Respir Med (In press). doi:10.1016/j.rmed.2010.11.022 [Online at *http://dx.doi.org*].

[725] Rowangould, G.M. (2013) A census of the U.S. near-roadway population: public health and environmental justice considerations. Transportation Research Part D; 59–67.

[726] Tian, N.; Xue, J.; Barzyk. T.M. (2013) Evaluating socioeconomic and racial differences in traffic-related metrics in the United States using a GIS approach. J Exposure Sci Environ Epidemiol 23: 215–222.

[727] Boehmer, T.K.; Foster, S.L.; Henry, J.R.; Woghiren-Akinnifesi, E.L.; Yip, F.Y. (2013) Residential proximity to major highways—United States, 2010. Morbidity and Mortality Weekly Report 62(3): 46–50.

[728] This variable primarily represents roadway proximity. According to the Central Intelligence Agency's World Factbook, in 2010, the United States had 6,506,204 km or roadways, 224,792 km of railways, and 15,079 airports. Highways thus represent the overwhelming majority of transportation facilities described by this factor in the AHS.

[729] Bailey, C. (2011) Demographic and Social Patterns in Housing Units Near Large Highways and other Transportation Sources. Memorandum to docket.

[730] *http://nces.ed.gov/ccd/.*

[731] Pedde, M.; Bailey, C. (2011) Identification of Schools within 200 Meters of U.S. Primary and Secondary Roads. Memorandum to the docket.

[732] National Research Council, (1993). Protecting Visibility in National Parks and Wilderness Areas. National Academy of Sciences Committee on Haze in National Parks and Wilderness Areas. National Academy Press, Washington, DC. This book can be viewed on the National Academy Press Web site at *http://www.nap.edu/books/0309048443/html/.*

[733] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F.

regulations such as the Acid Rain Program.[734]

In the Clean Air Act Amendments of 1977, Congress recognized visibility's value to society by establishing a national goal to protect national parks and wilderness areas from visibility impairment caused by manmade pollution.[735] In 1999, EPA finalized the regional haze program to protect the visibility in Mandatory Class I Federal areas.[736] There are 156 national parks, forests and wilderness areas categorized as Mandatory Class I Federal areas.[737] These areas are defined in CAA Section 162 as those national parks exceeding 6,000 acres, wilderness areas and memorial parks exceeding 5,000 acres, and all international parks which were in existence on August 7, 1977.

EPA has also concluded that $PM_{2.5}$ causes adverse effects on visibility in other areas that are not targeted by the Regional Haze Rule, such as urban areas, depending on $PM_{2.5}$ concentrations and other factors such as dry chemical composition and relative humidity (*i.e.,* an indicator of the water composition of the particles). EPA revised the $PM_{2.5}$ standards in December 2012 and established a target level of protection that is expected to be met through attainment of the existing secondary standards for $PM_{2.5}$.

(2) Plant and Ecosystem Effects of Ozone

The welfare effects of ozone can be observed across a variety of scales, *i.e.* subcellular, cellular, leaf, whole plant, population and ecosystem. Ozone effects that begin at small spatial scales, such as the leaf of an individual plant, when they occur at sufficient magnitudes (or to a sufficient degree) can result in effects being propagated along a continuum to larger and larger spatial scales. For example, effects at the individual plant level, such as altered rates of leaf gas exchange, growth and reproduction, can, when widespread, result in broad changes in ecosystems, such as productivity, carbon storage, water cycling, nutrient cycling, and community composition.

Ozone can produce both acute and chronic injury in sensitive species depending on the concentration level and the duration of the exposure.[738] In those sensitive species,[739] effects from repeated exposure to ozone throughout the growing season of the plant tend to accumulate, so that even low concentrations experienced for a longer duration have the potential to create chronic stress on vegetation.[740] Ozone damage to sensitive species includes impaired photosynthesis and visible injury to leaves. The impairment of photosynthesis, the process by which the plant makes carbohydrates (its source of energy and food), can lead to reduced crop yields, timber production, and plant productivity and growth. Impaired photosynthesis can also lead to a reduction in root growth and carbohydrate storage below ground, resulting in other, more subtle plant and ecosystems impacts.[741] These latter impacts include increased susceptibility of plants to insect attack, disease, harsh weather, interspecies competition and overall decreased plant vigor. The adverse effects of ozone on areas with sensitive species could potentially lead to species shifts and loss from the affected ecosystems,[742] resulting in a loss or reduction in associated ecosystem goods and services. Additionally, visible ozone injury to leaves can result in a loss of aesthetic value in areas of special scenic significance like national parks and wilderness areas and reduced use of sensitive ornamentals in landscaping.[743]

The most recent Integrated Science Assessment (ISA) for Ozone presents more detailed information on how ozone affects vegetation and ecosystems.[744] The ISA concludes that ambient concentrations of ozone are associated with a number of adverse welfare effects and characterizes the weight of evidence for different effects associated with ozone.[745] The ISA concludes that visible foliar injury effects on vegetation, reduced vegetation growth, reduced productivity in terrestrial ecosystems, reduced yield and quality of agricultural crops, and alteration of below-ground biogeochemical cycles are causally associated with exposure to ozone. It also concludes that reduced carbon sequestration in terrestrial ecosystems, alteration of terrestrial ecosystem water cycling, and alteration of terrestrial community composition are likely to be causally associated with exposure to ozone.

(3) Atmospheric Deposition

Wet and dry deposition of ambient particulate matter delivers a complex mixture of metals (*e.g.,* mercury, zinc, lead, nickel, aluminum, and cadmium), organic compounds (*e.g.,* polycyclic organic matter, dioxins, and furans) and inorganic compounds (*e.g.,* nitrate, sulfate) to terrestrial and aquatic ecosystems. The chemical form of the compounds deposited depends on a variety of factors including ambient conditions (*e.g.,* temperature, humidity, oxidant levels) and the sources of the material. Chemical and physical transformations of the compounds occur in the atmosphere as well as the media onto which they deposit. These transformations in turn influence the fate, bioavailability and potential toxicity of these compounds.

Adverse impacts to human health and the environment can occur when particulate matter is deposited to soils, water, and biota.[746] Deposition of heavy metals or other toxics may lead to the human ingestion of contaminated fish, impairment of drinking water, damage to terrestrial, freshwater and marine ecosystem components, and limits to recreational uses. Atmospheric deposition has been identified as a key component of the environmental and human health hazard posed by several pollutants including mercury, dioxin and PCBs.[747]

[734] U.S. EPA. 2009 Final Report: Integrated Science Assessment for Particulate Matter. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, 2009.

[735] See Section 169(a) of the Clean Air Act.

[736] 64 FR 35714, July 1, 1999.

[737] 62 FR 38680–38681, July 18, 1997.

[738] 73 FR 16486, March 27, 2008.

[739] 73 FR 16491, March 27, 2008. Only a small percentage of all the plant species growing within the U.S. (over 43,000 species have been catalogued in the USDA PLANTS database) have been studied with respect to ozone sensitivity.

[740] The concentration at which ozone levels overwhelm a plant's ability to detoxify or compensate for oxidant exposure varies. Thus, whether a plant is classified as sensitive or tolerant depends in part on the exposure levels being considered. Chapter 9, Section 9.3.4 of U.S. EPA, 2013 Integrated Science Assessment for Ozone and Related Photochemical Oxidants. Office of Research and Development/National Center for Environmental Assessment. U.S. Environmental Protection Agency. EPA 600/R–10/076F.

[741] 73 FR 16492, March 27, 2008.

[742] 73 FR 16493–16494, March 27, 2008, Ozone impacts could be occurring in areas where plant species sensitive to ozone have not yet been studied or identified.

[743] 73 FR 16490–16497, March 27, 2008.

[744] U.S. EPA. Integrated Science Assessment of Ozone and Related Photochemical Oxidants (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–10/076F, 2013. The ISA is available at *http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492#Download.*

[745] The Ozone ISA evaluates the evidence associated with different ozone related health and welfare effects, assigning one of five ''weight of evidence'' determinations: causal relationship, likely to be a causal relationship, suggestive of a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship. For more information on these levels of evidence, please refer to Table II of the ISA.

[746] U.S. EPA. Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/139F, 2009.

[747] U.S. EPA. (2000). Deposition of Air Pollutants to the Great Waters: Third Report to Congress. Office of Air Quality Planning and Standards. EPA–453/R–00–0005.

The ecological effects of acidifying deposition and nutrient enrichment are detailed in the Integrated Science Assessment for Oxides of Nitrogen and Sulfur-Ecological Criteria.[748] Atmospheric deposition of nitrogen and sulfur contributes to acidification, altering biogeochemistry and affecting animal and plant life in terrestrial and aquatic ecosystems across the United States. The sensitivity of terrestrial and aquatic ecosystems to acidification from nitrogen and sulfur deposition is predominantly governed by geology. Prolonged exposure to excess nitrogen and sulfur deposition in sensitive areas acidifies lakes, rivers and soils. Increased acidity in surface waters creates inhospitable conditions for biota and affects the abundance and biodiversity of fishes, zooplankton and macroinvertebrates and ecosystem function. Over time, acidifying deposition also removes essential nutrients from forest soils, depleting the capacity of soils to neutralize future acid loadings and negatively affecting forest sustainability. Major effects in forests include a decline in sensitive tree species, such as red spruce (*Picea rubens*) and sugar maple (*Acer saccharum*). In addition to the role nitrogen deposition plays in acidification, nitrogen deposition also leads to nutrient enrichment and altered biogeochemical cycling. In aquatic systems increased nitrogen can alter species assemblages and cause eutrophication. In terrestrial systems nitrogen loading can lead to loss of nitrogen-sensitive lichen species, decreased biodiversity of grasslands, meadows and other sensitive habitats, and increased potential for invasive species. For a broader explanation of the topics treated here, refer to the description in Chapter 8.1.2.3 of the RIA.

Building materials including metals, stones, cements, and paints undergo natural weathering processes from exposure to environmental elements (*e.g.,* wind, moisture, temperature fluctuations, sunlight, etc.). Pollution can worsen and accelerate these effects. Deposition of PM is associated with both physical damage (materials damage effects) and impaired aesthetic qualities (soiling effects). Wet and dry deposition of PM can physically affect materials, adding to the effects of natural weathering processes, by potentially promoting or accelerating the corrosion of metals, by degrading paints and by deteriorating building materials such as stone, concrete and marble.[749] The effects of PM are exacerbated by the presence of acidic gases and can be additive or synergistic due to the complex mixture of pollutants in the air and surface characteristics of the material. Acidic deposition has been shown to have an effect on materials including zinc/galvanized steel and other metal, carbonate stone (as monuments and building facings), and surface coatings (paints).[750] The effects on historic buildings and outdoor works of art are of particular concern because of the uniqueness and irreplaceability of many of these objects.

(4) Environmental Effects of Air Toxics

Emissions from producing, transporting and combusting fuel contribute to ambient levels of pollutants that contribute to adverse effects on vegetation. Volatile organic compounds, some of which are considered air toxics, have long been suspected to play a role in vegetation damage.[751] In laboratory experiments, a wide range of tolerance to VOCs has been observed.[752] Decreases in harvested seed pod weight have been reported for the more sensitive plants, and some studies have reported effects on seed germination, flowering and fruit ripening. Effects of individual VOCs or their role in conjunction with other stressors (*e.g.,* acidification, drought, temperature extremes) have not been well studied. In a recent study of a mixture of VOCs including ethanol and toluene on herbaceous plants, significant effects on seed production, leaf water content and photosynthetic efficiency were reported for some plant species.[753]

Research suggests an adverse impact of vehicle exhaust on plants, which has in some cases been attributed to aromatic compounds and in other cases to nitrogen oxides.[754] [755] [756]

C. Emissions Inventory Impacts

As described in Section VII, the agencies conducted two analyses for these rules using DOT's CAFE model and EPA's MOVES model, relative to different reference cases (*i.e.,* different baselines). The agencies used EPA's MOVES model to estimate the non-GHG impacts for tractor-trailers (including the engine that powers the vehicle) and vocational vehicles (including the engine that powers the vehicle). For heavy-duty pickups and vans, the agencies performed separate analyses using the CAFE model (included in NHTSA's ''Method A;'' See Section VI) and the MOVES model (included in EPA's ''Method B;'' See Section VI) to estimate non-GHG emissions from these vehicles. For these methods, the agencies analyzed the impact of the rules relative to two different reference cases—flat and dynamic. The flat baseline projects very little improvement in new vehicles in the absence of new Phase 2 standards. In contrast, the dynamic baseline projects more significant improvements in vehicle fuel efficiency. The agencies considered both reference cases. The results for all of the regulatory alternatives relative to both reference cases, derived via the same methodologies discussed in Section VII of the Preamble, are presented in Section X of the Preamble.

For brevity, a subset of these analyses are presented in this section and the reader is referred to both Chapter 11 of the RIA and NHTSA's FEIS Chapters 3, 4 and 5 for complete sets of these analyses. In this section, Method A is presented for the final standards, relative to both the dynamic baseline (Alternative 1b) and the flat baseline (Alternative 1a). Method B is presented for the final standards, relative only to the flat baseline.

The following subsections summarize two slightly different analyses of the annual non-GHG emissions reductions expected from these standards. Section VIII.A.(1) presents the impacts of the

[748] NO_X and SO_X secondary ISA[1] U.S. EPA. Integrated Science Assessment (ISA) for Oxides of Nitrogen and Sulfur Ecological Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R–08/082F, 2008.

[749] U.S. Environmental Protection Agency (U.S. EPA). 2009. Integrated Science Assessment for Particulate Matter (Final Report). EPA–600–R–08–139F. National Center for Environmental Assessment—RTP Division. December. Available on the Internet at <*http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546*>.

[750] Irving, P.M., e.d. 1991. Acid Deposition: State of Science and Technology, Volume III, Terrestrial, Materials, Health, and Visibility Effects, The U.S. National Acid Precipitation Assessment Program, Chapter 24, page 24–76.

[751] U.S. EPA. (1991). Effects of organic chemicals in the atmosphere on terrestrial plants. EPA/600/3–91/001.

[752] Cape JN, ID Leith, J Binnie, J Content, M Donkin, M Skewes, DN Price AR Brown, AD Sharpe. (2003). Effects of VOCs on herbaceous plants in an open-top chamber experiment. Environ. Pollut. 124:341–343.

[753] Cape JN, ID Leith, J Binnie, J Content, M Donkin, M Skewes, DN Price AR Brown, AD Sharpe. (2003). Effects of VOCs on herbaceous plants in an open-top chamber experiment. Environ. Pollut. 124:341–343.

[754] Viskari E–L. (2000). Epicuticular wax of Norway spruce needles as indicator of traffic pollutant deposition. Water, Air, and Soil Pollut. 121:327–337.

[755] Ugrekhelidze D, F Korte, G Kvesitadze. (1997). Uptake and transformation of benzene and toluene by plant leaves. Ecotox. Environ. Safety 37:24–29.

[756] Kammerbauer H, H Selinger, R Rommelt, A Ziegler-Jons, D Knoppik, B Hock. (1987). Toxic components of motor vehicle emissions for the spruce Picea abies. Environ. Pollut. 48:235–243.

final rules on non-GHG emissions using the analytical Method A, relative to two different reference cases—flat and dynamic. Section VIII.A.(2) presents the impacts of these standards, relative to the flat reference case only, using the MOVES model for all heavy-duty vehicle categories.

(1) Impacts of the Final Rules Using Analysis Method A

(a) Calendar Year Analysis

(i) Upstream Impacts of the Final Program

Increasing efficiency in heavy-duty vehicles will result in reduced fuel demand and, therefore, reductions in the emissions associated with all processes involved in getting petroleum to the pump. Both Method A and Method B project these impacts for fuel consumed by vocational vehicles and combination tractor-trailers, using EPA's MOVES model. See Section VII.A. for the description of this methodology. To project these impacts for fuel consumed by HD pickups and vans, Method A used similar calculations and inputs applicable to the CAFE model, as discussed above in Section VI. More information on the development of the emission factors used in this analysis can be found in Chapter 5 of the RIA.

The following two tables summarize the projected upstream emission impacts of the final program on both criteria pollutants and air toxics from the heavy-duty sector, relative to Alternative 1b (dynamic baseline conditions under the No-Action Alternative) and Alternative 1a (flat baseline conditions under the No-Action Alternative), using analysis method A. Using either No-Action Alternative shows decreases in upstream emissions of all criteria pollutants, precursors, and air toxics; using Alternative 1a as the reference point attributes more of the emission reduction to the standards. Note that the rule is projected, in all analyses, of reducing emissions of NO_X, contrary to implications in some of the public comments that fuel efficiency/GHG controls come at the expense of increased NO_X emissions.

TABLE VIII–1—ANNUAL UPSTREAM IMPACTS ON CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1b USING ANALYSIS METHOD A [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	−1	−4.9	−4	−18	−5	−19
Acetaldehyde	−3	−4.4	−14	−15	−16	−16
Acrolein	−0.4	−4.6	−2	−16	−2	−17
Benzene	−23	−4.8	−88	−16	−105	−18
CO	−3,785	−4.9	−14,714	−17	−17,629	−19
Formaldehyde	−18	−4.9	−71	−17	−86	−19
NO_X	−9,255	−4.9	−35,964	−17	−43,089	−19
$PM_{2.5}$	−975	−4.9	−3,850	−18	−4,618	−19
SO_X	−5,804	−4.9	−22,550	−17	−27,019	−19
VOC	−4,419	−4.8	−14,857	−15	−17,385	−16

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

TABLE VIII–2—ANNUAL UPSTREAM IMPACTS ON CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD A [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	−1	−5.3	−4	−20	−5	−21
Acetaldehyde	−4	−4.6	−15	−16	−17	−17
Acrolein	−0.4	−4.9	−2	−17	−2	−18
Benzene	−25	−5.1	−96	−18	−115	−19
CO	−4,142	−5.4	−16,298	−19	−19,558	−20
Formaldehyde	−20	−5.3	−79	−19	−95	−20
NO_X	−10,124	−5.4	−39,813	−19	−47,779	−20
$PM_{2.5}$	−1,065	−5.3	−4,258	−19	−5,117	−21
SO_X	−6,349	−5.4	−24,961	−19	−29,958	−20
VOC	−4,810	−5.2	−16,218	−16	−19,004	−17

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

(ii) Downstream Impacts of the Final Program

For vocational vehicles and tractor-trailers, the agencies used the MOVES model to determine non-GHG emissions inventories. The improvements in engine efficiency and road load, the increased use of APUs, and VMT rebound were included in the MOVES analysis. For NHTSA's Method A analysis, presented in this section, the DOT CAFE model was used for HD pickups and vans. Further information about DOT's CAFE model is available in Section VI.C and Chapter 10 of the RIA. The following two tables summarize the projected downstream emission impacts of the final program on both criteria pollutants and air toxics from the heavy-duty sector, relative to Alternative 1b and Alternative 1a, using analysis Method A. Using either baseline shows a reduction in all criteria pollutants and air toxics—except for 1,3-Butadiene, and CY2025 levels of acrolein, which show small increases in downstream emissions.

TABLE VIII–3—ANNUAL DOWNSTREAM IMPACTS ON CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1b USING ANALYSIS METHOD A [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	1	0.5	4	3.6	4	3.4
Acetaldehyde	−1	0.0	−16	−0.7	−19	−0.8
Acrolein	0.2	0.0	−0.3	−0.1	−1	−0.4
Benzene	−2	−0.1	−13	−1.2	−13	−1.1
CO	−9,045	−0.6	−34,702	−2.8	−42,095	−3.0
Formaldehyde	−21	−0.3	−96	−1.6	−119	−1.8
NO_X	−12,082	−1.3	−53,254	−9.1	−65,068	−9.9
$PM_{2.5}$ [b]	−58	−0.2	−363	−2.0	−453	−2.2
SO_X	−201	−4.1	−851	−16	−1,028	−17
VOC	−769	−0.8	−3,436	−5.3	−4,128	−5.8

Notes:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.
[b] $PM_{2.5}$ from tire wear and brake wear are included.

TABLE VIII–4—ANNUAL DOWNSTREAM IMPACTS ON CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD A [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	1	0.5	4	3.7	4	3.5
Acetaldehyde	−1	0.0	−14	−0.7	−18	−0.8
Acrolein	0.2	0.0	−0.3	−0.1	−1	−0.4
Benzene	−2	−0.2	−13	−1.2	−14	−1.2
CO	−8,944	−0.6	−34,502	−2.8	−41,880	−3.0
Formaldehyde	−20	−0.3	−91	−1.6	−113	−1.7
NO_X	−13,368	−1.5	−60,594	−10.2	−74,206	−11
$PM_{2.5}$ [b]	−78	−0.2	−473	−2.6	−591	−2.9
SO_X	−219	−4.5	−941	−17	−1,138	−19
VOC	−831	−0.8	−3,736	−5.8	−4,499	−6.3

Notes:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.
[b] $PM_{2.5}$ from tire wear and brake wear are included.

(iii) Total Impacts of the Final Program

The following two tables summarize the projected upstream emission impacts of the final program on both criteria pollutants and air toxics from the heavy-duty sector, relative to Alternative 1b and Alternative 1a, using analysis Method A. Under both baselines, Method A predicts a decrease in total emissions by calendar year 2050, but the amount attributable to the standards is larger using the flat baseline than the dynamic baseline.

TABLE VIII–5—ANNUAL TOTAL IMPACTS (UPSTREAM AND DOWNSTREAM) OF CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1b USING ANALYSIS METHOD A [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	0.3	0.1	0.1	0.1	−0.4	−0.3
Acetaldehyde	−4	−0.1	−30	−1.3	−35	−1.4
Acrolein	−0.2	0.0	−2	−0.7	−3	−0.9
Benzene	−25	−1.2	−101	−6.3	−118	−6.7
CO	−12,830	−0.9	−49,416	−3.7	−59,724	−4.0
Formaldehyde	−39	−0.5	−167	−2.7	−205	−2.9
NO_X	−21,337	−2.0	−89,218	−11	−108,157	−12
$PM_{2.5}$	−1,033	−2.0	−4,213	−10	−5,071	−11
SO_X	−6,005	−4.9	−23,401	−17	−28,047	−19
VOC	−5,188	−2.7	−18,293	−11	−21,513	−12

Notes:

[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

TABLE VIII–6—ANNUAL TOTAL IMPACTS (UPSTREAM AND DOWNSTREAM) OF CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD A [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	0.2	0.1	−0.2	−0.1	−1.0	−0.5
Acetaldehyde	−5	−0.2	−29	−1.3	−35	−1.4
Acrolein	−0.2	0.0	−2	−0.7	−3	−1.0
Benzene	−27	−1.4	−109	−6.8	−129	−7.2
CO	−13,086	−0.9	−50,800	−3.8	−61,438	−4.1
Formaldehyde	−40	−0.5	−170	−2.7	−208	−2.9
NO_X	−23,492	−2.2	−100,407	−12	−121,985	−14
$PM_{2.5}$	−1,143	−2.2	−4,731	−12	−5,708	−13
SO_X	−6,568	−5.3	−25,902	−19	−31,096	−20
VOC	−5,641	−3.0	−19,954	−12	−23,503	−13

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

(b) Model Year Lifetime Analysis

Table VIII–7 shows the lifetime Non-GHG reductions for model years 2018–2029 attributable to the standards using Method A relative to both No-Action Alternatives. For NO_X, approximately half of the emission reductions are downstream and half are upstream. However, for $PM_{2.5}$ and SO_X proportionally more of the emission reductions are attributable to upstream emission reductions than to downstream emission reductions. A similar pattern emerges as with single calendar year snapshots; more emission reductions are attributable to the standards using the 1a baseline as the reference point than by using the 1b baseline as the reference point.

TABLE VIII–7—LIFETIME NON-GHG REDUCTIONS USING ANALYSIS METHOD A—SUMMARY FOR MODEL YEARS 2018–2029

[U.S. Short Tons] [a]

NO–action alternative (baseline)	Final program	
	1b (Dynamic)	1a (Flat)
NO_X	494,495	548,630
Downstream	246,509	276,413
Upstream	247,986	272,217
$PM_{2.5}$	27,827	30,838
Downstream[b]	1,437	1,891
Upstream	26,390	28,947
SO_X	159,367	174,918
Downstream	3,849	4,214
Upstream	155,518	170,704

Notes:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.
[b] $PM_{2.5}$ from tire wear and brake wear are included.

(2) Impacts of the Final Rules Using Analysis Method B

(a) Calendar Year Analysis

(i) Upstream Impacts of the Final Program

Increasing efficiency in heavy-duty vehicles will result in reduced fuel demand and, therefore, reductions in the emissions associated with all processes involved in getting petroleum to the pump. To project these impacts, Method B estimated the impact of reduced petroleum volumes on the extraction and transportation of crude oil as well as the production and distribution of finished gasoline and diesel. For the purpose of assessing domestic-only emission reductions, it was necessary to estimate the fraction of fuel savings attributable to domestic finished gasoline and diesel and, of this fuel, what fraction is produced from domestic crude. Method B estimated the emissions associated with production and distribution of gasoline and diesel from crude oil based on emission factors in the ‘‘Greenhouse Gases, Regulated Emissions, and Energy used in Transportation’’ model (GREET) developed by DOE's Argonne National Laboratory. In some cases, the GREET values were modified or updated by the agencies to be consistent with the National Emission Inventory (NEI) and emission factors from MOVES. Method B estimated the projected corresponding changes in upstream emissions using the same tools originally created for the Renewable Fuel Standard 2 (RFS2) rulemaking analysis,[757] used in the LD

[757] U.S. EPA. Draft Regulatory Impact Analysis: Changes to Renewable Fuel Standard Program.

GHG rulemakings,[758] HD GHG Phase 1,[759] and updated for the current analysis. More information on the development of the emission factors used in this analysis can be found in Chapter 5 of the RIA.

Table VIII–8 summarizes the projected upstream emission impacts of the final program on both criteria pollutants and air toxics from the heavy-duty sector, relative to Alternative 1a, using analysis Method B. The comparable estimates relative to Alternative 1b are presented in Section VIII.C.(1).

TABLE VIII–8—ANNUAL UPSTREAM IMPACTS ON CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD B [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	−1	−4.8	−5	−19.0	−6	−20.6
Acetaldehyde	−7	−3.2	−35	−14.5	−38	−15.9
Acrolein	−1	−3.5	−3	−15.2	−4	−16.7
Benzene	−30	−3.8	−143	−16.1	−166	−17.6
CO	−3,809	−4.8	−16,884	−18.9	−20,227	−20.5
Formaldehyde	−20	−4.6	−90	−18.3	−107	−19.9
NO_X	−9,314	−4.8	−41,280	−18.9	−49,462	−20.5
$PM_{2.5}$	−1,037	−4.7	−4,619	−18.7	−5,520	−20.3
SO_X	−5,828	−4.8	−25,811	−18.9	−30,941	−20.5
VOC	−4,234	−3.7	−20,010	−15.9	−23,240	−17.4

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

(ii) Downstream Impacts of the Final Program

The final program will impact the downstream emissions of non-GHG pollutants. These pollutants include oxides of nitrogen (NO_X), oxides of sulfur (SO_X), volatile organic compounds (VOC), carbon monoxide (CO), fine particulate matter ($PM_{2.5}$), and air toxics. The agencies expect reductions in downstream emissions of NO_X, $PM_{2.5}$, VOC, SO_X, CO, and air toxics. Much of these estimated net reductions are a result of the agencies' anticipation of increased use of auxiliary power units (APUs) in combination tractors during extended idling; APUs emit these pollutants at a lower rate than on-road engines during extended idle operation, with the exception of $PM_{2.5}$. As discussed in Section III.C.3, EPA is adopting Phase 1 and Phase 2 requirements to control $PM_{2.5}$ emissions from APUs installed in new tractors and therefore, eliminate the unintended consequence of increased $PM_{2.5}$ emissions from increased APU use.

Additional reductions in tailpipe emissions of NO_X and CO and refueling emissions of VOC will be achieved through improvements in engine efficiency and reduced road load (improved aerodynamics and tire rolling resistance), which reduces the amount of work required to travel a given distance and increases fuel economy. For vehicle types not affected by road load improvements, such as HD pickups and vans [760], non-GHG emissions will increase very slightly due to VMT rebound. In addition, brake wear and tire wear emissions of $PM_{2.5}$ will also increase very slightly due to VMT rebound. The agencies estimate that downstream emissions of SO_X will be reduced, because they are roughly proportional to fuel consumption.

For vocational vehicles and tractor-trailers, the agencies used MOVES to determine non-GHG emissions impacts of the final rules, relative to the flat baseline (Alternative 1a) and the dynamic baseline (Alternative 1b). The improvements in engine efficiency and road load, the increased use of APUs, and VMT rebound were included in the MOVES analysis. For this analysis, Method B also used the MOVES model for HD pickups and vans.

The downstream criteria pollutant and air toxics impacts of the final program, relative to Alternative 1a, using analysis Method B, are presented in Table VIII–9.

TABLE VIII–9—ANNUAL DOWNSTREAM IMPACTS ON CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD B [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	−1	−0.2	−3	−1.5	−3	−1.8
Acetaldehyde	−3	−0.1	−18	−0.8	−23	−0.9
Acrolein	−0.1	0	−1	−0.3	−1	−0.4
Benzene	−5	−0.2	−22	−1.4	−26	−1.6
CO	−9,445	−0.4	−35,710	−2.4	−43,642	−2.7

Chapters 2 and 3. May 26, 2009. Docket ID: EPA–HQ–OAR–2009–0472–0119.

[758] 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards (77 FR 62623, October 15, 2012).

[759] Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (76 FR 57106, September 15, 2011).

[760] HD pickups and vans are subject to gram per mile (distance) emission standards, as opposed to larger heavy-duty vehicles which are certified to a gram per brake horsepower (work) standard.

TABLE VIII–9—ANNUAL DOWNSTREAM IMPACTS ON CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD B [a]—Continued

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
Formaldehyde	−20	−0.2	−97	−1.5	−120	−1.7
NO_X	−13,396	−1.4	−60,681	−9.7	−74,362	−10.8
$PM_{2.5}$ [b]	−73	−0.2	−462	−2.2	−580	−2.5
SO_X	−252	−4.7	−1,122	−18.5	−1,341	−20.1
VOC	−1,071	−0.8	−5,060	−5.9	−6,013	−6.6

Notes:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.
[b] $PM_{2.5}$ from tire wear and brake wear are included.

As noted above, EPA is adopting Phase 1 and Phase 2 requirements to control $PM_{2.5}$ emissions from APUs installed in new tractors. In the NPRM, EPA projected an unintended increase in downstream $PM_{2.5}$ emissions because engines powering APUs are currently required to meet less stringent PM standards (40 CFR 1039.101) than on-road engines (40 CFR 86.007–11) and because the increase in emissions from APUs more than offset the reduced tailpipe emissions from improved engine efficiency and road load. However, with the new requirements for APUs, the final program is projected to lead to reduced downstream $PM_{2.5}$ emissions of 462 tons in 2040 and 580 tons in 2050 (Table VIII–9). The net reductions in national $PM_{2.5}$ emissions from the requirements for APUs are 927 tons and 1,114 tons in 2040 and 2050, respectively (Table VIII–10). See Section III.C.3 of the Preamble for additional details on EPA's PM emission standards for APUs. The development of APU emission rates with PM control is documented in a memorandum to the docket.[761]

TABLE VIII–10—IMPACT ON $PM_{2.5}$ EMISSIONS OF FURTHER $PM_{2.5}$ CONTROL ON APUS—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD B

[US Short Tons] [a]

CY	Baseline national heavy-duty vehicle $PM_{2.5}$ emissions (tons)	Final HD phase 2 program national $PM_{2.5}$ emissions without further PM control (tons)	Final HD phase 2 program national $PM_{2.5}$ emissions with further PM control (tons)	Net impact on national $PM_{2.5}$ emission with further PM control on APUs (tons)
2040	20,939	21,403	20,476	−927
2050	22,995	23,529	22,416	−1,114

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

It is worth noting that the emission reductions shown in Table VIII–9 are not incremental to the emissions reductions projected in the Phase 1 rulemaking. This is because, as described in Sections III.D.(1).a of the Preamble, the agencies have revised their assumptions about the adoption rate of APUs. This final rule assumes that without the Phase 2 program (*i.e.,* in the Phase 2 baselines), the APU adoption rate will be 9 percent for model years 2010 and later. EPA conducted an analysis to estimate the combined emissions impacts of the Phase 1 and the Phase 2 programs for NO_X, VOC, SO_X and $PM_{2.5}$ in calendar year 2050 using MOVES2014a. The results are shown in Table VIII–11. For NO_X and $PM_{2.5}$ only, we also estimated the combined Phase 1 and Phase 2 downstream and upstream emissions impacts for calendar year 2025, and project that the two rules combined will reduce NO_X by up to 55,000 tons and $PM_{2.5}$ by up to 33,000 tons in that year. For additional details, see Chapter 5 of the RIA.

TABLE VIII–11—COMBINED PHASE 1 AND PHASE 2 ANNUAL DOWNSTREAM IMPACTS ON CRITERIA POLLUTANTS FROM HEAVY-DUTY SECTOR IN CALENDAR YEAR 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD B

[US Short Tons] [a]

CY	NO_X	VOC	SO_X	$PM_{2.5}$ [b]
2050	−100,878	−10,067	−2,249	−1,001

Notes:

[761] U.S. EPA. Updates to MOVES for Emissions Analysis of Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2 FRM. Docket No. EPA–HQ–OAR–2016, July 2016.

[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and more dynamic baseline, 1b, please see Section X.A.1.

(iii) Total Impacts of the Final Program

As shown in Table VIII–12, EPA estimates that the final program will result in overall net reductions of NO_X, VOC, SO_X, CO, $PM_{2.5}$, and air toxics emissions. The results are shown both in changes in absolute tons and in percent reductions from the flat reference to the final program for the heavy-duty sector.

TABLE VIII–12—ANNUAL TOTAL IMPACTS (UPSTREAM AND DOWNSTREAM) OF CRITERIA POLLUTANTS AND AIR TOXICS FROM HEAVY-DUTY SECTOR IN CALENDAR YEARS 2025, 2040 AND 2050—FINAL PROGRAM VS. ALT 1a USING ANALYSIS METHOD B [a]

Pollutant	CY2025		CY2040		CY2050	
	US short tons	% Change	US short tons	% Change	US short tons	% Change
1,3-Butadiene	−2	−0.5	−8	−3.7	−9	−4.1
Acetaldehyde	−10	−0.3	−53	−2.0	−61	−2.1
Acrolein	−1	−0.1	−4	−1.3	−5	−1.3
Benzene	−35	−1.1	−165	−6.8	−192	−7.5
CO	−13,254	−0.6	−52,594	−3.3	−63,869	−3.8
Formaldehyde	−40	−0.5	−187	−2.7	−227	−2.9
NO_X	−22,710	−1.9	−101,961	−12.1	−123,824	−13.3
$PM_{2.5}$	−1,110	−1.9	−5,081	−11.1	−6,100	−12.1
SO_X	−6,080	−4.8	−26,933	−18.9	−32,282	−20.5
VOC	−5,305	−2.2	−25,070	−11.9	−29,253	−13.0

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

(b) Model Year Lifetime Analysis

In addition to the annual non-GHG emissions reductions expected from the final rules, EPA estimated the combined (downstream and upstream) non-GHG impacts for the lifetime of the impacted vehicles. Table VIII–13 shows the fleet-wide reductions of NO_X, $PM_{2.5}$ and SO_X from the final program, relative to Alternative 1a, through the lifetime [762] of heavy-duty vehicles. For the lifetime non-GHG reductions by vehicle categories, see Chapter 5 of the RIA.

TABLE VIII–13—LIFETIME NON-GHG REDUCTIONS USING ANALYSIS METHOD B—SUMMARY FOR MODEL YEARS 2018–2029

[U.S. Short Tons] [a]

No-action alternative (baseline)	Final program
	1a (Flat)
NO_X	549,881
Downstream	277,644
Upstream	272,237
$PM_{2.5}$	32,251
Downstream [b]	1,824
Upstream	30,427
SO_X	175,202
Downstream	4,931
Upstream	170,272

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.
[b] $PM_{2.5}$ from tire wear and brake wear are included.

D. Air Quality Impacts of Non-GHG Pollutants

Changes in emissions of non-GHG pollutants due to these rules will impact air quality. Information on current air quality and the results of our air quality modeling of the projected impacts of these rules are summarized in the following section. Additional information is available in Chapter 6 of the RIA.

(1) Current Concentrations of Non-GHG Pollutants

Nationally, levels of $PM_{2.5}$, ozone, NO_X, SO_X, CO and air toxics are declining.[763] However, as of April 22, 2016, more than 125 million people lived in counties designated nonattainment for one or more of the NAAQS, and this figure does not include the people living in areas with a risk of exceeding a NAAQS in the future.[764] Many Americans continue to be exposed to ambient concentrations of air toxics at levels which have the potential to cause adverse health effects.[765] In addition, populations who live, work, or attend school near major roads experience elevated exposure concentrations to a wide range of air pollutants.[766]

(a) Particulate Matter

There are two primary NAAQS for $PM_{2.5}$: An annual standard (12.0 micrograms per cubic meter (μg/m³)) set in 2012 and a 24-hour standard (35 μg/m³) set in 2006, and two secondary NAAQS for $PM_{2.5}$: An annual standard (15.0 μg/m³) set in 1997 and a 24-hour standard (35 μg/m³) set in 2006.

There are many areas of the country that are currently in nonattainment for the annual and 24-hour primary $PM_{2.5}$ NAAQS. In 2005 the EPA designated 39 nonattainment areas for the 1997 $PM_{2.5}$ NAAQS.[767] As of April 22, 2016, more than 23 million people lived in the 7 areas that are still designated as nonattainment for the 1997 annual $PM_{2.5}$ NAAQS. These $PM_{2.5}$

[762] A lifetime of 30 years is assumed in MOVES.

[763] U.S. EPA, 2011. Our Nation's Air: Status and Trends through 2010. EPA–454/R–12–001. February 2012. Available at: *http://www3.epa.gov/airtrends/2011/*.

[764] Data come from Summary Nonattainment Area Population Exposure Report, current as of April 22, 2016 at: *https://www3.epa.gov/airquality/greenbk/popexp.html* and contained in Docket EPA–HQ–OAR–2014–0827.

[765] U.S. EPA. (2015) Summary of Results for the 2011 National-Scale Assessment. *https://www3.epa.gov/sites/production/files/2015-12/documents/2011-nata-summary-results.pdf*.

[766] Health Effects Institute Panel on the Health Effects of Traffic-Related Air Pollution. (2010) Traffic-related air pollution: A critical review of the literature on emissions, exposure, and health effects. HEI Special Report 17. Available at *http://www.healtheffects.org*].

[767] 70 FR 19844 (April 14, 2005).

nonattainment areas are comprised of 33 full or partial counties. In December 2014 EPA designated 14 nonattainment areas for the 2012 annual $PM_{2.5}$ NAAQS.[768] In March 2015, EPA changed the initial designation from nonattainment to unclassifiable/attainment for four areas based on the availability of complete, certified 2014 air quality data showing these areas met the 2012 annual $PM_{2.5}$ NAAQS. The EPA also changed the initial 2012 annual $PM_{2.5}$ NAAQS designation from nonattainment to unclassifiable for the Louisville, Indiana-Kentucky area. [769] As of April 22, 2016, 9 of these areas remain designated as nonattainment, and they are composed of 20 full or partial counties with a population of over 23 million. On November 13, 2009 and February 3, 2011, the EPA designated 32 nonattainment areas for the 2006 24-hour $PM_{2.5}$ NAAQS.[770] As of April 22, 2016, 16 of these areas remain designated as nonattainment for the 2006 24-hour $PM_{2.5}$ NAAQS, and they are composed of 46 full or partial counties with a population of over 32 million. In total, there are currently 24 $PM_{2.5}$ nonattainment areas with a population of more than 39 million people.[771]

The EPA has already adopted many mobile source emission control programs that are expected to reduce ambient PM concentrations. As a result of these and other federal, state and local programs, the number of areas that fail to meet the $PM_{2.5}$ NAAQS in the future is expected to decrease. However, even with the implementation of all current state and federal regulations, there are projected to be counties violating the $PM_{2.5}$ NAAQS well into the future. States will need to meet the 2006 24-hour standards in the 2015–2019 timeframe and the 2012 primary annual standard in the 2021–2025 timeframe. The emission reductions and improvements in ambient $PM_{2.5}$ concentrations from this action, which will take effect as early as model year 2018, will be helpful to states as they work to attain and maintain the $PM_{2.5}$ NAAQS.[772] The standards can assist areas with attainment dates in 2018 and beyond in attaining the NAAQS as expeditiously as practicable and may relieve areas with already stringent local regulations from some of the burden associated with adopting additional local controls.

(b) Ozone

The primary and secondary NAAQS for ozone are 8-hour standards with a level of 0.07 ppm. The most recent revision to the ozone standards was in 2015; the previous 8-hour ozone primary standard, set in 2008, had a level of 0.075 ppm. Final nonattainment designations for the 2008 ozone standard were issued on April 30, 2012, and May 31, 2012.[773] As of April 22, 2016, there were 44 ozone nonattainment areas for the 2008 ozone NAAQS, composed of 216 full or partial counties, with a population of more than 120 million. In addition, EPA plans to finalize nonattainment areas for the 2015 ozone NAAQS in October 2017.

States with ozone nonattainment areas are required to take action to bring those areas into attainment. The attainment date assigned to an ozone nonattainment area is based on the area's classification. The attainment dates for areas designated nonattainment for the 2008 8-hour ozone NAAQS are in the 2015 to 2032 timeframe, depending on the severity of the problem in each area. Nonattainment area attainment dates associated with areas designated for the 2015 NAAQS will be in the 2020–2037 timeframe, depending on the severity of the problem in each area.[774]

EPA has already adopted many emission control programs that are expected to reduce ambient ozone levels. As a result of these and other federal, state and local programs, 8-hour ozone levels are expected to improve in the future. However, even with the implementation of all current state and federal regulations, there are projected to be counties violating the ozone NAAQS well into the future. The emission reductions from this action, which will take effect as early as model year 2018, will be helpful to states as they work to attain and maintain the ozone NAAQS.[775] The standards can assist areas with attainment dates in 2018 and beyond in attaining the NAAQS as expeditiously as practicable and may relieve areas with already stringent local regulations from some of the burden associated with adopting additional local controls.

(c) Nitrogen Dioxide

The EPA most recently completed a review of the primary NAAQS for NO_2 in January 2010. There are two primary NAAQS for NO_2: An annual standard (53 ppb) and a 1-hour standard (100 ppb). The EPA promulgated area designations in the **Federal Register** on February 17, 2012. In this initial round of designations, all areas of the country were designated as ''unclassifiable/attainment'' for the 2010 NO_2 NAAQS based on data from the existing air quality monitoring network. The EPA and state agencies are working to establish an expanded network of NO_2 monitors, expected to be deployed in the 2014–2017 time frame. Once three years of air quality data have been collected from the expanded network, the EPA will be able to evaluate NO_2 air quality in additional locations.[776][777]

(d) Sulfur Dioxide

The EPA most recently completed a review of the primary SO_2 NAAQS in June 2010. The current primary NAAQS for SO_2 is a 1-hour standard of 75 ppb. The EPA finalized the initial area designations for 29 nonattainment areas in 16 states in a notice published in the **Federal Register** on August 5, 2013. In this first round of designations, EPA only designated nonattainment areas that were violating the standard based on existing air quality monitoring data provided by the states. The agency did not have sufficient information to designate any area as ''attainment'' or make final decisions about areas for which additional modeling or monitoring is needed (78 FR 47191, August 5, 2013). On March 2, 2015, the U.S. District Court for the Northern District of California accepted, as an enforceable order, an agreement between the EPA and Sierra Club and Natural Resources Defense Council to resolve litigation concerning the deadline for completing designations.[778] The court's order directs the EPA to complete designations for all remaining

[768] EPA 2014. Fact Sheet: Final Area Designations for the Annual Fine Particle Standard. *https://www3.epa.gov/pmdesignations/2012standards/final/20141218fs.pdf.*

[769] *https://www3.epa.gov/pmdesignations/2012standards/final/20150331fs.pdf.*

[770] 74 FR 58688 (November 13, 2009) and 76 FR 6056 (February 3, 2011).

[771] The 39 million total is calculated by summing, without double counting, the 1997, 2006 and 2012 $PM_{2.5}$ nonattainment populations contained in the Summary Nonattainment Area Population Exposure report (*https://www3.epa.gov/airquality/greenbk/popexp.html*). If there is a population associated with more than one of the 1997, 2006 and 2012 nonattainment areas, and they are not the same, then the larger of the populations is included in the sum.

[772] The final Phase 2 trailer standards and PM controls for APUs begin with model year 2018.

[773] 77 FR 30088 (May 21, 2012) and 77 FR 34221 (June 11, 2012).

[774] *https://www3.epa.gov/ozone-pollution/2015-ozone-naaqs-timelines.*

[775] The final Phase 2 trailer standards begin with model year 2018.

[776] U.S. EPA. (2012). Fact Sheet—Air Quality Designations for the 2010 Primary Nitrogen Dioxide (NO_2) National Ambient Air Quality Standards. *http://www3.epa.gov/airquality/nitrogenoxides/designations/pdfs/20120120FS.pdf.*

[777] U.S. Environmental Protection Agency (2013). Revision to Ambient Nitrogen Dioxide Monitoring Requirements. March 7, 2013. *http://www3.epa.gov/airquality/nitrogenoxides/pdfs/20130307fr.pdf.*

[778] *Sierra Club* v. *McCarthy,* No. 3–13–cv–3953 (SI) (N.D. Cal. Mar. 2, 2015).

areas in the country in up to three additional rounds: The first round by July 2, 2016, the second round by December 31, 2017, and the final round by December 31, 2020.

(e) Carbon Monoxide

There are two primary NAAQS for CO: An 8-hour standard (9 ppm) and a 1-hour standard (35 ppm). The primary NAAQS for CO were retained in August 2011. There are currently no CO nonattainment areas; as of September 27, 2010, all CO nonattainment areas have been redesignated to attainment.

The past designations were based on the existing community-wide monitoring network. EPA is making changes to the ambient air monitoring requirements for CO. The new requirements are expected to result in approximately 52 CO monitors operating near roads within 52 urban areas by January 2015 (76 FR 54294, August 31, 2011).

(f) Diesel Exhaust PM

Because DPM is part of overall ambient PM and cannot be easily distinguished from overall PM, we do not have direct measurements of DPM in the ambient air. DPM concentrations are estimated using ambient air quality modeling based on DPM emission inventories. DPM emission inventories are computed as the exhaust PM emissions from mobile sources combusting diesel or residual oil fuel. DPM concentrations were recently estimated as part of the 2011 NATA.[779] Areas with high concentrations are clustered in the Northeast, Great Lake States, California, and the Gulf Coast States and are also distributed throughout the rest of the U.S. The median DPM concentration calculated nationwide is 0.76 $\mu g/m^3$. Half of the DPM can be attributed to heavy-duty diesel vehicles.

(g) Air Toxics

The most recent available data indicate that the majority of Americans continue to be exposed to ambient concentrations of air toxics at levels which have the potential to cause adverse health effects. The levels of air toxics to which people are exposed vary depending on where people live and work and the kinds of activities in which they engage, as discussed in detail in EPA's most recent Mobile Source Air Toxics Rule.[780] According to the National Air Toxic Assessment (NATA) for 2011, mobile sources were responsible for 50 percent of outdoor anthropogenic toxic emissions and were the largest contributor to cancer and noncancer risk from directly emitted pollutants.[781] [782] Mobile sources are also large contributors to precursor emissions which react to form air toxics. Formaldehyde is the largest contributor to cancer risk of all 71 pollutants quantitatively assessed in the 2011 NATA. Mobile sources were responsible for more than 25 percent of primary anthropogenic emissions of this pollutant in 2011 and are major contributors to formaldehyde precursor emissions. Benzene is also a large contributor to cancer risk, and mobile sources account for almost 80 percent of ambient exposure. Over the years, EPA has implemented a number of mobile source and fuel controls which have resulted in VOC reductions, which also reduced formaldehyde, benzene and other air toxic emissions.

(2) Impacts of the Rule on Projected Air Quality

Along with reducing GHGs, the Phase 2 standards also have an impact on non-GHG, criteria and air toxic pollutant, emissions. As shown above in Section VIII.C, the standards will impact exhaust emissions of these pollutants from vehicles and will also impact emissions that occur during the refining and distribution of fuel (upstream sources). Reductions in emissions of NO_X, VOC, $PM_{2.5}$ and air toxics expected as a result of the Phase 2 standards will lead to improvements in air quality, specifically decreases in ambient concentrations of $PM_{2.5}$, ozone, NO_2 and air toxics, as well as better visibility and reduced deposition.

Emissions and air quality modeling decisions are made early in the analytical process because of the time and resources associated with full-scale photochemical air quality modeling. As a result, the inventories used in the air quality modeling and the benefits modeling are different from the final emissions inventories presented in Section VIII.C. The air quality inventories and the final inventories are consistent in many ways, but there are some important differences. For example, in this final rulemaking, EPA is adopting Phase 1 and Phase 2 requirements to control $PM_{2.5}$ emissions from APUs installed in new tractors, so we do not expect increases in downstream $PM_{2.5}$ emissions from the Phase 2 program; however, the air quality inventories do not reflect these requirements and therefore show increases in downstream $PM_{2.5}$ emissions. Chapter 5 of the RIA has more detail on the differences between the air quality and final inventories. The results of our air quality modeling of the criteria pollutant and air toxics impacts of the Phase 2 standards are summarized in the RIA and presented in more detail in Appendix 6A to the RIA.

IX. Economic and Other Impacts

This section presents the costs, benefits and other economic impacts of the Phase 2 standards. It is important to note that NHTSA's fuel consumption standards and EPA's GHG standards will both be in effect, and each will lead to average fuel efficiency increases and GHG emission reductions.

The net benefits of the Phase 2 standards consist of the effects of the program on:

- vehicle program costs (costs of complying with the vehicle CO_2 and fuel consumption standards)
- changes in fuel expenditures associated with reduced fuel use resulting from more efficient vehicles and increased fuel use associated with the ''rebound'' effect, both of which result from the program
- economic value of reductions in GHGs
- economic value of reductions in non-GHG pollutants
- costs associated with increases in noise, congestion, and crashes resulting from increased vehicle use
- savings in drivers' time from less frequent refueling
- benefits of increased vehicle use associated with the ''rebound'' effect
- economic value of improvements in U.S. energy security

The benefits and costs of these rules are analyzed using 3 percent and 7 percent discount rates, consistent with current OMB guidance.[783] These rates

[779] U.S. EPA (2015) 2011 National-Scale Air Toxics Assessment. *https://www3.epa.gov/national-air-toxics-assessment/2011-nata-assessment-results#emissions*.

[780] U.S. Environmental Protection Agency (2007). Control of Hazardous Air Pollutants from Mobile Sources; Final Rule. 72 FR 8434, February 26, 2007.

[781] U.S. EPA. (2015) 2011 NATA: Assessment Results. *https://www3.epa.gov/national-air-toxics-assessment/2011-nata-assessment-results*.

[782] NATA also includes estimates of risk attributable to background concentrations, which includes contributions from long-range transport, persistent air toxics, and natural sources; as well as secondary concentrations, where toxics are formed via secondary formation. Mobile sources substantially contribute to long-range transport and secondarily formed air toxics.

[783] The range of Social Cost of Carbon ($SC–CO_2$) values uses several discount rates because the literature shows that the $SC–CO_2$ is quite sensitive to assumptions about the discount rate, and because no consensus exists on the appropriate rate to use in an intergenerational context (where costs and benefits are incurred by different generations). Refer to Section IX.F.1 for more information.

TABLE IX–16—ANNUAL UPSTREAM AND DOWNSTREAM HFC-134a BENEFITS FOR THE GIVEN SC-CO_2 VALUE USING METHOD B AND RELATIVE TO THE FLAT BASELINE, USING THE GWP APPROACH [a b]

[Millions of 2013$] [b]

Calendar year	HFC-134a			
	5% Average	3% Average	2.5% Average	3%, 95th Percentile
2018	$0	$0	$0	$0
2019	$0	$0	$0	$0
2020	$0	$0	$0	$0
2021	$0	$1	$1	$3
2022	$1	$2	$3	$5
2023	$1	$3	$4	$8
2024	$1	$4	$5	$11
2025	$1	$5	$7	$14
2026	$2	$6	$9	$18
2027	$2	$7	$10	$21
2028	$3	$8	$12	$25
2029	$3	$10	$14	$29
2030	$4	$11	$16	$33
2035	$5	$15	$22	$47
2040	$6	$18	$25	$54
2050	$9	$23	$31	$70
NPV	$44	$200	$320	$620

Notes:
[a] The SC-CO_2 values are dollar-year and emissions-year specific.
[b] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

(c) Additional Non-CO_2 GHGs Co-Benefits

In determining the relative social costs of the different gases, the Marten et al. (2014) analysis accounts for differences in lifetime and radiative efficiency between the non-CO_2 GHGs and CO_2. The analysis also accounts for radiative forcing resulting from methane's effects on tropospheric ozone and stratospheric water vapor, and for at least some of the fertilization effects of elevated carbon dioxide concentrations. However, there exist several other differences between these gases that have not yet been captured in this analysis, for example the non-radiative effects of methane-driven elevated tropospheric ozone levels on human health, agriculture, and ecosystems, and the effects of carbon dioxide on ocean acidification. Inclusion of these additional non-radiative effects would potentially change both the absolute and relative value of the various gases.

Of these effects, the human health effect of elevated tropospheric ozone levels resulting from methane emissions is the closest to being monetized in a way that would be comparable to the SCC. Premature ozone-related cardiopulmonary deaths resulting from global increases in tropospheric ozone concentrations produced by the methane oxidation process have been the focus of a number of studies over the past decade (*e.g.,* West et al. 2006; [843] Anenberg et al. 2012; [844] Shindell et al. 2012 [845]). Recently, a paper was published in the peer-reviewed scientific literature that presented a range of estimates of the monetized ozone-related mortality benefits of reducing methane emissions (Sarofim et al. 2015). For example, under their base case assumptions using a 3 percent discount rate, Sarofim et al. find global ozone-related mortality benefits of methane emissions reductions to be $790 per ton of methane in 2020, with 10.6 percent, or $80, of this amount resulting from mortality reductions in the United States. The methodology used in this study is consistent in some (but not all) aspects with the modeling underlying the SC-CO_2 and SC-CH_4 estimates discussed above, and required a number of additional assumptions such as baseline mortality rates and mortality response to ozone concentrations. While the EPA does consider the methane impacts on ozone to be important, there remain unresolved questions regarding several methodological choices involved in applying the Sarofim et al. (2015) approach in the context of an EPA benefits analysis, and therefore the EPA is not including a quantitative analysis of this effect in this rule at this time.

H. Monetized Non-GHG Health Impacts

This section discusses the economic benefits from reductions in health and environmental impacts resulting from non-GHG emission reductions that can be expected to occur as a result of the Phase 2 standards. CO_2 emissions are predominantly the byproduct of fossil fuel combustion processes that also produce criteria and hazardous air pollutant emissions. The vehicles that are subject to the Phase 2 standards are also significant sources of mobile source air pollution such as direct PM, NO_X, VOCs and air toxics. The standards will affect exhaust emissions of these pollutants from vehicles and will also affect emissions from upstream sources that occur during the refining and distribution of fuel. Changes in ambient concentrations of ozone, $PM_{2.5}$, and air toxics that will result from the Phase 2 standards are expected to affect human health by reducing premature deaths and other serious human health effects, as well as other important improvements in public health and

[843] West JJ, Fiore AM, Horowitz LW, Mauzerall DL (2006) Global health benefits of mitigating ozone pollution with methane emission controls. Proc Natl Acad Sci USA 103 (11):3988–3993. doi:10.1073/pnas.0600201103

[844] Anenberg SC, Schwartz J, Shindell D, Amann M, Faluvegi G, Klimont Z, . . . , Vignati E (2012) Global air quality and health co-benefits of mitigating near-term climate change through methane and black carbon emission controls. Environ Health Perspect 120 (6):831. doi:10.1289/ehp.1104301.

[845] Shindell D, Kuylenstierna JCI, Vignati E, van Dingenen R, Amann M, Klimont Z, . . ., Fowler D (2012) Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security. Science 335 (6065):183–189. doi:10.1126/science.1210026.

welfare. Children especially benefit from reduced exposures to criteria and toxic pollutants, because they tend to be more sensitive to the effects of these respiratory pollutants. Ozone and particulate matter have been associated with increased incidence of asthma and other respiratory effects in children, and particulate matter has been associated with a decrease in lung maturation. Some minority groups and children living under the poverty line are even more vulnerable with higher prevalence of asthma.

It is important to quantify the health and environmental impacts associated with the standards because a failure to adequately consider ancillary impacts could lead to an incorrect assessment of their costs and benefits. Moreover, the health and other impacts of exposure to criteria air pollutants and airborne toxics tend to occur in the near term, while most effects from reduced climate change are likely to occur only over a time frame of several decades or longer.

Impacts such as emissions reductions, costs and benefits are presented in this analysis from two perspectives:

• A ''model year lifetime analysis'' (MY), which shows impacts of the program that occur over the lifetime of the vehicles produced during the model years subject to the Phase 2 standards (MYs 2018 through 2029).,

• A ''calendar year analysis'' (CY), which shows annual costs and benefits of the Phase 2 standards for each year from 2018 through 2050. We assume the standard in the last model year subject to the standards applies to all subsequent MY fleets developed in the future.

In previous light-duty and heavy-duty GHG rulemakings, EPA has quantified and monetized non-GHG health impacts using two different methods. For the MY analysis, EPA applies PM-related ''benefits per-ton'' values to the stream of lifetime estimated emission reductions as a reduced-form approach to estimating the $PM_{2.5}$-related benefits of the rule.[846] [847] For the CY analysis, EPA typically conducts full-scale photochemical air quality modeling to quantify and monetize the $PM_{2.5}$- and ozone-related health impacts of a single representative future year. EPA then assumes these benefits are repeated in subsequent future years when criteria pollutant emission reductions are equal to or greater than those modeled in the representative future year.

This two-pronged approach to estimating non-GHG impacts is precipitated by the length of time needed to prepare the necessary emissions inventories and the processing time associated with full-scale photochemical air quality modeling for a *single* representative future year. The timing requirements (along with other resource limitations) preclude EPA from being able to do the more detailed photochemical modeling for every year that we include in our benefit and cost estimates, and require EPA to make air quality modeling input decisions early in the analytical process. As a result, it was necessary to use emissions from the proposed program to conduct the air quality modeling.

The chief limitation when using air quality inventories based on emissions from the proposal in the CY modeling analysis is that they can diverge from the estimated emissions of the final rulemaking. How much the emissions might diverge and how that difference would impact the air quality modeling and health benefit results is difficult to anticipate. For the FRM, EPA concluded that when comparing the proposal and final rule inventories, the differences were enough to justify the move of the typical CY benefits analysis (based on air quality modeling) from the primary estimate of costs and benefits to a supplemental analysis in an appendix to the RIA (See RIA Appendix 8.A).[848] While we believe this supplemental analysis is still illustrative of the standard's potential benefits, EPA has instead chosen to characterize the CY benefits in a manner consistent with the MY lifetime analysis. That is, we apply the PM-related ''benefits per-ton'' values to the CY final rule emission reductions to estimate the PM-related benefits of the final rule.

This section presents the benefits-per-ton values used to monetize the benefits from reducing population exposure to PM associated with the standards. EPA bases its analyses on peer-reviewed studies of air quality and health and welfare effects and peer-reviewed studies of the monetary values of public health and welfare improvements, and is generally consistent with benefits analyses performed for the analysis of the final Tier 3 Vehicle Rule,[849] the final 2012 p.m. NAAQS Revision,[850] and the final 2017–2025 Light Duty Vehicle GHG Rule.[851]

EPA is also requiring that rebuilt engines installed in new incomplete vehicles (*i.e.,* ''glider kit'' vehicles) meet the emission standards applicable in the year of assembly of the new vehicle, including all applicable standards for criteria pollutants (Section XIII.B). For the final rule, EPA has updated its analysis of the environmental impacts of these glider kit vehicles (see Section XIII.B.1). These standards will decrease PM and NO_X emissions dramatically, leading to substantial public health-related benefits. Although we only present these benefits as a sensitivity analysis in Section XIII.B, it is clear that removing even a fraction of glider kit vehicles from the road will yield substantial health-related benefits that are not captured by the primary estimate of monetized non-GHG health impacts described in this section.

(1) Economic Value of Reductions in Particulate Matter

As described in Section VIII, the standards will reduce emissions of several criteria and toxic pollutants and their precursors. In this analysis, EPA only estimates the economic value of the human health benefits associated with the resulting reductions in $PM_{2.5}$ exposure. Due to analytical limitations with the benefit per ton method, this analysis does not estimate benefits resulting from reductions in population exposure to other criteria pollutants such as ozone.[852] Furthermore, the

[846] Fann, N., Baker, K.R., and Fulcher, C.M. (2012). *Characterizing the PM $_{2.5}$-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S.*, Environment International, 49, 241–151, published online September 28, 2012.

[847] See also: *http://www3.epa.gov/airquality/benmap/sabpt.html*. The current values available on the Web page have been updated since the publication of the Fann et al., 2012 paper. For more information regarding the updated values, see: *http://www3.epa.gov/airquality/benmap/models/Source_Apportionment_BPT_TSD_1_31_13.pdf* (accessed September 9, 2014).

[848] Chapter 5 of the RIA has more detail on the differences between the air quality and final inventories.

[849] U.S. Environmental Protection Agency. (2014). *Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards Final Rule: Regulatory Impact Analysis,* Assessment and Standards Division, Office of Transportation and Air Quality, EPA–420–R–14–005, March 2014. Available on the internet: *http://www3.epa.gov/otaq/documents/tier3/420r14005.pdf*.

[850] U.S. Environmental Protection Agency. (2012). *Regulatory Impact Analysis for the Final Revisions to the National Ambient Air Quality Standards for Particulate Matter,* Health and Environmental Impacts Division, Office of Air Quality Planning and Standards, EPA–452–R–12–005, December 2012. Available on the internet: *http://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf*.

[851] U.S. Environmental Protection Agency (U.S. EPA). (2012). *Regulatory Impact Analysis: Final Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards,* Assessment and Standards Division, Office of Transportation and Air Quality, EPA–420–R–12–016, August 2012. Available on the Internet at: *http://www3.epa.gov/otaq/climate/documents/420r12016.pdf*.

[852] The air quality modeling that underlies the PM-related benefit per ton values also produced estimates of ozone levels attributable to each sector. However, the complex non-linear chemistry governing ozone formation prevented EPA from developing a complementary array of ozone benefit

Continued

benefits per-ton method, like all air quality impact analyses, does not monetize all of the potential health and welfare effects associated with reduced concentrations of $PM_{2.5}$.

This analysis uses estimates of the benefits from reducing the incidence of the specific $PM_{2.5}$-related health impacts described below. These estimates, which are expressed per ton of $PM_{2.5}$-related emissions eliminated by the final program, represent the monetized value of human health benefits (including reductions in both premature mortality and premature morbidity) from reducing each ton of directly emitted $PM_{2.5}$ or its precursors (SO_2 and NO_X), from a specified source. Ideally, the human health benefits would be estimated based on changes in ambient $PM_{2.5}$ as determined by full-scale air quality modeling. However, the length of time needed to prepare the necessary emissions inventories, in addition to the processing time associated with the modeling itself, has precluded us from performing air quality modeling that reflects the emissions and air quality impacts associated with the final program.

EPA received comment regarding the omission of ozone-related benefits from the non-GHG benefits analysis included in the proposal. EPA agrees that total benefits are underestimated when ozone-related benefits are not included in the primary analysis. However, for reasons described in the introduction to this section, PM- and ozone-related health benefits based on air quality modeling for the CY analysis are not included in the primary estimate of costs and benefits. Instead, they can be found as a supplemental analysis to the RIA in Appendix 8A.

The PM-related dollar-per-ton benefit estimates used in this analysis are provided in Table IX–17. As the table indicates, these values differ among pollutants, and also depend on their original source, because emissions from different sources can result in different degrees of population exposure and resulting health impacts. In the summary of costs and benefits, Section IX.K of this Preamble, EPA presents the monetized value of PM-related improvements associated with the final program.

TABLE IX–17—PM-RELATED BENEFITS-PER-TON VALUES

[Thousands, 2013$] [a]

Year [c]	On-road mobile sources			Upstream sources [d]		
	Direct $PM_{2.5}$	SO_2	NO_X	Direct $PM_{2.5}$	SO_2	NO_X
Estimated Using a 3 Percent Discount Rate [b]						
2016	$380–$870	$20–$46	$7.8–$18	$330–$760	$71–$160	$6.9–$16
2020	410–920	22–50	8.2–18	350–800	76–170	7.5–17
2025	450–1,000	25–56	9.0–20	400–890	84–190	8.2–18
2030	490–1,100	28–62	9.7–22	430–960	92–200	8.9–20
Estimated Using a 7 Percent Discount Rate [b]						
2016	$340–$780	$18–$42	$7.1–$16	$300–$680	$64–$140	$6.3–$14
2020	370–830	20–45	7.5–17	320–730	68–150	6.7–15
2025	410–920	22–50	8.1–18	350–800	76–170	7.4–17
2030	440–990	25–56	8.8–20	380–870	82–180	8.0–18

Notes:

[a] The benefit-per-ton estimates presented in this table are based on a range of premature mortality estimates derived from the ACS study (Krewski et al., 2009) and the Six-Cities study (Lepeule et al., 2012). See Chapter VIII of the RIA for a description of these studies.

[b] The benefit-per-ton estimates presented in this table assume either a 3 percent or 7 percent discount rate in the valuation of premature mortality to account for a twenty-year segmented premature mortality cessation lag.

[c] Benefit-per-ton values were estimated for the years 2016, 2020, 2025 and 2030. We hold values constant for intervening years (*e.g.,* the 2016 values are assumed to apply to years 2017–2019; 2020 values for years 2021–2024; 2030 values for years 2031 and beyond).

[d] We assume for the purpose of this analysis that total "upstream emissions" are most appropriately monetized using the refinery sector benefit per-ton values. The majority of upstream emission reductions associated with the final rule are related to domestic onsite refinery emissions and domestic crude production. While total upstream emissions also include storage and transport sources, as well as sources upstream from the refinery, we have chosen to simply apply the refinery values.

The benefit-per-ton technique has been used in previous analyses, including EPA's 2017–2025 Light-Duty Vehicle Greenhouse Gas Rule,[853] the Reciprocating Internal Combustion Engine rules,[854] [855] and the Residential Wood Heaters NSPS.[856] Table IX–18 shows the quantified $PM_{2.5}$-related cobenefits captured in those benefit per-ton estimates, as well as unquantified effects the benefit per-ton estimates are unable to capture.

per ton values. This limitation notwithstanding, we anticipate that the ozone-related benefits associated with reducing emissions of NO_X and VOC are substantial. Refer to RIA Appendix 8.A for the ozone benefits results from the supplemental CY benefits analysis.

[853] U.S. Environmental Protection Agency (U.S. EPA). (2012). *Regulatory Impact Analysis: Final Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards,* Assessment and Standards Division, Office of Transportation and Air Quality, EPA–420–R–12–016, August 2012. Available on the Internet at: *http://www3.epa.gov/otaq/climate/documents/420r12016.pdf.*

[854] U.S. Environmental Protection Agency (U.S. EPA). (2013). *Regulatory Impact Analysis for the Reconsideration of the Existing Stationary Compression Ignition (CI) Engines NESHAP,* Office of Air Quality Planning and Standards, Research Triangle Park, NC. January. EPA–452/R–13–001. Available at *http://www3.epa.gov/ttnecas1/regdata/RIAs/RICE_NESHAPreconsideration_Compression_Ignition_Engines_RIA_final2013_EPA.pdf.*

[855] U.S. Environmental Protection Agency (U.S. EPA). (2013). *Regulatory Impact Analysis for Reconsideration of Existing Stationary Spark Ignition (SI) RICE NESHAP,* Office of Air Quality Planning and Standards, Research Triangle Park, NC. January. EPA–452/R–13–002. Available at *http://www3.epa.gov/ttnecas1/regdata/RIAs/NESHAP_RICE_Spark_Ignition_RIA_finalreconsideration2013_EPA.pdf.*

[856] U.S. Environmental Protection Agency (U.S. EPA). (2015). *Regulatory Impact Analysis for Residential Wood Heaters NSPS Revision.* Office of Air Quality Planning and Standards, Research Triangle Park, NC. February. EPA–452/R–15–001. Available at *http://www2.epa.gov/sites/production/files/2015-02/documents/20150204-residential-wood-heaters-ria.pdf.*

TABLE IX–18—HUMAN HEALTH AND WELFARE EFFECTS OF $PM_{2.5}$

Pollutant/ effect	Quantified and monetized in primary estimates	Unquantified effects changes in:
$PM_{2.5}$	Adult premature mortality	Chronic and subchronic bronchitis cases.
	Acute bronchitis	Strokes and cerebrovascular disease.
	Hospital Admissions: Respiratory and cardiovascular	Low birth weight.
	Emergency room visits for asthma	Pulmonary function.
	Nonfatal heart attacks (myocardial infarction)	Chronic respiratory diseases other than chronic bronchitis.
	Lower and upper respiratory illness	Non-asthma respiratory emergency room visits.
	Minor restricted-activity days	Visibility.
	Work loss days	Household soiling.
	Asthma exacerbations (asthmatic population).	
	Infant mortality.	

A more detailed description of the benefit-per-ton estimates is provided in Chapter 8 of the RIA that accompanies this rulemaking. Readers interested in reviewing the complete methodology for creating the benefit-per-ton estimates used in this analysis can consult EPA's ''Technical Support Document: Estimating the Benefit per Ton of Reducing $PM_{2.5}$ Precursors from 17 Sectors.'' [857] Readers can also refer to Fann et al. (2012) [858] for a detailed description of the benefit-per-ton methodology.

As Table IX–17 indicates, EPA projects that the per-ton values for reducing emissions of non-GHG pollutants from both vehicle use and upstream sources such as fuel refineries will increase over time.[859] These projected increases reflect rising income levels, which increase affected individuals' willingness to pay for reduced exposure to health threats from air pollution.[860] They also reflect future population growth and increased life expectancy, which expands the size of the population exposed to air pollution in both urban and rural areas, especially among older age groups with the highest mortality risk.[861]

(2) Unquantified Health and Environmental Impacts

One commenter supported the inclusion of all quantifiable impacts of reductions in non-GHG pollutants. Specifically, they suggested the inclusion of ecosystem benefits from reduced non-GHG pollutants including those to crops as well as consideration of the impacts on toxic air contaminants such as diesel PM.

In addition to the PM-related co-pollutant health impacts EPA quantifies in this analysis, EPA acknowledges that there are a number of other health and human welfare endpoints that we are not able to quantify or monetize because of current limitations in the methods or available data. These impacts are associated with emissions of air toxics (including benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, naphthalene and ethanol), ambient ozone, and ambient $PM_{2.5}$ exposures. Chapter 8 of the RIA lists these unquantified health and environmental impacts. While there will be impacts associated with air toxic pollutant emission changes that result from the final standard, EPA will not attempt to monetize those impacts. This is primarily because currently available tools and methods to assess air toxics risk from mobile sources at the national scale are not adequate for extrapolation to incidence estimations or benefits assessment. The best suite of tools and methods currently available for assessment at the national scale are those used in the National-Scale Air Toxics Assessment (NATA). EPA's Science Advisory Board specifically commented in their review of the 1996 NATA that these tools were not yet ready for use in a national-scale benefits analysis, because they did not consider the full distribution of exposure and risk, or address sub-chronic health effects.[862] While EPA has since improved the tools, there remain critical limitations for estimating incidence and assessing benefits of reducing mobile source air toxics.[863] EPA continues to work to address these limitations; however, EPA does not have the methods and tools available for national-scale application in time for the analysis of the final rules.[864]

I. Energy Security Impacts

The Phase 2 standards are designed to require improvements in the fuel efficiency of medium- and heavy-duty vehicles and, thereby, reduce fuel consumption and GHG emissions. In turn, the Phase 2 standards help to reduce U.S. petroleum imports. A reduction of U.S. petroleum imports reduces both financial and strategic risks caused by potential sudden disruptions in the supply of imported petroleum to the U.S., thus increasing

[857] For more information regarding the updated values, see: *http://www3.epa.gov/airquality/benmap/models/Source_Apportionment_BPT_TSD_1_31_13.pdf* (accessed September 9, 2014).

[858] Fann, N., Baker, K.R., and Fulcher, C.M. (2012). *Characterizing the $PM_{2.5}$-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S.,* Environment International, 49, 241–151, published online September 28, 2012.

[859] As we discuss in the emissions chapter of the RIA (Chapter V), the rule will yield emission reductions from upstream refining and fuel distribution due to decreased petroleum consumption.

[860] The issue is discussed in more detail in the 2012 p.m. NAAQS RIA. See U.S. Environmental Protection Agency. (2012). *Regulatory Impact Analysis for the Final Revisions to the National Ambient Air Quality Standards for Particulate Matter,* Health and Environmental Impacts Division, Office of Air Quality Planning and Standards, EPA–452–R–12–005, December 2012. Available on the internet: *http://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf.*

[861] For more information about EPA's population projections, please refer to the following: *http://www3.epa.gov/air/benmap/models/BenMAPManualAppendicesAugust2010.pdf* (See Appendix K).

[862] Science Advisory Board. 2001. NATA—Evaluating the National-Scale Air Toxics Assessment for 1996—an SAB Advisory. *http://www3.epa.gov/ttn/atw/sab/sabrev.html.*

[863] Examples include gaps in toxicological data, uncertainties in extrapolating results from high-dose animal experiments to estimate human effects at lower does, limited ambient and personal exposure monitoring data, and insufficient economic research to support valuation of the health impacts often associated with exposure to individual air toxics. See Gwinn et al., 2011. Meeting Report: Estimating the Benefits of Reducing Hazardous Air Pollutants—Summary of 2009 Workshop and Future Considerations. Environ Health Perspectives, Jan 2011; 119(1): 125–130.

[864] In April, 2009, EPA hosted a workshop on estimating the benefits of reducing hazardous air pollutants. This workshop built upon the work accomplished in the June 2000 in an earlier (2000) Science Advisory Board/EPA Workshop on the Benefits of Reductions in Exposure to Hazardous Air Pollutants, which generated thoughtful discussion on approaches to estimating human health benefits from reductions in air toxics exposure, but no consensus was reached on methods that could be implemented in the near term for a broad selection of air toxics. Please visit *http://epa.gov/air/toxicair/2009workshop.html* for more information about the workshop and its associated materials.

critical systems or systems affecting safety-critical functions, or technologies designed for the purpose of reducing the frequency of vehicle crashes. NHTSA prohibited credits for these technologies under any circumstances in its CAFE program (see 77 FR 62730). NHTSA believes a similar strategy is warranted for heavy-duty vehicle as well.

(4) Credit Acquisition Plan Requirements

The National Program was designed to provide manufacturers with averaging, banking and trading (ABT) flexibilities for meeting the GHG and fuel efficiency standards to optimize the effectiveness of the program. As a part of these flexibilities, manufacturers generating a shortfall in fuel consumption credits for a given model year must submit a credit plan to NHTSA describing how it plans to resolve its deficits within 3 models year. To assist manufacturers, NHTSA is modify 49 CFR 535.9(a)(6) of its regulation to clarify and provide guidance to manufacturers on the requirements for a credit allocation plan which contains provisions to acquire credits from another manufacturer which will be earned in future model years.

The current regulations do not specify if future credit acquisition is permitted or not and the revision is intended to clarity that it is, with respect to the limitation a credit shortfall can only be carried forward three years. Providing this clarification is intended to increase transparency within the program and ensure all manufacturers are aware of its available flexibilities. NHTSA is adopting the requirement that in order for a credit allocation plan to be approved, NHTSA will require an agreement signed by both manufacturers. This requirement will assist NHTSA with its determination that the credits will become available to the acquiring manufacturer when they are earned.

(5) New Vehicle Field Inspections and Recordkeeping Requirements

Previously, NHTSA decided not to include recordkeeping provisions in its regulations for the Phase 1 program. EPA regulations include recordkeeping requirements in 40 CFR 1036.250, 1036.735, 1036.825, 1037.250, 1037.735, and 1037.825. For the Phase 2 program, NHTSA is adding recordkeeping provisions to facilitate its compliance validation program for the final rule. For the Phase 1 and 2 programs, manufacturers test and conduct modeling to determine GHG emissions and fuel consumption performance, and EPA and NHTSA perform validation testing. EPA uses the results of the validation tests to create a finalized report that confirms the manufacturer's final model year GHG emissions and fuel consumption results. Each agency will use this report to enforce compliance with its standards.

NHTSA assesses compliance with fuel consumption standards each year, based upon EPA final verified data submitted to NHTSA for its heavy-duty vehicle fuel efficiency program established pursuant to 49 U.S.C. 32902(k). NHTSA may conduct verification testing throughout a given model year in order to validate data received from manufacturers and will discuss any potential issues with EPA and the manufacturer. See 49 CFR 535.9. After the end of the model year, NHTSA may also decide to conduct field inspections in order to confirm whether or not a new vehicle was manufactured as originally certified. NHTSA may conduct field inspections separately or in coordination with EPA. To facilitate inspections, the agencies will add additional provisions to the EPA recordkeeping provisions to require manufacturers to keep build documents for each manufactured tractor or vocational vehicle. Each build document will be required to contain specific information on the design, manufacturing, equipment and certified components for a vehicle. NHTSA will request build documents through EPA and the agencies will collaborate on the finding of all field inspections. Manufacturers will be required to keep records of build documents for a period of 8 calendar years.

XIII. Other Regulatory Provisions

In addition to the new GHG standards in these rules, EPA and NHTSA are amending various aspects of the regulations as part of the HD GHG Phase 1 standards for heavy-duty highway engines and vehicles, as described in Section XII. EPA is also taking the opportunity to amend regulatory provisions for other requirements that apply for heavy-duty highway engines, and for certain types of nonroad engines and equipment.

Most of the amendments described in this section represent minor technical issues and, as such, were not the subject of extensive comment. Two exceptions are the issues related to glider kits and to competition vehicles, as noted below. The rest of this section, for which we received fewer comments, generally includes only references to the more significant comments, such as comments that impacted our conclusions for the provisions adopted in the final rule. See the RTC for a more complete discussion of the comments.

For the convenience of the reader, we are republishing some related text that is not being amended. We note, however, that we have not reopened the standards or other fundamental aspects of these programs that remain unchanged substantively.

A. Amendments Related to Heavy-Duty Highway Engines and Vehicles

This section describes a range of regulatory amendments for heavy-duty highway engines and vehicles that are not directly related to GHG emission standards. Note that Section XIII. B. describes new requirements for glider kits and Section XIII. F. describes additional changes related to test procedures that affect heavy-duty highway engines.

(1) Alternate Emission Standards for Specialty Heavy-Duty Vehicles

Motor vehicles conventionally comprise a familiar set of vehicles within a relatively narrow set of parameters—motorcycles, cars, light trucks, heavy trucks, buses, etc. The definition of ''motor vehicle;'' however, is written broadly to include a very wide range of vehicles. Almost any vehicle that can be safely operated on streets and highways is considered a motor vehicle under 40 CFR 85.1703. Development of EPA's emission control programs is generally focused on a consideration of the technology, characteristics, and operating parameters of conventional vehicles, and typically includes efforts to address concerns for special cases. For example, the driving schedule for light-duty vehicles includes a variation for vehicles that are not capable of reaching the maximum speeds specified in the Federal Test Procedure.

Industry innovation in some cases leads to some configurations that make it particularly challenging to meet regulatory requirements. We are aware that plug-in hybrid-electric heavy-duty vehicles are an example of this. An engine for such a vehicle is expected to have a much lower power rating and duty cycle of engine speeds and loads than a conventional heavy-duty engine. The costs of regulatory compliance and the mismatch to the specified duty cycle can make it cost-prohibitive for engine manufacturers to certify such an engine under the heavy-duty highway engine program.

To address concerns about certifying atypical engines to highway heavy-duty standards for use in hybrid vehicles, we are therefore adopting a provision allowing manufacturers of heavy-duty highway vehicles the option to install limited numbers of engines certified to alternate standards. Qualifying engines would be considered motor vehicle engines, but they may be certified to standards that are based on standards adopted for comparable nonroad engines. EPA's nonroad emission standards have reached a point that involves near parity with the level of emission control represented by the emission standards for heavy-duty highway engines. EPA developed these provisions especially for vehicles with hybrid powertrains; however, the same principles apply for three other unusual vehicles types: amphibious vehicles, vehicles with maximum speed at or below 45 miles per hour, and as described below, certain all-terrain vehicles. We are therefore applying the same provisions to these additional vehicles.

California ARB suggested that we limit relief to hybrid vehicles that have a series configuration, or to hybrid vehicles that have a minimum all-electric range. We chose not to adopt these limitations because these features are not fundamental to what we believe is the basis for accommodating special vehicle designs. For example, if a vehicle needs a 20-kW gasoline engine to recharge batteries used for propulsion, and provides a small amount of power directly to the wheels, we believe this should not be disqualified from using the specialty-vehicle provisions because there is no expectation that 20 kW engines will be certified to the conventional highway heavy-duty engine standards anytime in the foreseeable future.

We proposed to offer this flexibility for hybrids, amphibious vehicles, and low-speed vehicles. We also received comment advocating that certain qualifying all-terrain vehicles are in a similar situation since they have unique engine-performance requirements that prevent them from finding compliant highway engines; we have modified the rule to also apply the specialty vehicle provisions to these all-terrain vehicles. The regulations will limit this allowance to vehicles that have portal axles, which are specialized axles that increase ground clearance. Cost and/or performance limits for such axles preclude their use for vehicles intended for use primarily on highways. Thus, we believe vehicles with such axles are designed primarily for off-road operation, while retaining the ability to occasionally operate on highways.

Under approach being adopted for these various vehicles, compression-ignition engines could be certified to alternate standards that are equivalent to the emission standards under 40 CFR part 1039, and spark-ignition engines could be certified to alternate standards that are equivalent to the Blue Sky emission standards under 40 CFR part 1048.[978] In response to a comment from California ARB, we are adopting a requirement that compression-ignition engines also meet a PM standard (Family Emission Limit) of 0.020 g/kW-hr corresponding to the PM standard that applies for heavy-duty highway engines. Similarly, we are adopting an N_2O standard of 0.1 g/kW-hr for SCR-equipped diesel-fueled engines that corresponds to the N_2O standard that applies for heavy-duty highway engines. This collection of standards aligns with our expectation that such engines would generally be expected to use the same technologies to control emissions as engines certified to the applicable emission standards for heavy-duty highway engines. (The regulation being finalized disallows this approach for compression-ignition engines below 56 kW since the nonroad standards for those engines are substantially less stringent than the standards that apply for heavy-duty highway engines). Also, since the nonroad duty cycles generally better represent the in-use operating characteristics of engines in these specialty vehicles, we expect the nonroad test procedures to be at least as effective in achieving effective in-use emission control. The regulations at 40 CFR part 1048 include a simplified form of diagnostic controls, and we are adopting in these rules a simplified diagnostic control requirement for 40 CFR part 1039. These engine-based diagnostic controls substitute for the diagnostic requirements specified in 40 CFR 86.010–18. Note that the diagnostic requirements apply for *engine* systems or components; as such, we generally apply those diagnostic requirements to hybrid powertrain systems and components only if the engine manufacturer includes those features or parameters as part of the certified configuration for their engines. We may revisit issues related to diagnostic requirements for hybrid systems in a future rulemaking.

These alternate standards relate primarily to the engine certification-based emission standards and certification requirements. All vehicle-based requirements for evaporative emissions continue to apply as specified in the regulation. In addition, hybrid vehicles would still be subject to all the standards and requirements that apply to heavy-duty vehicles under 40 CFR part 1037. For example, manufacturers would need to perform powertrain testing and run GEM to determine the applicable g/ton-mile emission rate for hybrid vehicles. However, the agencies are not requiring vehicle certification for the three other types of specialty vehicles. Low-speed vehicles are already excluded from the vehicle requirements under Phase 1, while the amphibious and all-terrain vehicles would present significant challenges to the vehicle simulations.

This allowance is intended to lower the barrier to introducing innovative technology for motor vehicles. It is not intended to provide a full alternative compliance path to avoid certifying to the emission standards and control requirements for highway engines and vehicles. To accomplish this, EPA will allow a manufacturer to produce no more than 1,000 hybrid vehicles in a single model year under this program, and no more than 200 amphibious vehicles, all-terrain vehicles, or speed-limited vehicles. In the case of hybrid vehicles, we are also acting on California ARB's request that we adopt a sunset provision for hybrid vehicles; accordingly, the simplified certification applies only through model year 2027. In the meantime we will monitor implementation of the program and consider whether there is any long-term need for these or other streamlined certification provisions for hybrid vehicles.

As described in the proposed rule, California ARB is in the process of developing similar provisions for a reduced compliance burden for qualifying highway vehicles toward the goal of incentivizing vehicles with hybrid powertrains and low-NO_X engines. The incentives generally consist of allowing specific OBD variances or deficiencies (for low-NO_X engines) or broadly waiving OBD requirements (for hybrid vehicles). To the extent that California ARB certifies vehicles based on approving OBD deficiencies, we would apply a similar discretion for 49-state certification of the same engine model to allow for nationwide sale of those products. If California ARB approves certification of hybrid systems in which the highway OBD requirements are mostly or entirely waived, we would expect to apply the provisions described in this section to allow vehicle manufacturers to produce up to 1000 such vehicles in a given year.

(2) Chassis Certification of Class 4 Heavy-Duty Vehicles

In the HD Phase 1 rule, the agencies included a provision allowing manufacturers to certify Class 4 and

[978] Blue Sky standards are voluntary low-emission standards under 40 CFR part 1048.

larger heavy-duty vehicles to the chassis-based emission standards in 40 CFR part 86, subpart S. This applied for greenhouse gas emission standards, but not criteria emission standards. EPA revisited this issue in the recent Tier 3 final rule, where we revised the regulation to allow this same flexibility relative to exhaust emission standards for criteria pollutants. However, this change to the regulation conflicted with our response to a comment in that rulemaking that EPA should not change the certification arrangement for criteria pollutants.

EPA requested comment on how best to address this issue in a way that resolves the various and competing concerns. Commenters argued for and against allowing certification of the heavier vehicles to chassis-based emission standards. In the final rule, we are adopting a limited allowance to certify vehicles above 14,000 pounds GVWR using chassis-based certification procedures of 40 CFR part 86, subpart S. In particular, manufacturers may rely on chassis-based certification for heavier vehicles only if there is a family with vehicles at or below 14,000 pounds GVWR that can properly accommodate the bigger vehicles as part of the same family. As part of this arrangement, chassis-certified vehicles above 14,000 pounds GVWR may not rely on a work factor that is greater than the largest work factor that applies for vehicles at or below 14,000 pounds GVWR from the same family.

(3) Nonconformance Penalties (NCPs)

The Clean Air Act requires that heavy-duty standards for criteria pollutants such as NO_X reflect the greatest degree of emission reduction achievable through the application of technology that EPA determines will be available. Such ''technology-forcing'' standards create the risk that one or more manufacturers may lag behind in the development of their technology to meet the standard and, thus, be forced out of the marketplace. Recognizing this risk, Congress enacted CAA section 206(g) (42 U.S.C. 7525(g)), which requires EPA to establish ''nonconformance penalties'' to protect these technological laggards by allowing them to pay a penalty for engines that temporarily are unable to meet the applicable emission standard, while removing any competitive advantage those technological laggards may have.

On September 5, 2012, EPA adopted final NCPs for heavy heavy-duty diesel engines, which were available to manufacturers of heavy-duty diesel engines unable to meet the current oxides of nitrogen (NO_X) emission standard. On December 11, 2013, the U.S. Court of Appeals for the District of Columbia Circuit issued an opinion vacating that Final Rule. It issued its mandate for this decision on April 16, 2014, ending the availability of the NCPs for the current NO_X standard, as well as vacating certain amendments to the NCP regulations, due to concerns about inadequate notice. In particular, the amendments revised the text explaining how EPA determines when NCPs should be made available. In the NPRM for this rulemaking, EPA proposed to remove the vacated regulatory text specifying penalties, and re-proposed most of the other vacated amendments. Having now provided this additional notice and a full opportunity for comment, we believe that it is appropriate to finalize the proposed changes. EPA is also adopting the proposed new 40 CFR 86.1103–2016 to replace the existing 40 CFR 86.1103–87.

(a) Vacated Penalties

In EPA's regulations, NCP penalties are calculated from inputs specific to the standards for which NCPs are available. The input values are specified in 40 CFR 86.1105–87. EPA is removing paragraph (j) of this section which specifies the vacated inputs for the 2010 NO_X emission standard. Since all manufacturers are currently complying with these standards, and the court vacated the text in question, it no longer has any purpose.

(b) Re-Proposed Text

The 2012 rule made amendments to four different sections in 40 CFR part 86. The amendments to 40 CFR 86.1104–91 and 86.1113–87 were supported during the rulemaking and were not questioned in the Court's decision. Nevertheless, these revisions were vacated along with the rest of the rule. In the NPRM, EPA re-proposed these changes, even though we had already provided full notice and opportunity for public comment for these changes. Since we are adopting text that is already in the CFR, the final rule consists of leaving these sections of the regulations unchanged.

(i) Upper Limits

The changes to 40 CFR 86.1104–91 affect the upper limit. The upper limit (UL) is the emission level established by regulation above which NCPs are not available. A heavy duty engine cannot use NCPs to be certified for a level above the upper limit. CAA section 206(g)(2) refers to the upper limit as a percentage above the emission standard, set by regulation, that corresponds to an emission level EPA determines to be ''practicable.'' The upper limit is an important aspect of the NCP regulations not only because it establishes an emission level above which no engine may be certified using NCPs, but it is also a critical component of the cost analysis used to develop the penalty rates. The regulations specify that the relevant costs for determining the COC50 and the COC90 factors are the difference between an engine at the upper limit and one that meets the applicable standards (see 40 CFR 86.1113–87).

The regulatory approach adopted under the prior NCP rules set the upper limit at the prior emission standard when a prior emission standard exists and is then changed to become more stringent. EPA concluded that this upper limit should be reasonably achievable by all manufacturers with engines or vehicles in the relevant class. It should be within reach of all manufacturers of HD engines or HD vehicles that are currently allowed so that they can continue to sell their engines and vehicles while finishing their development of fully complying engines. A manufacturer of a previously certified engine or vehicle should not be forced to immediately remove a HD engine or vehicle from the market when an emission standard becomes more stringent. The prior emission standard generally meets these goals because manufactures have already certified their vehicles to that standard.

One of EPA's changes to the regulations in 40 CFR 86.1104–91 clarifies that EPA may set the upper limit at a level below the previous standard if we determine that the lower level is achievable by all engines or vehicles in the relevant subclass. This was the case for the vacated NCP rule. Another change allows us to set the upper limit at a level above the previous standard in unusual circumstances, such as where a new standard for a different pollutant, or other requirement, effectively increases the stringency of the standard for which NCPs would apply. This occurred for heavy heavy-duty engines with the 2004 standards.

(ii) Payment of Penalties

The changes to 40 CFR 86.1113–87 correct EPA organizational units and mail codes to which manufacturers must send information. The previous information is no longer valid.

(c) Criteria for the Availability of NCPs

Since the promulgation of the first NCP rule in 1985, subsequent NCP rules generally have been described as continuing ''phases'' of the initial NCP rule. The first NCP rule (Phase 1), sometimes referred to as the ''generic'' NCP rule, established three basic criteria for determining the eligibility of emission standards for nonconformance penalties in any given model year (50 FR 35374, August 30, 1985). (For regulatory language, see 40 CFR 86.1103–87). The first criterion is that the emission standard in question must become more difficult to meet. This can occur in two ways, either by the emission standard itself becoming more stringent, or due to its interaction with another emission standard that has become more stringent. Second, substantial work must be required in order to meet the emission standard. EPA considers ''substantial work'' to mean the application of technology not previously used in that vehicle or engine class/subclass, or a significant modification of existing technology, in order to bring that vehicle/engine into compliance. EPA does not consider minor modifications or calibration changes to be classified as substantial work. Third, EPA must find that a manufacturer is likely to be noncomplying for technological reasons (referred to in earlier rules as a ''technological laggard''). Prior NCP rules have considered such a technological laggard to be a manufacturer who cannot meet a particular emission standard due to technological (not economic) difficulties and who, in the absence of NCPs, might be forced from the marketplace. During the 2012 rulemaking, some commenters raised issues relating to EPA's interpretation of these criteria:

- The extent to which the criteria are intended to constrain EPA's ability to set NCPs
- The timing for evaluating the criteria
- The meaning of technological laggard

As its primary finding in the 2013 decision, the Court stated that EPA had not provided sufficient notice or opportunity for comment regarding its interpretation of these criteria. To address the Court's notice and comment concern, EPA solicited comments in the Phase 2 NPRM on our proposed revisions to these criteria. Note that we proposed changes that are different from those at issue during the court case.

(i) Constraints on EPA

Several commenters on the 2012 rule argued (implicitly or explicitly) that EPA cannot establish NCPs unless all of the regulatory criteria for NCPs (in 40 CFR 86.1103–87) are met. Some went further to argue that EPA must demonstrate that the criteria are met. However, the actual regulatory text has never stated that EPA may establish NCPs only if all criteria are met, but rather that EPA shall establish NCPs ''provided that EPA finds'' the criteria are met. These criteria were included in the regulations to clarify that manufacturers should not expect EPA to initiate a rulemaking to establish NCPs where these criteria were not met. Moreover, the regulations clearly defer to EPA's judgment for finding that the criteria are met. While EPA must explain the basis of our finding, the regulatory language does not require us to prove or demonstrate that the criteria are met.

This interpretation is consistent with the text of the Clean Air Act, which places no explicit restrictions on when EPA can set NCPs. In fact, it seems to create a presumption that NCPs will be available. The Act actually requires EPA to allow certification of engines that do not meet the standard unless EPA determines the practicable upper limit to be equal to the new emission standard.

To address this confusion, the revised regulatory text explicitly states that where EPA cannot determine if all of the criteria have been met, we may presume that they have. In other words, EPA does not have the burden to prove they have been met. This policy was opposed by Volvo in its comments to this current rulemaking. It stated that EPA findings ''must be subject to public review and scrutiny'' to ''adequately protect complying manufacturers' competitive interests.'' However, EPA sees no basis in the Act to believe that Congress intended EPA to protect complying manufacturers by denying a request for NCPs. Rather, Congress directed EPA to *set the penalty* at a level that would ''remove any competitive disadvantage to manufacturers whose engines or vehicles achieve the required degree of emission reduction.'' [979] Under the changes being adopted here, compliant manufacturers would retain the ability to challenge whether or not EPA had set penalties at a level that protects them.

(ii) Timing for Evaluating Criteria

In order to properly understand the appropriate timing for evaluating each of the NCP criteria, it is necessary to understand the purpose of each. When considered together, these criteria evaluate the likelihood that a manufacturer will be technologically unable to meet a standard on time. However, when EPA initially proposed the NCP criteria, we noted that the first two criteria addressed whether there was a possibility for a technological laggard to develop. When the first criterion (that there be a new standard) is met, it creates the possibility for a technological laggard to exist. When manufacturers must perform substantial work (as required for the second criterion), it is possible that at least one will be unsuccessful and will become a laggard. Thus, when evaluating these first two criteria, the purpose is to determine whether the standard created the possibility for a laggard to exist. The third criterion is different because it asks whether that *possibility* has turned into a *likelihood* that a technological laggard has developed. For example, a standard may become significantly more stringent and substantial effort might be required for compliance, but all manufacturers may be meeting the applicable standard. In that situation, a technological laggard is not likely and penalties would be unnecessary.

In this context, it becomes clear that since the first two of these criteria are intended to address the question of whether a given standard creates the possibility for this to occur, they are evaluated before the third criterion that addresses the likelihood that the possibility will actually happen. In most cases, it is possible to evaluate these criteria at the point a new standard is adopted. This is the value of these criteria, that they can usually be evaluated long before there is enough information to know whether a technological laggard is actually likely. For example, where EPA adopts a new standard that is not technology-forcing, but rather merely an anti-backsliding standard, EPA could determine at the time it is adopted that the second criterion is not met so that manufacturers would know in advance that no NCPs will be made available for that standard.

One question that arose in the 2012 rule involved how to evaluate the second criterion if significant time has passed and some work toward meeting the standard has already been completed. To address this question, the revised text clarifies that this criterion is to be evaluated based on actual work needed to go from meeting the previous standard to meeting the current standard, regardless of the timing of such changes. EPA looks at whether ''substantial work'' is or was required to meet the revised standard at any time after the standard was issued—the important question is whether manufacturers who were using technology that met the previous standard would need to build upon that technology to meet the revised standard.

[979] 42 U.S.C. 7525(g)(3)(E).

Other interpretations would seem to be directly contrary to the purpose of the statute, which is designed to allow technological laggards to be able to certify engines even if other manufacturers have met the standard.

(iii) Technological Laggards

Questions also arose in 2012 about the meaning of the term ''technological laggard.'' While the regulations do not define ''technological laggard,'' EPA has previously interpreted this as meaning a manufacturer who cannot meet the emission standard due to technological difficulties, not merely economic difficulties (67 FR 51464–51465, August 8, 2002). Some have interpreted this to mean that NCPs cannot be made available where a manufacturer tries and fails to meet a standard with one technology but knew that another technology would have allowed them to meet the standard. In other words, that it made a bad business decision. However, EPA's reference to ''economic difficulties'' applies where a technological path exists—at the time EPA is evaluating the third criterion—that would allow the manufacturer to meet the standard on time, but the manufacturer chooses not to use it for economic reasons. The key question is whether or not the technological path exists at the time of the evaluation. To address this confusion, the revised text clarifies that where there is uncertainty about whether a failure to meet the standards is a technological failure, EPA may presume that it was. Note that this does not mean that EPA might declare any failure to meet standards as a technological failure. The change would only apply where it is not clear.

(4) In-Use Testing

EPA and manufacturers have gained substantial experience with in-use testing over the last four or five years. This has led to important insights in ways that the test protocol can be adjusted to be more effective. EPA is accordingly making the following changes to the regulations in 40 CFR part 86, subparts N and T:

• Revise the NTE exclusion based on aftertreatment temperature to associate the exclusion with the specific aftertreatment device that does not meet the temperature criterion. For example, there should be no NO_X exclusion if a diesel oxidation catalyst is below the temperature threshold. EPA is also revising the exclusion to consider accommodation of CO emissions when there is a problem with low temperatures in the exhaust.

• Clarify that exhaust temperatures should be measured continuously to evaluate whether those temperatures stay above the 250 °C threshold.

• Add specifications to describe where to measure temperatures for exhaust systems with multiple aftertreatment devices.

• Include a provision to add 0.00042 g/hp-hr to the PM measurement to account for PM emissions vented to the atmosphere through the crankcase vent.

• Increase the time allowed for submitting quarterly reports from 30 to 45 days after the end of the quarter.

(5) Miscellaneous Amendments to 40 CFR Part 86

As described elsewhere, EPA is making several changes to 40 CFR part 86. This includes primarily the GHG standards for Class 2b and 3 heavy-duty vehicles in subpart S. EPA is also making regulatory changes related to hearing procedures, adjustment factors for infrequent regeneration of aftertreatment devices, and the testing program for heavy-duty in-use vehicles.

EPA is making several minor amendments to 40 CFR part 86, including the following:

• Revise 40 CFR 86.1811–17 to clarify that the Tier 2 SFTP for 4,000 mile testing applies to MDPVs, alternative fueled vehicles, and flexible fueled vehicles when operated on a fuel other than gasoline or diesel fuel, even though these vehicles were not subject to SFTP standards under the Tier 2 program. We described this in the Preamble to the Tier 3 final rule, and we are now making this explicit in the regulations.

• Revise 40 CFR 86.1813–17 to clarify that gaseous-fueled vehicles are not subject to the bleed emission test or standard.

• Revise 40 CFR 86.1823 to extend the default catalyst thermal reactivity coefficient for Tier 2 vehicles to also apply for Tier 3 vehicles. This change was inadvertently omitted from the recent Tier 3 rulemaking. EPA will also be interested in a broader review of the appropriate default value for the catalyst thermal reactivity coefficient in some future rulemaking. EPA will be interested in reviewing any available data related to this issue.

• Establish a minimum maintenance interval of 1500 hours for DEF filters for heavy-duty engines. This reflects the technical capabilities for filter durability and the expected maintenance in the field.

• Add crankcase vent filters to the list of maintenance items for heavy-duty engines. This allows manufacturers to specify a maintenance interval of 50,000 miles, or request a shorter interval under § 86.004–25. We are also revising consolidating regulatory provisions in § 86.004–25 to allow us to remove § 86.007–25; this reorganization does not change any regulatory requirements.

• Remove the idle CO standard from 40 CFR 86.007–11 and 40 CFR 86.008–10. This standard no longer applies, since all engines are now subject to diagnostic requirements instead of the idle CO standard.

• Revise 40 CFR 86.094–14 to consolidate the streamlined certification procedures for small-volume manufacturers. The consolidated section reduces potential confusion by listing only the provisions that do not apply, rather than trying to create (and maintain) a comprehensive list of all the provisions that apply, in addition to the provisions that do not apply. Except for removing obsolete content, the revised regulation does not include substantive changes to the specified procedures.

• Revise 40 CFR 86.1301 to remove obsolete content.

EPA is also adopting several amendments to remove obsolete text, update cross references, and streamline redundant regulatory text. For example, paragraph (f)(3) of Appendix I includes a duty cycle for heavy-duty spark-ignition engines that is no longer specified as part of the certification process.

(6) Applying 40 CFR Part 1068 to Heavy-Duty Highway Engines and Vehicles

As part of the Phase 1 standards, EPA applied the exemption and importation provisions from 40 CFR part 1068, subparts C and D, to heavy-duty highway engines and vehicles. EPA also specified that the defect reporting provisions of 40 CFR 1068.501 were optional. In an earlier rulemaking, EPA applied the selective enforcement auditing under 40 CFR part 1068, subpart E (75 FR 22896, April 30, 2010). EPA is in this rule adopting the rest of 40 CFR part 1068 for heavy-duty highway engines and vehicles, with certain exceptions and special provisions.

40 CFR part 1068 captures a range of compliance provisions that are common across our engine and vehicle programs. These regulatory provisions generally provide the legal framework for implementing a certification-based program. 40 CFR part 1068 works in tandem with the standard-setting part for each type of engine/equipment. This allows EPA to adopt program-specific provisions for emission standards and certification requirements for each type of engine/equipment while taking a uniform approach to the compliance provisions that apply generally.

Many of the provisions in 40 CFR part 1068 were originally written to align with the procedures established in 40 CFR part 85 and part 86. EPA expects the following provisions from 40 CFR part 1068 to not involve a substantive change for heavy-duty highway engines and vehicles:

- Part 1068, subpart A, describes how EPA handles confidential information, how the Administrator may delegate decision-making within the agency, how EPA may enter manufacturers' facilities for inspections, what information manufacturers must submit to EPA, how manufacturers are required to use good engineering judgment related to certification, and how EPA may require testing or perform testing. There is also a description of labeling requirements that apply uniformly for different types of engines/equipment.
- The prohibited acts, penalties, injunction provisions, and related requirements of 40 CFR 1068.101 and 1068.125 correspond to what is specified in Clean Air Act sections 203 through 207 (also see section 213(d)).
- 40 CFR 1068.103 describes how a certificate of conformity applies on a model-year basis. With the exception of the stockpiling provisions in paragraph (g), as described below, these provisions generally mirror what already applies for heavy-duty highway engines.
- 40 CFR 1068.120 describes requirements that apply for rebuilding engines. This includes more detailed provisions describing how the rebuild requirements apply for cases involving a used engine to replace a certified engine.
- 40 CFR part 1068, subpart F, describes procedural requirements for voluntary and mandatory recalls. As noted below, EPA is modifying these regulations to eliminate a few instances where the part 1068 provisions differ from what is specified in 40 CFR part 86, subpart S.
- 40 CFR part 1068, subpart G, describes how EPA would hold a hearing to consider a manufacturer's appeal of an adverse compliance decision from EPA. These procedures apply for penalties associated with violations of the prohibited acts, recall, nonconformance penalties, and generally for decisions related to certification. As noted below, EPA is migrating these procedures from 40 CFR part 86, including an effort to align with EPA-wide regulations that apply in the case of a formal hearing.

EPA is adopting a requirement for manufacturers to comply with the defect-reporting provisions in 40 CFR 1068.501. Defect reporting under 40 CFR 1068.501 involves a more detailed approach for manufacturers to track possible defects and establishes thresholds to define when manufacturers must perform an investigation to determine an actual rate of emission-related defects. These thresholds are scaled according to production volumes, which allows us to adopt a uniform protocol for everything from locomotives to lawn and garden equipment. Manufacturers that also produce nonroad engines have already been following this protocol for several years. These defect-reporting requirements are also similar to the rules that apply in California.

40 CFR part 1068 includes a definition of ''engine'' to clarify that an engine becomes subject to certification requirements when a crankshaft is installed in an engine block. At that point, a manufacturer may not ship the engine unless it is covered by a certificate of conformity or an exemption. Most manufacturers have opted into this definition of ''engine'' as part of the replacement engine exemption as specified in 40 CFR 85.1714. We are making this mandatory for all manufacturers. A related provision is the definition of ''date of manufacture,'' which we use to establish that an engine's model year is also based on the date of crankshaft installation. To address the concern that engine manufacturers might install a large number of crankshafts before new emission standards start to apply as a means of circumventing those standards, we state in 40 CFR 1068.103(g) that manufacturers must follow their normal production plans and schedules for building engines in anticipation of new emission standards. In addition to that broad principle, we state that we will consider engines to be subject to the standards for the new model year if engine assembly is not complete within 30 days after the end of the model year with the less stringent standards.

40 CFR part 1068 also includes provisions related to vehicle manufacturers that install certified engines. EPA states in 40 CFR 1068.105(b) that vehicle manufacturers are in violation of the tampering prohibition if they do not follow the engine manufacturers' emission-related installation instructions, which we approve as part of the certification process.

40 CFR part 1068 also establishes that vehicles have a model year and that installing certified engines includes a requirement that the engine be certified to emission standards corresponding to the vehicle's model year. An exception to allow for normal production and build schedules is described in 40 CFR 1068.105(a). This ''normal-inventory'' allowance is intended to allow for installation of previous-tier engines that are produced under a valid certificate by the engine manufacturer shortly before the new emission standards start to apply. Going beyond normal inventory is considered to be ''stockpiling.'' Stockpiling such engines will be considered an unlawful circumvention of the new emission standards. The range of companies and production practices is much narrower for heavy-duty highway engines and vehicles than for nonroad engines and equipment. EPA is therefore finalizing the proposed additional specifications to define or constrain engine-installation schedules that will be considered to fall within normal-inventory practices. In particular, vehicle manufacturers must follow their normal production schedules to use up their supply of ''previous-tier'' engines once new emission standards start to apply; the regulation further specifies that this allowance may not extend beyond three months into the year in which new standards apply. For any subsequent installation of previous-tier engines, EPA requires that vehicle manufacturers get EPA approval based on a demonstration that the excess inventory is a result of unforeseeable circumstances rather than circumvention of emission standards. EPA approval in those circumstances will be limited to a maximum of 50 engines to be installed for up to three additional months for a single vehicle manufacturer.

We are finalizing these stockpiling provisions, although we received two comments that supported changes from the proposal. Daimler suggested a greater allowance of 1000 or more engines meeting the earlier tier of standards to correspond to prevailing production volumes. This comment appears to reflect an expectation that engine manufacturers would continue to produce these previous-tier engines after the new emission standards have started to apply; however, this is not the case. The inventory allowance is focused on vehicle manufacturers using up their normal inventories of engines that were built before the change in emission standards over some number of months into the New Year. Even high-volume vehicle manufacturers should not be buying large quantities of engines shortly before a change in emission standard. The inventory allowance rather allows for vehicle manufacturers to prudently plan to make a reasonable transition to the new engines in the months following the point at which the standards start to apply.

Gillig also commented on the stockpiling provisions, advocating a June 30 date for using up their inventory of previous-tier engines. Their production schedule typically involves building a single bus in a day, with the transition to new standards depending on engine manufacturers to provide compliant engines in a timely manner. The proposed allowance was intended to accommodate current business practices that involved using up normal inventory of previous-tier engines within three months after new standards start to apply, with a possible extension to six months if the manufacturer needs additional time to use up the last few of its normal inventory of previous-tier engines. We believe this approach is consistent with Gillig's recommendation.

EPA considered applying 40 CFR part 1068 broadly. It is relatively straightforward to apply the provisions of this part to all engines subject to the criteria emission standards in 40 CFR part 86, subpart A, and the associated vehicles. Manufacturers of comparable nonroad engines are already subject to all these provisions. However, highway motorcycles and Class 2b and 3 heavy-duty vehicles subject to criteria emission standards under 40 CFR part 86, subpart S, are covered by a somewhat different compliance program. EPA is therefore applying only the hearing procedures from 40 CFR part 1068 for highway motorcycles, light-duty vehicles, light-duty trucks, medium-duty passenger vehicles, and chassis-certified Class 2b and 3 heavy-duty vehicles. See Section XIII.D.(1) for a description of the hearing procedures from 40 CFR part 1068.

Note that EPA is amending 40 CFR 85.1701 to specify that the exemption provisions of 40 CFR part 85, subpart R, apply to heavy-duty engines subject to regulation under 40 CFR part 86, subpart A. This is intended to limit the scope of this provision so that it does not apply for Class 2b and 3 heavy-duty vehicles subject to standards under 40 CFR part 86, subpart S. This change corrects an inadvertently broad reference to heavy-duty vehicles in 40 CFR 85.1701.

B. Amendments Affecting Glider Vehicles and Glider Kits

(1) Background

EPA proposed several amendments related to both criteria pollutant and GHG emissions from glider vehicles, as well as related provisions for glider kits.[980] With respect to criteria pollutant emissions, EPA proposed that as of January 1, 2018, most donor engines installed in glider vehicles would have to meet criteria pollutant standards corresponding to the year of assembly of the glider vehicle. This would amend the provision allowing donor engines to meet the standards for the year of the engine. 40 CFR 1037.150(j). EPA further solicited comment on an earlier effective date for this provision. 80 FR 40529.

With respect to GHG emissions, EPA proposed that all glider vehicles (whether produced by large or small manufacturers) meet the Phase 2 vehicle standards (which, among other things, would entail glider kit manufacturers generating fuel maps for each engine that would be used). This would remove a transition provision from the Phase 1 rules which allowed glider vehicles to use engines not certified to the Phase 1 standards. 40 CFR 1037.150(j). Glider vehicles produced by large manufacturers are presently subject to the Phase 1 vehicle standards, but those produced by small manufacturers are not. 40 CFR 1037.150(c). Put a different way, the combination of these two provisions means that non-small businesses could use pre-2013 engines in glider vehicles, but were required to meet (and certify to) the Phase 1 GHG vehicle standards. EPA proposed to require all glider vehicles to meet the applicable GHG standards as of January 1, 2018. See generally 80 FR 40528.

In the March, 2016 Notice of Data Availability, EPA solicited further comment on possible exceptions to the proposal.[981] Specifically, EPA solicited comment with respect to engines meeting 2010 criteria pollutant standards, and for engines still within their original regulatory useful life. 81 FR 10826.[982]

EPA received many comments from manufacturers of both glider kits and glider vehicles, many comments from manufacturers of engines meeting current criteria pollutant standards and dealers selling trucks containing those compliant engines, and comments from the NGO community and from CARB. Engine and vehicle manufacturers took opposing positions. Some supported the proposed approach, and urged an earlier effective date to avoid a pre-buy of glider vehicles with highly polluting engines. Others stated that the proposed provisions exceeded EPA's authority to set emission standards for new engines and new vehicles, in addition to objecting to the proposed provisions as a matter of policy. See Section I.E.1 of this document and RTC Section 14.2. Some of the comments helped EPA target flexibility for glider vehicles that serve arguably legitimate purposes (such as reclaiming relatively new powertrains from vehicles chassis that fail prematurely), without causing substantial adverse environmental impacts. All of these comments are fully summarized and responded to in RTC Section 14.2. We set out here the actions we are taking in this Phase 2 rule, and then explain the basis for those actions.

(2) Overview of Final Rule Provisions for Glider Kits and Glider Vehicles

We are finalizing the proposed glider-related provisions but have made several revisions in recognition of the differences between glider vehicles produced to avoid the 2010 criteria pollutant emission standards and those manufactured for other more legitimate purposes. The provisions being finalized are intended to allow a transition to a long-term program in which manufacture of glider vehicles better reflects the original reason manufacturers began to offer these vehicles—to allow the reuse of relatively new powertrains from damaged vehicles.

Under the provisions being finalized for the long-term program, all glider vehicles will need to be covered by both vehicle and engine certificates. The vehicle certificate will require compliance with the GHG vehicle standards of 40 CFR part 1037. The engine certificate will require compliance with the GHG engine standards of 40 CFR part 1036, plus the criteria pollutant standards of 40 CFR part 86. Used/rebuilt/remanufactured engines may be installed in the glider vehicles without meeting standards for the year of glider vehicle assembly, provided the engines are within their regulatory useful life (or meet similar criteria). These engines would still need to meet criteria pollutant standards corresponding to the year of the engine.

EPA is also finalizing a transitional program that will allow glider vehicle manufacturers additional flexibility. The first step allows each

[980] Glider vehicles are motor vehicles produced to accept rebuilt engines (or other used engines) along with used axles and/or transmissions. The common commercial term ''glider kit'' is used here primarily to refer to a chassis into which the used/rebuilt engine is installed. See Figure I–1 in section I.E.1 of this Preamble, showing a picture of a glider kit.

[981] The NODA requested comment on an EPA memorandum ''Legal Memorandum Discussing Issues Pertaining to Trailers, Glider Vehicles, and Glider Kits under the Clean Air Act'', February 2016, EPA–HQ–OAR–2014–0827–1627, 81 FR 10826.

[982] Glider vehicles and glider kits are exempt from NHTSA's Phase 1 fuel consumption standards. NHTSA did not propose revisions specific to glider vehicles in this rulemaking.

manufacturer's combined production of glider kits and glider vehicles with higher polluting engines to be at the manufacturer's highest annual production of glider kits and glider vehicles for any year from 2010 to 2014.[983] Any glider vehicles produced in greater volumes would need to meet the engine standards corresponding to the year of the assembly of the glider vehicle. With respect to GHG standards, all vehicles within this allowance will remain subject to the existing Phase 1 requirements for both engines and vehicles, so that small manufacturers would still be exempt from these provisions up to the allowance. Any glider kits and glider vehicles produced beyond this allowance will be subject to all requirements applicable to new engines and new vehicles for MY 2017. Other than the 2017 production limit, EPA will continue the Phase 1 approach until January 1, 2018. This allows small businesses to produce glider kits and glider vehicles up to the production limit without new constraints. Large manufacturers producing complete glider vehicles remain subject to the 40 CFR part 1037 GHG vehicle standards, as they have been since the start of Phase 1. However large manufacturers may provide exempted glider kits to small businesses during this time frame.

Effective January 1, 2018, the long-term program begins generally, but with certain transitional flexibilities. In other words, except for the following allowances, glider vehicles will need to comply with the long-term program. The exceptions are:

- Small businesses may produce a limited number of glider vehicles without meeting either the engine or vehicle standards of the long-term program. Larger vehicle manufacturers may provide glider kits to these small businesses without the assembled vehicle meeting the applicable vehicle standards. This number is limited to the small vehicle manufacturer's highest annual production volume in 2010 through 2014 or 300, whichever is less.
- Model year 2010 and later engines are not required to meet the Phase 1 GHG engine standards.
- Used/rebuilt/remanufactured engines may be installed in the glider vehicles without meeting standards for the year of glider vehicle assembly, provided the engines are within their regulatory useful life (this provision continues from the transitional program).

These 2018 allowances mostly continue after 2020, but effective January 1, 2021, all glider vehicles will need to meet the Phase 2 GHG vehicle standards. This means that large manufacturers providing glider kits to small manufacturers will need to meet the GHG vehicle standards for the completed vehicle (pursuant to the delegated assembly provisions), or ship the glider kit to the final glider vehicle manufacturer pursuant to the incomplete vehicle provisions (where the final glider vehicle manufacturer would be the certificate holder).

EPA is thus discontinuing both 40 CFR 1037.150(c) and (j) in this Phase 2 rulemaking. As finalized, the Phase 2 regulations will therefore generally treat glider vehicles the same as other new vehicles.[984] As a result, glider vehicles must be certified to the Phase 2 vehicle GHG standards, which (among other things) require a fuel map for the actual engine in order to run GEM. In other words, manufacturers producing glider kits need to meet the applicable GHG vehicle standards and, as part of their compliance demonstration, need to have a fuel map for each engine used. Alternatively, the final assembler could be the entity to obtain the certificate, provided it had substantial control of the overall emissions performance of the completed vehicle. In either case, manufacturers unable to obtain a fuel map for an engine may ask to use a default map, consistent with good engineering judgment.

EPA is also providing a limited allowance for small business manufacturers as described in 40 CFR 1037.150(t), and also providing a generally-applicable allowance that is conditioned on the age of the reused engine as described in 1037.635. See Section XIII.B.(4) below. EPA is also adopting new definitions of ''glider vehicle'' and ''glider kit'' in 40 CFR 1037.801 that are generally consistent with the common understanding of these terms as meaning new chassis with a rebuilt or other used engine and new chassis designed to accept a rebuilt or other used engine/powertrain. EPA is also clarifying its requirements for certification and revising its definitions for glider manufacturers, as described below, to ensure that affected manufacturers understand their responsibilities under the regulations.

It is important to emphasize that EPA is not banning gliders. Rather, as described below, EPA is requiring that glider vehicles meet the standards that all other new trucks are required to meet, unless eligible for certain limited exemptions that provide flexibility for small businesses and for certain other specific applications. Moreover, the provisions being finalized are more flexible than those proposed, but focus the additional flexibility on vehicles using relatively clean engines, and on engines within their regulatory useful life, consistent with the original purpose of glider kits and vehicles.[985]

EPA proposed to begin these requirements January 1, 2018, but requested comment on beginning the requirements sooner. Since the NPRM, production of gliders has surged and now likely exceeds 10,000 per year. We are concerned that by finalizing restrictions for 2018 in this rule we risk causing a pre-buy scenario where production surges further in 2017. This would be both very harmful to the environment and disruptive to the market. To avoid these problems and to ensure a smoother transition, we are finalizing a glider kit and glider vehicle production limit for calendar year 2017 for glider vehicles using high polluting engines. The allowable production is based on past sales for all large and small manufacturers. Specifically, each manufacturer's combined 2017 production of glider kits and glider vehicles using high polluting engines will be capped at the manufacturer's highest annual production of glider kits and glider vehicles for any year from 2010 to 2014. All vehicles within this allowance will remain subject to the existing Phase 1 GHG provisions as they presently apply. Any glider kits or glider vehicles produced beyond this allowance will be subject to all requirements applicable to new engines and new vehicles for MY 2017.

(3) Impacts of Current Glider Market

Current standards for NO_X and PM (which began in 2007 and took full effect in 2010) are at least 90 percent lower than the most stringent previously applicable standards, so the NO_X and PM emissions of any glider vehicles using pre-2007 engines are at least ten times higher than emissions from equivalent vehicles being produced with brand new engines.[986] However,

[983] Although discussed here as a limit on the number of glider vehicles that may be produced, these provisions are actually exemptions for manufacturers from the more generally applicable restrictions on the production of glider vehicles, as the following sentence in the text above makes clear.

[984] EPA has structured these regulations for glider vehicles to lay out a general requirement that treats glider vehicles (and the engines installed in them) the same as other new vehicles (and new engines), but also includes several exemptions from this general requirement.

[985] Although discussed here as a limit on the number of glider vehicles that may be produced, these provisions are actually exemptions for manufacturers from the more generally applicable restrictions on the production of glider vehicles.

[986] The NO_X and PM standards for MY 2007 and later engines are 0.20 g/hp-hr and 0.01 g/hp-hr,

most gliders being produced today use engines originally manufactured before *2002*.[987] Since these pre-2002 engines lack both EGR and exhaust aftertreatment, they would have NO_X and PM emissions 20–40 times higher than current engines. If miscalibrated, emissions could be even higher. Thus, each glider vehicle using an older engine that is purchased instead of a new vehicle with a current MY engine results in significantly higher in-use emissions of air pollutants associated with a host of adverse human health effects, including premature mortality (see Section VIII above).

These emission impacts have been compounded by the increasing sales of these vehicles. Estimates provided to EPA indicate that production of glider vehicles has increased by an order of magnitude from what it was in the 2004–2006 time frame—from a few hundred each year to thousands.[988] Glider vehicle production is not currently being reported to EPA, but EPA estimates that current production is close to 10,000 each year based on comments—including comments from manufacturers of glider vehicles. While the few hundred glider vehicles produced annually in the 2004–2006 timeframe may have been produced for arguably legitimate purposes, such as salvaging powertrains from vehicles otherwise destroyed in crashes, EPA believes (as did many commenters) that the more than tenfold increase in glider kit production since the MY 2007 criteria pollutant emission standards took effect reflects an attempt to avoid these more stringent standards and (ultimately) the Clean Air Act.

At proposal, EPA estimated the environmental impact of 5,000 glider vehicles per year, which would be roughly 2 percent of the Class 8 vehicles manufactured annually.[989] We estimated that at that rate, these gliders could account for as much as one-half of total NO_X and PM emissions from all new Class 8 vehicles. Several commenters supported EPA's assessment of the environmental impacts of glider vehicles. Volvo suggested the impacts were even greater, estimating that 2014 glider sales were ''on the order of 6,000'' and that they emit twice as many tons of PM as the rest of the 2014 vehicles. In later supplemental comments, Volvo provided evidence that current sales have grown to 10,000 or more per year. Even some commenters opposing EPA's proposal acknowledged that glider sales are now over 10,000 units annually. No commenters disagreed with EPA's previous (understated) assessment of NO_X and PM impacts.

For the final rule, EPA has updated its analysis of the environmental impacts of gliders. The updated analysis used the same emissions modeling tool used to estimate the other emissions impacts of the rule, described in Section VII of the Preamble. The modeling of gliders assumed annual glider sales of 10,000 for 2015 and later, consistent with the comments received on the proposal. The modeling also assumed that these gliders emit at the level equivalent to the engines meeting the MY 1998–2001 standards, since most glider vehicles currently being produced use remanufactured engines of this vintage, and projects them to have the same usage patterns/lifetimes as similar new vehicles. (We did not attempt to account for any miscalibration of these engines). This analysis shows that without the new restrictions, glider vehicles on the road in 2025 would emit nearly 300,000 tons of NO_X and nearly 8,000 tons of PM annually. Although glider vehicles would make up only 5 percent of heavy-duty tractors on the road, their emissions would represent *about one third* of all NO_X and PM emissions from heavy-duty tractors in 2025. By restricting the number of glider vehicles with high polluting engines on the road, these excess PM and NO_X emissions will decrease dramatically, leading to substantial public health-related benefits. Put into monetary terms using PM-related benefit-per-ton values described in Section IX.H, the removal of all unrestricted glider vehicle emissions from the atmosphere would yield between $6 to $14 billion in benefits annually (2013$). It is clear that removing even a fraction of these glider vehicles with high polluting engines from the road will yield substantial health-related benefits.

(4) EPA Engine Standards

EPA is thus amending its rules to generally require that glider vehicles produced on or after January 1, 2017 use engines certified to the standards applicable to the calendar year in which assembly of the glider vehicle is completed, with an exception in 2017 that provides a larger number of glider vehicles under the transitional production allowance. (Other exceptions to this general requirement are discussed later). This requirement applies to all pollutants, and thus encompasses criteria pollutant standards as well as the separate GHG standards. Used or rebuilt engines may be used, as long as they have been certified to the same standards that apply for the calendar year of glider vehicle assembly. For example, if assembly of a glider vehicle is completed in calendar year 2020, the engine must generally meet standards applicable for MY 2020. (If the engine standards for model year 2020 are the same as for model years 2017 through 2019, then any model year 2017 or later engine may be used).

EPA is amending these rules because, with the advent in MY 2007 of more stringent HD diesel engine criteria pollutant standards, continuation of provisions allowing unlimited use of rebuilt and reused engines meeting much earlier MY criteria pollutant standards results in unnecessarily high in-use emissions. See Section XII.B.(3) above. As stated there, these emissions form an increasingly high percentage of the vehicular inventory for such dangerous pollutants as NO_X and diesel exhaust PM (a likely human carcinogen), all of which are associated with the most serious adverse health effects up to and including premature mortality. GHG emissions from these engines also are controllable. As more glider vehicles are produced, EPA believes these emissions should be controlled to the same levels as other new engines.

The older engines currently being used in most glider vehicles could be retrofitted with exhaust aftertreatment to meet current standards. However, the primary reason these engines have been used is because they do *not* include aftertreatment.[990] Thus, we believe retrofitting these engines would not be a preferred path. The more likely compliance path would be to install a used 2010 or later engine, since such engines are presently available and it would be probably be much simpler and less expensive to use a 2010 engine than to retrofit an older engine to meet current standards. Manufacturers will

respectively. The standards for MY 2004 through 2006 engines were ten times these levels, and earlier standards were even higher.

[987] See, *e.g. http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx*, describing the engines used by a leading manufacturer of glider vehicles (''1999 to 2002-model diesels were known for reliability, longevity and good fuel mileage. Fitzgerald favors Detroit's 12.7-liter Series 60 *from that era,* but also installs pre-EGR 14-liter Cummins and 15-liter Caterpillar diesels. All are rebuilt . . . . '') (emphasis added). See also additional documentation of this point in RTC Section 14.2.

[988] ''Industry Characterization of Heavy Duty Glider Kits,'' MacKay & Company, September 30, 2013.

[989] Frequently Asked Questions about Heavy-Duty ''Glider Vehicles'' and ''Glider Kits,'' EPA–420–F–15–904, July 2015.

[990] *http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx.*, accessed July 16, 2016.

likely also seek to qualify under other flexibilities provided in the Final Rule.

Recognizing that the environmental impacts of gliders using newer engines will generally be much smaller, EPA requested comment on whether we should treat such gliders differently than gliders using older engines. 80 FR 40528; 81 FR 10826. Based on comments received on the NODA, EPA is finalizing additional flexibilities for newer engines and for engines with very low mileage. More specifically, EPA will allow engines meeting any of the following criteria to be used in glider vehicles without meeting current engine standards for either criteria pollutants or GHGs:

(1) Engines still within their original useful life in terms of both miles and years.

(2) Engines of any age with less than 100,000 miles of engine operation, provided the engines' miles are properly documented.

(3) Engines less than three years old with any number of accumulated miles of engine operation.[991]

Engines covered by these three criteria are consistent with the original intended use of glider kits—the salvaging of relatively new powertrains from vehicle chassis that have been damaged or have otherwise failed prematurely. Most of these engines would be covered by the first criterion. While nearly all of these engines would be model year 2010 or later, this criterion would theoretically allow use of model year 2008 or 2009 engines in calendar years before 2020. Nevertheless, such engines would have been certified to the same PM standards as the 2010 engines, and would likely have NO_X emissions at or below 1.2 g/hp-hr (*i.e.,* the typical certification level for engines of that vintage). EPA is adopting the second criterion to address very rare cases that were identified in comments in which annual VMT is so low that engines would not reach 100,000 miles within ten years (the useful life in years). These engines could be higher emitting, but would necessarily be in applications with very low usage, such as a small town fire truck. As such, the total emissions from such vehicles would be very small. The third criterion would address other rare cases such as where an engine is just outside the useful life in miles, or the miles cannot be determined. These engines would necessarily be model year 2015 or later, and would thus all meet the 2010 standards. Considered together, this additional flexibility would have little adverse emission impact because there would be relatively few engines covered by these exceptions and the vast majority would be 2010 or later.

Several commenters supported allowing unlimited production of glider vehicles if they use engines certified to 2010 or later NO_X and PM standards, without regard to whether the engines were still within their useful life. EPA sees merit in this concept, but is concerned that it may not be appropriate in perpetuity. Obviously, reuse of engines originally certified to the 2010 standards for criteria pollutants would not have the same adverse environmental impacts as the current practice of reusing pre-2002 engines that have NO_X and PM emissions 20–40 times higher than current engines (or using post-2002 but pre-2007 engines, which remain an order of magnitude more polluting). However, they would not necessarily be as clean for GHG or criteria pollutants as brand new engines with all new aftertreatment components. The Phase 1 and Phase 2 engine standards mean that brand new engines will have lower GHG emissions than pre-Phase 1 engines. See RIA Chapter 8 and RTC Section 14.2. And used 2010 aftertreatment components may be less effective at reducing NO_X or PM than when new. Moreover, EPA has been petitioned to adopt more stringent NO_X and/or PM standards in the future. See Section I.F.(1) above. Thus, while using 2010 engines in glider vehicles would greatly reduce the most serious concerns about NO_X and PM emissions relative to current gliders, it would not eliminate all adverse environmental impacts.

To balance these factors, EPA is finalizing an interim provision—a provision which may sunset if EPA adopts new more stringent NO_X or PM standards for heavy duty engines—that will treat gliders using MY 2010 and later engines the same as those using engines within their useful life. This would avoid most of the adverse impacts, especially for NO_X and PM. Not requiring these engines to meet the latest GHG standards could have some impacts, but they would likely be small, especially if glider vehicle sales return to pre-2007 levels. EPA will continue to monitor sales patterns and may rescind this flexibility in a future rulemaking.

Several commenters expressed concern about the impact of the proposed changes on small businesses that produce glider vehicles. However, commenters opposing the proposed requirements/clarifications did not address the very significant adverse environmental impacts of the huge increase in glider vehicle production over the last several years. EPA recognized at the time of the proposal that production of a smaller number of other gliders by small manufacturers may be appropriate, at least as an interim allowance. 80 FR 40529. To allow this, EPA is adopting the proposed provision that will somewhat preserve the regulatory status quo for existing small businesses, allowing limited production using highly polluting engines based on recent sales. This means a limited number of glider vehicles produced by small businesses may use older rebuilt or used engines, provided those engines were certified to standards from the year of the engine's manufacture. (Note that beginning in MY 2021, these vehicles will have to meet the GHG vehicle standards, although they would not be required to meet current criteria pollutant standards.) For example, an existing small business that produced glider vehicles between 2010 and 2014, with a peak production of 200 in 2013, may produce up to 200 glider vehicles per year under without having to certify them to the GHG standards, or re-certifying the engines to the now-applicable EPA standards for criteria pollutants (so long as the engine is certified to criteria pollutant standards for the year of its manufacture). To be eligible for this provision, 40 CFR 1037.150(t), the regulation specifies that no small entity may produce more than 300 glider vehicles (including any glider kits it sells to another assembler) using the older engines in any given model year without recertifying the engines to current EPA standards. EPA believes that this level reflects the upper end of the range of production that occurred before significant avoidance of the 2007 criteria pollutant standards began. EPA believes that, given this relief combined with the other changes being made into the final regulations, any small businesses that have been focused on producing gliders for legitimate purposes will not be significantly

[991] EPA's authority to craft different provisions for engines within their useful life, and provisions allowing continued production of glider vehicles using pre-2010 engines comes from CAA authority to consider costs under section 202(a)(2) and 202(a)(3)(D), as well as the broad authority in section 202(a)(3)(D) over engine rebuilding. Thus, many of these flexibilities are tailored to avoid significant and disproportionate economic impacts on small business glider vehicle manufacturers by allowing most small businesses to continue to produce glider vehicles consistent with current levels of production, consistent with the recommendations of the Small Business Advocacy Review panel. See RIA section 12.7.3. Allowing continued use of engines within their original useful life is also consistent with one purpose of the engine rebuilding provisions, which is to find some legitimate means of salvaging heavy duty engines without backsliding from those engines' original certified condition. See 62 FR 54702.

impacted by the new requirements, since they can use donor engines within their regulatory useful life for either age or mileage. See generally RIA Chapter 12.7.3. Only those small businesses that have significantly increased production to create new trucks to avoid the 2010 NO_X and PM standards will have their sales significantly restricted.

This small business flexibility is intended for small entities for whom glider production is a substantial portion of their revenue to allow them to transition to the long-term program where they would generally install newer cleaner engines. (We recognize that the final regulations will allow some small businesses to produce a limited number of glider vehicles with higher polluting engines as a side business, but do not expect these manufacturers to produce very many glider vehicles.) We intend to monitor its use and may place additional restriction on this flexibility in the future consistent with this intended purpose.

We are also adopting provisions to facilitate a smoother transition for small businesses that assemble glider vehicles from glider kits produced by larger manufacturers. Although the long-term program will require vehicle certificates for glider vehicles produced by small manufacturers using exempted engines, we are delaying the requirement for a vehicle certificate until 2021 for these glider vehicles. This means the large glider kit manufacturers may continue the Phase 1 allowance to sell exempted glider kits (*i.e.,* uncertified glider kits) to small assemblers as previously allowed under Phase1 by 40 CFR 1037.620. However, beginning January 1, 2021, each glider kit sold to small assemblers will need to have a vehicle certificate the same as is required for other new Phase 1 and Phase 2 glider vehicles.

Although we are allowing this flexibility for glider kit manufacturers, they remain responsible to take reasonable steps to ensure that their glider kits are not used to produce complete vehicles in violation of the regulations. Most importantly, the glider kit manufacturer must comply fully with the requirements of 40 CFR 1037.622, which specifies certain minimum requirements for shipping uncertified incomplete vehicles. If the glider kit manufacturer is the certificate holder, then the glider kit manufacturer would have to comply with the delegated assembly requirements of 40 CFR 1037.621. See 40 CFR 1037.635(d)(3). In addition, we would expect manufacturers of glider kits to have records to verify that the vehicle assembler to whom they are shipping an uncertified glider kit (which would remain permissible under Phase 1) is aware of the regulatory requirements and is eligible to produce glider vehicles with older engines that do not meet current criteria pollutant standards (*i.e.* is a small business within the volume limit, or is using engines within their regulatory useful life). For any assembler that is purchasing more than one hundred glider kits in a year from a kit manufacturer, the kit manufacturer should verify that they are not exceeding their allotted number. For smaller assemblers, it may be sufficient to verify that they are not requesting more glider kits from that kit manufacturer than they purchased in any year from 2010 to 2014. Failure to comply with these requirements, or shipping glider kits to an ineligible manufacturer which produces glider vehicles with non-compliant engines, may void the exemption granted pursuant to 40 CFR 1037.621 or 1037.622. For example, as explained in Section I.E.(1)(d) above, supplying glider kits to an ineligible manufacturer could result in causing a violation of the Act, and thus is itself a prohibited act under section 203(a)(1).

Finally, we are adopting a new provision in 40 CFR 1036.150(o) that would allow an engine manufacturer to modify a used engine to be identical to a previously certified configuration. (This is similar to the allowance in 40 CFR 1068.201(i).) This allows the manufacturer to include the used engine in an existing certificate for the purposes of complying with the requirement to meet current standards when installing an engine into a glider vehicle. For example, if an engine manufacture modified a used 2009 engine to be identical to a certified 2017 engine, we would allow the 2009 engine to be covered by the 2017 certificate, which would allow it to be installed into a glider vehicle without restriction.

(5) Lead Time for Amended Provisions

Other than the production volume provision discussed at the beginning of this Section XIII.B, the requirement for gliders to meet engine and vehicle standards applicable to other new vehicles and engines do not take effect before January 1, 2018. With respect to the criteria pollutant engine standards, EPA believes this provides sufficient time to ''permit the development and application of the requisite control measures'' (CAA section 202(a)(3)(D)) because compliant engines are available today, although manufacturers will need several months to change business practices to comply.

Some commenters argued that because some of these requirements relate to criteria pollutant standards, EPA must provide at least four years lead time pursuant to section 202(a)(3)(C) of the Clean Air Act. EPA addresses these comments in Section I.E.(1) and in the RTC Sections 1.3.1 and 14.2. With respect to the vehicle standards, EPA notes that the requirements already apply for vehicles not produced by small businesses. EPA believes that delaying the applicability of the vehicle standards to small businesses until 2021 when Phase 2 takes effect provides ample time to comply with vehicle GHG standards. See CAA section 202(a)(2) (standards to provide lead time sufficient to allow for ''development and application of the requisite technology'').

(6) Legal Authority and Definitions Under the Clean Air Act

With respect to statutory authority for the criteria pollutant standards under the Clean Air Act, EPA notes first that it has broad authority to control all pollutant emissions from ''any'' rebuilt heavy duty engines (including engines beyond their statutory useful life). See CAA section 202(a)(3)(D). EPA is to give ''appropriate'' consideration to issues of cost, energy, and safety in developing such standards, and to provide necessary lead time to implement those standards. If a used engine is placed in a new glider vehicle, the engine will be considered a ''new motor vehicle engine'' because it is being used in a new motor vehicle. See CAA section 216(3) and Section I.E.(1). With respect to the vehicle-based GHG standards, there is no question that the completed glider vehicle is a ''motor vehicle'' under the Clean Air Act. Some commenters have questioned whether a glider kit (without an engine) is a motor vehicle. However, EPA considers glider kits to be incomplete motor vehicles and entities manufacturing gliders to be manufacturers of those vehicles, and EPA has the authority to regulate incomplete motor vehicles and manufacturers thereof, including un-motorized chassis. See Section I.E.(1)

Under the CAA, it is also important that ''new'' is determined based on legal title and does not consider prior use. Thus, glider vehicles that have a new vehicle identification number (VIN) and new title are considered to be ''new motor vehicles'' even if they incorporate previously used components. It is also the case that under the Clean Air Act, EPA does not consider the fact that a vehicle retained the VIN of the donor vehicle from which the engine was obtained determinative of whether or not the vehicle is new. See Section I.E.(1) (responding to comment on this point).

The CAA also defines ''manufacturer'' to include any person who assembles new motor vehicles. As proposed, EPA is revising its regulatory definitions of these terms in 40 CFR 1036.801 and 1037.801 to more clearly reflect these aspects of the CAA definitions. The revised definitions make clear that:

- New glider kits are ''new motor vehicles.'' Manufacturers therefor must certify to the Phase 2 vehicle standards unless they are selling the glider kit to a secondary manufacturer that has its own certificate.
- Previously used engines installed into glider kits are ''new motor vehicle engines.''
- Any person who completes assembly of a glider vehicle is a ''manufacturer'' thereof.

EPA also notes that under existing regulations, glider kit assemblers (*i.e.* entities that assemble the glider vehicle by adding the donor engine to the kit) are already considered to be secondary vehicle manufacturers, who may receive incomplete vehicles (such as glider kits) from OEMs if they have a valid certificate or exemption (see 40 CFR 1037.622). Secondary vehicle manufacturers may also receive certified glider kits to complete in a delegated assembly agreement (see 40 CFR 1037.621).

To further clarify that EPA considers both glider kits and completed glider vehicles to be motor vehicles, EPA is adding a clarification to our definition of ''motor vehicle'' in 40 CFR 85.1703 regarding vehicles such as gliders that clearly are intended for use on highways, consistent with the CAA definition of ''motor vehicle'' in CAA section 216(2). The regulatory definition previously contained a provision stating that vehicles lacking certain safety features required by state or federal law are not ''motor vehicles.'' EPA recognized that this caveat needed a proper context: Is the safety feature one that would prevent operation on highways? See 80 FR 40529. If not, absence of that feature does not result in the vehicle being other than a motor vehicle. The amendment will consequently make clear that vehicles that are clearly intended for operation on highways are motor vehicles, even if they do not have every safety feature. This clarifying provision takes effect with this rule.

We note that NHTSA and EPA have separate definitions for motor vehicles under their separate statutory authorities. As such, EPA's determination of how its statute and regulations apply to glider kits and glider vehicles has no bearing on how NHTSA may apply its safety authority with regard to them.

(7) Summary of the Requirements for Glider Vehicles

The provisions being finalized are intended to allow a transition to a long-term program in which use of glider kits is permissible consistent with the original reason manufacturers began to offer glider kits—to allow the reuse of relatively new powertrains from damaged vehicles. The long-term program as well as the transitional program are summarized below.

(a) Long-Term Program for Gliders

Ultimately all gliders will need to be covered by both vehicle and engine certificates. The vehicle certificate will require compliance with the GHG vehicle standards of 40 CFR part 1037. The engine certificate will require compliance with the GHG engine standards of 40 CFR part 1036, plus the criteria pollutant standards of 40 CFR part 86. Used/rebuilt engines may be installed in the glider vehicles, provided (1) they meet all standards applicable to the year in which the assembly of the glider vehicle is completed; or (2) meet all standards applicable to the year in which the engine was originally manufactured and also meet one of the following criteria:

- The engine is still within its original useful life in terms of both miles and years.
- The engine has less than 100,000 miles of engine operation.
- The engine is less than three years old.

In most of these cases, the glider vehicles will need to have a vehicle certificate demonstrating compliance with the vehicle GHG standards that apply for the year of assembly. However, in the case of engines with less than 100,000 miles, glider vehicles conforming to the vehicle configuration of the donor vehicle do not need to be recertified to current vehicle standards.

(b) Transitional Program for Gliders

For calendar year 2017, each manufacturer's combined production of glider kits and glider vehicles will be capped at the manufacturer's highest annual production of glider kits and glider vehicles for any year from 2010 to 2014. All vehicles within this allowance will remain subject to the existing Phase 1 provisions, including its exemptions. Any glider kits or glider vehicles produced beyond this allowance will be subject to the long-term program.

Other than the 2017 production limit, EPA will continue the Phase 1 approach until January 1, 2018. This allows small businesses to produce glider vehicles up to the allowance without other new constraints before 2018. Large manufacturers producing complete glider vehicles remain subject to the 40 CFR part 1037 GHG vehicle standards, as they have been since the start of Phase 1. However large manufacturers may provide exempted glider kits to small businesses during this time frame. Other than the 2017 production limit, EPA will continue the Phase 1 approach until January 1, 2018. This allows small businesses to produce glider vehicles up to the cap without other new constraints before 2018. Large manufacturers producing complete glider vehicles remain subject to the 40 CFR part 1037 GHG vehicle standards, as they have been since the start of Phase 1. However large manufacturers may provide exempted glider kits to small businesses during this time frame.

Effective January 1, 2018, the permissible number of glider vehicles that may be produced without meeting the long-term program will be limited to two specific exceptions. The exceptions are:

- Small businesses may produce a limited number of glider vehicles without meeting either the engine or vehicle standards of the long-term program. Larger vehicle manufacturers may provide glider kits to these small businesses without meeting the applicable vehicle standards. This number is limited to the small manufacturer's highest annual production volume in 2010 through 2014 or 300, whichever is less.
- Model year 2010 and later engines are not required to meet the Phase 1 GHG engine standards.

These 2018 allowances mostly continue after 2020, but the following change takes effect January 1, 2021:

- All glider kits provided by large manufacturers (including to small manufacturers or for use with 2010 engines) must meet the vehicle standards for the completed vehicle.

EPA is not establishing an end to these transitional provisions at this time. We intend to monitor this industry and will reevaluate the appropriateness of these provisions in the future.

C. Applying the General Compliance Provisions of 40 CFR Part 1068 to Light-Duty Vehicles, Light-Duty Trucks, Chassis-Certified Class 2_B and 3 Heavy-Duty Vehicles and Highway Motorcycles

As described above, EPA is applying all the general compliance provisions of 40 CFR part 1068 to heavy-duty engines by both agencies. The information collection requirements are not enforceable until OMB approves them.

The agencies will collect information to ensure compliance with the provisions in these rules. This includes a variety of testing, reporting and recordkeeping requirements for vehicle and engine manufacturers. Section 208(a) of the CAA requires that manufacturers provide information the Administrator may reasonably require to determine compliance with the regulations; submission of the information is therefore mandatory. We will consider confidential all information meeting the requirements of section 208(c) of the CAA.

Respondents/affected entities: Respondents are manufacturers of engines and vehicles within the North American Industry Classification System (NAICS) and use the coding structure as defined by NAICS. 336111, 336112, 333618, 336120, 541514, 811112, 811198, 336111, 336112, 422720, 454312, 541514, 541690, 811198, 333618, 336510, for Motor Vehicle Manufacturers, Engine and Truck Manufacturers, Truck Trailer Manufacturers, Commercial Importers of Vehicles and Vehicle Components, and Alternative Fuel Vehicle Converters and Manufacturers.

Respondent's obligation to respond: The information that is subject to this collection is collected whenever a manufacturer applies for a certificate of conformity. Under section 206 of the CAA (42 U.S.C. 7521), a manufacturer must have a certificate of conformity before a vehicle or engine can be introduced into commerce.

Estimated number of respondents: It is estimated that this collection affects approximately 141 engine and vehicle manufacturers.

Frequency of response: Annually.

Total estimated burden: The burden to the manufacturers affected by these rules has a range based on the number of engines and vehicles a manufacturer produces. The estimated average annual respondent burden associated with the first three implementation years of the Phase 2 program is 61,800 hours (*see* Table XIV–1). This estimated burden for engine and vehicle manufacturers is an average estimate for both new and existing reporting requirements for calendar years 2017, 2018 and 2019, in which trailer manufacturers will prepare for and begin certifying for Phase 2 while Phase 1 will continue for the other affected manufacturers. Burden is defined at 5 CFR 1320.3(b). Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

TABLE XIV–1—BURDEN FOR REPORTING AND RECORDKEEPING REQUIREMENTS

Number of Affected Engine and Vehicle Manufacturers.	141.
Annual Labor Hours for Each Manufacturer to Prepare and Submit Required Information.	Varies.
Total Annual Information Collection Burden.	61,800 Hours.

Total estimated cost: The estimated average annual cost associated with the first three implementation years of the Phase 2 program is approximately $8 million. This includes approximately $3 million in capital and operation & maintenance costs. This estimated cost for engine and vehicle manufacturers is an average estimate for both new and existing testing, recordkeeping, and reporting requirements for calendar years 2017, 2018 and 2019, in which trailer manufacturers will prepare for and begin certifying for Phase 2 while Phase 1 will continue for the other affected manufacturers.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in title 40 are listed in 40 CFR part 9. When OMB approves this ICR, the Agency will announce that approval in the **Federal Register** and publish a technical amendment to 40 CFR part 9 to display the OMB control number for the approved information collection activities contained in this final rule.

D. Regulatory Flexibility Act

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. The small entities subject to the requirements of this action are small businesses. EPA has determined that less than 20 percent, and fewer than 100 regulated entities in each sector may experience an impact of greater than one percent of their annual revenue. Details of this analysis are presented in Chapter 12 of the Regulatory Impact Analysis located in the rulemaking docket (EPA–HQ–OAR–2014–0827), and are summarized below.

Pursuant to section 603 of the RFA, the agencies prepared an initial regulatory flexibility analysis (IRFA) for the proposed rule. Pursuant to section 609(b) of the RFA, the EPA convened a Small Business Advocacy Review (SBAR) Panel to obtain advice and recommendations from representatives of small entities that would potentially be regulated by the rule. A summary of the IRFA and the SBAR Panel's recommendations is presented in the proposed rule (at 80 FR 40542, July 13, 2015). The Final Panel Report is also available in the rulemaking docket.

The agencies identified four industries that would be potentially affected by this rulemaking: Alternative fuel engine converters, heavy-duty engine manufacturers, vocational vehicle chassis manufacturers, and trailer manufacturers. The agencies proposed and sought comment on the recommendations from the Panel. The flexibilities proposed for the engine manufacturers, engine converters, vocational vehicle manufacturers, and glider manufacturers are adopted in the final rule and fewer than 20 percent of the small entities in those sectors are estimated to incur a burden greater than one percent of their annual revenue. In addition to the flexibilities proposed for the trailer program, the agencies reduced the number of small entities regulated by the final rules by limiting the non-box trailer program to three distinct trailer types. As a result, 73 small business trailer manufacturers have zero burden from this rulemaking. Of the remaining small business trailer manufacturers, only 12 percent are estimated to have an economic impact greater than one percent of their annual revenue. As a result of these findings, EPA believes it can certify that these rules will not have a significant economic impact on a substantial number of small entities under the RFA. See Chapter 12.7 and 12.8 of the Regulatory Impact Analysis (RIA) of these rules for a more detailed description of the flexibilities adopted for and economic effects on the small businesses in these sectors.

(1) Legal Basis for Agency Action

Heavy-duty vehicles are classified as those with gross vehicle weight ratings

(GVWR) of greater than 8,500 lb. section 202(a) of the Clean Air Act (CAA) allows EPA to regulate new vehicles and new engines by prescribing emission standards for pollutants which the Administrator finds ''may reasonably be anticipated to endanger public health or welfare.'' In 2009, EPA found that six greenhouse gases (GHGs) were anticipated to endanger public health or welfare, and new motor vehicles and new motor vehicle engines contribute to that pollution. This finding was upheld by the unanimous court in *Coalition for Responsible Regulation* v. *EPA,* 684 F. 3d 102 (D.C. Cir. 2012). Acting under the authority of the CAA, EPA set the first phase of heavy-duty vehicle GHG standards (Phase 1) and specified certification requirements for emissions of four GHGs emitted by mobile sources: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and hydrofluorocarbons (HFC).

(2) Summary of Potentially Affected Small Entities

Table XIV–2 provides an overview of the primary SBA small business categories potentially affected by this regulation. EPA is not aware of any small businesses that manufacture complete heavy-duty pickup trucks and vans or Class 7 and 8 tractors.

TABLE XIV–2—PRIMARY SMALL BUSINESS CATEGORIES POTENTIALLY AFFECTED BY THIS REGULATION

Industry expected in rulemaking	Industry NAICS [a] code	NAICS description	Defined as small entity by SBA if less than or equal to:
Alternative Fuel Engine Converters	333999	Misc. General Purpose Machinery	500 employees.
	811198	All Other Automotive Repair & Maintenance.	$7.5 million (annual receipts).
Voc. Vehicle Chassis, Class 7 & 8 Tractor Manufacturers.	336120	Heavy-Duty Truck Manufacturing	1,500 employees.
HD Trailer Manufacturers	336212	Truck Trailer Manufacturing	1,000 employees.
HD Engine Manufacturers	336310	Motor Vehicle Gasoline Engine & Engine Parts.	1,000 employees.

Note:
[a] North American Industrial Classification System.

EPA used the criteria for small entities developed by the Small Business Administration under the North American Industry Classification System (NAICS) as a guide. Information about these entities comes from sources including EPA's certification data, trade association databases, and previous rulemakings that have affected these industries. EPA then found employment information for these companies using the business information database Hoover's Online (a subsidiary of Dan and Bradstreet). These entities fall under the categories listed in the table.

The agencies believe there are about 178 trailer manufacturers and 147 of these manufacturers qualify as small entities with 1,000 employees or less.[1011] EPA and NHTSA identified ten heavy-duty engine manufacturers that are currently certifying natural gas engines. Six of these companies are small businesses. Seventeen companies meet EPA requirements under 40 CFR part 85 as alternative fuel engine converters. We believe all 17 of the engine converters qualify as small businesses. Currently, 20 manufacturers that make chassis for vocational vehicles certify with EPA under the Phase 1 program and the agencies have identified an additional 19 small vocational chassis manufacturers that are not currently certifying under Phase 1.

Glider kits and glider vehicles are a subset of tractor and vocational vehicles under the final Phase 2 rulemaking (including for regulation of criteria pollution emissions). Glider vehicle manufacturers traditionally purchase or manufacture new vehicle bodies (vocational vehicles or Class 7 and 8 tractors) for use with older powertrains and/or complete assembly of these vehicles by installing the powertrain. The agencies were aware of four glider vehicle manufacturers (for whom glider vehicle production was a primary business) at the time of the SBAR Panel and we identified three of these manufacturers as small entities. We are not aware of any small businesses that produce glider *kits* for others to assemble.[1012] Public comments to the proposed rule indicated that nearly 1,200 purchasers of glider kits, and we presume they would all meet the Act's definition of ''manufacturer'', which includes anyone who assembles motor vehicles. See Section I.E.(1)(c). We believe a majority of these manufacturers qualify as small businesses. However, it is likely that few of these entities that purchase glider kits do so as their primary business. It is likely that many (if not most) of these entities assemble gliders for their own use from glider kits produced by large heavy-duty vehicle manufacturers. NHTSA is not finalizing fuel efficiency regulations applicable to gliders or glider kits at this time.

(3) Potential Reporting, Recordkeeping and Compliance Burdens

For any emission control program, EPA must have assurances that the regulated products will meet the standards. The program that EPA is adopting for manufacturers subject to this rule will include testing, reporting, and recordkeeping requirements. Testing requirements for these manufacturers include use of EPA's Greenhouse gas Emissions Model (GEM) vehicle simulation tool to obtain the overall CO_2 emissions rate for certification of vocational chassis and trailers, aerodynamic testing to obtain aerodynamic inputs to GEM for some tractor and trailer manufacturers and engine dynamometer testing for alternative fuel engine converters to ensure their conversions meet the CO_2, CH_4 and N_2O engine standards. Reporting requirements will likely include emissions test data or model inputs and results, technical data related to the vehicles, and end-of-year sales information. Manufacturers will have to keep records of this information.

(4) Related Federal Rules

The primary federal rule that is related to the Phase 2 rules under consideration is the 2011 Greenhouse

[1011] The Small Business Administration amended its classification criteria for trailer manufacturers between the NPRM and this final rule. The threshold for qualifying as a small business trailer manufacturer is now 1,000 employees. Previously the small business threshold for trailer manufacturers was 500 employees.

[1012] Although this discussion is written based on the assumption that no small businesses produce glider kits for others to assemble, the conclusions would also be valid with respect to small entities that produce glider kits for sale, should they exist.

Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (76 FR 57106, September 15, 2011). The Phase 1 program will continue to be in effect in the absence of these final rules. Small businesses are exempt under the Phase 1 program. California adopted its own greenhouse gas initiative, which places aerodynamic requirements on trailers used in long-haul applications.

(5) Summary of SBREFA Panel Process and Panel Outreach

(a) Significant Panel Findings

The Small Business Advocacy Review Panel (SBAR Panel, or the Panel) considered regulatory options and flexibilities to help mitigate potential adverse effects on small businesses as a result of these rules. During the SBREFA Panel process, the Panel sought out and received comments on the regulatory options and flexibilities that were presented to SERs and Panel members. The recommendations of the Panel are described below and are also located in the SBREFA Final Panel Report, which is available in the public docket.

(b) Panel Process

As required by section 609(b) of the RFA, as amended by SBREFA, we also conducted outreach to small entities and convened an SBAR Panel to obtain advice and recommendations of representatives of the small entities that potentially will be subject to the rule's requirements. On October 22, 2014, EPA's Small Business Advocacy Chairperson convened a Panel under section 609(b) of the RFA. In addition to the Chair, the Panel consisted of the Division Director of the Assessment and Standards Division of EPA's Office of Transportation and Air Quality, the Chief Counsel for Advocacy of the Small Business Administration, and the Administrator of the Office of Information and Regulatory Affairs within the Office of Management and Budget.

As part of the SBAR Panel process, we conducted outreach with representatives of small businesses that will potentially be affected by the final rulemaking. We met with these Small Entity Representatives (SERs) to discuss the potential rulemaking approaches and potential options to decrease the impact of the rulemaking on their industries. We distributed outreach materials to the SERs; these materials included background on the rulemaking, possible regulatory approaches, and possible rulemaking alternatives. The Panel met with SERs from the industries that will be directly affected by the Phase 2 rules on November 5, 2014 (trailer manufacturers) and November 6, 2014 (engine converters and vocational vehicle chassis manufacturers) to discuss the outreach materials and receive feedback on the approaches and alternatives detailed in the outreach packet. The Panel also met with SERs on July 19, 2014 for an initial, introductory outreach meeting, and held a supplementary outreach meeting with the trailer manufacturer SERs on October 28, 2014. The Panel received written comments from the SERs following each meeting in response to discussions had at the meeting and the questions posed to the SERs by the agency. The SERs were specifically asked to provide comment on regulatory alternatives that could help to minimize the rule's impact on small businesses.

The Panel's findings and discussions were based on the information that was available during the Panel process and issues that were raised by the SERs during the outreach meetings and in their comments. It was agreed that EPA should consider the issues raised by the SERs and discussions had by the Panel itself, and that EPA should consider comments on flexibility alternatives that would help to mitigate negative impacts on small businesses to the extent legally allowable by the Clean Air Act.

Alternatives discussed throughout the Panel process included those offered in previous or current EPA rulemakings, as well as alternatives suggested by SERs and Panel members. A summary of these recommendations is detailed below, and a full discussion of the regulatory alternatives and hardship provisions discussed and recommended by the Panel can be found in the SBREFA Final Panel Report. A complete discussion of the provisions for which we are requesting comment and/or proposing in this action can be found in Sections IV.E and V.D of this Preamble with a summary in Chapter 12 of the RIA. Also, the Panel Report includes all comments received from SERs (Appendix B of the Report) and summaries of the two outreach meetings that were held with the SERs. In accordance with the RFA/SBREFA requirements, the Panel evaluated the aforementioned materials and SER comments on issues related to the IRFA. The Panel's recommendations from the Final Panel Report are discussed below.

(c) Panel Recommendations

(i) Small Business Trailer Manufacturers

Comments from trailer manufacturer SERs indicated that these companies are familiar with most of the technologies presented during our outreach, but have no experience with EPA certification and do not anticipate they could manage the accounting and reporting requirements without additional staff and extensive training. Performance testing, which is a common requirement for many of EPA's regulatory programs, is largely unfamiliar to these small business manufacturers and the SERs believed the cost of testing would be a significant burden on their companies. In light of this feedback, the Panel recommended a combination of streamlined compliance and targeted exemptions for these small businesses based on the specific trailer types that they manufacture. The Panel believed these strategies would achieve many of the benefits for the environment by driving adoption of CO_2-reducing technologies, while significantly reducing the burden that these new regulations would introduce on small businesses.

(ii) Box Trailer Manufacturers

Box trailer manufacturers have the benefit of relying on the aerodynamic technology development initiated through EPA's voluntary SmartWay program. The Panel was aware that EPA planned to propose a simplified compliance program for all manufacturers, in which aerodynamic device manufacturers have the opportunity to test and certify their devices with EPA as technologies that can be used by trailer manufacturers in their trailer certification. This pre-approved technology strategy was intended to provide all trailer manufacturers a means of complying with the standards without the burden of testing. In the event that this strategy is limited to the early years of the trailer program for all manufacturers, the Panel recommended that small manufacturers continue to be given the option to use pre-approved devices in lieu of testing.

In the event that small trailer manufacturers adopt pre-approved aerodynamic technologies and the appropriate tire technologies for compliance, the Panel recommended an alternative compliance pathway in which small business trailer manufacturers could simply report to EPA that all of their trailers include approved technologies in lieu of collecting all of the required inputs for the GEM vehicle simulation.

(iii) Non-Box Trailer Manufacturers

The Panel recommended no aerodynamic requirements for non-box trailers. The non-box trailer SERs indicated that they had no experience installing aerodynamic devices and had only seen them in prototype-level demonstrations. In terms of the aerodynamic devices currently in use, most non-box trailer SERs identified unique operations in which their trailers are used that preclude the use of those technologies.

Some non-box trailer manufacturers had experience with LRR tires and ATI systems. However, the non-box trailer manufacturer SERs indicated that LRR tires are not currently available for some of their trailer types. The SERs noted that tire manufacturers are currently focused on box trailer applications and there are only a few LRR tire models that meet the needs of their customers. The Panel recommended EPA ensure appropriate availability of these tires in order for it to be deemed a feasible means of achieving these standards and recommended a streamlined compliance process based on the availability of technologies. The Panel suggested the best compliance option from a small business perspective would be for EPA to pre-approve tires, similar to the approach being proposed for aerodynamic technologies, and to maintain a list that could be used to exempt small businesses when no suitable tires are available. However, the Panel recognized the difficulties of maintaining an up-to-date list of certified technologies. The Panel recommended that, if EPA did not adopt the list-based approach, the agency consider a simplified letter-based compliance option that allows manufacturers to petition EPA for an exemption if they are unable to identify tires that meet the LRR performance requirements on a trailer family basis.

(iv) Non-Highway Trailer Manufacturers

The Panel recommended excluding all trailers that spend a significant amount of time in off-road applications. These trailers may not spend much time at highway speeds and aerodynamic devices may interfere with the vehicle's intended purpose. Additionally, tires with lower rolling resistance may not provide the type of traction needed in off-road applications.

(v) Compliance Provisions for all Small Trailer Manufacturers

Due to the potential for reducing a small business's competitiveness compared to the larger manufacturers, as well as the ABT recordkeeping burden, the Panel recommended that EPA consider small business flexibilities to allow small entities to opt out of ABT without placing themselves at a competitive disadvantage to larger firms that adopt ABT, such as a low volume exemption or requiring only LRR where appropriate. EPA was asked to consider flexibilities for small businesses that would ease and incentivize their participation in ABT, such as streamlined the tracking requirements for small businesses. In addition, the Panel recommended that EPA request comment on the feasibility and consequences of ABT for the trailer program and additional flexibilities that will promote small business participation.

(vi) Lead Time Provisions for all Small Trailer Manufacturers

For all trailer types that will be included in the rule, the Panel recommended a 1-year delay in implementation for small trailer manufacturers at the start of the program to allow them additional lead time to make the proper staffing adjustments and process changes and possibly add new infrastructure to meet these requirements. In the event that EPA is unable to provide pre-approved technologies for manufacturers to choose for compliance, the Panel recommended that EPA provide small business trailer manufacturers an additional 1-year delay for each subsequent increase in stringency. This additional lead time will allow these small businesses to research and market the technologies required by the new standards.

(vii) Small Business Alternative Fuel Engine Converters

To reduce the compliance burden of small business engine converters who convert engines in previously-certified complete vehicles, the Panel recommended allowing engine compliance to be sufficient for certification—meaning that the converted vehicle would not need to be recertified *as a vehicle.* This recommended flexibility would eliminate the need for these small manufacturers to gather all of the additional component-level information in addition to the engine CO_2 performance necessary to properly certify a vehicle with GEM (*e.g.,* transmission data, aerodynamic performance, tire rolling resistance, etc.). In addition, the Panel recommended that small engine converters be able to submit an engineering analysis, in lieu of measurement, to show that their converted engines do not increase N_2O emissions. Many of the small engine converters are converting SI-engines, and the catalysts in these engines are not expected to substantially impact N_2O production. Small engine converters that convert CI-engines could likely certify by ensuring that their controls require changes to the SCR dosing strategies.

The Panel did not recommend separate standards for small business natural gas engine manufacturers. The Panel stated that it believes this would discourage entrance for small manufacturers into this emerging market by adding unnecessary costs to a technology that has the potential to reduce CO_2 tailpipe emissions. In addition, the Panel noted that additional leakage requirements beyond a sealed crankcase for small business natural gas-fueled CI engines and requirements to follow industry standards for leakage could be waived for small businesses with minimal impact on overall GHG emissions.

Finally, the Panel recommended that small engine converters receive a one-year delay in implementation for each increase in stringency throughout the program. This flexibility will provide small converters additional lead time to obtain the necessary equipment and perform calibration testing if needed.

(viii) Emergency Vehicle Chassis Manufacturers

Fire trucks, and many other emergency vehicles, are built for high level of performance and reliability in severe-duty applications. Some of the CO_2-reducing technologies listed in the materials could compromise the fire truck's ability to perform its duties and many of the other technologies simply provide no benefit in real-world emergency applications. The Panel recommended proposing less stringent standards for emergency vehicle chassis manufactured by small businesses. The Panel suggested that feasible standards could include adoption of LRR tires at the baseline Phase 2 level and installation of a Phase 2-compliant engine. In addition, the Panel recommended a simplified certification approach for small manufacturers who make chassis for emergency vehicles that reduces the number of inputs these manufacturers must obtain for GEM.

(ix) Off-Road Vocational Vehicle Chassis Manufacturers

At the time of the Panel process, EPA's intent was to continue the exemptions in Phase 1 for off-road and low-speed vocational vehicles (see generally 76 FR 57175). These provisions currently apply for vehicles that are defined as ''motor vehicles'' per 40 CFR 85.1703, but may conduct most of their operations off-road. Vehicles qualifying under these provisions must comply with the applicable engine standard, but need not comply with a vehicle-level GHG standard. The Panel concluded this exemption is sufficient to cover the small business chassis manufacturers who design chassis for off-road vocational vehicles.

(x) Custom Chassis Manufacturers

The Panel concluded that chassis designed for specialty operations often have limited ability to adopt CO_2 and fuel consumption-reducing technologies due to their unique use patterns. In addition, the manufacturers of these chassis have very small annual sales volumes. The Panel recommended that EPA propose a low volume exemption for these custom chassis manufacturers. The Panel did not receive sufficient information to recommend a specific sales volume, but recommended that EPA request comment on how to design a small business exemption by means of a volume exemption, and an appropriate annual sales volume threshold.

(xi) Glider Manufacturers

The Panel was aware that EPA would like to reduce the production of glider vehicles that have higher emissions of criteria pollutants like NO_X and PM than current engines, and which could have higher GHG emissions than Phase 2 engines. However, the Panel estimated that the number of vehicles produced by the small businesses who manufacture glider kits is too small to have a substantial impact on the total heavy-duty GHG inventory and recommended that existing small businesses be allowed to continue assembling glider vehicles without having to comply with the GHG requirements.[1013] The Panel recommended that EPA establish an allowance for existing small business glider manufacturers to produce some number of glider vehicles for legitimate purposes, such as for newer vehicles badly damaged in crashes. The Panel recommended that any other limitations on small business glider production be flexible enough to allow sales levels as high as the peak levels in the 2010–2012 timeframe.

E. Unfunded Mandates Reform Act

This action contains a federal mandate under UMRA, 2 U.S.C. 1531–1538, that may result in expenditures of $100 million or more for state, local and tribal governments, in the aggregate, or the private sector in any one year. Accordingly, the agencies have prepared a statement required under section 202 of UMRA. The statement is included in the docket for this action and briefly summarized here.

The agencies have prepared a statement of the cost-benefit analysis as required by section 202 of the UMRA; this discussion can be found in this Preamble, and in the RIA. The agencies believe that this action represents the least costly, most cost-effective approach to achieve the statutory requirements of the rules. Section IX explains why the agencies believe that the fuel savings that will result from this action will lead to lower prices economy wide, improving U.S. international competitiveness. The costs and benefits associated with this action are discussed in more detail above in Section IX and in the Regulatory Impact Analysis, as required by the UMRA.

This action is not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments.

F. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicited comment from State and local officials on the proposed rules.

NHTSA notes that EPCA contains a provision (49 U.S.C. 32919(a)) that expressly preempts any State or local government from adopting or enforcing a law or regulation related to fuel economy standards or average fuel economy standards for automobiles covered by an average fuel economy standard under 49 U.S.C. Chapter 329. However, commercial medium- and heavy-duty on-highway vehicles and work trucks are not ''automobiles,'' as defined in 49 U.S.C. 32901(a)(3). In Phase 1 NHTSA concluded that EPCA's express preemption provision will not reach the fuel efficiency standards to be established in this rulemaking. NHTSA is reiterating that conclusion here for the Phase 2 standards.

NHTSA also considered the issue of implied or conflict preemption. The possibility of such preemption is dependent upon there being an actual conflict between a standard established by NHTSA in this rulemaking and a State or local law or regulation. See *Spriestma* v. *Mercury Marine,* 537 U.S. 51, 64–65 (2002). At present, NHTSA has no knowledge of any State or local law or regulation that will actually conflict with one of the fuel efficiency standards to be established in this rulemaking.

G. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications as specified in Executive Order 13175. These rules will be implemented at the Federal level and impose compliance costs only on vehicle and engine manufacturers. Tribal governments will be affected only to the extent they purchase and use regulated vehicles. Thus, Executive Order 13175 does not apply to this action.

Although Executive Order 13175 does not apply to this action, EPA and NHTSA specifically solicited additional comment from tribal officials in developing this action.

H. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

This action is subject to Executive Order 13045 because it is an economically significant regulatory action as defined by Executive Order 12866, and the agencies believe that the environmental health or safety risk addressed by this action may have a disproportionate effect on children. Accordingly, we have evaluated the environmental health or safety effects of these risks on children. The results of this evaluation are discussed below.

A synthesis of the science and research regarding how climate change may affect children and other vulnerable subpopulations is contained in the Technical Support Document for Endangerment or Cause or Contribute Findings for Greenhouse Gases under section 202(a) of the Clean Air Act, which can be found in the public docket for this action. In making those findings, EPA Administrator placed weight on the fact that certain groups, including children, are particularly vulnerable to climate-related health effects. In those findings, EPA Administrator also determined that the health effects of climate change linked to observed and projected elevated concentrations of GHGs include the increased likelihood of more frequent and intense heat waves, increases in ozone concentrations over broad areas of the country, an increase of the severity of extreme weather events such as hurricanes and floods, and increasing severity of coastal storms due to rising sea levels. These effects can all increase

[1013] The Panel was unaware of the enormous increase in glider vehicle production in recent years, and its attendant adverse environmental impacts. See section XIII.B.(3) and (4) and RTC Section 14.2.

describes a protocol for using computational fluid dynamics to determine aerodynamic drag.

The regulations for the Phase 1 standards included a reference to SAE J1526 as a test procedure for measuring in-use fuel consumption. An updated version of SAE J1526 was adopted in September 2015. As noted in the proposed rule, we are revising the regulations to reference the updated version of SAE J1526. All SAE documents are available from the publisher's Web site at *www.sae.org*.

We are adopting a standard to facilitate measurement with fourier transform infrared (FTIR) analyzers—ASTM D6348 (February 2012). We are also adopting an updated version of ASTM D4809–13, which specifies test methods for determining the heat of combustion of liquid hydrocarbon fuels for both Phase 1 and Phase 2 standards.

We are referencing a new supplement to ANSI NGV1, which we already use for defining system requirements for compressed natural gas vehicles. The supplement from the same publisher is known as CSA IR–1–15, ''Compressed Natural Gas Vehicle (NGV) High Flow Fueling Connection Devices.'' This documents is available from the ANSI Web site at *www.ansi.org*. The supplement will eventually be incorporated into ANSI NGV1, at which point we would no longer need to reference to CSA IR–1–15.

This action also involves technical standards for which there is no available voluntary consensus standard. First, the agencies are adopting greenhouse gas emission standards for heavy-duty vehicles that depend on computer modeling to predict an emission rate based on various engine and vehicle characteristics. Such a model is not available from other sources, so EPA has developed the Greenhouse Gas Emission Model as a simulation tool for demonstrating compliance with emission standards. See Section II for a detailed description of the model. A working version of this software is available for download at *http://www3.epa.gov/otaq/climate/gem.htm*.

Second, 40 CFR part 1037 includes several test procedures involving calculation with numerous physical quantities. We are incorporating by reference NIST Special Publication 811 to allow for standardization and consistency of units and nomenclature. This standard, which already applies for 40 CFR parts 1065 and 1066, is published by the National Institute of Standards and Technology (Department of Commerce) and is available at no charge at *www.nist.gov*.

Third, the amendments for marine diesel engines involve technical standards related to the requirements that apply internationally. There are no voluntary consensus documents that address these technical standards. In earlier rulemakings, EPA has adopted an incorporation by reference for MARPOL Annex VI and the NO_X Technical code in 40 CFR parts 1042 and 1043. The International Maritime Organization adopted changes to these documents in 2013 and 2014, which need to be reflected in 40 CFR parts 1042 and 1043. EPA recently adopted the updated reference documents in 40 CFR part 1043. As noted in Section XIV.H.4, this rule includes the remaining step of incorporating the updated IMO documents by reference in 40 CFR part 1042. All these documents are available at *www.imo.org*.

K. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

The agencies believe the human health or environmental risk addressed by this action will not have potential disproportionately high and adverse human health or environmental effects on minority, low-income or indigenous populations. The results of this evaluation are discussed below.

With respect to GHG emissions, the agencies have determined that these final rules will not have disproportionately high and adverse human health or environmental effects on minority, low-income or indigenous populations because they increase the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority, low-income or indigenous population. The reductions in CO_2 and other GHGs associated with the standards will affect climate change projections, and the agencies have estimated reductions in projected global mean surface temperatures (Section VII and NHTSA's FEIS). Within communities experiencing adverse impacts related to climate change, certain parts of the population may be especially vulnerable; these include the poor, the elderly, those already in poor health, the disabled, those living alone, and/or indigenous populations dependent on one or a few resources.[1017]

For non-GHG co-pollutants such as ozone, $PM_{2.5}$, and toxics, the agencies have concluded that it is not practicable to determine whether there will be disproportionately high and adverse human health or environmental effects on minority, low income and/or indigenous populations from these rules. As discussed in Section VIII and NHTSA's FEIS, however, based on the magnitude of the non-GHG co-pollutant emissions changes predicted to result from these standards, EPA and NHTSA expect that there will be improvements in ambient air quality that will likely help in mitigating the disparity in racial, ethnic, and economically-based exposures.

L. Endangered Species Act (ESA)

Section 7(a)(2) of the ESA requires federal agencies, in consultation with the National Oceanic and Atmospheric Administration Fisheries Service and/or the U.S. Fish and Wildlife Service (FWS), to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of federally listed endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. 16 U.S.C. 1536(a)(2). Under relevant implementing regulations, section 7(a)(2) applies only to actions where there is discretionary federal involvement or control. 50 CFR 402.03. Further, consultation is required only for actions that ''may affect'' listed species or critical habitat. 50 CFR 402.14. Consultation is not required where the action has no effect on such species or habitat. Under this standard, it is the federal agency taking the action that evaluates the action and determines whether consultation is required. *See* 51 FR 19926, 19949 (June 3, 1986). Effects of an action include both the direct and indirect effects that will be added to the environmental baseline. 50 CFR 402.02. Indirect effects are those that are caused by the action, later in time, and that are reasonably certain to occur. *Id.* To trigger a consultation requirement, there must be a causal connection between the federal action, the effect in question, and the listed species, and the effect must be reasonably certain to occur.

As discussed in this Preamble and the FEIS, the agencies note that the projected environmental effects of this rule are highly positive. However, the fact that the rule will have overall positive effects on the environment does not mean that the rule ''may affect'' any listed species or designated critical

[1017] EPA 2009. Technical Support Document for Endangerment and Cause of Contribute Findings for Greenhouse Gases under section 202(a) of the Clean Air Act. Available at: *http://www3.epa.gov/climatechange/Downloads/endangerment/Endangerment_TSD.pdf*.

XX.
EPA Documents Relating to Current Regulation of Gliders

2. Excerpts from U.S. EPA & NHTSA, *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2*, Response to Comments for Joint Rulemaking (Aug. 2016)

Segments of the Response to Comments document for the Heavy-Duty Phase 2 rulemaking relevant to this litigation, as listed below, are included in this appendix.

Section of HDP2 Response to Comments	**Document page numbers**	**Starts at Appendix page number**
1.3 EPA and NHTSA Statutory Authorities – 1.3.1 EPA Authority	20-67	418
1.4 General Compliance Provisions – 1.4.3 Selective enforcement audits and confirmatory testing	133-147	466
1.4 General Compliance Provisions – 1.4.4 Delegated assembly	147-172	480
6.4 Exemptions and Exclusions – 6.4.1 Small Businesses and Small Volume Producers	1273-1296	506
10 Non-GHG Emissions Impacts and their Associated Effects	1457-1467	530
14.2 Amendments Affecting Gliders and Glider Kits	1823-1886	541
Appendix A to Section 14 – Sensitivity Analysis to Glider Impacts	1960-1968	605

Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2

Response to Comments for Joint Rulemaking

Office of Transportation and Air Quality
U.S. Environmental Protection Agency

And

National Highway Traffic Safety Administration
U.S. Department of Transportation

EPA-420-R-16-901
August 2016

1.3.1 EPA Authority 20

Organization: California Air Resources Board (CARB)

Alternative 4 is Consistent with U.S. EPA's Statutory Authority

U.S. EPA is promulgating the proposed Phase 2 greenhouse gas emission standards pursuant to the statutory authority of Title II of the federal CAA, and specifically sections 202(a)(1) and (2), sections 202(d), 203-209, 216, and 301 (42 U.S.C. 7521 (a)(1) and (2), 7521(d), 7522-7543, 7550, and 7601). [EPA-HQ-OAR-2014-0827-1265-A1 p.24]

Alternative 4 is consistent with the statutory provisions applicable to U.S. EPA's determination of the requisite lead time requirements associated with the proposed greenhouse gas emission standards. CAA section 202(a)(2) [42 U.S.C.§ 7521(a)(2)] provides that "[a]ny regulation prescribed under paragraph (1) of this subsection (and any revision thereof) shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." [EPA-HQ-OAR-2014-0827-1265-A1 p.24]

Courts interpreting section 202(a) of the CAA have recognized that Congress intended U.S. EPA to rely upon projected future developments and advances in pollution control technology in establishing emission standards, and expected U.S. EPA to "press for the development and application of improved technology rather than be limited by that which exists today." *Natural Resources Defense Council v. U.S. EPA*, 655 F.2d 318, 328 (D.C. Cir. 1981) (*NRDC*). The NRDC court noted that a longer lead time "gives the U.S. EPA greater scope for confidence that theoretical solutions will be translated successfully into mechanical realizations",[11] and further stated that "the presence of substantial lead time for development before manufacturers will have to commit themselves to mass production of a chosen prototype gives the agency greater leeway to modify its standards if the actual future course of technology diverges from expectation." (Id.). The court concluded: [EPA-HQ-OAR-2014-0827-1265-A1 p.24]

"We think that the U.S. EPA will have demonstrated the reasonableness of its basis for prediction if it answers any theoretical objections to the [projected control technology], identifies the major steps necessary in refinement of the [projected control technology], and offers plausible reasons for believing that each of those steps can be completed in the time available."[12] [EPA-HQ-OAR-2014-0827-1265-A1 p.25]

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[11] *Id.* at 329.

[12] *Id.* at 331-32. *Accord*, *Husqvarna AB v. Environmental Protection Agency*, 254 F.3d 195, 201 (D.C. Cir. 2001) and *National Petrochemical & Refiners Association v. Environmental Protection Agency*, 287 F.3d 1130, 1136 (D.C. Cir. 2002).

Organization: Center for Biological Diversity

EPA's authority to regulate greenhouse gas emissions from Heavy Duty ("HD") Vehicles is codified in section 202(a) of the Clean Air Act ("CAA").[19] The Act's pollution emission reduction goals are technology-forcing: [EPA-HQ-OAR-2014-0827-1460-A1 p.5]

Case and statutory law support the broad authority of EPA to force substantial change on the status quo on an industry-wide basis. The 'technology-forcing goals' of Subchapter 11, the portion of the Clean Air Act that establishes emissions standards for moving vehicles, are well recognized. *See Whitman v. American Trucking Ass'ns*, 531 U.S. 457, 491-492, 121 S. Ct. 903, 149 L. Ed. 2d 1 (2001) (Breyer, J. dissenting). The technology-forcing authority of the Clean Air Act is embodied in the language of the Act that directs EPA to promulgate standards 'that 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 the standards apply, ...' 42 U.S.C. § 7521(a)(3)(A)(i). EPA is thus empowered to set standards for future model years based on reasonable projections of technology that may not be available currently. *NRDC v. Thomas*, 256 U.S. App. D.C. 310, 805 F.2d 410, 429 (D.C. Cir. 1986). [EPA-HQ-OAR-2014-0827-1460-A1 p.5]

Cent. Valley Chrysler-Jeep, Inc. v. Goldstene, 529 F. Supp. 2d 1151, 1178 (E.D. Cal. 2007); *see also Motor Vehicle Mfrs. Ass'n v. New York State DEC,* 17 F.3d 521, 536 (2nd Cir. 1994) (noting that the Clean Air Act is 'technology forcing' in the context of California's LEV program). [EPA-HQ-OAR-2014-0827-1460-A1 p.5]

Most importantly, when directly comparing the Proposed Rule 2027 standards and what SuperTruck partners have already achieved, the proposed standards for tractors-trailers would achieve only about three-quarters of the fuel savings that have been demonstrated by SuperTruck partners.[50] The Proposed Rule takes SuperTruck research and development into account when calculating the dynamic baseline, or reference truck, but fails to properly employ the demonstrated improvements from the SuperTruck program when determining what technology is maximally feasible. In fact, the Draft Regulatory Impact Analysis (“RIA”) explicitly acknowledges that there are likely to be more advanced aerodynamics options by 2027. [52] Since the Agencies already predict such advances, the technology-forcing nature of the governing statutes requires that they be included in the standards, especially when the proposed time horizon is within the range of tractor redesign cycles.[53] [EPA-HQ-OAR-2014-0827-1460-A1 p.11

Although the Proposed Rule assumes a wide range of technologies, the penetration rates assumed by the Agencies and potential improvements appear to be underestimated.[54] The technology forcing nature of Clean Air Act § 202 and EPCA/EISA requires more aggressive assumptions regarding technology adoption. The Agencies are proposing standards that are either already attained or easily attainable, and then hoping that manufacturers will explore and continue to improve technologies of their free will.[55]This is contrary to the specific language, structure, and intent of the statutes: a clear regulatory signal is necessary and intended to drive innovation, ensuring that technology improvements occur as rapidly as possible. [EPA-HQ-OAR-2014-0827-1460-A1 p.11

In sum, the total reductions of greenhouse gas emissions and fuel usage could be significantly greater if the Agencies adopt standards that represent true maximum efficiency improvements, even while remaining economically feasible and safe. The NHTSA may not adopt standards that undermine the purpose of the EPCA/EISA – energy conservation. Yet, the proposed fuel use reductions for tractor-trailers would provide only about one-third of the maximal feasible benefits. This constitutes an arbitrary and capricious balancing of factors that significantly impedes the congressional mandate to promote energy conservation. Likewise, these minimal reductions fail the Clean Air Act’s technology-forcing requirement. [EPA-HQ-OAR-2014-0827-1460-A1 p.11-12]

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19 42 U.S.C. § 7521(a)(3)(A)(i).

[50] ICCT SuperTruck blog, *supra* note 46.

[52] Draft RIA at 2-18.

[53] *Id.* at 2-16 ("tractor model lifecycle of up to 10 years").

[54] For example, dual clutch systems are assumed to provide only up to 2% improvement (Proposed Rule at Table III-7), but the stakeholder workshop assigned this technology approximately 5.5 (+ 2) % improvement (ICCT Tractor-Trailer report, *supra*note 44); the Proposed Rule omits weight reduction in setting stringency assigning an improvement of 0.3 % (Proposed Rule at 40223), while the stakeholder workshop found over 3 (+ 1) % improvements from weight reduction (ICCT Tractor-Trailer report,*supra* note 44).

[55] *See, e.g.,* Draft RIA, *supra* note 43 at 2-16 ("we anticipate manufacturers would continue to apply these techniques [sealing gaps] across their models and continue to explore refinements and re-designs in other areas of the tractor"). But note that the Agencies are also fully aware that a regulatory signal is necessary to correct private market failures and "provide regulatory certainty and thus generate important economic benefits in addition to reducing externalities." *Id.*at 8-5.

Organization: Daimler Trucks North America LLC

Legal Issues with Glider Provisions

As DTNA expressed in its comments to the Phase 2 Proposed Rule, DTNA has concerns with EPA's proposed regulation of 'glider kits' and 'glider vehicles,' including EPA's legal authority for regulating them. EPA's Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act ('CAA'), which does not provide EPA authority to regulate the sale of motor vehicle components. The CAA only provides EPA with authority to regulate 'new motor vehicles' and their engines, defined as 'self-propelled' vehicles 'the equitable or legal title to which has never been transferred to the ultimate purchaser'—not non-motorized frames, cabs, and axles. 42 U.S.C. §§ 7522(a), 7550(3). In turn, any regulation of glider kits is beyond the agency's authority. Further, glider vehicles when constructed retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not 'new' under the CAA. Thus, EPA lacks authority to regulate glider vehicles. And even if the EPA had authority to regulate, the CAA requires 4-years' lead-time for new or revised NOx and PM requirements and for regulations governing engine rebuilding practices, which has not been met under the proposed regulations. [EPA-HQ-OAR-2014-0827-1926-A1 p.2]

B. EPA Lacks Authority to Regulate 'Glider Kits' and 'Glider Vehicles'

The distinction between 'glider kits' and 'glider vehicles' is important because EPA lacks authority to regulate vehicle parts, including assemblages of parts (without an engine) such as glider kits. EPA's Phase 2 Proposed Rule is being carried out under the authority of the CAA, and the CAA does not provide EPA authority to regulate the sale of motor vehicle components, which is all that glider kits are. The CAA only authorizes EPA to set emission standards for 'new motor vehicles' and 'new motor vehicle engines,' 42 U.S.C. § 7521(a)(1), and to prohibit the sale of uncertified 'new motor vehicles' and 'new motor vehicle engines,' see 42 U.S.C. § 7522(a)(1). 'New motor vehicles' are defined under the CAA as 'self-propelled' vehicles 'the equitable or legal title to which has never been transferred to an ultimate purchaser'—not non-motorized frames, cabs, and axles. 42 U.S.C. § 7550(2), (3). Because glider kits do not contain engines, transmissions, and drive axles, and have no motive power, the CAA does not authorize EPA to regulate the sale of glider kits. [EPA-HQ-OAR-2014-0827-1926-A1 p.2-3]

EPA's examples of CAA provisions that address certain vehicle components are inapplicable. EPA cites to three CAA provisions granting it authority to regulate evaporative emissions, including from certain components, and concludes from those specific provisions that it has authority to regulate all vehicle components, whether or not they produce emissions in any form. Specifically, EPA cites to 'CAA section 202(a)(6) (standards for onboard vapor recovery systems on 'new light-duty vehicles,' and requiring installation of such systems); section 202(a)(5)(A) (standards to control emissions from refueling motor vehicles, and requiring consideration of, and possible design standards for, fueling system components), 202(k) (standards to control evaporative emissions from gasoline-fueled motor vehicles).' EPA Legal Memo, at 3. From these examples, EPA concludes that it has authority to regulate all vehicle components, a conclusion that is not justified under the language, of the Act. First, the fact that the CAA lists specific components that EPA may regulate suggests that EPA lacks authority to regulate other components that are not specifically listed, particularly given the broader dictate that EPA may set emission standards only for 'new motor vehicles' and 'new motor vehicle engines,' 42 U.S.C. § 7521(a)(1), and may prohibit only the sale of uncertified 'new motor vehicles' and 'new motor vehicle engines,' 42 U.S.C. § 7522(a)(1). Second, all of the examples cited by EPA relate to evaporative emissions. Although EPA might be able to argue that it has authority to regulate evaporative emissions from those specific components, and exhaust emissions from 'new motor vehicles' and 'new motor vehicle engines,' it is a stretch to say that EPA has authority to regulate all motor vehicle components. This is particularly true where, as with glider kits, the components do not produce emissions on their own. EPA itself recognizes that it cannot extend its argument to the smallest vehicle component—'This is not to say that the Act authorizes emission standards for any part of a motor vehicle, however small,' EPA Legal Memo, at 3—but nonetheless believes it has the authority to draw the line to include glider kits and trailers. In fact, Congress drew the line in the CAA at 'new motor vehicles' and 'new motor vehicle engines,' and EPA may not extend its authority further than Congress allowed. [EPA-HQ-OAR-2014-0827-1926-A1 p.3]

EPA also lacks authority to regulate glider vehicles. When constructed, glider vehicles retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not 'new' under the CAA and not subject to EPA's regulatory authority. EPA's argument that glider assemblers market their finished products as 'new trucks' is unavailing. A company's marketing materials have no bearing on the statutory definition that governs EPA's authority. Although the CAA may not reference Vehicle Identification Numbers as determinative of new motor vehicle status, the Act does contain an express definition of 'new motor vehicles'—'self-propelled' vehicles 'the equitable or legal title to which has never been transferred to an ultimate purchaser,' 42 U.S.C. § 7550(2), (3)—which EPA is not free to disregard. Glider vehicles incorporate not just a used engine, as EPA suggests, but the engine, transmission, and rear axle—the entire powertrain that comprises a significant portion of a vehicle's cost and identity—from a previously owned vehicle. The glider kit, which may be considered to be 'new' vehicle parts, is not self-propelled. The glider becomes self-propelled only when the powertrain components are added, but cannot be a 'new motor vehicle' because the equitable or legal title of those powertrain components has previously been transferred to an ultimate purchaser. [EPA-HQ-OAR-2014-0827-1926-A1 p.3-4]

· **EPA Lacks Authority to Regulate 'Glider Kits'** - The distinction between “glider kits” and “glider vehicles” is important because EPA lacks authority to regulate vehicle parts, including assemblages of parts (without an engine) such as glider kits. EPA’s Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act (“CAA”), and the CAA does not provide EPA authority to regulate the sale of motor vehicle components, which is all that glider kits are. The CAA only authorizes EPA to prohibit the sale of uncertified “new motor vehicles” and “new motor vehicle engines.” See 42 U.S.C. § 7522(a)(1). “New motor vehicles” are defined under the CAA as “self-propelled” vehicles “the equitable or legal title to which has never been transferred to an ultimate purchaser”—not non-motorized frames, cabs, and axles. 42 U.S.C. § 7550(2), (3). Because glider kits do not contain engines, and have no motive power, the CAA does not authorize EPA to regulate the sale of glider kits. [EPA-HQ-OAR-2014-0827-1164-A1 p.122-123]

· **Regulation of 'Glider Vehicles' Targets NOx / PM Emissions and Must Meet Statutory Lead Time Requirement -** In addition, the proposed regulation of "glider vehicles" actually targets NOx/PM emissions rather than GHG emissions, as EPA concedes, and is therefore inappropriate for inclusion in a GHG rule. Glider sales actually create the potential to reduce GHG emissions by incorporating used and rebuilt engines in newer, more aerodynamic vehicles. Rebuilt engines used in glider vehicles emit fewer GHGs, and new cabs and low rolling resistance tires are more efficient than what they replace. Because regulation of glider vehicles targets NOx/PM emissions, it should be done only in a separate rulemaking, if at all. [EPA-HQ-OAR-2014-0827-1164-A1 p.123][This comment can also be found in section 14.2 of this comment document]

In addition, this separate rulemaking should be carefully drafted to meet statutory lead-time requirements for NOx and PM regulations as required by statute. NOx and PM emissions standards are subject to an express CAA lead-time requirement under which new or revised NOx and PM requirements cannot take effect sooner than the model year commencing 4 years after new or revised standard is promulgated. 42 U.S.C. § 7521(a)(3)(C). As currently proposed, with an effective date of January 1, 2018, the proposed glider regulations violate the 4- year lead-time requirement under the CAA. Assuming the Phase 2 rule is finalized in early 2016, the earliest that the regulations governing glider vehicles could take effect would be 2020, in compliance with the CAA lead-time requirement. [EPA-HQ-OAR-2014-0827-1164-A1 p.123]

For its proposed glider provisions, EPA purports to rely on its authority to regulate the "practice of rebuilding heavy-duty engines." 42 U.S.C. § 7521(a)(3)(D). However, EPA is not regulating engine rebuilding practices, as evidenced by the lack of relevant proposed amendments to its engine rebuilding regulations (40 C.F.R. §§ 86.004-40, 1068.120). Instead, EPA is attempting to regulate vehicle rebuilding, which it clearly does not have the authority to do under the CAA. Congress granted EPA authority to regulate "new motor vehicles" and "new motor vehicle engines" only, and while Congress granted EPA authority to regulate engine rebuilding, it did not grant EPA similar authority to regulate vehicle rebuilding. EPA's reliance on (3)(D) is misplaced with respect to its proposed regulation of glider vehicles. [EPA-HQ-OAR-2014-0827-1164-A1 p.123]

Even if EPA were properly regulating heavy-duty engine rebuilding practices with its proposed glider provisions, it would be subject to the same four-year statutory lead-time requirement. The four-year lead-time and three-year stability requirements of 42 U.S.C. § 7521(a)(3)(C) are applicable to all of paragraph 3, which includes the engine rebuilding provision contained in (3)(D). It is not enough for EPA to opine that the January 1, 2018 implementation date for the glider provisions allows "sufficient time to 'permit the development and application of the requisite control measures'" under 42 U.S.C. § 7521(a)(3)(D). The four-year lead-time and three-year stability requirements of (3)(C) provide an absolute minimum, even for engine rebuilding regulations, and then EPA must determine whether additional time is required above and beyond that based on its determination under the standard contained in (3)(D). [EPA- HQ-OAR-2014-0827-1164-A1 p.123]

As currently proposed, EPA is attempting to regulate NOx and PM in the GHG rule in a way it could not undertake in a proper NOx and PM rulemaking. Under the CAA, EPA must allow four years of lead time, at a minimum, before its proposed glider provisions would take effect. [EPA-HQ-OAR-2014-0827-1164-A1 p.124]

· **Delegated Assembly, EPA's lack of authority** - DTNA has a concern about the EPA creating a large paperwork burden, requiring contracts with and instructions to body builders, that creates no benefit to the environment beyond our current business practice of supplying an Incomplete Vehicle Document (IVD) to final stage manufacturers. This concern drives us to comment that the EPA lacks the authority for delegated assembly regulations any more expansive than those in 40 C.F.R. § 1037.620 today. EPA bases its delegated assembly regulations on the authority to regulate the "introduction into commerce" and a claim that the sale of a partially complete vehicle or engine from the primary manufacturer to the secondary manufacturer is within the scope of this "commerce." 42 U.S.C. §7522(a)(1) (authorizing regulation at the introduction into commerce) and 75 Fed. Reg. 74152 at 74362 (Nov. 30, 2010) (citing EPA authority for Part 1037 delegated assembly regulations). But the EPA incorrectly interprets what "commerce" is. [EPA-HQ-OAR-2014-0827-1164-A1 p.105-106]

Unlike Congress's authority over commerce, which extends down to matters within a manufacturing plant located entirely within one state (see, e.g., National Labor Relations Board v. Jones & Laughlin Steel, 301 U.S. 1 (1937)), Congress defined the scope of the EPA's "commerce" more narrowly than its own. If Congress intended for the EPA to regulate manufacturing processes or to consider "introduction into commerce" to include the manufacturing process, Congress knew how to specify so. Within the CAA itself, Congress commanded the EPA to regulate the manufacture of consumer or commercial products (prohibiting "the manufacture or introduction into commerce..."), the manufacture of aftermarket motor vehicle components (prohibiting any person to "manufacture or sell..."), and the manufacture of fuel (prohibiting "the manufacture, introduction into commerce, offering for sale, or sale..."). 42 U.S.C. §§ 7511b (e)(3)(A), 7522(a)(3)(B), and 7545(c)(1) (emphases added). Moreover, the text of the Air Quality Act of 1967, the predecessor to the CAA, contained a prohibition against the "manufacture for sale" of noncompliant vehicles and engines, but Congress explicitly struck "manufacture for sale" from the law relating to vehicles during the 1970 amendment process. Air Quality Act, P.L. 90-148 (Nov. 21, 1967), §203(a)(1), formerly 42 U.S.C. §1857f-2(a)(1); CAA, P.L. 91-604, §203(a)(1) (Dec. 31, 1970) (enacting H.R. 17255). Following the canons of statutory interpretation, one might logically presume that Congress intended for manufacture of vehicles and engines not to be regulated from the fact that (1) Congress omitted manufacturing from the regulated activities while including it elsewhere and (2) it actively struck manufacturing from the list of such activities. Stated another way, if Congress considered "introduction into commerce" to include manufacturing, then the "manufacture for sale" is surplusage in the sections of the CAA where it sits alongside mention of sale or introduction into commerce. In summary, Congress's vehicle and engine regulations provide for regulation at the "introduction into commerce" but not for regulation of manufacture, as do (e.g.) the fuel regulations. [EPA-HQ-OAR-2014-0827-1164-A1 p.106]

So what is "introduction into commerce"? Congress gives an indication through its regulation of vehicles and engines over their "useful life." 42 U.S.C. §7521(a)(1). Useful life is defined in the CAA and in the EPA's regulations to be "a period of use" of some number of years or thousands of miles, depending on the type of vehicle. See, e.g., 42 U.S.C. §7521(d)(1) (defining useful life for light-duty vehicles and light-duty trucks as "a period of use of five years or of fifty thousand miles ..., whichever first occurs") and 40 C.F.R. §86.004-2 (defining the useful life for Class 8 heavy-duty vehicles as "a period of use" of 10 years or 435,000 miles). It strains credulity to argue that the useful life, defined as "a period of use," also includes periods prior to the engines or vehicles first use. In other words, the most logical inference to draw from both Congress's and the EPA's own definition of the useful lives is that the period over which an engine or vehicle can be regulated is only a period beginning with initial use. By contrast, regulation of an engine or vehicle's emissions prior the first use or prior to completion of manufacturing is beyond the EPA's authority. In turn, because regulation of an engine or vehicle's emissions prior to its being used is beyond the EPA's authority, the most reasonable interpretation of "introduction into commerce," the point at which the EPA can begin to regulate, is not a sale part way through the manufacturing process (as in a sale from an original-stage manufacturer to a later-stage manufacturer) but the sale to the ultimate purchaser (at which point the vehicle begins its period of use). [EPA-HQ-OAR-2014-0827-1164-A1 p.106-107]

Even if the EPA could regulate prior to the first use of an engine or vehicle, Congress authorized only test-based standards, not regulations over how vehicles or engines are manufactured. In particular, Congress (first) mandated the EPA to create "standards [that] shall be applicable to such vehicles and engines for their useful life." 42 U.S.C. §7521(a)(1). Second, "to determine whether [a] vehicle or engine conforms with regulations prescribed under section 202 [§7521] of [the CAA]," the EPA "shall test, or require to be tested in such manner as [the EPA Administrator] deems appropriate," such vehicles or engines. 42 U.S.C. §7525(a)(1) (emphases added). That is, "testing" of vehicles or engines is the means by which the EPA determines the compliance that is necessary for a vehicle or engine's introduction into commerce. Prescribing procedures relating to contracts between manufacturers is not "testing." [EPA-HQ-OAR-2014-0827-1164-A1 p.107]

The CAA's legislative history bears out the above interpretation of the EPA's authority. A Senate report shows Congressional intent that "[e]very manufacturer must provide, at the time of delivery, dealers and the ultimate purchaser a certificate that the vessel, vehicle, aircraft, or engine conforms to the regulations." Sen. Rpt. 91-1196, at 62 (1970) (emphasis added). Similarly, a House report authorized "test[ing] ... any new motor vehicle or motor vehicle engine as it comes off the assembly line in order to determine whether the vehicle or engine conforms with the applicable emission standards" but not a requirement for contracts between manufacturers. H.R. Rpt. 91-1146, at 53585359 (1970) (emphasis added). Further during a discussion between then-Vice President of Ford Motor Company Herbert Misch and Senator Robert Dole, Mr. Misch stated that one act proposed to be prohibited in Section 203 of the CAA goes too far: "the requirement that 'manufacture for sale' cease upon revocation of certification. We do not feel that production should cease in order to remedy whatever defects may be found through sampling." 2 Clean Air Act Amendments of 1970 1015 (U.S. Government Printing Office 1970) (quoting Joint Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works and the Committee on Commerce, United States Senate, March 24 and 25, 1970). Senator Dole responded "[A]s long as we prohibit the sale of the defective vehicle it should not be necessary to stop production." That is, Mr. Misch and Senator Dole spoke in favor of allowing the manufacturing of vehicles and engines whose compliance certificate has been revoked, as long as the manufacturer did not sell them. And, as discussed above, in the final CAA text Congress struck "manufacture for sale" from the list of acts prohibited "unless [a] vehicle or engine is covered by a certificate of conformity." 42 U.S.C. §7522(a)(1). In short, the legislative history is replete with statements like those above voicing a desire for test-based standards and for end of assembly line testing that will reflect in-use emissions, but not for compliance prior to completion of the vehicle nor formal written requests or other such mandatory documents. [EPA-HQ-OAR-2014-0827-1164-A1 p.107]

In summary, the text and history of the CAA show that regulation of assembly processes and the requirement for delegated assembly contracts are beyond the EPA's authority under the CAA. DTNA respectfully suggests that the EPA work with us to develop text that we could add to the industry's current IVD to instruct second stage manufacturers what remains to be completed in order to bring the vehicle into compliance. [EPA-HQ-OAR-2014-0827-1164-A1 p.108]

Organization: Environmental Defense Fund (EDF)

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. [EPA-HQ-OAR-2014-0827-1312-A1 p.19]

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] [EPA-HQ-OAR-2014-0827-1312-A1 p.19]

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] [EPA-HQ-OAR-2014-0827-1312-A1 p.19]

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 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-HQ-OAR-2014-0827-1312-A1 p.19-20]

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] [EPA-HQ-OAR-2014-0827-1312-A1 p.20]

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] [EPA-HQ-OAR-2014-0827-1312-A1 p.20]

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 . . .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] [EPA-HQ-OAR-2014-0827-1312-A1 p.20-21]

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-HQ-OAR-2014-0827-1312-A1 p.21]

EPA describes its Phase 2 proposal as technology forcing, in line with this long and successful history. 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. [EPA-HQ-OAR-2014-0827-1312-A1 p.21]

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. 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. [EPA-HQ-OAR-2014-0827-1312-A1 p.21]

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-HQ-OAR-2014-0827-1312-A1 p.21]

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 (tractor or combination tractor) and a detachable trailer." 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. [EPA-HQ-OAR-2014-0827-1312-A1 p.21-22]

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. [EPA-HQ-OAR-2014-0827-1312-A1 p.22]

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] [EPA-HQ-OAR-2014-0827-1312-A1 p.22]

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. [EPA-HQ-OAR-2014-0827-1312-A1 p.23]

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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.

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.

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.

100 Id.

101 42 U.S.C. § 7550 (emphasis added).

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 CO2 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 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.

Organization: Fitzgerald Truck Sales

EPA Lacks Authority to Regulate "Glider Kits"

The distinction between "glider kits" and "glider vehicles" is important because EPA lacks authority to regulate vehicle parts, including assemblages of parts (without an engine) such as glider kits. EPA's Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act ("CAA"), and the CAA does not provide EPA authority to regulate the sale of motor vehicle components, which is all that glider kits are. The CAA only authorizes EPA to prohibit the sale of uncertified "new motor vehicles" and "new motor vehicle engines." See 42 U.S.C. § 7522(a)(1). Because glider kits do not contain engines, and have no motive power, regulation of the sale of glider kits is not authorized by the CAA. EPA has been aware of the use of glider kits for over 35 years, and has not attempted to regulate them because they are not "new motor vehicles" or "new motor vehicle engines" under the CAA. [EPA-HQ-OAR-2014-0827-1134-A1 p.4]

Organization: Navistar, Inc.

Title II of the Clean Air Act ("CAA") governs regulation of on-highway medium- and heavy-duty engines and vehicles. According to EPA, the Proposed GHG Rule implements Section 202(a) of Title II of the CAA. That section requires the EPA Administrator to "prescribe (and from time to time revise) . . . standards applicable to the emission of any air pollutant from any class of classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipate to endanger public health and welfare." 42 U.S.C. § 7521(a)(1). [EPA-HQ-OAR-2014-0827-1199-A1 p.3-4]

The agencies acknowledge in the NPRM that the Proposed Rule is technology-forcing.[2] That is, manufacturers must develop new technologies or significantly improve existing technologies to meet the standards. In that case, the agencies must demonstrate that their predictions are reasonable, that they have answered any theoretical objection to the identified technologies, identified the steps needed for the technology to be completed in the available time and offer reasons that those steps can be completed.[3] Thus EPA bears the burden of laying out the pathway to the predicted technology in order to make its demonstration that a Proposed Rule is feasible. [EPA-HQ-OAR-2014-0827-1199-A1 p.4]

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2 NPRM at 80 Fed. Reg. 40154.

3 Natural Resources Defense Council, Inc. v. US EPA, 655 F.2d 317 (DC Cir 1981).

Organization: Neapco

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Organization: Recreational Vehicle Industry Association (RVIA)

b. Consistency can be achieved by exempting motorhomes from the Phase 2 Regulation

Under Phase 1, NHTSA and EPA plainly differed on their regulation of motorhomes. While NHTSA exempted such vehicles from fuel efficiency standards for the reasons discussed above, EPA exercised regulatory authority over these vehicles under the Clean Air Act. Such divergent treatment may not be ideal from the regulator's perspective, but harmonization can be worse for the regulated entity where fuel efficiency standards may impose undue costs or require impractical reduction with little fuel savings as they would here. [EPA-HQ-OAR-2014-0827-1261-A1 p.12]

We recognize the importance of regulatory consistency. Executive Order (EO) 13563 requires agencies to 'tailor its regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations.' The EO seeks to 'promote such coordination, simplification, and harmonization' as will reduce redundancy, inconsistency, and costs of multiple regulatory requirements. [EPA-HQ-OAR-2014-0827-1261-A1 p.12]

The only fair and lawful way to ensure consistency, harmony and cost-effective regulation is for EPA to exclude motorhomes from its regulations as NHTSA is required to do by EISA. The goal of harmonization cannot be used to create legal authority where there is none. NHTSA's authority under EISA is limited to commercial vehicles. EPA should exercise its discretion to follow NHTSA's congressionally mandated course and exclude motorhomes from its Phase 2 regulations. This approach takes into account both legal authority and disproportionate costs on the motorhome sector. [EPA-HQ-OAR-2014-0827-1261-A1 p.12-13]

In order to maintain regulatory consistency, harmony and cost-effectiveness, EPA should also exempt motorhomes entirely from its Phase 2 standards. [EPA-HQ-OAR-2014-0827-1261-A1 p.27]

Organization: Truck Renting and Leasing Association

The context for these comments is President Obama's January 18, 2011 executive order on regulatory review, which states that "[w]here relevant, feasible, and consistent with regulatory objectives, and to the extent permitted by law, each agency ... shall consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public" (Executive Order, "Improving Regulation and Regulatory Review," § 4 (White House, Jan. 18, 2011)). [EPA-HQ-OAR-2014-0827-1140-A1 p.2]

Organization: Truck Trailer Manufacturers Association (TTMA)

<u>EPA lacks statutory authority.</u>

In our "Authority Objections" section (3), we will discuss the legal rationale the agencies are putting forward for regulating trailers, why that rationale is flawed, and that the agencies should focus their efforts on end users, which they actually do have authority to regulate. [EPA-HQ-OAR-2014-0827-1172-A1 p.2]

EPA and NHTSA do not have statutory authority to adopt GHG emission and fuel efficiency standards applicable to trailers. [EPA-HQ-OAR-2014-0827-1172-A1 p.3]

Trailers themselves fail to meet the definition of a "motor vehicle" which states: [EPA-HQ-OAR-2014-0827-1172-A1 p.3]

(2) The term "motor vehicle" means any self-propelled vehicle designed for transporting persons or property on a street or highway. [EPA-HQ-OAR-2014-0827-1172-A1 p.3]

Trailers are not self-propelled, do not burn fuel or exhaust "Greenhouse Gasses." A vehicle is defined as something used for conveyance having a frame, a suspension, and a braking system. A motorized vehicle is a vehicle (such as a car, truck, or motorcycle) that is powered by a motor. A trailer is a *vehicle* that is not motorized and therefore does not fall under the jurisdiction of the Clean Air Act. [EPA-HQ-OAR-2014-0827-1172-A1 p.3]

EPA acknowledges this in its claim to authority and then attempts to dismiss it by claiming that the tractor, when combined with the trailer, together creates the motor vehicle that they are allowed to regulate under the CAA. "Connected together, a tractor and trailer constitute "a self-propelled vehicle designed for transporting . . . property on a street or highway," and thus meets the definition of "motor vehicle" under Section 216(2) of the CAA." [EPA-HQ-OAR-2014-0827-1172-A1 p.3]

Trucks and trailers are legally recognized by the U.S. federal and state governments as two different vehicles, each possessing its own DOT vehicle identification number (VIN), state license plate, registration, regulations, and ownership. The EPA cannot legally declare one vehicle part of the other or the two vehicles to be the same or treated as the same vehicle to enable a new regulation. If they do, then it is not the trailer manufacturer who is creating a new motor vehicle. The CAA directs the EPA Administrator to regulate "new motor vehicles." The trailer is not a motor vehicle under CAA statute until it is "connected" making it possibly subject to EPA authority not at the time the trailer was constructed, but at the time an operator connects it to a tractor and completes the "Self-propelled motor vehicle" that EPA is claiming meets the definition provided under 216(2) of the CAA. At connection, the combination could then be said to meet the definition for "new motor vehicle" in 216(3) since the combination has not yet had its title transferred to the ultimate purchaser, defined in 216(5) as "the first person who in good faith purchases such new motor vehicle." [EPA-HQ-OAR-2014-0827-1172-A1 p.3-4]

Any given trailer is not intended to be permanently connected to any truck by the trailer OEM for the useful life of the trailer. This is the distinction that makes the trailer different from any other part or component of the truck. The truck has a device that engages the trailer's king pin and traps it within the truck's fifth wheel. It is a third party that engages and disengages this truck device, not the trailer, and not the trailer OEM. Specifically, trailer manufacturers do not sell new "tractor-trailers." As such, the tractor and trailer cannot be considered a single motor vehicle (indeed, a single trailer is likely to be hauled by multiple tractors during its lifetime, and, conversely, a single tractor is likely to haul multiple trailers). [EPA-HQ-OAR-2014-0827-1172-A1 p.4]

Therefore, if the Agency wants to claim, for practical reasons, that the trailer and tractor are a regulated motor vehicle, it can only regulate the party that joined the trailer to the tractor. EPA has been claiming that they cannot regulate end users of trailers, and so must aim their regulations at trailer manufactures, but this exposes EPA's lack of authority to regulate, for these trailer manufacturers do not create the vehicles that EPA claims authority to regulate. Under the laws given in the CAA and the usual industry practice of creating new combinations of tractors and trailers to be used briefly and then separating the tractor from the trailer to create a new combination, all without transferring the titles of the combination or even of any of the individual components of the combination, it is those end users who are routinely manufacturing motor vehicles and are thus possibly subject to regulation under the laws of the CAA. It is these very end users who could and possibly should be directed to select certain trailer-based GHG-Reduction/Fuel-Economy devices based on how they ultimately use the vehicle they alone assemble. [EPA-HQ-OAR-2014-0827-1172-A1 p.4]

Since a trailer is built for customer specifications and not an intended truck, trailer OEMs cannot be regulated by the EPA GHG-2 regulations. At the time of trailer manufacture, there is no defined or intended truck and the trailer is still a non-motor vehicle. Upon completion and the trailer title is passed from the trailer OEM to the trailer dealer, or end user, there is still no motorized truck that can be associated with the trailer. The trailer can be pulled by a gas, diesel, natural gas, or electric truck in the future with unknown, varying aerodynamic characteristics. When title of the trailer passes, the trailer OEM has no legal ownership of the trailer vehicle and the trailer is not a part of any truck or other motorized vehicle. The trailer at this point is a separate product yet to be put into commerce. The EPA's definition of a trailer being a part of a motorized vehicle has not been met and the OEM no longer has a legal basis to alter the vehicle. [EPA-HQ-OAR-2014-0827-1172-A1 p.4]

The language and structure of the Clean Air Act requirements and prohibitions for new motor vehicles and engines also contradict EPA's interpretation. Those provisions contemplate a single manufacturer of each new motor vehicle or each new motor vehicle engine. For example, Section 206(a)(1) requires EPA to require testing of "any new motor vehicle . . . submitted by a manufacturer" to determine whether the vehicle may be certified as conforming to emissions regulations. Section 206(b) authorizes EPA to conduct emissions testing to determine whether new motor vehicles "manufactured by a manufacturer do in fact conform" after being certified. Section 207 requires "the manufacturer of each new motor vehicle" to provide an emissions warranty to the ultimate purchaser to certify that the vehicle conforms to the emissions regulations and is free of defects for its useful life. And Section 203(a) prohibits "a manufacturer of new motor vehicles or new motor vehicle engines" from selling or importing such vehicles or engines unless covered by a certificate of conformity. The language of these provisions plainly contemplates a single manufacturer that is responsible for each motor vehicle, not multiple manufacturers of "two detachable parts" that together constitute the single motor vehicle, and are mixed and matched in different pairs throughout their lifetime. Moreover, these provisions on their face do not work as applied to "two detachable parts" of a single motor vehicle that are mixed and matched. In the case of separate manufacturers of the tractor and various trailers that might be hauled by that tractor, the requirements to test, certify, and warrant "the motor vehicle" cannot on their face apply as written, since there is no single manufacturer of "the motor vehicle." And responsibility for violations, such as by selling an uncertified new motor vehicle, is unspecified. [EPA-HQ-OAR-2014-0827-1172-A1 p.4-5]

EPA also contends that the tractor minus the engine constitutes a "motor vehicle," even though such a chassis cannot move without the engine. We are skeptical of this assertion. We are aware of no instance in which EPA has sought to regulate a "motor vehicle" that does not contain an engine, for the obvious reason that such a "vehicle" is not self-propelled and thus does not fall within EPA's jurisdiction. In short, Congress authorized EPA to regulate both engines and complete motor vehicles (containing engines), but did not authorize EPA to regulate a trailer, which is not self-propelled, even if that trailer might be regarded as essential to the purpose of a tractor to transport property. [EPA-HQ-OAR-2014-0827-1172-A1 p.5]

Therefore, as the legal basis of the proposal from the EPA perspective is flawed, all parts of the proposal suggesting expansion of regulation of EPA to trailers should be struck. NHTSA regulation should remove requirements that, by extension, require trailer manufacturers to be regulated by EPA by directing compliance with regulations in 40CFR. [EPA-HQ-OAR-2014-0827-1172-A1 p.5]

The legal basis for including trailers in this rulemaking is flawed and as such it should remove trailers from consideration. If the agencies are set on working to reduce greenhouse gas emissions and fuel consumption as a result of trailer use, they would be better served by regulating that use directly. Drivers and fleets are the ones in control of trailer use, from specification thru disposal; they create new tractor-trailer combinations every day and are the ones who purchase fuel and emit greenhouse gas as a result. [EPA-HQ-OAR-2014-0827-1172-A1 p.18]

Organization: American Council for an Energy-Efficient Economy (ACEEE) et al.

EPA's Clean Air Act Authority

Reducing Emissions through Trailer Improvements

We support EPA's interpretation of its authority to regulate trailer manufacturers, namely, that the trailer manufacturer is a motor vehicle manufacturer subject to compliance with emission standards under section 202 of the Clean Air Act. EPA's prior regulations affecting the manufacturers of major components of the motor vehicle demonstrate the agency's tradition of addressing mobile sources as systems of components that contribute to vehicle emissions. The trailer manufacturer is the entity with control over the design of the trailer -the load-carrying component of the heavy-duty vehicle, and thus a major contributor to that vehicle's emissions. As such, it is eminently reasonable for EPA to devise standards that harness the emissions-reducing opportunities inherent in trailer design. [EPA-HQ-OAR-2014-0827-1896-A1 p.7]

Organization: Environmental Defense Fund (EDF)

Along with the NODA, EPA has provided a legal memorandum responding to certain claims made by TTMA that further explicates its legal authority to establish standards for trailers.[16] We support EPA's reasonable interpretation that a combined tractor-trailer is a motor vehicle within the meaning of section 202(a) and agree that EPA has permissibly required trailer manufactures to demonstrate compliance with these requirements. We also support NHTSA's separate statutory authority to adopt standards for trailers. [EPA-HQ-OAR-2014-0827-1886-A1 p.6-7]

a. <u>EPA reasonably determined the combined tractor-trailer constitutes a "new motor vehicle" within the meaning of section 202(a) and has permissibly established standards for trailers on that basis.</u>

Section 202(a)(1) of the Act directs the Administrator to:

by regulation prescribe . . . standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.[17] [EPA-HQ-OAR-2014-0827-1886-A1 p.7]

The Act further defines "motor vehicle" to mean "any self-propelled vehicle designed for transporting persons or property on a street or highway."[18] EPA reasonably explained that a combined tractor-trailer meets the statutory definition for motor vehicle, noting “Class 7/8 heavy-duty vehicles are composed of three major components:—The engine, the cab-chassis (i.e. the tractor), and the trailer,” and “[c]onnected together, a tractor and trailer constitute ‘a self-propelled vehicle designed for transporting . . . property on a street or highway,’ and thus meet the definition of ‘motor vehicle’ under Section 216(2) of the CAA.”[19] [EPA-HQ-OAR-2014-0827-1886-A1 p.7]

TTMA argues that, for purposes of regulating trailer manufacturers, the agency must separately consider the tractor and trailer, but later, once physically connected, TTMA seems to concede that the combined tractor-trailer would meet the statutory definition of “motor vehicle.”[20] That conclusion certainly does not flow inextricably from the statute; nor is it reasonable. Indeed, TTMA’s preferred interpretation—which creates artificial limitations on the agency’s ability to establish standards for a “new motor vehicle”— ignores the realities of how these vehicles are designed and used, and would frustrate EPA’s statutory mandate to regulate “the emission of any air pollutant from any class or classes of new motor vehicles.”[21] [EPA-HQ-OAR-2014-0827-1886-A1 p.7-8]

In any event, EPA is tasked with interpreting ambiguous statutory provisions and has done so reasonably here, concluding that a trailer is a vehicle “when it has a frame with axles attached.”[22] That interpretation is reasonable, it enables the agency to address a significant source of emissions from new motor vehicles consistent with section 202’s mandate and the underlying purposes of the Act, and should be accorded deference. [EPA-HQ-OAR-2014-0827-1886-A1 p.8]

EPA’s regulation of trailers is likewise consistent with and supported by the agency’s long-standing, holistic approach to addressing pollution from mobile sources. EPA identifies numerous examples, both of section 202 provisions that authorize regulation of specific components, as well as past agency regulations that address specific vehicle components, including by requiring testing of components and incomplete vehicles to certify compliance with emission standards.[23] In addition to these provisions, EPA has, in other instances, reasonably established and assessed compliance with emissions standards based on the ability of the integrated vehicle system to secure reductions. [EPA-HQ-OAR-2014-0827-1886-A1 p.8]

Engine and Vehicle Standards. EPA and NHTSA’s joint Heavy Duty and Light Duty National Programs recognize the reality that reducing emissions from a class of vehicle requires a holistic approach. In the Phase 1 heavy-duty rule, for instance, EPA and NHTSA affirmed “the importance of addressing the entire vehicle in reducing fuel consumption and GHG emissions,”[24] setting separate standards for the tractor cab and the engine installed in the tractor,[25] including “improvements in the tractor (such as aerodynamics), tires, and other vehicle systems.”[26] Similarly, in setting the Phase 1 standards for light-duty vehicles, EPA and NHTSA considered reductions that could be achieved by deploying advanced technologies and optimizing vehicle systems.[27] [EPA-HQ-OAR-2014-0827-1886-A1 p.8]

Compliance Assessment. EPA’s Greenhouse Gas Emissions Model (GEM) for medium- and heavy-duty vehicles, supporting Phase 1 and 2, likewise reflects an integrated, holistic approach. GEM allows various vehicle characteristics to be evaluated for compliance with standards, including for Class 7 and 8 tractor manufacturers, inputs like aerodynamic drag, tire rolling resistance, vehicle speed limiter, vehicle weight reduction, and extended idle reduction.[28] These inputs implicate numerous components of the vehicle including the tires, wheels, body, and transmission.[29] [EPA-HQ-OAR-2014-0827-1886-A1 p.9]

Similarly, the OMEGA model for light-duty vehicles allows manufacturers to “choose from a myriad of CO2 reducing technologies,” so that “for a variety of levels of CO2 emission control, there are an almost infinite number of technology combinations which produce the desired CO2 reduction."[30] [EPA-HQ-OAR-2014-0827-1886-A1 p.9]

EPA's past practice reflects a holistic approach to both establishing and assessing compliance with vehicle emission standards, which allows emission standards to be met through improvements to many portions of the integrated vehicle. In keeping with this longstanding approach, EPA has reasonably interpreted its authority to include establishing emission standards for trailers, a major source of emissions from the integrated heavy-duty vehicle. [EPA-HQ-OAR-2014-0827-1886-A1 p.9]

b. <u>EPA has Reasonably Required Trailer Manufacturers to Demonstrate Compliance with Trailer Standards.</u>

TTMA likewise objects that each motor vehicle can have only one manufacturer, that the trailer manufacturer is not 'the' manufacturer for the combined tractor-trailer, and thus, that trailer manufacturers cannot be regulated.[31] [EPA-HQ-OAR-2014-0827-1886-A1 p.9]

As a threshold matter, section 202(a)(1)—the provision under which EPA has adopted these standards—requires that the agency adopt standards "applicable to . . . new motor vehicles" but does not describe whether one or more entities may be responsible for meeting these standards. In the absence of such a limitation, EPA reasonably determined that standards could apply to trailer manufacturers as well as tractor manufacturers, given that "[t]he trailer manufacturer sets the design specifications that affect the GHG emissions attributable to pulling the trailer."[32] [EPA-HQ-OAR-2014-0827-1886-A1 p.9-10]

Even so, EPA reasonably determined that trailer manufacturers fall within statutory definition of manufacturer in section 216, which is defined as: [EPA-HQ-OAR-2014-0827-1886-A1 p.10]

any person engaged in the manufacturing or assembling of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, or importing such vehicles or engines for resale, or who acts for and is under the control of any such person in connection with the distribution of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines.[33] [EPA-HQ-OAR-2014-0827-1886-A1 p.10]

This definition is capacious and in no way suggests a new motor vehicle must have a single manufacturer. EPA has determined that "[i]t is reasonable to view the trailer manufacturer as 'engaged in' (section 216 (1)) the manufacturing or assembling of the tractor-trailer,"[34] and that its responsibility under section 202 of the CAA to "prescribe (and from time to time revise) . . . standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles . . . which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare" includes the authority to regulate the manufacturer of the trailer component of the combined tractor-trailer.[35] [EPA-HQ-OAR-2014-0827-1886-A1 p.10]

TTMA points to several provisions in Title II to support its alternative construction, but these provisions do not compel its single-manufacturer interpretation. Moreover, as EPA notes, the single-manufacturer interpretation would result in an unworkable system where entities without design or manufacturing authority would face compliance obligations.[36] [EPA-HQ-OAR-2014-0827-1886-A1 p.10]

Accordingly, the agency's determination to set standards applicable to trailer manufacturers—given that the trailer is a major contributor to the emissions of the heavy duty vehicle—is a reasonable interpretation of the statutory scheme it is entrusted to administer. As such, the decision warrants deference.[37] [EPA-HQ-OAR-2014-0827-1886-A1 p.10]

c. NHTSA has Clear Authority to Regulate Trailers

TTMA likewise challenges NHTSA's authority to adopt trailer standards, but those challenges are equally without merit. The Energy Independence and Security Act (EISA) requires NHTSA to create a medium- and heavy-duty fuel efficiency program "designed to achieve the maximum feasible improvement" in fuel efficiency.[38] Inclusion of trailers in NHTSA's program is reasonable, consistent with the statute, and crucial to satisfying NHTSA's mandate to improve fuel efficiency. Moreover, inclusion of trailers in the program reasonably harmonizes EISA with NHSTA's authority under the Motor Vehicle Safety Act (MVSA) and with EPA authority. [EPA-HQ-OAR-2014-0827-1886-A1 p.11]

EISA's fuel economy standards for medium- and heavy-duty on-highway vehicles and work trucks amends 49 U.S.C. 32902, by adding a subsection (k). EISA also amends the defined terms contained in section 32901 by adding the terms, 'automobile,' 'commercial medium- and heavy-duty on-highway vehicle,' 'non-passenger automobile,' and 'work truck,' each of which is defined as a 'vehicle' of a particular type.[39] For example, a commercial medium- and heavy-duty on-highway vehicle is "an on-highway vehicle with a gross vehicle weight rating of 10,000 pounds or more."[40] [EPA-HQ-OAR-2014-0827-1886-A1 p.11]

As NHTSA notes in the rule proposal,[41] EISA does not define 'vehicle,' a term that appears repeatedly in the provisions creating the fuel efficiency program for commercial medium- and heavy-duty on-highway vehicles and work trucks, as well as in the definitions of the added terms. Nor is 'vehicle' an otherwise defined term under section 32901. In light of this silence, NHTSA reasonably looked to its organic statute, the MVSA, contained at the same subtitle, which defines motor vehicle as "a vehicle driven or drawn by mechanical power and manufactured primarily for use on public streets, roads, and highways, but does not include a vehicle operated only on a rail line."[42] Relying both on the terms of the MVSA and EISA, NHTSA reasonably determined that trailers be included within the fuel efficiency program. [EPA-HQ-OAR-2014-0827-1886-A1 p.11]

TTMA asserts that the statutory reference to "gross vehicle weight rating" (GVWR) combined with the distinction that EPA drew in a previous rulemaking between GVWR and 'gross combined weight rating' (GCWR) somehow expressly forecloses NHTSA's regulation of trailers.[43] However, at most this reference helps to elucidate the types of tractors contemplated by the regulation and does not expressly (or otherwise) foreclose regulation of trailers. Moreover, contrary to TTMA's assertion, EPA's definition of GVWR considers the "loaded weight" of the vehicle, "in operational status with all standard equipment."[44] Indeed, the term, 'gross combined weight rating,' does not appear in any provision under Title 42 or Title 49. [EPA-HQ-OAR-2014-0827-1886-A1 p.11-12]

Accordingly, NHTSA reasonably concluded that trailers fall within the definition of commercial medium- and heavy-duty on highway vehicle. Doing so is consistent with the statutory text; and reasonably furthers NHTSA's mandate to secure "maximum feasible" improvements in fuel efficiency from medium- and heavy-duty vehicles. [EPA-HQ-OAR-2014-0827-1886-A1 p.12]

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16 EPA, Legal Memorandum Discussing Issues Pertaining to Trailers, Glider Vehicles, and Glider Kits under the Clean Air Act, Docket ID. No. EPA-HQ-OAR-2014-0827-1627.

17 42 U.S.C. § 7521(a)(1).

18 42 U.S.C. § 7550(2).

19 80 Fed. Reg. 40170.

20 Comment submitted by John Freiler, Engineering Manager, Truck Trailer Manufacturers Association (TTMA) to EPA Proposed Rule: Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium and Heavy-Duty Engines and Vehicles; Phase 2, at 3, Docket ID No. EPA-HQ-OAR-2014-0827-1172 (September 30, 2015).

21 42 U.S.C. § 7521(a)(1).

22 80 Fed. Reg. 40170.

23 EPA, Legal Memorandum Discussing Issues Pertaining to Trailers, Glider Vehicles, and Glider Kits under the Clean Air Act, at 3 (citing examples including section 202 (a)(6) (standards for onboard vapor recovery systems on light-duty vehicles, requiring installation of such systems); section 202 (a)(5)(A) (standards to control emissions from refueling motor vehicles, requiring consideration of, and possible design standards for, fueling system components); 202 (k) (standards to control evaporative emissions from gasoline-fueled motor vehicles); and 40 C.F.R. 86.146-96 and 86.150-98 (refueling spitback and refueling test procedures)).

24 76 Fed. Reg. 57115.

25 76 Fed. Reg. 57134.

26 76 Fed. Reg. 57135.

27 EPA and NHTSA reviewed a wide range of technologies available to manufacturers, including gasoline direct injection, downsized engines that use turbochargers, advanced transmissions, start-stop technology, improved tire rolling resistance, reductions in vehicle weight, and improvements in vehicle air conditioners, including low leak systems. 75 Fed. Reg. 25332.

28 76 Fed. Reg. 57147.

29 In fact, a number of commenters on the proposal requested "that cab doors, cab sides and backs, cab underbodies, frame rails, cross members, clutch housings, transmission cases, axle differential carrier cases, brake drums, and other components be allowed to be replaced with light-weight versions" to meet the tractor fuel consumption and CO2 emissions standards." 76 Fed. Reg. 57151.

30 75 Fed. Reg. 25452. Inputs to the OMEGA model include low rolling resistance tires, low friction lubricants, engine friction reduction, aggressive shift logic, early torque converter lock-up, improved electrical accessories, low drag brakes, and advanced gasoline engine and transmission technologies such as turbo/downsizing, gasoline direct injection, and dual-clutch transmission. 75 Fed. Reg. 25449-50.

31 Comment submitted by John Freiler, Engineering Manager, Truck Trailer Manufacturers Association (TTMA), at 5.

32 EPA, Legal Memorandum, at 5.

33 42 U.S.C. § 7550(1) (CAA § 216(1)).

34 EPA, Legal Memorandum at 5.

35 42 U.S.C. § 7521(a)(1).

36 EPA, Legal Memorandum, at 6.

37 See Chevron, U.S.A. v. Natural Resources Defense Council, Inc., 467 U.S. 837, 844 (1984) (Courts "have long recognized that considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer." When an agency's authority "on a particular question is implicit rather than explicit . . . a court may not substitute its own construction of a statutory provision for a reasonable interpretation made by the administrator of an agency.").

38 49 U.S.C. 32902(k).

39 The EISA defines both the 'commercial medium- and heavy-duty on-highway vehicle' and the 'work truck' under section 32901 as a 'vehicle' of a particular gross vehicle weight rating. 49 U.S.C. § 32901(a)(7), (19).

40 49 U.S.C. § 32901(a)(7).

41 80 Fed. Reg. 40171.

42 49 U.S.C. § 30102(a)(7).

43 Comment submitted by John Freiler, Engineering Manager, Truck Trailer Manufacturers Association (TTMA), at 6 ("EISA's definition of "commercial medium- and heavy-duty on-highway vehicle" excludes trailers. GVWR is distinct from the gross combined weight rating ("GCWR"), which includes both the weight of a loaded trailer and the weight of the tractor.").

44 40 CFR 86.1803-01. GVWR is defined as "the value specified by the manufacturer as the maximum design loaded weight of a single vehicle, consistent with good engineering judgment." 'Loaded weight' is defined as "the vehicle's curb weight plus 300 pounds." 'Curb weight' is defined as "the actual or the manufacturer's estimated weight of the vehicle in operational status with all standard equipment, and weight of fuel at nominal tank capacity, and the weight of optional equipment computed in accordance with § 86.1832-01."

Organization: National Association of Clean Air Agencies (NACAA)

2. February 2016 draft EPA *Legal Memorandum Discussing Issues Pertaining to Trailers, Glider Vehicles, and Glider Kits under the Clean Air Act*

NACAA is a strong proponent of regulating greenhouse gas emissions associated with trailers. In our September 29, 2015 comments, we commended the agency for proposing such regulations for the first time at the national level. In fact, we noted our belief that EPA's proposed trailer provisions missed several opportunities to maximize fuel efficiency technologies in the heavy-duty trailer sector and urged the agency to consider our recommendations for additional provisions in the final rule. NACAA has also expressed support for the agency's proposal to close the existing loophole for glider kits and glider vehicles, under which pre-2013 engines – with no limit on age – may be installed into new glider kits without meeting applicable standards. We believe EPA has the environmental obligation to regulate trailers, glider vehicles and glider kits, as well as the legal authority to do so in the way it proposes and, in fact, could go further. NACAA, therefore, welcomes the agency's draft legal memorandum on this issue that provides clarification of the firm legal basis for its proposed actions. [EPA-HQ-OAR-2014-0827-1890-A1 p.2]

Organization: Stoughton Trailers

Non-Vehicle

A trailer is not powered for self-transportation and does not directly produce CO2; therefore, is not under the authority of EPA with regard to the area of focus. [EPA-HQ-OAR-2014-0827-1212-A2 p.2]

Organization: Truck Trailer Manufacturers Association (TTMA)

Regarding Section (g) of the Memo: Alternative Provisions for Trailer Manufacturers.

We would first like to comment on Section (g) of the Memo, which states that EPA is considering an alternative rule that would simply require trailer manufacturers to label and/or provide some test data to show that the trailer is capable of being assembled into a compliant tractor-trailer, and then impose the responsibility of combining compliant trailers with compliant tractors on the motor carriers. While we would want to see the specifics of such a regulation and carefully consider the statutory authority and practical implications, in general we find this approach be superior to the approach taken in the original proposal, for again, as we understand this proposal, the agency would be placing the compliance obligation on the motor carrier in matching tractors to trailers in daily use so as to achieve the regulatory goals. [EPA-HQ-OAR-2014-0827-1873-A2 p.2]

Presuming that the Agencies can regulate the combination of tractors to trailers under the CAA, we could, in principal, agree with the idea that marketing a trailer constructed in such a way that it could not be used to meet those requirements or willfully mislabeled so as to nullify the regulations on the combination of tractors and trailers could be viewed as a defeat-device under the regulation. We would caution that there would undoubtedly be designs of trailers that could be legitimately used in accordance with these regulations the Agency is considering, or be misused by an end user, and the possibility of such misuse must not constitute "causing" the use of a defeat device. [EPA-HQ-OAR-2014-0827-1873-A2 p.2]

Regarding the remainder of Memo as it pertains to Trailer Manufacturers:

Section 3 of our previous comment on the proposed rulemaking, submitted on September 30, 2015, contained, set forth our objections to the Agencies' assertion of legal authority to regulate manufacturers of non-motorized trailers, and we again incorporate that discussion here and add the following summary comments: [EPA-HQ-OAR-2014-0827-1873-A2 p.2]

<u>EPA Authority</u>: Congress, in enacting the Clean Air Act, did not authorize EPA to regulate trailers: [EPA-HQ-OAR-2014-0827-1873-A2 p.2

A trailer is not a "motor vehicle" as that term is defined in the Clean Air Act (i.e. it is not "self-propelled"). [EPA-HQ-OAR-2014-0827-1873-A2 p.2]

Tractors and trailers are manufactured and sold separately by different sets of manufacturers to customer populations that are not the same. As such, the tractor and the trailer cannot be considered a single motor vehicle. [EPA-HQ-OAR-2014-0827-1873-A2 p.2]

The language and structure of the Clean Air Act requirements and prohibitions contemplate a single manufacturer of each new motor vehicle or each new motor vehicle engine. In the case of separate manufacturers of the tractor and various trailers that might be hauled by that tractor, the requirements to test, certify, and warrant "the motor vehicle" cannot on their face apply as written, since there is no single manufacturer of "the motor vehicle." It also is unclear which of the manufacturers would be responsible for selling an uncertified motor vehicle. [EPA-HQ-OAR-2014-0827-1873-A2 p.2-3

That the Clean Air Act authorizes EPA to establish standards for certain types of emission-related vehicle components (e.g., onboard vapor recovery systems) does not grant EPA an open-ended license to regulate any vehicle component. To the contrary, that Congress authorized EPA to regulate certain types of components establishes that EPA is not authorized to regulate those components not specifically enumerated in the Act. EPA's position is limitless and suggests that EPA has authority to regulate the design characteristics of any component or portion of the vehicle, which thereby renders more specific provisions in the Act superfluous, contrary to well-established rules of statutory interpretation. [EPA-HQ-OAR-2014-0827-1873-A2 p.3]

In short, Congress authorized EPA to regulate both engines and complete motor vehicles (containing engines), but Congress did not authorize EPA to regulate a trailer, which is not self-propelled, even if that trailer might be regarded as essential to the purpose of a tractor to transport property. [EPA-HQ-OAR-2014-0827-1873-A2 p.3]

NHTSA Authority: Congress, in enacting the Energy Independence and Security Act ("EISA"), did not authorize NHTSA to regulate trailers. [EPA-HQ-OAR-2014-0827-1873-A2 p.3]

The EISA defines "commercial medium- and heavy-duty on-highway vehicle" to mean "an on-highway vehicle with a gross vehicle weight rating [GVWR] of 10,000 pounds or more." This definition excludes trailers. In particular, GVWR is widely understood, including by EPA and NHTSA in prior rulemakings, to include only the loaded weight of the tractor, and specifically to exclude the weight of the trailer. [EPA-HQ-OAR-2014-0827-1873-A2 p.3

GVWR is distinct from the gross combined weight rating ("GCWR"), which includes both the weight of a loaded trailer and the weight of the tractor itself. And indeed, EPA and NHTSA recognized this important distinction in promulgating GHG emission standards and fuel efficiency standards for medium and heavy-duty engines and vehicles in 2011, stating: "GVWR describes the maximum load that can be carried by a vehicle, including the weight of the vehicle itself. Heavy-duty vehicles also have a gross combined weight rating (GCWR), which describes the maximum load that the vehicle can haul, including the weight of a loaded trailer and the vehicle itself." See 76 Fed. Reg. 57,106, 57,114 (Sept. 15, 2011). [EPA-HQ-OAR-2014-0827-1873-A2 p.3]

In other words, the EISA definition is tethered to GVWR. If Congress intended the definition of "commercial medium- and heavy-duty on-highway vehicle" to include trailers, it could have done so either explicitly or by defining the category of vehicles by reference to GCWR instead of GVWR. [EPA-HQ-OAR-2014-0827-1873-A2 p.3]

The statutory directive for the agency to regulate the fuel economy of commercial medium- and heavy duty on-highway vehicles and work trucks indicates that Congress did not intend to encompass trailers.

Specifically, Section 32902(k) directs the Secretary of Transportation to examine “the fuel efficiency of commercial and medium- and heavy-duty on-highway vehicles,” to determine procedures and methods “for measuring the fuel efficiency of such vehicles,” to take into consideration the “work performed by such on-highway vehicles” and to implement “fuel economy standards.” But trailers do not actually have any source of power, do not consume fuel, and do not do any work by themselves. As discussed above in relation to EPA authority, trailers may be hauled by multiple different tractors, resulting in different fuel economy for the various tractor-trailer combinations. Even if trailers might have aerodynamic characteristics that affect the fuel economy of the tractor that actually uses fuel, the trailer does not itself have “fuel efficiency,” and Congress did not authorize the Secretary to establish aerodynamic requirements. [EPA-HQ-OAR-2014-0827-1873-A2 p.3-4]

Conclusion

While direct regulation of trailer manufacturers remains outside the statutory authority granted under the Clean Air Act or the Energy Independence and Security Act, there is a method suggested in Section (g) of the Memo and laid out in our comments to the proposed rulemaking to accomplish the Agencies’ goals that may be fall within the bounds of statutory authority. While we stand by our contention that EPA’s SmartWay program provides the optimal solution to reducing greenhouse gas emissions and fuel consumption in the heavy duty freight sector, we hope that if the Agencies feel that additional regulation is needed, they will pursue the “Alternative Provisions” approach and work with the trucking industry to create a set of reasonable and effective regulations. [EPA-HQ-OAR-2014-0827-1873-A2 p.4]

Once again, we appreciate the Agencies’ outreach to the trailer manufacturers and pledge to continue our cooperation in efforts to develop the most effective regulations possible within the existing legal framework. [EPA-HQ-OAR-2014-0827-1873-A2 p.4]

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22 E.g. 80FR40612 Table 1 of §1037.107 – Phase 2 CO2 Standards for Trailers.

23 For Long Dry Vans, the proposal goes from a baseline of 87.6 to 77 g/ton-mile of CO2 or a 12% reduction. Fuel required roughly scales with the cube of speed, so a reduction of 4% to speed limits, or reducing 65 to 62 would do that.

29 As pointed out in the text, member companies cannot share specifics through the Truck Trailer Manufacturers Association. We will be encouraging individual members to cite this footnote and supply supporting materials as confidential business information.

Organization: Utility Trailer Manufacturing Company

Along with its persistent commitment to building the industry’s strongest, lightest, and safest trailers, Utility is an excellent steward of the environment. Utility Trailer therefore appreciates the Agencies’ overall goal of reducing greenhouse gas emissions. [EPA-HQ-OAR-2014-0827-1183-A1 p.1]

Unfortunately, by extending its Proposed Rule to semi-trailers, the EPA has adopted an unprecedented interpretation of its authority that exceeds its Congressional authorization. Additionally, the Agencies have based its analysis on assumptions that are completely untethered from the real world, resulting in proposed regulations that will yield minimal, if any, net greenhouse-gas reduction while imposing crippling administrative burdens on the semi-trailer industry. Utility Trailer respectfully requests that the Agencies reconsider the wisdom of pursuing its foray into regulating the aerodynamic performance of trailers, and – if they nonetheless are committed to this path – to reform their rules to minimize unnecessary burdens on the industry. [EPA-HQ-OAR-2014-0827-1183-A1 p.1]

Organization: Volvo Group

Also included in the NoDA were arguments related to the Agencies' authority to regulate glider vehicles and trailers. The Volvo Group fully supports EPA's and NHTSA's efforts to achieve efficiency gains and criteria emissions reductions as related to gliders and trailers, and offer our comments that follow accordingly. [EPA-HQ-OAR-2014-0827-1928-A1 p.3]

Comments on Legal Memorandum Pertaining to Trailers, Glider Vehicles, and Glider Kits under the CAA - EPA-HQ-OAR-2014-0827-1627

Volvo further supports EPA's proposal to regulate trailers, although we have no comment with respect to the Agency's position on its legal authority to do so. The regulation of trailers is integral to the success of EPA's Phase II GHG regulation. As EPA's Proposed Rule notes, the Agency predicts that between 3 percent and 8 percent of anticipated fuel consumption and CO2 improvements from the Phase II regulations are expected to come from proposed trailer requirements.[8] While it may be possible, with significant investment, research and development, to design tractors to meet these limits using advanced aerodynamic trailers, and while it may be possible to certify tractors using such trailers, these efforts will be significantly undermined in the absence of regulations requiring the development of aerodynamic trailers. The imposition of stringent new GHG standards on tractors is unreasonable in the absence of similar standards for trailers given the relatively low benefits derived from what will require a very substantial investment for vehicle manufacturers. [EPA-HQ-OAR-2014-0827-1928-A1 p.25]

Organization: Wabash National Corporation

B. Granting "Small" Manufacturers Exemptions Appears Legally Problematic

EPA's legal basis for temporarily exempting small trailer manufacturers is questionable. While EPA relied on the Regulatory Flexibility Act to create special provisions for small trailer manufacturers, "[t]he Regulatory Flexibility Act's requirements are purely procedural and only require the agency to describe the required topics."[54] The Regulatory Flexibility Act therefore "'does not alter the substantive mission of the agencies under their own statutes; rather, the Act creates procedural obligations to assure that the special concerns of small entities are given attention in the comment and analysis process. . . .'"[55] [EPA-HQ-OAR-2014-0827-1242-A2 p.22]

Here, Section 202 of the CAA sets "the substantive mission" of EPA, authorizing the agency to set emissions standards for on-road vehicles and engines.[56] But the text of Section 202 says nothing about authorizing EPA to grant special exemptions for small manufacturers. In contrast, several other sections of the CAA contain small business exemptions.[57] Reading a similar small business exception into Section 202 is dubious because "[w]here Congress explicitly enumerates certain exceptions to a general prohibition, additional exceptions are not to be implied, in the absence of evidence of a contrary legislative intent."[58] [EPA-HQ-OAR-2014-0827-1242-A2 p.22]

The legislative history of Section 202 suggests that Congress did not intend to grant EPA authority for a small manufacturer exemption. In the 1977 CAA amendments, Congress amended Section 202 to create a small manufacturer exemption for certain model years of motor vehicles. That exemption, however, expired in the 1982 model year and was then repealed as part of the 1990 amendments of the CAA.[59] [EPA-HQ-OAR-2014-0827-1242-A2 p.22]

Section 317 of the CAA bolsters the view that Congress never intended EPA to alter or adjust Section 202 emissions standards for small manufacturers. Consistent with the Regulatory Flexibility Act, Section 317 of the CAA requires EPA to prepare a procedural analysis of the "effects" of CAA rulemakings "with respect to small business."[60] However, Section 317 further provides that "[n]othing" in Section 317 "shall be construed" to "alter the basis on which a standard or regulation is promulgated under this chapter," including Section 202.[61] Congress, moreover, stripped courts of jurisdiction to consider any claims arising from EPA's procedural analysis of small business impacts under Section 317.[62] [EPA-HQ-OAR-2014-0827-1242-A2 p.23]

None of these elaborate references to small businesses in the CAA would make much sense if EPA could rely on implied authority to craft small business exemptions.[63] Wabash respectfully submits that all trailer manufacturers, including the remaining 80% of the industry that EPA deems small businesses, comply with the proposed Phase 2 standards. [EPA-HQ-OAR-2014-0827-1242-A2 p.23]

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50 *See id.* at 40,285, 40,544–46. In addition to proposing that small manufacturers receive a one-year delay in complying with the 2018 deadline, EPA requested comment on whether a similar one-year delay maybe warranted when the trailer standards become more stringent in 2021 and 2024. *Id.* at 40,285. EPA also requested comment on whether compliance might be delayed in the future where LRR tires and ATIS might be unavailable for small manufacturers. *Id.* Wabash opposes these vague proposals for future delays because they are speculative, unjustified, and unlawful. Generalized fears about the ability to comply years down the road are no basis to grant additional delays now. If concrete problems arise during the implementation of the rule, small manufacturers may petition EPA for relief, which could then be handled pursuant to the agency's ordinary procedures.

[51] *See id.* at 40,616 (proposed 40 C.F.R. § 1037.150) ("Standards apply on a delayed schedule for manufacturers meeting the small business criteria specified in 13 CFR 121.201.").

[52] *See, e.g.*, EPA & NHTSA, *Draft Regulatory Impact Analysis: Proposed Rulemaking for Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2*, at 1–4 (June 2015) [hereinafter "Draft RIA"] ("Trailers are far less mechanically complex than the tractors that haul them, and much of trailer manufacturing is done by hand.").

[53] Draft RIA at 1-5. *See also* ICR Supporting Statement, at 25 ("Of the 114 trailer manufacturers, 95 are considered small businesses.").

[54] *Associated Dog Clubs ofNew York State, Inc. v. Vilsack*, 75 F. Supp.3d 83, 95 (D.D.C. 2014) (citing *Nat'l Tel. Coop. Ass'n v. FCC,* 563 F.3d 536, 540 (D.C. Cir. 2009) and *U.S. Cellular Corp. v. FCC*, 254 F.3d 78, 88 (D.C. Cir. 2001)

[55] *N.C. Fisheries Ass'n, Inc. v. Gutierrez*, 518 F.Supp.2d 62, 72 (D.D.C. 2007) (quoting *Little Bay Lobster Co., Inc. v. Evans*, 352 F.3d 462, 470 (1st Cir. 2003)).

[56] 42 U.S.C. § 7521(a).

[57] *See, e.g.*, 42 U.S.C. § 7511a(b)(3)(A) (exempting certain small gas stations from gasoline vapor recovery); *id.* § 7545(e)(3) (authorizing EPA to exempt, defer, or modify fuel and additive testing for small businesses); *id.* § 7545(o) (granting small refineries certain exemptions from the Renewable Fuels Standard); *id.* § 7625 (vapor recovery for small business marketers of petroleum products); *id.* § 7651(h) (allowance provisions for small diesel refineries); *id.* § 7661f (small business stationary source technical and environmental compliance assistance program).

[58] *TRW Inc. v. Andrews,* 534 U.S. 19, 28 (2001); *see also NRDC v. EPA*, 489 F.3d 1250, 1259 (D.C. Cir. 2007) ("When the Congress wanted to exempt a particular kind of solid waste combustor from [CAA] section 129's coverage—based on the desirability of resource recovery or any other interest—it knew how to accomplish this through an express statutory exception and in fact did so for four specific classes of combustion units.... Had the Congress intended to exempt all units that combust waste for the purpose of recovering thermal energy, it could likewise have expressly provided for their exemption in the statute.").

[59] *See* CAA Amendments of 1977, PL 95-95, 91 Stat. 685, § 201 (formerly codified at CAA § 202(b)(1)(B), 42 U.S.C. § 7521(b)(1))*; Am. Motors Corp. v. Blum*, 603 F.2d 978 (D.C. Cir. 1979) (vacating EPA action because it violated the small manufacturer exemption formerly found in CAA Section 202(b)(1)(B)).

[60] 42 U.S.C. § 7617(a)(5) (providing that Section 317 applies to rulemakings under Section 202), § 7617 (c)(3) (requiring an analysis of small business impacts for rulemakings covered under Section 317).

[61] 42 U.S.C. § 7617(e)(1); *see also id.* § 7617(c) ("Nothing in this section shall be construed to provide that the analysis of the factors specified in this subsection affects or alters the factors which the Administrator is required to consider in taking any action referred to in subsection (a) of this section.").

[62] 42 U.S.C. § 7617(e)(3) ("Nothing in this section shall be construed. . . to authorize or require any judicial review of any such standard or regulation, or any stay or injunction of the proposal, promulgation, or effectiveness of such standard or regulation on the basis of failure to comply with this section."); *see also Motor & Equip. Mfrs. Ass'n v. Nichols*, 142 F.3d 449, 467 (D.C. Cir. 1998) (holding that Section 317(e)(3) deprived the court of subject matter jurisdiction to review auto suppliers claims that EPA failed to analyze the small business impacts of a Section 202 rule).

[63] *See Michigan v. EPA*, 268 F.3d 1075, 1084 (D.C. Cir. 2001) ("EPA cannot rely on its general authority [under the CAA] to make rules necessary to carry out its functions when a specific statutory directive defines the relevant functions of EPA in a particular area.").

Organization: Rubber Manufacturers Association (RMA)

IV. EPA Should Not Add Regulatory Text Giving the Agency Authority to Recall Trailer Tires

In its October 1, 2015 comments, RMA provided several legal and policy reasons why EPA should not give itself recall authority over tires. RMA's comments seem to be in line with an EPA legal memorandum[4] recently added to the docket and mentioned in the NODA. Specifically, RMA supports EPA's acknowledgement in the legal memorandum that tire manufacturers are not vehicle manufacturers under the Clean Air Act, meaning that the agency would not have recall authority over tire manufacturers. [EPA-HQ-OAR-2014-0827-1933-A1 p.5]

In the legal memorandum, EPA distinguished tire manufacturers from trailer manufacturers in such a way to make clear that tire manufacturers should not be considered vehicle manufacturers.[5] First, EPA pointed out that GHG emissions attributable to the trailer are a substantial portion of the total GHG emissions from the tractor trailer. Next, the agency noted that the trailer is a significant, integral part of the finished motor vehicle. Then, because of those reasons, EPA asserted that a trailer manufacturer is not analogous to a part or component manufacturer such as a tire manufacturer or a manufacturer of a side skirt. By making these arguments, EPA acknowledged that a tire's impact on a trailer's overall GHG emissions is more attenuated, recognized that tires alone are not a significant portion of a finished motor vehicle, and correctly identified tire manufacturers as part manufacturers. [EPA-HQ-OAR-2014-0827-1933-A1 p.5]

Therefore, by EPA characterizing tire manufacturers as part manufacturers, not vehicle manufacturers, the agency is essentially acknowledging that it would not have recall authority over tire manufacturers. RMA supports this determination for several legal and policy reasons discussed below and in prior comments. [EPA-HQ-OAR-2014-0827-1933-A1 p.6]

In the Preamble to the proposed rule, EPA requested comment on whether it should add regulatory text that would essentially give the agency authority to recall trailer tires that do not conform to the regulations.[6] As support for this idea, EPA pointed to section 207(c)(1) of the Clean Air Act, the Act's recall provision.[7]Section 207(c)(1) notes that: [EPA-HQ-OAR-2014-0827-1933-A1 p.6]

If the Administrator determines that a substantial number of any class or category of vehicles or engines, although properly maintained and used, do not conform to the regulations ... of this title, when in actual use throughout their useful life ... [the Administrator] shall require the manufacturer to submit a plan for remedying the nonconformity of the vehicles or engines...[8] [EPA-HQ-OAR-2014-0827-1933-A1 p.6]

Section 216 of the Clean Air Act defines manufacturer as "any person engaged in the manufacturing or assembling of new motor vehicles ... or [any person] who acts for and is under control of any such person."[9] As noted in past comments, the plain language of these provisions seems to provide EPA with recall authority over manufacturers of vehicles and engines only, not over other part manufacturers. [EPA-HQ-OAR-2014-0827-1933-A1 p.6]

The legislative history provides additional evidence that Congress did not intend to give EPA recall authority over other part manufacturers. The portions of the U.S. House Committee Report and the Conference Report that covered section 207 only mention vehicles and engines as the products that could be recalled under that section of the Clean Air Act.[10] The House Committee also envisioned testing of vehicles and engines to be quick, easy, and uniform, which seems incongruous to the testing process for tires.[11] [EPA-HQ-OAR-2014-0827-1933-A1 p.6]

Additionally, tires are a consumable item, not a durable component of the trailer and EPA has historically focused on durable components of vehicles for recall purposes. In addition, unlike many other emissions-related vehicle components, a tire's efficiency improves (tire rolling resistance decreases) as a tire wears, thus improving the tire's contribution to fuel economy. In the most recent and publicly available guidance document on recalls, EPA tracked vehicle and engine recalls by problem category and none of the categories seem comparable to tires. For example, EPA recalls have primarily been related to the catalytic system, the fuel delivery system, or the computer system based on their direct impact on emissions.[12] A tire's impact on emissions is more attenuated. [EPA-HQ-OAR-2014-0827-1933-A1 p.7]

If EPA's recall regulations were applied to tires, it is unclear how they would be enforced. The agency has acknowledged that insignificant defects do not warrant recalls.[13] But in the proposal EPA does not discuss tolerances or other policies to account for manufacturing or testing variability. Similar issues have been addressed in Europe, where regulations setting rolling resistance performance thresholds set a regulatory allowance of 0.3 kg/t to accommodate sources of variability.[14] [EPA-HQ-OAR-2014-0827-1933-A1 p.7]

Other global regions that have adopted the allowance of +0.3 kg/t allowance for conformity of production testing include: [EPA-HQ-OAR-2014-0827-1933-A1 p.7]

• The Brazilian Regulation # R544 "Conformity Assessment Requirements For New Tires"

• South Korea "Regulations for Measurement of Energy Efficiency of Tires for Motor Vehicles, and Its Rating and Identification"

Without an alignment procedure that addresses sources of testing variability (machine alignment, machine drift, production variation, etc.), demonstrating non-compliance would be very difficult. [EPA-HQ-OAR-2014-0827-1933-A1 p.7]

Response: General EPA Authority Issues

Levels of the Standards and Alternative 4

As described in the FRM preamble and in Chapter 2 of the RIA, the agencies have adopted technology-forcing standards that are fully consistent with the agencies' respective statutory authorities. However, the agencies have determined that the so-called Alternative 4 pull ahead vehicle standards would not provide sufficient lead time (raising, among other things, issues of technical reliability, as noted by a number of commenters), and thus would not be appropriate under either agency's authority.

Authority to Exempt Small Businesses

Wabash Corp. argues that section 202 (a)(1) and (2) do not provide authority for EPA to create exemptions for small businesses. (The comment does not address NHTSA's parallel authority under EISA). The gist of the argument is that section 202 (a)(1) and (2) do not explicitly mention exemption authority or small business impacts, that section 202 previously contained such a provision which was removed in the 1990 amendments, and that other provisions of the Act (notably section 317) do address small business impacts showing that Congress was explicit when desiring EPA to consider such impacts, at least in an exemption context. The comment is perplexing. EPA is required to consider "cost of compliance" in establishing standards under section 202 (a)(2). An aspect of considering costs is (or, at the very least, can be) to consider impacts on small entities. Regulatory costs can impact small businesses disproportionately, and also result in standards which are less cost effective due to the smaller volumes of pollutant emitted. These are all factors EPA at the very least may consider in determining an appropriate regulatory regime. Any exemptions EPA chooses to create as part of this consideration must have a reasoned factual basis, but are certainly not outside EPA's delegated authority. The commenter's reference to the former section 202 (b) (1), which was removed by the 1990 amendments, is misplaced. That provision required EPA to consider a different NOx standard and lead time for vehicles manufactured in the 1981 and 1982 model years by smaller volume producers who did not produce their own catalytic converters and lacked the resources to do so. See *American Motors Corp. v. Boyd*, 603 F. 2d 978 (D.C. Cir.1979). The provision was undoubtedly removed in the 1990 amendments because it was moot. Certainly, there is nothing about that former provision suggesting that EPA cannot consider whether regulation is warranted under section 202 (a)(2) as part of consideration of costs. Cf. *U.S. Sugar Corp. v. EPA*, No. 11-1108 (D.C. Cir. July 29, 2016) slip op. at 52 ("Under the CAA, the EPA may sometimes act with a soft touch, rather than a firm hand").

Authority to Establish Delegated Assembly Provisions

Daimler Truck maintains that EPA lacks authority to establish delegated assembly provisions, largely based on a convoluted argument that Congress intended a more restrictive definition of "commerce" in the Clean Air Act (or perhaps in Title II), and that pre-sale vehicles aren't introduced into commerce under that restricted definition. At the beginning of this argument, Daimler states that EPA bases its delegated assembly regulations on the authority to regulate the "introduction into commerce". However, this is incomplete and misleading. The relevant statutory prohibition in section 203(a)(1) prohibits not only the "introduction into commerce" of uncertified vehicles, but also the "distribution in commerce" or "sale" of uncertified vehicles (among others). Daimler does not dispute that, without the exemption provided by the delegated assembly regulations, selling and/or distributing vehicles that are not in a certified configuration is prohibited because such vehicles are not actually covered by a valid certificate of conformity. However, because Daimler's comment focuses on "introduction into commerce", the remainder of this response addresses that aspect of their comment.

Delegated assembly provisions are, of course, not unique to this rule and have been in place for many years. See, e.g. 73 FR 59034, 59137-38 (Oct. 8, 2008). Daimler has operated under these provisions (as it acknowledges), and so may be raising its comment far out of time. In this regard, EPA has already addressed the issue of the relationship between the "introduced into commerce" provision of section 203 (a)(1) and the need for delegated assembly allowances in light of that provision, and so has already addressed the scope of the delegated assembly allowance. See 70 FR 40424-25 (July 13, 2005). EPA did not reopen, reconsider, or otherwise seek comment on this longstanding interpretation. However, in the event this seemingly untimely comment requires response, EPA believes that Daimler is mistaken for the reasons set out below.

Daimler's comment presents the following questions:

1. Does EPA have authority to promulgate pre-sale regulations? More specifically, are pre-sale regulations authorized as regulation of vehicles' "introduction to commerce" under Sec. 202(a)(1))?

2. Assuming EPA's ability to regulate pre-sale matters, is EPA authorized to regulate contracts between the primary manufacturer and any secondary manufacturers for the installation of emissions-related components?

These questions can be answered simply:

1. Yes. Pre-sale regulations fall within the scope of EPA's general Title II authority. In addition, "introduction into commerce" includes pre-sale activities, as "commerce" is not narrowly defined in the Clean Air Act.

2. Yes. EPA may condition the granting of certificates of conformity on a wide range of factors, especially when the primary manufacturer is relying on a secondary manufacturer for partial assembly of the vehicle.

   We explain these answers below.

I. Pre-sale regulation clearly falls within the scope of EPA's general Title II authority.

For most of Title II, no line is drawn for the point at which EPA may begin to regulate. In fact, much of Title II specifically contemplates pre-sale regulation. For example, Sec. 203(a)(3)(A) forbids removal or tampering with devices installed "in compliance with regulations under this subchapter prior to its sale…" and Sec. 203 (a)(3)(B) expressly prohibits "any person to manufacture or sell, or offer to sell, or install, any part or component…where a principle effect of the part is to" render such devices inoperative. Certification under section 206 necessarily addresses pre-sale vehicles.

II. The Clean Air Act does not create a narrow definition of "commerce."

The commenter relies on context clues to argue that the definition of "commerce" under the Clean Air Act (or at least Title II) is narrower than Congress's authority over commerce. There is no direct evidence of Congressional intent to shrink the definition of commerce in the Clean Air Act, however. In fact, Sec. 216(6) defines "commerce" as "(A) commerce between any place in any State and any place outside thereof; and (B) commerce wholly within the District of Columbia." (The commenter, surprisingly, does not even cite this provision). If Congress had meant to define commerce differently from its well-accepted and heavily litigated legal definition, which, as the commenter point out, extends to manufacturing activities, it would have done so expressly in Sec. 216.

III. "Introduction into commerce" includes pre-sale activities.

Congress also meant "introduction into commerce" to include manufacturing and other pre-sale activities. The commenter argues that "if Congress considered 'introduction into commerce' to include manufacturing, then the 'manufacture for sale' is surplusage in the sections of the CAA where it sits alongside mention of sale or introduction into commerce." However, it is clear that the lists of activities outlined in various parts of the Clean Air Act and quoted in part by the commenter are repetitive by design—otherwise, the same surplusage logic applies with equal force to the term "introduction to commerce" itself. The use of "introduction to commerce" in these lists across the Clean Air Act is instructive:

- Sec. 183(e)(3)(A) (42 U.S.C. Sec. 7511b(e)(3)(A)): "In order to carry out this section, the Administrator may, by regulation, control or prohibit any activity, including the manufacture or introduction into commerce, offering for sale, or sale of any consumer or commercial product…"
- Sec. 187(b)(3) (42 U.S.C. Sec. 7512a(b)(3)): "The State shall submit a revision to require that gasoline sold, supplied, offered for sale or supply, dispensed, transported or introduced into commerce…be blended…"
- Sec. 203(a)(1) (42 U.S.C. Sec. 7522(a)(1)) (the provision at issue here): "In the case of a manufacturer…the sale, or the offering for sale, or the introduction, or delivery for introduction, into commerce [is prohibited]…"
- Sec. 211(a) (42 U.S.C. Sec. 7545(a)): "No manufacturer or processor of any such fuel or additive may sell, offer for sale, or introduce into commerce such fuel or additive…"
- Sec. 211(c)(1) (42 U.S.C. Sec. 7545(c)(1)): "The Administrator may…by regulation, control or prohibit the manufacture, introduction into commerce, offering for sale, or sale of any fuel or fuel additive for use in a motor vehicle…"

- Sec. 211(f)(2) (42 U.S.C. Sec. 7545(f)(2)): "It shall be unlawful for any manufacturer of any fuel to introduce into commerce any gasoline which contains a concentration of manganese in excess of .0625…"
- Sec. 211(h)(1) (42 U.S.C. Sec. 7545(h)(1)): "The Administrator shall promulgate regulations making it unlawful for any person during the high ozone season…to sell, offer for sale, dispense, supply, offer for supply, transport, or introduce into commerce gasoline…"

It is unclear from many of these lists what independent work "introduce into commerce" is doing. What does it mean, if not "sale, offer for sale, dispense, supply, offer for supply, [or] transport"? It seems to have been designed by Congress as a catch-all term that allows EPA to regulate commerce-related activities, manufacturing included.

Furthermore, those sections of the Clean Air Act either specifically apply to manufacturers (Secs. 203(a)(1), 211(a), and 211(f)(2)), specifically include manufacturing (Secs. 183(e)(3)(A) and 211(c)(1)), or regulate a product in which manufacturing restrictions would be absurd (Sec. 187(b)(3)), which requires gasoline to be blended with oxygen-rich fuels in certain areas and during certain times of the year to provide for attainment of carbon monoxide NAAQS, and Sec. 211(h)(1), which has a similar time- and place-specific requirement to provide for attainment of the ozone NAAQS).

If a manufacturer is being regulated for what it can "introduce into commerce," that regulation naturally extends to the manufacturing itself. Congress only needed to include "manufacture" in the list of activities that could be regulated for provisions that applied to a broader set of actors than manufacturers themselves.

The commenter also attempts to draw a parallel between "introduction into commerce" and the "useful life" provisions of Title II. That parallel does not seem to exist in any statutory language or legislative history of which EPA is aware. "Useful life" and "introduction into commerce" are used in very different ways in distinct sections of the Clean Air Act, and thus do not inform each other's definitions.

IV. Legislative history supports the view that Sec. 203 allows for regulation of pre-sale activities.

The commenter draws attention to changes in the language of Sec. 203 during the passage of the 1970 Clean Air Act Amendments, but brings up no evidence that these changes actually restrict EPA authority to regulate pre-sale activities. Throughout the debates and eventual passage of the 1970 amendments, Congress made sure to characterize all of the changes made to Sec. 203 as either the status quo ("Sections 203, 204, and 205 would be, for practicable purposes, repetition of existing law." S. Rep. No. 91-1196, at 28) or as expansions of EPA's authority ("This revised section [203] extends the prohibitions now in the Act" in numerous areas. S. Rep. No. 91-1196, at 61).

Statements made during the House debate of the bill support this interpretation. In regards to Sections 203 and 206, "the bill provides for tighter automotive emission control standards and for new testing and certification procedures to insure that new motor vehicle engines comply with the regulations." 116 Cong. Rec. 19,220 (1970) (statement of Rep. Monagan). The same is true for hearings in the Senate. "We wrote the law with the intention of giving the Secretary every authority he could conceivably need" in regards to certificates of conformity. *Air Pollution – 1970: Hearing on S. 2466 Before the Subcomm. on Air and Water Pollution of the S. Comm. on Public Works*, 91st Cong. (1970) (Statement of Sen. Muskie).

V. EPA's testing and inspection authority extends to creation of the "delegated assembly" regulatory provisions.

Under Sec. 206(a)(1), EPA is authorized to issue certificates of conformity to manufacturers whose products pass testing requirements laid down by EPA ("tested in such a manner as [the Administrator] deems appropriate"). Part of that testing regime is being able to understand how individual components of the vehicle contribute to emissions or emissions reductions. Sec. 206(a)(3) explains that such a certificate may only be issued if "any emissions control device, system, or element of design" abides by applicable regulations in Sec. 202(a)(4), which allows for the Administrator to consider a number of factors.

As noted above, delegated assembly provisions were created by EPA years ago to handle the realities of the manufacturing process, especially for heavy duty vehicles, in accord with the structure of the Clean Air Act. If most of a vehicle is built by a primary manufacturer, and then emissions control devices or any other part are installed by a secondary manufacturer, EPA must inquire into the communications and contracts between those manufacturers to verify that the correct parts are going on the correct vehicles consistently, and the installation process is occurring according to the regulations. Certificates of conformity are how Congress empowered EPA to verify the consistency of the manufacturing and recordkeeping processes taken by manufacturers so that the agency didn't have to require extensive testing of every vehicle that came off the line. Delegated assembly provisions, including certain requirements for contracts between primary and secondary manufacturers, allow EPA to continue to issue certificates of conformity for manufacturers who do not assemble the entire vehicle on their own. Without those provisions, EPA would be unable to verify that Sec. 206(a)(3)'s statutory mandate was fulfilled.

The commenter argues that even if EPA can regulate prior to first sale of a vehicle, it still can only adopt "test-based" provisions, and concludes that "prescribing procedures relating to contracts between manufacturers is not 'testing'". This argument fails for the reasons just given. The delegated assembly provisions are a necessary adjunct to the certification (i.e. testing) requirements which are the heart of Title II's compliance regime. This is not regulating the means of manufacture, as the commenter would have it, but rather part of the process of assuring that the vehicle will be assembled in its certified condition.

Finally, Daimler omits mention of several additional relevant points. First, delegated assembly is an option provided as a flexibility in multi-manufacturer situations, but Daimler is free to be the sole manufacturer of the motor vehicle. Second, even if (against our view) one were to accept the commenter's argument of a restrictive definition of commerce, "the offering for sale" and the "delivery for introduction, into commerce" of vehicles without a certificate would still be prohibited. See section 203 (a)(1) of the Act. (As noted above, these additional prohibitions also indicate on their face that pre-sale activities are within EPA's authority under Title II.) Thus, a vehicle must evidently be in certified condition pre-sale by some means. The delegated assembly provisions provide flexibility in multi-manufacturer situations but they are voluntary. Daimler remains free to act as a sole manufacturer should it not wish to utilize the delegated assembly flexibility.

Recall Authority over Tires

The Rubber Manufacturers Association maintain that recall authority exists only with respect to vehicles and engines, and because tires are a part, and not a vehicle or an engine, tire manufacturers cannot be compelled to recall tires. The commenter also points to EPA's discussion in the context of trailers and glider kits which it believes illustrates that, unlike trailers and glider kits, tires are parts, not vehicles.

CAA section 207(c)(1) requires "the manufacturer" to remedy certain in-use problems. The remedy process is generally called recall, and the regulations for this process are in 40 CFR part 1068, subpart F. EPA requested comment on whether to apply these requirements to tire manufacturers in the case of in-use problems with trailer tires. EPA is not adopting this suggestion in the Phase 2 rules, and so we are not requiring that component manufacturers conduct recalls independent of the certificate holder. The Rubber Manufacturers Association indicates correctly that tires are not incomplete vehicles and hence that the recall authority does not apply. However, EPA remains of the view that in the event that trailers do not conform to the standards in-use due to nonconforming tires, tire manufacturers would have a role to play in remedying the problem. In this (hypothetical) situation, a tire manufacturer would not only have produced the part in question, but would have significantly more resources and knowledge regarding how to address (and redress) the problem. Accordingly, EPA would likely require that a component manufacturer responsible for the nonconformity assist in the recall to an extent and in a manner consistent with the provisions of CAA 208 (a). This section specifies that component and part manufacturers "shall establish and maintain records, perform tests where such testing is not otherwise reasonably available under this part and part C of this subchapter (including fees for testing), make reports and provide information the Administrator may reasonably require to determine whether the manufacturer or other person has acted or is acting in compliance with this part and part C of this subchapter and regulations thereunder, or to otherwise carry out the provision of this part and part C of this subchapter...". Any such action would be considered on a case-by-case basis, adapted to the particular circumstances at the time.

Response: EPA Authority for Gliders and Trailers

In this final rule, EPA is establishing first-time CO_2 emission standards for trailers hauled by tractors. 80 FR 40170. Certain commenters, notably the Truck Trailer Manufacturers Association (TTMA), maintained that EPA lacks authority to adopt requirements for trailer manufacturers, and that emission standards for trailers could be implemented, if at all, by requirements applicable to the entity assembling a tractor-trailer combination. The argument is that trailers by themselves are not "motor vehicles" as defined in section 216 (2) of the Act, that trailer manufacturers therefore do not manufacture motor vehicles, and that standards for trailers can be imposed, if at all, only on "the party that joined the trailer to the tractor." Comments of TTMA, p. 4; Comments of TTMA (March 31, 2016) p. 2.

EPA also proposed a number of changes and clarifications for rules respecting glider kits and glider vehicles. 80 FR 40527-40530. As shown in **Error! Reference source not found.**, a glider kit is a tractor chassis with frame, front axle, interior and exterior cab, and brakes. It is intended for self-propelled highway use, and becomes a glider vehicle when an engine, transmission, and rear axle are added. Engines are often salvaged from earlier model year vehicles, remanufactured, and installed in the glider kit. The final manufacturer of the glider vehicle, i.e. the entity that installs an engine, is typically a different manufacturer than the original manufacturer of the glider kit. The final rule contains emission standards for engines used in glider vehicles and for greenhouse gas emissions from glider vehicles, but does not contain separate standards for glider kits.[2]

[2] As discussed below, however, manufacturers of glider kits can, and typically are, responsible for obtaining a certificate of conformity before shipping a glider kit. This is because they are manufacturers of motor vehicles, in this case, an incomplete vehicle. Note that Daimler, in its comments, essentially indicates (in the context of comments related to delegated assembly provisions) that EPA may adopt "test-based" provisions for manufacturers of incomplete vehicles ("even if the EPA could regulate prior to the first use of an engine or

Figure 1 - Typical Glider Kit Configuration

Many commenters to both the proposed rule and the NODA supported EPA's interpretation. However, a number of commenters, including Daimler, argued that glider kits are not motor vehicles and so EPA lacks the authority to impose any rules respecting their sale or configuration. Comments of Daimler, pp.

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vehicle, Congress authorized only test-based standards …testing of vehicles or engines is the means by which the EPA determines the compliance that is necessary for a vehicle or engine's introduction into commerce") The provisions applicable to glider kits are just this type of testing provision, examples being testing of tires and aerodynamic components to generate inputs used in the certification process. (The commenter's arguments that other aspects of the delegated assembly provisions are impermissible are addressed earlier in this same Response).

122-23; Comments of Daimler Trucks (April 1, 2016) pp. 2-3. We respond to these comments below, with additional discussion in RTC Section 14.2.

Under the Act, "motor vehicle" is defined as "any self-propelled vehicle designed for transporting persons or property on a street or highway." CAA section 216 (2). At proposal, EPA maintained that tractor-trailers are motor vehicles and that EPA therefore has the authority to promulgate emission standards for complete and incomplete vehicles – both the tractor and the trailer. 80 FR 40170. The same proposition holds for glider kits and glider vehicles. Id. at 80 FR 40528. The argument that a trailer, or a glider kit, standing alone, is not self-propelled, and therefore is not a motor vehicle, misses the key issues of authority under the Clean Air Act to promulgate emission standards for motor vehicles produced in discrete segments, and the further issue of the entities – namely "manufacturers" – to which standards and certification requirements apply. Simply put, EPA is authorized to set emission standards for complete and incomplete motor vehicles, manufacturers of complete and incomplete motor vehicles can be required to certify to those emission standards, and there can be multiple manufacturers of a motor vehicle, each of which can be required to certify.

Standards for Complete Vehicles – Tractor-Trailers and Glider Vehicles

Section 202 (a)(1) authorizes EPA to set standards "applicable to the emission of any air pollutant from any … new motor vehicles." There is no question that EPA is authorized to establish emission standards under this provision for complete new motor vehicles, and thus can promulgate emission standards for air pollutants emitted by tractor-trailers and by glider vehicles.

Daimler maintained in its comments that although a glider vehicle is a motor vehicle, it is not a "new" motor vehicle because "glider vehicles, when constructed retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not 'new' under the CAA." Daimler Comments p. 121; see also the similar argument in Daimler Truck Comments (April 1, 2016), p. 4. Daimler maintains that because title to the powertrain from the donor vehicle has already been transferred, the glider vehicle to which the powertrain is added cannot be "new." Comments of April 1, 2016 p. 4. Daimler also notes that NHTSA considers a truck to be "newly manufactured" and subject to Federal Motor Vehicle Safety Standards when a new cab is used in its assembly, "unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle." 49 CFR 571.7(e). Daimler urges EPA to adopt a parallel provision here.

First, this argument appears to be untimely. In Phase 1, EPA already indicated that glider vehicles are new motor vehicles, at least implicitly, by adopting an interim exemption for them. See 76 FR 57407 (adopting 40 CFR 1037.150(j) indicating that the general prohibition against introducing a vehicle not subject to current model year standards does not apply to MY 2013 or earlier engines). Assuming the argument that glider vehicles are not new can be raised in this rulemaking, EPA notes that the Clean Air Act defines "new motor vehicle" as "a motor vehicle the equitable or legal title to which has never been transferred to an ultimate purchaser" (section 216(3)). Glider vehicles are typically marketed and sold as "brand new" trucks. Indeed, one prominent assembler of glider kits and glider vehicles advertises that "Fitzgerald Glider Kits offers customers the option to purchase a *brand new 2016 tractor*, in any configuration offered by the manufacturer… Fitzgerald Glider Kits has mastered the process of taking the 'Glider Kit' and installing the components to work seamlessly *with the new truck*." [3] The purchaser

[3] Advertisement for Fitzgerald Glider kits in Overdrive magazine (December 2015)(emphasis added).

of a "new truck" necessarily takes initial title to that truck.[4] Daimler would have it that this 'new truck' terminology is a mere marketing ploy, but it obviously reflects reality. As shown in **Error! Reference source not found.** above, the glider kit constitutes the major parts of the vehicle, lacking only the engine, transmission, and rear axle. The EPA sees nothing in the Act that compels the result that adding a used component to an otherwise new motor vehicle necessarily vitiates classification of the motor vehicle as "new." See 80 FR 40528. Certainly, there is no language in the definition of "new motor vehicle" which directly addresses this issue. Indeed, as noted in Preamble section I.E.1, the definition of "new motor vehicle engine" encompasses engines of any vintage. At the least, this shows that the model year of the engine is not determinative of whether the motor vehicle is "new". Put another way, a "new motor vehicle" can contain an earlier model year engine. See CAA section 216 (3).[5] Many commenters agreed. See, e.g. Comments of MECA ("Glider vehicles are classified as "new motor vehicles" because they use a new chassis, although they can continue to use engines that are 10-15 years old and emit 20-40 times more pollution than vehicles equipped with a new engine"). Thus, EPA is reasonably interpreting the Act to indicate that adding the engine and transmission to the otherwise-complete vehicle does not prevent the glider vehicle from being "new" – as marketed. As to the suggestion to adopt a provision parallel to the NHTSA definition, EPA notes that the NHTSA definition was developed for different purposes using statutory authority which differs from the Clean Air Act in language and intent. There consequently is no basis for requiring EPA to adopt such a definition, and doing so would impede meaningful control of both GHG emissions and criteria pollutant emissions from glider vehicles, the latter being an imperative, immediate public health concern (see RTC 14.2).

Standards for Incomplete Vehicles

Section 202 (a)(1) not only authorizes EPA to set standards "applicable to the emission of any air pollutant from any … new motor vehicles," but states further that these standards are applicable "whether such vehicles … are designed as complete systems or incorporate devices to prevent or control such pollution." The Act in fact thus not only contemplates, but in some instances, directly commands that EPA establish standards for incomplete vehicles and vehicle components. See CAA section 202 (a)(6) (standards for onboard vapor recovery systems on "new light-duty vehicles," and requiring installation of such systems); section 202 (a)(5)(A) (standards to control emissions from refueling motor vehicles, and requiring consideration of, and possible design standards for, fueling system components); 202 (k) (standards to control evaporative emissions from gasoline-fueled motor vehicles). Both TTMA and Daimler argued, in effect, that these provisions are the exceptions that prove the rule and that without this type of enumerated exception, only entire, complete vehicles can be considered to be "motor vehicles." This argument is not persuasive. Congress did not indicate that these incomplete vehicle provisions were exceptions to the definition of motor vehicle. Just the opposite. Without amending the new motor vehicle definition, or otherwise indicating that these provisions were not already encompassed within Title II authority over "new motor vehicles", Congress required EPA to set standards for evaporative emissions from a portion of a motor vehicle. Congress thus indicated in these provisions: 1) that standards should apply to "vehicles" whether or not the "vehicles" were designed as complete systems; 2) that some standards should explicitly apply only to certain components of a

[4] Fitzgerald states "All Fitzgerald glider kits will be titled in the state of Tennessee and you will receive a title to transfer to your state." https://www.fitzgeraldgliderkits.com/frequently-asked-questions. Last accessed July 9, 2016.

[5] EPA has also previously addressed the issue of used components in new engines and vehicles explicitly in regulations in the context of locomotives and locomotive engines in 40 CFR part 1033. There we defined remanufactured locomotives and locomotive engines to be "new" locomotives and locomotive engines. See 63 FR 18980; see also Summary and Analysis of Comments on Notice of Proposed Rulemaking for Emission Standards for Locomotives and Locomotive Engines (EPA-420-R-97-101 (December 1997)) at pp. 10-14.

vehicle that are plainly not self-propelled. Congress thus necessarily was of the view that incomplete vehicles can be motor vehicles.

Emission standards EPA sets pursuant to this authority thus can be, and often are focused on emissions from the new motor vehicle, and from portions, systems, parts, or components of the vehicle. Standards thus apply not just to exhaust emissions, but to emissions from non-exhaust portions of a vehicle, or from specific vehicle components or parts. See the various evaporative emission standards for light duty vehicles in 40 CFR part 86, subpart B (e.g., 40 CFR 86.146-96 and 86.150-98 (refueling spitback and refueling test procedures); 40 CFR 1060.101-103 and 73 FR 59114-59115 (various evaporative emission standards for small spark ignition equipment); 40 CFR 86.1813-17(a)(2)(iii) (canister bleed evaporative emission test procedure, where testing is solely of fuel tank and evaporative canister); see also 79 FR 23507 (April 28, 2014) (incomplete heavy duty gasoline vehicles could be subject to, and required to certify compliance with, evaporative emission standards)). These standards are implemented by testing the particular vehicle component, not by whole vehicle testing, notwithstanding that the component may not be self-propelled until it is installed in the vehicle or (in the case of non-road equipment), propelled by an engine.[6]

EPA thus can set standards for all or just a portion of the motor vehicle notwithstanding that an incomplete motor vehicle may not yet be self-propelled. This is not to say that the Act authorizes emission standards for any part of a motor vehicle, however insignificant. Under the Act it is reasonable to consider both the significance of the components in comparison to the entire vehicle and the significance of the components for achieving emissions reductions. A vehicle that is complete except for an ignition switch can be subject to standards even though it is not self-propelled. Likewise, as just noted, vehicle components that are significant for controlling evaporative emissions can be subject to standards even though in isolation the components are not self-propelled. However, not every individual component of a complete vehicle can be subjected to standards as an incomplete vehicle. To reflect these considerations, EPA is adopting provisions stating that a trailer is a vehicle "when it has a frame with one or more axles attached," and a glider kit becomes a vehicle when "it includes a passenger compartment attached to a frame with one or more axles." Section 1037.801 definition of "vehicle," paragraphs (1)(ii) and (iii); see also Section XIII.B of the FRM Preamble.

TTMA and Daimler each maintained that this claim of authority is open-ended, and can be extended to the least significant vehicle part. As noted above, EPA acknowledges that lines need to be drawn, but whether looking at the relation between the incomplete vehicle and the complete vehicle, or looking at the relation between the incomplete vehicle and the emissions control requirements, it is evident that trailers and glider kits should properly be treated as vehicles, albeit incomplete ones.[7] They properly fall on the vehicle side of the line. When one finishes assembling a whole aggregation of parts to make a finished section of the vehicle (e.g. the trailer), that is sufficient. You have an entire, complete section made up of assembled parts. Everything needed to be a trailer is complete. This is not an engine block, a wheel, or a headlight. Similarly, glider kits comprise the largely assembled tractor chassis with front axles, frame, interior and exterior cab, and brakes. This is not a few assembled components; rather, it is an assembled truck with a few components missing. See CAA section 216 (9) of the Act, which defines

[6] "Non-road vehicles" are defined differently than "motor vehicles" under the Act, but the difference does not appear relevant here. Non-road vehicles, like motor vehicles, must be propelled by an engine. See CAA section 216 (11) ("'nonroad vehicle' means a vehicle that is powered by a nonroad engine"). Pursuant to this authority, EPA has promulgated many emission standards applicable to components of engineless non-road equipment, for which the equipment manufacturer must certify.

[7] Cf. *Marine Shale Processors v. EPA*, 81 F. 3d 1371, 1383 (5th Cir. 1996) ("[w]e make no comment on this argument: this is simply not a thimbleful case").

"motor vehicle or engine part manufacturer" as "any person engaged in the manufacturing, assembling or rebuilding of any device, system, part, component or element of design which is installed in or on motor vehicles or motor vehicle engines." Trailers and glider kits are not "installed in or on" a motor vehicle. A trailer is half of the tractor-trailer, not some component installed on the tractor. And one would more naturally refer to the donor drivetrain being installed on the glider kit than vice versa. See Figure 1 above. Furthermore, as discussed below, the trailer and the glider kit are significant for purposes of controlling emissions from the completed vehicle.

Incomplete vehicle standards must, of course, be reasonably designed to control emissions caused by that particular vehicle segment. The standards for trailers would do so and account for the tractor-trailer combination by using a reference tractor in the trailer test procedure (and, conversely, by use of a reference trailer in the tractor test procedure). The Phase 2 rule contains no emission standards for glider kits in isolation, but the standards for engines installed in glider vehicles, and the greenhouse gas standards for the glider vehicles, necessarily reflect the contribution of the glider kit.

Application of Emission Standards to Manufacturers

In some ways, the critical issue is to whom do these emission standards apply.[8] As explained in this section, the emission standards apply to manufacturers of motor vehicles, and manufacturers thus are required to certify compliance to test and to certify compliance to those standards. Moreover, the Act contemplates that a motor vehicle can have multiple manufacturers. With respect to the further question of which manufacturer certifies and tests in multiple manufacturer situations, EPA rules have long contained provisions establishing responsibilities where a vehicle has multiple manufacturers. We are again applying the principles already established in these rules in the Phase 2 provisions. The overarching and common sense principle is that the entity with most control over the particular vehicle segment due to producing it is usually the most appropriate entity to test and certify.[9] EPA is implementing the trailer and glider vehicle emission standards in accord with this principle, so that the entities required to test and certify are the trailer manufacturer and, for glider kits and glider vehicles, either the manufacturer of the glider kit or glider vehicle, depending on which is more appropriate in individual circumstances.

Definition of Manufacturer

Emission standards are implemented through regulation of the manufacturer of the new motor vehicle. See, e.g. section 206 (a)(1) (certification testing of motor vehicle submitted by "a manufacturer"); 203 (a)(1) (manufacturer of new motor vehicle prohibited from introducing uncertified motor vehicles into commerce); 207 (a)(1) (manufacturer of motor vehicle to provide warranty to ultimate purchaser of

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[8] This issue is independent of the discussion above, and thus is not dependent on whether trailers are motor vehicles. Under any theory, EPA may issue emission standards for new motor vehicles and engines. Manufacturers of these vehicles and engines can be required to comply with these standards by testing and certification, and the Act contemplates multiple manufacturers to whom these obligations can attach.

[9] See discussion of standards applicable to small SI equipment fuel systems, implemented by standards for the manufacturers of that equipment at 73 FR 59115 ("In most cases, nonroad standards apply to the manufacturer of the engine or the manufacturer of the nonroad equipment. Here, the products subject to the standards (fuel lines and fuel tanks) are typically manufactured by a different manufacturer. In most cases the engine manufacturers do not produce complete fuel systems and therefore are not in a position to do all the testing and certification work necessary to cover the whole range of products that will be used. We are therefore providing an arrangement in which manufacturers of fuel-system components are in most cases subject to the standards and are subject to certification and other compliance requirements associated with the applicable standards.").

compliance with applicable emission standards); 207 (c) (recall authority); 208 (a) (recordkeeping and testing can be required of every manufacturer of new motor vehicle).

The Act further distinguishes between manufacturers of motor vehicles and manufacturers of motor vehicle parts. See, e.g. section 206 (a)(2) (voluntary emission control system verification testing); 203 (a)(3)(B) (prohibition on parts manufacturers and other persons relating to defeat devices); 207 (a)(2) (parts manufacturer may provide warranty certification regarding use of parts); 208 (a) (recordkeeping and testing requirements for manufacturers of vehicle and engine "parts or components").

Thus, the question here is whether a trailer manufacturer or glider kit manufacturer can be a manufacturer of a new motor vehicle and thereby become subject to the certification and related requirements for manufacturers, or must necessarily be classified as a manufacturer of a motor vehicle part or component. EPA may reasonably classify trailer manufacturers and glider kit manufacturers as motor vehicle manufacturers.

Section 216 (1) defines a "manufacturer" as:

> "any person engaged in the manufacturing or assembling of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, or importing such vehicles or engines for resale, or who acts for and is under the control of any such person in connection with the distribution of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, but shall not include any dealer with respect to new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines received by him in commerce"

It appears plain that this definition was not intended to restrict the definition of "manufacturer" to a single person per vehicle. The use of the conjunctive, specifying that a manufacturer is "*any* person engaged in the manufacturing or assembling of new motor vehicles . . . *or* who acts for and is under the control of any such person…" (emphasis added) indicates that Congress anticipated that motor vehicles could have more than one manufacturer, since in at least some cases those will plainly be different people. The capacious reference to "any person engaged in the manufacturing of motor vehicles" likewise allows the natural inference that it could apply to multiple entities engaged in manufacturing.[10]

The provision also applies both to entities that manufacture and entities that assemble, and does so in such a way as to encompass multiple parties: manufacturers "or" (rather than 'and') assemblers are included. Nor is there any obvious reason that only one person can be engaged in vehicle manufacture or vehicle assembling.

Reading the Act to provide for multiple motor vehicle manufacturers reasonably reflects industry realities, and achieves important goals of the CAA. Since title II requirements are generally imposed on "manufacturers" it is important that the appropriate parties be included within the definition of manufacturer --"any person engaged in the manufacturing or assembling of new motor vehicles." Indeed, as set out in Chapter 1 of the RIA, most heavy-duty vehicles are manufactured or assembled by multiple entities; see also Comments of Daimler (October 1, 2015) p. 103.[11] One entity produces a

[10] See *United States v. Gonzales,* 520 U.S. 1, 5, (1997) ("Read naturally the word `any' has an expansive meaning, that is, `one or some indiscriminately of whatever kind'); *New York v. EPA*, 443 F.3d 880, 884-87 (DC Cir. 2006).
[11] "The EPA should understand that vehicle manufacturing is a multi-stage process (regardless of the technologies on the vehicles) and that each stage of manufacturer has the incentive to properly complete manufacturing …[T]he

chassis; a different entity manufactures the engine; specialized components (e.g. garbage compactors, cement mixers) are produced by still different entities. For tractor-trailers, one person manufactures the tractor, another the trailer, a third the engine, and another typically assembles the trailer to the tractor. Installation of various vehicle components occurs at different and varied points and by different entities, depending on ultimate desired configurations. See, e.g. Comments of Navistar (October 1, 2015), pp. 12-13. The heavy-duty sector thus differs markedly from the light-duty sector (and from manufacturing of light duty pickups and vans), where a single company designs the vehicle and engine (and many of the parts), and does all assembling of components into the finished motor vehicle.

Controls on Manufacturers of Trailers

It is reasonable to view the trailer manufacturer as "engaged in" (section 216 (1)) the manufacturing or assembling of the tractor-trailer. The trailer manufacturer designs, builds, and assembles a complete and finished portion of the tractor-trailer. All components of the trailer – the tires, axles, flat bed, outsider cover, aerodynamics – are within its control and are part of its assembling process. The trailer manufacturer sets the design specifications that affect the GHG emissions attributable to pulling the trailer. It commences all work on the trailer, and when that work is complete, nothing more is to be done. The trailer is a finished product. With respect to the trailer, the trailer manufacturer is analogous to the manufacturer of the light duty vehicle, specifying, controlling, and assembling all aspects of the product from inception to completion. GHG emissions attributable to the trailer are a substantial portion of the total GHG emissions from the tractor-trailer.[12] Moreover, the trailer manufacturer is not analogous to the manufacturer of a vehicle part or component, like a tire manufacturer, or to the manufacturer of a side skirt. The trailer is a significant, integral part of the finished motor vehicle, and is essential for the tractor-trailer to carry out its commercial purpose. See 80 FR 40170; see also the comment of EDF at n. 104, explaining that trucking companies do not provide insurance protection for truckers when operating a truck-tractor without an attached trailer; it is considered to be a non-business activity).[13] Although it is true that another person may ultimately hitch the trailer to a tractor (which might be viewed as completing assembly of the tractor-trailer), as noted above, EPA does not believe that the fact that one person might qualify as a manufacturer, due to "assembling" the motor vehicle, precludes another person from qualifying as a manufacturer, due to "manufacturing" the motor vehicle. Given that section 216(1) does not restrict motor vehicle manufacturers to a single entity, it appears to be consistent with the facts and the Act to consider trailer manufacturers as persons engaged in the manufacture of a motor vehicle.

This interpretation of section 216(1) is also reasonable in light of the various provisions noted above relating to implementation of the emissions standards – certification under section 206, prohibitions on entry into commerce under section 203, warranty and recall under section 207, and recall under section 208. All of these provisions are naturally applied to the entity responsible for manufacturing the trailer, which manufacturer is likewise responsible for its GHG emissions.

EPA should continue the longstanding industry practice of allowing primary manufacturers to pass incomplete vehicles with incomplete vehicle documents to secondary manufacturers who complete the installation."

[12] The relative contribution of trailer controls depends on the types of tractors and trailers, as well as the tier of standards applicable; however, it can be approximately one-third of the total reduction achievable for the tractor-trailer.

[13] 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.

TTMA maintains that if a tractor-trailer is a motor vehicle, then only the entity connecting the trailer to the tractor could be subject to regulation.[14] This is not a necessary interpretation of section 216 (1), as explained above. TTMA does not discuss that provision, but notes that other provisions refer to "a" manufacturer (or, in one instance, "the" manufacturer), and maintains that this shows that only a single entity can be a manufacturer. See TTMA Comment pp. 4-5, citing to sections 206 (a)(1), 206 (b), 207, and 203 (a). This reading is not compelled by the statutory text. First, the term "manufacturer" in all of these provisions necessarily reflects the underlying definition in section 216(1), and therefore is not limited to a single entity, as just discussed. Second, the interpretation makes no practical sense. An end assembler of a tractor-trailer is not in a position to certify and warrant performance of the trailer, given that the end-assembler has no control over how trailers are designed, constructed, or even which trailers are attached to the tractor. It makes little sense for the entity least able to control the outcome to be responsible for that outcome. The EPA doubts that Congress compelled such an ungainly implementation mechanism, especially given that it is well known that vehicle manufacture responsibility in the heavy-duty vehicle sector is divided. Moreover, the reference to "a" rather than "the" manufacturer in the provisions of section 206(a)(1) and 203(a)(1) – the provisions on vehicle certification and prohibited acts which are the most critical to Title II's implementation -- is ambiguous as to whether there can be multiple manufacturers. See Webster's New Collegiate Dictionary (1979) (definition of "a" includes "any", the same capacious term used in the section 216 definition of "manufacturer").

TTMA further maintains that the various requirements and prohibitions in Title "on their face do not work as applied to 'two detachable parts' of a single motor vehicle that are mixed and matched. In the case of separate manufacturers of the tractor and various trailers that might be hauled by that tractor, the requirements to test, certify, and warrant 'the motor vehicle' cannot on their face apply as written, since there is no single manufacturer of 'the motor vehicle.' And responsibility for violations, such as by selling an uncertified new motor vehicle, is unspecified."

EPA disagrees. As just explained, the definition of "manufacturer" plainly contemplates that more than one entity can be the manufacturer of a motor vehicle (as do the references to "a manufacturer"). The fact that portions of the CAA refer to "a manufacturer" does not amend the explicit definition of "manufacturer" to limit it to a single entity per motor vehicle —it merely indicates the responsibilities that can attach to any entity that manufactures motor vehicles. EPA has long interpreted and applied these provisions in a manner that comports with Congressional intent and industry practice to place the responsibilities for certification with the most appropriate of those entities. This can be done by explicitly assigning certification responsibility, or by having multiple manufacturers determine among themselves which are the most appropriate to certify given their particular division of responsibilities. Thus, in the case of tractor-trailers, the entity that has control over design and emissions performance of the tractor is responsible for testing and certifying that the tractor will comply with applicable standards, while the entity that has control over design and emissions performance of the trailer is responsible for testing and certifying that the trailer will comply with applicable standards. The long-standing provisions on delegated assembly and secondary manufacturing are examples of the second situation where manufacturers determine among themselves testing, documentation, and certification responsibilities. See 40 CFR 1037.620, 1037.621, 1037.622, and Preamble Section I.F.2.e.

EPA is therefore reasonably interpreting the definition of "manufacturer" and the various implementation provisions using that term to reflect the realities of the heavy duty vehicle industry whereby multiple manufacturers are responsible for assembling the motor vehicle.

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[14] Consequently, the essential issue here is not whether EPA can issue and implement emission standards for trailers, but at what point in the implementation process those standards apply.

Controls on Manufacturers of Glider Kits

Application of these same principles indicate that a glider kit manufacturer is a manufacturer of a motor vehicle and, as an entity responsible for assuring that glider vehicles meet the Phase 2 vehicle emission standards, can be a party in the certification process as either the certificate holder or the entity which provides essential test information to the glider vehicle manufacturer. As noted above, glider kits include the entire tractor chassis, cab, tires, body, and brakes. Glider kit manufacturers thus control critical elements of the ultimate vehicle's greenhouse gas emissions, in particular, all aerodynamic features and all emissions related to steer tire type. Glider kit manufacturers would therefore be the entity generating critical GEM inputs – at the least, those for aerodynamics and tires. Glider kit manufacturers also often know the final configuration of the glider vehicle, i.e. the type of engine and transmission which the final assembler will add to the glider kit.[15] This is because the typical glider kit contains all necessary wiring, and it is necessary, in turn, for the glider kit manufacturer to know the end configuration in order to wire the kit properly. Thus, a manufacturer of a glider kit can reasonably be viewed as a manufacturer of a motor vehicle under the same logic as above: there can be multiple manufacturers of a motor vehicle; the glider kit manufacturer designs, builds, and assembles a substantial, complete and finished portion of the motor vehicle; and that portion contributes substantially to the GHG emissions from the ultimate glider vehicle. A glider kit is not a vehicle part; rather, it is an assembled truck with a few components missing. The ultimate point here is that both of these entities are manufacturers of the glider motor vehicle and therefore both are within the Act's requirements for certification and testing

EPA rules have long provided provisions establishing responsibilities where there are multiple manufacturers of motor vehicles. See 40 CFR 1037.620 (responsibilities for multiple manufacturers), 40 CFR 1037.621 (delegated assembly), and 40 CFR 1037.622 (shipment of incomplete vehicles to secondary vehicle manufacturers). These provisions, in essence, allow manufacturers to determine among themselves as to which should be the certificate holder, and then assign respective responsibilities depending on that decision. The end result is that incomplete vehicles cannot be introduced into commerce without one of the manufacturers being the certificate holder.

Under the Phase 1 rules, glider kits are considered to be incomplete vehicles which may be introduced into commerce to a secondary manufacturer for final assembly. See 40 CFR 1037.622(b)(1)(i) and 1037.801 (definition of "vehicle" and "incomplete vehicle") of the Phase 1 regulations (76 FR 57421). Note that 40 CFR 1037.622(b)(1)(i) was originally codified as 40 CFR 1037.620(b)(1)(i). EPA is expanding somewhat on these provisions, but in essence, as under Phase 1, glider kit and glider vehicle manufacturers could operate under delegated assembly provisions whereby the glider kit manufacturer would be the certificate holder. See 40 CFR 1037.621 of the final regulations. Glider kit manufacturers would also continue to be able to ship uncertified kits to secondary manufacturers, and the secondary manufacturer must assemble the vehicle into certifiable condition. 40 CFR 1037.622.[16]

Additional Authorities Supporting EPA's Actions

[15] PACCAR indicated in its comments that manufacturers of glider kits may not know all details of final assembly. Provisions on delegated assembly, shipment of incomplete vehicles to secondary manufacturers, and assembly instructions for secondary vehicle manufacturers allow manufacturers of glider kits and glider vehicles to apportion responsibilities, as appropriate, including responsibility as to which entity shall be the certificate holder. See 40 CFR 1037.130, 1037.621, and 1037.622.

[16] Under this provision in the Phase 2 regulations, the glider kit manufacturer would still have some responsibility to ensure that products they introduce into U.S. commerce will conform with the regulations when delivered to the ultimate purchasers.

Even if, against our view, trailers and glider kits are not considered to be "motor vehicles," and the entities engaged in assembling trailers and glider kits are not considered to be manufacturers of motor vehicles, the Clean Air Act still provides authority for the testing requirements adopted here. Section 208 (a) of the Act authorizes EPA to require "every manufacturer of new motor vehicle or engine parts or components" to "perform tests where such testing is not otherwise reasonably available." This testing can be required to "provide information the Administrator may reasonably require to determine whether the manufacturer … has acted or is acting in compliance with this part," which includes showing whether or not the parts manufacturer is engaged in conduct which can cause a prohibited act. Testing would be required to show that the trailer will conform to the vehicle emission standards. In addition, testing for trailer manufacturers would be necessary here to show that the trailer manufacturer is not causing a violation of the combined tractor-trailer GHG emission standard either by manufacturing a trailer which fails to comply with the trailer emission standards, or by furnishing a trailer to the entity assembling tractor-trailers inconsistent with tractor-trailer certified condition. Testing for glider kit manufacturers is necessary to prevent a glider kit manufacturer furnishing a glider kit inconsistent with the tractor's certified condition. In this regard, we note that section 203 (a)(1) of the Act not only prohibits certain acts, but also prohibits "the causing" of those acts. Furnishing a trailer not meeting the trailer standard would cause a violation of that standard, and the trailer manufacturer would be liable under section 203 (a)(1) for causing the prohibited act to occur. Similarly, a glider kit supplied in a condition inconsistent with the tractor standard would cause the manufacturer of the glider vehicle to violate the GHG emission standard, so the glider kit manufacturer would be similarly liable under section 203 (a)(1) for causing that prohibited act to occur.

In addition, section 203 (a)(3)(B) prohibits use of 'defeat devices' – which include "any part or component intended for use with, or as part of, any motor vehicle … where a principal effect of the part or component is to … defeat … any … element of design installed … in a motor vehicle" otherwise in compliance with emission standards. Manufacturing or installing a trailer not meeting the trailer emission standard could thus be a defeat device causing a violation of the emission standard. Similarly, a glider kit manufacturer furnishing a glider kit in a configuration that would not meet the tractor standard when the specified engine, transmission, and axle are installed would likewise cause a violation of the tractor emission standard. For example, providing a tractor with a coefficient of drag or tire rolling resistance level inconsistent with tractor certified condition would be a violation of the Act because it would cause the glider vehicle assembler to introduce into commerce a new tractor that is not covered by a *valid* certificate of conformity. Daimler argued in its comments that a glider kit would not be a defeat device because glider vehicles use older engines which are more fuel efficient since they are not meeting the more rigorous standards for criteria pollutant emissions. (Daimler Truck Comment, April 1, 2016, p. 5). However, the glider kit would be a defeat device with respect to the tractor *vehicle* standard, not the separate engine standard. A non-conforming glider kit would adversely affect compliance with the vehicle standard, as just explained. Furthermore, as explained in RTC 14.2, Daimler is incorrect that glider vehicles are more fuel efficient than Phase 1 2017 and later vehicles, much less Phase 2 vehicles.

In the memorandum accompanying the Notice of Data Availability, EPA solicited comment on adopting additional regulations based on these principles. EPA has decided not to adopt those provisions, but again notes that the authorities in CAA sections 208 and 203 support the actions EPA is taking here with respect to trailer and glider kit testing.

Standards for Glider Vehicles and Lead Time for Those Standards

At proposal, EPA indicated that engines used in glider vehicles are to be certified to standards for the model year in which these vehicles are assembled. 80 FR 40528. This action is well within the agency's legal authority. As noted above, the Act's definition of "new motor vehicle engine," includes any "engine in a new motor vehicle" without regard to whether or not the engine was previously used. Given the Act's purpose of controlling emissions of air pollutants from motor vehicle engines, with special concern for pollutant emissions from heavy-duty engines, it is reasonable to require engines placed in newly-assembled vehicles to meet the same standards as all other engines in new motor vehicles. Put another way, it is both consistent with the plain language of the Act and reasonable and equitable for the engines in "new trucks" (see Section I.E.(1)(a) of the FRM Preamble) to meet the emission standards for all other engines installed in new trucks.

Daimler challenged this aspect of EPA's proposal, maintaining that it amounted to regulation of vehicle rebuilding, which (according to the commenter) is beyond EPA's authority. Comments of Daimler, p. 123; Comments of Daimler Trucks (April 1, 2016) p. 3. This comment is misplaced. The EPA has authority to regulate emissions of pollutants from engines installed in new motor vehicles. As explained above, glider vehicles are new motor vehicles. As also explained above, the Act's definition of "new motor vehicle engine" includes any "engine in a new motor vehicle" without regard to whether or not the engine was previously used. CAA section 216(3). Consequently, a previously used engine installed in a glider vehicle is within EPA's multiple authorities. See CAA sections 202 (a) (1) (GHGs), and 202 (a)(3)(D) (pollutants from rebuilt heavy duty engines).[17]

As explained in more detail in Section XIII.B of the FRM Preamble, the final rule requires that as of January 1, 2017, glider kit and glider vehicle production involving engines not meeting criteria pollutant standards corresponding to the year of glider vehicle assembly be allowed at the highest annual production for any year from 2010 to 2014. See section 1037.150 (t)(3). (Certain exceptions to this are explained in Section XIII.B. of the FRM Preamble). The rule further requires that as of January 1, 2018, engines in glider vehicles meet criteria pollutant standards and GHG standards corresponding to the year of the glider vehicle assembly, but allowing introduction into commerce of engines meeting criteria pollutant standards corresponding to the year of the engine for up to 300 vehicles per year, or up to the highest annual production volume for calendar years 2010 to 2014, whichever is less. Section 1037.150 (t)(1)(ii) (again subject to various exceptions explained in Section XIII.B. of the FRM Preamble). Glider vehicles using these exempted engines will not be subject to the Phase 1 GHG *vehicle* standards, but will be subject to the Phase 2 vehicle standards beginning with MY 2021.

[17] Comments from, e.g. Mondial and MEMA made clear that all of the donor engines installed in glider vehicles are rebuilt. See also http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx ("1999 to 2002-model diesels were known for reliability, longevity and good fuel mileage. Fitzgerald favors Detroit's 12.7-liter Series 60 from that era, but also installs pre-EGR 14-liter Cummins and 15-liter Caterpillar diesels. All are rebuilt …..").

There are compelling environmental reasons for taking these actions in this time frame. As shown in a separate Sensitivity Analysis of Glider Impacts (Appendix A to Section 14 of this RTC), the restriction on 2017 production is projected to prevent the use of high polluting pre 2002-engines in 5,000 to 10,000 glider vehicles, and would prevent the emission of 207,500-415,000 tons of NOx and 3,400-6,800 tons of PM over the lifetime of those vehicles and engines. This is estimated to prevent *350 to 1,600* premature mortalities. If these restrictions were delayed until MY 2021, as commenters argued, this could mean the production of 30,000 to 40,000 additional glider vehicles using the older high polluting engines. Using the same assumptions as above, these three additional model years of production are estimated to result in an additional *2,100 to 6,400* premature mortalities.

These estimates are conservative. They do not account for diesel exhaust PM being a likely human carcinogen (see Preamble section VIII.A.6), and so do not assess potential additional cancers caused by exposure to diesel PM exhaust from these glider vehicles. Nor do these estimates evaluate premature mortality attributable to increased generation of, and exposure to ozone resulting from the increased NOx emissions.

With regard to the issue of lead time, EPA indicated at proposal that the agency has long since justified the criteria pollutant standards for engines installed in glider kits. 80 FR 40528. EPA further proposed that engines installed in glider vehicles meet the emission standard for the year of glider vehicle assembly, as of January 1, 2018 and solicited comment on an earlier effective date. Id. at 40529. The agency noted that CAA section 202 (a)(3)(D)[18] requires that standards for rebuilt heavy-duty engines take effect "after a period … necessary to permit the development and application of the requisite control measures." Here, no time is needed to develop and apply requisite control measures for criteria pollutants because compliant engines are immediately available.[19] In fact, manufacturers of compliant engines, and dealers of trucks containing those compliant engines, commented that they are disadvantaged by manufacturing more costly compliant engines while glider vehicles avoid using those engines. Not only are compliant engines immediately available, but, as commenters warned, there can be risk of massive pre-buys. Moreover, EPA does not envision that glider manufacturers will actually modify the older engines to meet the applicable standards. Rather, they will either choose from the many compliant engines available today, or they will seek to qualify under other flexibilities provided in the final rule. See Section XIII.B of the FRM Preamble. Given that compliant engines are immediately available, the flexibilities provided in the final rule for continued use of donor engines for traditional glider vehicle functions and by small businesses, and the need to expeditiously prevent further perpetuation of use of heavily polluting engines, EPA sees a need to begin constraining this practice on January 1, 2017 However, the final rule is merely capping glider production using higher-polluting engines in 2017 at 2010-2014 production levels, which would allow for the production of thousands of glider vehicles using these higher polluting engines in 2017, and unlimited production of glider vehicles using less polluting engines.

Various commenters, however, argued that the EPA must provide four years lead-time and three-year stability pursuant to section 202 (a) (3)(C) of the Act, which applies to regulations for criteria pollutant emissions from heavy duty vehicles or engines. For criteria pollutant standards, CAA section

[18] The engine rebuilding authority of section 202 (a)(3)(D) includes removal of an engine from the donor vehicle. See 40 CFR section 86.004-40 and 62 FR 54702 (Oct. 21, 1997). EPA interprets this language as including installation of the removed engine into a glider kit, thereby assembling a glider vehicle. Daimler, in its comments, questioned whether engine rebuilding authorities were at issue here when EPA did not propose to amend the specific regulations relating to engine rebuilding. EPA has added a conforming cross-reference to the final rule. See section 1068.120 (f).

[19] Memo to Docket, "Availability of Rebuilt Engines that Comply with 2010 Emission Standards", August 2016.

202(a)(3)(C) establishes lead time and stability requirements for "[a]ny standard promulgated or revised under this paragraph and applicable to classes or categories of heavy duty vehicles or engines." In this rule, EPA is generally requiring large manufacturers of glider vehicles to use engines that meet the standards for the model year in which a vehicle is manufactured. EPA is not promulgating new criteria pollutant standards. The NO_X and PM standards that apply to heavy duty engines were promulgated in 2001.

We are not amending these provisions or promulgating new criteria pollutant standards for heavy duty engines here. EPA interprets the phrase "classes or categories of heavy duty vehicles or engines" in CAA 202(a)(3)(C) to refer to categories of vehicles established according to features such as their weight, functional type, (e.g. tractor, vocational vehicle, or pickup truck) or engine cycle (spark-ignition or compression-ignition), or weight class of the vehicle into which an engine is installed (LHD, MHD, or HHD). EPA has established several different categories of heavy duty vehicles (distinguished by gross vehicle weight, engine-cycle, and other criteria related to the vehicles' intended purpose) and is establishing in this rule GHG standards applicable to each category.[20] By contrast, a "glider vehicle" is defined not by its weight or function but by its method of manufacture. A Class 8 tractor glider vehicle serves exactly the same function and market as a Class 8 tractor manufactured by another manufacturer. Similarly, rebuilt engines installed in glider vehicles (i.e. donor engines) are not distinguished by engine cycle, but rather serve the same function and market as any other HHD or MHD engine. Thus, EPA considers "glider vehicles" and engines installed in glider vehicles to be a description of a method of manufacturing new motor vehicles, not a description of a separate "class or category" of heavy duty vehicles or engines. Consequently, EPA is not adopting new standards for a class or category of heavy duty engines within the meaning of section 202 (a)(3)(C) of the Act.

EPA believes this approach is most consistent with the statutory language and the goals of the Clean Air Act. The date of promulgation of the criteria pollutant standards was 2001. There has been plenty of lead time for the criteria pollutant standards and as a result, manufacturers of glider vehicles have many options for compliant engines that are available on the market today—just as manufacturers of other new heavy-duty vehicles do. We are even providing additional compliance flexibilities to glider manufacturers in recognition of the historic practice of salvaging a small number of engines from vehicles involved in crashes. See Section XIII.B of the FRM Preamble. We do not believe that Congress intended to allow changes in how motor vehicles are manufactured to be a means of avoiding existing, applicable engine standards. Obviously, any industry attempts to avoid or circumvent standards will not become apparent until the standards begin to apply. The unreasonableness of the commenters' interpretation becomes apparent when one realizes that it would effectively preclude EPA from curbing many types of avoidance, however dangerous, until at least four years from detection. As noted above, EPA estimates conservatively that thousands of premature mortalities are at issue here, emphasizing the need to take expeditious action.

As to Daimler's further argument that the lead time provisions in section 202 (3)(C) not only apply but also must trump those specifically applicable to heavy duty engine rebuilding, the usual rule of construction is that the more specific provision controls. See, e.g. *HCSC-Laundry v. U.S.*, 450 U.S.1, 6 (1981). EPA also does not accept Daimler's further argument that section 202 (a)(3)(C) lead time provisions also apply to engine rebuilding because those provisions fall within the same paragraph. First, as explained above, section 202 (a)(3)(C) applies to categories of vehicles and engines established according to features such as their weight, functional type, or engine cycle, or weight class of the vehicle into which an engine is installed. Rebuilt engines are not distinguished by engine cycle, but

[20] Note, however, the Phase 2 GHG standards for tractors and vocational vehicles do not apply until MY 2021.

rather serve the same function and market as any other engine. Consequently, EPA does not believe that section 202 (a)(3)(C) is applicable here. Moreover, the interpretation advocated by the commenters would render the separate lead time provisions for engine rebuilding a virtual nullity.[21] The sense of the provision is that Congress intended there to be independent lead time consideration for the distinct practice of engine rebuilding. For example, section 202 (a)(3)(C) specifies three "model years" of needed lead time. The concept of model years is a virtual non-sequitur as applied to engine rebuilding, when there is no specific model year (or year-by-year) production involved. Rather, individual engines from any year are being rebuilt. More generally, the purpose of long lead time, to accommodate manufacturers' necessarily long design and redesign cycles and to allow time for research and development plus field testing, again do not apply to engine rebuilding. Engines can be rebuilt at any time, and rebuilding is not tied to design cycles or R&D decisions. It involves an engine-by-engine, ad hoc decision. Under these circumstances, it is at least ambiguous as to whether the reference to "paragraph" in section 202 (a)(3)(C) (assuming, against our view that the provision applies at all) encompasses the separate lead time provision for rebuilt engines in section 202 (a)(3)(D). Cf. *Desert Citizens Against Pollution v. EPA*, 699 F. 3d 524, 527-28 (D.C. Cir. 2013) (reference to "section" held to be ambiguous where applying provisions of that section leads to results at odds with the overall statutory scheme).

1.3.2 NHTSA Authority67

Organization: *Allison Transmission, Inc.*

EPA and NHTSA Face Statutory Constraints in Requiring New Technology; Alternative 4 is Not Supported in The Record

The Proposed Rule states that several steps have been taken in the rulemaking to address concerns about disrupting the market, including providing considerable lead time, phasing-in of the standards, preserving technology choices, allowing emission averaging, banking and trading and economic savings over time through reduced fuel costs.[12] But these steps only can go so far in a market which is driven by customer demands for vehicles that accomplish specific tasks. EPA and NHTSA cannot conflate necessary flexibility in implementation of new standards with a statutory ability to increase the stringency of emission and fuel efficiency standards beyond a reasonable projection of future technology specific to MD/HD vehicles and the lead time necessary for market adoption. Both Clean Air Act ("CAA") section 202 and NHTSA's statutory authority in 49 U.S.C. §32902(k) are not unbounded, but must be read in context of the MD/HD market, including such periods as are necessary to "permit the development and application of requisite technology."[13] [EPA-HQ-OAR-2014-0827-1284-A1 p.11-12]

In this regard, EPA indicates that it has "significant discretion in assessing, weighing, and balancing the relevant statutory criteria." As discussed above, this discretion to the extent it exists must be based on solid record evidence regarding the ability of the MD/HD market to develop and deploy additional technologies that will, in fact, be purchased by end users. This record is lacking in this rulemaking and EPA is thereby constrained in its legal ability to adopt Alternative 4. Indeed, unlike the most recent

[21] The argument that the lead time provision for rebuilt engines means that standards for rebuilt engines can take effect only after three model years but can be even longer makes no practical sense. As discussed in the text above, the concept of model year has no basis for rebuilt engines. Even more basically, it does not make sense for Congress to have allowed more lead time for rebuilt engines when less time is needed due to engine rebuilding being an engine-by-engine decision which can be made at any time unconstrained by engine design cycles.

Just as some technologies that were considered off-cycle for Phase 1 are being adopted as primary technologies in Phase 2, the agencies may revise the regulation in a future rulemaking to create a more direct path to recognize technologies currently considered off-cycle. For example, although we are including specific provisions to recognize certain electrified accessories, recognizing others would require the manufacturer to go through the off-cycle process. However, it is quite possible that the agencies could gather sufficient data to allow us to adopt specific provisions in a future rulemaking to recognize other accessories in a simpler manner. Because such a change would merely represent a simpler way to receive the same credit as could be obtained under the regulations being adopted today (rather than a change in stringency), it would not require us to reconsider the standards.

Some suppliers commented that the agencies should allow them to apply for off-cycle credit independent of any certifying OEMs. However, we believe it is important to include the certificate holder that would be responsible for the in-use performance of the technology.

Separate Families

EMA commented that the agencies should not require vehicles with off-cycle technologies to be certified in separate vehicle families. That was the approach adopted in the Phase 1 program, but the agencies proposed to eliminate this restriction. For the FRM, the agencies have made it clearer that we are ending this restriction.

Credit for Life Cycle Reductions

AISI commented that the agencies should provide off-cycle credits for life cycle reductions. See Section 1.8 of this chapter for a discussion of life cycle issues

1.4.3 Selective enforcement audits and confirmatory testing 133

Organization: American Automotive Policy Council

In-Use Compliance and Useful Life - AAPC agrees with continuing the 3 percent adjustment factor applied to the full useful-life certification standards for the purpose of determining in-use emissions and fuel consumption standards. [EPA-HQ-OAR-2014-0827-1238-A1 p.3]

In-Use Compliance and Useful Life

The agencies requested comment (80 Federal Register 40206) on the appropriateness of continuing the 3 percent adjustment factor applied to the full useful-life certification standards for the purpose of determining in-use emissions and fuel consumption standards. This adjustment factor was applied in Phase 1 based on the agencies' assessment of testing variability inherent in comparing results among different laboratories and different engines. AAPC supports the continuance of this allowance for in-use testing. No material advances have occurred that would result in the variability factors relevant in Phase 2 being significantly different than they were in Phase 1. Furthermore, the appropriateness of the 3% allowance has not yet been assessed against actual in-use data on 2014 MY or later vehicles and engines near their full useful lives. Absent such data, a thorough assessment of the appropriateness of this allowance cannot be made. AAPC further notes that in-use verification program limits in Light-Duty are 10% to account for in-use variations. [EPA-HQ-OAR-2014-0827-1238-A1 p.16]

Organization: Caterpillar Inc, et al.

There are a number of new or updated test procedures in the Phase 2 proposal including aerodynamic coast-down, fuel mapping procedure, powertrain test procedure, rear axle efficiency, Selective Enforcement Audits (SEA), and in-use chassis dyno testing. The current proposal does not include compliance margins for modified or new procedures, such as aerodynamic and engine fuel map audits. To reduce some of the variability that is inherent in the proposed test procedures, we recommend that the Agencies perform confirmatory and SEA tests using the same method and location that the manufacturer used to certify the vehicle or component. Furthermore, we have worked with the Agencies to improve the accuracy of the procedures, for example we have recommended the inclusion of the yaw angle in the coast-down procedure to reduce the impact of wind conditions. To account for the remaining variability, compliance margins must be included in the Phase 2 regulation. If not corrected, these issues will subject manufacturers to risks simply as a result of expected test variation that can only be mitigated by downgrading our declared certifications to levels significantly worse than the actual test results, so as to cover the range of production and test variability. We estimate these issues have the impact of raising the de facto targets by approximately 12.5%; that is, we need to achieve 36.5% efficiency improvement to meet the stated 24% target for high-rise sleeper tractors. [EPA-HQ-OAR-2014-0827-1215-A1 p.8] 134

Organization: Cummins, Inc.

Cummins opposes using any possible vehicle configuration for an engine fuel map SEA [EPA-HQ-OAR-2014-0827-1298-A1 p.26]

In 1036.301(b)(1), the agencies broadly define that “any applicable vehicle configuration” could be used during an engine fuel map SEA. With any vehicle configuration available for an SEA, there is no clear audit cycle on which to evaluate and optimize CO2 performance. Cummins recommends the fuel map SEA uses a predefined vehicle configuration. [EPA-HQ-OAR-2014-0827-1298-A1 p.26]

Organization: Daimler Trucks North America LLC

The agencies must resolve problems with audit procedures and compliance margins for those audits. Although we strongly support the agencies’ use of audits to find noncompliance, the problematic procedures and margins make the rest of the agencies’ proposed standards impracticable. [EPA-HQ-OAR-2014-0827-1164-A1 p.6]

Audits/In-Use Testing

Daimler Trucks North America (DTNA) starts our comments with some serious concerns about audits, before even getting to engine testing or GEM-based certification, as the manner of auditing and the compliance margins assumed for each audit have such profound impact on all other aspects of certification and compliance. There are problems with the agencies’ audit proposals, but these can easily be rectified in order to make the program workable. [EPA-HQ-OAR-2014-0827-1164-A1 p.6]

1. SEAs, generally

SEAs in § 1037.301 - The EPA should clarify that a vehicle fails an SEA only if it fails by a margin larger than the uncertainty involved in testing the component(s) that the agency audited. If an SEA shows a 1% higher emission than the manufacturer submitted to the EPA, but the uncertainty in testing components is 3%, then the 1% exceedance may be due to test variability. If, on the other hand, the agency expects that manufacturers will build into each vehicle's FEL the (say) 3% necessary to pass

SEAs, then the EPA must also include this 3% buffer in its standards (i.e., the g CO2/ton-mile numbers) given that the standards the EPA assigned lacked this buffer and therefore will not be achievable with the EPA's assumed technology mixes. [EPA-HQ-OAR-2014-0827-1164-A1 p.7]

Suspending or revoking certificates based on SEAs, § 1037.301(f): The agencies propose to give themselves the authority to suspend or revoke certificates based on the results of an SEA. § 1037.301(f), 80 FR 40622. If a vehicle family fails an SEA, for example for aerodynamics, then the family's aerodynamic drag values for use in GEM should be revised. But as long as the family can still meet limit values, perhaps with AB&T credits, there is no reason that the EPA should be able to suspend or revoke the family's certificate. [EPA-HQ-OAR-2014-0827-1164-A1 p.7]

2. GEM and Fuel Map Audits

GEM SEA: With the introductory text of § 1037.551 (particularly that "engine-based measurements may be used for confirmatory testing ... or for selective enforcement audits"), the agencies appear—and the text is not clear on this topic—to give themselves great flexibility in auditing, up to allowing them to audit vehicles in a manner unlike the lawful manner that the manufacturer used to certify. If that is the agencies' intention, then we disagree with this approach. The reason is that it fails to find when a manufacturer submitted bad data and instead confounds test-to-test variability into the audit process. Rather, the manner in which the EPA should audit manufacturers, whether for compliance using GEM or for anything else, is to first start with a process audit. The EPA should evaluate whether the manufacturer is following allowable procedures at each step within the certification or compliance procedure--given that there are a number of different options at many steps within the procedure and each one could cause slightly different GEM results. So for example, rather than auditing a fuel-map based GEM result using a powertrain test, the EPA should audit the fuel map, as auditing an engine fuel map result through powertrain testing confounds the differences between the tests with the test results themselves. Similarly, regarding aero SEAs, the agency should not audit a manufacturer's CFD-based aero value through coast-down and ARC; the EPA should audit the CFD result. In short, if the manufacturer chose a lawful procedure for generating GEM inputs, then the agencies would focus their analysis on the results of that lawful process and would omit any audit of what the results would be if the manufacturer had used some other (equally lawful) process. [EPA-HQ-OAR-2014-0827-1164-A1 p.8-9]

Fuel Map SEA and Confirmatory Testing - The EPA proposes to audit fuel maps as part of confirmatory testing (1036.235). EPA proposes to audit fuel maps on a point by point basis, including points rarely encountered in drive cycles but captured in the 143 point fuel map. Some of these points have relatively high variability of CO2 emissions on a percentage basis, because of the low fuel consumption rates. Because these points are rarely encountered in drive cycles, they should not receive the same scrutiny as points that factor highly into driving operation. In turn, point by point fuel map auditing will force manufacturers to build sometimes large compliance margins (or buffers) into points within the fuel map. While this does solve the variability problem and protect against audits, it leads to the EPA receiving potentially misrepresentative fuel map information. Better would be for the EPA to remove point by point auditing so that the agency gets accurate—rather than misrepresentative—information from manufacturers. An alternative method is provided. [EPA-HQ-OAR-2014-0827-1164-A1 p.9]

Second, the EPA's proposal would confound normal engine to engine variability with GEM noncompliance, which is a vehicle-side issue. If in an SEA the EPA selects an engine with fuel consumption toward the high end of the engine family's distribution, then any GEM run using that engine's measured fuel map will indicate high fuel consumption, incorrectly indicating that the vehicle manufacturer may have misstated GEM-based emissions. Because neither the EPA nor the vehicle manufacturer will know a priori whether the engine is at the high end of the fuel consumption distribution, any failure of a GEM audit is immediately suspect. [EPA-HQ-OAR-2014-0827-1164-A1 p.9]

Third, the EPA's proposal confounds errors of the output of GEM, which is the agency's responsibility, with errors of the input of GEM, which is the vehicle manufacturer's responsibility. In an SEA, the EPA should be concerned that a vehicle manufacturer 1) uses correct inputs to GEM and 2) uses the agency's supplied GEM. Where an input comes from a supplier other than the vehicle manufacturer, the EPA should require only that the vehicle manufacturer used that supplier's input in good faith, as the EPA currently does with tire inputs. [EPA-HQ-OAR-2014-0827-1164-A1 p.9]

The result is that the proper way to audit GEM and its inputs is: 1) require that engine manufacturers submit fuel maps and that they be held accountable for the maps' accuracy, as they currently are through SEAs that are RMC-based (an integrated, rather than point by point compliance measure) and FTP based (integrated over a test cycle); 2) do not conduct confirmatory testing of fuel maps on a point by point basis, as doing so highlights areas of variability that are unimportant yet downplays areas that are important; 3) audit vehicle manufacturers' inputs to GEM; and 4) audit that the vehicle manufacturer properly used the agency's GEM. In other words, the proper way to audit is a step by step auditing process, checking inputs individually, rather than confounding potential sources of error or, worse, highlighting errors that are unimportant. [EPA-HQ-OAR-2014-0827-1164-A1 p.9-10]

As an alternative for SEA testing, the agencies should establish regulations that recognize engine to engine variability and the need for an AQL in audits. The agencies would start by clarifying what vehicle configurations will be used for GEM inputs in fuel map audits, then test an engine or engines to generate fuel maps, use those fuel maps in GEM, and compare the results to those that the manufacturer would have gotten with its original fuel map. If the difference is above the test-to-test variability—and here we would suggest 3%, like the variability that created the FCL to FEL ratio—in a large enough number that the manufacturer did not meet an established AQL level (e.g., 40%), then and only then does the manufacturer fail the audit. This procedure is justifiable, given statistical variation, whereas the agencies' current proposal is not. [EPA-HQ-OAR-2014-0827-1164-A1 p.10]

Similarly for confirmatory testing EPA should consider evaluating a manufacturer's fuel map via GEM simulation wherein GEM results using the EPA generated fuel map are compared to results using the manufacturers certified fuel map. Pass criteria should be established based on the certified fuel map GEM result plus the aforementioned 3% compliance margin. Should the GEM result using the EPA generated fuel map be above the pass criteria, the manufacturer should be required to accept the EPA fuel map for certification purposes. [EPA-HQ-OAR-2014-0827-1164-A1 p.10]

Fuel map compliance (SEA and Confirmatory Testing) - The agencies originally proposed to conduct SEA of fuel map compliance through GEM to rectify the problem that points of low fuel consumption (and hence poor signal to noise) or of infrequent applicability during driving (and hence little importance) be audited as fully as the main driving points. The agencies recognized that point-by-point compliance is even more stringent than current compliance requirements on the SET-RMC test, which is audited based on the weighted result of the thirteen points. Consequently, the agencies proposed to incorporate GEM into audits and not to overwrite individual points but to have a more statistically-based audit procedure. We applaud use of GEM for SEA audit of engine fuel map results. Further, for confirmatory testing we agree with the agencies' revised view that audit engine map differences (high only points) should be not used to modify cert fuel map. We suggest that, for both confirmatory testing and SEA, the agencies use 3% compliance margin applied to GEM output using the certified fuel map as both a pass criteria for SEA and as the criteria for determining in confirmatory testing whether the manufacturer fuel map should be replaced by the EPA measured map (but that if the map is replaced, it be replaced in its entirety). [EPA-HQ-OAR-2014-0827-1164-A1 p.48-49]

Organization: International Council on Clean Transportation (ICCT)

Confirmatory testing. The U.S. EPA memo on Selective Enforcement Audit and Confirmatory Testing provides a welcome addition to the regulatory development of protocols to monitor compliance with the regulation. Previously, there were limited such details on questions about aerodynamic testing protocols, allowable measurements, thresholds, and margins, so the memo provides helpful guidance and also helps narrow the testing and compliance margins. This opens up a broader set of questions regarding how the agencies will confirm the regulatory compliance data, such as the GEM inputs for various technology-specific drop-down menus, tire low rolling resistance, etc. We would ask that the agencies consider sharing similar details in the Final Rule and/or in guidance memos on how all regulatory input data will be confirmed as valid for vehicles in real-world settings. Confirmatory testing of aerodynamics and GEM inputs, and production vehicle chassis testing, is key to ensuring CO2 and fuel use reductions over the certification tests correlate with reductions in the real world (Sharpe et al, 2014; ICCT, 2015). In order for the real-world testing program to be successful, it will be critical that the emission results from the testing program are shared publicly and that the testing program starts as soon as possible (i.e., in2016 ideally) to discern ongoing and future trends from the earliest possible time. [EPA-HQ-OAR-2014-0827-1876-A1 p.2]

International Council on Clean Transportation (ICCT, 2015). International Council on Clean Transportation comments on United States' proposed Phase 2 Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium and Heavy-Duty Engines and Vehicles. https://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2014-0827-1180

Sharpe, B., Delgado, O., Muncrief, R. (2014). Comparative assessment of heavy-duty vehicle regulatory design options for U.S. greenhouse gas and efficiency regulation. http://www.theicct.org/us-phase2-hdv-regulation-design-options

Organization: International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)

Therefore OEMs would have to report worse aero performance to ensure passing an audit, with as much as 5% impact. [EPA-HQ-OAR-2014-0827-1248-A2 p.9]

No compliance margin is provided for engine fuel map audits, compared to the 3% margin allowed in Phase 1 for engine efficiency. Consequently OEMs will likely declare lower engine efficiency than their certification measurement to ensure meeting stringency. In sum, faulty assumptions driven by technology penetration rates, the absence of audit compliance margins could add as much as 17% greater reduction in fuel consumption than the proposed rule estimates. If not addressed, this could prove to be an untenable threshold and market disruptions could very possibly follow. [EPA-HQ-OAR-2014-0827-1248-A2 p.9]

Organization: National Association of Clean Air Agencies (NACAA)

1. February 19, 2016 EPA memorandum, *Additional Discussion of Selective Enforcement Audit and Confirmatory Testing for Aerodynamic Parameters for Combination Tractors and for Trailers*

On February 19, 2016, EPA issued a memorandum, *Additional Discussion of Selective Enforcement Audit and Confirmatory Testing for Aerodynamic Parameters for Combination Tractors and for Trailers*, discussing potential approaches to applying the longstanding principles behind selective enforcement audits and confirmatory testing for aerodynamic measurements. In our September 29, 2015 comments on the Phase 2 proposal, NACAA urged EPA "to do everything feasible to implement in-use compliance." We believe firmly that the integrity of the Phase 2 program and achieving the associated emissions reductions rely upon strong enforcement and compliance tools and that it is imperative for EPA to finalize a program that is enforceable and auditable and includes confirmatory testing. We are, therefore, pleased that the agency has issued this memorandum to provide further insight into enforcement of and compliance with the Phase 2 program (and, potentially, the Phase 1 tractor program). [EPA-HQ-OAR-2014-0827-1890-A1 p.2]

Organization: Navistar, Inc.

The NPRM proposes changes in Selective Enforcement Audit (SEA) provisions in both engine and vehicle. The engine compliance margins were carried over in the engine regulation, but not included in the vehicle regulation. For instance, for the fuel map SEA the pass criteria are set at the GEM input value. The engine SEA includes a 3% margin due to variability of engines and test facilities. The SEA of the engine fuel map used in the GEM for the vehicle regulation should also include that same 3% margin. The number of runs does not effectively make up for the lack of a vehicle compliance margin because test variability arising from variations like location conditions may not change run to run. Of particular concern are the provisions that allow SEAs for each component included as a GEM input. This vastly expands the number of subsystems potentially exposed to SEA. [EPA-HQ-OAR-2014-0827-1199-A1 p.10]

The function of an SEA should be to confirm that the vehicle, as certified, achieves in-use emissions levels consistent with its certification. Necessarily, however, this must recognize the inherent variability of vehicle to vehicle performance, particularly when one is looking at one subsystem within the vehicle. Not only may there be variability vehicle to vehicle, but specific test methods with respect to particular systems may be variable as well. [EPA-HQ-OAR-2014-0827-1199-A1 p.10]

It is improper to attempt to create subcategories of features or systems subject to an audit. These functions are not subject to emissions limits in and of themselves. The vehicle or engine as a whole is subject to the emission standard, and that is what should be subject to an SEA. It is arbitrary and capricious to subject a manufacturer to liability for a system that might not meet the defined input when the vehicle as a whole may meet the emissions. This appears to be an inherent flaw in the use of the GEM model. [EPA-HQ-OAR-2014-0827-1199-A1 p.10]

Even if one were to accept that SEAs could apply to individual systems within the vehicle, we have concerns as to the proposal. The primary concern stems around whether the SEA appropriately replicates the conditions under which the certification tests were conducted. Variations between appropriately conducted certification tests and SEA methodology can create significant risks. [EPA-HQ-OAR-2014-0827-1199-A1 p.11]

In the ongoing EPA-sponsored laboratory "Round Robin" test exercise it has been demonstrated that it is unrealistic to expect repeatable CO_2 emissions within 3% of the average from one test facility to another. This is the case despite the application of the same cycle validation criteria noted in Table 4 of

1037.550 for each of the participating engine test facilities. This variability is also minimized through the use of the same engine and charge air coolers at each facility. The variability validates the premise that individual engine dynamometers configured with equivalent coolant and charge air cooler components can still yield statistically significant differences. The engine/dynamometer normalized test schedule accommodates the inherent variability in rotating inertia, load response and speed control to satisfy the cycle validation criteria. However, these inter-cell or intra-facility differences in dynamometer configuration and control are sufficient to yield differing results as witnessed in the Round Robin exercise. [EPA-HQ-OAR-2014-0827-1199-A1 p.11]

This is of considerable concern, since EPA has taken the position that if the agency test arrives at a different number during a confirmatory test than the number resulting from the manufacturer's test, the EPA number is substituted in the certificate of conformity. That number then becomes the official test value for that vehicle, even if all of the procedures were properly followed by the manufacturer during the initial certification test. That introduces an unacceptable amount of uncertainty into the certification process. Confirmatory tests should not be used to change a manufacturer's tested number based solely on testing variability. [EPA-HQ-OAR-2014-0827-1199-A1 p.12]

We therefore request that the Proposed Rule be modified to specifically allow a test margin for all confirmatory tests, or, at the very least, a provision that states that EPA will substitute its confirmatory number for a manufacturer's only if it identifies an error in the manufacturer's certification test procedures and identifies a different test number as a result. [EPA-HQ-OAR-2014-0827-1199-A1 p.12]

Organization: SmartTruck

In addition to commenting on aerodynamic testing methodology, we direct the following comments to the Additional Discussion of Selective Enforcement Audit and Confirmatory Testing for Aerodynamic Parameters, Docket No. EPA-HQ-OAR-2014-0827-1625. [EPA-HQ-OAR-2014-0827-1923-A1 p.3]

SmartTruck supports the EPA in its effort to provide dependable validation for aerodynamic devices and believes that a reliable testing protocol is necessary for the success of GHG Phase 2. The NPRM outlines a basic guideline for SEA and confirmatory testing structure that closely aligns with the scale and scope of tractor and trailer vehicle OEMs and provides a verification structure to ensure production vehicles conform to their certifications. [EPA-HQ-OAR-2014-0827-1923-A1 p.3-4]

In the case of trailer aerodynamics, the agencies have proposed the Aerodynamic Device Testing Alternative to allow device manufacturers to seek preliminary approval of aero-devices and supply GEM inputs to trailer OEMs. Recognizing that trailer manufacturing OEMs may have little experience with aerodynamic testing, it is likely that the majority of trailer aerodynamic testing will be performed by aerodynamic device manufacturers and provided to trailer OEMs in the form of GEM model inputs and will be subsequently used in the certification of their trailer families. We therefore seek an SEA and confirmatory testing structure that will align with the scope and size of device manufacturers in order to strengthen the GHG Phase 2 program and to utilize our experience with aerodynamic testing to expedite the certification process for both trailer OEMs and EPA. [EPA-HQ-OAR-2014-0827-1923-A1 p.4]

Although the EPA has provided SEA guidelines for trailer OEMs, the business of manufacturing a complete vehicle and manufacturing a vehicle component are fundamentally different and should be reflected in testing protocol. In aerodynamic testing, tractor and trailer OEMs use a vehicle completely manufactured or assembled by themselves whereas device manufacturers are testing a component designed to be used on a variety of vehicles, such as dry vans, refrigerated units, and partial-aero trailers, manufactured by a variety of different OEM manufacturers and a variety of different configurations. While it makes sense to require a vehicle manufacturer to use the current model year for validation testing, it is unreasonable to require a device manufacturer to do so. For example, a device manufacturer should be able to test its model-year components on a tractor from a prior year. Especially considering that a trailer equipped with an aerodynamic device could be pulled by a tractor from any previous year. Allowing component manufacturers to test with glider kits will further ease the burden. A testing protocol specifically structured for device manufacturers would still give the EPA the right to choose the aero component to be tested but would also allow the device manufacturer greater flexibility in choosing the vehicle to be used for component testing. [EPA-HQ-OAR-2014-0827-1923-A1 p.4]

These fundamental differences are also present in relation to the size of device manufacturers compared to tractor and trailer OEMs, which greatly increase the burden on device manufacturers to comply with the proposed validation testing protocols. While vehicle OEMs have been around for several decades, the majority of aero-device manufacturers have emerged within the last ten years and are represented on just a portion of the market offered by trailer OEMs. Device manufacturers are less likely to have in-house testing facilities such as wind tunnels or test tracks and are less likely to have multiple vehicles of the current model year that can be utilized for testing. The majority of component manufacturers complete testing at third party locations which must be secured several months in advance. These factors further increase the difficulties and burden faced by device manufacturers in complying to a testing structure that is based on large vehicle manufacturers. A unique structure designated for device manufactures should account for this by allowing device manufacturers greater flexibility in choosing testing facilities pre-approved by the EPA to ensure a greater confidence in SEA and confirmatory testing results. [EPA-HQ-OAR-2014-0827-1923-A1 p.4]

Lastly, in supporting the effort of creating a national greenhouse gas emissions program, aero-device manufacturers are in a position to work closely with the EPA to mitigate the cost and burden of compliance testing for the EPA and to provide trailer manufacturers with a confident process of compliance. By providing full disclosure of all confirmatory documentation to the component manufacturer, the EPA eases the burden by allowing component manufacturers the ability to identify possible concerns in testing results. The full disclosure of SEA and confirmatory testing criteria would also give device manufacturers the ability to mitigate validation proceedings by ensuring a greater confidence in initial certification validation. [EPA-HQ-OAR-2014-0827-1923-A1 p.5]

Organization: Truck & Engine Manufacturers Association (EMA)

A fourth core issue relates to the proposed requirement that engine manufacturers certify fuel maps as a part of their overall certification to the Phase 2 engine standards for reduced CO2 emissions, and that they be required to provide those “certified” fuel maps to vehicle manufacturers (for their input into the updated GEM model) beginning with the 2020 model year (or even as early as 2019). Engine manufacturers would be required to use a new steady-state engine dynamometer test procedure to generate detailed fuel maps for each of their various engine families, which unique fuel maps could be input into GEM during vehicle manufacturers’ certification of their various vehicle configurations. (See Proposed § 1036.535). As a corollary enforcement mechanism, the agencies also are proposing unique selective enforcement audit (“SEA”) provisions for the manufacturer-developed fuel maps. (See Proposed § 1036.301(b)). Such SEA testing would test production engines to determine the fuel-consumption rates at each of the specified points under the engine fuel map, and then would use those SEA-measured values as inputs in GEM to generate comparisons against the manufacturer’s declared GEM results at certification. EPA would be allowed to audit and test through GEM simulations up to ten (10) unique vehicle certifications using the SEA-derived fuel map. [EPA-HQ-OAR-2014-0827-1269-A1 p.5]

There are a number of very serious issues relating to the agencies' proposed fuel-mapping and related SEA requirements. As an initial matter, the proposed engine fuel map would include 143 operating test points (13 speed points with 11 torque values at each speed point) and 4 idle test points, a very large number, which represents a dramatic increase over the Phase 1 engine testing requirements. Moreover, that testing burden would have very significant consequences, since the test results from the 143-point fuel mapping process would become the declared values that vehicle manufacturers would use for certification purposes. [EPA-HQ-OAR-2014-0827-1269-A1 p.5]

That leads to another fundamental concern. The agencies' proposed SEA testing procedure includes no margin whatsoever for the modeled GEM emission results. Under the agencies' proposal, if there is any shortfall between the GEM results using the SEA-derived fuel map (in up to 10 vehicle configurations) as compared against the GEM results reported using the engine manufacturer's original fuel map (which, in effect, creates 10 chances to "fail"), the engine manufacturer's certification could be suspended or revoked. (See Proposed § 1036.301(d)). Such a high-risk testing regime, with attendant liability, including the possible revocation of a manufacturer's engine certification, is unreasonable and would impose inherently infeasible requirements on engine manufacturers. Lab-to-lab variability, test-to-test variability, and engine-to-engine variability all need to be accounted for through the allowance of sufficient data-driven testing margins. As it stands, the agencies' proposed SEA process for the 143-point engine fuel maps is not reasonable. [EPA-HQ-OAR-2014-0827-1269-A1 p.5]

Unless EPA and NHTSA address the testing burdens and inherently infeasible SEA requirements associated with the proposed requirement for certified engine fuel maps, the Proposed Phase 2 vehicle standards could prove to be unworkable. As stated above, EMA stands ready to work with the agencies to implement the necessary revisions to the various engine-mapping issues. EMA's recommendations in that regard are set forth below. [EPA-HQ-OAR-2014-0827-1269-A1 p.5-6]

As noted above, a compliance margin is needed for the proposed "certified" fuel maps. However, proposed section 1036.301 does not include any compliance margin whatsoever for an SEA of the fuel map input into GEM, despite the inherent inaccuracies in the fuel map development procedure (see Proposed § 1036.535). Without an audit compliance margin in the rule, manufacturers would have to build a margin into their fuel maps (resulting in higher GEM inputs) to ensure passing an SEA, which would make achieving the GEM output targets significantly more challenging. The Phase 1 rule provides a 3% compliance margin for the engine certification program. For the same reasons that the margin is used in engine certification, the 3% compliance margin (at a minimum) should be implemented for the fuel-map based GEM results as well. Stated differently, a 3% compliance margin should be applied to the GEM result obtained using a certified fuel map when assessing whether an engine/vehicle passes a confirmatory or SEA test. [EPA-HQ-OAR-2014-0827-1269-A1 p.23]

Recent collaborative emissions-measurement research has demonstrated the continuing need for and suitability of a 3% compliance testing margin for GHG emissions. More specifically, EPA and EMA are currently involved in a collaborative "round-robin" engine testing program (managed by Southwest Research Institute ("SwRI")) to assess the extent of emissions-testing variability when the same test article (a heavy-duty motor vehicle engine) is tested at eight different Part-1065-compliant emissions-testing laboratories, including EPA's facilities in Ann Arbor, Michigan. The round-robin testing program has assessed the lab-to-lab variability for a number of regulated emissions, including CO2. The round-robin results for CO2, which are presented below, show that there is a 2.0% variability (as a percentage of the relevant standard) for CO2 emissions assessed over the FTP test cycle. (Additional production variability, which ranges from +/- 2%, also needs to be accounted for). In light of those results, there is no basis for EPA to eliminate the 3% compliance margin that was included in the Phase 1 program. [EPA-HQ-OAR-2014-0827-1269-A1 p.23]

[Graphics, 'Round-Robin Engine Testing Results for CO2 Emissions', can be found on p.24-25]

In addition, EMA is in the process of commissioning follow-up research at SwRI to derive data to better quantify and account for the specific test-to-test and production variability relating to any subsequent audits of fuel maps. A copy of the SwRI proposal for that follow-up research is attached as Appendix "1." EPA and NHTSA should commit to co-funding and incorporating the results of that research into any final audit regulations and procedures. [EPA-HQ-OAR-2014-0827-1269-A1 p.26]

Finally, the fuel-map audit process should be more clearly defined and more predictable through the incorporation of pre-defined standard vehicle configurations for use in audit testing. [EPA-HQ-OAR-2014-0827-1269-A1 p.26]

Organization: Truck Trailer Manufacturers Association (TTMA)

The Truck Trailer Manufacturers Association (TTMA) is an international trade association representing approximately 90% of the truck-pulled trailers manufactured in the United States. TTMA has a history of working closely with regulators to help them understand the unique nature of the heavy-duty trailer industry and to act as a conduit between the member companies and regulators. TTMA is offering this comment in response to the Notice of Data Availability published in the Federal Register March 2, 2016. [EPA-HQ-OAR-2014-0827-1873-A1 p.1]

Specifically, we will be commenting on the Environmental Protection Agency's Memorandum titled Additional Discussion of Selective Enforcement Audit and Confirmatory Testing for Aerodynamic Parameters for Combination Tractors and for Trailers (the Memo hereafter). [EPA-HQ-OAR-2014-0827-1873-A1 p.1]

As noted in the proposed rule's Preamble, there are "a large number of small businesses in this industry". The agencies recognized that performance testing requirements "would be the more challenging obstacles for this newly regulated industry." As such the agencies designed the proposed rules in such a way as to allow most trailer manufacturers to build without full testing of trailers, by passing-through tested components and using a change in CDA value, along with a discounting formula when multiple devices are used. We anticipate that if the rule advances as written, most trailer manufacturers will make use of this pass through system, with the larger manufacturers performing some of their own testing, often relying on CFD and Wind Tunnel data to contain costs in an industry the agencies admit "is very competitive". [EPA-HQ-OAR-2014-0827-1873-A1 p.2]

As such, the sort of repetitive coast-down tests (twenty to a hundred coast-down runs per device tested) will be rarely employed by trailer manufacturers. [EPA-HQ-OAR-2014-0827-1873-A1 p.2]

If EPA singles out a certain manufacturer for Selective Enforcement Action (SEA) and requires the manufacturer to pay for these expensive tests, we would view the SEA itself as punitive. [EPA-HQ-OAR-2014-0827-1873-A1 p.2]

For manufacturers who are only using pass-through data, they should be immune to SEA's requiring coast-down tests in favor of investigations focusing on the supplier of the component. For those suppliers, the use of coast-down data related to the bin the eventual trailer it goes on are not properly applicable. An entirely different approach to audit a component manufacturers is called for: one that should focus on the integrity of the tests used to obtain a delta CDA or CRR (or even to verify the performance of an Automatic Tire Inflation System). [EPA-HQ-OAR-2014-0827-1873-A1 p.2]

In the proposed rule, §1037.301(d) requires that with respect to drag area, manufactures are directed to "use the same method you used for certification" which better reflects the realities of the trailer world. The Memo's methodology of generally allowing extra tests to be performed if early tests show unexpected results can and should be applied to all approved certification methods. [EPA-HQ-OAR-2014-0827-1873-A1 p.2]

We thank you for this opportunity to comment on new data and remain available to answer any questions you may have. [EPA-HQ-OAR-2014-0827-1873-A1 p.2]

The assumption that there is no need to provide any compliance testing margin, SEA testing margin, engine fuel map margin, or coastdown testing margin is manifestly unreasonable. [EPA-HQ-OAR-2014-0827-1269-A1 p.72

Organization: Volvo Group

[T]he lack of margins for aerodynamic and engine map audits would force us to understate our certified efficiency inputs to ensure passing a subsequent audit. [EPA-HQ-OAR-2014-0827-1290-A1 p.10]

Excessive stringency results in uncertainty that the proposal can be implemented, excessive cost, unreliable products, delays in new vehicle purchases, production disruption, lay-offs, and delays in achieving benefits. Volvo supports comments by EMA relative to stringencies and we elaborate on our concerns below. [EPA-HQ-OAR-2014-0827-1290-A1 p.18]

Engine Fuel Mapping and Audit

As noted in EMA's comments, at least 3% margin needs to be provided for a Selective Enforcement Audit (SEA) of the fuel map to account for production and measurement variability. Otherwise, even with 60% accepted quality level (AQL), we will be forced to downgrade our mapped efficiency due to production and test variability that is equal to, or greater than, the feasible engine improvement steps. Alternatively, the Agencies need to reduce the assumed baseline engine efficiencies and the vehicle standards that rely on engine map inputs. [EPA-HQ-OAR-2014-0827-1290-A1 p.37]

Furthermore, we cannot agree that the Agencies should be able to test the engine map over as many as 10 vehicle configurations, determined only at the time of an SEA, failure on any of which constitutes an audit failure. A single, predetermined vehicle configuration that exercises the typical range of engine operation is more than adequate. This vehicle configuration could be standardized for Class 8 tractor and vocational vehicles or could be agreed upon as part of each engine certification. [EPA-HQ-OAR-2014-0827-1290-A1 p.37]

Organization: Cummins, Inc.

Cummins opposes engine-only testing for powertrain SEA [EPA-HQ-OAR-2014-0827-1298-A1 p.39]

As part of powertrain testing, 40 CFR 1037.550(q) requires manufacturers to record engine speed and torque over the powertrain cycles. The recorded engine speed and torque would then be used to test only the engine as part of an SEA instead of testing a complete powertrain. Cummins has concerns with this approach as a powertrain SEA surrogate. [EPA-HQ-OAR-2014-0827-1298-A1 p.39-40]

An SEA is the method EPA uses to assess a manufacturer's certified configuration against submitted test results; however, if a powertrain SEA is completed using an engine-only test, the SEA would only verify the compliance of production engines over powertrain cycles. Absent are GHG/FE impacts associated with variation in powertrain characteristics such as transmission efficiency and, most importantly, the interaction of the engine and transmission controllers. The highly complex controls of the engine and transmission actively manage, together, how the vehicle required torque is met, which is a critical part of the integration of an optimized powertrain. Not capturing these control interactions may result in elevated emissions for an engine-only test and a failed SEA. Furthermore, it is not clear how efficiency losses from the transmission would be accounted for when running an engine-only powertrain SEA. [EPA-HQ-OAR-2014-0827-1298-A1 p.40]

For the above reasons, Cummins does not support the engine-only test as a means of a powertrain SEA. [EPA-HQ-OAR-2014-0827-1298-A1 p.40]

Organization: Eaton Vehicle Group

Conformity testing issues

A simple conformity testing procedure has been suggested as follows: at the time of powertrain certification, a time trace of the transmission gear and load should be recorded and then used in subsequent conformity testing actions on an engine dynamometer. Thus, conformity testing can be done in engine-only mode. However, this approach is close to the "simulated transmission" substitute for the powertrain test and we believe it cannot be applied to the highly integrated engine and transmissions. The two controllers exchange information in real time and make decisions based on each other's inputs. Thus, when the engine is exposed to a time-trace of a previous run, A) it has no transmission ECU to communicate with, and B) the any results that differ from the initial run would be inconclusive. [EPA-HQ-OAR-2014-0827-1194-A1 p.10-11]

Recommendation: The conformity tests for powertrains should be clarified with discussions with engine, transmission and vehicle manufactures. [EPA-HQ-OAR-2014-0827-1194-A1 p.11]

Response:

EPA requested comment on our provisions related to confirming a manufacturer's test data during certification (i.e., confirmatory testing) and verifying a manufacturer's vehicles are being produced to perform as described in the application for certification (i.e., selective enforcement audits or SEAs). The EPA confirmatory testing provisions for engines and vehicles are in 40 CFR 1036.235 and 1037.235. The SEA provisions are in 40 CFR 1036.301 and 1037.301-1037.30. The NHTSA provisions are in 49 CFR 535.9(a).

Commenters generally supported the inclusion of confirmatory and SEA testing provisions. However, as discussed below, several industry stakeholders requested changes to the proposed provisions.

ICCT requested that we include additional details in the FRM, which we have done.

Compliance Margins

Some commenters suggested that the agencies should apply a compliance margin to confirmatory and SEA test results to account for test variability. However, other commenters supported following EPA's past practice, which has been to base the standards on technology projections that assume manufacturers will apply compliance margins to their test results for certification. In other words, we effectively require manufacturers to design their products to have emissions below the standards by some small margin so that test-to-test or lab-to-lab variability would not cause them to exceed any applicable standards. Consistent with this policy, EPA has typically not set standards precisely at the lowest levels achievable, but rather at slightly higher levels – expecting manufacturers to target the lower levels to provide compliance margins for themselves. As is discussed in Sections II through VI of the FRM, the agencies have applied this approach to the Phase 2 standards.

It is also important to consider the specific consequences that occur if emissions (or other measured GEM inputs) measured during confirmatory or SEA testing are worse than the declared values. If this occurs during confirmatory testing, the manufacturer simply continues on with the certification process using the new EPA values. It is not considered a violation. For SEAs, the test engine would be considered a failure, but no action would be required unless a large number of engines failed. In neither case would small variations in measured results lead to financial penalties for the manufacturer.

As discussed in Section I.C.(1)(a) of the FRM Preamble, we assume manufacturers will incorporate appropriate compliance margins for all measured GEM inputs. In other words, they will declare values slightly higher than their measured values. As discussed in Section II.D.(5) of the Preamble, compliance margins associated with fuel maps are likely to be approximately one percent. For aerodynamic inputs, we believe the bin structure will eliminate the need for CdA compliance margins for most vehicles. However, for vehicles with measured CdA values very near the upper bin boundary, manufacturers will likely choose to certify some of them to the next higher bin values (as a number of commenters noted). For tire rolling resistance, our feasibility rests on the Phase 1 standards, consistent with our expectation that manufacturers will to continue to incorporate the compliance margins they considered necessary for Phase 1. With respect to optional axle and/or transmission power loss maps, we believe manufacturers will need very small compliance margins. These power loss procedures require high precision so measurement uncertainty will likely be on the order of 0.1 percent of the transmitted power. All of these margins are reflected in our projections of the emission levels that will be technologically feasible.

Fuel Map Confirmatory Testing

We are making several changes to the proposed EPA confirmatory testing provisions in response to comments. First, the regulations being adopted specify that EPA will conduct triplicate tests for engine fuel maps to minimize the impact of test-to-test variability. The final regulations also state that we will consider entire fuel maps rather than individual points. Engine manufacturers objected to EPA's proposal that individual points could be replaced based on a single test, arguing that it effectively made the vehicle standards more stringent due to point-to-point and test-to-test variability. We believe that the changes being adopted largely address the concerns raised in the comments. We are also applying this approach for axle and transmission maps for similar reasons.

Manufacturers pointed to a round-robin test program showing significant variability between test sites. However, those results were not corrected for fuel properties, as is required for both Phase 1 and Phase 2 testing. Thus, they do not represent variability that would be expected to occur with EPA compliance testing. Nevertheless, the agencies do see value in working with manufacturers on the type of research project suggested by EMA.

It is worth noting that round-robin data did show that test-to-test variability within a given laboratory (where fuel properties would be constant) is on the order of one-half percent with existing equipment. It is likely that, as long as differences in fuel properties are corrected, lab-to-lab variability should be similar. Thus, we believe that overall test variability for engine testing will be about one percent in the Phase 2 time frame.

Daimler commented that EPA should evaluate the manufacturer's fuel maps using GEM for confirmatory testing. However, it is not necessary to constrain EPA testing in this manner. EPA has long treated its confirmatory results as official emission results that are fully valid.

SEAs for Fuel Maps

We have revised the SEA procedures for fuel maps in response to comments. The final provisions will evaluate fuel maps using four pre-defined GEM vehicle configurations. Volvo recommended that EPA use a single GEM configuration, but we believe this would not cover a broad enough range of the fuel map.

Aerodynamic Testing

As described in Section 4, EPA has modified the SEA regulations for verifying aerodynamic performance. These revised regulations differ somewhat from the standard SEA regulations to address the unique challenges of measuring aerodynamic drag. In particular, EPA recognizes that for coastdown testing, test-to-test variability is expected to be large relative to production variability. This differs fundamentally from traditional compliance testing, in which test-to-test variability is expected to be *small* relative to production variability. To address this difference, the modified regulations call for more repeat testing of the same vehicle, but fewer test samples.

Comments from the trailer industry supported less burdensome confirmatory and SEA procedures, even to the point of excusing manufacturers relying on supplier data from any test requirements or liability. Although, the statutes do not allow us to completely excuse certifying manufacturers in this way, we understand these concerns. Therefore, the agencies plan to work with industry to minimize compliance burdens. In particular, we plan to limit SEAs to those cases in which we have a reason to believe the products are not fully compliant with the regulations.

Test Procedures

Daimler objected to text in the proposed §1037.551 that states:

> *These engine-based measurements may be used for confirmatory testing as described in §1037.235, or for selective enforcement audits as described in §1037.301, as long as the test engine's operation represents the engine operation observed in the powertrain test.*

However, Daimler does not appear to understand how this provision would be used. First, they ignore the end of the text which clearly makes it apply only where "the test engine's operation represents the engine operation observed in the powertrain test." Under this provision, manufacturers certifying using powertrain testing are required to measure speed and load values to allow for engine testing. Thus, testing would only occur over the manufacturer's specified cycle. Moreover, since the manufacturers perform all SEA testing, this would be an option for the manufacturer rather than something imposed by EPA. So perhaps Daimler objects to the narrow circumstance in which EPA performs confirmatory engine testing of an engine that was certified using powertrain testing, follows the manufacturer's specified engine test cycle, and ensures that the test accurately represents the engine's performance during the powertrain test. However, it is not clear why this would be problematic. It is reasonable to assume that testing the engine in this way would result in equivalent emission results. Moreover, a strict requirement to require powertrain testing by EPA in such cases could lead to other problems for manufacturers. In particular, we note that in the case of an EPA confirmatory engine test indicating the manufacturer's powertrain fuel map is not accurate, the alternative would be to delay certification until EPA can perform a confirmatory test of the powertrain.

Cummins and Eaton also raised concerns about this approach. In particular, Cummins stated that not capturing control interactions could result in elevated emissions for an engine-only test. But again, a condition of this provision is that the test engine's operation must represent the engine operation observed in the powertrain test. Cummins' question about how efficiency losses from the transmission would be accounted for when running an engine-only test ignores the specification that the cycle be specified based on engine torque rather than transmission torque. To the extent Cummins concerns remain, they would be free to certify their engines based on engine-only fuel maps rather than powertrain testing.

SmartTruck commented that a device manufacturer should be able to test its model-year components on a tractor from a prior year. This is allowed. SmartTruck also commented that the agencies should allow device manufacturers greater flexibility in choosing testing facilities pre-approved by the EPA to ensure a greater confidence in SEA and confirmatory testing results. However, the program is already structured to allow manufacturers to choose any facilities for their SEAs. With respect to confirmatory testing, we note that the agencies (not the manufacturers) perform that testing.

Supplier Data

Daimler commented that for inputs from a component supplier (such as an axle manufacturer) the agencies "should require only that the vehicle manufacturer used that supplier's input in good faith" and suggested that this is the current policy for tire inputs. However, Daimler is not correct in claiming that this is the Phase 1 policy for tires. They appear to be misinterpreting text that attaches some liability for tire manufacturers to mean that there is no liability for vehicle manufacturers. In general, the certificate holder is responsible for compliance for all aspects of the vehicle covered by their certificate, even if the agencies find another manufacturer to also be responsible.

1.4.4 Delegated assembly (dividing responsibility among manufacturers) 147

Organization: American Automotive Policy Council

Vocational A/C Delegated Assembly Concerns

EPA is proposing to add vocational vehicles to the heavy-duty air conditioning leakage requirement beginning with MY2021 using the same SAE J2727 design approach used in Phase 1. While AAPC agrees that the design approach for calculating leakage is correct, we are concerned regarding responsibilities for compliance and certification. [EPA-HQ-OAR-2014-0827-1238-A1 p.20]

Currently, for non-air conditioning related system compliance, a secondary manufacturer can use the first manufacturer's Certificate of Conformity (COC) if the system is not modified and the vehicle does not exceed certain criteria such as GVWR and Frontal Area. However, for heavy-duty applications, there will be numerous cases where the second manufacturer will modify or add to the air conditioning system. In these cases it should be clear that it is the second manufacturer's responsibility for compliance and certification of the completed air conditioning system for leakage. In such cases, the secondary manufacturer should also be responsible to attest to the durability of the complete A/C system. Once an A/C system has been modified, the integrity of the resulting system depends as much on the workmanship of the modifier as it does on the workmanship of the original manufacturer. Only the entity making the modifications can attest to durability of the final, as-modified system. Original manufacturers should not be held responsible for any alterations to the A/C system outside of their control. [EPA-HQ-OAR-2014-0827-1238-A1 p.20-21]

Organization: Truck & Engine Manufacturers Association (EMA)

[T]he proposed changes to the Phase 1 requirements for delegated assembly should not be finalized, as those changes also would amount to retroactive amendments to the overall stringency and cost of the Phase 1 program in violation of administrative due process and the CAA's leadtime and stability provisions. In sum, there is no reason to pull those proposed provisions forward, especially when to do so would disrupt the implementation and feasibility of Phase 1. [EPA-HQ-OAR-2014-0827-1269-A1 p.22]

Organization: Daimler Trucks North America LLC

Changes to Phase 1: There should be no changes to Phase 1. 80 FR 40519. It is too late for us to revise aero numbers or our delegated assembly procedures, given the agencies' lead time requirements, which require four years' lead time for NHTSA and require a joint program for the EPA (see Massachusetts v. EPA 549 U.S. 497, 532, 2007, where the Supreme Court stated that "there is no reason to think the two agencies [EPA and NHTSA] cannot both administer their obligations and yet avoid inconsistency"). We are busy working on Phase 2, to go back and adjust computer systems or delegated assembly at this point in time is too much for our limited groups. [EPA-HQ-OAR-2014-0827-1164-A1 p.111]

Organization: Aperia Technologies

As a prospective certifying manufacturer of automatic tire inflation systems and for the reasons below, Aperia Technologies (Burlingame, CA) supports the delegated assembly provision proposed for inclusion in 40 CFR 1037.621 providing for an 'allowance for vehicle manufacturers to sell or ship vehicles that are missing certain emission-related components if those components will be installed by a secondary vehicle manufacturer': [NHTSA-2014-0132-0104 p.1]

- Impacts on real-world operational efficiency and greenhouse gas emissions of vehicle configurations are path-independent; it doesn't matter who installs the device, just that it works. [NHTSA-2014-0132-0104 p.1]

- Such flexibility will enable faster adoption of good technology, no matter who builds it or when it gets installed. OEMs will be incented to find good technology partners, just as the market for development and commercialization of differentiated technologies by after-market manufacturers will be catalyzed toward higher competition and faster innovation. [NHTSA-2014-0132-0104 p.1]

- Certain technologies, like Aperia's Halo Tire Inflator, enable fast installation on both new and existing fleet vehicles. For such technologies, the delegated assembly provision applicable to new vehicles is likely to induce accelerated adoption among existing fleet vehicles. [NHTSA-2014-0132-0104 p.1]

We advocate the following specifically: [NHTSA-2014-0132-0104 p.1]

- We recommend that automatic tire inflation systems be added to aerodynamic devices and air conditioning systems as key aftermarket technologies. Currently, draft Phase 2 regulation does not propose to limit the use of delegated assembly to aerodynamic devices and air conditioning systems, but nonetheless focuses only on those two. [NHTSA-2014-0132-0104 p.1]

Organization: Association for the Work Truck Industry (NTEA)

Delegated Assembly

Vehicles produced by NTEA member companies for commercial or vocational use include, but are not limited to, dump trucks, utility company vehicles, aerial bucket trucks, tow trucks, beverage delivery trucks, digger derricks, snow removal vehicles, agricultural platform and stake body trucks, fire trucks, ambulances and a host of other specialized configurations.

The typical NTEA distributor member (a FSM by NHTSA definition) is capable of producing an almost endless variety of vehicle configurations. They can mount any one of numerous body types and work equipment on a chassis of any size from any of the manufacturers. For instance, the same company may mount a utility body on a Dodge chassis one day, an aerial bucket on a Ford chassis the next day, a dump body on a Freightliner, a stake body on a GM or a telescoping crane on a Peterbilt, etc… Items such as toolboxes, winches, lift gates and ladders might also be added before the vehicle is completed.

The NTEA's Membership Roster and Product Directory lists over 129 separate body types. Each of these body types could be mounted to multiple truck chassis from multiple chassis manufacturers. In addition, multiple combinations of equipment (ladder racks, winches, snow plows, salt spreaders, light bars, towing hardware, lift gates and hundreds of other mountable components) can be added to any of the aforementioned chassis/body combinations.

In EPA's existing regulations (40 CFR 1068.261), engine manufacturers may sell or ship engines that are missing certain emission-related components if those components will be installed by the vehicle manufacturer. According to this proposal EPA would provide a similar allowance for vehicle manufacturers to sell or ship vehicles that are missing certain emission-related components if those components will be installed by a secondary vehicle manufacturer. [EPA-HQ-OAR-2014-0827-1187-A1 p.5]

The NTEA supports the EPA concept of delegated assembly. This concept could allow for greater adoption of advanced fuel savings and emission reducing technologies. Due to the nature of the manufacturing process for vocational trucks, there is little or no recognition currently for work done on a vehicle after it leaves the chassis manufacturer and before it is sold to the customer. Intermediate and final stage manufacturers can, and do, perform manufacturing operations that positively affect fuel efficiency and emissions. [EPA-HQ-OAR-2014-0827-1187-A1 p.5]

We would like to suggest that the requirement for written instructions for completion/alteration of the vehicle and/or its emissions-related components be made more flexible such that those instructions come from the most appropriate entity. For instance, if a chassis manufacturer has contracted with a hybrid drive manufacturer for installation of a hybrid drive system on the chassis manufacturer's otherwise completed chassis, the instructions for installation may best be provided by the hybrid drive manufacturer rather than the chassis manufacturer. [EPA-HQ-OAR-2014-0827-1187-A1 p.5]

The NTEA supports the concept of delegated assembly in which manufacturers involved in the production of trucks after the emissions certification process by the engine and chassis manufacturers can contribute and be recognized for the emissions reduction their work and products creates. These intermediate and final stage manufacturers or alterers would be bound contractually, rather than by regulation to install specified products that result in specified regulatory benefits that can be used by the certifying manufacturer. [EPA-HQ-OAR-2014-0827-1187-A1 p.6]

Organization: California Air Resources Board (CARB)

The CARB staff supports the approach delineated in 40 CFR 1037.620-622 which defines the responsibility for each entity involved in an engine/vehicle with multiple manufacturers. This clearly defined approach will make it evident which party is responsible for every facet of the engine/vehicle. [EPA-HQ-OAR-2014-0827-1265-A1 p.190]

CARB staff further believes that 40 CFR1037.622 (page 40654 of the NPRM, paragraph (5)) should use “site” instead of “cite” (“[T]he secondary manufacturer must identify the regulatory cite site identifying the applicable exemption instead of a valid family name when ordering engines from the original vehicle manufacturer.”).[EPA-HQ-OAR-2014-0827-1265-A1 p.190]

Organization: CALSTART

Delegated Assembly Modification. This is salient to flexibility for the following reasons. For example, while the draft fuel economy rule does call out work site idle as part of potential “off cycle” credits, because this equipment is often added in the final stage of assembly, or even the aftermarket, it is not normally added with the involvement of or at the designation of the chassis OEM. Therefore, we are concerned that without a mechanism that matches this market structure dynamic the rule will not adequately recognize such systems that can reduce or eliminate a significant component of idling, and there will be less regulatory compliance value in supporting the development and addition of these systems. The result will be leaving significant fuel savings and emission reductions off the table. As one industry supplier noted in private comments to us, “By nature, there is usually a lot of reluctance from [an] OEM to adopt and incorporate advanced technologies, especially when it comes from second or third tier suppliers. Credits, with potential multipliers, would give OEMs incentives to adopt these technologies.” [EPA-HQ-OAR-2014-0827-1190-A1 p.6-7]

One approach we think useful to explore could be an expansion or modification of the delegated assembly provision to allow final stage or aftermarket suppliers to generate credits beyond those “delegated” by an OEM, and to be able to offer those credits back to an OEM. Ideally, the long term goal is to drive greater integration of such functions, but realistically, the innovation and installation of such systems currently takes place outside the OEM and often without the direct control or knowledge of the OEM, and the rules as drafted do not recognize this. An approach such as this could be a highly valuable design that would capture these savings and make them available to the OEM for compliance flexibility. However, as noted, such as expansion is not useful if stringency levels remain at proposed levels, as the OEM would have no need to use them. [EPA-HQ-OAR-2014-0827-1190-A1 p.7]

The introduction of the “delegated assembly” provision for vehicle manufacturers increases the flexibility for both primary and secondary manufacturers but needs further refinement, as noted earlier in our comments. While the delegated assembly provisions better reflect the work truck market, they still require that the certifying manufacturers be aware of the final state of the vehicle. This does not reflect current business practices, where chassis are up fitted before final delivery to the customer but well after point of sale from a chassis manufacturer’s perspective. [EPA-HQ-OAR-2014-0827-1190-A1 p.8-9]

In the proposal, this provision was identified as a strategy for secondary manufacturers responsible for modest alterations to the vehicle (e.g., attaching aerodynamic devices); however, it is applicable to secondary manufacturers more broadly, including manufacturers whose systems alter the powertrain on the vehicle, and we request that the agencies explicitly identify this as a pathway for advanced technologies. These mechanisms could also be used for technologies that reduce fuel use in idling. [EPA-HQ-OAR-2014-0827-1190-A1 p.9]

We also request that the agencies expand the use of the "delegated assembly" provision to Class 2b/3 complete vehicles. These changes will help increase flexibility for manufacturers and provide additional certainty around how fuel reduction solutions from secondary manufacturers can be captured by the regulatory process. [EPA-HQ-OAR-2014-0827-1190-A1 p.9]

Organization: Daimler Trucks North America LLC

10. Delegated Assembly and Body Builder Instructions

· **Delegated assembly, general comment:** We believe that the EPA should not expand its current delegated assembly procedures either in Phase 1 or in Phase 2. The current procedures require that a manufacturer ensure a vehicle is in its certified configuration by the time it reaches the ultimate purchaser. But the current regulations allow manufacturers significant leeway in doing so. For example, the current § 1037.620 allows manufacturers to ship vehicles to secondary manufacturers as long as the vehicles "will be in their certified tractor [or vocational] configuration before they reach ultimate purchasers." This allows manufacturers to, for example, send vehicles with natural gas engines to natural gas tank installers without any unnecessary paperwork burden. The EPA does provide that "delegated assembly provisions may apply" (emphasis added), but the agency does not provide that they do. Moreover, the existing delegated assembly provisions in Part 1068 do not apply in such circumstances. We recommend that the EPA continue this approach as 1) there is no evidence that manufacturers are somehow sending to ultimate purchasers uncertified vehicles and 2) the paperwork burden presented by delegated assembly is impossibly large. Regarding the paperwork burden, unlike with delegated assembly of engines for which there are a small number of vehicle manufacturers all of which are known to the engine manufacturers, there are a large number of secondary vehicle manufacturers and primary vehicle manufacturers might not even know them or what they do—thus making it extremely difficult to require the primary manufacturers contract with them. For example, there are secondary manufacturers that add aerodynamic components, modify sleepers, add auxiliary AC components, etc. But a primary manufacturer often has no awareness that this will happen. These secondary manufacturers are required to comply with the Part 1037 regulations and ensure that the resulting vehicle complies with the regulations prior to releasing the vehicle to the ultimate purchaser; that should be enough. Requiring the primary manufacturer to police all the people who might modify the vehicles is unnecessary. So as a general comment, we recommend that the EPA stick with the minimal delegated assembly rules. [EPA-HQ-OAR-2014-0827-1164-A1 p.103]

The agencies specifically ask for comments on how the procedures should be applied more broadly or more narrowly for specific technologies. 80 FR 40328. The above statements apply to all types of technologies: as happens with incomplete vehicles under NTHSA regulations, the EPA should understand that vehicle manufacturing is a multi-stage process (regardless of the technologies on the vehicles) and that each stage of manufacturer has the incentive to properly complete manufacturing—without burdensome contracts and audits. Rather, the EPA should continue the longstanding industry practice of allowing primary manufacturers to pass incomplete vehicles with incomplete vehicle documents to secondary manufacturers who complete the installation according to 1) their normal practices (with which the primary manufacturer is often not familiar) and 2) the IVDs. No more is necessary, nor is more necessary for certain types of technologies. [EPA-HQ-OAR-2014-0827-1164-A1 p.103]

· **Complete vehicles:** We wish to clarify the agencies' general approach, as discussed in meetings on August 25 and 26. The agencies stated that their intent with the proposed delegated assembly regulations is unclear. The agencies stated that they intend for tractors and chassis cabs to be considered complete vehicles under these regulations, so that the vehicles can be labeled as compliant and so that manufacturers need not follow any delegated assembly procedures with such vehicles. For example, the agencies stated that they do not intend to require primary vehicle manufacturers to provide components' installation instructions to body builders unless the components are emission related components described in a certificate of conformity. We agree with this approach. [EPA-HQ-OAR-2014-0827-1164-A1 p.103-104]

· **Secondary manufacturers and delegated assembly:** it seems that the EPA has the right approach with 1037.620 and .801, where the EPA says that manufacturers only become secondary manufacturers if they put a vehicle into its final certified configuration or modify it from a certified configuration. Those are the only instances when the EPA should regulate the secondary manufacturer or the interaction between the primary and secondary manufacturers. Moreover, only when the primary manufacturer arranges for the secondary manufacturer to complete the process of getting a vehicle into its certified configuration should there be any reason to involve the primary manufacturer in delegated assembly requirements. Rather, if a primary manufacturer introduces into commerce a chassis-cab that meets the GHG regulations, that should be the end of the primary manufacturer's responsibilities; it should be between the EPA and the secondary manufacturer to ensure that the secondary manufacturer does not remove or render inoperative elements of emission control. On more minor notes: First, the EPA has a typo in 1037.621, in that the regulation references 'paragraph (f) of this section' yet the section only has paragraphs (a) and (b). Second, the EPA's addition of the provision in 1068.261(c)(7)(ii), that manufacturers add 'Del Assy' to the cert labels of incomplete vehicles, is unnecessary in many cases. Moreover it is burdensome. Labeling of vehicles is a lot more complex than labeling of engines, involving more calculations and varieties of information. In turn, it is more difficult to add text, especially if it is unnecessary. For many vehicles, like those sold without natural gas fuel systems (which the secondary manufacturers install), the vehicles cannot be driven until the secondary manufacturer completes its processes. So there is no concern about the vehicle being driven on road in a noncompliant state (except perhaps for driving as a part of manufacturing or testing). The EPA should not require additional burdensome labeling for such vehicles. 1037.650 / .621 / .801 [EPA-HQ-OAR-2014-0827-1164-A1 p.104]

· **Changes to secondary manufacturing and delegated assembly should be delayed until Phase 2, not implemented in the middle of Phase 1:** the EPA proposes to make changes to multi-stage manufacturing processes by adding the requirements of 1068.261, through 1037.621. This is a major change to the process necessary to manufacture vehicles and should not be implemented in a short time frame; manufacturers need a long time to work with their various secondary manufacturers and implement the procedures that the EPA demands (such as annual affidavits of part numbers, contractual obligations, and record keeping). While these are not huge burdens, they are new and they may involve many secondary manufacturers, including small businesses, such that implementation will take significant time and effort. Better yet, the EPA should simply regulate at the vehicles' sale to an ultimate manufacturer, not partway through the manufacturing process. Also the provisions of 1037.622(b)(5), the new (5), are unclear. Why would there be 'no valid family name' for a vehicle? When does this provision apply? 1037.621 [EPA-HQ-OAR-2014-0827-1164-A1 p.104]

Cert labels for delegated assembly vehicles: We agree that the EPA takes the right approach by omitting HDVs from provision § 1068.261(c)(7)(ii), which requires that manufacturers add 'Del Assy' to the cert labels of incomplete vehicles. This is burdensome and, in the case of HDVs, is unnecessary. Labeling of vehicles is a lot more complex than labeling of engines, involving more calculations and varieties of information. This complexity more difficult to add text, especially if it is unnecessary. For many vehicles, like those sold without natural gas fuel systems (which the secondary manufacturers install), the vehicles cannot be driven until the secondary manufacturer completes its processes. So there is no concern about the vehicle being driven on road in a noncompliant state (except perhaps for driving as a part of manufacturing or testing, which the agency explicitly allows). The EPA should not require additional burdensome labeling for such vehicles when there will be no benefit. [EPA-HQ-OAR-2014-0827-1164-A1 p.105]

Delegated Assembly – Concerns with the text as written: As the text that follows will show, we need some clarification that we have correctly understood the EPA's intent. Assembly instructions for secondary vehicle manufacturers: it seems that the EPA wants truck manufacturers to include assembly instructions with each truck sold without the body (like the box van), which is nearly all trucks. In 1037.130, the EPA proposes to require that the truck manufacturers tell those body installers how to install bodies in a manner compliant with the GHG standards. But it is not clear how things like a box van are subject to the GHG regulations or how a truck manufacturer would have any expertise in installing box vans or the variety of bodies that might get put onto a truck. We request that the EPA clarify what the agency expects truck manufacturers to tell these body installers, and we suggest that the EPA limit any such instructions to areas of truck manufacturers' expertise. In other words, manufacturers should not have to tell body installers how to mount equipment or van boxes--especially when such matters do not relate to the GHG regulations. Given all of this confusion, we wish for the EPA to clarify what the agency proposes. On a more minor note: the EPA has a typo in 1037.621, in that the regulation references 'paragraph (f) of this section' yet the section only has paragraphs (a) and (b). [EPA-HQ-OAR-2014-0827-1164-A1 p.105]

1037.622 is improperly named: it refers to shipping incomplete vehicles, when it should refer to partially complete vehicles, as the text is primarily focused on partially complete vehicles. The misnomer makes it unclear what we believe the EPA means: that the agency intends 1) to allow a primary vehicle manufacturer to certify an incomplete vehicle, such that the secondary manufacturer would have no need to certify the vehicle, but 2) to regulate the sale of partially complete vehicles (those not yet in their certified configuration at the time of sale to a secondary manufacturer). As written, the proposed text refers to secondary manufacturers getting certification in the case of partially complete vehicles in a section whose title refers to another type of vehicle. The EPA should clarify. [EPA-HQ-OAR-2014-0827-1164-A1 p.105]

Organization: Edison Electric Institute

D. Delegated assembly procedures may not provide sufficient incentive for PEVs, including e-PTO systems, as well as PHEVs and BEVs

In section V.E.2.c of the Preamble of the proposed Phase 2 Program, EPA and NHTSA also seek comment "on how the procedures should be applied more broadly or more narrowly for specific technologies."[43] In response, EEI offers the following comments. [EPA-HQ-OAR-2014-0827-1327-A2 p.17]

Delegated assembly procedures may not provide sufficient incentive for PEVs, including e-PTO systems, as well as PHEVs and BEVs. The proposed rule indicates that the delegated assembly provisions “are focused on add-on features to reduce aerodynamic drag, and on air conditioning systems.” As proposed, the rule falls short in limiting the scope of the delegated assembly provisions to these technologies alone. [EPA-HQ-OAR-2014-0827-1327-A2 p.17]

End use customers, including EEI members, who wish to procure PEV technologies often turn to “upfitters” or secondary vehicle manufacturers when the product is not offered from the typical chassis manufacturers. In many cases, the chassis manufacturers or “upstream” manufacturers may not be aware of the technology being applied to their vehicles by secondary vehicle manufacturers before entering into service. Under the current structure of the proposed rule, the compliance depends entirely on the chassis manufacturers to certify the greenhouse gas performance of their vehicles. Such a focused application potentially risks ignoring major greenhouse gas reduction initiatives occurring in the regulated sector. [EPA-HQ-OAR-2014-0827-1327-A2 p.17-18]

“Upfitters,” or secondary vehicle manufacturers, should also be incentivized to deploy greenhouse gas reduction technologies as part of any final rule. One solution may be to allow secondary vehicle manufacturers to “opt-in” to the regulation. Such an option would require the secondary vehicle manufacturers to create an agreement with the otherwise regulated entity (i.e. the chassis manufacturer) to ensure the appropriate credit is apportioned between the two entities in a manner reflective of the total overall reductions. Another solution may be to create a “users’ council” that could propose to the agencies the full suite of downstream technologies being applied to upstream chassis. This users’ council could also serve to facilitate the establishment of agreements between chassis manufacturers and downstream manufacturers. [EPA-HQ-OAR-2014-0827-1327-A2 p.18]

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43 See 80 Fed. Reg. at 40,328.

Organization: Electric Drive Transportation Association (EDTA)

Delegated Assembly

The proposed rule’s delegated assembly procedures should provide increased clarity and certainty regarding electric and plugin hybrid systems, including electric PTO systems, as all of these systems are currently developed and deployed by third-party providers to Original Equipment Manufacturers (OEMs). The emphasis of the rule should be expanded beyond aero-dynamic and air conditioning to include the spectrum of electric drive systems. [EPA-HQ-OAR-2014-0827-1217-A1 p.3]

Delegated assembly procedures should also recognize the role of up-fitters and after-market manufacturers in compliance strategies. Several options for so doing are being offered by the industry, including allowing tradeable credits between manufacturers in the chain and allowing secondary manufacturers to “opt- in” to the regulation. We support providing the pathways to incentivize the increased recognition of this segment of the manufacturing chain and would like to work with the agencies’ to identify effective and feasible mechanisms to do so. [EPA-HQ-OAR-2014-0827-1217-A1 p.3]

Organization: Green Truck Association (GTA)

Delegated Assembly

Many of the member companies in the GTA produce products that are specifically designed to reduce fuel usage by vocational trucks. This reduction in fuel use and GHG emissions may be accomplished by advanced technologies (such as hybrid drive systems), alternative fuel conversions, reduced aerodynamic drag or use of lightweight materials. [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

In the past, many of the above mentioned products or technologies were not necessarily recognized by the regulations as they were installed after the engine and chassis had been certified. Applying the delegated assembly concept, perhaps with minor adjustments, could bring regulatory recognition of a sort to these significant fuel saving and emission reducing actions. This recognition could increase the adoption of these technologies and equipment, furthering the goals of these proposed rules. [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

In EPA's existing regulations (40 CFR 1068.261), engine manufacturers may sell or ship engines that are missing certain emission-related components if those components will be installed by the vehicle manufacturer. According to this proposal EPA would provide a similar allowance for vehicle manufacturers to sell or ship vehicles that are missing certain emission-related components if those components will be installed by a secondary vehicle manufacturer. [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

<u>The GTA supports the EPA concept of delegated assembly.</u>

While we enthusiastically support the concept of delegated assembly, we also appreciate the Agencies' willingness to consider minor modifications to the process. [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

The proposal notes, "We also request comment on any further modifications that should be made to the delegated assembly provisions to reflect the nature of manufacturing relationships or technologies that are specific to greenhouse gas standards for heavy-duty highway vehicles." [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

We would like to suggest that the requirement for written instructions for completion/alteration of the vehicle and/or its emissions-related components be made more flexible such that those instructions come from the most appropriate entity. It certainly would be appropriate for the chassis manufacturer to contractually require proper installation. However, for instance, if a chassis manufacturer has contracted with a hybrid drive manufacturer for installation of a hybrid drive system on the chassis manufacturer's otherwise completed chassis, the instructions for installation may best be provided by the hybrid drive manufacturer rather than the chassis manufacturer. [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

As such, the arrangement should allow the OEM to require proper installation of the equipment by the secondary manufacturer. The actual installation instructions should be written by the entity most qualified to do so. That may be the final stage manufacturer whose responsibility it is to mount pieces of equipment or the manufacturer of the equipment (for instance a fuel conversion kit manufacturer). [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

<u>Delegated Assembly Questions</u>

The proposed rules state that in order to utilize the proposed delegated assembly provisions, the certifying manufacturer would have "… a contractual obligation with the secondary manufacturer to complete the assembly properly and provide instructions about how to do so. Keep records to demonstrate compliance. Apply a temporary label to the incomplete vehicles. Take other reasonable steps to ensure the assembly is completed properly. Describe in its application for certification how it will use this allowance." [EPA-HQ-OAR-2014-0827-1188-A1 p.2]

The GTA would be interested in clarifying the scope of the delegated assembly provisions being proposed. Assuming that the procedural steps above have been taken, could the Agency provide clarification with regard to the following situations and whether or not the delegated assembly provisions could be applicable: [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

Scenario 1. Aerodynamic Devices

The coefficient of drag is one factor that determines the necessary horsepower, and subsequently fuel, to propel a vehicle forward. [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

A chassis manufacturer contracts with a final stage manufacturer who will be installing bodies and adding ladder racks to a significant number of identically prepared chassis to also install an aerodynamic shroud over the ladder rack. The vehicle would fall in the vocational category to be operated in the "regional" mode. The chassis manufacturer can quantify the aerodynamic improvement of the shroud. With the proper contractual arrangement, could the chassis manufacturer include the resultant reduction in emissions to their certification? [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

Similarly, on a regional mode vocational truck could the installation of aerodynamic mud flaps with a specified aerodynamic profile improvement over conventional mud flaps be the subject of such a contractual arrangement between chassis manufacturer and later stage manufacturer? [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

Could the chassis manufacturer and the later stage manufacturer negotiate between themselves the value attached to the later stage manufacturer's efforts? [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

Scenario 2. Hybrid

A chassis manufacturer delivers a completed chassis (with drivetrain) to an intermediate stage manufacturer who installs a plug-in hybrid system on the chassis and then ships the chassis to a final stage manufacturer. The chassis will be operated in the urban mode and will likely be doing a lot of start/stop and operating a power take off unit to drive equipment at a jobsite. [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

First, can the chassis manufacturer enter into a contract with the installer of the hybrid drive system for "delegated assembly" purposes? [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

What information would the chassis manufacturer need in order to take advantage of the emissions improvements provided by the hybrid system over the standard (non-hybrid) chassis configuration for the certification process? [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

Scenario 3. Alternative Fuel Conversion

Similar to Scenario 2, a chassis manufacturer sends a completed diesel powered chassis to an intermediate stage manufacturer who installs an alternative fuel conversion (liquid propane autogas, CNG). First, can the chassis manufacturer enter into a contract with the converter for "delegated assembly" purposes? [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

What information would the chassis manufacturer need in order to take advantage of any emissions improvements provided by the conversion of the chassis from diesel to the alternative fuel? [EPA-HQ-OAR-2014-0827-1188-A1 p.3]

Scenario 4. Lightweighting

A completed chassis is delivered to a final stage manufacturer for installation of the body in order to complete the vehicle. A lightweight body (fiberglass/composite material) is specified instead of a standard body resulting in a specified reduction in vehicle weight. [EPA-HQ-OAR-2014-0827-1188-A1 p.4]

First, can the chassis manufacturer enter into a contract with the final stage manufacturer for "delegated assembly" purposes? [EPA-HQ-OAR-2014-0827-1188-A1 p.4]

What information would the chassis manufacturer need in order to take advantage of any emissions improvements provided by the lightweighting of the completed vehicle? [EPA-HQ-OAR-2014-0827-1188-A1 p.4]

Could the contract be between the chassis manufacturer and the body manufacturer (whose multiple distributors could install the body in locations nationwide)? [EPA-HQ-OAR-2014-0827-1188-A1 p.4]

Other

If a delegated assembly provision were to be promulgated through this rulemaking, could it be used during the Phase 1 time period? [EPA-HQ-OAR-2014-0827-1188-A1 p.4]

Conclusion

The GTA supports the overall structure of the proposal as it relates to delegated assembly. This concept would allow the efforts of body and equipment, intermediate and final stage manufacturers to be recognized with regard to the fuel and emission reducing technologies they add to otherwise certified truck chassis. [EPA-HQ-OAR-2014-0827-1188-A1 p.4]

Organization: National Automobile Dealers Association (NADA)

Under Phase 2, vocational vehicles will continue to include what the other two motorized vehicle groupings do not. The range of Class 2b through Class 8 trucks, tractors, and buses is very wide, as is the scope of work functions and duty-cycles they engage in. Vocational vehicles often involve multi-stage manufacturing where one manufacturer builds the chassis or cab chassis and (at least) one other adds a body or other equipment to it. Often, vocational truck and tractor customers do not spec and purchase complete vehicles directly from a single manufacturer, but rather from a tractor and truck chassis dealership and a body and equipment manufacturer. The contractual arrangements involved are many. Vocational vehicle purchasers typically specify engines and other major components from a variety of suppliers with no single manufacturer having complete dominion over the finished product. Moreover, dealerships often alter or up-fit vocational vehicles prior to delivery. [EPA-HQ-OAR-2014-0827-1309-A1 p.9]

Vocational vehicle production can be both commercial (read "for stock"), or "custom" in nature. Regarding the latter, it is not at all unusual for "production" runs to involve just one vehicle. So, unlike for most on-highway combination tractors, there are literally thousands of unique and distinct potential vehicle combinations being produced by thousands of different manufacturers and alterers, which are sold by thousands of dealerships. [EPA-HQ-OAR-2014-0827-1309-A1 p.9]

NADA/ATD does not object to making OEMs primarily responsible for any and all components, including tires, which they install in their vehicles. Dealerships selling and purchasers buying commercial vehicles should not be burdened by having to look to several different potential OEMs when an issue arises. Instead, if and when an issue arises, the truck or tractor manufacturer should be required to work things out with the suppliers whose parts or components they install. On the other hand, OEMs should not be primarily responsible for the performance of parts and components installed by a downstream manufacturer or installer where they have no control over the manufacture or installation of such those parts or components. [EPA-HQ-OAR-2014-0827-1309-A1 p.11-12]

Organization: Navistar, Inc.

In general, Navistar agrees with EMA's position on delegated assembly and secondary manufacturers but would like to emphasize certain points. The delegated assembly and secondary manufacturer are another area where it is useful to keep in mind the vast difference between the heavy duty commercial and light duty industries. Heavy duty vehicles, particularly vocationals, are routinely customized to an extent not seen in the light duty world. Very often this customization takes place after control of the vehicle has passed to a dealer or customer. [EPA-HQ-OAR-2014-0827-1199-A1 p.12]

The number of delegated assembly agreements required by the NPRM would be nearly unmanageable and far beyond any benefit. In the past, delegated assembly agreements typically were between an engine manufacturer and a vehicle OEM. Now, in addition to those, a vehicle manufacturer may be required to maintain agreements with air conditioner installers, idle reduction technology installers, hybrid PTO installers and aerodynamic device installers. [EPA-HQ-OAR-2014-0827-1199-A1 p.12]

The RIA states that this requirement is justified because this has worked well with engine manufacturers. We would note, however, that the number of engine manufacturers and installing vehicle manufacturers is relatively small, and that most of these entities themselves tend to be larger, more accustomed to regulatory requirements and have adequate personnel to manage complicated regulatory requirements. By contrast, installers are far more numerous, often regional and generally smaller companies.[18] These companies may not have the resources or infrastructure to enter into and manage numerous delegated assembly agreements. As a result, they may not be willing to enter into the agreements or may not have the resources to maintain compliance if they do enter into the agreements. This may lead to a reduced usage of the technologies or to their invisibility to the manufacturer or EPA. [EPA-HQ-OAR-2014-0827-1199-A1 p.13]

As to the latter point, we would like to highlight the possibility that this requirement could lead to the rule not capturing the benefit of many effective technologies. If the requirement of a delegated assembly agreement comes to be seen as a burden, we predict many secondary manufacturers will simply install these elements without an agreement. This means that, although the technology may be present, it would not be captured in the emission level for that vehicle. This will be an issue for both the manufacturer and the agencies. For the manufacturer, it means that a particular vehicle may be rated as having higher emission levels than is actually the case. For the agencies, they may not see all of the emission reductions that exist in the field. There should be some streamlined method of capturing the downstream installation of beneficial technologies. [EPA-HQ-OAR-2014-0827-1199-A1 p.13]

In addition, this proposal misunderstands the nature of the existing arrangements for the completion of primarily vocational, vehicles. Often items such as those described are ordered and installed either by dealers or directly by customers. Unlike with engines, vehicle manufacturers sometimes play little or no role in the installation of many of these technologies and are in no position to control their installation. There is almost always an existing contract between an engine manufacturer and a vehicle manufacturer. That contractual agreement typically does not extend between a vehicle manufacturer and an installer of, for example, a hybrid PTO. In that case, the contract is generally either between the installer and a dealer or a customer and the installer. [EPA-HQ-OAR-2014-0827-1199-A1 p.13]

Requiring a delegated assembly agreement is no way to encourage greater awareness of these technologies. The agencies should consider less intrusive and burdensome, methods of confirming the presence of these technologies. We also agree with EMA's proposed resolutions to this issue. [EPA-HQ-OAR-2014-0827-1199-A1 p.13]

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[18] The NTEA, representing work truck body and trailer manufacturers, has over 1,700 member companies. https://www.ntea.com/content.aspx?id=24280

Organization: Odyne Systems LLC

Delegated Assembly and Regulatory Compliance

Additionally, Odyne believes there could be a potential "chicken and egg" problem with how credits are held, if OEMs are the likely credit holder and the third party's system – potentially Odyne – needing to be certified in advance. Separately, should EPA consider expanding the delegated assembly process to include hybrid up-fitting, this could offer a potential solution to reduce regulatory burden and drive easier adoption of hybrid technology. [EPA-HQ-OAR-2014-0827-1239-A1 p.25-26]

Odyne has been working with CARB as they developed their proposed Innovative Technology Regulation (ITR) process. Since we are not an OEM and are installed on already certified vehicles we have focused on the Aftermarket process versus the New Certification process. We believe this process has appropriately accounted for nuances in the truck manufacturing process that can cloud the point at which a truck reaches certification as a new vehicle versus an aftermarket vehicle. [EPA-HQ-OAR-2014-0827-1239-A1 p.29-30]

Our understanding of current regulatory compliance and accounting proposed in Phase Two for fuel efficiency and emission benefits added through technology like Odyne's is as follows. OEMs would be required to work with third-party manufacturers, or at times called 'up-fitters', like Odyne to obtain credit for efficiencies made after a truck chassis is delivered, and typically already in a "certified" state. While it is theoretically possible for OEMs to delay certification, the combination of lower stringency requirements proposed in Scenario Three and extremely complex and diverse post-OEM applications for vocational trucks in particular make it difficult – and we believe too high a bar – for OEMs to seek credit for up-fitter improvements after the OEMs work is complete. In this case, should an OEM decide not to obtain credit for improvements made by up-fitters/intermediate stage manufacturers like Odyne, Oydne would not be able to become a credit holder, as the vehicle would technically be considered an aftermarket vehicle by the EPA. Even should up-fitters like Odyne be able to become a certification holder, we believe this would cause undue and unnecessary burden on small manufacturers. This would not be a preferred approach. [EPA-HQ-OAR-2014-0827-1239-A1 p.30]

We believe this lack of clarity could be a major roadblock for achieving the highest market penetrations of advanced emission and fuel saving technologies like Odyne's and others in the hybrid space. [EPA-HQ-OAR-2014-0827-1239-A1 p.30]

One potential remedy for this issue could be including a similar process to the Delegated Assembly provisions that the EPA is considering for Phase Two for hybrid systems. We understand that a number of stakeholders may be suggesting a similar approach, but remain open to EPA thinking to address this issue. [EPA-HQ-OAR-2014-0827-1239-A1 p.31]

We highly recommend EPA convene stakeholders, including Odyne, to address what could be a major regulatory barrier for Phase Two rules in the development of final rules. [EPA-HQ-OAR-2014-0827-1239-A1 p.31]

The CARB ITR was developed to achieve a similar purpose, with the assumption that given the highly regulated nature of the heavy duty industry, new technologies need incentive – even in small volumes – to be tested and proven, and advanced credits can serve as the catalysts to drive the development of these technologies, while also enabling the potential for earlier widespread adoption of technologies that could move the industry even beyond the emission requirements set out in this rulemaking. As noted above, any methods to streamline EPA and NHTSA rulemaking with CARB regulatory efforts would be extremely helpful to the industry. [EPA-HQ-OAR-2014-0827-1239-A1 p.31]

Odyne also believes that other aspects of certification such as warranty could be handled separately. Since the OEM is typically responsible for the main emissions related systems (engine, exhaust, etc.) and they are certifying that base configuration, they should carry the warranty for those systems. The OEM would hold the warranty, with a sub-warranty being held by Odyne for its own systems, as it is also important to point out that hybrid systems have a different life cycle than traditional powertrains. For example the battery system can vary depending on the application (load, duty cycle). Odyne currently offers a 1 year / 12,000 mile warranty and the option to purchase extended warranty up to 3 years / 36,000 miles. In our applications it is more important to focus on time/duration than mileage since the stationary/jobsite operation out weights the driving operation. [EPA-HQ-OAR-2014-0827-1239-A1 p.31-32]

Odyne understands that this is a complex issue and we applaud the EPA in its understanding that regulatory burden on small and innovative manufacturers can be detrimental to the deployment of advanced technologies, like hybrid systems. [EPA-HQ-OAR-2014-0827-1239-A1 p.32]

Organization: Odyne Systems LLC

As described previously, it will also be important to properly account for the benefits of various technologies in GEM model and testing. Odyne specifically supports and encourages the inclusion of PHEV systems interfaced with automatic transmissions, idle reduction systems and ePTO systems in GEM model and testing. In addition, once the technology is properly accounted for and given the credits it has earned it will be very important to provide a method like Delegated Assembly to "sell" those credits to OEM's to lower the burden on Small Companies and to recognize intermediate and final stage manufacturers that can integrate efficiency technology during the new vehicle build process to significantly reduce GHG emissions from medium and heavy duty vocational vehicles. [EPA-HQ-OAR-2014-0827-1920-A2 p.12-13]

Organization: PACCAR, Inc.

Secondary Manufacturers and Delegated Assembly Provisions

The Agencies' proposal would impose complicated, burdensome delegated assembly requirements for secondary manufacturers. The proposed requirements are disproportional to the number of vehicles that undergo secondary manufacture and the types of alterations that are made, which have minimal effects on fuel consumption and GHG emissions. PACCAR also believes that the Agencies have significantly underestimated the number of secondary manufacturers currently operating in the heavy-duty and vocational vehicle areas, most that would be classified as small business. [EPA-HQ-OAR-2014-0827-1204-A1 p.27]

PACCAR requests that the small business exemption be carried over from Phase 1 and finalize it as a permanent flexibility, to again alleviate the potentially onerous certification and compliance requirements for these companies. This exemption would also eliminate the need for the burdensome delegated assembly requirements for OEMs and any company that cannot certify the modified vehicles with the Agencies. [EPA-HQ-OAR-2014-0827-1204-A1 p.27]

PACCAR also recommends that the Agencies clarify that any delegated assembly provisions, if finalized, do not apply to manufacturers of glider kits, nor to the dealers or others to whom the glider kits are sold. Applying delegated assembly requirements to glider assemblers could require OEMs to administer more than 200 individual contracts per year and would shift a significant portion of the compliance burden onto the OEM where the OEM has little true ability to oversee or control the process [EPA-HQ-OAR-2014-0827-1204-A1 p.27]

PACCAR requests that the Agencies consider modifying the statement regarding frontal area in §1037.622(a)(2). The intent of the provision is beneficial but sleepers added in the aftermarket and cab modifications such as those to create a crew cab generally increase the frontal area of the vehicle in either height and/or width as compared to the frontal area of the vehicle as it leaves the vehicle factory. PACCAR will work with the Agencies to modify the proposed regulatory text to accomplish the intent of this subsection. [EPA-HQ-OAR-2014-0827-1204-A1 p.27-28]

LNG Tank Issues

PACCAR recognizes the importance of being able to offer our customers a natural gas powered option. In order to encourage further growth in this segment, the proposed regulation needs to be modified with regard to tank installations. PACCAR does not believe it should be responsible for LNG 5-day boil-off limits. PACCAR does not install these tanks. This is performed by secondary manufacturers who add these tanks to customer specifications. PACCAR supports the EMA comments that the proposed LNG tank requirements should apply to the tank itself and not the vehicle. [EPA-HQ-OAR-2014-0827-1204-A1 p.29]

PACCAR should not be responsible via delegated assembly for the installation of LNG tanks. [EPA-HQ-OAR-2014-0827-1204-A1 p.30]

Organization: Truck & Engine Manufacturers Association (EMA)

Delegated Assembly and Secondary Manufacturers

Under the Phase 1 program, manufacturers of "incomplete vehicles" can enter into delegated assembly agreements with secondary manufacturers (such as cab-builders, sleeper-installers, A/C installers, LNG tank installers, etc.), pursuant to which the vehicle manufacturers provide instructions regarding the installation of GHG-related components to ensure that the vehicle is "completed" in an appropriate

GHG-certified condition. This arrangement is then confirmed through an incomplete vehicle document ("IVD") that the vehicle manufacturer submits to EPA, which satisfies the vehicle manufacturer's responsibility for that vehicle. Consequently, in any subsequent Phase 1 audit testing, the secondary manufacturer, not the original manufacturer of the incomplete vehicle, is responsible for any emissions exceedances caused by its improper completion of a vehicle. [EPA-HQ-OAR-2014-0827-1269-A1 p.32-33]

The Agencies should not adopt any new regulations that would undercut the viability of delegated assembly, especially since the Agencies have not assessed the economic impact of a potential shutdown of that segment of the vehicle manufacturing industry. Instead, the Phase 1 provisions relating to delegated assembly should be retained. [EPA-HQ-OAR-2014-0827-1269-A1 p.33]

In that regard, EMA agrees with the provisions of proposed section 1037.801, which provides generally that manufacturers can only be deemed as secondary manufacturers if they modify a vehicle from its original certified configuration. EMA further agrees that those are the only instances when the Agencies should regulate the secondary manufacturer or the interaction between the primary and secondary manufacturers, particularly given the very large number of entities that complete but do not "modify" heavy-duty vehicles. Moreover, only when the primary manufacturer arranges for the secondary manufacturer to complete the process of putting a vehicle into its certified configuration, and only when that modification is from a previously certified configuration, should there be any reason to involve the primary manufacturer in any delegated assembly requirements. Otherwise, if a primary manufacturer introduces into commerce a chassis-cab or tractor that meets the GHG regulations, that should be the end of the primary manufacturer's responsibilities. After that point, it should be the secondary manufacturer's duty under the federal Clean Air Act ("CAA") to ensure that the secondary manufacturer does not remove or render inoperative any elements of emission control, including those relating to GHG emissions. Notwithstanding the foregoing, EMA requests clarification from the Agencies regarding these issues, as the current language of the proposed regulations is not sufficiently clear on these important points. [EPA-HQ-OAR-2014-0827-1269-A1 p.33]

EMA also supports the Agencies' proposal to exclude heavy-duty vehicles from the provisions of section 1068.261(c)(7)(ii), which require that manufacturers add 'Del Assy' to the certification labels of incomplete vehicles. Including that language would be burdensome and, in the case of heavy-duty vehicles, is unnecessary. The labeling of vehicles is much more complex than the labeling of engines, involving many more calculations and varieties of information. That complexity makes it far more difficult to add text, especially if it is unnecessary. For many heavy-duty vehicles, like those sold without natural gas fuel systems (which the secondary manufacturers install), the vehicles cannot be driven until the secondary manufacturer completes its processes. Accordingly, there is no concern about the vehicle being driven on-road in a noncompliant condition (except perhaps for some very limited driving as a part of manufacturing or testing, which the Agencies explicitly allow). Consequently, EPA should not require additional burdensome labeling for heavy-duty vehicles when there will be no benefit. [EPA-HQ-OAR-2014-0827-1269-A1 p.33]

Turning to other specifics, it appears that proposed section 1037.622 is improperly captioned: it refers to shipping incomplete vehicles, when it should refer to partially complete vehicles, as the text is primarily focused on partially complete vehicles. Moreover, the Agencies never actually define the "partially complete" vehicles that are the subject of that section. The lack of definition of this key term makes EPA's intent unclear. In particular, it is unclear whether the Agencies intend: (i) to allow a primary vehicle manufacturer to certify an incomplete vehicle and certain partially complete vehicles as described in 1037.622(a)(1-3), such that the secondary manufacturer would have no need to certify the vehicle; or (ii) to regulate the sale of partially complete vehicles that (a) will be certified by the secondary manufacturer, or (b) will involve the secondary manufacturer having a significant role in the vehicle design. As written, the proposed text refers to secondary manufacturers obtaining certification in the case of partially complete vehicles, an undefined type of vehicle, in a section whose title refers to another type of vehicle. The Agencies need to clarify this regulatory provision. [EPA-HQ-OAR-2014-0827-1269-A1 p.33-34]

Further, any changes to the Agencies' secondary manufacturing and delegated assembly requirements should be delayed until Phase 2, not implemented in the middle of Phase 1. This includes the proposed changes to the multi-stage manufacturing processes that would be implemented through proposed sections 1037.620 through 1037.622. Those proposed requirements amount to a major change to the process for manufacturing vehicles, and should not be implemented in a shortened time frame. Manufacturers need sufficient time to work with their various secondary manufacturers to implement the procedures that EPA seeks to impose (such as annual affidavits of part numbers, contractual obligations, and record-keeping). While those are not unmanageable burdens, they are new and may involve many secondary manufacturers, including small businesses, such that implementation will take significant time and effort. [EPA-HQ-OAR-2014-0827-1269-A1 p.34]

With respect to assembly instructions for secondary vehicle manufacturers, it seems that the Agencies are seeking to compel truck manufacturers to include assembly instructions with each truck sold without a body (like a box van), which is nearly all trucks. In proposed section 1037.130, the Agencies propose to require that the truck manufacturers instruct body-installers how to install bodies in a manner compliant with the GHG/FE standards. But it is not clear how trucks such as box vans are subject to the GHG/FE regulations, nor how a truck manufacturer would have any expertise with respect to the installation of box vans or the variety of other bodies that might get put onto a truck. Accordingly, EMA requests that the Agencies clarify what instructions they expect truck manufacturers to provide to body-installers. In that regard, EMA suggests that the Agencies limit any such instructions to topics within truck manufacturers' expertise. In other words, manufacturers should not have to instruct body-installers how to mount equipment or van boxes – especially when such matters do not relate to the GHG/FE regulations. [EPA-HQ-OAR-2014-0827-1269-A1 p.34]

In today's market, it is not uncommon for an end-user to bring a vehicle to a secondary manufacturer for post-factory modifications that can impact GHG/FE parameters, without the knowledge of the original vehicle manufacturer. Under Phase 1 of the GHG/FE regulations, any modifications made by the secondary manufacturer that could affect the GHG/FE configuration of the vehicle must be covered by a certificate of conformity ("CoC"), whether that be held by the secondary manufacturer or the original OEM. However, there are provisions that would allow for the secondary manufacturer to qualify for a small business exemption, thereby exempting the modified vehicles. [EPA-HQ-OAR-2014-0827-1269-A1 p.34]

Under the Phase 2 proposal, that small business exemption would be eliminated starting in MY2022, which would add burden, or potentially restrict the ability for secondary manufacturers to maintain their business viability because they are not equipped to handle the certification, labeling, on-going compliance, and reporting for heavy-duty vehicles. [EPA-HQ-OAR-2014-0827-1269-A1 p.34-35]

Phase 1 was only concerned with those modifications that could affect the vehicle's GHG/FE parameters. For vocational vehicles, where bodies and/or crew cabs are commonly added, this meant that the only variable of concern was a modification in tires. The Phase 2 regulations would expand this to include modification of the air conditioning system and other vehicle systems, regardless of vehicle configuration. This would add significant burden to the certification and management of vehicles in the Vocational regulatory subcategories. The original manufacturer could now become responsible for the

A/C leakage rate resulting from the secondary manufacturer's modification(s) if the secondary manufacturer did not hold a CoC for that make/model/regulatory subcategory. That is not a reasonable result. [EPA-HQ-OAR-2014-0827-1269-A1 p.35]

Additionally, for vehicles in the Tractor subcategory, modifications that affect vehicle aerodynamics are expected to continue as a major GHG/FE impact, especially in calculating roof heights for determining the appropriate regulatory subcategory and aerodynamic Bin as an input to GEM. Consequently, the original manufacturer would also have to know explicit details surrounding any down-stream modification if it affects roof height and/or aerodynamics to mitigate the risk of mislabeling or mischaracterizing the aerodynamic assessment of the vehicle. That is also problematic. [EPA-HQ-OAR-2014-0827-1269-A1 p.35]

Because it is unlikely for a secondary manufacturer to have the data or sophistication to support the many certification and compliance requirements for Phase 2, EMA recommends that the following options be added to the proposed language in the NPRM. One option for Phase 2 would be to allow specified exemptions for small businesses. In the NPRM, proposed section 1037.635(c) allows a limited exemption for small businesses that produce glider kits. EMA recommends that the Agencies provide a similar exemption for secondary manufacturers that are small businesses, subject to an annual production cap of 300 units, as specified under proposed section 1037.635(c), for both Tractor and Vocational vehicles. The exemption would apply to the vehicle-related GHG/FE requirements, other than the instruction and labeling requirements outlined in the Phase 1 regulations; the exemption would not apply to the engine-related GHG/FE requirements, or to the current criteria emission requirements. [EPA-HQ-OAR-2014-0827-1269-A1 p.35]

Another option would be to allow the vehicle to be built and labeled under the original manufacturer's CoC. The original manufacturer ("OEM") would be required to provide the maximum allowable air conditioning leakage requirements, the regulatory references, and an explanation of the potential ramifications if those requirements were not met. The same would be true for all other GHG/FE certification parts and systems. No OEM monitoring, reporting, or compliance audits would be required. For aerodynamics, due to the vast array of modifications that could affect the frontal area of the vehicle, the vehicles would have to be conservatively scored in lower aerodynamic Bins. In some cases, however, the modifications could improve the aerodynamics, so this approach may not be prudent. [EPA-HQ-OAR-2014-0827-1269-A1 p.35]

To remedy that issue, the OEM could either obtain sufficient details from the secondary manufacturer regarding the modifications impacting aerodynamics to be able to use an EPA-approved alternative aerodynamic assessment methodology, or the OEM could use an equivalent cab or sleeper profile from its product line that is certified with the Agency and then use one aerodynamic Bin lower as the GEM input (i.e., the Bin with the next higher CdA GEM input value) for determining the GHG score through GEM for the modified vehicle. No additional assessment of aerodynamics and no compliance testing would be required of the OEM. Determination of the regulatory subcategory and associated labeling would be the responsibility of the OEM. The vehicle request process from Phase 1 would still continue. [EPA-HQ-OAR-2014-0827-1269-A1 p.35-36]

In addition to implementing the other necessary revisions discussed above relating to delegated assembly and secondary manufacturers, the Agencies should implement the foregoing options to address the aerodynamic performance of vehicles completed by secondary manufacturers. [EPA-HQ-OAR-2014-0827-1269-A1 p.36]

LNG Tank Requirements

Currently, and out to the foreseeable future, LNG fuel tanks are installed outside the OEM's vehicle-manufacturing process and control. Dealers and/or customers work directly with the LNG tank manufacturer's certified installers to complete the fuel system. Under the Phase 2 proposal, the fuel system would have to meet the requirements in Section 4.2 of SAE J2343, which specify that vehicles should meet a five-day hold time after a refueling event before the fuel reaches the point of venting to relieve pressure. However, since the tanks are designed, selected, and installed outside of the OEM's manufacturing process, EMA believes that additional provisions under delegated assembly should be included that limit the OEM's role simply to informing the tank supplier of the relevant requirements, while the tank supplier is held responsible for the design and installation of the LNG tank. An alternative is to require OEM communication of the tank leakage requirement to the dealer and tank suppliers/installers. Using precedence in other regulatory areas, such as the regulations relating to fuel hoses for small SI engines, the tank manufacturer could be required to certify their tanks with EPA to a modified leakage requirement, thereby fulfilling the intent of the current language. [EPA-HQ-OAR-2014-0827-1269-A1 p.44]

Organization: Union of Concerned Scientists (UCS)

DELEGATED ASSEMBLY

The delegated assembly provision for vehicles is a significant improvement because it better reflects the way in which the work truck market functions. The agencies should also expand the use of this provision to Class 2b/3 complete vehicles—cargo vans in particular may benefit from the application of technologies from secondary manufacturers, particularly for strong hybridization, which is already being applied to aftermarket vehicles. But despite the promise of the delegated assembly provision to drive innovation, it needs further refinement. [EPA-HQ-OAR-2014-0827-1329-A2 p.24]

The delegated assembly provisions still require that the certifying manufacturers be aware of the final state of the vehicle. This does not reflect current business practices, where chassis are upfit before final delivery to the customer but well after point of sale from a chassis manufacturer's perspective. The agencies should work with secondary manufacturers to determine a way for the secondary or final stage manufacturer to "close the loop" on a vehicle's certification, provided that the vehicle is still in its certified configuration and has not been delivered to the end user. While this may add complexity to the certification process for these vehicles, this will help capture all of the technologies most applicable to the sector. This is a preferable alternative to the inclusion of aftermarket technology credits, which could undermine the efficacy of the regulations. [EPA-HQ-OAR-2014-0827-1329-A2 p.24]

Organization: Volvo Group

Volvo Group supports the EMA comments concerning delegated assembly provisions in their entirety except as noted in the discussion regarding Glider Kits and Small Volume Manufacturers put forth later in this document. [EPA-HQ-OAR-2014-0827-1290-A1 p.49]

Volvo Group supports the EMA comments on vehicle and engine warranty provisions of the proposed Phase 2 Rule, but requests the Agencies add manufacturers of newly regulated components to 40 CFR 1037.650 and any additionally referenced or supporting sections. [EPA-HQ-OAR-2014-0827-1290-A1 p.57]

40 CFR 1037.650 provides that tire manufacturers choosing to provide test data and warranties to vehicle manufacturers in support of the certification and warranty requirements of the regulation are

responsible to the Agencies for meeting the requirements of the rule as they pertain to those components. Specifically, the tire manufacturer is responsible to the Agencies for the emission test data they provide and can be contractually obligated to the vehicle manufacturer to provide tire warranty and related defect tracking and reporting under the obligations of the regulation and associated parts. [EPA-HQ-OAR-2014-0827-1290-A1 p.57]

As with tires, vehicle manufacturers typically do not see warranty claims related to many vendor supplied components such as engines, transmissions and axles since many suppliers deem this as sensitive and confidential information, especially when dealing with vertically integrated OEMs who manufacture many of the same components. Many of these components, or systems made up of these components, will now be part of the OEMs' certified vehicle configuration and some failures of these components may still allow for the vehicle's continued operation at increased emissions levels, making them warrantable emissions systems under this part. [EPA-HQ-OAR-2014-0827-1290-A1 p.57]

Given this, Volvo Group requests that the Agencies amend 1037.650 to cover these newly regulated components and their manufacturers. Below is a list of components that Volvo Group believes should be covered under this provision; however, this list is not all inclusive, partly due to unforeseen technologies not considered in the rulemaking and unknown, future, off-cycle technology certification by Volvo Group or the suppliers. [EPA-HQ-OAR-2014-0827-1290-A1 p.57]

Components and manufacturers proposed to be covered under 1037.650 where they are part of the certified vehicle configuration: [EPA-HQ-OAR-2014-0827-1290-A1 p.57]

- Vendor engines
- Vendor hybrid systems
- Vendor certified powertrain systems (e.g. Cummins/Eaton alliance)
- Transmission systems (e.g. neutral at idle, shift calibration software, etc.)
- Axle systems intended to reduce emissions (e.g. part-time 6x2, low friction))
- LNG evaporative emission systems
- Auxiliary Power Units (pending inclusion as a creditable technology) [EPA-HQ-OAR-2014-0827-1290-A1 p.57]

Organization: XL Hybrids

[The following comments were submitted as testimony at the Long Beach, California public hearing on August 18, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1420, p. 243-244.]

While the EPA and NHTSA are regulating these primary manufacturers, we don't believe the agencies are prevented from measuring and assigning credits to third party products that produce measurable, robust, documentable savings that could then participate in a compliance credit marketplace. In XL Hybrids' current business model, our savings right now would primarily benefit just the end fleets when they could also be contributing in the phase 2 regulation goals. The benefits to the public would be a more market-driven process resulting in a faster introduction of these advanced savings technologies and the potential for achieving greater reductions and stringency. We recognize structuring such a program would be challenging, but we ask that the rules be modified to specifically allow for such a possibility so that such a program could be developed.

Response:

In EPA's existing regulations (40 CFR 1068.261), we allow engine manufacturers to sell or ship engines that are missing certain emission-related components if those components will be installed by the vehicle manufacturer. The Phase 1 regulations likewise state that this provision may apply to heavy duty vehicles as appropriate, and so likewise provide a similar allowance for vehicle manufacturers to sell or ship vehicles that are missing certain emission-related components if those components will be installed by a secondary vehicle manufacturer. 40 CFR 1037.621.

EPA has found this provision to work well for engine manufacturers and is finalizing a new section 40 CFR 1037.621 that formalizes this process. As conditions of this allowance, manufacturers will be required to:

- Have a contractual obligation with the secondary manufacturer to complete the assembly properly and provide instructions about how to do so
- Keep records to demonstrate compliance
- Apply a temporary label to the partially complete vehicles
- Take other reasonable steps to ensure the assembly is completed properly
- Describe in its application for certification how it will use this allowance

Under delegated assembly, it is the upstream manufacturer that holds the certificate and assumes primary responsibility for all compliance requirements. Our experience applying this approach with engines has shown that holding the upstream manufacturer responsible ensures that they will exercise due diligence throughout the process. Commenters generally supported these provisions, but as described below, several requested changes to the proposed program.

See also the initial response in Section 1.4 for a discussion of permissible modifications to certified configurations, such as potential modifications to stock vehicles at dealerships.

Applicability

EPA proposed to apply this new section broadly. However, commenters raised valid questions about whether it is necessary to apply this formal process as broadly as proposed. In response, we have reconsidered this proposed approach and have determined that it would be appropriate to allow a less formal process with components for which market forces will make it unlikely that a secondary manufacturer would not complete assembly properly. In those cases, the certifying manufacturers will be required to provide sufficiently detailed installation instructions to the secondary manufacturers, who would then be obligated to complete assembly properly before the vehicles are delivered to the ultimate purchasers.

One example of a case for which market forces could ensure that assembly is completed properly would be air conditioning leakage requirements. Purchasers will have the expectation that the systems will not leak, and a secondary manufacturer should have no incentive to not follow the certifying manufacturer's instructions.

As revised, §1037.621 will require the formal delegated assembly process for the following technologies if they are part of the OEM's certified configuration but are not shipped with the vehicle:

- Auxiliary power units
- Aerodynamic devices
- Hybrid components
- Natural gas fuel tanks

Certificate holders will remain responsible for other certified components, but will not automatically be required to comply with the formal delegated assembly requirements. As is currently specified in §1037.621 and §1068.261, EPA will retain the authority to apply additional necessary conditions (at the time of certification) to the allowance to delegated assembly of certified emission components to secondary manufacturers. In particular, we would likely apply such additional conditions for secondary manufacturers that we determine to have previously not completed assembly properly.

Commenters supporting the formal delegated assembly provisions urged the agencies to further specify by regulation those technologies to be included within the process. The agencies are not limiting by regulation technologies for which the certificate holders may delegate final assembly in addition to the four technologies noted above (when the components are not shipped with the vehicle to the secondary manufacturer). Manufacturers may delegate final assembly for any components for which they can demonstrate during the certification process that the vehicles will be properly assembled before reaching the ultimate purchaser. For example, we generally agree with the Aperia Technologies comment that we should allow installation of automatic tire inflation systems to be delegated to secondary manufacturers.

In response to comments, we are also extending these delegated assembly allowances for complete HD pickups and vans regulated under 40 CFR part 86.

In response to the comments requesting clarity on applicability, we note that delegated assembly would only apply where components identified as part of the certified configuration are to be installed or modified by a secondary manufacturer. Manufacturers are also correct that delegated assembly does not include unauthorized modifications to a vehicle already in its certified configuration.

PACCAR commented that the proposed requirements would impose a disproportional burden relative to the actual impacts. EMA expressed similar concerns. While we believe the changes already discussed will ameliorate some of the manufacturers' concerns, the changes do not go as far as they requested. We are not providing a blanket exclusion for small businesses, dealers, or glider vehicle assemblers that install engines into glider kits. As finalized, the regulations will allow manufacturers to work with the agencies to develop appropriate procedures to ensure that vehicles completed by such entities are in the certified configuration before reaching the ultimate purchasers.

Process Issues

NTEA commented that the requirement to provide instructions for completion of the vehicle be made more flexible such that those instructions come from someone other than the certificate holder. Such arrangements will generally be allowed under §1037.620, which provides that EPA's focus will generally be on ensuring that a requirement is met rather than on who meets it. However, that process will work slightly differently than NTEA envisioned in their comments. NTEA stated that "intermediate and final stage manufacturers or alterers would be bound contractually, rather than by regulation to install specified products that result in specified regulatory benefits that can be used by the certifying manufacturer." While it is true that secondary manufacturers will likely be contractually bound to complete assembly properly, they will also be required to do so by the regulations or be subject to penalties for tampering. See §1037.621(e).

It is also important to note that the regulations do not require a specific format for assembly instructions, provided the information is properly conveyed. The agencies would judge the sufficiency of the instructions by how well they ensure proper assembly. For example, detailed instructions on a website could be sufficient, as long as its location was well known to each secondary manufacturer.

EMA incorrectly stated that when final assembly is delegated, "the secondary manufacturer, not the original manufacturer of the incomplete vehicle, is responsible for any emissions exceedances caused by its improper completion of a vehicle." Under both the existing and revised regulations, both manufacturers would be liable. Regarding downstream modifications more generally, EMA commented that the regulations would require the OEM "to know explicit details surrounding any down-stream modification if it affects roof height and/or aerodynamics to mitigate the risk of mislabeling or mischaracterizing the aerodynamic assessment of the vehicle." However, we view the requirements as requiring the OEM to explain in the assembly instructions what modifications are not permissible.

Regarding Odyne's comment on up-fitting a complete vehicle, the recommended paths under the regulations would be for Odyne to do one of the following:

1. Obtain its own certificate so that it would be allowed to purchase uncertified vehicles from the OEM. As the certificate holder, ODYNE would be eligible for emission credits
2. Work with the OEM to add the Odyne system to the OEM certificate.
3. Modify certified vehicles in a permissible manner that does not increase emissions. However no credits could be generated for the vehicle.

For each path, the certificate holder would be fully responsible for the warranty requirements, but could make contractual arrangements with the other manufacturer.

Daimler's comment regarding labeling was unclear. They acknowledged that the labeling requirements in 40 CFR 1068.261(c)(7) do not apply for vehicles using delegated assembly under part 1037, and yet objected to them in a previous paragraph.

Section 1037.621(a) has been revised to eliminate the incorrect reference to paragraph (f). Section 1037.622(b)(5) has been revised to require the manufacturer to "identify the regulatory *citation*" for the applicable exemption. The title of 1037.622 has also been revised.

Volvo commented that the agencies should specify the obligations for manufacturers of the following components, similar to the existing requirements for tire manufacturers:

- Vendor engines
- Vendor hybrid systems
- Vendor certified powertrain systems (e.g. Cummins/Eaton alliance)
- Transmission systems (e.g. neutral at idle, shift calibration software, etc.)
- Axle systems intended to reduce emissions (e.g. part-time 6x2, low friction))
- LNG evaporative emission systems
- Auxiliary Power Units (pending inclusion as a creditable technology)

We have modified the regulations to reflect additional components.

Custom Sleepers and Natural Gas Vehicles

In 40 CFR 1037.622 we are allowing small businesses to modify certified tractors as long as they do not modify the front of the vehicle and so long as the sleeper compartment or natural gas tank does not exceed more than 102 inches wide or 162 inches in height. EPA is also finalizing an optional compliance path in 40 CFR 1037.150(x). This option allows small manufacturers to convert a low or mid roof tractor to a high roof configuration without recertification, provided it is for the purpose of building a custom sleeper tractor or conversion to a natural gas tractor. The allowance to convert low and mid roof tractors to high roof tractors is being adopted as an interim provision, although we have not established an end date at this time. We expect to reevaluate as manufacturers begin to make use of the provision and may decide to revise it in the future, potentially deciding to make it a permanent allowance. To be eligible for this option, the secondary manufacturer must be a small business manufacturer, and the original low or mid roof tractor must be covered by a valid certificate of conformity. The modifications may not increase the frontal area of the tractor beyond the frontal area of the equivalent high roof tractor paired with a standard box van.

Regarding evaporative emission standards for natural gas fuel tanks, we note that the regulations allow different manufacturers to hold the GHG and evaporative certificates (once again illustrating how the statute and regulations contemplate multiple manufacturers of a motor vehicle; see response in 1.3.1 above). In the circumstances identified by PACCAR, they would be allowed under §1037.622 to ship vehicles without the natural gas fuel tanks to secondary manufacturers, as long as the secondary manufacturer had a valid evaporative emission certificate for the vehicle.

The agencies received supplemental comments from American Reliance Industries recommending expansion of the allowances to also allow conversion of low-roof tractors to mid-roof configurations. We have modified the interim allowance in §1037.150 to allow this.

Other Small Secondary Manufacturers

EMA recommends the agencies provide an exemption for secondary manufacturers that are small businesses, subject to an annual production cap of 300 units. We generally do not permanently exempt small business from our regulations. We included a small business exemption in Phase 1 so that small businesses would have time to adjust to the new GHG requirements. However, Phase 2 does not start for these manufacturers until 2021. This provides more than enough time for them to become familiar with the applicable requirements.

Credits for Non-Certifying Manufacturers

Some commenters recommended that the agencies allow non-certifying secondary manufacturers to generate emission credits. However, EPA limits emission credits to certificate holders to ensure full compliance. The formal certification path includes many safeguards and procedures to ensure the vehicles are fully compliant. Without these provisions, it would be much more difficult for us to provide proper oversight. We believe the delegated assembly provisions will provide a sufficient pathway to incentivize these advanced technologies.

Changes to Phase 1

Manufacturers argued that applying the proposed changes to Phase 1 vehicles would amount to a retroactive change in stringency. However, this ignores the existing text in §1037.620(a) (a Phase I provision) noting that delegated assembly may apply with regard to vehicles shipped prior to completion of assembly into their final certified configuration. Daimler acknowledged this provision but incorrectly interpreted it, reading "may" to make the provision purely advisory. This is not a correct interpretation. The provision's plain meaning is that delegated assembly provisions may sometimes apply when partially complete vehicles are introduced into commerce but are placed in their final certified configuration by a secondary manufacturer. Thus, we do not see the proposed changes as adding fundamentally *new* requirements to the Phase 1 provisions. Also, as described below, the changes being made to the delegated assembly process lessen the likelihood that there would be any significant changes for manufacturers who were already complying with the Phase 1 requirements.

While we do not agree with the comments arguing the proposed requirements are fundamentally new, we have made two changes that avoid the problems feared by the manufacturers. First, as already noted, we are reducing the number of components that will require the formal delegated assembly process. This will limit the formal process to a small number of vehicles. Furthermore, two of these components (i.e. hybrids and natural gas fuel tanks) are not part of the primary technology basis for Phase 1 standards and so delegated assembly for these components would not arise with any frequency with respect to Phase 1 vehicles. APUs and aerodynamic technologies are part of the basis for the Phase 1 tractor standard (although not the vocational vehicle standard), and so could potentially trigger this provision in the limited instance when the APU or aerodynamic components are not attached to or otherwise shipped with the vehicle to the secondary manufacturer by the primary manufacturer. This would be an unusual circumstance, especially for aerodynamic components. In addition, for these Phase 1 components, it is unclear how the certifying manufacturer would currently be ensuring that the vehicles they certify are in the proper certified configuration without having some process substantially similar to formal delegated assembly process being finalized.

Notwithstanding, we are delaying implementation of the changes until January 1, 2018 to provide manufacturers over a year of additional lead time. EMA raised concerns about the time needed "to work with their various secondary manufacturers to implement the procedures that EPA seeks to impose (such as annual affidavits of part numbers, contractual obligations, and record-keeping)." We believe in nearly all cases, the formal delegated assembly provisions will not apply and the additional lead time will be more than enough to put appropriate processes in place. To the extent that any manufacturer is currently relying on a secondary manufacturer to complete final assembly of any of the covered components, they should already have a substantial process in place under the Phase 1 regulations. So compliance with the formal process should also be achievable by January 1, 2018.

Specific Scenarios

In response to specific scenarios identified by GTA:

Scenario 1. Aerodynamic Devices

A certifying chassis manufacturer may contract with a final stage manufacturer who will be making aerodynamic improvements, and may input the improvement into GEM for certification if the certifying manufacturer (and the secondary manufacturer) comply with the delegated assembly provisions.

Scenario 2. Hybrids

A chassis manufacturer may contract with a hybrid installer for "delegated assembly" purposes, but the chassis manufacturer would need to test the hybrid system in order to take advantage of the emissions improvements in the certification process.

Scenario 3. Alternative Fuel Conversion

A chassis manufacturer may also contract with an alternative fuel converter for "delegated assembly" purposes, but the chassis manufacturer would need to have a certified fuel map for the converted engine.

Scenario 4. Light-weighting

We do not envision it to be possible for a certifying manufacturer to generate credit for lightweight body components because we cannot define the baseline configuration.

1.4.5 Labeling172

Organization: Allison Transmission, Inc.

EPA and NHTSA Should Explore Emission Control Labels In Separate Rulemaking

Within the agencies discussion of emission control labels, EPA and NHTSA have requested comment on methods to provide for an electronic means to identify vehicles and access to databases that would include vehicle-specific information on the emission control system utilized in the vehicle. Currently, OEMs are required to report vehicle GHG certification level by VIN. If a vehicle had the VIN as a machine-readable code, this seems like reasonably simple technology that could be implemented without great cost to those responsible. As a component supplier, Allison believes that OEMs have the capability to configure a machine-readable code similar to the Vehicle Identification Number (VIN). It should be noted, however, that suppliers of electronic components do not always have the ability to label components prior to delivery to the vehicle OEM because vehicle OEMs program specific configurations on their assembly line. [EPA-HQ-OAR-2014-0827-1284-A1 p.48]

EPA has indicated that such electronic systems if they are considered would be subject to a separate rulemaking proceeding. Allison agrees that this would be the proper process in order to review options and receive informed comment on the benefits and costs of such systems. More broadly, in the context effectiveness between four and six percent, the use of aerodynamic devices would likely fall in a range of cost-effectiveness similar to ATIS for Regional vocational vehicles. ATIS is a technology that we are also not projecting as part of standard-setting (except for custom chassis where more details are known about the vehicles). All of the above reasons have led the agencies to conclude that aerodynamic improvements should not be factored into the stringency of the Phase 2 program, and should be made available only as an optional credit at this time.

In response to Daimler's concerns regarding delegated assembly, we agree that by regulating vocational vehicles at the incomplete stage when a chassis manufacturer may not know what type of body will be fitted on the chassis, this is a possible barrier to adoption of aerodynamic improvements. As described in the NPRM, we are requiring chassis manufacturers employing this option to provide assurances to the agencies that these devices will be installed as part of the certified configuration, even if the installation is completed by another entity. We expect that this option will only be chosen by manufacturers that can overcome these market barriers, which is another reason why it is not considered as part of stringency. We received many comments on the requirements for secondary manufacturers as they apply for vocational aerodynamics as well as other technologies that may be specified by a chassis manufacturer but installed later. See Section 1.4.4 for responses to delegated assembly comments.

6.4 Exemptions and Exclusions

6.4.1 Small Businesses and Small Volume Producers

Organization: Innovus Enterprise LLC

Additional Comments: On page 40295, there is a discussion about chassis manufacturers, small volume manufacturers and small businesses and a request for comments on alternate approach and sales volume threshold. We can say this: There is often a convolution of the terms "small volume" and "small entity." There are cases where a large manufacturer, with resources normally far exceeding that of the small business, is as a small volume producer, offered flexibility on compliance issues. We are of the opinion that only small volume producers who also qualify as a small entity be the thrust for regulatory flexibility. [EPA-HQ-OAR-2014-0827-1116-A1 p.7]

A request for comment was posed asking for a means to determine what would constitute the correct quantity that amounts to "small volume." We suggest using a formula based on a percentage of market sales in that particular industry; industry being the particular one that a certificate is sought. Actually, it seems the same question is posed every time small volume flexibility is posed - what is the correct or fair quantity? We have developed such a formula and parameters for a program which could apply to all small volume conditions throughout the CAA program. We can share this with the Agency and further discuss if they are interested. [EPA-HQ-OAR-2014-0827-1116-A1 p.7]

On page 40545, paragraph *(x) Custom Chassis Manufacturers*, a request is made for suggestions as to a low volume exception. We are fully supportive of this exemption for small entity/small volume custom chassis manufacturers. We feel that a volume of 200 vehicles per year could be adequate since it is consistent with the other like categories. Additionally, we think there could also be some qualifying factor such as: The exemption is warranted when the feasibility to employ fuel saving and emission reduction technologies are beyond the capability of the small entity to reasonably engineer. Or, the vehicles operate in a manner essentially making them incompatible with fuel saving and emission reduction technologies. The recordkeeping, reporting and labeling could follow along the line of that in 1037.631. [EPA-HQ-OAR-2014-0827-1116-A1 p.7]

Organization: Association for the Work Truck Industry (NTEA)

Emergency Vehicles

We agree with the concept of differing standards for emergency vehicles. This small population of vehicles is critical to society. Ensuring their continued operation is a legitimate public safety issue. [EPA-HQ-OAR-2014-0827-1187-A1 p.5]

Organization: Truck & Engine Manufacturers Association (EMA)

EMA supports the proposed less stringent requirements for emergency vehicles, which requirements would focus on the use of low rolling resistance tires. The unique performance requirements and applications for emergency vehicles make it infeasible to implement the full Phase 2 program for those vehicles. However, EPA should expand the definition of emergency vehicles beyond just ambulances and fire trucks. EMA also requests that the agencies establish simplified consistent labeling requirements for emergency vehicles (just as for non-emergency vehicles), including through the elimination of requirements for emissions control identifiers. [EPA-HQ-OAR-2014-0827-1269-A1 p.45]

Organization: Volvo Group

It is unclear why motor homes, cement mixers, and emergency vehicle chassis could be certified to a family not requiring use of GEM, while this option would not be available for other Custom Chassis types.

Single weight class assumptions are not correct, as some Class 8 Motor Coaches are completed as Motor Homes and thus a manufacturer could not average between the two if they were certified to Class 7.

Organization: E-ONE

Gliders are an important product in the emergency vehicle industry. An emergency vehicle, while critical to saving lives in the event of an emergency; typically does not drive very many miles over the lifetime of the vehicle. The industry standard of the lifetime of an emergency vehicle is 10 to 20 years in which an emergency vehicle may only have traveled 10-50,000 miles, although it is not uncommon for an emergency vehicle of 30+ years of service to have the same amount of miles. E-ONE has found that the durability of engines in class 8 emergency vehicles far surpass the longevity of the chassis that they power, this can be attributed to the extreme environment that these vehicles have to endure. Having the ability to purchase a glider allows municipalities with limited financial resources capable of maintain a fleet that is required to save lives. [EPA-HQ-OAR-2014-0827-1185-A1 p.1]

Organization: Fire Apparatus Manufacturers' Association (FAMA)

Emergency Vehicle Proposal

FAMA supports the language in the Phase II proposal concerning emergency vehicles that limits regulation of emergency vehicles to the Phase I levels. This approach works in the best interest of both the users of emergency vehicles (fire fighters, EMTs, etc.…) and members of the public who become recipients of the services rendered using emergency vehicles. [EPA-HQ-OAR-2014-0827-1163-A1 p.1]

Organization: Navistar, Inc.

Navistar supports the proposed requirements for emergency vehicles, which essentially vocational vehicles. The unique performance requirements and applications for emergency vehicles make it infeasible to implement the full Phase 2 program for those vehicles and we support this establishment of this unique segment. Navistar also requests that the agencies establish simplified labeling requirements for emergency vehicles (just as for non-emergency vehicles) as noted above in the discussion of Labelling. [EPA-HQ-OAR-2014-0827-1199-A1 p.40-41]
1275
Organization: Allison Transmission, Inc.

Low Volume Exemption Should Allow for Deployment of Advanced Technologies

The agencies have requested comment on whether different standards and simplified compliance procedures should apply to custom chassis manufacturers. Allison generally supports flexibility in implementing Phase 2 standards in order to recognize the varied nature of the MD/HD market -- there are many specialized vehicles that may be "purpose-built" to perform certain tasks. The limited number and specialized nature of such vehicles means that there would be marginal environmental gains from regulating such vehicles on a comparable basis to higher volume production vehicles. In addition, excessive burdens could inhibit innovation driven by some low-volume manufacturers. [EPA-HQ-OAR-2014-0827-1284-A1 p.49]

EPA and NHTSA Should Consider Limited, Low-Volume Exemption

Allison believes that providing a less stringent standard for small volume chassis manufacturers is appropriate. Allison further believes the basis for this flexibility should be to allow small volume manufacturers the ability to continue operations until they grow to a size where applying more stringent standards is appropriate. Using the Phase 1 rule as a guide, a sales volume strategy similar to the Phase 1 three year rolling average of vocational tractor sales would be a reasonable approach (it is assumed the threshold would be different). [EPA-HQ-OAR-2014-0827-1284-A1 p.50]

Allison does not favor additional lead time as the only solution for flexibility for small volume manufacturers. In our experience, the challenge for small volume manufacturers is typically a lack of resources. If a small manufacturer lacks the resources (or ability to add resources) to address increasingly stringent standards, the situation is unlikely to change simply based on allowing an additional one or two years for compliance. Instead, additional lead time coupled with less stringent standards represents a balanced approach to addressing this issue. [EPA-HQ-OAR-2014-0827-1284-A1 p.50]

The low overall volume of custom chassis manufacturers may inhibit their ability to benefit from averaging, banking and trading ("ABT") systems. ABT systems work to provide flexibility if a manufacturer has a number of different vehicles which may underrun or exceed regulatory standards. In a low volume scenario, a specialty vehicle manufacturer simply may not be able to generate enough credits within the time period required. In such a situation, a theoretical recourse would be to purchase credits for compliance, but realistically, such might be unavailable since larger companies may desire to retain such credits for their own future compliance or be otherwise reluctant to sell such credits to a smaller competitor. [EPA-HQ-OAR-2014-0827-1284-A1 p.50]

In addition, EPA and NHTSA should consider the additional testing burden that might result from small volume manufacturers creating different types of vehicles which may not have all attributes measurable through GEM, thus necessitating powertrain testing in order to demonstrate compliance or generate credits. This additional testing would result in relatively higher costs per vehicle for the smaller volume manufacturer. In order to accommodate such vehicles – and additionally to allow for further innovation in vehicle construction -- EPA and NHTSA should allow for a limited period of time whereby vehicles incorporating new advanced technologies (independent of the type of manufacturer) can be sold under a low volume exemption. [EPA-HQ-OAR-2014-0827-1284-A1 p.50]

EPA and NHTSA Should Consider Low-Volume Phase-In

The agencies should additionally consider providing for a limited period of time (e.g., 18 months) and a limited volume (e.g. 500 vehicles) as a "phase-in" period for low-volume manufacturing of advanced technology, during which time less stringent standards would apply. Under this concept, once the time or volume limit was reached, the phase-in period would end and full compliance with the emission and fuel efficiency standards established by the final rule would be required. [EPA-HQ-OAR-2014-0827-1284-A1 p.50]

This flexibility should be allowed for all manufacturers, regardless of size or type since the object of the phase-in period is to encourage innovation. Allowing for a phase-in period would improve the ability of the marketplace to explore innovative technologies - and potentially large gains in emissions and fuel efficiency performance - while limiting any potentially negative impacts on GHG emissions and fuel use. The concept should not be confused with the simplified compliance procedures proposed for low volume manufacturers. While these procedures are helpful, they do not fully address the multiple barriers to entry faced by new technology. [EPA-HQ-OAR-2014-0827-1284-A1 p.50-51]

Organization: School Bus Manufacturers Technical Council

For the years of 2010-2014, the average number of large school buses produced each year was 26,368 units. Given the reasons stated above and the relatively small volume of school buses produced each year, we respectfully request that the agencies consider allowing school buses to meet some of the less stringent standards as being proposed for emergency type vehicles. [EPA-HQ-OAR-2014-0827-1287-A1 p.2]

Organization: Autocar, LLC

Autocar is a small business that should be exempt from Phase 2. In 2011, the agencies determined that its small size justified a deferral from compliance from the Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 1 regulations ("Phase 1") for Autocar. The relevant facts remain the same, and Autocar's size, volume and product lines continue to justify an exemption or different standards for its vehicles.[EPA-HQ-OAR-2014-0827-1233-A1 p.2]

<u>The estimated costs and payback for compliant technologies may inhibit industry adoption</u>. Autocar does not have access to data that would enable the Company to confirm assumptions and calculations of incremental cost and payback for compliant technology for vocational vehicles in 2021, 2024 and 2027. Assuming that the calculated costs per truck (for most Low-speed/Frequent-stop Vehicles) of $1,998 in 2021, $3,332 in 2024 and $7,422 in 2027 are accurate for those vehicles, the costs are too high and would likely discourage the adoption of compliant technology. The proposed payback of 6-7 years may not be compelling to customers typically maintaining refuse and sweeper trucks in service for the 7-12 years recognized by the agencies at 80 Fed. Reg. 40286. Vocational truck buyers will view their estimated costs and payback as unfair when compared to the lower costs and shorter payback for non-vocational truck buyers. Truck owners will likely choose to defer purchases and extend the lives of old

non-compliant trucks, rather than spending more to purchase new compliant trucks, threatening or delaying the effectiveness of the GHG regulations. [EPA-HQ-OAR-2014-0827-1233-A1 p.9][This comment can also be found in section 13.2.4 of this comment summary]

The agencies' analysis of, and reasons for, exempting small volume manufacturers of emergency vehicles also applies to small volume manufacturers of Low-speed/Frequent-stop Vehicles. Similar to the rationale the agencies provided in granting the exceptions for small manufacturers of emergency vehicle chassis, the agencies should similarly grant exceptions for small manufacturers of refuse truck, street sweeper and other Low-speed/Frequent-stop Vehicle chassis. [EPA-HQ-OAR-2014-0827-1233-A1 p.13]

Manufacturer Diversity. Custom chassis manufacturers are a diverse group, even within particular truck markets. For example, in the North American refuse truck chassis market, Autocar generally competes with two very different manufacturers. As noted in Section 1.1, Autocar has less than 300 employees, one plant and annual production of roughly 2,000 refuse trucks and 500 other trucks. Autocar's two competitors also produce approximately 1,500-2,500 refuse trucks per year, but in contrast to Autocar, they are large, publicly-held, worldwide corporations with thousands of employees, multiple plants, multiple brands and annual production of tens of thousands of other trucks.[9] Both of Autocar's major competitors build and install their own engines, and at least one of them also builds and installs proprietary transmissions in its own trucks. [EPA-HQ-OAR-2014-0827-1233-A1 p.13]

4.2.2 Compliance Burden. The compliance requirements of the Proposed Regulations would impose burdens disproportionately high for a company that assembles small volumes of customized chassis and no other product lines. The ability to benefit from averaging would be limited or non-existent, as would be the ability to spread compliance costs across many vehicles. [EPA-HQ-OAR-2014-0827-1233-A1 p.13]

4.2.3 Reliability Requirements. Like emergency vehicles, refuse trucks perform a public health function and therefore require a high level of reliability. Refuse trucks manage America's solid waste stream and transport many recyclable materials. Some refuse trucks even serve double-duty as snow plows. Refuse trucks serve a critical, "24/7" function in our society, and must continue to be made available and affordable in the market. [EPA-HQ-OAR-2014-0827-1233-A1 p.13]

4.2.4 Performance Requirements. Further, the refuse industry requires a high level of performance and durability. Refuse trucks travel on residential and commercial streets, highways, dirt and gravel roads and paved and unpaved alleys. The truck must be sturdy enough to carry a widely-variable payload and to withstand the pressures exerted when the compaction unit is operating. The purpose-built features of refuse trucks, such as the high steel content (and resulting weight), high-traction tires and high PTO-running time limit the opportunities for GHG emissions reductions. These high-performance aspects present technological feasibility issues beyond other vocational vehicles, and the severe duty cycles of these vehicles (discussed above in Section 2.3) create constraints in terms of vehicle design and application of technology. [EPA-HQ-OAR-2014-0827-1233-A1 p.13-14]

4.2.5 Averaging. As discussed above in Section 2.4, certain GHG and fuel saving technologies can be applied, but Low-speed/Frequent-stop Vehicles are so different from other vocational vehicles that keeping them in the same averaging sets as other vocational vehicles is not appropriate. Accordingly, a separate standard, evaluated from a baseline specific to these vehicles, is warranted. Further, with all of the standards being predicated on averages, an assembler of just a few types of vehicles may be disproportionately impacted by its vehicles' actual standards being at the far end of the spectrum from the averages. [EPA-HQ-OAR-2014-0827-1233-A1 p.14]

4.2.6 Low Volume → Low Impact. According to the International Council on Clean Transportation (ICCT),[10] less than one percent of all new heavy duty trucks from 2003 to 2007 were registered to sanitation/refuse companies, and not all of those trucks were refuse vehicles (some were service trucks, freight trucks and other trucks used by sanitation companies). The annual North American market for refuse collection trucks, such as those assembled by Autocar, has averaged 6,000 new trucks over the past 10 years. The agencies recognize that an aggregate industry count 5,700 new emergency vehicles per year is too small to justify compliance with the Proposed Regulations (80 Fed. Reg. at 40,294), and should consistently extend this conclusion to the similarly-sized refuse market. Because relatively few of these vehicles exist, and they travel a relatively low number of miles, modified GHG and fuel consumption standards would not detract from the greater objectives of the rulemaking. [EPA-HQ-OAR-2014-0827-1233-A1 p.14]

4.3 The exceptions granted should be limited to 5,000 chassis per year. Autocar proposes to set a 5,000-vehicle limitation on the number of vehicles that a small chassis manufacturer may produce under this exception annually. This figure is consistent with the small-volume vehicle manufacturer exemption for NHTSA's TREAD reporting. See 49 C.F.R. § 579.27 (reporting requirements applicable to manufacturers of fewer than 5,000 vehicles). [EPA-HQ-OAR-2014-0827-1233-A1 p.14]

The exception granted for emergency vehicles should be extended to similar Low-speed/Frequent-stop Vehicles. In the Proposed Regulations, the agencies provide a simplified compliance procedure and less stringent Phase 2 standards for emergency vehicles, and the agencies request comment on extending those flexibilities to other custom chassis manufacturers.[8] 80 Fed. Reg. at 40,292-40,295. If the agencies do not grant an exemption as proposed in Sections 2 and 3 of these Comments above, Autocar proposes that small manufacturers of chassis of Low-speed/Frequent-stop Vehicles be provided a simplified compliance procedure and less stringent Phase 2 standards for their vehicles. [EPA-HQ-OAR-2014-0827-1233-A1 p.12-13]

The exceptions granted should provide for a simplified compliance model. In light of the different set of feasible technologies discussed above in Section 4.4, it is appropriate to provide a simplified compliance model, as is proposed for emergency vehicles. A Phase 1-style GEM interface with a default compliant engine and transmission[12] and a simpler set of vehicle-level standards and technologies may be appropriate, but that would not sufficiently reduce the small custom chassis manufacturer's administrative burden of running GEM simulations for thousands of custom configurations for its customized chassis. We propose that installing certified engines should be sufficient proof of compliance. [EPA-HQ-OAR-2014-0827-1233-A1 p.16] /12/ Lacking vertical integration, a small custom chassis manufacturer has no means by which to test engines or transmissions to obtain the maps and other data needed to run GEM simulations, and in fact may be prohibited from doing so under its contracts with suppliers

Additional lead time would not provide sufficient relief. Although Autocar appreciates the agencies' willingness to consider providing additional lead time for compliance by small custom chassis manufacturers, the Company believes that additional lead time would not remedy the difficulties faced by such manufacturers in meeting the proposed standards or the negative consequences for the industry. For example, the manufacturers would still have limited ability to benefit from averaging and to spread compliance costs across many vehicles. We would still suffer from the shortage of technical compliance expertise, and customers would still experience disruption to their businesses due to production delays, upfront cost increases and increased continuing maintenance costs.[EPA-HQ-OAR-2014-0827-1233-A1 p.16]

2 Autocar's Low-speed/Frequent-stop Vehicles include the following: residential and commercial refuse collection trucks, street sweepers, asphalt patchers, stripers and blasters, concrete pumpers and conveyers, aircraft deicers, refuelers and stockers and sewage suction trucks.

3 Autocar's class 8 heavy-duty terminal tractors (referred to as "yard hostlers" in the Proposed Regulations) and Class 8 heavy-duty chassis for mobile cranes are "vocational tractors," exempt from Phase 2 compliance under §1037.630, because terminal tractors and mobile cranes are intended for off-road operation. The agencies correctly recognize that these machines do not operate at highway speeds and would not benefit from the efficiency improvements designed for line-haul tractors. 80 Fed. Reg. at 40,654.

4 A typical average refuse vehicle payload is 10,000 pounds, and a typical maximum refuse vehicle payload is 20,000 pounds.

5 Additionally, in the Draft Regulatory Impact Analysis, Autocar observed that the testing for vocational vehicles was conducted using what is described as a "New Flyer refuse truck" with an "AT" Eaton transmission. We are not aware that New Flyer ever produced a refuse truck, and do not believe that the Eaton transmission is an AT, but rather an AMT. Autocar encourages the agencies to confirm that the baselines and standards being asserted for refuse trucks based on this testing were actually derived from a refuse truck, and not a New Flyer transit bus.

8 The agencies correctly recognize that small custom chassis manufacturers such as Autocar offer a narrow range of products, such that averaging is not of practical value as a compliance flexibility. Such companies do not have large sales volumes over which to distribute technology development costs and would bear disproportionate compliance burdens in the event that the agencies require compliance with the primary proposed Phase 2 standards. 80 Fed. Reg. at 40,294.

9 More specifically, according to recent SEC filings, one of Autocar's main competitors in 2014 sold 69,750 Class 8 trucks in the U.S. and Canada, had plants in seven countries, had over 23,000 employees and spent $215 million on research and development. Autocar's other main competitor, which is part of the world's second largest truck maker, sold 57,714 trucks in North America (92% of which had proprietary engines), had plants in 19 countries, employed over 100,000 people and spent $1.96 billion on research and development.

10 ICCT, June 2009, "Heavy-Duty Vehicle Market Analysis: Vehicle Characteristics & Fuel Use, Manufacturer Market Shares."

11 As currently designed for use in refuse vehicles, hybrid technology captures normally-wasted energy from braking, converting that energy into available power to accelerate or drive the vehicle, thus reducing fuel consumption and emissions. Testing methodologies for this technology must accommodate the braking, load and terrain factors that are integral to measuring the gains derived from hybrid refuse vehicles. Dynamometer testing will not demonstrate actual improvements in GHG emissions and fuel consumption.

12 Lacking vertical integration, a small custom chassis manufacturer has no means by which to test engines or transmissions to obtain the maps and other data needed to run GEM simulations, and in fact may be prohibited from doing so under its contracts with suppliers.

Supplemental comments from Autocar:

In our October 1, 2015 comments, Autocar explained how the Proposed Regulations would adversely affect this small business that already contributes to substantial GHG emissions reduction, because it installs emissions-certified engines and transmissions[1] and sells a high concentration of trucks with compressed natural gas engines and hybrid-drive powertrains. Yet, the EPA's Vocational Custom Chassis Memorandum (the 'Memorandum') and the underlying research set forth in documents included in the agencies' recent Notice of Data Availability (the 'NODA') propose compliance schemes that do not take into account:

• the impact of this complex compliance path on small, low-volume businesses like Autocar;

• the minimal emissions improvements achievable with the proposed technologies;

• the fact that Autocar only builds the chassis, and the body builder and vehicle owner make considerable modifications to the truck before putting it into service, over which Autocar has no control; nor

• the emissions-reduction effect Autocar already contributes by producing alternative-fuel vocational trucks.

For these reasons, Autocar submits these comments to the NODA and the Memorandum and respectfully renews its request for an exemption. [EPA-HQ-OAR-2014-0827-1885-A1 p.2]

Organization: California Air Resources Board (CARB)

CARB staff understands the unique nature and uses of emergency vehicles and supports the proposal's provisions to allow emergency vehicles to certify to less stringent standards with reduced compliance procedures than for other vocational vehicles. California Statute and many of CARB staff's in-use regulations similarly have special provisions for emergency vehicles. CARB staff also understands that current idle reduction technologies applicable to the Phase 2 vocational standards may not be sufficient to power all of the on-board electronics required by emergency vehicles. Therefore, CARB supports proposed emergency vehicle standards that do not require the use of specific idle reduction technologies. [EPA-HQ-OAR-2014-0827-1265-A1 p.64]

Additionally, because the proposed compliance method for emergency vehicles is simplified compared to that of other Phase 2 vocational vehicles, emergency vehicle manufacturers would not follow the otherwise applicable Phase 2 approach of entering an engine map into GEM. Instead, CARB staff supports the proposed equation-based compliance approach using a Phase 1-style GEM interface with a default engine simulated in GEM is appropriate for the emergency vehicle category. [EPA-HQ-OAR-2014-0827-1265-A1 p.64]

Organization: Daimler Trucks North America LLC

Fire/Emergency Vehicles and RVs - On 80 Fed. Reg. 40294-5, the agencies propose a scaled-down certification procedure for emergency vehicles and RVs. For applications like firetrucks and RVs, which drive little, spend little time idling, and have small volume production, a simplified compliance is indeed warranted. We recommend that the agencies use the same certification and compliance mechanisms and procedures as for all other vehicles, however, given that manufacturers cannot implement different computer systems for each type of vehicle. Rather, for vehicle applications like RVs, a GEM-based compliance mechanism that ensures compliance for vehicles built with certified engines may suffice. For emergency vehicles, which may need high torque or power or high traction tires to react to emergencies, even if such needs result in temporarily high fuel consumption, compliance through GEM may simply mean that the vehicle has a fuel map as good as a 2014 fuel map for such emergency vehicles. [EPA-HQ-OAR-2014-0827-1164-A1 p.75]

Possible Standards for Other Custom Chassis Manufacturers - On providing custom chassis manufacturers with additional lead time to comply. 80 FR 40295. DTNA supports providing custom chassis manufacturers with additional lead time to comply as long as the additional lead time is given to all custom chassis manufacturers regardless of sales volumes or any other criteria which would not be in the best interest of fair market competition. [EPA-HQ-OAR-2014-0827-1164-A1 p.75]

Lower Rolling Resistance Tires – The agencies proposed discontinuing the option to qualify for the off-road or low speed exemption solely if the vehicle is fitted with tires that have a maximum speed rating at or below 55 mph. 80 FR 40300. DTNA agrees with EPA that the qualifying criteria related to the design and use of the vehicle should be retained. We agree that the speed rating of the tire is not as reliable a factor as the other factors listed, GAWR of 29k lbs or more, speed attainable of not more than 33 mph in two miles, or speed attainable of not more than 45 mph in two miles with unloaded vehicle weight not less than 95% of the GVWR. [EPA-HQ-OAR-2014-0827-1164-A1 p.79]

iv. RV & Custom Chassis

· **Possible Standards for Other Custom Chassis Manufacturers (Compliance Procedure) -** The agencies request comment on extending the above simplified compliance procedure and less stringent Phase 2 standards to other custom chassis manufacturer. 80 FR 40294. DTNA does not believe that it is fair or beneficial to the environment to allow simplified compliance procedures and less stringent Phase 2 standards to certain manufacturers based solely on sales volumes. If the technology exists for one manufacturer to meet the standard, then it exists for all manufacturers. [EPA-HQ-OAR-2014-0827-1164-A1 p.100]

· **Possible Standards for Other Custom Chassis Manufacturers (Stringency)** – The agencies request comment on the merits of offering less stringent standards to small volume chassis manufacturers, and seek comment as well as to other factors the agencies should consider to ensure this approach would have unintended consequences for business competing in the vocational vehicle market. 80 FR 40295. DTNA does not believe that it is fair or beneficial to the environment to allow simplified compliance procedures and less stringent Phase 2 standards to certain manufacturers based solely on sales volumes. If the technology exists for one manufacturer to meet the standard, then it exists for all manufacturers. [EPA-HQ-OAR-2014-0827-1164-A1 p.100-101]

· **Possible Standards for Other Custom Chassis Manufacturers (Sales Volume)** – The agencies request comment on an appropriate sales volume to qualify for these possible standards, and also request comment as to whether the sale volume thresholds should be different for different markets. 80 FR 40295. DTNA does not believe that it is fair or beneficial to the environment to allow simplified compliance procedures and less stringent Phase 2 standards to certain manufacturers based solely on sales volumes. If the technology exists for one manufacturer to meet the standard, then it exists for all manufacturers. [EPA-HQ-OAR-2014-0827-1164-A1 p.101]

· **Possible Standards for Other Custom Chassis Manufacturers (Competitiveness)** – The agencies request comment on whether it could adversely affect business competitiveness if custom chassis manufacturers were held to a different standard than commercial chassis manufacturers, and whether the agencies should consider allowing commercial chassis manufacturers competing in the markets to sell a limited number of chassis certified to a less stringent standard. 80 FR 40295. DTNA believes that having different and less stringent standards would undermine fair market competition. If the technology exists for one manufacturer to meet the standard, then it exists for all manufacturers. [EPA-HQ-OAR-2014-0827-1164-A1 p.101]

· **Possible Standards for Other Custom Chassis Manufacturers (Recreational Vehicles) -** The agencies request comment on whether we should develop separate standards for different vehicle types such as recreational vehicles and buses. 80 FR 40295. DTNA would be supportive of less stringent GHG standards for recreational vehicle products. Applicable technology package considerations should be focused on 6-8 year payback periods based on typical RV duty cycles. Standard-setting technologies for the RVs should be based on a study of the technology currently used in RVs, including a study of RVs' Crr values. All vehicle labeling standards and requirements should be consistent regardless of any specific application allowances or exemption status. The agencies should establish a pathway to certification of vehicles using engines from small manufacturers, allowing the use of a default engine fuel map without penalizing the vehicle manufacturers, until the time that small engine manufacturers have their fuel maps measured and ready for use. [EPA-HQ-OAR-2014-0827-1164-A1 p.101]

· **Possible Standards for Other Custom Chassis Manufacturers (Vehicle Exemption)** – The agencies request comment on how to design a small business vocational vehicle exemption by means of a custom chassis volume exemption and what sales volume would be an appropriate threshold. 80 FR 40295. DTNA does not believe that it is fair or beneficial to the environment to allow simplified compliance procedures and less stringent Phase 2 standards to certain manufacturers based solely on sales volumes. If the technology exists for one manufacturer to meet the standard, then it exists for all manufacturers. [EPA-HQ-OAR-2014-0827-1164-A1 p.101]

· **Custom chassis manufacturer:** what is the definition of a custom chassis manufacturer? What is the cut off in sales? [EPA-HQ-OAR-2014-0827-1164-A1 p.102]

· **Proposed Standards for Emergency Vehicles** – The agencies request comment on whether we should include any market adoption rate of idle reduction technologies for emergency vehicles, as part of the basis for the phase 2 emergency vocational vehicle standard. 80 FR 40162. In regards to adoption rate of idle technologies for emergency vehicles, we believe that the rate will be 0. We do not plan on providing any type of technology of idle reduction until it is demanded or requested by the industry as we do not want to cause any disruptions when the vehicle needs to be operating at 100% in emergency situations. If idle reduction is still necessary it should follow California's heavy duty diesel vehicle idling regulations. [EPA-HQ-OAR-2014-0827-1164-A1 p.102]

· **Proposed Standards for Emergency Vehicles -** The agencies request comment on the merits of using equation-based compliance approach for emergency vehicle manufacturers, similar to the approach proposed for trailer manufacturers. 80 FR 40293. DTNA believes the agencies should continue using GEM as the source emergency vehicle compliance. This will continue to provide a consistent methodology of compliance for all vehicles and not introduce additional complexities that could arise from using the compliance equation. [EPA-HQ-OAR-2014-0827-1164-A1 p.102]

· **Aligning HDV Emergency Vehicles (Fire Trucks) Definition** – The agencies request comment on the merits and drawbacks of aligning the definition of emergency vehicle for purposes of the Phase 2 program with the definition of emergency of the light duty GHG provisions under 40 CFR 86.1818, such as those used by law enforcement. We support the idea of aligning the definition of emergency vehicle as we have the capability of running separate reports using specific data codes to determine the amount of emergency vehicles that have been sold. The second option that we would like to propose is that the agencies adopt the same definition as defined in 13 CCR 1956.8(a)(6). [EPA-HQ-OAR-2014-0827-1164-A1 p.102]

Organization: ABC Bus Companies, Inc.

Proposed Phase 2 Standards and Vocational Vehicles, states that the agencies have held dozens of meetings with manufacturers, suppliers, non-governmental organizations and other stakeholders. As there are only 4 to 6 motorcoach manufacturers that currently supply motorcoaches to the United States, it does not seem that this small group in the 'Vocational Vehicles' category was invited to provide comments related to these proposed changes. As the commodity of the Motorcoach Industry is moving people safely and comfortably, it seems that the majority of the Phase 2 text is geared to moving freight. Passenger carrying vehicles demand additional constraints that will be described further in this document. It is important to have these stakeholders' input regarding the current and past Phase 1 effects, to help determine the future effects of these Phase 2 proposals on this industry segment during the drafting process. The costs of Phase 2 compliance in the Trucking Industry can be divided up between hundreds of thousands of trucks, while there is less ability to absorb such costs for the estimated 1,000 motorcoaches produced annually. It seems that the motorcoach manufacturers will be left to deal with high compliance costs that could have an adverse effect on the Motorcoach Industry as a whole. [EPA-HQ-OAR-2014-0827-1430-A2 p.1]

There should be preemptive language in any new regulations. [EPA-HQ-OAR-2014-0827-1430-A2 p.2]

Many proposed NHTSA motorcoach 'Safety Standards', for example, coach Roll-Over Roof Structure, Passenger Window Glazing, and Fire Protection requirements, etc. are still being drafted and will not be finalized for some years to come. While motorcoach manufacturers are trying to prepare for the implementation of these 'Safety Standards' many proposed Standards in Phase 2 could conflict with the still unknown mandated 'Safety Standards'. AS NHTSA has had so much involvement in the Phase 2 proposals, we could not find where these future mandates were taken into consideration in any of the current NHTSA/EPA proposed rules, or made any allowances for them? [EPA-HQ-OAR-2014-0827-1430-A2 p.2]

ABC Bus Companies note that the Preamble gives examples of Vocational Vehicles including: urban delivery, refuse hauling, utility service, dump, concrete mixing, transit service, shuttle service, school bus, emergency, motor homes, and tow trucks, but no mention of 'over the road' or motorcoach 'line-run', or 'charter' service has been defined. [EPA-HQ-OAR-2014-0827-1430-A2 p.3]

Organization: GILLIG LLC

The agencies requested comment on extending the simplified compliance procedure and less stringent Phase 2 standards proposed for emergency vehicles to other custom chassis manufacturers. Many of the reasons the agencies used in support of the separate emergency vehicle standard hold true for transit buses: [EPA-HQ-OAR-2014-0827-1156-A1 p.6]

-as technologies to improve powertrain efficiencies become more complex, the compliance burden is disproportionately high for the low volume of transit buses produced. [EPA-HQ-OAR-2014-0827-1156-A1 p.6]

-with our narrow range of product offering, using averaging as a compliance flexibility is limited. [EPA-HQ-OAR-2014-0827-1156-A1 p.6]

-with approximately 1800 transit buses produced annually, GILLIG's ability to spread compliance costs across a large number of vehicles is limited. [EPA-HQ-OAR-2014-0827-1156-A1 p.6]

-transit buses are designed, built and operated very differently than other vocational vehicles such as dump trucks, tow trucks, cement mixers, refuse trucks, etc. making the proposed one size fits all vocational standard inappropriate. [EPA-HQ-OAR-2014-0827-1156-A1 p.6]

The agencies went on to suggest that a possible approach for custom chassis manufactures would be 'predicated on a simpler set of technologies.....most likely lower rolling resistance tires and idle reduction.' [EPA-HQ-OAR-2014-0827-1156-A1 p.6]

In summary, GILLIG would enthusiastically support Agency efforts for a simplified compliance procedure and less stringent Phase 2 standards for transit buses. We would propose a simplified compliance procedure for transit buses, a separate subcategory from other vocational vehicles, similar to the emergency vehicle procedure, based on lower rolling resistance tire and neutral idle technologies. We feel the neutral idle technology more so than the idle reduction technology is applicable to transit buses for reasons mentioned above. GILLIG also requests the agencies to review again the potential business impacts of the currently proposed Phase 2 rule with respect to the certification process, limited compliance flexibility, the burden of compliance and the stockpiling rule as they relate to transit buses. We believe that any one of these parts of the rule could have crippling business consequences for a transit bus manufacturer, its employees and customers. [EPA-HQ-OAR-2014-0827-1156-A1 p.6]

Organization: Tiffin Motorhomes, Inc.

II. Summary of Comments

It is our belief and contention that the EPA and NHTSA should reconsider how the Proposed Regulations might apply to manufacturers such as Tiffin. If the regulations are adopted in their current form, the chassis division of Tiffin does not see a path to compliance for chassis it manufactures. Using Averaging, Banking and Trading provisions are not a feasible alternative for the chassis Tiffin manufactures due to the low volume, and singular purpose of use. Further, the technologies proposed by these rules do not provide a path to compliance even if all proposed technologies are applied. In order to avoid the closing of our chassis production, we respectfully request that motorhomes (1) be exempted from the proposed rules, or (2) that the EPA should establish separate regulations for motorhomes taking into account their uniqueness in both design and use, similar to what the Agency is doing with emergency vehicles. [NHTSA-2014-0132-0099-A1 p.2]

III. Impact of the economy and cost on the industry

Tiffin, like the motorhome industry as a whole, was hit hard by the recession of 2008 which saw our production drop from 13 motorhomes per day to 3 motorhomes per day. The chassis division suffered a 50% reduction in employment during this time. It was an extreme example of the volatility in the Recreational Vehicle market. As a leisure item with retail costs from $120,000.00 to $650,000.00, demand for Tiffin products drops precipitously when the overall economy significantly constricts or slows down. The chassis division returned to its pre-2008 level in 2010, but the instability in the national economy makes the motorhome market as whole somewhat uncertain. Unnecessary regulations, with a high cost of implementation and a low impact on the environment, would add an additional burden on the recovery that the company has experienced. [NHTSA-2014-0132-0099-A1 p.3]

It should also be noted that unlike commercial vehicles motorhomes do not generate income or increase in value. They are generally used only for personal recreational use and are driven less than 5000 miles per year resulting in significantly lower emissions than those produced by commercial vehicles. These factors make the increased cost imposed by these regulations difficult to absorb, and lead to extended payback periods, often beyond 20 years. [NHTSA-2014-0132-0099-A1 p.3]

IV. Compliance with the proposed regulations using ABT is not possible or feasible for Tiffin

After a studied reading of the proposed regulations, it is not possible or feasible for Tiffin to meet the proposed 2021, 2024 and 2027 standards using ABT. [NHTSA-2014-0132-0099-A1 p.3]

The ABT provisions are not a viable alternative for Tiffin for two reasons. First and foremost, Tiffin currently manufactures only two chassis models, one classified as a MHO, the other as an HHD. These chassis are produced only for motorhomes, and exclusively for Tiffin. This narrow range or products along with the low production volume provide a much lower level of compliance flexibility under the ABT provisions. The annual production volumes for these chassis are; MHO 300-500 units per year, and HHD 500-700 units per year. [NHTSA-2014-0132-0099-A1 p.3-4]

V. Technologies proposed do not provide a path to compliance for Tiffin

The technologies proposed in this rule, if available, and fully implemented, do not achieve compliance under this rule. The chart below shows the potential outcome using the proposed technologies. [NHTSA-2014-0132-0099-A1 p.4]

[Chart can be found on p.4 of docket number NHTSA-2014-0132-0099-A1]

As can be seen in this chart the proposed technologies when applied still leave a deficit to compliance of almost 6%. This assumes that these technologies are available, and provide the proposed benefit. Our low production volumes also provide less opportunity for Tiffin to spread the cost of developing these new technologies across a large number of vehicles. [NHTSA-2014-0132-0099-A1 p.4]

VI. Exemption

Tiffin acknowledges the need for new regulations in an effort to reduce GHG emissions. It is our belief that it is appropriate and acceptable for small chassis manufactures to continue with rules similar to those in Phase 1 of Heavy Duty GHG Standards where chassis are manufacture using LRR tirest and compliant engines. We respectfully request and exemption from the remaining regulations proposed in Phase 2 of these standards. [NHTSA-2014-0132-0099-A1 p.5]

VII. If not exemption then less stringent standards

If the Agency is not willing to exempt small specialty chassis manufactures from the proposed Phase 2 regulations it is our belief that a less stringent standard is justifiable for these manufactures. We believe a standard similar to what the Agency has done for the Emergency Vehicle industry would be a viable alternative to provide a path to compliance for these manufactures. [NHTSA-2014-0132-0099-A1 p.5]

Organization: Newell Coach Corporation

Looking forward, we are very concerned that compliance with the Phase 2 HI-ID vocational vehicles standards could force us out of business since compliance with the standards do not appear to be feasible for manufacturers like Newell who have no opportunity to utilize the agency's averaging, banking and trading (ABT) provisions. In 2024, even if we were to install all the technology available in the GEM model for regional cycle vocational vehicles (e.g., start stop and weight reduction), our chassis would be far from compliant. Stop-start systems would provide very little benefit given our drive cycle at a tremendous cost.

Given the above, we respectfully request an extension of the current SBA exception for small manufacturers. In our view, a continuation of the current exemption for small businesses, if not for all small businesses then at least for motorhome chassis, would be the simplest solution for small companies like ours, and for EPA. However, if the EPA should conclude that a continuation of the SBA exemption for motorhome chassis manufacturers is not appropriate, we believe that companies who annually manufacture 500 or fewer Class 8 - HHD motorhome chassis should be provided the opportunity to certify their chassis to a less stringent standard (similar to that which has been proposed for emergency vehicles). [EPA-HQ-OAR-2014-0827-1319-A1 p.2]

Organization: Recreational Vehicle Industry Association (RVIA)

The motorhome industry is relatively unique within the motor vehicle sector. Motorhome vehicle miles traveled (VMT) and production volumes are relatively low, and the fact that these vehicles are for non-commercial use mean there are no recoupment of costs or asset appreciation considerations available. As we will explain in more detail below, the unique nature of these vehicles merits special consideration under the Proposed Rule. [EPA-HQ-OAR-2014-0827-1261-A1 p.3-4]

RVIA's comments also address EPA's request for information on custom chassis manufacturers and recommend both a standard and a volume-based definition for the group, based on EPA precedent. Our response, however, in no way changes our overall view that motorhomes should be exempt as a group or at minimum subject to separate, more feasible standards. [EPA-HQ-OAR-2014-0827-1261-A1 p.4]

In order to understand the unique nature of the motorhome industry and why the Proposed Regulations inflict such disproportionate costs on the sector, it is important to provide some details on the sector.

General categories of motorhomes, prices and volumes

i. Motorhomes Types

Motorhomes are typically categorized by type of chassis as Type A, Type B or Type C. [pictures of motorhomes included][EPA-HQ-OAR-2014-0827-1261-A1 p.5]

Type A Motorhome

A Type A motorhome is built on a heavy-duty chassis with the engine located either in the rear or the front. Virtually all are built on chassis designed specifically for motorhomes. Type A's fall into the light heavy duty (LHD), medium heavy duty (MHD) or heavy-duty (HHD) vocational vehicle categories and the average retail price is $180,000 for gasoline powered units, or $250,000 for a diesel pusher. [EPA-HQ-OAR-2014-0827-1261-A1 p.5]

Type B Motorhome

A Type B motorhome is built using a cargo van as the base. Most are built with a modified roof that is high enough to allow occupants to stand up inside. Type B motorhomes fall into the LHD vocational vehicle or work truck categories and the average retail price is $90,000. [EPA-HQ-OAR-2014-0827-1261-A1 p.5]

Type C Motorhome

Type C motorhomes usually use an extended van or pickup truck chassis with an attached cab. The Type C motorhome is known by many people as a "cab-over" motorhome, as most have an area that hangs over the cabin with a mattress for sleeping. Type C motorhomes fall into the LHD, MHD, or HHD vocational vehicle categories and have an average retail price of $89,000. [EPA-HQ-OAR-2014-0827-1261-A1 p.6]

EPA's proposed regulations are not feasible for motorhomes and the regulations impose unreasonable costs on manufacturers and consumers with little benefit to consumers or the environment

For a number of reasons, RVIA believes that it would be inappropriate to apply the proposed vocational vehicle standards to motorhomes.[26] [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

Compliance is not feasible for most motorhomes, especially when ABT provisions cannot be utilized. Moreover, the costs of compliance for motorhomes greatly exceed benefits to the environment and consumers. In fact, the Proposed Rules will have significant negative impacts on consumers, motorhome production, and American jobs.[27] [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

a. Compliance is not feasible for most motorhomes

For motorhome chassis manufacturers, based on *EPA's OWn analysis*, compliance with the proposed vocational vehicle standards is not feasible in many instances. RVIA carried out a compliance assessment for all motorhome types against the proposed Alternative 3 regional vocational vehicle compliance standards for 2021, 2024, and 2027.[28] The results of this assessment are contained in Appendix B to this submission. The table below summarizes the results of the assessment, with red shading to indicate where compliance is not feasible based on EPA's own data. It shows the following: [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

- Compliance with the proposed 2027 standards is not feasible for any category of motorhomes
- Compliance with the proposed 2024 standards is not feasible for LHD gas motorhomes, MHD diesel motorhomes, and HHD diesel motorhomes. Only LHD diesel and MHD gas motorhomes could theoretically meet the required improvements commercially or economically available to manufacturers.
- Compliance with the proposed 2021 standards is not feasible for LHD and MHD diesel motorhomes. Only LHD and MHD gas and HHD diesel motorhomes could theoretically meet the required improvements. [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

[Chart, feasible versus needed GHG reductions for motorhomes, can be found on p.16 of docket number EPA-HQ-OAR-2014-0827-1261-A1]

ABT provisions will not address the compliance feasibility problem for most motorhome chassis manufacturers. Most manufacturers will not be able to average costs and credits across their own fleets and would be forced to purchase credits corresponding to the relevant vocational vehicle weight groups elsewhere. However, credits will be limited and expensive and may not even be available. As set forth above, the pool of chassis manufacturers is quite small and the motorhome market is very limited. There are some motorhome chassis manufacturers that serve primarily the motorhome industry and they have no opportunity to utilize the ABT provisions through averaging. There are some motorhome chassis manufacturers that serve only the motorhome industry as well as otherwise exempt segments (e.g., emergency vehicle and military segments). They also have no opportunity to utilize the averaging provisions of ABT. Both categories would have no choice but to compete for a limited pool of credits that might be available from manufacturers of larger fleets, assuming such credits are available. Significantly, EPA has made no analysis of the availability or price of such credits so cannot simply rely on the expectation that such provisions would be available and at a reasonable cost. It is EPA's burden to show its regulations impose reasonable costs. The significant cost numbers we provide below, for example, do not even begin to include the potential costs of buying credits on the market. [EPA-HQ-OAR-2014-0827-1261-A1 p.16-17]

There are also some chassis manufacturers that serve not only the motorhome industry but also multiple truck industry segments and are part of larger entities with larger fleets. These manufacturers are unlikely to utilize ABT to take care of motorhomes as doing so would increase the cost of chassis sold to more important, larger and significantly more profitable business segments. Thus, for many manufacturers of motorhome chassis, compliance with the Proposed Rules would hurt their ability to compete in the more important, larger and more profitable segments that they rely on for the bulk of their revenue. [EPA-HQ-OAR-2014-0827-1261-A1 p.17]

Moreover, it is our understanding that most vocational vehicle manufacturers will face their own difficulties meeting the standards set by EPA, at least without significant changes to EPA's GEM model for vocational vehicles. Given these circumstances, there may very well be no credits available for ABT either within the larger manufacturers' fleets or from other regulated parties. Again, EPA has provided no analysis of the availability of credits for averaging or trading within and among these manufacturers, and simply assumes, without data, that such options will be available at reasonable cost. This kind of assumption is insufficient to support the outcomes that would result with this rulemaking. [EPA-HQ-OAR-2014-0827-1261-A1 p.17]

VII. If not exempt entirely, EPA should establish separate standards for motorhomes

In the event EPA concludes that it will not exempt motorhomes entirely to maintain harmonization with the NHTSA exemption, *see* earlier discussion above in section IV, it is fair and reasonable that separate and more feasible standards for motorhomes be established. Proposed standards are not feasible for motorhome chassis manufacturers, as these entities are generally not in a position to utilize ABT to meet the standards and the technologies are not cost-effective. For LHD motorhomes, we support adopting only the 2021MY LHD vocational vehicle standards and maintaining those standards through 2027. For MHD and HHD motorhomes, the adoption of standards that would only require MHD and HHD motorhomes to be equipped with more efficient engines and tires could be adopted. As discussed by EPA in the Proposed Rules, standards based on improved transmissions for MHD and HHD vocational vehicles/motorhomes would not be feasible since the engine and transmission are manufactured by non-integrated manufacturers. [EPA-HQ-OAR-2014-0827-1261-A1 p.23]

Complying with standards based on the above recommendations in lieu of those proposed would reduce the incremental per vehicle cost of compliance by approximately 75% and this would reduce if not eliminate the negative economic impacts seen in the four scenario analysis discussed in the previous section. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

VIII. Custom chassis manufacturer exemption

EPA has requested comment on whether "customs chassis manufacturers," like emergency vehicles, should be exempt from some of the Proposed Rules and how that term should be defined. While we believe that an exemption is appropriate for all motorhomes, or at minimum, separate standards, we will provide some information in response to this request. However, RVIA strongly urges EPA not to take the position that a custom chassis manufacturer exemption will resolve all the issues RVIA has raised in this submission. While custom chassis manufacturers do deserve some special consideration, especially since they particularly cannot use ABT provisions to meet infeasible standards or the costs of the Proposed Rule, this does not mean other motorhome chassis manufacturers do not merit separate and more achievable standards. This is especially true since these other motorhome chassis manufacturers are also unlikely to be able to use ABT to solve their non-compliance problems due to the fact that most other vocational vehicles that might generate credits for motorhome chassis manufacturers are also unable to comply under the GEMS program. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

With the above qualifications in mind, RVIA would support a standard for custom chassis manufacturers that would be solely based on fitting vehicles with more efficient engines and tires. This is similar to that proposed for emergency vehicles. This would allow feasible and reasonable technologies to be applied to reduce emissions rather than fully exempting customs chassis manufacturers from all standards. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

To reduce the potential for such a provision providing some smaller manufacturers with a competitive advantage, RVIA proposes that all manufacturers, regardless of size, have the opportunity to certify a motorhome chassis to the custom chassis manufacturer standards up to a specified volume threshold. We suggest the following thresholds: [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

1,000 LHD (class 2b-5) motorhome chassis

1,000 MHD (class 6-7) motorhome chassis

2,500 HHD (class 8) motorhome chassis

We note that such a definition is consistent with prior EPA practice. EPA permits small volume test groups to be certified as if they were small volume manufacturer test groups. *See* 40 C.F.R. § 86.183801 (Small volume manufacturer certification procedures). [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

The same logic should apply to large, multi-vehicle manufacturers who only produce low volumes of chassis designed exclusively for use in the motorhome industry. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

EPA and NHTSA should recognize the unique nature of the motorhome sector, including its exceptional cost-sensitivity, low mileage and low production of its vehicles, and its inability to absorb significant and cumulative regulatory costs. [EPA-HQ-OAR-2014-0827-1261-A1 p.27]

Given these costs, which exceed any benefits, EPA should put motorhomes in a category separate from other vocational vehicles. If they are not exempt, they should be subject to a different and more feasible set of regulations which impose more reasonable costs. Such standards could be: [EPA-HQ-OAR-2014-0827-1261-A1 p.28]

-For LDH motorhomes, EPA should adopt only the MY 2021 LHD vocational vehicle standards and continue them through MY 2027. [EPA-HQ-OAR-2014-0827-1261-A1 p.28]

-For MHD and HHD motorhomes, EPA should require only more efficient engines and tires. [EPA-HQ-OAR-2014-0827-1261-A1 p.28]

Custom chassis manufactures merit special recognition given their low volumes and inability to average vehicles across fleets or otherwise make economic use of the ABT provisions. These vehicles should only be required to use more efficient engines and tires. Customs chassis should be defined by volume of production set forth in section VIII to avoid unintended competitive harms, in accordance with EPA precedent. [EPA-HQ-OAR-2014-0827-1261-A1 p.28]

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[26] RVIA does not assert that motorhomes belong in a separate regulatory category other than vocational, but that, if regulated, it should have its own separate standards within the vocational group, just as emergency vehicles are regulated separately.

[27] The analysis below only focuses on Alternative 3 as presented in the Proposed Rules. Alternative 4 would be even more problematic, but for purposes of these comments, was not modeled.

[28] Clearly, if requirements under Alternative 3 arte not feasible, imposition of Alternative 4 would be even less feasible.

Organization: Recreational Vehicle Industry Association (RVIA)

The motorhome industry is relatively unique within the motor vehicle sector. Motorhome vehicle miles traveled (VMT) and production volumes are relatively low, and the fact that these vehicles are for non-commercial use mean there are no recoupment of costs or asset appreciation considerations available. As we will explain in more detail below, the unique nature of these vehicles merits special consideration under the Proposed Rule. [EPA-HQ-OAR-2014-0827-1261-A1 p.3-4]

RVIA's comments also address EPA's request for information on custom chassis manufacturers and recommend both a standard and a volume-based definition for the group, based on EPA precedent. Our response, however, in no way changes our overall view that motorhomes should be exempt as a group or at minimum subject to separate, more feasible standards. [EPA-HQ-OAR-2014-0827-1261-A1 p.4]

In order to understand the unique nature of the motorhome industry and why the Proposed Regulations inflict such disproportionate costs on the sector, it is important to provide some details on the sector.

General categories of motorhomes, prices and volumes

i. Motorhomes Types

Motorhomes are typically categorized by type of chassis as Type A, Type B or Type C. [pictures of motorhomes included][EPA-HQ-OAR-2014-0827-1261-A1 p.5]

Type A Motorhome

A Type A motorhome is built on a heavy-duty chassis with the engine located either in the rear or the front. Virtually all are built on chassis designed specifically for motorhomes. Type A's fall into the light heavy duty (LHD), medium heavy duty (MHD) or heavy-duty (HHD) vocational vehicle categories and the average retail price is $180,000 for gasoline powered units, or $250,000 for a diesel pusher. [EPA-HQ-OAR-2014-0827-1261-A1 p.5]

Type B Motorhome

A Type B motorhome is built using a cargo van as the base. Most are built with a modified roof that is high enough to allow occupants to stand up inside. Type B motorhomes fall into the LHD vocational vehicle or work truck categories and the average retail price is $90,000. [EPA-HQ-OAR-2014-0827-1261-A1 p.5]

Type C Motorhome

Type C motorhomes usually use an extended van or pickup truck chassis with an attached cab. The Type C motorhome is known by many people as a "cab-over" motorhome, as most have an area that hangs over the cabin with a mattress for sleeping. Type C motorhomes fall into the LHD, MHD, or HHD vocational vehicle categories and have an average retail price of $89,000. [EPA-HQ-OAR-2014-0827-1261-A1 p.6]

EPA's proposed regulations are not feasible for motorhomes and the regulations impose unreasonable costs on manufacturers and consumers with little benefit to consumers or the environment

For a number of reasons, RVIA believes that it would be inappropriate to apply the proposed vocational vehicle standards to motorhomes.[26] [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

Compliance is not feasible for most motorhomes, especially when ABT provisions cannot be utilized. Moreover, the costs of compliance for motorhomes greatly exceed benefits to the environment and consumers. In fact, the Proposed Rules will have significant negative impacts on consumers, motorhome production, and American jobs.[27] [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

a. Compliance is not feasible for most motorhomes

For motorhome chassis manufacturers, based on *EPA's OWn analysis*, compliance with the proposed vocational vehicle standards is not feasible in many instances. RVIA carried out a compliance assessment for all motorhome types against the proposed Alternative 3 regional vocational vehicle compliance standards for 2021, 2024, and 2027.[28] The results of this assessment are contained in Appendix B to this submission. The table below summarizes the results of the assessment, with red shading to indicate where compliance is not feasible based on EPA's own data. It shows the following: [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

- Compliance with the proposed 2027 standards is not feasible for any category of motorhomes
- Compliance with the proposed 2024 standards is not feasible for LHD gas motorhomes, MHD diesel motorhomes, and HHD diesel motorhomes. Only LHD diesel and MHD gas motorhomes could theoretically meet the required improvements commercially or economically available to manufacturers.

- Compliance with the proposed 2021 standards is not feasible for LHD and MHD diesel motorhomes. Only LHD and MHD gas and HHD diesel motorhomes could theoretically meet the required improvements. [EPA-HQ-OAR-2014-0827-1261-A1 p.15]

[Chart, feasible versus needed GHG reductions for motorhomes, can be found on p.16 of docket number EPA-HQ-OAR-2014-0827-1261-A1]

ABT provisions will not address the compliance feasibility problem for most motorhome chassis manufacturers. Most manufacturers will not be able to average costs and credits across their own fleets and would be forced to purchase credits corresponding to the relevant vocational vehicle weight groups elsewhere. However, credits will be limited and expensive and may not even be available. As set forth above, the pool of chassis manufacturers is quite small and the motorhome market is very limited. There are some motorhome chassis manufacturers that serve primarily the motorhome industry and they have no opportunity to utilize the ABT provisions through averaging. There are some motorhome chassis manufacturers that serve only the motorhome industry as well as otherwise exempt segments (e.g., emergency vehicle and military segments). They also have no opportunity to utilize the averaging provisions of ABT. Both categories would have no choice but to compete for a limited pool of credits that might be available from manufacturers of larger fleets, assuming such credits are available. Significantly, EPA has made no analysis of the availability or price of such credits so cannot simply rely on the expectation that such provisions would be available and at a reasonable cost. It is EPA's burden to show its regulations impose reasonable costs. The significant cost numbers we provide below, for example, do not even begin to include the potential costs of buying credits on the market. [EPA-HQ-OAR-2014-0827-1261-A1 p.16-17]

There are also some chassis manufacturers that serve not only the motorhome industry but also multiple truck industry segments and are part of larger entities with larger fleets. These manufacturers are unlikely to utilize ABT to take care of motorhomes as doing so would increase the cost of chassis sold to more important, larger and significantly more profitable business segments. Thus, for many manufacturers of motorhome chassis, compliance with the Proposed Rules would hurt their ability to compete in the more important, larger and more profitable segments that they rely on for the bulk of their revenue. [EPA-HQ-OAR-2014-0827-1261-A1 p.17]

Moreover, it is our understanding that most vocational vehicle manufacturers will face their own difficulties meeting the standards set by EPA, at least without significant changes to EPA's GEM model for vocational vehicles. Given these circumstances, there may very well be no credits available for ABT either within the larger manufacturers' fleets or from other regulated parties. Again, EPA has provided no analysis of the availability of credits for averaging or trading within and among these manufacturers, and simply assumes, without data, that such options will be available at reasonable cost. This kind of assumption is insufficient to support the outcomes that would result with this rulemaking. [EPA-HQ-OAR-2014-0827-1261-A1 p.17]

VII. If not exempt entirely, EPA should establish separate standards for motorhomes

In the event EPA concludes that it will not exempt motorhomes entirely to maintain harmonization with the NHTSA exemption, *see* earlier discussion above in section IV, it is fair and reasonable that separate and more feasible standards for motorhomes be established. Proposed standards are not feasible for motorhome chassis manufacturers, as these entities are generally not in a position to utilize ABT to meet the standards and the technologies are not cost-effective. For LHD motorhomes, we support adopting only the 2021MY LHD vocational vehicle standards and maintaining those standards through 2027. For MHD and HHD motorhomes, the adoption of standards that would only require MHD and HHD motorhomes to be equipped with more efficient engines and tires could be adopted. As discussed by EPA in the Proposed Rules, standards based on improved transmissions for MHD and HHD vocational vehicles/motorhomes would not be feasible since the engine and transmission are manufactured by non-integrated manufacturers. [EPA-HQ-OAR-2014-0827-1261-A1 p.23]

Complying with standards based on the above recommendations in lieu of those proposed would reduce the incremental per vehicle cost of compliance by approximately 75% and this would reduce if not eliminate the negative economic impacts seen in the four scenario analysis discussed in the previous section. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

VIII. Custom chassis manufacturer exemption

EPA has requested comment on whether "customs chassis manufacturers," like emergency vehicles, should be exempt from some of the Proposed Rules and how that term should be defined. While we believe that an exemption is appropriate for all motorhomes, or at minimum, separate standards, we will provide some information in response to this request. However, RVIA strongly urges EPA not to take the position that a custom chassis manufacturer exemption will resolve all the issues RVIA has raised in this submission. While custom chassis manufacturers do deserve some special consideration, especially since they particularly cannot use ABT provisions to meet infeasible standards or the costs of the Proposed Rule, this does not mean other motorhome chassis manufacturers do not merit separate and more achievable standards. This is especially true since these other motorhome chassis manufacturers are also unlikely to be able to use ABT to solve their non-compliance problems due to the fact that most other vocational vehicles that might generate credits for motorhome chassis manufacturers are also unable to comply under the GEMS program. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

With the above qualifications in mind, RVIA would support a standard for custom chassis manufacturers that would be solely based on fitting vehicles with more efficient engines and tires. This is similar to that proposed for emergency vehicles. This would allow feasible and reasonable technologies to be applied to reduce emissions rather than fully exempting customs chassis manufacturers from all standards. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

To reduce the potential for such a provision providing some smaller manufacturers with a competitive advantage, RVIA proposes that all manufacturers, regardless of size, have the opportunity to certify a motorhome chassis to the custom chassis manufacturer standards up to a specified volume threshold. We suggest the following thresholds: [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

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The same logic should apply to large, multi-vehicle manufacturers who only produce low volumes of chassis designed exclusively for use in the motorhome industry. [EPA-HQ-OAR-2014-0827-1261-A1 p.24]

EPA and NHTSA should recognize the unique nature of the motorhome sector, including its exceptional cost-sensitivity, low mileage and low production of its vehicles, and its inability to absorb significant and cumulative regulatory costs. [EPA-HQ-OAR-2014-0827-1261-A1 p.27]

Given these costs, which exceed any benefits, EPA should put motorhomes in a category separate from other vocational vehicles. If they are not exempt, they should be subject to a different and more feasible set of regulations which impose more reasonable costs. Such standards could be: [EPA-HQ-OAR-2014-0827-1261-A1 p.28]

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Custom chassis manufactures merit special recognition given their low volumes and inability to average vehicles across fleets or otherwise make economic use of the ABT provisions. These vehicles should only be required to use more efficient engines and tires. Customs chassis should be defined by volume of production set forth in section VIII to avoid unintended competitive harms, in accordance with EPA precedent. [EPA-HQ-OAR-2014-0827-1261-A1 p.28]

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[27] The analysis below only focuses on Alternative 3 as presented in the Proposed Rules. Alternative 4 would be even more problematic, but for purposes of these comments, was not modeled.

[28] Clearly, if requirements under Alternative 3 are not feasible, imposition of Alternative 4 would be even less feasible.

Response:

The agencies' responses to comments related specifically to companies meeting the definition of small business under SBA regulations are addressed in Section 15.4 of this response to comments document.

As was mentioned above in Section 6.2.3, use of simplified GEM as an optional certification tool can be justified in cases where either the typical duty cycle of the vocational application is poorly represented by any of the three final test cycles; where we find that the default GEM vehicle characteristics are so different from real world characteristics (for example engine power to vehicle weight ratio) that use of full GEM with active simulation of actual driveline parameters would not reasonably test the effectiveness of applied technologies; and where the certifying manufacturer produces small volumes of vocational chassis using a non-integrated business model where driveline optimization is not feasible and other transmission improvements would either be ineffective or not cost-effective.

Upon careful consideration of all the comments related to vocational vehicle chassis manufacturers who produce small volumes of specialized or non-diversified products, we are adopting optional standards for seven applications of vocational vehicles that we are calling custom chassis. Although this issue has some implications for our consideration of small business concerns, the custom chassis provisions discussed in the proposal were not intended to be limited to small businesses, and are not so limited in the final rules.

Discussions with representatives on our Small Business Advocacy Review Panel included exploration of a low volume production threshold below which some manufacturers may avoid some obligations of this regulation. Consistent with the recommendations of the Panel, the agencies requested comment on how to design a small business vocational vehicle program, including comments on a possible small volume threshold below which some small business exemption may be available.[195] Some commenters addressing this issue supported a small volume threshold for small businesses of either 200 vehicles per year, or a different threshold set based on the market share of the entity, or other low-volume thresholds ranging as high as 26,000 vehicles per year. We received adverse comment from Daimler stating it would be unfair to make less stringent standards available solely on the basis of sales volume, because if a technology exists for one manufacturer, it is available to all manufacturers. We received adverse comment from OshKosh that less stringent regulations on a limited production volume stifles a custom chassis manufacturers' opportunity to grow their business.

Upon consideration of these comments, the agencies are not finalizing a broad sales volume threshold below which a vocational chassis manufacturer may certify under the optional standards. Instead we are adopting an optional custom chassis program that is available to businesses of all sizes and production volumes. In addition to the flexibilities described in Section 15.4, the custom chassis program includes some flexibilities for small businesses that will not be available to large manufacturers. Specifically, we are permitting small businesses to use credits generated in the primary program as part of a custom chassis compliance plan, and we are permitting small businesses that manufacture drayage tractors to certify a small number of these vehicles each year to the custom chassis standards otherwise applicable to transit buses. See Section V.C.3 of the Preamble.

In response to the comment requesting clarification on our reasons for adopting a non-GEM design standard option for motor homes, cement mixers, and emergency vehicle chassis, this is because we have determined these vehicles to have the least number of feasible technologies that can be applied in Phase 2. Emergency vehicles and concrete mixers have been determined by the agencies to essentially need only to apply low rolling resistance tires in addition to certified engines and low leakage air conditioning. Motor homes have been determined to apply these technologies as well as tire pressure systems. We generally agree with the commenters from the motor home sector that there are very few technologies likely to prove cost-effective for these vehicles, given the typically low miles traveled by these vehicles. See Section 6.3.7 above for more details on why we conclude that tire pressure systems are feasible. Where a manufacturer of these vehicles is able to apply the same technology on all of its production without averaging, we offer the non-GEM option as a compliance flexibility to avoid some of the certification burden associated with running GEM. We were unable to identify other custom chassis technology packages that we believed could be applied at 100 percent adoption rate; thus, averaging (and use of GEM) was deemed necessary for other vehicles.
In response to the comment with concerns about the custom chassis program assuming a single weight class for each vehicle type, we have concluded this simplification is valid for preventing stranded averaging sets and easing the compliance burden for low-volume manufacturers.[196] We fully expect manufacturers to continue producing vehicles in varying weight classes as demanded by the market. The regulatory simplification does not mean that custom chassis vehicles actually must be produced at

[195] See proposed rules at 80 FR 40295, July 13, 2015.
[196] Averaging sets for custom chassis include all weight classes of a single custom chassis subcategory.

the weight corresponding to the assumed regulatory category. For example, a manufacturer may produce 100 motor homes where 90 are MHD and 10 are HHD. All of these may be simulated as MHD in GEM and comprise one averaging set, and credits for purposes of averaging will be calculated according to the actual vehicle-level regulatory useful life. The actual engines used in these vehicles will separately be certified to the applicable engine standard. See Section 6.5 for responses to comments on certification of custom chassis, and see Section V.D of the Preamble for more discussion of this process.

6.4.2 Off-Road/Low Speed Vehicles

Organization: Clarke Power Services

1031.631 Exemption of vocational vehicles intended for off-road use: The chassis of vehicles in the vocational industries in general and the off-road vehicles take a tremendous amount of load and torque (twisting). This kind of use guarantees that the chassis will be worn out prior to the modifications that were used to prepare the vehicle to be a vocational truck. The work box, crane, hydraulic lifts, etc. that are required in the vocational application are expensive and are transferred to the next chassis. When the replacement chassis is a Glider, then this commenter believes that the flexibility should be granted with regard to the engine choice. This commenter recommends that one sentence should be struck from 1031.631; that sentence being "This section does not exempt engines used in vehicles from the standards of 40 CFR part 86 or part 1036" atop of page 40655. Striking this sentence will give maximum flexibility once the agencies realize the vocational equipment being described may be older than MY 2014. [EPA-HQ-OAR-2014-0827-1005-A1 p.5]

Organization: Rubber Manufacturers Association (RMA)

The Agencies Should Continue to Exempt Vehicles Equipped with Tires with a Maximum Speed Rating at or Below 55 mph

In the Phase 1 rulemaking, EPA exempted a vehicle based solely on the use of tires with a maximum speed rating at or below 55 mph ("speed restricted tires"). In the Phase 2 NPRM, the agencies are proposing to eliminate this exemption because "the agencies are concerned that tires are so easily replaced that this would be an unreliable way to identify vehicles that truly need special consideration." 80 Fed. Reg. at 40295. While RMA recognizes the concern that the agencies express in eliminating this exemption, RMA believes that the speed restricted tires merit special consideration. [EPA-HQ-OAR-2014-0827-1304-A1 p.15] [EPA-HQ-OAR-2014-0827-1933-A1 p.2]

These tires typically are designed to achieve tire performances such as high load carrying capacity and durability that are specific to the vehicles on which they are installed, which often are used in off-road applications. A tire that is appropriate for use on a vehicle used for off-road applications would not see a meaningful fuel consumption benefit due to the use of low rolling resistance tires due to its typical drive cycle at low speeds on aggressive terrain. A speed restricted tire would not be suitable for use on a vehicle that does not specify these tires. The concern that this type of tire could be installed on a vehicle that otherwise does not require these tires is not founded, since speed restricted tires would not perform appropriately on other types of vehicles. For example, if a speed restricted tire were installed on a vehicle that is used in highway applications, the integrity of the tire would be impaired at highway speeds, and the operator of the vehicle would not be satisfied with its performance. [EPA-HQ-OAR-2014-0827-1304-A1 p.15] [EPA-HQ-OAR-2014-0827-1933-A1 p.2]

10 Non-GHG Emissions Impacts and Their Associated Effects

10.1 Emissions Inventory Impacts

Organization: California Air Resources Board (CARB)

__**Neutral Comment to Provide Additional Information**__

Comment – NOx benefits from the extended use of APUs appear overestimated

According to page 40219 of the NPRM, to date, manufacturers are meeting the 2014 MY GHG standards without the use of automatic engine shutdown (AES) systems or APUs. U.S. EPA and NHTSA assume an APU/AES technology adoption rate of 90 percent for 2024+ MY class 7 and 8 tractors (page 40393 – 40394 of the NPRM). Given that manufacturers complied with Phase 1 without using APUs, CARB staff believes a 90 percent adoption rate may be too high. [EPA-HQ-OAR-2014-0827-1265-A1 P.172]

Additionally, CARB's engine certification database shows that almost all of the 2014 MY engines which are sold in California (especially in class 8) are certified (as 50-State families) to the California clean idle engine requirements of 30 grams/hour NOx at idle. Following U.S. EPA and NHTSA's projection of increased use of APUs during extended idling in combination tractors, the NPRM claims 34 percent NOx emissions reduction in year 2050 (page 40412 of the NPRM). Considering that APUs emit only a slightly lower NOx emissions than CA clean idle certified engines (because they are certified to CA clean idle requirements), such a high reduction in tailpipe NOx emissions (i.e., 34 percent) is not expected. [EPA-HQ-OAR-2014-0827-1265-A1 P.172]

Therefore, CARB staff encourages U.S. EPA and NHTSA to: [EPA-HQ-OAR-2014-0827-1265-A1 p.172]

1. Re-evaluate the projected level of AES/APU systems that will be used by manufacturers to comply with the requirements of the proposed regulation and;
2. Provide more information on the methodology and assumptions used to estimate the NOx emission benefits associated with this regulation.
3. Update the NOx emission benefit estimates to account for the current prevalence of clean idle certified engines.

Response:

In response to the comments from the proposal, the agencies have modified the projected adoption rates of idle reduction technologies. Additional details are provided in Chapter 2.4 and 2.8 of the RIA. Furthermore, the MOVES emission rates for extended idle and APUs were updated based on the analyses of the latest test programs that reflect the current prevalence of clean idle certified engines. This change resulted in smaller differences between emission rates for extended idle of the main engine and APUs for all criteria pollutants. Therefore, the emissions benefits of using APUs during extended idle, instead of the main engine, are much lower for non-GHGs in the final rulemaking than the proposal (see Section VIII of the Preamble). Additional details on the revised emission rates are provided in the memorandum to the docket.[203]

Organization: California Air Resources Board (CARB)

Comment – Need to control PM emissions from APUs to prevent Phase 2 causing PM increases

The NPRM requests comment on the need and appropriateness to further reduce PM emissions from APUs. The Phase 1 regulations included provisions to use extended idle reduction technologies as a compliance path to meet the GHG standards for sleeper cab tractors. In developing the Phase 1 GHG standards, U.S. EPA and NHTSA assumed that manufactures would install diesel-fueled APUs on all of the sleeper cab tractors to meet the Phase 1 GHG standards. Because the federal emission standards for APUs are less stringent than those for on-road heavy-duty engines, it was estimated that compliance with the Phase 1 standards using APUs as a compliance option would increase PM emissions by approximately 8 percent in 2030. Concerned about this potential increase in PM emissions, CARB and other stakeholders recommended that U.S. EPA and NHTSA regulate PM emissions from diesel-fueled APUs in the Phase 1 rulemaking.[75] However, U.S. EPA and NHTSA chose not to take action on APUs because such action was outside the scope of the Phase 1 rulemaking. [EPA-HQ-OAR-2014-0827-1265-A1 p.178-179]

To date, CARB staff is not aware of any tractor manufacturers using APUs as a technology option to meet the Phase 1 GHG standards. Nonetheless, U.S. EPA and NHTSA are proposing the use of extended idle reduction technologies as a compliance option to meet the proposed Phase 2 standards. Moreover, like in Phase 1, the proposed rule does not require PM control from APUs. Thus, U.S. EPA and NHTSA's inventory estimates project that compliance with the Phase 2 standards would increase federal PM emissions from heavy-duty trucks by approximately 10 percent in 2050 mainly due to PM increases from APUs. The NPRM requests comments on the need and appropriateness to further control PM emissions from APUs, taking into account cost, safety, noise, and energy factors. Although, as noted above, CARB staff believes the projection of APU use in the NPRM may be too high and hence the actual PM increases may be lower than projected, CARB staff is concerned about any such PM increases and believes they should be eliminated. [EPA-HQ-OAR-2014-0827-1265-A1 p.179]

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75 See http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2010-0162-2354 for Phase 1 Comment submitted CARB and for comments by others "EPA Response to Comments, EPA-420-R-11004, August 2011, Pages 136-140 http://www.epa.gov/otaq/climate/regs-heavy-duty.htm.

Response:

In addition to the CO_2 emission standards for tractors, EPA is adopting Phase 1 and Phase 2 requirements to control particulate matter (PM) emissions from diesel-fueled auxiliary power units (APU) installed in new tractors. Additional details are discussed in Section III.C.3 of the FRM Preamble.

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[203] U.S. EPA. Updates to MOVES for Emissions Analysis of Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2 FRM. Docket No. EPA-HQ-OAR-2016. July, 2016.

10.2 Health Effects, Environmental Effects, and Air Quality Impacts of Non-GHG Pollutants

Organization: American Lung Association

This past April, the American Lung Association's 16th annual State of the Air report once again found that cities in California ranked among the most polluted in the nation for both ozone and particle pollution. Transportation is leading source of pollution here, threatening the health of all residents of this region, but especially children, seniors, people living with asthma, COPD and other respiratory conditions. Pollution from the transportation sector is an added burden for those communities most disadvantaged by multiple pollution sources, including refineries, ports, rail yards and the freeways that carry the nation's goods through these communities first and most. [NHTSA-2014-0132-0087-A1 p.2] [[These comments can also be found in Docket Number EPA-HQ-OAR-2014-0827-1420, pp.142-143.]]

The residents of Southern California and the San Joaquin Valley have perhaps the most to gain from a strong rule of any area in the nation. In the past months, Californians have experienced record temperatures, raging wildfires, torrential flooding and a persistent drought that has grown over the past four years into a major threat to air quality, water supplies, and the way of life that makes California unique. [NHTSA-2014-0132-0087-A1 p.2 [These comments can also be found in Docket Number EPA-HQ-OAR-2014-0827-1420, p.143.]]

Organization: Bay Area Air Quality Management District (BAAQMD)

The San Francisco Bay Area (Bay Area) is home to more than 7 million people, and has one of the densest populations located adjacent to highways in the United States. The BAAQMD Community Air Risk Evaluation (CARE) program and California Air Resources Board (ARB) studies have shown that 85% of the risk from toxic air contaminants in the Bay Area comes from diesel Particulate Matter (PM). This is a significant air quality problem especially in the West Oakland area where an ARB health-risk assessment showed that up to 70% of the cancer risk is coming from on-road sources of air pollution. [EPA-HQ-OAR-2014-0827-1136-A1 p.1]

Organization: California Air Resources Board (CARB)

In 1998, CARB identified diesel PM as a toxic air contaminant. In 2012, the International Agency for Research on Cancer, which is part of the World Health Organization, also classified diesel engine exhaust as carcinogenic to humans.[76] Numerous studies have shown diesel PM's adverse effects on human respiratory and cardiovascular systems and its contribution to increased morbidity and mortality. Further details regarding diesel PM health effects is available on CARB's website at http://www.arb.ca.gov/research/diesel/diesel-health.htm. [EPA-HQ-OAR-2014-0827-1265-A1 p.180]

The health risk posed by diesel PM is one of the largest public health problems tackled by CARB in recent decades, and even after an extensive control program including a series of air toxic control measures in California (see for example the mobile source measures listed at http://www.arb.ca.gov/toxics/atcm/atcm.htm), diesel PM remains responsible for 60 percent of the known risk for air contaminants. Hence, controlling diesel PM remains a huge priority for CARB. Diesel PM also contains black carbon, which is a powerful short-lived climate pollutant, so even beyond the toxicity reasons for controlling diesel PM, there are climate reasons as well. The PM 2.5 increases projected for the Phase 2 regulation are very significant – an increase of 1,631 tons and 2,257 tons of nationwide PM 2.5 in 2035 and 2050,[77] respectively. To put those emission increases in perspective, they are greater than the entire projected reductions of 1,058 tons statewide diesel PM in 2023 from CARB's Truck and Bus Regulation.[78] While this issue does not significantly affect California because CARB already requires DPFs on APUs, CARB staff supports adopting similar requirements at the federal level concurrent with the Phase 2 program. [EPA-HQ-OAR-2014-0827-1265-A1 p.180-181][This comment can also be found in section 4.6 of this comment summary]

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76 IARC: Diesel Engine Exhaust Carcinogenic, http://www.iarc.fr/en/media-centre/pr/2012/pdfs/pr213E.pdf

[77] Phase 2 Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium and Heavy-Duty Engines and Vehicles; Notice of Proposed Rulemaking; 40 CFR 1036; 40 CFR 1037; 40 CFR 86; http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2014-0827-0002.

[78] (CARB, 2014d) California Air Resources Board, "Staff Report: Initial Statement of Reasons for Proposed Rulemaking – Proposed Amendments to the Truck and Bus Regulation," page 33, March 2014, <http://www.arb.ca.gov/regact/2014/truckbus14/tb14isor.pdf>.

Organization: California State Senator Ricardo Lara

[The following comments were submitted as testimony at the Long Beach, California public hearing on August 18, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1420, p. 57.]

In order to meet our reduction goals, we must invest in cleaner transportation technologies with a technology-neutral approach that incentivizes improvements in air quality along with reductions in greenhouse gases. We have made that commitment in California, investing millions of cap and trade dollars to the development of clean truck technology. However, we need an ambitious federal standard that complements and supports these efforts with stringent rules that will be implemented as soon as possible. [This comment can also be found in section 9.3 of this comment summary]

Organization: City of South Bend, Indiana

Locally, air quality affects our County, with ozone and particulates adversely impacting human health approximately eight days per year.[2] With a diverse community and a poverty rate of 27.8 percent,[3] we recognize that we must protect the health of vulnerable populations while being good stewards of limited taxpayer resources. Here in South Bend we are already replacing much of our fleet with cleaner-burning and lower-cost compressed natural gas vehicles. [EPA-HQ-OAR-2014-0827-1009-A1 p.1]

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2 American Lung Association, 2015 State of the Air, St. Joseph County Indiana

3 U.S. Census Bureau, American Community Survey, 5-Year Estimates

Organization: Climate 911

35 million Americans live or work within 300 meters of a major roadway and are exposed to diesel pollution. Health consequences include adverse birth outcomes, childhood asthma, impaired lung

development, cancer, heart disease, and premature death. (EPA 2002, 2014). This hazardous exposure should be decreased to the greatest extent technically and economically feasible in the shortest possible amount of time. [EPA-HQ-OAR-2014-0827-1179-A1 p.1]

U.S. EPA. Health Assessment Document for Diesel Engine Exhaust (Final 2002). U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington Office, Washington, DC, EPA/600/8-90/057F, 2002.

US EPA Update on Diesel Health Issues and EPA Actions 2014 http://www.epa.gov/cleandiesel/documents/diesel-health-issues-5-21-14.pdf Clean Air Task Force, An Analysis of Diesel Air Pollution and Public Health in America

Organization: Coalition on the Environment and Jewish Life

Finally, the proposed rule would reduce toxic air pollution from idling trucks and refineries that produce fuel, resulting in $37 billion in health and welfare benefits, including reductions in mortality and hospitalizations. Many refineries and areas where trucks idle for long periods of time are in low-income areas, so this rule will have a particularly important impact on these affected communities. [EPA-HQ-OAR-2014-0827-1249-A2 p.1]

Organization: Dignity Health

[The following comments were submitted as testimony at the Long Beach, California public hearing on August 18, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1420, p. 204.]

Dignity Health's healing mission and values compel us to seek ways to further improve air quality and the health of communities throughout the Southwest.

Strict standards will provide incentives to increase investment in clean truck technology and to help the U.S. meet federal ozone standards, which Dignity Health activity supports.

Our nation's current heavy-duty truck fleet poses significant health risks to Americans across the country.

Organization: East Yard Communities for Environmental Justice (EYCEJ)

These standards have the ability to help protect our most vulnerable populations from air pollution and the impacts of climate change. These impacts are disproportionately felt in low income and communities of color. From the idling of trucks to the refineries located next to homes and other sensitive receptors, it is the duty of the EPA to ensure that best practices are implemented to protect public health. Our members live on the fence line of oil and gas production, live with trucks idling nearby and rumbling through their neighborhoods, and shoulder the undue costs of these impacts through medications, hospitalizations, physical ailments, and premature deaths. [EPA-HQ-OAR-2014-0827-0843 p.1-2]

Organization: Environmental Law and Policy Center

[The following comments were submitted as testimony at the Chicago, Illinois public hearing on August 6, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1372, p. 216-219.]

They would save over a thousand lives each year.

The proposed regulation should do more to protect children's health. Asthma hospitalization rates in Chicago are nearly double those of the national average, and that's why we're so concerned that the proposed rule would actually increase particulate pollution by encouraging the use of auxiliary power units on trucks. We urge you to amend this rule by requiring that these units be equipped with particulate filters. This would eliminate the long-term increase in particulate pollution which may occur as a result of these regulations. [This comment can also be found in section 4.6 of this comment summary]

Organization: Gilroy, JD

Since I work as a health care utilization analyst for a large insurance company, I am very well aware that massive reductions in pollution can also yield great reductions in morbidity and mortality for residents susceptible to asthma, heart attacks, and other cardiovascular conditions. To speak anecdotally, while I take great joy in the beauty of the city of Chicago, the air quality here is notoriously bad, even years after the state of Illinois outlawed public indoor smoking and the city closed two old coal-fired power plants known as Crawford and Fisk. I have simply lost count of all the friends and family members who suffer from asthma or other more exotic medical conditions that are very probably linked in part to environmental toxins and irritants. [EPA-HQ-OAR-2014-0827-0751 p.2]

Organization: Houston-Galveston Area Council (H-GAC)

This rule, as proposed, will have substantial regional air quality and public health benefits. Projected emission reductions of 2.4 million tons of NOx emissions over the lifetime of the program should result in significant improvements of ground level ozone levels in our region. [EPA-HQ-OAR-2014-0827-1142-A2 p.1]

Organization: Illinois Public Interest Research Group (PIRG)

[The following comments were submitted as testimony at the Chicago, Illinois public hearing on August 6, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1372, p. 255.]

The standards are also important for public health. The reduction of toxic air pollution by the proposal rule will result in $37 billion in health and welfare benefits, including reductions in mortality and hospitalizations.

Organization: League of Women Voters of Los Angeles County

As we continue to learn that climate change is expected to increase to dangerous ozone levels in many areas and that the poorest people live within the areas closest to Los Angeles County's main port areas of Los Angeles and Long Beach and along the related freeway truck routes, it is abundantly clear that unless we adopt the proposed truck standards, air pollution will worsen asthma symptoms and trigger higher rates of asthma attacks among children and adults, along with other dire impacts on the health of citizens of Los Angeles County.

Organization: Manufacturers of Emission Controls Association (MECA)

Emission reductions aimed at lowering emissions of the primary precursors of ozone such as volatile organic compounds (VOCs) and NOx, will have a positive impact on lower ambient ozone levels, climate change, as well as human health. [EPA-HQ-OAR-2014-0827-1210-A3 p.3]

Organization: Mass Comment Campaign sponsored by anonymous 1 (email) - (23)

I am concerned about the impact of climate change and air pollution on the health of my family. Climate change threatens the health of our children through increased heat, air pollution, fires, storms, drought, airborne allergens, and other serious effects. That's why I strongly support improved fuel efficiency standards that would reduce dangerous climate pollution from medium and heavy duty trucks. [EPA-HQ-OAR-2014-0827-1341-A1 p.1]

The proposed standards will help protect our families from harmful climate change and from unhealthy air pollution. They will significantly reduce our national fuel consumption, and will save money for both truckers and consumers. [EPA-HQ-OAR-2014-0827-1341-A1 p.1][This comment can be found in 9.4 of this comment summary]

Organization: Mass Comment Campaign sponsored by the Pew Charitable Trusts (web) - (4,452)

Burning less fossil fuels also means less pollution and related illnesses such as asthma [EPA-HQ-OAR-2014-0827-1252-A1 p.1]

Organization: Manufacturers of Emission Controls Association (MECA)

The link between Ground Level Ozone and Climate Change

There is a significant linkage between ground level ozone concentrations and climate change impacts. One example was detailed by a group of researchers from the United Kingdom in a 2007 Nature publication. In this work, ground-level ozone was shown to damage plant photosynthesis resulting in lower carbon dioxide uptake from plants that have been exposed to higher levels of ozone. Other studies have shown that increasing average annual temperatures, resulting from climate change, are likely to result in even higher levels of ozone in the environment. [EPA-HQ-OAR-2014-0827-1210-A3 p.3]

Emission reductions aimed at lowering emissions of the primary precursors of ozone such as volatile organic compounds (VOCs) and NOx, will have a positive impact on lower ambient ozone levels, climate change, as well as human health. [EPA-HQ-OAR-2014-0827-1210-A3 p.3

Policies that aim to reduce ambient ozone levels may also become more necessary and important to either mitigate the climate change impacts of ground level ozone or to mitigate higher ozone levels that result from climate change. [EPA-HQ-OAR-2014-0827-1210-A3 p.3-4]

The health-based National Ambient Air Quality Standards require that states focus on reducing their ambient levels of criteria pollutants. California and the Northeast states are struggling to achieve existing federal ozone ambient standards, and are already preparing to meet tighter ozone NAAQS limits in the future. These states are concerned about GHG emissions as well as NOx from mobile sources such as heavy-duty engines since the mobile sector represent 50-80% of their NOx inventory.

Implicit in federal and state greenhouse gas emission analyses is the ability of these advanced powertrain options to meet the applicable criteria pollutant emission standards, such as CO, NOx, and non-methane organic gases (NMOG). All of these advanced, heavy-duty powertrain options combined with the appropriately designed and optimized emission control and efficiency technologies can meet all current and future federal and state criteria emission requirements. In this manner, advanced emission controls for criteria pollutants enable advanced powertrains to also be viable options for reducing greenhouse gas emissions. [EPA-HQ-OAR-2014-0827-1210-A3 p.4]

Organization: Moms Clean Air Force

[The following comments were submitted as testimony at the Chicago, Illinois public hearing on August 6, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1372, p. 64-65.]

While I, of course, am concerned about my child's health, I know that also frequently there are more freight depots and shipping companies in frontline neighborhoods where pollution is worse than in my neck of the woods. In Illinois, the rate of childhood asthma is at 13 percent, which is one percent higher than the national rate. The age adjusted asthma mortality rate here in Chicago is nearly five times higher in non-Hispanic blacks than in non-Hispanic whites. This rule will have a significantly positive impact on these affected communities.

Organization: Moving Forward Network

Eliminate loophole for Auxiliary Power Units (APUs), which will increase harmful Particulate Matter Emissions – As the California Air Resources Board has pointed out, a regulation that will increase the use of APUs more extensively throughout the nation will result in increased PM2.5 emissions unless these APUs are equipped with diesel particulate filters. We cannot sacrifice public health protections as we seek to battle climate pollution. We represent groups on the front lines battling deadly pollution from the freight industry. This approach that increase PM2.5 emissions is even more problematic given at least one state, California, has shown that diesel particulate filters can be required on APUs. The final rule should require the use of diesel particulate filters on APUs. [EPA-HQ-OAR-2014-0827-1130-A2 p.2][This comment can also be found in section 4.6 of this comment summary]

Organization: Northeast States for Coordinated Air Use Management (NESCAUM)

Ozone

Ozone remains a persistent pollution problem in parts of the NESCAUM region during warm weather months. The evolution of severe ozone episodes often begins with the passage of a large high pressure area from the Midwest to the middle or southern Atlantic states. Three primary pollution transport pathways affect air quality in the region: long-range, mid-level, and near-surface. During severe ozone episodes associated with high-pressure systems, these pathways converge on the Mid-Atlantic area, where sea and bay breezes act as a barrier and funnel ozone and other air pollutants up the Northeast Corridor. [EPA-HQ-OAR-2014-0827-1221-A1 p.4-5]

Collectively, NOx emissions and ambient ozone concentrations in the region have dropped significantly since 1997, along with the frequency and magnitude of exceedances of the health-based ozone national ambient air quality standard (NAAQS).[5] Despite this demonstrated progress, some of the most populous areas of the region continue to violate the 2008 0.075 ppm ozone NAAQS. Attaining the standard in these areas will require significant additional NOx reductions within the Northeast and in upwind areas.

Looking toward the future, additional NOx reductions will be critical to ozone attainment in order to meet the recently revised 0.070 ppm ozone NAAQS, which EPA projects will continue to be exceeded in our region in 2025. [EPA-HQ-OAR-2014-0827-1221-A1 p.5][This comment can also be found in section 15.8.2 of this comment summary]

Particulate Matter

Scientific evidence has established a solid link between cardiac and respiratory health risks and transient exposure to ambient fine particle pollution that is capable of penetrating deep into the lungs.[6] Exceedances of the fine particle NAAQS can occur at any time of the year, with some of the highest levels often reached in the winter. There are important differences in the chemical species responsible for high fine particle levels during summer and winter in the Northeast. Regional fine particle formation in the eastern United States is primarily due to SO2, but NOx is also important because of its influence on the chemical equilibrium between sulfate and nitrate particles during winter when nitrates can be a relatively greater contributor to urban PM2.5 levels. [EPA-HQ-OAR-2014-0827-1221-A1 p.5][This comment can also be found in section 15.8.2 of this comment summary]

Acid Deposition

Atmospheric sources of nitrogen are a primary contributor to acidification of forest soils and fresh water ecosystems in the Northeast. Nitrogen saturation results in a number of important changes in forest ecosystem functions, including: (1) increased acidification of soils and surface waters; (2) depletion of soil nutrients and the development of plant nutrient imbalances; and (3) forest decline and changes in species composition. More than 30 percent of the lakes in the Adirondacks and at least 10 percent of the lakes in New England are susceptible to the effects of acidic episodes that include long-term increases in mortality, emigration, and reproductive failure of fish, as well as short-term acute effects. Acidic episodes can occur at any time of the year but typically are most severe during spring snowmelt, when biological demand for nitrogen is low and saturated soils exhibit lower nitrogen retention.[7] [EPA-HQ-OAR-2014-0827-1221-A1 p.5-6]

Marine Eutrophication

Airborne nitrogen is an important contributor to eutrophication, the process by which a body of water acquires a high concentration of nutrients that promote excessive growth of algae. As the algae die and decompose, high levels of organic matter and decomposing organisms deplete the water of available oxygen, causing the death of other organisms, such as fish. Atmospheric nitrogen is a major contributor to eutrophication of key coastal resources in the Northeast, including Barnegat Bay in New Jersey and Long Island Sound.[8] The Chesapeake Bay is the largest estuary in the U.S. and its watershed stretches across more than 64,000 square miles, encompassing parts of six states, including New York. Since the 1950s, the bay has experienced a decline in water quality due to over-enrichment of unwanted nutrients such as phosphorus and nitrogen. The major contributors to nutrient discharge in the bay are wastewater effluent, urban and agricultural runoff, and air deposition.[9] [EPA-HQ-OAR-2014-0827-1221-A1 p.6]

Visibility Impairment

Regional haze is a form of air pollution that obscures the views of city skylines as well as “pristine” scenic vistas. It is caused by fine particle air pollution and can cover hundreds of square miles in the East. Natural visibility conditions in the East are estimated at 60 to 80 miles in most locations. Under current polluted conditions, average visibility ranges from 20 to 40 miles. On the worst days, regional haze can reduce visibility to just a few miles. Outdoor recreation is a multi-billion dollar industry in the

U.S. and is of particular economic importance to communities near protected federal lands. Surveys indicate visitors have rated “clean, clear air” as among the most important features of national parks and have overwhelmingly ranked scenic views and clean air as “extremely” or “very” important. Studies have yielded estimates in the billions of dollars for the visibility benefits associated with substantial national pollution reductions.[10] While sulfate, formed from SO2 emissions, is currently the most important particle constituent of regional haze in the East, reductions in other local and distant pollutant emissions, including NOx, will be necessary to achieve the nation’s long-term goal of restoring pristine visibility conditions year-round in national parks and wilderness areas.[11] [EPA-HQ-OAR-2014-0827-1221-A1 p.6-7]

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5 NESCAUM. 2010. The Nature of the Ozone Air Quality Problem in the Ozone Transport Region: A Conceptual Description, prepared for the Ozone Transport Commission by NESCAUM, Boston, MA (August 2010). Available at: http://www.nescaum.org/documents/2010_o3_conceptual_model_final_revised_20100810.pdf.

6 U.S. EPA. 2005. Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information, USEPA OAQPS Staff Paper, EPA-452/R-05-005a (December 2005).

7 Driscoll, C.T., G.B. Lawrence, A.J. Bulger, T.J. Butler, C.S. Cronan, C. Eagar, K.F. Lambert, G.E. Likens, J.L. Stoddard, and K.C. Weathers. 2001. Acidic deposition in the northeastern United States: Sources and inputs, ecosystem effects, and management strategies, BioScience 51, 180–198.

8 Bricker, S.B., C.G. Clement, D.E. Pirhalla, S.P. Orlando, and D.R.G. Farrow. 1999. National Estuarine Eutrophication Assessment: Effects of Nutrient Enrichment in the Nation’s Estuaries, NOAA, National Ocean Service, Special Projects Office and the National Centers for Coastal Ocean Science. Silver Spring, MD: 71 pp.

9 Maryland Department of the Environment, Chesapeake Bay Restoration, http://www.mde.state.md.us/programs/Water/Pages/water/bayrestoration.aspx (accessed September 1, 2011).

10 NESCAUM. 2001. Regional Haze and Visibility in the Northeast and Mid-Atlantic States, NESCAUM, Boston, MA (January 31, 2001). Available at: http://www.nescaum.org/documents/regional-haze-and-visibility-in-the-northeast-and-mid-atlantic-states/.

11 In 1999, EPA promulgated the Regional Haze Rule in pursuit of the national visibility goal created by Congress in the Clean Air Act to ultimately restore natural visibility conditions in 156 national parks and wilderness areas across the country (called “Class I” areas).

Organization: Respiratory Health Association

[The following comments were submitted as testimony at the Chicago, Illinois public hearing on August 6, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1372, p.129.]

Tailpipe derived particulate matter triggers asthma attacks and heart attacks, and drives increases in emergency room visits, and hospitalizations, and premature deaths. Eliminating those emissions as well as slashing ozone forming and toxic air pollution has reduced health risks and, in fact, has saved lives.

Response:

EPA agrees that emissions of non-GHG pollutants from heavy-duty vehicles contribute to ambient air pollution that poses significant health and environmental concerns. Along with reducing GHGs, the Phase 2 standards also have an impact on non-GHG, criteria and air toxic pollutant, emissions. As discussed in Section VIII.C of the Preamble, the standards will impact exhaust emissions of these pollutants from vehicles and will also impact emissions that occur during the refining and distribution of fuel (upstream sources). Reductions in emissions of NO_X, VOC, $PM_{2.5}$ and air toxics expected as a result of the Phase 2 standards will lead to improvements in air quality, specifically decreases in ambient concentrations of $PM_{2.5}$, ozone, NO_2 and air toxics, as well as better visibility and reduced deposition. Section VIII of the Preamble for this final rule details the health and environmental impacts associated with non-GHG air pollutants. In addition, Section VIII.A.6 focuses on diesel exhaust and Section VIII.A.8 focuses on exposures and health effects associated with traffic. EPA also agrees that Environmental Justice (EJ) is an important principle and a more detailed discussion on EJ is included in Section VIII.A.9.

Several commenters noted concern about the fact that the proposal increased $PM_{2.5}$ emissions due to increased usage of auxiliary power units (APUs). EPA is adopting Phase 1 and Phase 2 requirements to control $PM_{2.5}$ emissions from APUs installed in new tractors, so we do not expect increases in downstream $PM_{2.5}$ emissions from the Phase 2 program. Additional discussion of the APU requirements can be found in Section 4.6 of this Response to Comments document.

14.2 Amendments Affecting Gliders and Glider Kits

Organization: American Council for an Energy-Efficient Economy (ACEEE)

Glider Kits

ACEEE 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. The Phase 2 proposal will allow only engines that have been certified to meet current standards to be installed in new glider vehicles (p.40174). The agencies have observed sharp increase in glider kit production (p.40529) recently, which suggests that gliders are being used more and more as a loophole to avoid purchasing engines that meet 2010 EPA emission standards, and potentially to avoid NHTSA safety regulations[26]. These vehicles, unless regulated, will emit significantly higher NOx and PM emissions than from equivalent vehicles being produced with new engines. [EPA-HQ-OAR-2014-0827-1280-A1 p.29]

Recommendation: Glider Kits [EPA-HQ-OAR-2014-0827-1280-A1 p.30]

- Adopt standards for Glider vehicles in order to prevent them from using older engines with high criteria emissions. [EPA-HQ-OAR-2014-0827-1280-A1 p.30]

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26 http://www3.epa.gov/otaq/climate/documents/420f15904.pdf

Organization: American Lung Association

The American Lung Association offers the following recommendations to strengthen the stringency and timing of the proposal and address several key elements of California's commitment to protecting public health and air quality. [NHTSA-2014-0132-0087-A1 p.2]

The American Lung Association urges that the glider kit loophole be closed. Glider kits sales have grown significantly. Many of the engines have substantially greater emissions of NOx and particulate matter than current emissions standards allow. Glider kit manufacturers must no longer be able to exploit this loophole leading to more health-threatening pollution. We urge you to finalize the provisions that would close the glider kit loophole. [NHTSA-2014-0132-0087-A1 p.3]

Organization: California Air Resources Board (CARB)

Comment on Topic Where NPRM Requests Comment

Comment – Gliders: Proposed amendment to U.S. EPA and NHTSA vehicle and engine standards

CARB staff supports U.S. EPA's proposal to end Phase 1 provisions in 40 CFR part 1037 that: a) allow used, remanufactured or rebuilt engines certified to pre-Phase 1 emission standards to be installed in glider kits; and b) exempt glider kits and glider vehicles[46] produced by small businesses from the requirement to obtain a *vehicle* certificate[47] for GHG emissions compliance. Since the adoption of the federal 2007/2010 emission standards for PM and NOx, glider sales have significantly increased, and the Phase 1 provisions affecting glider kit and glider vehicle production did not inhibit the accelerated growth in the glider market. [EPA-HQ-OAR-2014-0827-1265-A1 p.133]

U.S. EPA believes, and CARB staff concurs, that the proposed changes in the Phase 2 rulemaking are necessary to curb the nearly 10-fold increase[48] in the sale of glider vehicles with older engines (used, remanufactured, or rebuilt), and the associated increase in emissions that has occurred since the implementation of the 2007/2010 NOx and PM standards. While criteria pollutant increases due to the sale of glider vehicles with older engines is somewhat constrained in California as a result of CARB's Truck and Bus Regulation, which required the installation of DPFs on heavier trucks (GVWR over 26,000 lbs) starting in 2012, and engine upgrades to at least 2010 NOx and PM emission levels starting in 2015 for lighter trucks (with GVWR under 26,000 lbs), CARB staff supports U.S. EPA 's proposal to limit the production and sale of glider vehicles with older, higher-emitting engines for the nationwide protection of human health and the environment and to close potential enforcement loopholes. [EPA-HQ-OAR-2014-0827-1265-A1 p.133-134]

Glider kits and glider vehicles are currently exempt from NHTSA's Phase 1 fuel consumption standards. Unlike U.S. EPA, NHTSA defines glider kits as motor vehicle equipment, not as motor vehicles, and therefore is only considering the inclusion of completed glider vehicles in its proposed Phase 2 requirements which will be similar in effect to U.S. EPA's proposal, including special provisions for small business manufacturers. NHTSA is seeking comments from the glider industry regarding its intent to include glider vehicles in its Phase 2 requirements. CARB staff supports NHTSA's intent to apply Phase 2 requirements to completed glider vehicles and strongly encourages it to develop provisions that align, to the extent possible, with U.S. EPA's proposed requirements. [EPA-HQ-OAR-2014-0827-1265-A1 p.134]

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[46] "Glider kit" typically refers to a chassis and cab assembly produced by a manufacturer without a new engine, transmission, or rear axle. "Glider vehicle" or "glider" typically refers to the completed assembly of the glider kit with a used, remanufactured, or rebuilt engine, a transmission, and/or rear axle. U.S. EPA considers "glider kits" to be incomplete motor vehicles, and, under the Clean Air Act, has the authority to regulate incomplete motor vehicles, including un-motorized chassis.

[47] Under Phase 1, U.S. EPA requires glider kits and gliders to obtain a *vehicle* certificate, except those produced by small businesses. The engine installed in the glider kit is not required to certify to the Phase 1 engine standards. Thus, depending on the size of the business producing the glider kit or glider vehicle, some are exempt from the requirement to obtain a Phase 1 vehicle certificate prior to introduction into commerce as a new vehicle.

[48] (U.S. EPA, 2015) "Frequently Asked Questions about Heavy-Duty Glider Vehicles and Glider Kits."

Organization: Capacity Trucks, Inc.

A terminal truck is a purpose-built truck: its only purpose is to move trailers in-yard more efficiently and effectively than can be done with a traditional heavy-duty over-the-road truck. Seventy percent of terminal trucks are built for off-road use only, operating only in yards. The terminal tractor industry is very small with only 4,000-6,000 terminal trucks built per year, and is primarily comprised of small businesses. Fifty percent of our competitors are small businesses and will be exempt from the proposed Phase 2 regulations governing glider kits and glider vehicles because of their size. This will likely cause a shift in the market and negatively impact our business.[EPA-HQ-OAR-2014-0827-1303-A1 p.1]

EPA should exempt engines that are still within their useful life—as measured by miles only, not years—from the proposed regulations governing glider kits and glider vehicles. Terminal trucks take a beating on the outside, while the powertrains remain intact. Capacity chassis are typically rebuilt or refurbished due to severe duty and use, with terminal trucks operating two and three shifts per day at an average speed of 20 mph. At the time of rebuilding/refurbishment, these trucks may be 5 years old or 25 years old, depending on the customer's use of the vehicle, but typically have limited miles on them. Terminal trucks are rebuilt and refurbished due to their operating environment: a small confined area, numerous impacts to trailers and docks or other obstructions, and corrosion from weather exposure. When a truck couples to a trailer parked against a dock door, as much as 7-8 gs of force is transmitted through the chassis. [EPA-HQ-OAR-2014-0827-1303-A1 p.1-2]

Vehicles with powertrains that are still within their mile and/or hour useful life should be exempted from the rule. EPA should not use the years component of the useful life definition because customers frequently bring in terminal trucks that are greater than ten years old but have very limited miles. Reusing these powertrains with rebuilt/refurbished or new chassis and vehicle components has no effect on overall emissions or negative environmental impacts, but results in important cost savings to our customers, many of whom are small businesses. [EPA-HQ-OAR-2014-0827-1303-A1 p.2]

Organization: Clarke Power Services

I. Amendments Affecting Gliders

A. Glider Definition Proposed Rules and Past Practices

1. *Gliders and Glider Kits*: The EPA has defined a Glider as a Motor Vehicle in the proposed rules and as a Motor Vehicle, Gliders would be subject to the Model Year (MY) Phase 2 GHG requirements. Reviewing past practices, the trucking industry over the last decade has worked under the NHTSA guidance that a glider is a repair part not dissimilar to any rebuilt part that is used in the repair and maintenance of heavy duty trucks and not a Motor Vehicle. The rebuilt engine in the Glider, as a repair part, complies to the criteria pollutant rules for the MY of the engine that is rebuilt. As a repair part, Gliders have been used by fleets to refresh or refurbish an "older" heavy duty truck that is beyond its useful life (defined as a greater than 435,000 miles). Trucks beyond useful life often have rebuilt engines, transmissions, and rear axle differentials installed to lengthen the miles and years a chassis can be utilized to haul freight. Fleets move the rebuilt engine, transmission, and/or the rear axle differentials from the "older" truck to the Glider after which the remainder of the "old" truck is salvaged removing it from service. Trucking fleets that have made this truck repair process using a Glider repair part an ongoing method for maintaining their fleet have dramatically changed the safety profile of their fleet. Glider repaired trucks now have "new" cab, electronics, controls, brakes, and air conditioning along with rebuilt engines, transmissions, and/or real axle differentials. The engine, transmission and axles are supplied from the "older" truck, often called a "donor" truck in the industry, and are usually rebuilt. For a fleet that does not have adequate capital (usually smaller fleets with less than 1000 heavy duty trucks in service) to purchase new equipment utilizing a Glider as a replacement part gives a freshly refurbished truck that has the following positive impacts: [EPA-HQ-OAR-2014-0827-1005-A1 p.1-2]

a) Improved operating costs with less down time for maintenance which improves utilization and reduces the number of trucks required to haul the same tonnage of freight.

b) Improved safety with the same braking, lane drift devices, dynamic cruise control, and blind spot detection devices found on current MY heavy duty trucks.

c) The new cab and controls improve driver skill level and safety.

d) Improved particulate, NOx, and GHG emissions of a newly rebuilt engine compared to worn oil burning engine which is beyond its useful life. The engine is returned to the MY standard of the "donor" truck.

e) New air-conditioning components reducing GHG emission compared to hydrofluorocarbon leakage from the old components. Also the latest standard for refrigerant can be used on Glider equipment with new air-conditioning components part of the kit.

This commenter recommends that used engines be eliminated as an option when assembling gliders. A rebuilt engine that has been brought back to the original MY EPA emission standard is always a cleaner option than a used engine installed in a Glider chassis. [EPA-HQ-OAR-2014-0827-1005-A1 p.2]

2. *Phase-out and Exemptions for Small Trucking Fleets:* It is the opinion of this commenter that the intentions of trucking fleets using gliders as described in this paragraph are not motivated by circumventing the EPA policies, but are most interested in being more efficient by removing old equipment from service and introducing a significantly improved heavy duty truck in its place. This being said, the agencies proposing the rule change should carefully access the impact on small trucking companies. A delay of the rules with an "appropriate" phase-out of the oldest engines to ease the burden on the small trucking fleets is needed. Also as part of the phase-out and to encourage the oldest engines to continue to be retired, a hard look at and consideration of the 2010 engine specification for the small fleet use in Glider equipment is also merited. A recommended schedule for Phase-out of older engines in Gliders follows: [EPA-HQ-OAR-2014-0827-1005-A1 p.2]

MY EPA Standard	Phase out in Gliders by
1998 – 2003	2021
2004 – 2007	2023
2008 – 2009	2025
2010	2027

Further, with the potential impact being severe on small trucking companies that have adopted the Glider repair part business model, exempting small trucking companies that have a history of assembling gliders for their own use should be considered. The agencies should use similar logic on exempting small fleets as other users of Gliders (Vocational Fleets) to limit the total number of Gliders. For example each small trucking company's exemption could be the lesser of the average number of Gliders built annually over the past 3 years or 150 units/year. This would limit the impact on GHG emissions because of small numbers of Gliders and aid small fleets in remaining competitive providing trucking capacity and driver jobs as transition is made. [EPA-HQ-OAR-2014-0827-1005-A1 p.3]

3. *Assemblers/Manufacturers of Gliders*: There are two type of Glider Assemblers that have been defined as Manufacturers by the agency's proposed new rules:[EPA-HQ-OAR-2014-0827-1005-A1 p.3]

a) Type 1 is an assembler/manufacturer that builds Gliders to sell directly to the industry either as a retail or wholesale completed truck [EPA-HQ-OAR-2014-0827-1005-A1 p.3]

b) Type 2 is an assembler/manufacturer that is contracted as a third party to assemble a complete truck. This type of assembler never owns the glider and is not building to resell the final product to an end user. [EPA-HQ-OAR-2014-0827-1005-A1 p.3]

As defined above, Type 2 assemblers/manufacturers are often hired by small trucking company customers to assemble the parts, components, and glider repair part into a completed truck. This type of assembler also has several small businesses that are dependent upon it for a small quantity of Glider assemblies each year. Further exemption should be evaluated for manufacturers dedicated to assembly only with no intent or history of retail or wholesale selling of the completed truck. The logic is that exempt Gliders for small businesses, vocational truck fleets, and off-highway and oil field operators can all benefit from the synergies of a quality manufacturer that is hired to complete the exempt Glider. The main qualification for this exemption would be that the Glider is never owned by the assembler/manufacturer and is not intended for retail sale or wholesale to the end user of the truck. The end user in this case owns the Glider and donor components throughout the assembly process. [EPA-HQ-OAR-2014-0827-1005-A1 p.3]

4. *Impact of Section XIV.B:* The proposing agencies need to assess carefully the impact of the proposed rules in light of past practice and the impact on small trucking companies and the assemblers that support them. There were four impacted groups identified by the agencies; Trailer Manufacturers, Alternative Fuel Converter, Vocational Chassis Manufacturer, and Glider Vehicle Assemblers. However, one of the most impacted groups was not identified by the agencies, small trucking companies. This commenter strongly recommends more diligent review of the impact on small trucking companies as part of the small business initial impact study as required by the SBREFA. [EPA-HQ-OAR-2014-0827-1005-A1 p.3]

5. *Cap of Glider Assemblies:* This commenter believes that the trucking company's decision to utilize Gliders will rationalize itself based on economic factors. As newer MY engines have become more fuel efficient, the demand for Gliders with cleaner engines will become the choice. Additionally, there is growing shortages of older engines, since diesel engine blocks have limited life and can only be rebuilt 3 times. This industry is currently considering MY 2010 engines as the choice for Gliders moving forward. So as the trucking industry transitions, this commenter recommends caps on non-exempt Gliders based on three years of production as recommended by the Panel Report, c, subsection xi, page 40545; however, instead of using production years 2010-2012 to establish peak levels use production years 2015-2016. [EPA-HQ-OAR-2014-0827-1005-A1 p.4]

B. Gliders for Special Purpose Vocational Trucks Proposed Rules

1. *Vocational Trucks related to Gliders*: Throughout the proposed rules beginning with the Executive Summary at Section D.(2) page 40142, the agencies discuss vocational trucks and define them as "a wide variety of truck and bus types (e.g. delivery, refuse, utility, dump, cement, transit bus, shuttle bus, school bus, emergency vehicles, and recreational vehicles." Clarity from the agencies in relating vocational trucks to Gliders would be helpful. [EPA-HQ-OAR-2014-0827-1005-A1 p.4]

a) 1037.630 Special Purpose Tractors states: "Vocational tractors are treated as vocational vehicles and are exempt from the standards of § 1037.106....This allowance is intended only for vehicles that do not typically operate at highway speeds, or would otherwise not benefit from efficiency improvements designed for line-haul tractors. This allowance is limited to the following vehicle and application types: [EPA-HQ-OAR-2014-0827-1005-A1 p.4]

1. Low-roof tractors intended for intra-city pickup and delivery, such as those that deliver bottled beverages to retail stores.
2. Tractors intended for off-road operation (including mixed service operation), such as those with reinforced frames and increased ground clearance.
3. Model year 2020 and earlier tractors with a gross combination weight rating (GCWR) over 120,000 pounds...."

b) This commenter recommends the agencies provide clarity which is specificity related to Gliders in the case of Special Purpose Tractors or Vocational Trucks. While exemptions from Phase 2 have been suggested in the proposed rules the definition of Vocational Trucks should clearly include trucks that are heavily modified for a vocational application. While heavy duty chassis, limited speeds when on-highway, and predominately off-highway application were called out by the agencies there are several vocational applications that the agencies intend to include in the proposed exclusions that are not clear. For example many utility, dump, and concrete applications are supported by Vocational Gliders that have mixed pattern of use i.e. stop and go city driving, urban highway driving, and/or rural highway driving where speed may be in excess of 55 MPH but the truck is clearly a special use vocational truck. The speed only test and/or the predominately off road test do not always apply to these types of vocational trucks or the Gliders that support their industries. [EPA-HQ-OAR-2014-0827-1005-A1 p.4-5]

2. *Special Use Trucks*: Other special use trucks for which Gliders are used and that need to brought to the attention of the agencies are: [EPA-HQ-OAR-2014-0827-1005-A1 p.5]

a) Auto Hauling Tractors: This is a special use tractor that is heavily modified with a substantially lower roof than even a day cab. This low roof requires a modification that is not performed by a major OEM but is contracted to a fabrication/modification "shop" The resulting vehicle is low in height and also to the ground with low ground clearances. This low configuration is necessary to haul the number of automobiles on a single load required to be cost, fuel consumption and therefore emissions per delivered car effective. The auto hauling tractor has limited suppliers in the market place. Modified Gliders assembled for this purpose is one of only two acceptable suppliers today. This commenter recommends including auto hauling Gliders in the exemption rules being proposed for vocational equipment. [EPA-HQ-OAR-2014-0827-1005-A1 p.5]

b) Safety Issues with Auto Hauling Tractors: Trucks conforming to MY 2014 emission requirements have proven to be not-fit-for the purpose of auto hauling. There have been reported cases in the auto hauling industry of fires that result from the regeneration cycle of MY 2014 and newer equipment that have been modified to haul automobiles. Because of the low ground clearances of the auto hauler the heat that is produced during the regen cycle has caught dry combustible material (grass and leaves) that may be under the truck when it is parked. This has damaged equipment and the automobiles that were being hauled. Using a Gilder with pre MY 2014 rebuilt engine solves this problem and is further evidence that Auto hauling Gliders need be included as a vocational truck in the proposed rules. [EPA-HQ-OAR-2014-0827-1005-A1 p.5]

c) Ultra-Light Weight Gliders: This is a Special Use Glider Truck that has been heavily modified to lower the overall weight of the Truck by 1,500 lbs. These modifications allow certain products to be transported more efficiently by loading more product into the trailer while conforming to the total vehicle weight limit required by the DOT. A lighter truck means more freight per load, therefore less loads are required to haul the same tonnage of product. A Glider can be produced that is the lightest heavy duty truck on the road today and is well received by carriers hauling products like beverages;

bulk powdered or liquid starches, syrups, and other bulk food grade products; and dry bulk and liquid chemicals. [EPA-HQ-OAR-2014-0827-1005-A1 p.5]

3. *1031.631 Exemption of vocational vehicles intended for off-road use:* The chassis of vehicles in the vocational industries in general and the off-road vehicles take a tremendous amount of load and torque (twisting). This kind of use guarantees that the chassis will be worn out prior to the modifications that were used to prepare the vehicle to be a vocational truck. The work box, crane, hydraulic lifts, etc. that are required in the vocational application are expensive and are transferred to the next chassis. When the replacement chassis is a Glider, then this commenter believes that the flexibility should be granted with regard to the engine choice. This commenter recommends that one sentence should be struck from 1031.631; that sentence being "This section does not exempt engines used in vehicles from the standards of 40 CFR part 86 or part 1036" atop of page 40655 . Striking this sentence will give maximum flexibility once the agencies realize the vocational equipment being described may be older than MY 2014. [EPA-HQ-OAR-2014-0827-1005-A1 p.5-6]

C. *Exemption Caps for vocational:* [EPA-HQ-OAR-2014-0827-1005-A1 p.6]

1. *Impact Study of number of Gliders*: The agencies proposing the Phase 2 GHG gas rules have not adequately defined the impact of the current number of Gliders which are assembled each year (XIV,B,3, page 40528), since no production numbers are reported to the EPA. Since the total is unknown, the impact on pollutants is also unknown; therefore additional studies need to be made to adequately define the "right" number of Gliders allowed. [EPA-HQ-OAR-2014-0827-1005-A1 p.6]
2. *Vocational Caps*: It is clear that the agencies propose to exempt vocational gliders, however, a cap is also being considered in the rules; proposed as not more than 21,000 in any three year period. This 7,000 average per year can be limiting to certain major U.S. industries and does not allow for growth and replacement for all transportation segments. This commenter recommends with regard to vocational trucks that no cap be mandated: [EPA-HQ-OAR-2014-0827-1005-A1 p.6]

a) The in-service life of a vocational truck exceeds 10 years and the equipment on the truck can be moved from one chassis to the next. So capping the number of gliders will adversely impact the moving of the very equipment needed to make the replacement Glider able to do the vocational work. The investment to modify a Glider chassis for vocational applications is large and every time vocational equipment can be moved to a new chassis it will be done. Caps become overly complicated when replacement and growth Gliders are considered. [EPA-HQ-OAR-2014-0827-1005-A1 p.6]

b) As the agencies have noted in their vocational definitions several different transportation segments and major industries are using vocational equipment. Limiting or capping vocational trucks can have the unintended effect of giving one transportation segment or industry access to Glider equipment over another. This can drive cost up as availability is limited and offer a favored advantages to a selected few U.S. industries that can pay. [EPA-HQ-OAR-2014-0827-1005-A1 p.6]

c) As the agencies commented the over-all volume of vocational is relatively low so the need to cap vocational is also low. So allowing each industry to rationalize the number of vocational vehicles necessary each year is more prudent that trying to regulate an artificial cap. [EPA-HQ-OAR-2014-0827-1005-A1 p.6]

II. Small Business Proposed Rules related to Gliders [EPA-HQ-OAR-2014-0827-1005-A1 p.6]

A. EPA Status Que and Proposed Cap of Glider Builds [EPA-HQ-OAR-2014-0827-1005-A1 p.6]

1. *EPA Regulatory Status Quo Proposed Rules*: Section XIV.B.(3) page 40529 This commenter is also concerned about the economic impacts on small businesses that assemble gliders and build glider kits. The agencies are correct in assuming that the activities of these small manufacturers are for non-circumvention purposes. The proposed rules that maintains the regulatory status quo for existing small businesses is supported. The additional point this commenter would make is to expand the small businesses impacted to include small trucking companies that have a history of assembling gliders in lieu of operating used equipment. Regulatory relief for this group would also be appropriate with reasonable caps. [EPA-HQ-OAR-2014-0827-1005-A1 p.7]
2. *Cap of Gliders Allowed*: The agencies ask for comment with regard to the methodology and total number of Gliders allowed to be assembled by small businesses. It is the opinion of this commenter that the number of small businesses engaged in Glider assembly is likely to decrease with the rule changes being proposed. If this is accurate then using the history of total production as the basis for establishing the limit on total production may disallow an otherwise efficient small business from acquiring additional customers as other assemblers cease business. A more equitable method would be to allow any small business assembler that has built a minimum of 100 gliders within the last three years be granted an exemption for gliders being built in any given year up to a cap of 300 gliders/year. This allows for competition and for high quality small business assemblers to secure business from lesser assemblers. Additionally, the vocational exemptions the agencies are proposing should also be made available to small business assemblers and it is recommended that this cap would also be 300 vocational units based on the definition of the final rules. The maximum cap with Gliders and Vocational Gliders would be 600/year. [EPA-HQ-OAR-2014-0827-1005-A1 p.7]
3. *Timing*: The EPA has solicited comment with regard to the timing of implementation of the proposed rules. The proposed date of January 1, 2018 is tight to transition all of the stake holders in the Glider industry. It is the opinion of this commenter that Phase 2 should be postponed until January 1, 2020 assuming there has been adequate assessment of the impact on the impacted groups including small trucking companies. [EPA-HQ-OAR-2014-0827-1005-A1 p.7]

Organization: Cummins, Inc.

Cummins supports limitations on the use of glider kits [EPA-HQ-OAR-2014-0827-1298-A1 p.41]

Glider kits are a necessary option for replacing damaged vehicles that still have usable powertrain components. However, glider kits should not be used to circumvent the purchase of a currently certified engine and aftertreatment system. Cummins urges the agencies to work with the industry to develop a workable solution for glider kits. [EPA-HQ-OAR-2014-0827-1298-A1 p.41]

Organization: Daimler Trucks North America and Detroit Diesel Company

• Memorandum discussing legal issues related to glider vehicles and glider kits (EPA–HQ–OAR–2014–0827–1627, NHTSA–2014–0132–0189):

We submitted separately to the docket a letter going into detail on the EPA’s memorandum. [This letter can be found in docket number EPA-HQ-OAR-2014-0827-1926-A1][EPA-HQ-OAR-2014-0827-1918-A2 p.9]

Organization: Daimler Trucks North America LLC

I. Legal Issues with Glider Provisions

As DTNA expressed in its comments to the Phase 2 Proposed Rule, DTNA has concerns with EPA's proposed regulation of 'glider kits' and 'glider vehicles,' including EPA's legal authority for regulating them. EPA's Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act ('CAA'), which does not provide EPA authority to regulate the sale of motor vehicle components. The CAA only provides EPA with authority to regulate 'new motor vehicles' and their engines, defined as 'self-propelled' vehicles 'the equitable or legal title to which has never been transferred to the ultimate purchaser'—not non-motorized frames, cabs, and axles. 42 U.S.C. §§ 7522(a), 7550(3). In turn, any regulation of glider kits is beyond the agency's authority. Further, glider vehicles when constructed retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not 'new' under the CAA. Thus, EPA lacks authority to regulate glider vehicles. And even if the EPA had authority to regulate, the CAA requires 4-years' lead-time for new or revised NOx and PM requirements and for regulations governing engine rebuilding practices, which has not been met under the proposed regulations. [EPA-HQ-OAR-2014-0827-1926-A1 p.2] [[This comment can also be found in section 1.3.1 of the Comment Summary.]]

A. Distinction Between 'Glider Kit' and 'Glider Vehicle'

As DTNA explained in its comments to the Phase 2 Proposed Rule, EPA has proposed two overlapping and potentially confusing definitions: 'Glider kit means any of the following: (1) A new vehicle that is incomplete because it lacks an engine, transmission, or axle; (2) A new vehicle produced with a used engine (including a rebuilt or remanufactured engine); (3) Any other new equipment that is intended to become a motor vehicle with a previously used engine (including a rebuilt or remanufactured engine)'; and 'Glider vehicle means a new vehicle produced with a used engine.' As EPA has proposed these definitions, 'glider vehicle' is a subset of 'glider kit,' whereas under industry usage and understanding, the two are separate, and should remain so under the regulations. A 'glider kit' should instead be defined as 'an assemblage of new vehicle components, including at a minimum the chassis, cab and front axle, but lacking a new engine, transmission, and rear axle.' Once the glider kit is used to rebuild a truck, EPA would consider it a 'glider vehicle.' [EPA-HQ-OAR-2014-0827-1926-A1 p.2]

EPA should clarify when a glider vehicle becomes a 'new motor vehicle' subject to regulation, as NHTSA has done, by adopting a provision similar to 49 C.F.R. § 571.7(e). Under its regulations, NHTSA considers a truck to be 'newly manufactured' and subject to Federal Motor Vehicle Safety Standards when a new cab is used in its assembly, 'unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle.' 49 C.F.R. § 571.7(e) (emphasis added). In other words, as long as the engine, transmission, and drive axle(s) are remanufactured and not new, and at least two of these components were taken from the same vehicle, the resulting glider vehicle would not be a new motor vehicle subject to regulation, and the glider kit used to build the glider vehicle could contain the third component (remanufactured engine, remanufactured transmission, or remanufactured drive axle(s)). This harmonization would be consistent with the agencies' commitment to establish a national GHG program. [EPA-HQ-OAR-2014-0827-1926-A1 p.2]

B. EPA Lacks Authority to Regulate 'Glider Kits' and 'Glider Vehicles'

The distinction between 'glider kits' and 'glider vehicles' is important because EPA lacks authority to regulate vehicle parts, including assemblages of parts (without an engine) such as glider kits. EPA's Phase 2 Proposed Rule is being carried out under the authority of the CAA, and the CAA does not provide EPA authority to regulate the sale of motor vehicle components, which is all that glider kits are.

The CAA only authorizes EPA to set emission standards for 'new motor vehicles' and 'new motor vehicle engines,' 42 U.S.C. § 7521(a)(1), and to prohibit the sale of uncertified 'new motor vehicles' and 'new motor vehicle engines,' see 42 U.S.C. § 7522(a)(1). 'New motor vehicles' are defined under the CAA as 'self-propelled' vehicles 'the equitable or legal title to which has never been transferred to an ultimate purchaser'—not non-motorized frames, cabs, and axles. 42 U.S.C. § 7550(2), (3). Because glider kits do not contain engines, transmissions, and drive axles, and have no motive power, the CAA does not authorize EPA to regulate the sale of glider kits. [EPA-HQ-OAR-2014-0827-1926-A1 p.2-3] [[This comment can also be found in section 1.3.1 of the Comment Summary.]]

EPA's examples of CAA provisions that address certain vehicle components are inapplicable. EPA cites to three CAA provisions granting it authority to regulate evaporative emissions, including from certain components, and concludes from those specific provisions that it has authority to regulate all vehicle components, whether or not they produce emissions in any form. Specifically, EPA cites to 'CAA section 202(a)(6) (standards for onboard vapor recovery systems on 'new light-duty vehicles,' and requiring installation of such systems); section 202(a)(5)(A) (standards to control emissions from refueling motor vehicles, and requiring consideration of, and possible design standards for, fueling system components), 202(k) (standards to control evaporative emissions from gasoline-fueled motor vehicles).' EPA Legal Memo, at 3. From these examples, EPA concludes that it has authority to regulate all vehicle components, a conclusion that is not justified under the language, of the Act. First, the fact that the CAA lists specific components that EPA may regulate suggests that EPA lacks authority to regulate other components that are not specifically listed, particularly given the broader dictate that EPA may set emission standards only for 'new motor vehicles' and 'new motor vehicle engines,' 42 U.S.C. § 7521(a)(1), and may prohibit only the sale of uncertified 'new motor vehicles' and 'new motor vehicle engines,' 42 U.S.C. § 7522(a)(1). Second, all of the examples cited by EPA relate to evaporative emissions. Although EPA might be able to argue that it has authority to regulate evaporative emissions from those specific components, and exhaust emissions from 'new motor vehicles' and 'new motor vehicle engines,' it is a stretch to say that EPA has authority to regulate all motor vehicle components. This is particularly true where, as with glider kits, the components do not produce emissions on their own. EPA itself recognizes that it cannot extend its argument to the smallest vehicle component—'This is not to say that the Act authorizes emission standards for any part of a motor vehicle, however small,' EPA Legal Memo, at 3—but nonetheless believes it has the authority to draw the line to include glider kits and trailers. In fact, Congress drew the line in the CAA at 'new motor vehicles' and 'new motor vehicle engines,' and EPA may not extend its authority further than Congress allowed. [EPA-HQ-OAR-2014-0827-1926-A1 p.3] [[This comment can also be found in section 1.3.1 of the Comment Summary.]]

EPA also lacks authority to regulate glider vehicles. When constructed, glider vehicles retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not 'new' under the CAA and not subject to EPA's regulatory authority. EPA's argument that glider assemblers market their finished products as 'new trucks' is unavailing. A company's marketing materials have no bearing on the statutory definition that governs EPA's authority. Although the CAA may not reference Vehicle Identification Numbers as determinative of new motor vehicle status, the Act does contain an express definition of 'new motor vehicles'—'self-propelled' vehicles 'the equitable or legal title to which has never been transferred to an ultimate purchaser,' 42 U.S.C. § 7550(2), (3)—which EPA is not free to disregard. Glider vehicles incorporate not just a used engine, as EPA suggests, but the engine, transmission, and rear axle—the entire powertrain that comprises a significant portion of a vehicle's cost and identity—from a previously owned vehicle. The glider kit, which may be considered to be 'new' vehicle parts, is not self-propelled. The glider becomes self-propelled only when the powertrain components are added, but cannot be a 'new motor vehicle' because the equitable or legal title of those powertrain components has previously been transferred to an ultimate purchaser. [EPA-

HQ-OAR-2014-0827-1926-A1 p.3-4] [[This comment can also be found in section 1.3.1 of the Comment Summary.]]

C. Regulation of 'Glider Vehicles' Targets NOx/PM Emissions and Must Meet Statutory Lead-Time Requirement

In addition, the proposed regulation of 'glider vehicles' actually targets NOx/PM emissions rather than GHG emissions, as EPA concedes, and is therefore inappropriate for inclusion in a GHG rule. Glider sales actually create the potential to reduce GHG emissions by incorporating used and rebuilt engines in newer, more aerodynamic vehicles. Rebuilt engines used in glider vehicles emit fewer GHGs, and new cabs and low rolling resistance tires are more efficient than what they replace. Because regulation of glider vehicles targets NOx/PM emissions, it should be done only in a separate rulemaking, if at all. [EPA-HQ-OAR-2014-0827-1926-A1 p.4]

In addition, this separate rulemaking should be carefully drafted to meet statutory lead-time requirements for NO and PM regulations as required by statute. NO and PM emissions standards are subject to an express CAA lead-time requirement under which new or revised NOx and PM requirements cannot take effect sooner than the model year commencing 4 years after a new or revised standard is promulgated. 42 U.S.C. § 7521(a)(3)(C). As currently proposed, with an effective date of January 1, 2018, the proposed glider regulations violate the 4-year lead-time requirement under the CAA. Assuming the Phase 2 rule is finalized in early 2016, the earliest that the regulations governing glider vehicles could take effect would be 2020, in compliance with the CAA lead-time requirement. [EPA-HQ-OAR-2014-0827-1926-A1 p.4]

For its proposed glider provisions, EPA purports to rely on its authority to regulate the 'practice of rebuilding heavy-duty engines.' 42 U.S.C. § 7521(a)(3)(D). However, EPA is not regulating engine rebuilding practices, as evidenced by the lack of relevant proposed amendments to its engine rebuilding regulations (40 C.F.R. §§ 86.004-40, 1068.120). Instead, EPA is attempting to regulate vehicle rebuilding, which it clearly does not have the authority to do under the CAA. Congress granted EPA authority to regulate 'new motor vehicles' and 'new motor vehicle engines' only, and while Congress granted EPA authority to regulate engine rebuilding, it did not grant EPA similar authority to regulate vehicle rebuilding. EPA's reliance on (3)(D) is misplaced with respect to its proposed regulation of glider vehicles. Even if EPA were properly regulating heavy-duty engine rebuilding practices with its proposed glider provisions, it would be subject to the same four-year statutory lead-time requirement. [EPA-HQ-OAR-2014-0827-1926-A1 p.4]

As currently proposed, EPA is attempting to regulate NO and PM in the GHG rule in a way it could not undertake in a proper NOx and PM rulemaking. Under the CAA, EPA must allow four years of lead time, at a minimum, before its proposed glider provisions would take effect. [EPA-HQ-OAR-2014-0827-1926-A1 p.4]

II. Alternative Provisions Proposed by EPA

In its draft legal memorandum, EPA proposes several alternative provisions for comment. These include alternative provisions governing glider kit manufacturers, engine remanufacturers, and glider vehicles using newer engines. [EPA-HQ-OAR-2014-0827-1926-A1 p.5]

A. Alternative Provisions for Glider Kit Manufacturers as Manufacturers of Motor Vehicle Parts

EPA proposes alternative provisions governing glider kit manufacturers that would apply in the event that its primary implementation provisions are held inapplicable. EPA asserts that a glider kit sold in a configuration that would not meet the tractor emission standard when the specified engine, transmission, and axle are installed would 'cause' a violation of that standard in violation of 42 U.S.C. § 7522(a)(1), or could be considered a prohibited defeat device under 42 U.S.C. § 7522(a)(3)(B). Under 42 U.S.C. § 7522(a)(1), a manufacturer is prohibited from distributing in commerce, selling or offering for sale, or introducing or delivering for introduction into commerce, a 'new motor vehicle' or 'new motor vehicle engine' that is not covered by a certificate of conformity. As explained above, neither a glider kit nor a glider vehicle meet the definition of 'new motor vehicle.' As a result, EPA's assertion that the sale of a glider kit could 'cause' a violation of an emission standard applicable to a new motor vehicle fails for the same reason that EPA does not have authority to regulate glider kits and glider vehicles—they are not 'new motor vehicles.' [EPA-HQ-OAR-2014-0827-1926-A1 p.5]

With respect to 'defeat devices,' the CAA prohibits 'any person' from manufacturing or selling or offering to sell or installing 'any part or component intended for use with, or as part of, any motor vehicle or motor vehicle engine, where a principal effect of the part or component is to bypass, defeat, or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this subchapter, and where the person knows or should know that such part or component is being offered for sale or installed for such use or put to such use.' 42 U.S.C. § 7522(a)(3)(B). It is difficult to see how a 'principal effect' of a glider kit is to 'bypass, defeat, or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine.' Because the engines installed in glider vehicles are typically older model year engines subject to less stringent emission standards, a glider kit generally improves the GHG emissions performance of the engine/vehicle. It is unclear how a glider kit could be said to 'bypass, defeat, or render inoperative any device or element of design installed on or in' these older model year engines, let alone for that to be the glider kit's 'principal effect.' [EPA-HQ-OAR-2014-0827-1926-A1 p.5]

EPA proposes an alternative rule which would require glider kit manufacturers to do one of two things: either a) affix a label on the glider kit stating that the 'glider kit is not to be used in combination with tractors certified to the applicable phase 2 GHG standard,' or b) 'conduct testing (including aerodynamic and tire testing) to show that the glider kit is consistent with the glider vehicle's final certified condition.' EPA Legal Memo, at 8. Both of these alternatives still assume that EPA has authority under the CAA to regulate glider kits as 'new motor vehicles' or as motor vehicle components and to regulate glider vehicles as 'new motor vehicles,' which as explained above, EPA does not. [EPA-HQ-OAR-2014-0827-1926-A1 p.5]

If EPA moves forward with regulating gliders, it should pursue a variation on the proposed cap rather than these alternative rules. As DTNA explained in its comments to the Phase 2 Proposed Rule, a cap of 300 vehicles is too low given the abrupt change this regulation brings to the 50-year-old glider industry and the disproportionate impact it will have on small businesses. A more reasonable approach would be to begin with a higher initial cap and gradually reduce it over time to allow large and small businesses in the glider industry to adapt to EPA's new requirements. Specifically, if EPA decides to implement a certification requirement for glider vehicles, the small business exemption should start with a cap of 1,500 vehicles in 2020 (complying with the statutory lead-time requirement) and then reduce the cap by 250 each year for the next 3 years to 1,250 in 2021, to 1,000 in 2022, and finally to 750 vehicles in 2023. Such a phase-down would allow these small manufacturers to transition to other lines of business and to move their employees to other types of work without extensive layoffs. Many small manufacturers will already be limited by their highest annual sales volume and will not be affected by the cap, while for those that are, the initial 1,500 vehicle cap and subsequent phase-down represents a substantial reduction. [EPA-HQ-OAR-2014-0827-1926-A1 p.5-6]

Further, EPA should clarify that the proposed glider provisions apply only to the final assembler of the glider vehicle, as that is the only entity that knows what the final vehicle configuration will be. There is no need for a glider kit manufacturer to label the assemblage of parts that it sells in accordance with the delegated assembly provisions. It is obvious that the glider kit requires further assembly as it lacks an engine, transmission, and/or rear axle. The regulations should require that only the glider vehicle, once assembled and ready to drive, be labeled by the assembler. [EPA-HQ-OAR-2014-0827-1926-A1 p.6]

B. Alternative Provisions for Engine Remanufacturers

EPA is also considering alternative provisions for engine remanufacturers if the primary implementing provisions are held to apply only to the glider vehicle assembler. Relying on its section 202(a)(3)(D) authority, EPA would require any rebuilt/remanufactured motor vehicle engines to meet current model year engine standards if they are intended to be installed in new motor vehicle chassis. [EPA-HQ-OAR-2014-0827-1926-A1 p.6]

If EPA proposes to amend its heavy-duty engine rebuilding provisions (40 C.F.R. §§ 86.004-40, 1068.120), it must do so in a separate rulemaking subject to public notice and comment, rather than making such a proposal in a draft legal memorandum entered into the Phase 2 Proposed Rule docket and not proposed or explained in the Federal Register. Further, if EPA intends to rely on its authority to regulate the 'practice of rebuilding heavy-duty engines' under 42 U.S.C. § 7521(a)(3)(D) to amend the heavy-duty engine rebuilding regulations, such amendment would be subject to the four-year statutory lead-time requirement. The four-year lead-time and three-year stability requirements of 42 U.S.C. § 7521(a)(3)(C) are applicable to all of paragraph 3, which includes the engine rebuilding provision contained in (3)(D). It is not enough for EPA to opine that the January 1, 2018 implementation date for the glider provisions allows 'sufficient time to 'permit the development and application of the requisite control measures' under 42 U.S.C. § 7521(a)(3)(D). The four-year lead-time and three-year stability requirements of (3)(C) provide an absolute minimum, even for engine rebuilding regulations, and then EPA must determine whether additional time is required above and beyond that based on its determination under the standard contained in (3)(D). [EPA-HQ-OAR-2014-0827-1926-A1 p.6]

C. Glider Vehicles Using Newer Engines

Assuming EPA moves forward with its proposal to regulate glider kits and glider vehicles, EPA solicits comment on certain potential flexibilities for glider vehicles using newer engines: (1) raising or eliminating the cap on sales for engines that were certified to meet the 2010 NOx and PM standards, as opposed to pre-2010 engines; (2) for vehicles using engines meeting the 2010 NOx and PM standards, raising or eliminating the cap on sales for glider vehicles using engines still within their regulatory useful life; and (3) for Class 8 vehicles, treating engines with high years/low mileage or low years/high mileage (e.g., engines that are more than 10 years old but have fewer than 100,000 miles or that are less than 3 years old regardless of mileage) as still within their useful life. EPA Legal Memo, at 9-10. DTNA would support all of these potential flexibilities. [EPA-HQ-OAR-2014-0827-1926-A1 p.6-7]

EPA should eliminate the cap on sales for engines that were certified to meet the 2010 NOx and PM standards. As EPA recognizes, the potential for adverse environmental effects from these engines is significantly reduced when compared to pre-2010 engines that have higher criteria pollutant emissions. This alternative would cover all 2010 and later engines without regard to their useful life and would provide manufacturers with necessary flexibility going forward. [EPA-HQ-OAR-2014-0827-1926-A1 p.7]

EPA should also eliminate the cap on sales for glider vehicles using engines that are still within their regulatory useful life, including treating Class 8 engines with high years/low mileage or low years/high mileage as being within their useful life. For Class 8 engines to be within their useful life under current regulations, they must be both less than 10 years old and have fewer than 435,000 miles of use. As EPA recognizes, some vehicles in very low use applications may have less than 100,000 miles after 10 years, while other vehicles may reach 435,000 miles within a few years. EPA should treat these engines as being within their useful life and eliminate the cap on sales for glider vehicles using these engines. [EPA-HQ-OAR-2014-0827-1926-A1 p.7]

III. NHTSA Exemption

As DTNA expressed in its comments to the Phase 2 Proposed Rule, DTNA supports NHTSA's current proposal to maintain its existing regulations with respect to glider kits and glider vehicles, under which NHTSA does not consider glider kits to be motor vehicles, and not to include gliders under its Phase 2 program. Since at least 1975, NHTSA has recognized that 'use of a new 'glider kit' ['typically a cab, frame rails, and front suspension'] in combination with the valuable components from an existing vehicle' is 'common practice' in the industry. 40 Fed. Reg. 19,485 (proposed May 5, 1975). In response to this common industry practice, NHTSA finalized a regulatory provision clarifying what it does and does not consider to be a 'new vehicle,' striking an appropriate balance between common-sense, cost-effective reuse of vehicle components and the need for adequate safety regulation of new vehicles. 40 Fed. Reg. 49,340 (Oct. 22, 1975). Under its regulations, NHTSA considers a truck to be 'newly manufactured' and subject to Federal Motor Vehicle Safety Standards when a new cab is used in its assembly, 'unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle.' 49 C.F.R. § 571.7(e) (emphasis added). DTNA supports the continuation of this long-standing regulatory provision. To the extent that NHTSA has concerns about compliance, it should issue guidance and engage in outreach to glider assemblers rather than revising its regulations. Further, NHTSA should not pursue inclusion of gliders under its Phase 2 program. [EPA-HQ-OAR-2014-0827-1926-A1 p.7]

8. Gliders

· **Legal Issues with Glider Provisions -** DTNA has concerns with EPA's proposed regulation of "glider kits" and "glider vehicles," including EPA's legal authority for regulating them. EPA's Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act ("CAA"), which does not provide EPA authority to regulate the sale of motor vehicle components. Moreover, the CAA only provides authority to regulate "new motor vehicles" and their engines,[2] defined as "self-propelled" vehicles "the equitable or legal title to which has never been transferred to the ultimate purchaser"—not non-motorized frames, cabs, and axles. CAA §§ 203(a), 216(3). In turn, any regulation of glider kits is beyond the agency's authority. Further, glider vehicles, when constructed retain the identity of the donor vehicle, such that the title has already been exchanged, making the vehicles not "new" under the CAA. So the EPA may not regulate them either. And even if the EPA had authority to regulate, the CAA requires 4-years' lead-time for new or revised NOx and PM requirements and for regulations governing engine rebuilding practices, which has not been met under the proposed regulations. [EPA-HQ-OAR-2014-0827-1164-A1 p.121-122]

· **Proposed Definitions of 'Glider Kit' and 'Glider Vehicle' -** EPA has proposed two overlapping and potentially confusing definitions: "Glider kit means any of the following: (1) A new vehicle that is incomplete because it lacks an engine, transmission, or axle; (2) A new vehicle produced with a used engine (including a rebuilt or remanufactured engine); (3) Any other new equipment that is intended to become a motor vehicle with a previously used engine (including a rebuilt or remanufactured engine)";

and “Glider vehicle means a new vehicle produced with a used engine.” As EPA has proposed these definitions, “glider vehicle” is a subset of “glider kit,” whereas under industry usage and understanding, the two are separate, and should remain so under the regulations. A “glider kit” should instead be defined as “an assemblage of new vehicle components, including at a minimum the chassis, cab and front axle, but lacking an engine, transmission, and rear axle.” Once the glider kit is used to rebuild a truck, EPA would consider it a “glider vehicle.” The EPA-proposed definitions are confusing because they conflate the two, which are typically sold by separate businesses. DTNA manufactures and sells glider kits, while most glider assemblers sell glider vehicles but do not manufacture glider kits. The third part of the proposed “glider kit” definition is simply too broad and vague to be workable: “Any other new equipment that is intended to become a motor vehicle with a previously used engine (including a rebuilt or remanufactured engine)” could potentially encompass any number of vehicle parts. Any other assemblages of parts that EPA considers to be “new equipment that is intended to become a motor vehicle “ could potentially be regulated as a glider kit, down to the wiring that constitutes a single headlight, or the glass and metal parts that together comprise a side mirror. This part of the proposed definition should be deleted. [EPA-HQ-OAR-2014-0827-1164-A1 p.122]

· **EPA Lacks Authority to Regulate 'Glider Kits' -** The distinction between “glider kits” and “glider vehicles” is important because EPA lacks authority to regulate vehicle parts, including assemblages of parts (without an engine) such as glider kits. EPA’s Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act (“CAA”), and the CAA does not provide EPA authority to regulate the sale of motor vehicle components, which is all that glider kits are. The CAA only authorizes EPA to prohibit the sale of uncertified “new motor vehicles” and “new motor vehicle engines.” See 42 U.S.C. § 7522(a)(1). “New motor vehicles” are defined under the CAA as “self-propelled” vehicles “the equitable or legal title to which has never been transferred to an ultimate purchaser”—not non-motorized frames, cabs, and axles. 42 U.S.C. § 7550(2), (3). Because glider kits do not contain engines, and have no motive power, the CAA does not authorize EPA to regulate the sale of glider kits. [EPA-HQ-OAR-2014-0827-1164-A1 p.122-123] [This comment can also be found in section 1.3.1 of this comment document]

· **Regulation of 'Glider Vehicles' Targets NOx / PM Emissions and Must Meet Statutory Lead Time Requirement -** In addition, the proposed regulation of “glider vehicles” actually targets NOx/PM emissions rather than GHG emissions, as EPA concedes, and is therefore inappropriate for inclusion in a GHG rule. Glider sales actually create the potential to reduce GHG emissions by incorporating used and rebuilt engines in newer, more aerodynamic vehicles. Rebuilt engines used in glider vehicles emit fewer GHGs, and new cabs and low rolling resistance tires are more efficient than what they replace. Because regulation of glider vehicles targets NOx/PM emissions, it should be done only in a separate rulemaking, if at all. [EPA-HQ-OAR-2014-0827-1164-A1 p.123] [This comment can also be found in section 1.3.1 of this comment document]

In addition, this separate rulemaking should be carefully drafted to meet statutory lead-time requirements for NOx and PM regulations as required by statute. NOx and PM emissions standards are subject to an express CAA lead-time requirement under which new or revised NOx and PM requirements cannot take effect sooner than the model year commencing 4 years after new or revised standard is promulgated. 42 U.S.C. § 7521(a)(3)(C). As currently proposed, with an effective date of January 1, 2018, the proposed glider regulations violate the 4- year lead-time requirement under the CAA. Assuming the Phase 2 rule is finalized in early 2016, the earliest that the regulations governing glider vehicles could take effect would be 2020, in compliance with the CAA lead-time requirement. [EPA-HQ-OAR-2014-0827-1164-A1 p.123] [This comment can also be found in section 1.3.1 of this comment document]

For its proposed glider provisions, EPA purports to rely on its authority to regulate the “practice of rebuilding heavy-duty engines.” 42 U.S.C. § 7521(a)(3)(D). However, EPA is not regulating engine rebuilding practices, as evidenced by the lack of relevant proposed amendments to its engine rebuilding regulations (40 C.F.R. §§ 86.004-40, 1068.120). Instead, EPA is attempting to regulate vehicle rebuilding, which it clearly does not have the authority to do under the CAA. Congress granted EPA authority to regulate “new motor vehicles” and “new motor vehicle engines” only, and while Congress granted EPA authority to regulate engine rebuilding, it did not grant EPA similar authority to regulate vehicle rebuilding. EPA’s reliance on (3)(D) is misplaced with respect to its proposed regulation of glider vehicles.[EPA-HQ-OAR-2014-0827-1164-A1 p.123] [This comment can also be found in section 1.3.1 of this comment document]

Even if EPA were properly regulating heavy-duty engine rebuilding practices with its proposed glider provisions, it would be subject to the same four-year statutory lead-time requirement. The four-year lead-time and three-year stability requirements of 42 U.S.C. § 7521(a)(3)(C) are applicable to all of paragraph 3, which includes the engine rebuilding provision contained in (3)(D). It is not enough for EPA to opine that the January 1, 2018 implementation date for the glider provisions allows “sufficient time to ‘permit the development and application of the requisite control measures’” under 42 U.S.C. § 7521(a)(3)(D). The four-year lead-time and three-year stability requirements of (3)(C) provide an absolute minimum, even for engine rebuilding regulations, and then EPA must determine whether additional time is required above and beyond that based on its determination under the standard contained in (3)(D). [EPA- HQ-OAR-2014-0827-1164-A1 p.123] [This comment can also be found in section 1.3.1 of this comment document]

· **Additional Considerations with Glider Provisions -** Although EPA states that it considered impacts on small businesses in drafting the Phase 2 Proposed Rule, the glider provisions particularly impact small businesses and it is not clear that EPA fully considered the consequences the proposed regulations will have or how they could be minimized. As EPA notes, the Small Business Advocacy Review Panel process—which EPA undertook to meet its legal requirements under the Regulatory Flexibility Act and Small Business Regulatory Enforcement Fairness Act—included only one glider assembler. As a result of this oversight, if EPA moves forward with regulation of glider vehicles in its Phase 2 rule, which would not be appropriate under the CAA, there are a number of additional ways that the proposal should be modified to mitigate the impacts of any glider regulation on small businesses, jobs, and the economy in general. [EPA-HQ-OAR-2014-0827-1164-A1 p.124]

· **'Glider Vehicle' Exemption Cap -** EPA has proposed that small manufacturers would be eligible for an exemption from EPA’s proposed glider vehicle certification requirements under 40 C.F.R. § 1037.635 that would allow them to continue selling a limited number of glider vehicles. This cap would be based on the manufacturer’s highest annual sales volume for calendar years 2010 through 2014 up to a maximum of 300 exempt glider vehicles. A cap of 300 vehicles is too low given the abrupt change this regulation brings to the 50-year-old glider industry and the disproportionate impact it will have on small businesses. A more reasonable approach would be to begin with a higher initial cap and gradually reduce it over time to allow large and small businesses in the glider industry to adapt to EPA’s new requirements. Specifically, if EPA decides to implement a certification requirement for glider vehicles, the small business exemption should start with a cap of 1,500 vehicles in 2020 (complying with the statutory lead-time requirement) and then reduce the cap by 250 each year for the next 3 years to 1,250 in 2021, to 1,000 in 2022, and finally to 750 vehicles in 2023. Such a phase-down would allow these small manufacturers to transition to other lines of business and to move their employees to other types of work without extensive layoffs. Many small manufacturers will already be limited by their highest annual sales volume and will not be affected by the cap, while for those that are, the initial 1,500 vehicle cap and subsequent phase-down represents a substantial reduction. The adjustment of the cap applicable to glider assemblers, coupled with the additional lead-time required under the CAA, is also critical to saving as many as 1,000 jobs at Detroit Reman, where a substantial portion of the business is driven by glider kit sales. [EPA-HQ-OAR-2014-0827-1164-A1 p.124]

· **Applicability to Engine Model Years -** As EPA recognizes, "the environmental impacts of gliders using 2010 and later engines would be much smaller," and as a result, EPA's proposed regulations should govern glider vehicles using pre-2010 engines only. As stated above, EPA's glider regulation is intended to address NOx and PM emissions, which are primarily a concern with pre-2010 engines rather than 2010 and later engines. Based on engine core availability, glider vehicles using pre-2010 engines will naturally decrease over time. While 2010 and later engines are not currently being used in glider vehicles in large numbers, their future use would enable many of the benefits to the U.S. economy from glider kit usage to continue, without the potential environmental impacts associated with the use of pre-2010 engines. EPA should incentivize, rather than limit, the rebuilding and reuse of 2010 and later engines in glider vehicles because such use would generate all of the benefits of rebuilding the engines and installing them in newer, more aerodynamic vehicles detailed above, including using 85% less energy than manufacturing the engines new, without the potential drawbacks of higher NOx and PM emissions. In the Phase 2 Proposed Rule, EPA proposes a requirement that glider vehicles incorporate engines certified to meet standards applicable for the engine model year corresponding to the vehicle's date of assembly but allows that earlier model year engines may be used "if the standards were identical." 40 C.F.R. § 1037.635. EPA does not offer a definition of "identical standards," which creates uncertainty. For example, new on-board diagnostics ("OBD") requirements may be introduced in a model year where otherwise emissions standards remained the same. It is unclear whether, under EPA's proposed regulations, an earlier model year engine could be used in a glider vehicle assembled in a year when new OBD requirements are in effect. EPA should instead allow the use of any 2010 or later engine in a glider vehicle, or at a minimum, define what it means by "identical standards." Although EPA recognizes that "salvaging powertrains from vehicles otherwise destroyed in accidents" is a "legitimate" purpose for producing glider vehicles, its requirement that glider vehicles incorporate engines certified to meet standards applicable for the engine model year corresponding to the vehicle's date of assembly could prevent this "legitimate" purpose from being met. As one example, under EPA's proposal, a new truck built to meet current emission standards and purchased in December that is then wrecked in February of the next year when new engine standards took effect, would require a brand-new engine due to the new engine standards, even though the salvageable engine was only a few months old. On a larger scale, if a fleet of more than 300 vehicles becomes wrecked—for example, in a flood—but the engines are salvageable, EPA should not prevent a company, no matter its size, from restoring the vehicles to service cost-effectively with glider kits and remanufacturing processes. EPA should provide sufficient exemptions for "legitimate" rebuilds of wrecked vehicles. [EPA-HQ-OAR-2014-0827-1164-A1 p.124-125]

· **Eligibility for Small Manufacturer Exemption -** EPA has proposed that only those small businesses that sold glider vehicles in 2014 (under the provisions of 40 C.F.R. § 1037.150(j)) are eligible for the exemption under 40 C.F.R. § 1037.635 that would allow them to continue selling a limited number of glider vehicles. This is too narrow a window for sales and associated exemption eligibility, and ignores business practices common to the industry. While some glider assemblers sell glider vehicles each year, others may not, depending on the extent of their glider assembly operations and their customers' demands. Some fleets order a few glider vehicles every year while others order every other year or every few years. In addition, due to delays associated with manufacturing and assembly, a customer might order a glider kit and not receive it for 12 months or more, with vehicle assembly taking additional time. As a result, EPA's current proposal unfairly penalizes those small businesses that did not sell gliders in 2014, but might have sold them in 2013 or 2015. Instead, EPA should allow small businesses that sold any glider vehicles in the calendar year 2010-2014 time period to be eligible for the exemption up to the highest annual sales volume from those years. This modification would still have the effect of preventing new market entrants (in 2015 and later), thereby limiting future glider vehicle production as EPA intends with its proposal, but not unfairly put a company out of business in year one simply because it did not sell a glider vehicle in 2014. [EPA-HQ-OAR-2014-0827-1164-A1 p.125-126]

· **NHTSA Exemption -** DTNA supports NHTSA's current proposal to maintain its existing regulations with respect to glider kits and glider vehicles, under which NHTSA does not consider glider kits to be motor vehicles, and not to include gliders under its Phase 2 program. Since at least 1975, NHTSA has recognized that "use of a new 'glider kit' ["typically a cab, frame rails, and front suspension"] in combination with the valuable components from an existing vehicle" is "common practice" in the industry. 40 Fed. Reg. 19,485 (proposed May 5, 1975). In response to this common industry practice, NHTSA finalized a regulatory provision clarifying what it does and does not consider to be a "new vehicle," striking an appropriate balance between common-sense, cost-effective reuse of vehicle components and the need for adequate safety regulation of new vehicles. 40 Fed. Reg. 49,340 (Oct. 22, 1975). Under its regulations, NHTSA considers a truck to be "newly manufactured" and subject to Federal Motor Vehicle Safety Standards when a new cab is used in its assembly, "unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle." 49 C.F.R. § 571.7(e) (emphasis added). DTNA supports the continuation of this long-standing regulatory provision. To the extent that NHTSA has concerns about compliance, it should issue guidance and engage in outreach to glider assemblers rather than revising its regulations. Further, NHTSA should not pursue inclusion of gliders under its Phase 2 program. [EPA-HQ-OAR-2014-0827-1164-A1 p.125]

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2 The CAA does authorize the EPA to regulate engine rebuilding practices, so in that limited respect the agency can regulate non-new products. But engine rebuilding is not at issue here. Moreover, given that Congress authorized regulation of engine rebuilding and could have similarly authorized vehicle rebuilding but did not, Congress made clear its intent not to authorize regulation of vehicle rebuilding.

Organization: Diesel 2 Gas, Inc.

Proposed EPA Glider Rule Detrimental To Lowering Heavy Duty Trucks Emissions [EPA-HQ-OAR-2014-0827-1198 p.1]

Glider Kit Trucks are the only means by which hundreds of thousands of Class 8 Trucks can have access to natural gas as an engine fuel. Several EPA approved dual fuel conversion systems are currently being applied to heavy duty engines 2009 and older allowing trucks to operate with up to 60% natural gas. [EPA-HQ-OAR-2014-0827-1198 p.1]

Modern 2010 and newer Class 8 Truck engines cannot be converted efficiently to dual fuel mode with any known technology. The electronics associated with these modern engines makes adaptation of dual fuel conversions not achievable in the foreseeable future. [EPA-HQ-OAR-2014-0827-1198 p.1]

Dedicated gas fired engines fail to meet the operating requirements of U.S. Class 8 Truck fleets in many operating applications. The lower horsepower and torque, lower efficiency and range limitations of dedicated gas engines prohibit many fleets from using them in their operating applications. Trucks carrying heavy loads and trucks operating in mountainous terrains cannot use the gas fired engines. [EPA-HQ-OAR-2014-0827-1198 p.1]

Without the availability of dual fuel conversion systems, these trucking applications cannot use natural gas as an engine fuel and will continue to be limited to diesel as a fuel. Operators of these trucks rebuild old engines of their old trucks that are less energy efficient than that of new Glider models. The effects of this rule change will stop the progress of natural gas use in these trucking applications. [EPA-HQ-OAR-2014-0827-1198 p.2]

The effect of this rule change will have a detrimental effect on the development of dual fuel technologies for Class 8 Trucks. Dual Fuel technologies have not been embraced by heavy duty engine OEMs. Therefore the current EPA approved dual fuel technologies have been developed by small and midsized and mostly U.S. companies. Owners of older trucks find it difficult to justify the expense of converting their depreciated older trucks to dual fuel. Gliders have provided the best platform to deploy these dual fuel systems allowing U.S. dual fuel manufactures to lead the world in heavy duty dual fuel technologies. 'Dual Fuel Gliders' have allowed these U.S. companies to continue prove and improve their technologies in the field. These sales provide resources for these companies to work on finding technology improvements that may lead to the eventual conversion of modern heavy duty engines. Without Gliders many of these technologies will fail to advance into reaching new post 2010 engines. [EPA-HQ-OAR-2014-0827-1198 p.2]

Without Gliders many of the current U.S. manufacturers of dual fuel conversion systems will fail. This will give foreign companies an advantage in deploying their own inferior dual fuel technologies overseas in countries where trucks are not required meet EPA standards. The effect of the proposed rule will have a detrimental effect on U.S. companies leading the world in availing natural gas as a means to lower the emissions of heavy duty engines. This rule will have a chilling effect on lowering U.S. and global emissions from heavy duty truck engines. [EPA-HQ-OAR-2014-0827-1198 p.2]

EPA's own previous rulings in 2011 state the beneficial environmental impact of dual fuel aftermarket conversion systems in many Class 8 Truck applications. The proposed rule is in conflict with EPA's previous ruling. [EPA-HQ-OAR-2014-0827-1198 p.2]

Organization: E-ONE

E-ONE would like to take this opportunity to comment on the proposed Phase 2 of the Heavy Duty Greenhouse Gas rule 40 CFR 1037. More specifically E-ONE would like to comment on the proposal that gliders will be required to meet current emission standards for the year in which they are produced. [EPA-HQ-OAR-2014-0827-1185-A1 p.1]

Gliders are an important product in the emergency vehicle industry. An emergency vehicle, while critical to saving lives in the event of an emergency; typically does not drive very many miles over the lifetime of the vehicle. The industry standard of the lifetime of an emergency vehicle is 10 to 20 years in which an emergency vehicle may only have traveled 10-50,000 miles, although it is not uncommon for an emergency vehicle of 30+ years of service to have the same amount of miles. E-ONE has found that the durability of engines in class 8 emergency vehicles far surpass the longevity of the chassis that they power, this can be attributed to the extreme environment that these vehicles have to endure. Having the ability to purchase a glider allows municipalities with limited financial resources capable of maintain a fleet that is required to save lives. [EPA-HQ-OAR-2014-0827-1185-A1 p.1]

E-ONE’s stance is that it would be advantageous to allow gliders, given that the donor engine is still within its useful life based on mileage but not based on age. Doing so will allow the EPA to limit the amount of gliders produced enough to make a significant difference in the emissions of heavy duty vehicles while still creating a standard that requires vehicles over time to continually increase in emission standards. [EPA-HQ-OAR-2014-0827-1185-A1 p.1]

With ever changing technology and the need for increased safety and efficiency of fire protection it can become a challenge for a community to determine when to replace a piece of fire apparatus. There is a large financial burden to a community when a new fire apparatus is purchased. This being said, every option needs to be explored to make the best financial decision for the community. While many large communities have a replacement program in place for their apparatus where the impact of this cost can be spread out, many smaller communities do not. [EPA-HQ-OAR-2014-0827-1253-A1 p.1]

In our service shops we offer a glider kit program to extend the life of a fire truck for communities with limited budgets. Fire trucks are historically extremely low mileage with many units as old as 10, 15 and 20 years with 10,000, 25,000 and 50,000 miles. The diesel engines and transmissions used in the fire service are designed to perform for a minimum of 300,000 to 1,000,000 miles. This gives the communities fire departments the ability to reuse these components, extending the life of the apparatus. This thus gives them the ability to increase the safety and efficiency of the apparatus while reducing the financial impact. [EPA-HQ-OAR-2014-0827-1253-A1 p.1]

Glider kits provide a new cab and chassis with the option to reuse the engine, transmission, axles, fire pumps and apparatus bodies or any combinations of these components (components that have considerable useful life remaining). This gives the small community department a piece of apparatus that will provide several years of additional service without the cost of a new apparatus. [EPA-HQ-OAR-2014-0827-1253-A1 p.1]

If the ability to 'glider' fire apparatus is prohibited it will have a serious impact on many communities and their fire departments across the country. When departments cannot afford to purchase new fire apparatus their only option is to repair or refurbish their existing apparatus. Most fire departments across the country are volunteer with limited budgets and sometimes purchase only one new truck and strive to maintain that unit for as long as possible. We need to give these communities as many options as possible. [EPA-HQ-OAR-2014-0827-1253-A1 p.1

I believe it would be a financial burden for many of these departments. With only one or two trucks and no other options, most would have to disband and close for lack of funds to support new apparatus. This could seriously affect the personal safety of lives in those communities. [EPA-HQ-OAR-2014-0827-1253-A1 p.1]

I have attached some letters for existing fire department so you can see firsthand their financial situation. [EPA-HQ-OAR-2014-0827-1253-A1 p.1]

Organization: Environmental Defense Fund (EDF)

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. [EPA-HQ-OAR-2014-0827-1312-A1 p.16]

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. [EPA-HQ-OAR-2014-0827-1312-A1 p.16]

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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").

Organization: Fitzgerald Truck Sales

Fitzgerald Truck Sales appreciates the opportunity to submit its comments on the Phase 2 Proposed Rule. In section I we speak to the underestimated and under investigated economic impact to small businesses and misconceptions about gliders and there part in a "Green" environment. In section II we see some key elements making gliders part of this Phase 2 proposal, in our opinion, lacking a comprehensive investigation and frankly confronting some legal challenges. [EPA-HQ-OAR-2014-0827-1134-A1 p.1]

EPA and NHTSA have specifically requested comment on their proposed regulation of "gliders" as part of the Phase 2 Proposed Rule. As used in the industry, a "glider kit" is a new cab, front axle, and frame rail/chassis that uses existing or rebuilt drivetrain components (engine, transmission, and rear axle) to repair or extend the life of a used truck. Fitzgerald Truck Sales rebuilds tractors using these OE supplied glider kits, and has been building kits since 1989. Rebuilding tractors with glider kits drives a significant volume and business to local economies especially in the smaller communities of Tennessee, like Byrdstown, Crossville and Jamestown. [EPA-HQ-OAR-2014-0827-1134-A1 p.1]

Glider History and its Economies - Glider kits have been around for almost 50 years and are used for a number of reasons. Gliders are less expensive than new trucks and offer a more economical option for smaller fleets and owner/operators to maintain the reliability of their commercial trucking operations. The reused drivetrain components constitute approximately 30-50% of the value of a new truck, which generates significant cost savings for small businesses and owner-operators. <u>Rebuilding an engine and transmission uses 85% less energy than manufacturing them new</u>, and results in engines and transmissions that are more reliable and efficient that pre-rebuild. With improved aerodynamics and low rolling resistance tires on trucks assembled from glider kits, these rebuilt vehicles actually have better fuel efficiency than when they were new. The engines most commonly used in gliders actually have better fuel economy and greenhouse gas ("GHG") emissions than today's ultra-low NO_x engines (pre-EGR EPA98 S60s). Wrecked or otherwise damaged trucks can be put back on the road economically by placing the undamaged powertrain components in a new cab/chassis. In addition to the use of glider kits for rebuilds, many CNG fleet operators prefer to buy glider kits and power them themselves, often recycling the fuel system or saving money on CNG system installation. Hundreds of small businesses have come to rely on gliders over the past 50 years as a cost-effective way of doing business. These businesses include glider distributors, glider assemblers, small fleets, owner/operators, and other small businesses in the commercial trucking industry. [EPA-HQ-OAR-2014-0827-1134-A1 p.1-2]

Additional Considerations with Glider Provisions

Although EPA states that it considered impacts on small businesses in drafting the Phase 2 Proposed Rule, the glider provisions particularly impact small businesses and it is not clear that EPA fully considered the consequences the proposed regulations will have or how they could be minimized. As EPA notes, the Small Business Advocacy Review Panel process—which EPA undertook to meet its legal requirements under the Regulatory Flexibility Act and Small Business Regulatory Enforcement Fairness Act—included only one glider assembler. As a result of this oversight, there are a number of additional ways that the proposal should be modified to mitigate the impacts of any glider regulation on small businesses, jobs, and the economy in general. [EPA-HQ-OAR-2014-0827-1134-A1 p.2]

Economic Impacts

- Gliders as a whole represent over 10,000 units annually. While this is insignificant as compared to new trucks sold it does support a very significant number of jobs both locally and nationwide.[EPA-HQ-OAR-2014-0827-1134-A1 p.2]
- Fitzgerald Employs 285 employees locally, predominately in areas historically economically challenged in recent years. [EPA-HQ-OAR-2014-0827-1134-A1 p.2]
- Fitzgerald supports 137 vendor/suppliers not including the OEM's and their downstream support. [EPA-HQ-OAR-2014-0827-1134-A1 p.2]
- The end user of Gliders is the smaller business owner and employer who may not be economically competitive and is definitely at risk if such rulings were to attempt to force them to rely solely on new equipment. [EPA-HQ-OAR-2014-0827-1134-A1 p.2]
- The independent truckers buying one or a few gliders does not have the purchasing power to buy new trucks at the same acquisition costs as a large fleet placing them at a disadvantage. [EPA-HQ-OAR-2014-0827-1134-A1 p.2]
- Beyond Fitzgerald, the Supporting OEM's like Daimler (DTNA) and Peterbilt and Kenworth (PACCAR), employ hundreds of men and women in the creation, support and manufacture of the base Glider chassis. [EPA-HQ-OAR-2014-0827-1134-A1 p.2]
- Detroit Diesel, is the largest supplier of rebuilt engines and engine parts in support of gliders and maintains an entire manufacturing facility in Ohio that would be devastated by the current proposal. [EPA-HQ-OAR-2014-0827-1134-A1 p.2]

"Glider Vehicle" Exemption Cap

EPA has proposed that small manufacturers would be eligible for an exemption from EPA's proposed glider vehicle certification requirements under 40 C.F.R. § 1037.635 that would allow them to continue selling a limited number of glider vehicles. This cap would be based on the manufacturer's highest annual sales volume for calendar years 2010 through 2014 up to a maximum of 300 exempt glider vehicles. A cap of 300 vehicles is too low given the abrupt change this regulation brings to the 50-year-old glider industry and the disproportionate impact it will have on small businesses. A more reasonable approach would be to begin with a higher initial cap and gradually reduce it over time to allow large and small businesses in the glider industry to adapt to EPA's new requirements. Specifically, if EPA decides to implement a certification requirement for glider vehicles, the small business exemption should start with a cap equal to the 2015 sales levels of vehicles in 2020 (complying with the statutory lead-time requirement) and then reduce the cap annually in levels that give business time to adjust. Such a phase-down would allow these small manufacturers to transition to other lines of business and to move their employees to other types of work without extensive layoffs. Many small manufacturers will already be limited by their highest annual sales volume and will not be affected by the cap. The adjustment of the cap applicable to glider assemblers, coupled with the additional lead-time required under the CAA, is also critical to saving literally thousands of jobs. [EPA-HQ-OAR-2014-0827-1134-A1 p.3]

Legal Issues with Glider Provisions

We are not alone in our concerns with EPA's proposed regulation of "glider kits" and "glider vehicles," including EPA's legal authority for regulating "glider kits." EPA's Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act ("CAA"), which does not provide EPA authority to regulate the sale of motor vehicle components. Moreover, the CAA requires 4-years' lead-time for new or revised NO_x and PM requirements, which has not been met under the proposed regulations. [EPA-HQ-OAR-2014-0827-1134-A1 p.3]

Proposed Definitions of "Glider Kit" and "Glider Vehicle"

EPA has proposed two overlapping and potentially confusing definitions: "*Glider kit* means any of the following: (1) A new vehicle that is incomplete because it lacks an engine, transmission, or axle; (2) A new vehicle produced with a used engine (including a rebuilt or remanufactured engine); (3) Any other new equipment that is intended to become a motor vehicle with a previously used engine (including a rebuilt or remanufactured engine)"; and "*Glider vehicle* means a new vehicle produced with a used engine." As EPA has proposed these definitions, "glider vehicle" is a subset of "glider kit," whereas under industry usage and understanding, the two are separate, and should remain so under the regulations. [EPA-HQ-OAR-2014-0827-1134-A1 p.3]

A "glider kit" should instead be defined as "an assemblage of new vehicle components, including at a minimum the chassis, cab and front axle, but lacking an engine, transmission, and rear axle." Once the glider kit is assembled using existing or rebuilt drivetrain components (engine, transmission, and rear axle), then it becomes a rebuilt truck, which EPA would consider a "glider vehicle." The EPA-proposed definitions are confusing because they conflate the two, which are typically sold by separate businesses. DTNA sells glider kits but not glider vehicles, while most glider assemblers sell glider vehicles but do not manufacture glider kits. The third part of the proposed "glider kit" definition is simply too broad and vague to be workable: "Any other new equipment that is intended to become a motor vehicle with a previously used engine (including a rebuilt or remanufactured engine)" could potentially encompass a single headlight or side mirror as a "glider kit." This part of the proposed definition should be deleted. [EPA-HQ-OAR-2014-0827-1134-A1 p.3-4]

Regulation of "Glider Vehicles" Targets NO_x/PM Emissions and Must Meet Statutory Lead-Time Requirement

In addition, the proposed regulation of "glider vehicles" actually targets NO_x/PM emissions rather than GHG emissions, as EPA concedes, and is therefore inappropriate for inclusion in a GHG rule. Glider sales actually create the potential to reduce GHG emissions by incorporating used and rebuilt engines in newer, more aerodynamic vehicles. Rebuilt engines used in glider vehicles emit fewer GHGs, and new cabs and low rolling resistance tires are more efficient than what they replace. Because regulation of glider vehicles targets NO_x/PM emissions, it should be done only in a separate rulemaking, if at all. In addition, this separate rulemaking should be carefully drafted to meet statutory lead-time requirements for NO_x and PM regulations as required by statute. NO_x and PM emissions standards are subject to an express CAA lead-time requirement under which new or revised NO_x and PM requirements cannot take effect sooner than the model year commencing 4 years after new or revised standard is promulgated. 42 U.S.C. § 7521(3)(C). As currently proposed with an effective date of January 1, 2018, the proposed glider regulations violate the 4-year lead-time requirement under the CAA. Assuming the Phase 2 rule is finalized in early 2016, the earliest that the regulations governing glider vehicles could take effect would be 2020, in compliance with the CAA lead-time requirement. As currently proposed, EPA is attempting to regulate NO_x and PM in the GHG rule in a way it could not undertake in a proper NO_x and PM rulemaking. [EPA-HQ-OAR-2014-0827-1134-A1 p.4]

Organization: GATR Truck Center

GATR Truck Center strongly supports the agencies' proposal to impose new requirements on companies assembling and offering for sale vehicles produced by installing used driveline components into new glider kits. EPA and NHTSA should require that manufacturers of these glider-based vehicles comply with all applicable and current greenhouse gas and criteria emissions standards. NHTSA should also enforce the existing regulations that require manufacturers of glider-based vehicles to comply with all applicable safety standards. [EPA-HQ-OAR-2014-0827-1010-A2 p.1]

Dealers such as ours have been subject to a growing unfair competition from this rapidly expanding market of non-compliant vehicles. Over the past few years, an increasing number of our customers have purchased these non-compliant glider vehicles at prices that are 25% less than our comparable new compliant trucks. [EPA-HQ-OAR-2014-0827-1010-A2 p.2]

GATR Truck Center supports the application of glider kits as a means to repair badly damaged vehicles, while taking advantage of the remaining useful life in the damaged vehicle's driveline components. When conducted within the requirements of 49 CFR 571.7[e), which sets forth NHTSA's rules for re-use of driveline components for installation into a glider kit, we have no specific concerns with such legitimate applications of glider kits. It's when these rules are violated, however, in an effort to offer for sale an essentially new vehicle whose production costs and total cost of ownership may be tens of thousands of dollars less than the fully compliant new products sold by our dealership that we strongly object to such an unfair disruption of market competition. Unfortunately, this practice has become widespread without consequence to the glider-based vehicle manufacturers, and it is unfairly and negatively impacting our business. In many cases, the manufacturers of glider-based vehicles are not collecting the 12% federal excise tax ('FET') that normally applies to new vehicle sales, giving customers even further financial incentive to purchase glider vehicles rather than fully compliant new vehicles. This abusive application of glider kits must be stopped; we strongly support the agencies' efforts to do so through appropriate new regulations and enforcement of existing regulations. EPA and NHTSA should seek to remedy this situation as soon as practicable, while protecting for the continued use of glider kits for legitimate purposes as we have described. [EPA-HQ-OAR-2014-0827-1010-A2 p.2]

We refer you to the comments of the Volvo Group North America for a more complete analysis and set of recommendations with respect to the regulation and enforcement of glider-based vehicles. GATR Truck Center supports the comments submitted by Volvo Group North America. [EPA-HQ-OAR-2014-0827-1010-A2 p.2]

The rapidly expanding glider-based vehicle market is seriously undermining the significant gains EPA, NHTSA, and the heavy-duty vehicle industry have made to reduce criteria and greenhouse gas emissions, reduce fuel consumption, and improve roadway safety. The market availability of these non-compliant engines and vehicles poses an unfair competitive disadvantage to manufacturers that have undertaken the enormous effort and investment necessary to comply with all applicable emissions, fuel efficiency, and safety standards, and likewise an unfair competitive advantage to the dealer network representing those OEM's. It is therefore imperative that the agencies follow through by finalizing regulations that prohibit the production of glider-based vehicles for anything other than legitimate purposes, and that the agencies actively ensure compliance to those requirements. [EPA-HQ-OAR-2014-0827-1010-A2 p.2]

Organization: Harrison Truck Centers

EPA and NHTSA have specifically requested comment on their proposed regulation of "gliders" as part of the Phase 2 Proposed Rule. As used in the industry, a "glider kit" is a new cab, front axle, and frame rail/chassis that uses existing or rebuilt drivetrain components (engine, transmission, and rear axle) to repair or extend the life of a used truck. Harrison Truck Centers rebuilds tractors using these glider kits, and has for over fifteen years. Rebuilding tractors with gliders kits drive a significant volume and business to our area. [NHTSA-2014-0132-0059-A1 p.1]

Glider kits have been around for almost 50 years and are used for a number of reasons. Gliders are less expensive than new trucks and offer a more economical option for smaller fleets and owner/operators to maintain the reliability of their commercial trucking operations. The reused drivetrain components constitute approximately 30-50% of the value of a new truck, which generates significant cost savings for small businesses and owner-operators. Remanufacturing an engine and transmission uses 85% less energy than manufacturing them new, and results in engines and transmissions that are more reliable and efficient that pre-rebuild. With improved aerodynamics and low rolling resistance tires on trucks assembled from glider kits, these rebuilt vehicles actually have better fuel efficiency than when they were new. The engines most commonly used in gliders actually have better fuel economy and greenhouse gas ("GHG") emissions than today's ultra-low NOX engines (pre-EGR EPA98 S60s). Wrecked or otherwise damaged trucks can be put back on the road economically by placing the undamaged powertrain components in a new cab/chassis. In addition to the use of glider kits for rebuilds, many CNG fleet operators prefer to buy glider kits and power them themselves, often recycling the fuel system or saving money on CNG system installation. Hundreds of small businesses have come to rely on gliders over the past 50 years as a cost-effective way of doing business. These businesses include glider distributors, glider assemblers, small fleets, owner/operators, and other small businesses in the commercial trucking industry. [NHTSA-2014-0132-0059-A1 p.1-2]

Harrison Truck Centers also repeated comments summarized above for Daimler.

Organization: International Council on Clean Transportation (ICCT)

Potential regulatory loophole

The ICCT recommends that the agencies ensure there are no regulatory loopholes whereby increasing unforeseen numbers of trucks exploit regulatory exemptions to avoid deploying emission reduction and efficiency technology. The ICCT spends a considerable amount of time investigating gaps between policy objectives and their market outcomes. The U.S. exemption for gliders (i.e., "glider kits," "gliders," or "glider vehicles") in the criteria pollutant heavy-duty vehicle regulations is among the more egregious and high-risk regulatory gaps. The glider kit provision that was previously used to assist in bringing hundreds of repaired vehicles per year is now creating an entirely new market with tens of thousands of sales per year, now with multiple suppliers competing in the space. This glider market is predicated upon reduced costs from vehicles that are not regulated and not certified through the full process that most modern tractors are. This is a clear distortion of the market and the exploitation of a regulatory provision that was not foreseen to be used in such a way. We recommend that the agencies' include glider kit-manufactured vehicles within the greenhouse gas emission and efficiency regulations, as well as criteria pollutant emission regulations as soon as possible. Exemptions, if granted, would ideally be restricted to a number that is consistent with pre-emission-regulation glider production – on the order of hundreds of units per year industry wide – and only those with legally or insurance-verified evidence of inoperably damaged tractor frames. [EPA-HQ-OAR-2014-0827-1180-A4 p.16]

Organization: Manufacturers of Emission Controls Association (MECA)

Heavy-Duty Glider Kits and Glider Vehicles

MECA strongly supports the agency's proposal to require that the engines installed in glider vehicles meet the same criteria and GHG emission requirements as new engines certified in the same model year. The recent rapid growth in the number of glider vehicles sold since 2007 to over 5,000 vehicles a year shows the large emissions impact that this category of high emitters has on the overall contribution of PM and NOx from heavy-duty engines. As new engines become cleaner in the future the contribution from glider vehicles will continue to grow. Glider vehicles are classified as "new motor vehicles" because they use a new chassis, although they can continue to use engines that are 10-15 years old and emit 20-40 times more pollution than vehicles equipped with a new engine. The existing exemption of glider vehicles from the latest pollution requirements represents a huge loophole in the regulation. Using this "new motor vehicle" designation under the clean air act, glider vehicles could potentially qualify for clean air incentive funding under some state in-use fleet programs while not meeting the intent or emission reduction goals of those programs. Glider vehicles, equipped with old diesel engines, or converted to alternative fuels could potentially compete for funding with newly manufactured trucks, replacement engines or retrofit emission control devices. The proposed glider kit and glider vehicle provision in this proposal takes an important step towards closing this loophole and MECA supports inclusion of this provision in the final regulation and moving the implementation date ahead of the proposed 2018 start date. There should be no "dirty diesel" loophole left in EPA's regulatory programs. [EPA-HQ-OAR-2014-0827-1210-A3 p.12] [[These comments can also be found in Docket Number EPA-HQ-OAR-2014-0827-1420, p.212.]]

MECA is concerned that the present proposed limited grandfathering of glider vehicle production for existing small businesses would still allow the continued production of up to 300 assembled gliders a year, per company. This exemption poses a significant threat to air quality as 300 trucks could emit the same amount of NOx as 7500 new heavy duty trucks. EPA should include a phase-out of this glider loophole completely that reduces the 300 glider kit limit per small existing business over a course of three years after which full compliance is required. This should provide sufficient time for small businesses to adapt their business models to produce and maintain clean diesels. Retaining a 300 per year limit indefinitely could result in a disproportionate number of dirty vehicles to continue to be produced and remain in the fleet for decades to come. To minimize the opportunity to abuse this exemption, EPA might consider limiting the conditions under which a glider vehicle may be purchased to legitimate situations such as when a vehicle is damaged in an accident and the engine can be salvaged. Requirements should include record keeping guidelines to support legitimate transactions to purchase glider vehicles. [EPA-HQ-OAR-2014-0827-1210-A3 p.12]

Organization: Mississippi Furniture Xpress (MFX)

MFX, LLC is one of the companies who would be negatively impacted by passage of this ruling due to our purchasing of glider trucks. This ruling would not only impact our company, but also our 150 employees as well as the numerous connected businesses with whom we contract and provide services throughout the country. [EPA-HQ-OAR-2014-0827-1338-A1 p.1]

In the past EPA regulations have been imposed with no opportunity for discourse and their impact on business and the livelihoods of those affected often not given consideration. This represents one of the many reasons that the citizens of this country are dissatisfied with government. I have worked in the trucking industry for over 30 years and have seen the advancements related to safety and emissions by the industry as a whole. The changes have been significant and positive; however, our industry faces a constant barrage of costly and restrictive regulations that threaten our operations so greatly, that we as business owners are deeply concerned that tighter regulations will be too costly, time consuming and burdensome to overcome. Pending regulations by FMCSA regarding ELD's is enough to ruin many small companies, much less adding more restrictive and burdensome EPA rules. [EPA-HQ-OAR-2014-0827-1338-A1 p.1]

We purchased used trucks when we began our company and nearly went bankrupt trying to keep them running due to all of the problems caused by EPA regulations on engines after 2007. Those problems continue to be devastating to companies who operate trucks with certain engines; the cost of repairs often exceeds 50% of the cost of the truck itself. Buying glider trucks absolutely saved us from going out of business due to repair costs for the used trucks we had purchased. Further regulations to these trucks feels like overreach and we're unaware of studies which show that the small percentage of glider trucks being sold have any appreciable impact on the environment, whereas they are most certainly having a positive economic effect for the people and businesses that choose to purchase them. [EPA-HQ-OAR-2014-0827-1338-A1 p.2]

Our current understanding is that the EPA does not have legal authority for regulation of glider kits. EPA's Phase 2 Proposed Rule is being carried out under the authority of the Clean Air Act ('CAA'), which does not provide EPA authority to regulate the sale of motor vehicle components. Moreover, the CAA requires 4-years' lead-time for new or revised NO„ and PM requirements, which has not been met under the proposed regulations. EPA has been aware of the use of glider kits for over 35 years, and has not attempted to regulate them because they are not 'new motor vehicles' or 'new motor vehicle engines' under the CAA. As regulations by FMCSA have been repealed due to not having sufficient data to support their assertions, this proposed ruling by the EPA seems open to challenge on the same basis. [EPA-HQ-OAR-2014-0827-1338-A1 p.2]

Thank you for the opportunity to comment; however, we strongly oppose this proposed ruling and ask that it be abandoned due to the reasons cited. [EPA-HQ-OAR-2014-0827-1338-A1 p.2]

Organization: Mondial Automotive

EPA and NHTSA have specifically requested comment on their proposed regulation of 'gliders' as part of the Phase 2 Proposed Rule. ***Mondial Automotive, Inc.*** appreciates the opportunity to submit its comments on the Phase 2 Proposed Rule. As used in the industry, a 'glider kit' is a new cab, front axle, and frame rail/chassis that uses existing or rebuilt drivetrain components (engine, transmission, and rear axle) to repair or extend the life of a used truck. Mondial Automotive, Inc. is a downstream supplier of Original Equipment Parts and Components that are used in the production of 'glider kits'. The 'glider kit' industry drives a significant volume of business to local economies such as our community of College Point, NY. [EPA-HQ-OAR-2014-0827-1337-A1 p.1]

Glider History and its Economies - Glider kits have been around for almost 50 years and are used for a number of reasons. Gliders are less expensive than new trucks and offer a more economical option for smaller fleets and owner/operators to maintain the reliability of their commercial trucking operations. The reused drivetrain components constitute approximately 30-50% of the value of a new truck, which generates significant cost savings for small businesses and owner-operators. Rebuilding an engine and transmission uses 85% less energy than manufacturing them new, and results in engines and transmissions that are more reliable and efficient that pre-rebuild. With improved aerodynamics and low rolling resistance tires on trucks assembled from glider kits, these rebuilt vehicles actually have better fuel efficiency than when they were new. The engines most commonly used in gliders actually have better fuel economy and greenhouse gas ('GHG') emissions than today's ultra-low NO, engines (pre-EGR EPA98 S60s). Wrecked or otherwise damaged trucks can be put back on the road economically by placing the undamaged powertrain components in a new cab/chassis. In addition to the use of glider kits for rebuilds, many CNG fleet operators prefer to buy glider kits and power them themselves, often recycling the fuel system or saving money on CNG system installation. Hundreds of small businesses have come to rely on gliders over the past 50 years as a cost-effective way of doing business. These businesses include glider distributors, glider assemblers, small fleets, owner/operators, and other small businesses in the commercial trucking industry. [EPA-HQ-OAR-2014-0827-1337-A1 p.1-2]

I. **Additional Considerations with Glider Provisions**

Although EPA states that it considered impacts on small businesses in drafting the Phase 2 Proposed Rule, the glider provisions particularly impact small businesses and it is not clear that EPA fully considered the consequences the proposed regulations will have or how they could be minimized. As EPA notes, the Small Business Advocacy Review Panel process—which EPA undertook to meet its legal requirements under the Regulatory Flexibility Act and Small Business Regulatory Enforcement Fairness Act—included only one glider assembler. As a result of this oversight, there are a number of additional ways that the proposal should be modified to mitigate the impacts of any glider regulation on small businesses, jobs, and the economy in general. [EPA-HQ-OAR-2014-0827-1337-A1 p.2]

A. Economic Impacts

- Gliders as a whole represent over 10,000 units annually. While this is insignificant as compared to new trucks sold it does support a very significant number of jobs both locally and nationwide. [EPA-HQ-OAR-2014-0827-1337-A1 p.2]
- Mondial Employs 47 employees locally, predominately in a minority populated urban area. [EPA-HQ-OAR-2014-0827-1337-A1 p.2]
- The end user of Gliders is the smaller business owner and employer who may not be economically competitive and is definitely at risk if such rulings were to attempt to force them to rely solely on new equipment. [EPA-HQ-OAR-2014-0827-1337-A1 p.2]
- The independent truckers buying one or a few gliders does not have the purchasing power to buy new trucks at the same acquisition costs as a large fleet placing them at a disadvantage. [EPA-HQ-OAR-2014-0827-1337-A1 p.2]
- OEM's like Daimler (DTNA) and Peterbilt and Kenworth (PACCAR), employ hundreds of men and women in the creation, support and manufacture of the base Glider chassis. [EPA-HQ-OAR-2014-0827-1337-A1 p.2]
- Detroit Diesel, is the largest supplier of rebuilt engines and engine parts in support of gliders and maintains an entire manufacturing facility in Ohio that would be devastated by the current proposal. [EPA-HQ-OAR-2014-0827-1337-A1 p.2]

B. 'Glider Vehicle' Exemption Cap

EPA has proposed that small manufacturers would be eligible for an exemption from EPA's proposed glider vehicle certification requirements under 40 C.F.R. § 1037.635 that would allow them to continue selling a limited number of glider vehicles. This cap would be based on the manufacturer's highest annual sales volume for calendar years 2010 through 2014 up to a maximum of 300 exempt glider vehicles. A cap of 300 vehicles is too low given the abrupt change this regulation brings to the 50-year-old glider industry and the disproportionate impact it will have on small businesses. A more reasonable approach would be to begin with a higher initial cap and gradually reduce it over time to allow large and small businesses in the glider industry to adapt to EPA's new requirements. Specifically, if EPA decides to implement a certification requirement for glider vehicles, the small business exemption should start with a cap equal to the 2015 sales levels of vehicles in 2020 (complying with the statutory lead-time requirement) and then reduce the cap annually in levels that give business time to adjust. Such a phase-down would allow these small manufacturers to transition to other lines of business and to move their employees to other types of work without extensive layoffs. Many small manufacturers will already be limited by their highest annual sales volume and will not be affected by the cap. The adjustment of the cap applicable to glider assemblers, coupled with the additional lead-time required under the CAA, is also critical to saving literally thousands of jobs. [EPA-HQ-OAR-2014-0827-1337-A1 p.2-3]

In closing Gliders are a necessity to our national commerce. Catering to the smaller businesses and truckers who survive using gliders as a necessary tool to compete in their markets. Gliders are indeed 'Green' in respects to the re-use of components, and putting cleaner and safer vehicles than those replaced components and vehicles that would have been on the road otherwise. The EPA falls well short in any assumption that restricting gliders unreasonably will drive our customers to in essence 'NEW TRUCKS'. This is simply not the case. [EPA-HQ-OAR-2014-0827-1337-A1 p.3]

Organization: Motor & Equipment Manufacturers Association (MEMA)

Reconsider Actions Impacting Remanufactured Engines [EPA-HQ-OAR-2014-0827-1274-A1 p.11]

In addition to representing original equipment suppliers, MEMA also represents remanufacturers and their suppliers. The proposed rule seeks to regulate non-new products under Phase 2, including gliders and remanufactured engines. There remains a legitimate need and purpose for glider kits and remanufactured engines and our members would like to support the reduction of potential objectionable uses of the standards. However, MEMA is concerned that the direction being proposed by the agency is swinging the pendulum too far in the other direction and has the potential to significantly impact this industry segment. [EPA-HQ-OAR-2014-0827-1274-A1 p.11]

Remanufactured parts are given an extended life, cost less to produce and purchase and minimize the impact on the environment by not ending up in the waste stream. The motor vehicle remanufacturing industry supports over 50,000 direct jobs in the U.S. and demonstrates a commitment to sustainability through product innovation and the incorporation of more environmentally-friendly manufacturing practices. The U.S. Congress has recognized the value of remanufactured parts and components as exemplified by the “Federal Vehicle Repair Cost Savings Act” (S. 565), which directs federal agencies to consider using remanufactured parts when maintaining federal vehicle fleets. This bill passed the Senate on June 15 and the House of Representatives on September 28. [EPA-HQ-OAR-2014-0827-1274-A1 p.11]

Remanufacturing is a standardized industrial process by which previously sold, worn or nonfunctional products are refurbished to a better condition and performance in order to reuse resources and reduce waste. The process incorporates technical specifications, including engineering, quality and testing standards to yield warranted products. In addition to remanufactured engines other examples of remanufactured components include: transmissions, alternators, starters, turbochargers, steering and suspension components and electronic control modules. Remanufacturing preserves some of the value of the original manufacturing − including energy costs, investment in capital and labor inputs − which recycling alone cannot do. This process saves about 85 percent of the energy and material used to manufacture similar new products. [EPA-HQ-OAR-2014-0827-1274-A1 p.11]

MEMA has concerns about the NPRM's approach on gliders – particularly the agencies' proposals: [EPA-HQ-OAR-2014-0827-1274-A1 p.12]

- to define used and remanufactured engines/equipment as "new" engines/equipment; [EPA-HQ-OAR-2014-0827-1274-A1 p.12]
- to impose on remanufactured engines the same compliance criteria as actual new engines for the year in which it was remanufactured (for all emissions); and, [EPA-HQ-OAR-2014-0827-1274-A1 p.12]
- to assert an earlier compliance timeline of MY2018. [EPA-HQ-OAR-2014-0827-1274-A1 p.12]

It is important to note that while a remanufactured component can be "manufactured again" to extend the service life, there are constraints as to how much and to what degree you can alter a component to meet newer design performance criteria beyond its original design. This task becomes increasingly more challenging the more complex the component/system. Furthermore, the proposed scope of the requirements for remanufactured engines would not only include GHG standards, but also all applicable criteria pollutant emissions standards; yet this Phase 2 rulemaking is a GHG rule, not for other pollutants. Also, the proposed timeline would kick in much sooner (by MY2018) than the other compliance requirements (MY2021). This timeline is impractical in terms of production planning and the remanufacturing process. Absent from the proposed rule are the data to demonstrate that the proposal will have a net positive impact on reducing CO2 emissions; nor is there a full evaluation of the cost-benefit impacts the proposal will have on rebuilt and remanufactured engines and components. As a result, while the NPRM assures that this is not a "ban" of glider kits – the proposed changes have the potential to significantly burden and overwhelm the remanufacturing sector. [EPA-HQ-OAR-2014-0827-1274-A1 p.12]

For all of these reasons, MEMA recommends that the agencies strike and remove the additional text from the definition of "new" in part 1068.30 that states: "Note that in certain cases, used and remanufactured engines/equipment may be 'new' engines/equipment." The remanufacturer members of MEMA and MERA are prepared to work with the agencies on a practical approach to address the government's concerns while still retaining this important industry sector for its intended and legitimate role and purpose. As we represent different manufacturers in this space, we anticipate that they will address these and related concerns in more detail in their company comments. [EPA-HQ-OAR-2014-0827-1274-A1 p.12]

Organization: National Association of Clean Air Agencies (NACAA)

We are also very much in favor of EPA's proposal to close the existing loophole for glider kits and glider vehicles, under which used pre-2013 engines – with no limit on age – may be installed into new glider kits without meeting applicable standards. We agree with EPA that its regulations should be revised to require that only engines that have been certified to meet the prevailing standards be eligible for installation into new glider kits. The sale of glider kits has increased 10-fold[1] since the implementation of federal 2007/2010 particulate matter (PM) and NOx emission standards. The proposed changes will stem the unrestricted sale of glider vehicles with older, higher-emitting engines. With respect to implementation of EPA's proposed glider requirements, we believe this should occur as soon as possible but no later than January 2018. [EPA-HQ-OAR-2014-0827-1157-A1 p.2] [[These comments can also be found in Docket Number EPA-HQ-OAR-2014-0827-1420, p.52.]]

1 U.S. EPA, Frequently Asked Questions about Heavy-Duty “Glider Vehicles” and “Glider Kits” (2015), http://www.epa.gov/OMS/climate/documents/420f15904.pdf.

Organization: National Automobile Dealers Association (NADA)

IV. GLIDER KITS

The Phase 2 proposal seeks to severely restrict the sale of glider kits by generally requiring that engines used in glider vehicles be certified to the standards applicable to the calendar year in which assembly of the glider vehicle is completed, and by requiring many rebuilders to obtain vehicle certificates. The Phase 2 proposal also contains new definitions of “glider vehicle” and “glider kit” ostensibly based on a common understanding of these terms.[4]. [EPA-HQ-OAR-2014-0827-1932-A1 p.3]

The Phase 2 proposal would continue to exempt small businesses using gliders to rebuild vehicles from the need to obtain vehicle certificates, but would limit the exemption to an annual production of 200 units (production in excess of the capped amount would be allowed, but subject to all otherwise applicable requirements including the Phase 2 standards). For example, a small business producing between 100 and 200 glider vehicles per year would be allowed to do so without having to certify them to current year GHG (and other emission) standards, so long as they meet applicable standards for the year of their manufacture. [EPA-HQ-OAR-2014-0827-1932-A1 p.3]

In its 2015 comments, NADA/ATD urged EPA and NHTSA to consider another alternative designed to harmonize with NHTSA’s long-standing “manufacture” exemption for vehicle rebuilding. That exemption keys on there being a single “donor” vehicle from which two of three used components (engine, transmission, and drive-axle) are incorporated into the rebuilt vehicle. This exemption from the definition of “manufacturing” allows the rebuilder to avoid having to meet NHTSA manufacturer registration and other requirements. NADA/ATD also suggested that when two of these three used components are incorporated into a rebuilt vehicle, using a glider kit, the used engine would only be required to meet emission standards applicable to its year of original manufacture and, if rebuilt, any subsequent running changes. Obviously, no emissions certification would be required. Under that alternative, it would matter not if the rebuilder was a small business or how many units were rebuilt in a year. [EPA-HQ-OAR-2014-0827-1932-A1 p.4]

With respect to the Memorandum referenced in the NODA, NADA/ATD is taking no position with respect to the legal opinions expressed therein. On the other hand, NADA/ATD has reviewed and does support certain additional glider engine considerations discussed in Section “I” of the Memorandum. These include no regulation of 2010 and later engines and engines less than three-years-old, the reuse of newer engines with remaining “useful life,” and the reuse of low mileage older engines. Lastly, NADA reiterates its support for the alternatives suggested in its 2015 comments. [EPA-HQ-OAR-2014-0827-1932-A1 p.4]

Glider Kits

The Phase 2 proposal seeks to severely restrict the sale of glider kits by generally requiring that engines used in glider vehicles be certified to the standards applicable to the calendar year in which assembly of the glider vehicle is completed, and by requiring many rebuilders to obtain vehicle certificates. The Phase 2 proposal also contains new definitions of 'glider vehicle' and 'glider kit' ostensibly based on a common understanding of these terms. [EPA-HQ-OAR-2014-0827-1309-A1 p.12]

The Phase 2 proposal also would continue to exempt small businesses using gliders to rebuild vehicles from the need to obtain vehicle certificates, but would limit the exemption to an annual production of 200 units (production in excess of the capped amount would be allowed, but subject to all otherwise applicable requirements including the Phase 2 standards). For example, a small business producing between 100 and 200 glider vehicles per year would be allowed to do so without having to certify them to current year GHG (and other emission) standards, so long as they meet applicable standards for the year of their manufacture. [EPA-HQ-OAR-2014-0827-1309-A1 p.12]

NADA/ATD urges EPA and NHTSA to consider another alternative designed to harmonize with NHTSA's long-standing "manufacture" exemption for vehicle rebuilding. That exemption keys on there being a single "donor" vehicle from which two of three used components (engine, transmission, and drive-axle) are incorporated into the rebuilt vehicle. This exemption from the definition of "manufacturing" allows the rebuilder to avoid having to meet NHTSA manufacturer registration and other requirements. Likewise, NADA/ATD suggests that when two of these three used components are incorporated into a rebuilt vehicle, using a glider kit, the used engine would only be required to meet emission standards applicable to its year of original manufacture and, if rebuilt, any subsequent running changes. Obviously, no emissions certification would be required. Under this alternative, it would matter not if the rebuilder was a small business or how many units were rebuilt in a year. [EPA-HQ-OAR-2014-0827-1309-A1 p.12]

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4 40 CFR 1037.801.

Organization: National Ready Mixed Concrete Association (NRMCA)

NRMCA supports maintaining the flexibility of ready mixed concrete producers to utilize their already purchased assets to their fullest capacity, such as with "glider kits." To this end, NRMCA opposes the proposal's suggestion to require glider kits contain Phase 2 compliant engines[7]. Continuing to allow ready mixed concrete producers the opportunity to utilize refurbished trucks, truck parts and engines is an entrepreneurial inventiveness affording industry members economic and productivity advantages and competitiveness. Changing the current glider kit system will undoubtedly cause undue harm and hardship for many ready mixed concrete companies that base their business model on glider kits instead of purchasing brand new trucks. [EPA-HQ-OAR-2014-0827-1146-A1 p.3]

Upending the current glider kit system serves as an unnecessary coercion on market forces that alone will inevitably pressure the phase out of pre-Phase 2 engines. Requiring glider kits to be Phase 2 compliant would be redundant, unnecessary, and unfairly expeditious on the ready mixed concrete industry. [EPA-HQ-OAR-2014-0827-1146-A1 p.3]

NRMCA opposes any changes to the current glider kit schemes. NRMCA would like to highlight comments recently reported on that were made by Matthew Spears, executive director of EPA's Heavy Duty Diesel Program at a recent session of the American Trucking Association's Technology & Maintenance Council (September 22, 2015)[8], in which he noted that the Phase 2 program changes to glider kits may be left alone when applied to concrete mixer truck chassis. NRMCA would very much support such a carve-out for ready mixed concrete trucks. As much, mixer trucks do fall in line with any criteria that would exclude their coverage based on low-mileage and/or vocational use. [EPA-HQ-OAR-2014-0827-1146-A1 p.3-4]

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7 80 Federal Register 40329, 40528
8 Tom Berg, "EPA Might Alter 'Implementation Roadmap' for GHG Phase 2 Rules," http://www.truckinginfo.com/channel/fuel-smarts/news/story/2015/09/epa-might-alter-implementation-roadmap-for-ghg-phase-2-rules.aspx, September 23, 2015).

Organization: Natural Resources Defense Council (NRDC)

Glider Vehicles and Glider Kits

NRDC supports the EPA proposal to clarify requirements for glider vehicle and kit manufacturers and to require new gliders to use engines that meet the standards current to the year of the glider manufacturing. The EPA action will ensure that there is not a large and growing loophole allowing glider vehicles with high-emitting engines to displace new vehicles that meet current pollution standards. NRDC agrees that these requirements should apply equally for GHG and non-GHG pollutants. We also recommend that NHTSA move forward with implementing similar requirements for fuel consumption. [EPA-HQ-OAR-2014-0827-1220-A1 p.10]

Organization: Navistar, Inc.

Navistar supports the portion of the NPRM that addresses gliders. Further, Navistar suggests that the allowance is too high, and that gliders should either be limited to 200 per year or eliminated completely. [EPA-HQ-OAR-2014-0827-1199-A1 p.14]

Organization: Neapco

The proposed rule would have an unfavorable impact on Neapco Components. If we were unable to sell product to the glider kit industry, we would have to reduce our employment levels in Beatrice Nebraska and Pottstown Pennsylvania. [EPA-HQ-OAR-2014-0827-1134 p.1]

The proposed rule understates the benefits of a glider kit truck on the environment and also underestimates the benefits of improved highway safety by replacing an older trucks with a glider kit truck with many improved components. The option of purchasing a glider kit truck also benefits small businesses who the government reports to be the primary source of new jobs in our country. [EPA-HQ-OAR-2014-0827-1134 p.1]

Organization: NGVAmerica

K. Glider Vehicle Regulations [EPA-HQ-OAR-2014-0827-1270-A1 p.8]

EPA has proposed for Phase 2 that no small business entity could produce more than 300 glider vehicles in any given model year without certifying (or recertifying) the vehicle and engine to the current EPA standards. This level of volume will limit the ability of OEM truck manufacturers to support their ongoing glider truck programs, which have proved beneficial to alternative fuel platforms and could be a solid foundation for the growth of alternative fuel usage. [EPA-HQ-OAR-2014-0827-1270-A1 p.8]

NGVAmerica, however, supports the proposal to provide a limited exemption for small manufacturers who produce completed glider trucks using pre-2007 engines. As described elsewhere in our comments, EPA should use the small business definitions currently set out in guidance provided for light duty aftermarket retrofit manufacturers. SBA regulations, 13 CFR 121.201, define a "small business" by the maximum number of employees; for example, this is currently 1,000 for heavy-duty vehicle manufacturing and 750 for engine manufacturing. These levels also should be used for purposes of the Phase 2 rules. [EPA-HQ-OAR-2014-0827-1270-A1 p.8]

We understand the concerns raised by EPA regarding the continued use of older engines in essentially new vehicles and the propensity for this to greatly extend the life of some engines thereby delaying improvements in emission benefits. This concern is well founded in cases where pre-2007 engines are simply rebuilt and used with no improvements in emissions. However, modifying in-use engines to operate on natural gas does lead to improvements and reductions in criteria emissions. Based on this fact, we would urge EPA to expand the ability of glider manufacturers to continue to make use of pre-2007 natural gas (or other alternative fuels) retrofitted engines that are certified or approved, and that demonstrate significant emission reductions in criteria pollutants such as nitrogen oxides and particulate matter. One way to accomplish this would be to provide a separate allowance for gliders equipped with alternative fuel engines, or increase the total number of allowances for companies utilizing alternative fuel engines. [EPA-HQ-OAR-2014-0827-1270-A1 p.9]

We also urge EPA to expand the opportunities for glider manufacturers to make use of 2010 compliant engines that are retrofitted by small volume manufacturers to operate on alternative fuels. Post-2010 engines do not present the same issue with regard to potential in-use emissions and thus should not be limited. We believe that adopting this policy comports with EPA's long standing policy of providing additional flexibility to small volume manufactures of alternative fuel systems and would help expand market opportunities for these companies and fleets interested in using alternative fuels. In some applications, such as larger engines, this may be the only way a fleet can expand its use of natural gas. [EPA-HQ-OAR-2014-0827-1270-A1 p.9]

Providing the flexibility described here will allow OEM Truck manufacturers to continue to produce a limited number of gliders each year, and will encourage greater use of alternative fuel trucks. [EPA-HQ-OAR-2014-0827-1270-A1 p.9]

Organization: North American Repower

[The following comments were submitted as testimony at the Long Beach, California public hearing on August 18, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1420, p. 309.]

You have asked specifically about the glider kits. In your Preamble, you say that people are going to glider kits to circumvent the Clean Air Act. That is not why they are doing it. Maybe you have more information than I do. Maybe there is somebody specifically trying to do that.

Organization: Northeast States for Coordinated Air Use Management (NESCAUM)

The agencies should close the "Glider Kit" loophole.

We strongly support the proposed measure to ensure that glider kits are subject to the same applicable regulations as other new trucks. This common sense measure will prevent gaming and will avoid significant amounts of unnecessary emissions of GHGs, NOx, and PM2.5. The agencies request comment on the appropriate magnitude of the exemption. While we agree that some minimal exemption opportunity is probably appropriate in limited cases, we urge the agencies to set this number as low as is practical without impeding small businesses with legitimate claims. [EPA-HQ-OAR-2014-0827-1221-A1 p.3] [[These comments can also be found in Docket Number EPA-HQ-OAR-2014-0827-1420, pp.139-140.]]

Organization: Nuss Truck & Equipment of Minnesota and Wisconsin

Nuss Truck & Equipment strongly supports the agencies' proposal to impose new requirements on companies assembling and offering for sale vehicles produced by installing used driveline components into new glider kits. EPA and NHTSA should require that manufacturers of these glider-based vehicles comply with all applicable and current greenhouse gas and criteria emissions standards. NHTSA should also enforce the existing regulations that require manufacturers of glider-based vehicles to comply with all applicable safety standards. Dealers such as ours have been subject to a growing unfair competition from this rapidly expanding market of non-compliant vehicles. [EPA-HQ-OAR-2014-0827-0918-A2 p.1]

Nuss Truck & Equipment sold glider kits in the past when our customers purchased to repair a wrecked truck, or worn out cab, hood and frame on a heavy duty truck, or because they owned a truck that recently had major investment in the powertrain, and it made sense to redeploy those components into a glider kit. Glider kit usage in the early 2000's dropped off significantly as our OEM manufacturers devoted time to building trucks to meet emission standards and not proposing a way around emissions (2002 - 2007). Now, truck purchasers have the ability to purchase a powertrain combination that they never owned in an existing truck, from assemblers who have chosen to exploit the law put in place that was intended to clean up air pollution. The original intent of selling gilder kits has moved from a rebuilding mechanism to now mainly evading diesel emissions EPA mandates. We see many truck owners and small fleets from Minnesota and Wisconsin traveling long distances, passing by dozens of legitimate truck dealers, to purchase glider kits directly from a manufacturer in another state, just to avoid the current EPA emissions standards. That should not be a legally acceptable reason to purchase a glider kit, if we all want clean air. [EPA-HQ-OAR-2014-0827-0918-A2 p.1]

Nuss Truck & Equipment supports the application of glider kits as a means to repair badly damaged vehicles, while taking advantage of the remaining useful life in the damaged vehicle's driveline components. When conducted within the requirements of 49 CFR 571.(e), which sets forth NHTSA's rules for re-use of driveline components for installation into a glider kit, we have no specific concerns with such legitimate applications of glider kits. It's when these rules are violated, however, in an effort to offer for sale an essentially new vehicle whose production costs and total cost of ownership may be tens of thousands of dollars less than the fully compliant new products sold by our dealership that we strongly object to such an unfair disruption of market competition. Unfortunately, this practice has become widespread without consequence to the glider-based vehicle manufacturers, and it is unfairly and negatively impacting our business. In many cases, the manufacturers of glider-based vehicles are not collecting the 12% federal excise tax ('FET') that normally applies to new vehicle sales, giving customers even further financial incentive to purchase glider vehicles rather than fully compliant new vehicles. This abusive application of glider kits must be stopped; we strongly support the agencies' efforts to do so through appropriate new regulations and enforcement of existing regulations. EPA and NHTSA should seek to remedy this situation as soon as practicable, while protecting for the continued use of glider kits for legitimate purposes as we have described. [EPA-HQ-OAR-2014-0827-0918-A2 p.2]

We refer you to the comments of the Volvo Group North America for a more complete analysis and set of recommendations with respect to the regulation and enforcement of glider-based vehicles. Nuss Truck & Equipment supports the comments submitted by Volvo Group North America. [EPA-HQ-OAR-2014-0827-0918-A2 p.2]

The rapidly expanding glider-based vehicle market is seriously undermining the significant gains EPA, NHTSA, and the heavy-duty vehicle industry have made to reduce criteria and greenhouse gas emissions, reduce fuel consumption, and improve roadway safety. The market availability of these non-compliant engines and vehicles poses an unfair competitive disadvantage to manufacturers that have undertaken the enormous effort and investment necessary to comply with all applicable emissions, fuel efficiency, and safety standards, and likewise an unfair competitive advantage to the dealer network representing those OEM's. It is therefore imperative that the agencies follow through by finalizing regulations that prohibit the production of glider-based vehicles for anything other than legitimate purposes, and that the agencies actively ensure compliance to those requirements. [EPA-HQ-OAR-2014-0827-0918-A2 p.2]

Organization: Owner-Operator Independent Drivers Association (OOIDA)

To compound this problem, the new proposal would limit the number of glider kits that could be produced and sold –under the assumption that drivers who use them would have less incentive to purchase a new truck that would achieve even greater efficiency. The unavailability of gliders kits is not likely a sufficient factor to overcome the fact that new trucks may be prohibitively expensive for many truck owners. The agencies should not discourage the modification of older equipment at the expense of incremental environmental benefits. This is especially true considering that one of the major benefits of a glider kit is reduced fuel consumption. When a reliable engine is placed into a new aerodynamic tractor, this will clearly result in a reduction of GHG emissions, which should be applauded by the agencies. If the agencies wish to address glider kits in any way OOIDA believes this issue should be the subject of a separate rulemaking. [EPA-HQ-OAR-2014-0827-1244-A1 p.44-45]

Organization: PACCAR, Inc.

I. Glider Standards: EPA and NHTSA Should Adopt Glider Regulations that Reflect the Needs of Customers and Manufacturers.

Gliders are and have been for many years a key tool for fleet and individual vehicle owners to cost effectively use all the vehicle major components, such as the engine, transmission, and rear axles, to transport goods to the American consumer and to do so at the lowest cost possible. PACCAR understands EPA's concern regarding oxides of nitrogen (NOx) emissions that comes from earlier emission level engines that can be put into current model year gliders. Recognizing this concern as well as the needs of the market, PACCAR provides the following recommendation for glider provisions in the Phase 2 regulation. [NHTSA-2014-0132-0223-A1 p,2]

• GHG Vocational and Tractor vehicles should be allowed to have installed post-2010 emissions engines with no volume or no mileage limitations on the engine [NHTSA-2014-0132-0223-A1 p.2]

• Implementation of the requirement to install post-2010 emissions engines should be phase-in with full implementation tied to the start of the Phase 2 GHG regulation in 2021, except for Small Business as is noted below [NHTSA-2014-0132-0223-A1 p.2

• EPA-defined Small Manufacturers would be exempt from the requirements of the GHG regulation through 2021. The volume limit of gliders for 2018 through 2021 will be their highest build volume between 2012 and 2014, inclusive, or 300 units, whichever is smaller. There is no restriction prior to 2018. As of 2022, the exemption requires the installation of post-2010 engines, same as for non-exempt businesses. [NHTSA-2014-0132-0223-A1 p.2]

a. Glider Manufacturers Do Not Have All the Details about the Final Glider Configuration.

In NODA document EPA-HQ-OAR-2014-0827-1627 titled “Legal Memorandum Discussing Issues Pertaining to Trailers, Glider Vehicles, and Glider Kits under the Clean Air Act” Section f. Controls on Manufacturers of Glider Kits, EPA states that “…glider kits include the entire tractor chassis, cab, tires, body, and brakes. Glider kit manufacturers thus control critical elements of the ultimate vehicle’s greenhouse gas emissions, in particular, all aerodynamic features and all emissions related to tire type.” EPA’s understanding of the content of a glider kit and the extent of the data knowledge of the glider manufacturer is incorrect. Gliders are built in a variety of configurations. Many do not have rear axles installed, thus no information is known by the manufacturer on the axle configuration, the rear axle ratio, or the rear tires. [NHTSA-2014-0132-0223-A1 p.2]

In some cases, the vehicle is modified during the assembly process to change the cab / sleeper configuration without the knowledge of the glider manufacturer. Other components that impact aerodynamics such as exhaust system configuration and roof fairing designs are not known by the manufacturer at the time of glider build. Thus the manufacturer does not always have the necessary data needed as input to GEM for that glider, which challenges the concept that the glider manufacturer is inherently the correct regulated entity for the glider as a finished vehicle. [NHTSA-2014-0132-0223-A1 p.2-3]

Additionally, in this same section, EPA states “Glider kit manufacturers also invariably know the final configuration of the glider vehicle, i.e. the type of engine and transmission which the final assembler will add to the glider kit. This is because the glider kit contains all necessary wiring, and it is necessary, in turn, for the glider kit manufacturer to know the end configuration in order to wire the kit properly.” Again, the reality is different from EPA’s understanding. The glider manufacturer does not always provide engine or transmission wiring for the major components that will be installed. Wiring harnesses can be ordered at the same time as the glider, but the reality is that the glider assembler often greatly modifies the harness so that it will work for a completely different and unintended engine. For example, wiring harnesses for a CAT engine are being reworked for a Detroit Diesel engine. It must be noted that even though these two engines are installed in significant numbers in gliders, neither of these engines are installed in PACCAR vehicles at the factory and have not been for nearly a decade. As a result, significant rework is required that is uncontrolled by PACCAR. Also, this means that the glider manufacturer does not necessarily know the engine or the transmission that will be installed. Transmission information is used only to determine the correct driveline length. Multiple transmissions that would have very different GEM inputs have the same effective lengths. Also, no information regarding manual versus automated manual configuration of a transmission are provided with the glider orders. [NHTSA-2014-0132-0223-A1 p.3

b. Labeling of Gliders as “Not for Tractors” Adds No Value Under PACCAR’s Proposal.

In Section g. Alternative Provisions for Trailer and Glider Kit Manufacturers as Manufacturers of Motor Vehicle Parts, EPA proposes a unique label for gliders that will be used in Vocational applications. In the PACCAR proposal that is detailed at the start of this document, there is no difference between Tractor and Vocational vehicles, therefore there is no need for a unique labeling requirement. [NHTSA-2014-0132-0223-A1 p.3]

c. Requirements for Rebuilt / Remanufactured Engines to Meet Current Engine Standards are Not Needed.

The requirement outlined in Section h. Alternative Provisions for Engine Remanufacturers, that all engines that are rebuilt or remanufactured must meet the current model year engine standard if the engine is used in a glider is no longer required under the PACCAR proposal. Starting in 2021, all glider engines must be post-2010 engines in compliant configurations with the appropriate aftertreatment system, thus eliminating this requirement and mitigating EPA's concern regarding pre-2010 engines being rebuilt or remanufactured for installation into gliders. [NHTSA-2014-0132-0223-A1 p.3]

d. PACCAR Agrees with Provision for Installation of Post-2010 Engines Without Restriction

PACCAR urges EPA to finalize the provision in Section i. Glider Vehicles Using Newer Engines, to allow the installation of post-2010 engines, those meeting the 2010 NOx and PM emissions standards, to be installed in gliders starting in 2021 without limitation to mileage, age, or quantity per manufacturer or assembler. [NHTSA-2014-0132-0223-A1 p.4]

e. Delegated Assembly Provisions Should Reflect the Information Known by and Available to the Glider Manufacturer

PACCAR also urges EPA to revise 40 CFR 1037.130 Assembly instructions for secondary vehicle manufacturers, to include only Sections (a), (b)(1), (b)(2), (b)(4), and (c) as the provisions required when delegated assembly is used to support the assembly of gliders by secondary manufacturers. [NHTSA-2014-0132-0223-A1 p.4]

PACCAR sells glider kits through the Kenworth and Peterbilt dealer networks. [NHTSA-2014-0132-0223-A1 p.4]

[Table can be found on p.4 of docket number NHTSA-2014-0132-0223-A1]

Supporting contracts, audits, affidavits, and documentation for each assembler and on-going support for each order of a glider are typically included with full delegated assembly provisions. EPA has not properly anticipated or included in the regulation development the associated burden for such a large number of assemblers if the Small Business exemption is removed. Limiting the delegated assembly requirements is the appropriate action, regardless of the decision on the Small Business exemption. [NHTSA-2014-0132-0223-A1 p.4]

PACCAR will work with the agencies on the appropriate content on gliders for end of year reporting. [NHTSA-2014-0132-0223-A1 p.4]

Gliders

The current proposal limiting the build of glider kits per year with non-current emissions engines is extremely stringent and overly burdensome to manufacturers, customers, and dealers. Also the requirement that each non-exempt glider have a current year emissions engine will render many powertrains as scrap parts even though they have recently been manufactured and are capable of powering a new vehicle body. [EPA-HQ-OAR-2014-0827-1204-A1 p.26]

Over the last three years, PACCAR has sold glider kits through the Kenworth and Peterbilt dealer network to over 1,200 unique individual customers who have assembled gliders or had gliders assembled for them. For model year 2014 alone, this number was more than 500 customers. In that three-year period, PACCAR sold glider kits to support those customer through 78 different dealer groups comprised of over 215 separate Kenworth and Peterbilt dealer locations across the United States. The vast majority of these dealer groups purchased fewer than 50 glider kits from PACCAR each of these years. Of these groups, 14 did not purchase any glider kits from PACCAR in 2014, the year on which EPA proposes to base the limit for glider exemptions, but did purchase fewer than 50 glider kits in one or both of the preceding or trailing years. If EPA finalizes the rule as proposed, these dealers would be unable to purchase PACCAR glider kits and provide customers with an option to retain powertrains after January 1, 2018. [EPA-HQ-OAR-2014-0827-1204-A1 p.26]

PACCAR understands EPA's concern about older, less efficient, higher-emission engines being installed into gliders when newer, more efficient, and cleaner powertrains are available. However, many glider purchasers have been involved in accidents, or have had other damage to the vehicle body, and are left with a fully functional powertrain. EPA's proposal would unduly penalize those operators and others who are not attempting to avoid purchasing newer-model year engines but are simply trying to continue to use an existing, undamaged powertrain. [EPA-HQ-OAR-2014-0827-1204-A1 p.26]

PACCAR recommends that the agencies extend the effective date of any limitation to January 1, 2021 to align with the Phase 2 regulation implementation, which will provide more lead-time for the industry to understand and accommodate the change in regulation. PACCAR also strongly recommends that the agencies provide more flexibility for entities that did not assemble any gliders in 2014 but which have done so between 2014 and the effective date of the Phase 2 final rule. Specifically, if the implementation is set at the recommended January 1, 2021 date, EPA should allow the assembly of up to 300 gliders per year for any individual company as exempt from the Phase 2 regulation, provided that the engine/powertrain to be installed meets MY2010 or newer emission standards. EPA also should allow without limit the assembly of gliders where the engine meets the emissions standard for the year the glider was assembled. [EPA-HQ-OAR-2014-0827-1204-A1 p.26-27]

If the implementation is set at January 1, 2018 as proposed in the NPRM, then EPA should allow all small businesses, as defined by federal regulations, to assemble a minimum of 50 gliders per year as exempt from the engine / vehicle model year requirements, regardless of the emission standard of the engine, and up to their maximum sales in 2013 or 2014, or 300. The agencies also should allow the installation of engines that meet MY2010 or newer emission standards without a volume limit for any company. This will mitigate the EPA concern about non-DPF engines from being installed at current volumes and eliminates the issues of recently built powertrains not being allowed for installation in new gliders. [EPA-HQ-OAR-2014-0827-1204-A1 p.27]

Organization: Reeves Brothers Trucking, Inc.

On The Economical End Of The Phase 2 Proposed By The EPA And NHTSA Regarding Greenhouse Gas Emissions And Fuel Efficiency Standards For Medium And Heavy Duty Engines And Vehicles, Gliders Are Less Expensive Than New Trucks And Offer A More Economical Option For Smaller Fleets And Owner Operators. [EPA-HQ-OAR-2014-0827-1465-A2 p.1]

A Glider Kit Trucks Is Not Considered A New Vehicle. It Has New Cab, Front Axle And Frame/Chassis with a Used Rebuilt Engine, Transmissions, Etc. Therefor Is Not Considered A New Truck Under The CAA. The Impact That Phase 2 Will Have On Small Business Would Bear Heavily On The Small Fleet and Single Owner/Operator. The Difference In A Glider Vehicle Compared To The Cost of A New Vehicle Could Mean Thousands Of Dollars When Purchasing One. Cost Is A Special Focus For Small Businesses. If The Price Is Unattainable They Are Less Likely To Purchase The Vehicle. In The End The Financial Burden Is On The Builders And Buyers. Small Businesses Do Not Have The Maintenance Capabilities Nor The Technology That Would Be Required To Keep New Vehicles Maintained And The Maintenance Up To Date. It Would Not Be Cost Effectively To The Small Businesses And The Burden Would Lie Upon Them. [EPA-HQ-OAR-2014-0827-1465-A2 p.1]

In Agreement, Rep. Diane Black Stated, The EPA's Phase 2 Proposal Would Unfairly Target the Glider Kit Industry and Limit the Buyer's Choices. The Builder of The Glider Kit Vehicle Provide Numerous Jobs To The Community And Surrounding Areas. If The Glider Kit Is Done Away It Would Be A Huge Blow To The Community As Well As The Suppliers And Not To Forget The Small Businesses And Owner Operators. The Bottom Line Is It Is Not An Economical Choice When Seen Thru The Small Businesses And Owner/Operator Eyes When Considering The Cost Of Glider Vehicle Compared To A New Vehicle Along With The Cost Of The New Technology And Maintenance It Would Require. [EPA-HQ-OAR-2014-0827-1465-A2 p.1]

Organization: Sierra Club

Close the glider kit loophole

We applaud the agencies for the proposed treatment of glider kits. In recent years, sales of glider kits have skyrocketed, accounting for roughly two percent of all Class 8 vehicles manufactured annually. Many of the engines used on these vehicles emit substantially greater amounts of NOx and particulate matter than current emissions standards allow. Under the proposal, glider kit manufacturers will no longer be able to exploit a loophole leading to more health-threatening pollution. We urge you to finalize the provisions that would close the glider kit loophole. [EPA-HQ-OAR-2014-0827-1277-A1 p.3] [[These comments can also be found in Docket Number EPA-HQ-OAR-2014-0827-1420, p.190.]]

Organization: Terex Corporation

[The following comments were submitted as testimony at the Chicago, Illinois public hearing on August 6, 2015. See Docket Number EPA-HQ-OAR-2014-0827-1372, p. 105-108.]

Comment number one, page 40529 of the proposal says that EPA requests comment on whether we should allow larger manufacturers to produce some limited number of glider kits.

Therefore, Terex proposes that if the EPA sets limits on the quantity of gliders produced, it should not be based solely on the number of employees the glider manufacturer has, but should also be based on the number of on highway vehicles it produces similar to the way the off highway transition program for equipment manufacturers is set up.

For example, Terex Corporation has approximately 20,000 employees globally, but only approximately 220 are involved in the manufacturer of gliders at one small facility located in Fort Wayne, Indiana. Should the proposed regulations continue unchanged, it would result in the redundancy of some 70 team members at the Fort Wayne facility. Therefore, Terex proposes if a company manufactured fewer than 1,000 on highway vehicles annually between calendar years 2010 and 2014, then it should be eligible for the same exemptions as a small manufacturer under the proposed 1037.635(b).

Comment number two, the proposed definition number three of 'glider kit' on page 40662 says that a 'glider kit' means 'any other new equipment that is intended to become a motor vehicle with a previously used engine, include a rebuilt or remanufactured engine.' Terex requests further clarification and/or a definition of 'other new equipment.' The intention of this request is to eliminate confusion over whether certain new parts or assemblies that would be used to repair an existing vehicle would be considered as 'new equipment' by the EPA.

Comment number three, page 40229 says that building a glider out of salvaged powertrain from vehicles destroyed in accidents is 'an arguably legitimate purpose,' and Terex agrees with the agencies on that.

The proposed limitation on gliders doesn't distinguish between repaired vehicles and glider kits. Terex suggests that language be added that allows for a used powertrain to be installed onto a new chassis for the case of repairing a damaged vehicle, and not be subject to regulations that are newer than the original bill date of the damaged vehicle.

And then my final comment number four is regarding page 40186. It says that six by six and eight by eight vehicle configurations are only manufactured for specialized vehicles that require extra traction for off road applications. They are very low volume sales, and their increased fuel consumption and CO2 emissions are not significant in comparison to the overall reductions of the Phase 2 program.

Therefore, Terex suggests that vehicles with six by six and eight by eight configurations must be added to the last of exemptions under the proposed 1037.635(b) concerning glider kits. Because these vehicles operate off road, they are far more susceptible to wear and tear type frame damage that is premature compared to the engines that were designed to operate for a million miles. For this reason, glidering six by six and eight by eight vehicles is and has always been common industry practice, even before the arrival of after treatment systems on diesel engines.

Organization: Truck & Engine Manufacturers Association (EMA)

Glider Kits

The same problems noted above also would flow from the agencies' proposed treatment of glider kits. Glider-kit manufacturers should not be held responsible for the ultimate downstream configuration of the vehicle, so long as the glider-kit manufacturer has provided proper instructions to the vehicle finisher for the installation of emission-related components. Beyond that, and just as in the case of incomplete-vehicle manufacturers, the manufacturers of glider kits should not be transformed by regulation into the de facto guarantors of separate business entities that complete the manufacture of vehicles using glider kits. [EPA-HQ-OAR-2014-0827-1269-A1 p.36]

With respect to the agencies' other proposals for regulating glider kits, EMA supports the agencies' proposal to provide a small business exemption for any business entity that employs less than 1000 people and that falls under the production cap set forth in proposed section 1037.635(c). A small business exemption is necessary to avoid disproportionate impacts on a significant number of diverse business entities, including the small businesses that participate in the assembly of gliders. [EPA-HQ-OAR-2014-0827-1269-A1 p.36]

It should be noted that in their proposed regulation of glider kits, the agencies are, in effect, proposing to adopt regulatory requirements for vehicle parts, as opposed to motor vehicles. The CAA defines a "motor vehicle" as any "self-propelled vehicle designed for transporting persons or property on a street or highway." (See 42 U.S.C. §7550(2)). A glider kit is not self-propelled and so, on its own, is not a "motor vehicle" within EPA's regulatory jurisdiction. Thus, the glider kit manufacturer is not an entity over which EPA has regulatory authority. [EPA-HQ-OAR-2014-0827-1269-A1 p.36]

Organization: Truck Country of Wisconsin

As you know, there are differences between the two agency's in their respective views on regulatory frameworks for safety and air emissions and definitions of 'glider kits' [EPA-HQ-OAR-2014-0827-1468-A1, p.1]

NHTSA defines a 'glider kit' as motor vehicle equipment that primarily includes the chassis cab, but generally does not include the engine or rear axles. EPA defines 'glider kits' to both the complete and incomplete vehicles and applies its regulations to both. (See 40 CFR 1037.801 of EPA's proposed regulatory text). [EPA-HQ-OAR-2014-0827-1468-A1, p.1]

I support EPA's definition of 'glider kits' as an important step to ensure uniformity between EPA and NHTSA for the following reasons. [EPA-HQ-OAR-2014-0827-1468-A1, p.1]

Air pollution and emissions are a significant problem with 'Glider kits' support EPA's definition 'glider kits' as an important step to ensure uniformity between the EPA and NHTSA for the following reasons:

1. We agree with EPA's assessment that most gliders manufactured today use remanufactured model year 2001 or older engines. Typically these engines have and NOX and particulate matter (PM) emissions 20 to 40 times higher than today's clean engines. Since 2010 when EPA's current NOx and PM standards for heavy duty engines took effect, glider sales have increased nearly 10-fold as compared to the 2004-2006 time frame. [EPA-HQ-OAR-2014-0827-1468-A1, p.1]

2. We agree with EPA that this increase reflects an attempt to avoid using engines that comply with EPA's 2010 standards, and is an attempt to circumvent the Clean Air Act purpose to protect human health and the environment. [EPA-HQ-OAR-2014-0827-1468-A1, p.1]

3. The Trucking Industry has made enormous investments in new engines standards to comply with past and future EPA regulations. We believe this circumvents these standards and will make it harder to meet compliance. [EPA-HQ-OAR-2014-0827-1468-A1, p.1]

4. We agree with EPA's Clean Air Act definition of 'new motor vehicle' is not based on the condition of the parts assembled to create the vehicle but rather encompasses the entire vehicle, even if they incorporate some previously used components. [EPA-HQ-OAR-2014-0827-1468-A1, p.2]

In conclusion, Truck Country supports the new EPA requirements are being proposed in the HD Phase 2 Notice of Proposed Rulemaking. By proposing new requirements beginning January 1, 2018 that would generally require engines installed in new gliders to meet the same requirements as new emissions-compliant engines- both for GHGs and for other harmful pollutants such as NOx and PM. Beginning in model year 2021, Phase 2 standards for heavy duty vehicles would also apply to gliders. [EPA-HQ-OAR-2014-0827-1468-A1, p.2]

In addition, we oppose the HD Phase 1 exemption for small businesses that manufacture gliders for model years 2018 and beyond and we fully support EPA's proposal to end this blanket exemption on January 1, 2018. We agree with EPA to limit the grandfathering of existing small businesses that currently install the used engines and other used parts into gliders. These special provisions allow too much discrepancy to continue production of assembled gliders creating an already air quality problem for industries who have to meet the Clean Power Plan and Ozone regulations. [EPA-HQ-OAR-2014-0827-1468-A1, p.2]

Finally, we believe EPA's approach in resolving this issue in proposing these changes is in the best interest to improving air quality in this country and create consistency between the two agencies. Properly regulating the 'glider kit' issue will improve the health care of all citizens as we try to address greenhouse gas emissions for future generations. [EPA-HQ-OAR-2014-0827-1468-A1, p.2]

Organization: Union of Concerned Scientists (UCS)

GLIDER KITS

UCS supports the closing of a loophole that currently allows glider kits—chassis and powertrains assembled by a third party and sold as new trucks—to not comply with fuel economy, greenhouse gas, and other pollution control regulations. These vehicles have traditionally played an important role in maintaining investments when parts of trucks were rendered unusable due to accidents and until recently only a few hundred a year were sold. In recent years, however, thousands of glider kits have been sold annually to get around pollution control systems. This has led to extreme discrepancies in pollution from OEM-manufactured new vehicles and new glider kit vehicles. EPA analysis shows that while glider kits make up only 2 percent of Class 8 vehicle sales, they contribute nearly half of the total NOx and particulate emissions from all new Class 8 vehicles (EPA and NHTSA 2015). These glider kit vehicles should be regulated the same as any other new vehicle and this proposal will put them on equal footing with other new trucks. [EPA-HQ-OAR-2014-0827-1329-A2 p.13]

Organization: Volvo Group

Glider Vehicles and Small Manufacturer Exemption

Volvo Group strongly supports the agencies' proposal to take action within this proposed rulemaking to require that companies selling new vehicles produced by installing used driveline components into new glider kits certify the compliance of these vehicles and their engines to the prevailing greenhouse gas and criteria emissions standards. The glider-based market, which has exploded over the last several years, is built upon the allure of simpler, lower maintenance engine designs of the pre-2004 emissions era, wherein these vehicles can be produced at a much lower cost due to the use of used driveline components and exclusion of emission and safety related systems. In Volvo Group's view, glider-kits can serve a legitimate purpose, that being a major repair to a vehicle that has been involved in an accident and is damaged to the point that only some driveline components are reasonably salvageable. Yet Volvo Group has deep concerns that the market which has emerged over recent years is one built upon circumvention of today's stringent emissions standards rather than a legitimate use of glider kits, and agrees with the agencies that the practice must stop or be significantly limited. [EPA-HQ-OAR-2014-0827-1290-A1 p.60-61]

Volvo Group also supports the agencies' proposal to eliminate the exemption to greenhouse gas and fuel efficiency requirements for small manufacturers, but proposes that the exemption sunset sooner than the agencies have proposed. [EPA-HQ-OAR-2014-0827-1290-A1 p.61]

Glider Kits can serve a Legitimate Purpose

The "glider kit" emerged some decades ago as an assemblage of new vehicle components absent the engine, transmission, and rear axles (the "driveline"). These kits were produced by vehicle OEMs, and made available for sale to dealers and other vehicle repair centers as a means to repair a vehicle that had been badly damaged in an accident or similar event. This permitted re-use of driveline components that had not yet accumulated end-of-life mileage by the time of the accident. Volvo Group believes this is a reasonable and practical application for a glider-kit; namely as a means for an individual truck owner to recover from such an unexpected event that would otherwise cut short the lifetime of a purchased capital good. [EPA-HQ-OAR-2014-0827-1290-A1 p.61]

For purposes of establishing acceptable practices concerning the application of glider kits in these instances, and to clarify what practices would constitute creation of a new vehicle obligating the assembler to certain requirements under NHTSA safety regulations, NHTSA adopted language as follows: [EPA-HQ-OAR-2014-0827-1290-A1 p.61]

49 CFR §571.7 Applicability.

(a) General. Except as provided in paragraphs (c) and (d) of this section, each standard set forth in subpart B of this part applies according to its terms to all motor vehicles or items of motor vehicle equipment the manufacture of which is completed on or after the effective date of the standard. [EPA-HQ-OAR-2014-0827-1290-A1 p.61]

* * * *

(e) *Combining new and used components.* When a new cab is used in the assembly of a truck, the truck will be considered newly manufactured for purposes of paragraph (a) of this section, the application of the requirements of this chapter, and the Act, unless the engine, transmission, and drive axle(s) (as a minimum) of the assembled vehicle are not new, and at least two of these components were taken from the same vehicle. [EPA-HQ-OAR-2014-0827-1290-A1 p.61]

Simply put, when assembling a motor vehicle using a new cab, as is the case with assemblies from glider kits, the final vehicle assembly is a new motor vehicle unless the engine, transmission *and* rear axle(s) are *all* used, *and* at least two of them come from the same donor vehicle. Said another way, if any of the three driveline components is new, the finished assembly is a new motor vehicle. Or, if all three are used components but were salvaged from more than two donor vehicles, the finished assembly is a new motor vehicle. The final assembler of any new motor vehicle is obligated, at minimum, to: (a) register with NHTSA as a vehicle manufacturer, (b) to create and register Vehicle Identification Numbers (VINs) with NHTSA, (c) certify compliance of the finished vehicle to all applicable NHTSA safety standards, (d) file reports regularly with NHTSA regarding safety defects, and (e) undertake recall obligations to correct certain safety defects. [EPA-HQ-OAR-2014-0827-1290-A1 p.61-62]

New Glider Kit Market is Based on Avoiding Emission Controls

A new market has emerged based on use of glider kits to create essentially new vehicles that do not comply with applicable safety, criteria emissions, or greenhouse gas standards.

While there is a limited, legitimate and practical application of glider kits in the heavy-duty truck market, a market has emerged whereby new vehicles are being assembled from glider kits -- not to repair a wrecked vehicle -- but rather to be offered for sale as new vehicles. These new vehicles are built with used or remanufactured engines that are not compliant with current criteria emissions standards at the time of vehicle manufacture. Similarly, neither these vehicles nor their installed engines are compliant to applicable greenhouse gas emissions and fuel consumption standards at the time of manufacture. Finally, these vehicles also do not comply with all applicable safety standards, and some glider vehicle manufacturers appear not to be complying with all obligations incumbent upon a new vehicle manufacturer per NHTSA regulations. [EPA-HQ-OAR-2014-0827-1290-A1 p.62]

Assemblers of glider vehicles ("glider vehicle," as used herein, means a fully assembled vehicle, built from a glider kit, complete with used or remanufactured driveline components installed) have adopted a number of business practices for producing these vehicles. Often, the rear axles installed on glider vehicles are not, in fact, used components; they are actually new units as purchased from the glider-kit supplier. Some engines installed are rebuilt before installation, others are remanufactured engines purchased from a remanufacturing facility. The same holds true for transmission sourcing.

Remanufactured engines typically are produced from a process that renders it impossible to link a finished product to a source "donor vehicle." None of these practices appear to be consistent with NHTSA regulations that allow the exception to the manufacturing of a new vehicle. [EPA-HQ-OAR-2014-0827-1290-A1 p.62]

Not only can these new glider-based vehicle assemblies be seen as a circumvention of regulatory obligations, they also set up an unfair competitive advantage to manufacturers of new motor vehicles who are complying with all applicable emissions, fuel consumption, and safety standards. Today's cleanest, most fuel efficient and safest vehicles are necessarily tens of thousands of dollars more costly to produce, more expensive to maintain, and can cost more to operate, than glider-based vehicles. As such, heavy-duty truck OEMs and their dealers are unfairly forced to compete with these higher-emitting, less safe vehicles. Additionally, application of certain Internal Revenue Service rules can result in new vehicle sales where the purchaser is not obligated to pay the 12% Federal Excise Tax (FET) that normally applies to new vehicle sales, giving customers even further financial incentive to purchase glider vehicles rather than fully compliant new vehicles. [EPA-HQ-OAR-2014-0827-1290-A1 p.62]

These unfair competitive advantages have led to a boom in glider vehicle sales in recent years. EPA and NHTSA state in the Preamble that total glider-based vehicle volumes were typically less than 1000 units prior to 2007. The Small Business Advocacy Review Panel for the Phase 2 proposal, however, notes that for 2011 and 2012, sales of glider vehicles "spiked to almost 4,000 per year." Moreover, based on Polk registration data, Volvo Group estimates that 2014 glider-based sales were on the order of 6,000 units or more, about 3% of the total Class 8 market; and 6 times the pre-2007 estimates that EPA and NHTSA appear to rely on in the proposal. Some assemblers report that plans for major expansions of their assembly capacity are underway. Such a gross expansion will further frustrate the ability of OEM dealers to compete in the marketplace with fully compliant products. Without regulatory intervention, there's little reason to expect this trend to be reversed, and therefore regulatory intervention is absolutely necessary. [EPA-HQ-OAR-2014-0827-1290-A1 p.62-63]

Glider-based Vehicles Have Huge Environmental Impact

Glider-based vehicle assemblies are having a huge impact on the environment, and introducing undue risk to American roadways.

In response to EPA's Clean Diesel Program, manufacturers of heavy-duty engines introduced complex and expensive technologies including exhaust gas recirculation systems, diesel particulate filters, and selective catalytic reduction aftertreatment systems to achieve unprecedented reductions in NOx and particulate matter. Most glider vehicle manufacturers are installing pre-2004 engines, which lack all of the technologies mentioned above, and hence have substantially higher emissions. Even if these engines were fully compliant with all requirements in place prior to the advent of clean diesel technology requirements, the emissions from these engines compared to modern diesels are considerably higher. EPA's own analysis as detailed in their recent glider Q&A document indicates that NOx and PM emissions from glider vehicles at current sales levels are equivalent to about 80 percent of the total NOx and PM emissions from the *entire* Class 8 sales fleet. Focusing on PM emissions, and applying the emissions levels indicated in Argonne National Lab's recent update to the GREET Analysis[13], at just 3% market penetration of the most egregious applications, the 2014 glider fleet emits *twice* the level of PM emissions that the 97% *entire* fleet of compliant vehicle sales emits that same year. [EPA-HQ-OAR-2014-0827-1290-A1 p.63]

These numbers are astounding; little more justification is needed to understand the importance of EPA taking action to address emissions from this market. [EPA-HQ-OAR-2014-0827-1290-A1 p.63]

While the impact of glider vehicles on heavy-duty greenhouse gas emissions and fuel consumption is not currently believed to be on the same scale as that of criteria emissions, the requirements promulgated in EPA's current and proposed greenhouse gas regulations, and the growth being witnessed in the glider market, will certainly lead to a huge compliance gap between glider vehicles and fully compliant vehicles. At present, the majority of manufacturers of glider vehicles fall under the small manufacturer exemption to the GHG Phase 1 regulation, relieving them of any obligation to certify their products to demonstrate conformance to EPA and NHTSA greenhouse gas and fuel consumption standards. [EPA-HQ-OAR-2014-0827-1290-A1 p.63-64]

Finally, with respect to safety, heavy-duty OEMs are making huge investments to fully comply with Federal Motor Vehicle Safety Standards ("FMVSS"), so as to verify and deploy the best known technologies to ensure the safety of American roadways. According to the current NHTSA regulation and our understanding of the assembly practices and component sourcing applied by glider vehicle manufacturers today, these manufacturers should likewise be responsible for all current applicable FMVSS standards. It appears, however, that they are not meeting all of these requirements, including full vehicle certification, safety defect reporting obligations, and reporting of vehicle VINs for purposes of potential safety recall obligations. This practice is putting the safety of America's roadways at risk and must be addressed. NHTSA must begin to take appropriate action to ensure these requirements are fulfilled by all manufacturers of heavy-duty vehicles. [EPA-HQ-OAR-2014-0827-1290-A1 p.64]

Volvo Group Supports Action to Reform Glider Market

Based on all the foregoing arguments, Volvo Group supports the regulatory action that EPA and NHTSA are proposing to subject glider vehicles and their engines to the same criteria emissions and greenhouse gas emissions requirements as apply to other new vehicles manufactured for sale in the United States. Volvo Group believes that NHTSA also should take steps to fully enforce their existing vehicle safety requirements applicable to glider based vehicles. [EPA-HQ-OAR-2014-0827-1290-A1 p.64]

With respect to EPA requirements, it is first important to recognize and clarify that vehicles produced from glider kits *already* are subject to GHG standards under 40 CFR Part 1037. This regulation applies to "all new heavy-duty vehicles, except as provided in § 1037.5" (40 CFR § 1037.1). With the exception of vehicles produced before 2014, none of the exclusions set forth under 1037.5 apply to vehicles produced from glider kits. Accordingly, these vehicles have been subject to EPA regulations since Jan. 1, 2014. EPA has recognized as much. In the proposal, the Agency states: "For EPA purposes, CO2 provisions of Phase 1 exempted gliders and glider kits produced by small businesses but did not include such a blanket exemption for other glider kits. Thus, some gliders and glider kits are already subject to the requirement to obtain a vehicle certificate prior to introduction into commerce as a new vehicle. *However, the agencies believe glider manufacturers may not understand how these regulations apply to them, resulting in a number of uncertified vehicles."* 80 *Fed. Reg.* 40138, 40215. Furthermore, EPA has identified at least one glider manufacturer that does not qualify as a small manufacturer, [RIA, Section 12.4], and it is unclear whether those that do have followed the requirements to notify EPA of their intent to produce excluded vehicles and label those vehicles as excluded pursuant to 40 CFR § 1037.150(c). [EPA-HQ-OAR-2014-0827-1290-A1 p.64]

While EPA believes some in the industry simply do not understand the Agency's regulations, Volvo Group is concerned that EPA has underestimated the sophistication of many in this industry, for which ignorance of the rules should not be an excuse for failure to comply. These include large glider vehicle manufacturers, which produce and sell complete glider vehicles that unquestionably are subject to GHG regulations. These are sophisticated operations that must be held accountable for complying with all EPA regulations to the same extent as other vehicle manufacturers. [EPA-HQ-OAR-2014-0827-1290-A1 p.64]

The small business exemption should be revoked sooner than EPA and NHTSA have proposed.

The sheer number of uncertified vehicles produced since 2014 also underscores a second significant shortcoming of EPA's Phase 1 rule, which must be addressed in Phase 2; the small manufacturer exemption at 40 CFR § 1037.150(c). The exemption, as currently applied, exempts manufacturers that employ fewer than 1,000 employees. As explained in Volvo Group's comments on the Phase 1 regulation, this exemption creates a sizable loophole for many manufacturers that produce substantial quantities of vehicles. [EPA-HQ-OAR-2014-0827-1290-A1 p.65]

EPA has proposed phasing out the small manufacturer exemption by 2022, or one year after all other manufacturers are required to comply with the Phase 2 requirements. Volvo Group does not believe the small manufacturer exemption was justified in Phase 1, and opposes further extension of this loophole for another seven years. Volvo Group believes that the Small Manufacturer Exemption should be phased out by January 1, 2018. Such a schedule gives these manufacturers *an additional* four years of lead-time to meet Phase 1 GHG standards, above and beyond the lead-time afforded to their competitors. Failing this, the agencies should simply eliminate the one year delay and remove the exemption for the entirety of Phase 2, starting with the 2021 Model Year. [EPA-HQ-OAR-2014-0827-1290-A1 p.65]

Volvo Group is uncertain of the correct interpretation of the provisions of 40 CFR 1037.635. This section is entitled "Glider Kits"; however, the agencies lay out the necessary conditions to qualify for the limited production exemption described in that section as, ."..if you are a small manufacturer and you sold vehicles in 2014 under the provisions of § 1037.150(j)." The provisions at 1037.150(j) permit a manufacturer to install 2013 model year and earlier engines in vehicles (the provision has been revised in this proposal to sunset with vehicles having a date of manufacture January 1, 2018 or later). Many manufacturers, large and small, have installed 2013 model year engines in vehicles sold in 2014. This may have included vehicles having a 2013 date of manufacture, or having a 2014 date of manufacture, that were sold in 2014. There are no requirements to inform the agencies of the plan to sell vehicles under the provisions of 1037.150(j), nor to provide any reports to EPA. On its face, the limited volume exemption at 1037.635 effectively applies to *all* small manufacturers of vehicles. If this was the agencies' intent, Volvo Group opposes the provisions, and considers that small business should not be afforded any exemptions. If this was not the agencies' intent, then Volvo Group proposes that the agencies clarify the language to specify that the vehicles sold under the provisions of 1037.150(j) must have been vehicles produced by small manufacturers from glider kits, as the name of the section implies. [EPA-HQ-OAR-2014-0827-1290-A1 p.65]

EPA Should Review Glider Exemption and Stockpiling Potential

Since glider vehicle producers assemble vehicles from parts purchased from OEMs, engine remanufacturers and other suppliers, these companies do not require a substantial number of employees to be able to produce a substantial number of vehicles. In this regard, EPA's small manufacturer exemption also creates a sizeable loophole for many glider vehicle producers, which in turn were able to produce (and continue to be able to produce) substantial numbers of uncertified glider vehicles. For this reason, Volvo Group supports EPA's efforts to limit this loophole through the Phase 2 rulemaking, but is concerned that the Agency's efforts may be too little too late in terms of stemming the impact of glider vehicles in undermining GHG and criteria emissions reductions achieved to date and in the future. At a minimum, EPA should impose the proposed 300-vehicle annual limit on the production of glider vehicles; although Volvo Group believes that even this limit likely far exceeds what is necessary to allow for legitimate use of glider vehicles while preserving important emissions reductions. [EPA-HQ-OAR-2014-0827-1290-A1 p.65-66]

EPA is proposing to provide an exemption that would allow most glider-vehicle manufacturers (those that qualify as small manufacturers) to avoid criteria emissions and greenhouse gas/fuel consumption requirements for a limited number of glider vehicle sales each year. The proposal would limit the number of exempt vehicles any manufacturer can sell in a given year, starting in 2018 with respect to engine compliance with criteria and CO2 emissions/fuel consumption requirements, and 2022 with respect to vehicle compliance with CO2/fuel consumption requirements. The annual sales would be limited to the manufacturer's highest annual sales volume over the years 2010 through 2014, or 300 units, whichever is less. Volvo Group questions why such an annual exemption is deemed necessary or appropriate, especially in light of the considerations set forth herein. [EPA-HQ-OAR-2014-0827-1290-A1 p.66]

In the Regulatory Impact Analysis, the agencies cite the recommendations of the Small Business Advocacy Review (SBAR) Panel in support of the proposed glider provisions. In particular, the agencies note "The Panel stated that it believes that the number of vehicles produced by small business glider manufacturers is too small to have a substantial impact on the total heavy-duty inventory." (RIA at 12-6) Nowhere in either the RIA or the SBAR Panel report, however, do any of the agencies provide a basis for this conclusion. Significantly, there is no discussion of the "spike" in production in 2011 and 2012 that the SBAR panel otherwise describes. There is no discussion or investigation of corresponding and increasing spikes in 2013 and 2014; or any acknowledgment – never mind further investigation – of this alarming trend. And there is no analysis of the impact of increased incentives to produce glider vehicles that will be generated by the GHG Phase 2 proposal. In summary, the agencies rely on a conclusory finding to dismiss what is likely to be a potentially significant undermining influence on the effectiveness of the GHG and criteria emissions regulations. [EPA-HQ-OAR-2014-0827-1290-A1 p.66]

First, EPA fails to take into account the incentive it is creating for more companies to engage in the manufacture of glider vehicles by codifying an exemption to the GHG Phase 2 regulations for these vehicles. As discussed earlier, while the proposal would be limited to entities that both installed engines pursuant to 40 CFR §1037.150(j) and qualify for the small manufacturer exemption, the universe of entities that meet these criteria likely is larger than the universe of existing glider vehicle manufacturers. Any entity that sold vehicles under the provisions of 40 CFR § 1037.150(j), regardless of its size at that time, could enter the glider-vehicle business as long as it qualifies as a small manufacturer at the time it elects to sell glider vehicles. If it elects to provide an exemption for glider vehicles, EPA should limit the exemption to entities that both qualified as small manufacturers in 2014 and sold vehicles *produced from glider kits* under the provisions of 40 CFR § 1037.150(j). [EPA-HQ-OAR-2014-0827-1290-A1 p.66]

Second, it does not appear that EPA has adequately considered the impact of its decision to delay imposition of any limits on these vehicles until 2018, when it proposes to require currently certified engines. The Agency, in doing so, is creating still further incentive for substantially increased production in 2016 and 2017. While pre-buys are a known consequence of new regulatory requirements (as occurred in 2007 and could again in 2016 prior to the reduced engine GHG standards effective with the 2017 model year), EPA need not exacerbate them by providing a window for the unfettered manufacture of non-compliant vehicles. At a minimum, EPA should adopt additional stringent measures to prevent the stockpiling of glider vehicles after new standards take effect, and/or pull forward the 2018 sunset date. [EPA-HQ-OAR-2014-0827-1290-A1 p.66]

Moreover, even if the Panel's conclusion were accurate when viewed on the basis of *production inventory,* this analysis makes no account of the impact these vehicles have on the *emissions* inventory. As illustrated earlier, we find the impact to be huge. Given the magnitude of the environmental impact these vehicles have compared to the fully compliant vehicles other manufacturers are obligated to sell, it would seem appropriate not to include any such exemption, or to limit the number to much less than 300. The Panel recommendations cited continue by saying, "The Panel also stated that there should be an allowance to produce some number of glider kits for legitimate purposes, such as for newer vehicles badly damaged in crashes." If the agencies are seeking to provide adequate volume to cover what have been characterized as "legitimate" applications of glider kits (wrecked vehicles and similar), it may be more appropriate to promulgate regulations that define allowed practices (repair of badly damaged vehicles) and prohibited practices (manufacture of new vehicles from new and used components that do not comply with current criteria and GHG emission requirements). If the agencies are seeking to provide a reasonable exemption to support the viability of small businesses already in existence today, we believe the recommendation of the panel to limit the exemption to "allow sales levels as high as the peak levels in the 2010-2012 timeframe," while retaining the condition that the annual volume never exceed 300 units per manufacturer, is the absolute maximum relief that should be granted. However, Volvo Group believes that the limit should be on the production of vehicles, rather than the sale. [EPA-HQ-OAR-2014-0827-1290-A1 p.67]

EPA has requested comment on whether the Agency should permit the sale of glider vehicles on the condition that they are equipped with 2010 or later model year engines, or somehow treat glider vehicles equipped with 2010 and later engines differently. It's unclear from the request for comment whether this provision would pertain to the units that are built under the limited annual small business exemption or to those that are produced by companies that do not qualify for the small business exemption (and those quantities sold in a year above the exemption cap). Anticipating that the latter is the intention, Volvo Group does not support such a relaxation of the "full compliance" obligation that EPA and NHTSA have proposed. [EPA-HQ-OAR-2014-0827-1290-A1 p.67]

Definition of "New Motor Vehicle," "Glider Kit" and "Glider Vehicle"

EPA has proposed adding new definitions of "glider kit" and "glider vehicle," and amending the definition of "new motor vehicle" to highlight that vehicles produced from glider kits are subject to the Clean Air Act, including 40 CFR Part 1037. As noted above, Volvo Group agrees with EPA that Part 1037, as currently drafted, already plainly covers these vehicles. That said, Volvo Group supports efforts to clarify the applicability of Part 1037 in this regard, including clarification of relevant definitions as appropriate. Volvo Group is concerned, however, that the proposed definitions and/or amendments related to glider kits and vehicles may create additional confusion. [EPA-HQ-OAR-2014-0827-1290-A1 p.67]

First, EPA proposes to add, for purposes of clarification, the following to the definition of "new motor vehicle": *"For example, vehicles commonly known as 'glider kits' or 'gliders' are new motor vehicles."* Volvo Group strongly supports the inclusion of language specifically recognizing vehicles produced from glider kits in this definition. However, we are concerned with the inclusion of the term 'glider kit' in this definition in so far as it indicates that all types of glider kits – taken alone – are subject to Part 1037 and the Clean Air Act. Where such a kit is incapable of being "self-propelled," it does not fall within the definition of "motor vehicle" under CAA § 216(2). We would recommend EPA revise the language to state, *"For example, vehicles produced from 'glider kits' are new motor vehicles."* [EPA-HQ-OAR-2014-0827-1290-A1 p.67]

Second, Volvo Group recommends that EPA amend the proposed definition of "glider kit" as follows: Glider kit means a new vehicle that is incomplete because it lacks an engine, transmission, or drive axle. A glider kit may include previously used parts. A glider kit becomes a new motor vehicle upon the installation of an engine, transmission, and axles, regardless of whether the ultimate purchaser has received title or placed it into service. [EPA-HQ-OAR-2014-0827-1290-A1 p.68]

Third, Volvo Group recommends that EPA amend the proposed definition of "glider vehicle" to state: Glider vehicle means a vehicle produced from a glider kit, or a new vehicle produced with a used engine. Volvo Group believes these definitions will more closely align EPA's proposed regulations to current practices and ensure that vehicles produced from glider kits do not circumvent Clean Air Act requirements. [EPA-HQ-OAR-2014-0827-1290-A1 p.68]

EPA and NHTSA Actions addressing Glider Kits are Appropriate

The rapidly expanding glider-based vehicle market is seriously undermining the significant gains EPA, NHTSA, and the heavy-duty vehicle industry have made to reduce criteria and greenhouse gas emissions, reduce fuel consumption, and improve roadway safety. Even at just a few percent of total Class 8 market sales, the level of PM and NOx emissions from these vehicles is on par with or exceeds the emissions from the balance of sales fulfilled by fully compliant products. The market availability of these non-compliant engines and vehicles poses an unfair competitive disadvantage to manufacturers that have undertaken the enormous effort and investment necessary to comply with all applicable emissions, fuel efficiency, and safety standards. It is therefore imperative that the agencies follow through by finalizing regulation that prohibits the production of glider-based vehicles for anything other than legitimate purposes and that the agencies actively ensure compliance to those requirements. [EPA-HQ-OAR-2014-0827-1290-A1 p.68]

Also included in the NoDA were arguments related to the agencies' authority to regulate glider vehicles and trailers. The Volvo Group fully supports EPA's and NHTSA's efforts to achieve efficiency gains and criteria emissions reductions as related to gliders and trailers, and offer our comments that follow accordingly. [EPA-HQ-OAR-2014-0827-1928-A1 p.3] [[This comment can also be found in section 1.3.1 of the Comment Summary.]]

Comments on Legal Memorandum Pertaining to Trailers, Glider Vehicles, and Glider Kits under the CAA - EPA-HQ-OAR-2014-0827-1627

Volvo agrees with EPA that the Agency has authority to establish emissions standards for complete new motor vehicles, and further that glider vehicles – or vehicles manufactured from glider kits – constitute complete new vehicles for purposes of the Agency's authority to establish emissions standards.[5] Volvo further agrees that the installation of non-new engines, such as rebuilt or remanufactured engines or used engines from "donor" vehicles, in a glider vehicle in and of itself is not determinative of whether that vehicle is new for purposes of compliance with Clean Air Act requirements. As we noted in our comments on the Proposed Rule, glider kits can serve a legitimate purpose, such as allowing individual truck owners to re-use driveline components that had not yet accumulated end-of-life mileage following an accident or other event that renders the rest of the vehicle unusable.[6] Volvo agrees, however, that such legitimate uses should not become a loophole through which truck manufacturers are able to produce otherwise new vehicles not subject to current emissions requirements merely by installing a rebuilt, remanufactured, or otherwise non-new engine in the vehicle. For these same reasons, Volvo agrees that the assignment of a vehicle identification number (VIN) from a pre-existing vehicle to a glider vehicle should not be determinative of whether the glider vehicle is new, as EPA notes.[7] Rather, EPA should consider a limited exemption for production of glider kits that permits their legitimate use as replacement components, similar to what the Agency already provides for new replacement engines. [EPA-HQ-OAR-2014-0827-1928-A1 p.24-25]

Volvo generally supports EPA's proposal to require that engines used in glider vehicles be certified to standards for the model year in which these vehicles are assembled. See 80 Fed. Reg. 40528. Volvo also agrees that this proposal is within EPA's legal authority given, as discussed above, glider vehicles are essentially new motor vehicles. Moreover, the regulatory language proposed by EPA is appropriately confined to a section of the regulations specifically applicable to glider kits, proposed 40 CFR § 1037.635. This is important, as this requirement, if applied more broadly, could impinge on the legitimate and legal use by vehicle manufacturers of engines that have a model year different from the calendar year in which a vehicle is assembled. For instance, vehicle manufacturers are permitted to use previous model-year engines that remain in a vehicle manufacturer's existing inventory, even if the engine model year differs from the calendar year in which the vehicle is manufactured. [EPA-HQ-OAR-2014-0827-1928-A1 p.25]

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5 EPA's position, as referenced here, is set forth in the document entitled Legal Memorandum Discussing Issues Pertaining to Trailers, Glider Vehicles, an Glider Kits under the Clean Air Act, USEPA February 2016 – Draft, at 2. (hereafter "Legal Memorandum").

6 Comments of the Volvo Group, Oct. 1, 2015, at 61.

7 Legal Memorandum at 2.

13 The GREET Model Expansion for Well-to-Wheels Analysis of Heavy Duty Vehicles, ANL/ESD-15/9, Argonne National Laboratory, May 2015

Organization: Worldwide Equipment Enterprises, Inc.

Worldwide Equipment strongly supports the agencies' proposal to impose new requirements on companies assembling and offering for sale vehicles produced by installing used driveline components into new glider kits. EPA and NHTSA should require that manufacturers of these glider-based vehicles to comply with all applicable and current greenhouse gas and criteria emissions standards. NHTSA should also enforce the existing regulations that require manufacturers of glider-based vehicles to comply with all applicable safety standards. [EPA-HQ-OAR-2014-0827-0948-A2 p.1]

Dealers such as ours have been subject to a growing unfair competition from this rapidly expanding market of non-compliant vehicles. Worldwide Equipment supports the application of glider kits as a means to repair badly damaged vehicles, while taking advantage of the remaining useful life in the damaged vehicle's driveline components. When conducted within the requirements of 49 CFR 571.7(e), which sets forth NHTSA's rules for re-use of driveline components for installation into a glider kit, we have no specific concerns with such legitimate applications of glider kits. It's when these rules are violated, however, in an effort to offer for sale an essentially new vehicle whose production costs and total cost of ownership may be tens of thousands of dollars less than the fully compliant new products sold by our dealership that we strongly object to such an unfair disruption of market competition. It is important to understand that the small number of companies ignoring the purpose and intent of the glider kit regulations are creating significant environmental issues as between 8,000 to 10,000 of these noncompliant engines were put in to service in glider kit rebuilds last year alone. Unfortunately, this practice has become widespread without consequence to the glider based vehicle manufacturers, and it is unfairly and negatively impacting our business. [EPA-HQ-OAR-2014-0827-0948-A2 p.2]

In addition to not having to follow the environmental regulations that legitimate dealers like Worldwide have to follow, the manufacturers of glider-based vehicles, in many cases, are not collecting the 12% federal excise tax ("FET") that normally applies to new vehicle sales, giving customers even further financial incentive to purchase glider vehicles rather than fully compliant new vehicles. In addition to creating an unfair financial advantage over legitimate dealers like Worldwide Equipment, this failure to collect the appropriate taxes hurts local and state governments as well which has a direct impact on the maintenance of transportation infrastructure that is so vital to the entire trucking industry. And this abuse of the glider kit regulations, as noted, creates significant environmental damage through the use of non-compliant engines and other components. [EPA-HQ-OAR-2014-0827-0948-A2 p.2]

This abusive application of glider kits must be stopped and Worldwide Equipment, Incorporated strongly support the agencies' efforts to do so through appropriate new regulations and enforcement of existing regulations. EPA and NHTSA should seek to remedy this situation as soon as practicable. [EPA-HQ-OAR-2014-0827-0948-A2 p.2]

In conclusion, the rapidly expanding glider-based vehicle market is seriously undermining the significant gains EPA, NHTSA, and the heavy-duty vehicle industry have made to reduce criteria and greenhouse gas emissions, reduce fuel consumption, and improve roadway safety. The market availability of these non-compliant engines and vehicles poses an unfair competitive disadvantage to manufacturers that have undertaken the enormous effort and investment necessary to comply with all applicable emissions, fuel efficiency, and safety standards, and likewise an unfair competitive advantage to the dealer network representing those OEM's. It is therefore imperative that the agencies follow through by finalizing regulations that prohibit the production of glider-based vehicles for anything other than legitimate purposes, and that the agencies actively ensure compliance to those requirements. [EPA-HQ-OAR-2014-0827-0948-A2 p.3]

Response:

Environmental Impacts of Gliders

Current standards for NOx and PM are at least 90 percent lower than the most stringent previously applicable standards, so the NOx and PM emissions of any glider vehicles using pre-2007 engines are at least ten times higher than emissions from equivalent vehicles being produced with brand new engines. 80 FR 40528. However, most gliders being produced today use engines originally manufactured before 2002. Since these pre-2002 engines lack both EGR and exhaust aftertreatment, they would have NOx and PM *20-40* times current engines. If miscalibrated, emissions could be even higher. Thus, each glider vehicle using an older engine that is purchased instead of a new vehicle with a current MY engine results in significantly higher in-use emissions[233].

[233] Thus, Mondial's statement that the 10,000 plus glider vehicles now produced annually is insignificant compared to the total number of tractors produced is seriously misplaced. The 10,000 gliders have the environmental impact of *at least 200,000* fully compliant new tractors.

Clarke Power Services commented that the EPA has "not adequately defined the impact of the current number of Gliders which are assembled each year" and that "additional studies need to be made to adequately define the "right" number of Gliders allowed." However, we do not see how the current rates of production would affect the "right number" to allow going forward. As described below, even a small number of glider vehicles using pre-2002 engines can have severe public health impacts. As described in Section XIII.B of the FRM Preamble, EPA's final regulations focus more on the ensuring the right type of gliders are produced using the right type of engines, rather than the right number. In an effort to lessen economic impacts on small businesses, we are reluctantly allowing certain small businesses to produce a limited number of glider vehicles using the higher emitting engines. However, this allowance is not based on our estimate of current or future production rates.

While EPA does not have precise estimates of current glider production, it is clear that production of glider vehicles has increased by an order of magnitude from what it was in the 2004-2006 time frame – from a few hundred each year to thousands.[234] EPA has previously estimated environmental impact of 5,000 glider vehicles per year, which would be roughly 2% of the Class 8 vehicles manufactured annually. We estimated that at that rate, these gliders could account for as much as one-half of total NOx and PM emissions from all new Class 8 vehicles.[235] Several commenters supported EPA's assessment of the environmental impacts of glider vehicles. Volvo suggested in its comments on the NPRM that the impacts were even greater, estimating that 2014 glider sales were "on the order of 6,000" and that they emit twice as many tons of PM as the rest of the 2014 vehicles. Similarly, as Volvo noted in its comments:

> EPA's own analysis as detailed in their recent glider Q&A document indicates that NOx and PM emissions from glider vehicles at current sales levels are equivalent to about 80 percent of the total NOx and PM emissions from the *entire* Class 8 sales fleet. Focusing on PM emissions, and applying the emissions levels indicated in Argonne National Lab's recent update to the GREET Analysis[236], at just 3% market penetration of the most egregious applications, the 2014 glider fleet emits *twice* the level of PM emissions that the 97% *entire* fleet of compliant vehicle sales emits that same year.

Even some commenters opposing EPA's proposal acknowledged that glider sales are now over 10,000 units annually.[237] No commenters disagreed with EPA's assessment of NOx and PM impacts. Clarke Power Services suggested that the growing shortage of older engines will limit the impact of gliders. However, as shown in Appendix A to this section, even a single year at current production rates has serious public health consequences.

For the final rule, EPA has updated its analysis of environmental impacts of gliders, reflecting the comments received. See Appendix A to this Section 14. We project that without the new restrictions, glider vehicles on the road in 2025 would emit nearly 300,000 tons of NOx and nearly 8,000 tons of diesel PM annually. Although glider vehicles would make up only 5 percent of heavy-duty tractors on

[234] "Industry Characterization of Heavy Duty Glider Kits," MacKay & Company, September 30, 2013.
[235] Frequently Asked Questions about Heavy-Duty "Glider Vehicles" and "Glider Kits", EPA-420-F-15-904, July 2015.
[236] The GREET Model Expansion for Well-to-Wheels Analysis of Heavy Duty Vehicles, ANL/ESD-15/9, Argonne National Laboratory, May 2015.
[237] In its comments, Fitzgerald indicated that current sales of glider vehicles exceed 10,000 vehicles annually but termed these amounts "insignificant" compared with the total number of trucks. Unfortunately, as shown in the text above, this is not the case. Criteria pollutant emissions impacts of 10,000 glider vehicles is equivalent to at least 200,000 fully compliant new trucks.

the road, their emissions would represent about *one-third* of all NOx and PM emissions from heavy-duty tractors in 2025. Put into monetary terms using PM-related benefit-per-ton values described in Section IX.H, the removal of all unrestricted glider vehicle emissions from the atmosphere would yield between $6 to $14 billion in benefits annually (2013$). It is clear that removing even a fraction of these glider vehicles from the road will yield substantial health-related benefits. Moreover, the PM valuation is for particulate matter generally. Although there is evidence suggestive of a causal relationship between long-term $PM_{2.5}$ exposures and carcinogenic effects (see 78 FR 3101/3 (Jan. 15, 2013), the causal connection with diesel PM (diesel exhaust) and carcinogenic effects is stronger. As described in Preamble Section VIII.A (6), exposure to diesel exhaust was classified as likely to be carcinogenic to humans by inhalation from environmental exposures, in accordance with the revised draft 1996/1999 EPA cancer guidelines.[238,239] A number of other agencies (National Institute for Occupational Safety and Health, the International Agency for Research on Cancer, the World Health Organization, California EPA, and the U.S. Department of Health and Human Services) had made similar hazard classifications prior to 2002. EPA also concluded in the 2002 Diesel HAD that it was not possible to calculate a cancer unit risk for diesel exhaust due to limitations in the exposure data for the occupational groups or the absence of a dose-response relationship. In the absence of a cancer unit risk, the Diesel HAD sought to provide additional insight into the significance of the diesel exhaust cancer hazard by estimating possible ranges of risk that might be present in the population. An exploratory analysis was used to characterize a range of possible lung cancer risk. The outcome was that environmental risks of cancer from long-term diesel exhaust exposures could plausibly range from as low as 10^{-5} to as high as 10^{-3}.

[238] U.S. EPA. (1999). *Guidelines for Carcinogen Risk Assessment*. Review Draft. NCEA-F-0644, July. Washington, DC: U.S. EPA. Retrieved on March 19, 2009 from http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=54932.

[239] U.S. EPA (2002). *Health Assessment Document for Diesel Engine Exhaust*. EPA/600/8-90/057F Office of Research and Development, Washington DC. Retrieved on March 17, 2009 from http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060. pp. 1-1 1-2.

A quantified risk analysis is included in Appendix A to this Section 14. As discussed further below, this analysis indicates that for a single model year, assuming the use of 5,000-10,000 high polluting engines in glider vehicles, $PM_{2.5}$-related exposures are estimated to result in 350 to 1,600 premature mortalities. Several commenters argued that EPA is precluded from adopting any controls on installation of high polluting engines in glider vehicles until MY 2021. This could mean the production of 30,000 to 40,000 additional glider vehicles using the older high polluting engines. Using the same assumptions as above, these three additional model years of production are estimated to result in an additional 2,100 to 6,400 premature mortalities. Some commenters seemed to suggest that the trend of increasing production of glider vehicles with high polluting engines would eventually reverse itself, but this analysis shows that EPA cannot simply wait for this problem to go away on its own.

The EPA regards these estimates as significantly conservative. First, based on the public comments from both glider vehicle producers and producers of engines which comply with current standards, it likely underestimates the number of glider vehicles with high-polluting engines produced today. Second, the analysis considers only potential premature mortality attributable to exposure to $PM_{2.5}$. This is conservative for at least three reasons. First, it does not account for the carcinogenic potential of diesel exhaust PM, which is a subset of $PM_{2.5}$. Second, it does not consider other health and welfare benefits of reducing exposure to $PM_{2.5}$ (see Appendix Table A-5). Third, it does not quantify premature mortality and other health effects attributable to exposure to ozone. Although ozone is not emitted directly, the chief precursor is NOx (see Preamble section VIII.A (3) and 80 FR 65299-300 (Oct. 26, 2015)), which glider vehicles emit in huge quantities, as noted above.

Some commenters argued that gliders offer an efficiency advantage compared to continuing to use older trucks, and that glider use also resulted in reduced HFC emissions from the A/C systems. However, this is a false comparison. While it may have been valid when glider vehicle sales were less than 1,000 per year, it is not valid for current sales. As supported by comments from truck manufacturers and dealerships, glider sales now come at the expense of sales of fully compliant new trucks.[240,241] Nor is the commenters' assertion regarding HFC emissions persuasive given the A/C leakage controls for tractors adopted in the Phase 1 rules. Some commenters stated that remanufacturing an engine and transmission uses 85% less energy than manufacturing them new, but did not provide an analysis for EPA to

[240] See, e.g., Comment from Nuss Truck: "Dealers such as ours have been subject to a growing unfair competition from this rapidly expanding market of non-compliant vehicles. …[T]ruck purchasers have the ability to purchase a powertrain combination that they never owned in an existing truck, from assemblers who have chosen to exploit the law put in place that was intended to clean up air pollution. The original intent of selling glider kits has moved from a rebuilding mechanism to now mainly evading diesel emissions EPA mandates. We see many truck owners and small fleets from Minnesota and Wisconsin traveling long distances, passing by dozens of legitimate truck dealers, to purchase glider kits directly from a manufacturer in another state, just to avoid the current EPA emissions standards. That should not be a legally acceptable reason to purchase a glider kit, if we all want clean air."

[241] The comment of Truck Country of Wisconsin similarly describes the competitive conumdrum facing dealers selling tractors with compliant engines: "1. We agree with EPA's assessment that most gliders manufactured today use remanufactured model year 2001 or older engines. Typically these engines have and NOX and particulate matter (PM) emissions 20 to 40 times higher than today's clean engines. Since 2010 when EPA's current NOx and PM standards for heavy duty engines took effect, glider sales have increased nearly 10-fold as compared to the 2004-2006 time frame; 2. We agree with EPA that this increase reflects an attempt to avoid using engines that comply with EPA's 2010 standards, and is an attempt to circumvent the Clean Air Act purpose to protect human health and the environment; 3. The Trucking Industry has made enormous investments in new engines standards to comply with past and future EPA regulations. We believe this circumvents these standards and will make it harder to meet compliance; and 4. We agree with EPA's Clean Air Act definition of 'new motor vehicle' is not based on the condition of the parts assembled to create the vehicle but rather encompasses the entire vehicle, even if they incorporate some previously used components."

evaluate. Clarke Power Services commented that newly rebuilt engines have lower criteria emissions than a "worn oil burning engine which is beyond its useful life." However, that is not relevant to this discussion since engines can be rebuilt without replacing the chassis. The appropriate comparison is to new vehicles with fully compliant new engines. When compared to these engines, even the most carefully rebuilt and recalibrated 1998-vintage engine would have NOx and PM emissions at least 20 times as high as engines meeting current standards.

Finally, some commenters stated that glider engines actually have better fuel economy and greenhouse gas ("GHG") emissions than today's low NOx engines. However, this is not true. Even before Phase 1, engine manufacturers had improved fuel consumption significantly beyond 2009 levels. The 2014 Phase 1 standards required significant additional improvement and the Phase 1 2017 standards will result in even more improvement. Fleets purchasing gliders would thus see greater efficiency improvements by purchasing trucks meeting GHG standards for new vehicles and engines.

Potentially Legitimate Purpose of Gliders

Although EPA is addressing this issue because of the adverse public health and environmental impacts of glider vehicles, many commenters (including some who supported EPA's proposed restrictions), commented that glider kits serve a legitimate purpose in some cases. Most identified cases in which relatively new vehicles suffer significant frame damage as the result of an accident or from a severe duty application, without significant damage to the driveline. Volvo stated:

> The "glider kit" emerged some decades ago as an assemblage of new vehicle components absent the engine, transmission, and rear axles (the "driveline"). These kits were produced by vehicle OEMs, and made available for sale to dealers and other vehicle repair centers as a means to repair a vehicle that had been badly damaged in an accident or similar event. This permitted re-use of driveline components that had not yet accumulated end-of-life mileage by the time of the accident.

Some commenters misinterpreted EPA statements about the "most legitimate" use of gliders in the NPRM and NODA to be a determination that some use of glider kits is legitimate. Although EPA has not taken a position on whether such use of glider kits is truly legitimate, we do agree that circumstances such as those addressed by Volvo represent their most legitimate use. Volvo commented that any allowances for glider kits should be limited to these legitimate purposes. While we are generally sympathetic to the goal of limiting the use of glider kits to the most legitimate circumstances, we do not think it would be possible to enforce restrictions based on the intent of the operator or assembler, so that such a regime would invite abuse (and thus serve to perpetuate environmentally unsound practices). We are also concerned that it would be difficult to enforce requirements based on the condition of the donor vehicle as a proxy for intent since the donor vehicle will typically be destroyed as part of the process. To the extent we reflect any of these factors in our regulations, we believe it will be more enforceable to base the requirements on the age and mileage of the engine, as explained in the following section of this response.

Some commenters suggested that another legitimate purpose of glider kits is to improve efficiency. For example, Clarke Power Services stated that trucking fleets purchasing glider vehicles "are not motivated by circumventing the EPA policies, but are most interested in being more efficient by removing old equipment from service and introducing a significantly improved heavy duty truck in its place." We do not agree. First, the significant adverse public health and environmental consequences of order of magnitude and greater increases in NOx and diesel PM emissions would exist even if the commenter were correct. The commenter is in any case mistaken in suggesting that glider vehicles have a fuel efficiency advantage over new tractors. As explained above, with the advent of the Phase 1 GHG and fuel consumption standards, fleets purchasing gliders would see greater efficiency improvements by purchasing trucks meeting GHG standards for new vehicles and engines. Although this would cost more upfront, these costs would be recouped via greater fuel savings within the first few years of ownership.

Treatment of Donor Engines within their Useful Life

In section (i) of the legal memorandum on issues pertaining to trailers, glider kits, and glider vehicles accompanying the Notice of Data Availability, EPA requested comment on finalizing special provisions for gliders using engines that are still within their original regulatory useful life (10 years and 435,000 miles for Class 8 vehicles) that would allow relatively new engines to be reused in gliders without recertification to standards corresponding to the year of assembly of the glider vehicle. Such engines would necessarily be cleaner than the pre-2002 engines being used in most gliders today, and by 2021, all would be compliant with the 2010 standards. This allowance would also be inherently consistent with the most legitimate use of glider kits because no one would scrap a chassis within the useful life unless it was severely damaged. Commenters generally supported this approach. Many also supported the additional approach EPA discussed in conjunction with the NODA that would ignore miles if the donor engine is less than three years old and ignore years if the engine had less than 100,000 miles. (These additional allowances would provide some additional flexibility for an engine not fully within its useful life). Some commenters argued that such a provision should only apply with respect to miles, and that EPA should not restrict this flexibility based on engine age so as not to disadvantage engines in very low usage applications. E-One's comments suggested that EPA should adopt provisions to address emergency vehicles that last 10 to 20 years but may have traveled only 10-50,000 miles.

After considering these comments, EPA has decided to finalize the approach described in the NODA. (As described later, the proposed small business flexibility is also being adopted, but as an interim provision). We believe this addresses the most traditional, legitimate use of glider kits, which is for vehicles in severe duty applications (such as cement mixers and dump trucks) that incur substantial chassis damage before the engine reaches the 10-year end of its regulatory useful life. By 2020 nearly all glider vehicles would have to be produced using engines meeting the 2010 NOx and PM standards (since an older-than-10 year engine would be outside its regulatory useful life). Because the potential for adverse environmental effects from such vehicles is significantly reduced (compared to the more common current use of pre-2002 model year engines, with their much higher criteria pollutant emissions), EPA is allowing their continued use in glider vehicles without recertification to more stringent criteria pollutant standards, and without meeting GHG standards.

This approach provides this flexibility to very low use applications, such as those identified by E-One, where donor engines have less than 100,000 miles after 10 years. The final regulations will thus allow reuse of an engine more than 10 years old without recertification, as long as the engine can be shown to have fewer than 100,000 miles on it. The environmental impact of allowing this should be minimal because there should be very few engines that qualify and they will necessarily be in applications that operate infrequently. (Any vehicles that operate more than 10,000 miles per year would exceed 100,000 miles before 10 years).

At the other extreme, some Class 8 vehicles may reach 435,000 miles within a few years. Today's Class 8 engines and vehicles are generally expected to last well beyond this point, so such engines would be installed in glider kits only if the chassis was defective or had been in a major accident. The NODA approach, which is being adopted, treats these engines as being within their useful life as long as they are less than 3 years old. This approach was supported by NADA. The environmental impact of allowing this should also be minimal because there should be very few engines that qualify and they will necessarily be engines certified to 2010 or later standards.

Treatment of MY 2010 and Later Donor Engines

Several commenters supported allowing unlimited production of glider vehicles if they use engines certified to 2010 or later NOx and PM standards, although Volvo opposed this concept. Daimler commented that "2010 and later engines are not currently being used in glider vehicles in large numbers," but Clarke Power Services commented that the "industry is currently considering MY 2010 engines as the choice for Gliders moving forward." EPA sees merit in this concept, but is concerned that it may not be appropriate in perpetuity. Obviously, reuse of engines originally certified to the 2010 standards for criteria pollutants would not have the same adverse environmental impacts as the current practice of reusing pre-2002 engines that have NOx and PM emissions 20-40 times higher than current engines. However, they would not necessarily be as clean for GHG or criteria pollutants as brand new engines with all new aftertreatment components. The Phase 1 and Phase 2 engine standards will result in brand new engines with lower GHG emissions (and better fuel efficiency) than pre-Phase 1 engines. And used 2010 aftertreatment components may be less effective at reducing NOx or PM than when new. Moreover, as described in Section I of the FRM Preamble, EPA may adopt more stringent NOx and/or PM standards for motor vehicles in the future. Thus, while using 2010 engines in glider vehicles would greatly reduce the concerns about NOx and PM emissions relative to current gliders, it would not eliminate all adverse public health and environmental impacts.

Sales patterns strongly support the idea that the surge in glider sales resulted from an attempt to avoid the 2010 criteria pollutant standards. Thus, it seems likely most purchasers of gliders today would not find gliders with 2010 engines nearly as attractive as they do current glider vehicles. Thus, we would not expect such an allowance to result in a continuation of the current surge in glider sales.

In an attempt to balance these factors, EPA is finalizing an interim provision – a provision which will sunset after EPA adopts new more stringent NOx standards – that will treat gliders using MY2010 and later engines the same as those using engines within their useful life. This would avoid most of the adverse impacts, especially for NOx and PM. Not requiring these engines to meet the latest GHG standards could have some impacts, but they would likely be small, especially if glider vehicle sales return to pre-2007 levels. EPA will continue to monitor sales patterns and may rescind this flexibility in a future rulemaking.

Legal Authority to Regulate Complete Glider Vehicles and Incomplete Glider Kits

See Section 1.3.1 and preamble Section I.E.(1) for a discussion of EPA's authority to regulate glider vehicles and glider kits. In addition, DTNA's argument that this rulemaking should not address gliders because the primary focus of the rulemaking is control of GHGs rather than criteria pollutants, EPA notes that it gave ample notice of all issues relating to gliders, and provided multiple opportunities for public comment. The many comments on the issue from all types of stakeholders confirm the adequacy of notice here. The further comment that regulations on GHGs should not deal with other pollution has no legal basis. DTNA also commented that the engine rebuilding authority in section 202 (a)(3)(D) was not properly invoked because EPA had not proposed to amend the engine rebuilding regulations. EPA has included conforming amendments to 1037.150 (j), and 1068. 120 (f) in the final rules. DTNA's argument that the rule addresses vehicle rebuilding, rather than engine rebuilding, is not correct. In addition to the reasons addressed in Preamble Section I.3, it is clear that the statutory authority over engine rebuilding authorizes EPA to determine what standards a rebuilt engine shall meet. See CAA section 202 (a)(3) (D) stating that "the Administrator may prescribe requirements to control rebuilding practices, including standards applicable to emissions from any rebuilt heavy-duty engines (whether or not the engine is past its statutory useful life)." Comments from, e.g. Mondial and MEMA made clear that all of the donor engines installed in glider vehicles are rebuilt. See also http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx ("1999 to 2002-model diesels were known for reliability, longevity and good fuel mileage. Fitzgerald favors Detroit's 12.7-liter Series 60 from that era, but also installs pre-EGR 14-liter Cummins and 15-liter Caterpillar diesels. All are rebuilt …..").

Lead Time

See Section 1.3.1 of this RTC and preamble Section I.E.(1) for a discussion of EPA's statutory obligation for lead time with respect to gliders and glider kits. From a more practical perspective, we note that little lead time is needed for the changes being adopted. Glider kit manufacturers already offer comparable vehicles that are fully compliant with current standards, and thus do not need extensive lead time. Such vehicles are often identical to the completed glider vehicles other than the powertrains.

Most small glider vehicle assemblers do not need additional lead time because they will be allowed to continue assembling gliders at pre-2015 rates. We are aware of one glider kit assembler that produces more than 300 vehicles from glider kits each year and it will need to reduce its production in 2017 and later. However, we do not believe that manufacturer truly needs additional lead time. This manufacturer indicates that it fills orders for glider vehicles within three to six weeks from placement of the order, which means the new restrictions should not impact any existing orders.[242] Any vehicles that are already on order should be completed before 2017. For 2017, the regulations will allow this manufacturer to produce at its 2014 production rate. This 2017 restriction applies with respect to the total *annual* production for 2017, so the manufacturer will be allowed to gradually reduce its production of high polluting glider vehicles. This provides sufficient lead time for it to find compliant engines before its production limit drops to 300 in 2018. It is unclear that additional lead time would change anything for this manufacturer other than allowing it to produce additional high polluting glider vehicles.

Finally, any consideration of lead time must necessarily be balanced against the potential environmental and public health impacts. As shown in Appendix A to this section, even a small number of additional glider vehicles would have severe impacts. For example, a one-year delay that allowed 10,000 additional glider vehicles to be produced with high polluting engines would result in the following impacts:

- 415,000 tons of addition NOx emissions
- 6,800 tons of additional PM emissions
- 700 to 1,600 premature deaths
- $3 to $11 billion in PM-related monetized disbenefits

Given the severity of these impacts, delaying these provisions cannot be justified by merely the potential for inconvenience to the industry. Rather commenters would needed to have demonstrated that it is not feasible to comply with these requirements within the lead time provided. They have not done so. Most commenters supporting additional lead time focused on statutory requirements that were addressed in Section 1.3.1. Commenters that did address economic impacts merely speculated about the impacts or made vague references to jobs or small business impacts. Of course, as many commenters pointed out, glider vehicle production with high polluting engines comes at the expense of domestic manufacturers producing engines complying with the latest criteria pollutant and GHG standards. See further discussion of Economic Impacts below. No commenters provided any specific basis that would justify

[242] Advertisement for Fitzgerald Glider Kits in Overdrive magazine (December 2015).

delaying the prevention of premature mortalities and billions of dollars of benefits achievable by implementing these provisions according to the final regulations.

Small Business Impacts

Several commenters expressed concern about the impact of the proposed changes on small businesses that produce glider vehicles. However, commenters opposing the proposed requirements/clarifications did not address the very significant adverse public health and environmental impacts of the huge increase in glider vehicle production over the last several years. More importantly, EPA believes that with the changes being made in the final regulations, any small businesses that have been focused on producing gliders for traditional and legitimate purposes will not be significantly impacted by the new requirements, since they can use donor engines within their regulatory useful life for either age or mileage. Only those that have significantly increased production to create new trucks to circumvent the 2010 NOx and PM standards will have their sales significantly restricted. We are aware that Fitzgerald Gliders currently produces more than 300 vehicles from glider kits, and they appear to all use pre-2002 engines. It will need to cut back on its production of these vehicles (although it can continue unlimited production using low-polluting engines). Nevertheless, the company has previously acknowledged that they could "make a profit at 300 a year."[243] Now Fitzgerald Gliders comments that "300 vehicles is too low given the abrupt change this regulation brings to the 50-year-old glider industry and the disproportionate impact it will have on small businesses." However, it failed to acknowledge in its comments that for most of the "50-year-old glider industry" total industry-wide production of glider vehicles was much closer to 300 per year than to current production rates.[244] Fitzgerald Gliders also failed to note how rapidly they have increased production of glider vehicles over the last few years.

One commenter stated that EPA should also consider the impacts on small trucking companies. But here too, for the same reasons, trucking companies that seek gliders for traditional, legitimate purposes should be able to obtain them. Only those companies that seek to use older engines will be impacted, and these companies can produce glider vehicles using readily available compliant engines.[245]

Some commenters argued that EPA did not include enough glider manufacturers in the SBREFA process. However, EPA met its obligations under SBREFA. See generally RTC section 15.4. One of the Small Entity Representatives was a manufacturer of glider vehicles. Small businesses also had two opportunities to provide comments on the requirements. It is unclear how having additional glider manufacturers involved in the process would have changed its result.

Volvo also commented that EPA should clarify that the exemption is limited to entities that both qualified as small manufacturers in 2014 and sold vehicles produced from glider kits under the provisions of 40 CFR § 1037.150(j). We believe that this is what the final regulations clearly state. However, DTNA commented that "EPA's current proposal unfairly penalizes those small businesses that did not sell gliders in 2014, but might have sold them in 2013 or 2015." However, the small business provisions are intended to prevent the regulations from having a significant impact on the businesses. It is unclear how any restrictions of gliders could have any impact on a business that sold none in 2014 that would meet the threshold for "significant." Clearly, glider sales cannot be an important portion of a company's revenues if they sold none in 2014.

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[243] http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx., accessed July 16, 2016.
[244] "Industry Characterization of Heavy Duty Glider Kits," MacKay & Company, September 30, 2013.
[245] Memo to Docket, "Availability of Rebuilt Engines that Comply with 2010 Emission Standards", August 2016.

PACCAR commented that EPA should eliminate the small business allowance altogether beginning in MY 2022 for gliders using pre-2010 engines. TCW opposed any relief for small businesses that assemble gliders, and Volvo commented that EPA should eliminate the small business exemption sooner than proposed. Consistent with Volvo's comments on the risk of a pre-buy, we are finalizing an additional restriction for 2017. Nevertheless, while EPA may eliminate or reduce the small manufacture provisions in a future rulemaking, such an action at this time would be inconsistent with the SBREFA Panel's recommendations, which EPA is choosing to largely follow to afford small businesses sufficient compliance flexibility, and to preserve opportunities for traditional uses of glider kits to provide a means of salvaging viable engines from non-viable powertrains. During the SBREFA process, EPA concurred with these recommendations, and without some more compelling reason, we believed it to be appropriate to allow this flexibility. Our recent reanalysis of the environmental impacts of even this small number of gliders suggests we may need to revisit it at some point within the Phase 2 time frame, especially if we find that this flexibility is being misused.

Terex Corporation comment that EPA should provide an exemption for any company manufactured fewer than 1,000 on highway vehicles annually between calendar years 2010 and 2014. However, we believe the other flexibilities allowing the use of newer engines will largely address Terex Corporation's concerns.

Sales Caps

EPA received comments supporting higher caps and comments supporting lower caps. Commenters supporting higher caps did not argue that higher caps were necessary to allow for legitimate production at or below pre-2006 levels. Instead, these commenters seemed to be concerned solely about allowing continuation of very high sales. We see no basis for that. This would perpetuate the very conduct – continued use of high-pollution engines in contravention of standards for new vehicles and engines – which this action is intended to restrict. One commenter argued that the caps should be raised to account for the likelihood that the number of small businesses assembling glider vehicles would decrease as a result of the rule changes. However, we think the other revisions being made to allow additional glider vehicles to be produced without a sales cap (i.e. allowing continued use of donor engines within their useful life for either mileage or age) will offset any impacts on the availability of gliders that might result from a reduction in the number of businesses in this market.

Combined with the other flexibilities in the final rule, this small manufacturer allowance should allow the industry to produce glider vehicles near pre-2006 levels. While there may be disruptions for some companies, higher caps cannot be justified by merely the potential for inconvenience to the industry or even significant disruption for a few companies. Fitzgerald Gliders currently produces more than 300 vehicles from glider kits and is likely to be the small business that will be most impacted by this cap, but as noted above, they have acknowledged that they could "make a profit at 300 a year."[246]

EPA also received comments supporting potentially lower cap levels. ICCT agreed that glider sales should be restricted to a number that is consistent with pre-emission-regulation glider production, which they stated should be on the order of hundreds of units per year industry wide. Navistar suggested the cap be lowered to 200 units per year. Volvo commented that the cap is too high and that small manufacturers should not be allowed to exceed "the peak levels in the 2010-2012 timeframe" to be consistent with the SBREFA Panel Report. EPA is not reducing the maximum cap level or basing it on only 2010-2012 sales at this time. As just noted, it is clear that the cap of 300 glider vehicles will allow existing small businesses to remain profitable. Thus, as an interim policy, we believe this level

[246] http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx, accessed July 16, 2016.

appropriately balances the environmental and economic impacts. See CAA section 202 (a)(3)(D) requiring consideration of "cost of compliance" as part of the standard setting process for rebuilt engines. Nevertheless, we recognize that this allowance will result in significant additional emissions of NOx and PM. We will continue to monitor this market and may lower these values in the future.

Consistent with Volvo's comments, the final regulations apply the cap as a production cap rather than a sales cap.

Definitions

Terex asked for clarification of the proposed definition 'glider kit' to mean 'any other new equipment that is intended to become a motor vehicle with a previously used engine, include a rebuilt or remanufactured engine.' We have added the clarifying condition that this includes only assemblies that are "substantially similar to" complete vehicles. Volvo suggested the following definition of "glider kit":

> Glider kit means a new vehicle that is incomplete because it lacks an engine, transmission, or drive axle. A glider kit may include previously used parts. A glider kit becomes a new motor vehicle upon the installation of an engine, transmission, and axles, regardless of whether the ultimate purchaser has received title or placed it into service.

EPA explained in Section 1.3.1 why we believe glider *kits* are new motor vehicles, albeit incomplete motor vehicles. See also preamble section I.E.1 explaining further that in any case, manufacturers of entities assembling glider kits are "manufacturers" under the Act and can consequently can be required to test and certify. Volvo's proposed definition would not be consistent with this. Nevertheless, we agree with Volvo that the glider vehicle provisions should not prevent vehicle manufacturers from using up their normal inventory of prior model year new engines when producing conventional new motor vehicles. The definitions being adopted will not interfere with this practice.

Identical Standards

Daimler commented that EPA should define "identical standards" to avoid uncertainty. As an example, they stated it is "unclear whether, under EPA's proposed regulations, an earlier model year engine could be used in a glider vehicle assembled in a year when new OBD requirements are in effect." In other contexts (such as export exemptions) EPA has previously interpreted this term strictly. This would clearly not allow differences in something as important as OBD requirements.

Economic Impacts

Commenters opposing the proposed changes argued that they would adversely impact hundreds of jobs. MEMA stated that the motor vehicle remanufacturing industry supports over 50,000 direct jobs in the U.S. Other commenters noted that allowing glider vehicle sales adversely impacts those producing and selling conventionally new vehicles, and penalizes those entities playing by the rules and producing new vehicles which pollute far, far less. In particular, several dealers that do not sell gliders commented that allowing gliders to circumvent newer emission controls creates an unfair competitive market. Volvo commented that gliders have an unfair competitive advantage because the "cleanest, most fuel efficient and safest vehicles are necessarily tens of thousands of dollars more costly to produce" than glider vehicles.

Considered together these comments suggest that jobs in the glider industry come at the expense of other jobs in the heavy-duty industry. Although EPA takes seriously any impacts on workers in the glider industry, they do not justify allowing the continued avoidance of emission standards which results in millions of tons of additional pollution and substantial avoidable public health risks, especially considering the adverse impacts glider sales have on other workers in the U.S. Clarke Power Services commented that the "industry is currently considering MY 2010 engines as the choice for Gliders moving forward." This suggests that any economic impacts compared to what would have happened without regulation are short-term rather than long-term.

Other commenters stated that gliders offer many advantages for operators over used trucks, including lower operating costs and improved safety. However, these operators could achieve these same or greater benefits by purchasing fully compliant new vehicles. MFX noted costs associated with the 2007-era vehicles, but they are no longer relevant. As noted above, with the advent of the Phase 1 standards, and even more so under the 2017 Phase 1 standards and, later, Phase 2 standards, operators will be able to purchase fully optimized Phase 1 or Phase 2 vehicles that will have much better fuel efficiency and reliability than the 2007 products.

Finally, some commenters argued that EPA should consider the economic impacts on small trucking companies that purchase glider vehicles or pay others to assemble glider vehicles from their donor vehicles. While we understand that small trucking companies may have less capital to purchase fully compliant new trucks than larger companies, we note that new glider vehicles are not inexpensive – generally costing at least two-thirds as much as a fully compliant new vehicles. Thus, any impact on these trucking companies would be marginal. Moreover, engines meeting the 2017 Phase 1 standards are likely to be more fuel efficient than the rebuilt pre-2002 engines, so these companies would likely recover the additional purchase costs from fuel savings.

Used Engines

One commenter suggested that EPA should prohibit the installation of used engines unless they have been rebuilt to the original certified configuration so as to (in the opinion of the commenter) reduce PM, NOx, and GHG emissions. However, as explained earlier, we believe the most legitimate use of glider kits is to salvage used components from newer vehicles that have been damaged in accidents. Thus, it would not be appropriate to ban used engines that have not been rebuilt to any particular configuration.[247]

Labeling and Delegated Assembly

PACCAR commented that EPA should not require a unique label for glider vehicles that will be used in vocational applications. However, because glider vehicles are new vehicles they must comply with the same Phase 2 requirements as any other new motor vehicles. This includes proper labeling identifying the standards to which the vehicle is certified.

Similarly, for all glider vehicles produced by multiple manufacturers, the manufacturers must comply fully with the requirements of §§1037.620 through 1037.622. PACCAR's comments urging less rigorous requirements for glider kits miss the point of these requirements, which is to ensure that the completed vehicles are in their proper certified configuration when placed into service. It is the manufacturer's choice to produce vehicles in this way. If they find it too difficult to ensure the completed glider vehicles conform to the regulations, they can simply not offer glider kits similar to

[247] Note again that removal of engines from donor vehicles, and installation of that engine into another vehicle continues to fall under the engine rebuilding provisions of part 86.004-40. See 86.004-40 second sentence (referring to "removal" which encompasses removal and installation into another vehicle).

current competitors. Nevertheless, as described in Section 1.4.4 of this RTC, we have revised the proposed delegated assembly requirements more generally, which may address some of PACCAR's concerns.

Natural Gas

NGV America commented that the regulations should allow greater flexibility for natural gas fueled gliders because they are cleaner than diesel gliders. Diesel 2 Gas, Inc. commented that glider kits "are the only means by which hundreds of thousands of Class 8 Trucks can have access to natural gas as an engine fuel." They stated that 2010 and newer engines "cannot be converted efficiently to dual fuel mode with any known technology" because of their electronics. However, we believe that the issue of circumvention is a concern for both natural gas and diesel gliders. We do not believe these comments justify special provisions for natural gas. Natural gas engines may be cleaner than diesel engines of the same vintage with respect to NOx and PM emissions, but natural gas conversions of older engines are not inherently cleaner than today's SCR and DPF equipped diesel engines.

As noted earlier, glider vehicles are new motor vehicles, even if they reuse an engine from another vehicle. This is even more obviously true when the engine is converted from diesel fuel to natural gas as part of the process of producing the new glider. Such a vehicle retains even less of a connection to any existing vehicle. Moreover, the nature of the process addressed by NGV and Diesel 2 Gas suggests the purpose is to produce a new natural gas vehicle, rather than to salvage a newer powertrain from a damaged chassis. Thus, an argument could be made that they deserve less (not more) accommodation. EPA has no objection to conversion of existing vehicles to natural gas. However, natural gas gliders are more likely competing against other new vehicles that are fully compliant with current standards for criteria pollutants, as well as for GHGs. If Diesel 2 Gas is unable to convert newer engines, they are free to convert the older engines that remain in the older chassis. By retaining the old chassis, they would not be subject to the new glider kit requirements.

Consideration of Existing NHTSA Regulations

Some commenters suggested that EPA's regulations should reflect principles laid out in existing NHTSA regulations. For example NADA/ATD urged EPA to harmonize with NHTSA's regulations that require there to be a single "donor" vehicle from which two of three used components (engine, transmission, and drive-axle) are incorporated into the rebuilt vehicle. NADA/ATD further commented that "when two of these three used components are incorporated into a rebuilt vehicle, using a glider kit, the used engine would only be required to meet emission standards applicable to its year of original manufacture." However, those regulations were promulgated pursuant to different statutory authority. They were also develop for different, albeit related purposes. Thus, EPA does not consider them to be necessarily relevant to this action. More importantly, such comments ignore the severe public health impacts of glider vehicles. These impacts are not lessened in anyway if the components come from a single donor vehicle.

14.3 Technical Amendments - Heavy-Duty Vehicles Other than GHG

1886

Organization: American Automotive Policy Council

Other Provisions

<u>Low Sulfur Labeling</u>

Appendix A to Section 14 - Sensitivity Analysis of Glider Impacts

EPA is restricting the number of gliders that may be produced using engines not meeting current standards. Current standards for NO_X and PM (which began in 2007 and took full effect in 2010) are at least 90 percent lower than the most stringent previously applicable standards, so the NO_X and PM emissions of any glider vehicles using pre-2007 engines are at least ten times higher than emissions from equivalent vehicles being produced with brand new engines.[248] However, most gliders being produced today use engines originally manufactured before *2002*. Since these pre-2002 engines lack both EGR and exhaust aftertreatment, they would have NO_X and PM emissions 20-40 times higher than current engines. If miscalibrated, emissions could be even higher. Thus, each glider vehicle using an older engine that is purchased instead of a new vehicle with a current MY engine results in significantly higher in-use emissions of air pollutants associated with a host of adverse human health effects, including premature mortality (see Section VIII of the FRM Preamble).

These emission impacts have been compounded by the increasing sales of these vehicles. Estimates provided to EPA indicate that production of glider vehicles has increased by an order of magnitude from what it was in the 2004-2006 time frame – from a few hundred each year to thousands.[249] Glider vehicle production is not currently being reported to EPA, but we estimate that current production is close to 10,000 each year. Some commenters to the proposed rule indicated that the volume may be higher still. Volvo provided evidence that current sales have grown to 10,000 or more per year. Even some commenters who produce glider vehicles and opposed EPA's proposal acknowledged that glider sales are now over 10,000 units annually. See Section XIII.B.(3) of the Preamble and Section 14.2 of this RTC.

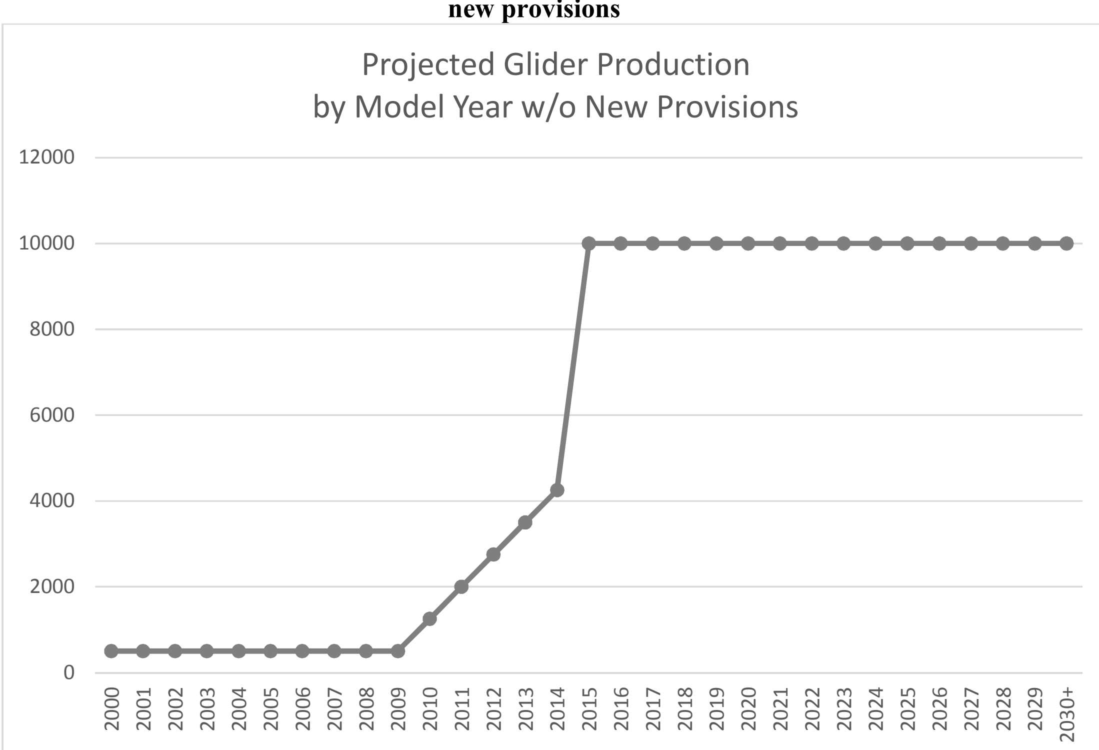
For the final rule, EPA has updated our analysis of the environmental impacts of gliders.[250] The updated analysis used the MOVES model, which is the same emissions modeling tool used to estimate the emissions impacts of the rule, described in Sections VII and VIII of the FRM. EPA performed two analyses which are described below. The first projected future fleetwide emissions for a control scenario based on the proposal (which is similar to the final rule). The second projected per-vehicle emissions for MY 2017 gliders. Both analyses focused on NOx and PM emissions and assumed that these gliders emit at the level equivalent to the engines meeting the MY 1998-2001 standards, since most glider vehicles currently being produced use remanufactured engines of this vintage. See Section XIII.B.(3) of the Preamble and Section 14.2 of this RTC. We did not attempt to account for any miscalibration of these engines or other factors that would cause emissions to be higher than 1998 engines. Finally, the analyses made the simplifying assumption that all gliders are tractors. Although not entirely correct, the vast majority of glider vehicles currently being produced are tractors, so this assumption still allows impacts to be reasonably approximated.

[248] The NO_X and PM standards for MY 2007 and later engines are 0.20 g/hp-hr and 0.01 g/hp-hr, respectively. The standards for MY 2004 through 2006 engines were ten times these levels, and earlier standards were even higher.
[249] "Industry Characterization of Heavy Duty Glider Kits," MacKay & Company, September 30, 2013.
[250] Memorandum to the Docket "Emissions Modeling Files for Glider Analysis" Docket No. EPA-HQ-OAR-2016. July, 2016.

Fleetwide Emission Projections

Based on public comments, EPA is estimating that approximately 10,000 gliders will be produced in 2016. Consistent with this, the modeling of gliders discussed here assumed annual glider sales of 10,000 for 2015 and later. As noted above, the modeling assumed that these gliders emit at the level equivalent to the engines meeting the MY 1998-2001 standards without miscalibration.

Figure A- 1: Glider vehicle production projected for fleetwide analysis without new provisions



We modeled impacts on NOx and PM inventories with and without restrictions for two calendar years: 2025 and 2040. The restrictions were modeled as limiting sales in 2018 and later to 1,000 new gliders each year. This control case roughly approximates the restrictions being adopted for 2018 and later, and is consistent with the proposed requirements. The total number of vehicles was held constant by increasing the number of fully compliant vehicles (i.e., vehicles with engines meeting 2017 and later standards for NOx and PM) by 9,000 for each model year after 2017. However, we recognize that the actual number of gliders produced annually under the control case may vary by year and/or be higher or lower than 1,000. The results are shown below. This control scenario does not reflect the restrictions being adopted for 2017. See the model year analysis below for the impacts of model year 2017 glider vehicles.

Table A-1: Fleetwide NOx and PM Emissions (tons) from Glider Vehicles for Calendar Year 2025

2025	Without Controls (US Tons per Year)	With Controls (US Tons per Year)	Reductions (US Tons per Year)
NOx	295,000	104,769	190,231
$PM_{2.5}$	7,817	2,753	5,064

Table A-2: Fleetwide NOx and PM Emissions (tons) from Glider Vehicles for Calendar Year 2040

	Without Controls (US Tons per Year)	With Controls (US Tons per Year)	Reductions (US Tons per Year)
NOx	371,091	52,476	318,615
$PM_{2.5}$	9,955	1,409	8,546

The model projects that if glider vehicle production remains at 10,000 per year, there would be 128,750 glider vehicles on the road in 2025 and that they would emit 295,000 tons/year of NOx in 2025 and 7,817 tons/year of $PM_{2.5}$. This means the average glider on the road in 2025 would emit 4,583 pounds of NOx and 121 pounds of $PM_{2.5}$ for that single year.[251]

Model Year Analysis

EPA also modeled the lifetime emissions of a single model year. The analysis estimated per-vehicle emissions, as well as the emission reductions associated with restricting the number of glider vehicles that could be produced in 2017 using older engines not meeting the current criteria pollutant standards. As with the fleetwide analysis, the model year analysis assumed that these gliders emit at the level equivalent to the engines meeting the MY 1998-2001 standards without miscalibration. Although presented for model year 2017, similar results would be expected for later years as well. The per-vehicle results are shown in the figures below (gray bars for glider vehicles). These figures also show the corresponding emissions projected for conventional model year 2017 vehicles with fully compliant engines (small blue bars).

[251] This estimate is for the projected number of vehicles on the road, and does not include vehicles projected to have been scrapped from the population.

**Figure A-2: Annual Per-Vehicle NOx Emissions (tons/year)
For Model Year 2017 Glider Vehicles and Other New Vehicles**

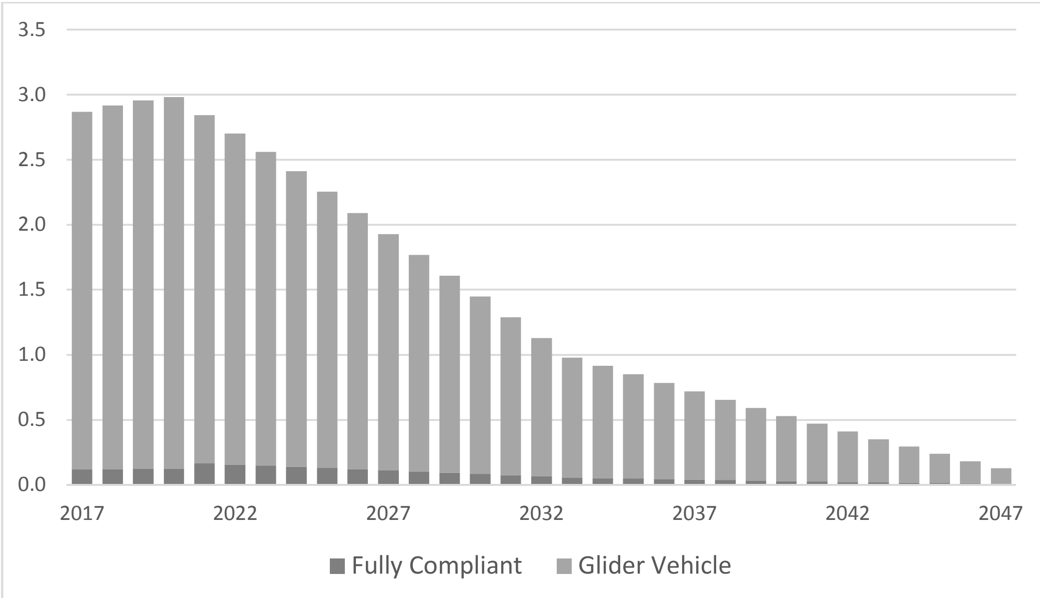
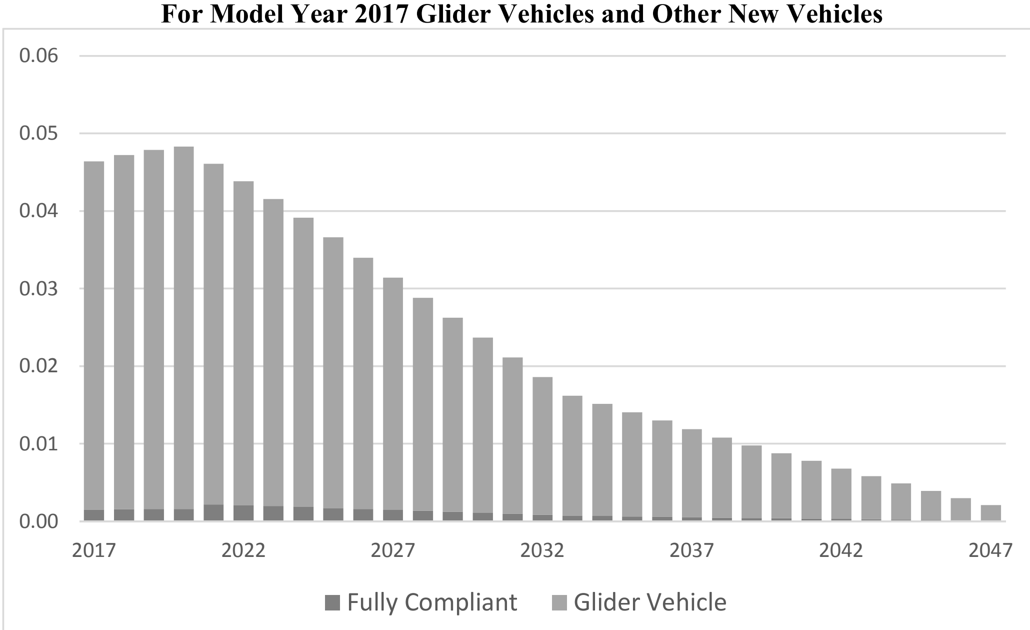


**Figure A-3: Annual Per-Vehicle PM Emissions (tons/year)
For Model Year 2017 Glider Vehicles and Other New Vehicles**



Emissions are shown normalized to the initial number of model year 2017 vehicles.[252] The trends shown in these figures largely reflect three phenomena: deterioration, scrappage, and declining use. Emissions initially increase due to deterioration of the engines (and deterioration of aftertreatment controls for the fully compliant engines). Then the average per-vehicle emissions decline as the projected annual mileage accumulation rates decline and some fraction of the vehicles are removed from service. Model year lifetime emissions are shown below per thousand glider vehicles.[253]

Table A-3: Lifetime NOx and PM Emissions (tons)
For Model Year 2017 Glider Vehicles and Other New Vehicles

	NOx Lifetime Tons per 1,000 Vehicles	$PM_{2.5}$ Lifetime Tons per 1,000 Vehicles
Model Year 2017 Glider Vehicles	43,800	710
Model Year 2017 Fully Compliant Vehicles	2,300	30
Difference	41,500	680

As shown in this table, even a small number of glider vehicles has a very large emission impact. Even without any projections of miscalibration, glider vehicles are projected to emit about 20 times as much NOx and PM as the same number of fully compliant vehicles.[254] Moreover every 1,000 glider vehicles that are produced instead of fully compliant vehicles results in 41,500 tons of additional NOx and 680 tons additional PM emitted into the atmosphere. Although we do not have precise historical production rates for glider vehicles, we are confident that they were less than 5,000 per year prior to 2015. Without controls, it is reasonable to assume that glider vehicle production for 2017 would be 10,000 to 15,000.[255] Thus, the restriction on 2017 production that is being adopted is projected to prevent the use of high polluting engines in 5,000 to 10,000 glider vehicles. This would prevent the emission of 207,500-415,000 tons of NOx and 3,400-6,800 tons of PM.

[252] These numbers differ from per-vehicle estimates from the fleetwide analysis because they are normalized to the total number of model year 2017 vehicles produced rather than those still in the fleet for a given calendar year.
[253] The maximum lifetime assumed for these vehicles is 30 years; however, MOVES models most vehicles as being removed from service after much less than 30 years. MOVES projects that nearly 80 percent of lifetime emissions will occur within the first 15 years of a vehicle's life.
[254] EPA has separately estimated that glider emissions could be as much more than twice as high as this (or producing more than 40 times as much NOx and PM as current engines) if the engines are miscalibrated, incompletely/improperly rebuilt, and/or were originally manufactured before 1998.
[255] 2016 production is projected to be approximately 10,000 glider vehicles. Given the trend of ever-increasing sales over the last several years, combined with the likelihood of some pre-buying occurring based on the proposed restrictions for 2018, we believe that 2017 production could have been 15,000 or more without the production limit for 2017.

Benefits of Controlling Emissions from Glider Vehicles

Reducing the number of glider vehicles produced using older engines will yield substantial improvements in public health. For example, using incidence-per-ton estimates, the number of $PM_{2.5}$-related premature mortalities caused by glider vehicles can be estimated from the lifetime reductions in both NO_X (which forms nitrate PM in secondary reactions) and directly emitted $PM_{2.5}$. Using benefit-per-ton values (described in Section IX.H of the FRM Preamble), the present value of total monetized $PM_{2.5}$-related benefits associated with these lifetime emission reductions can also be calculated. These health-related benefits are presented in the table below. Cases of premature mortality avoided are presented as a range based on results derived from two studies (the American Cancer Society cohort study - Krewski et al., 2009, and the Harvard Six-cities study - Lepeule et al., 2012). Monetized benefits are presented as net present values in 2013$, assuming a 30-year vehicle lifetime and a 3% and 7% discount rate. Both premature mortalities and benefits are shown for model year 2017 glider vehicles based on the increase in lifetime emissions over a fully compliant model year 2017 vehicle. Note, as discussed below, there would be additional benefits that have not been quantified.

Table A-4: Lifetime NOx and PM Emissions Increases (tons) For Model Year 2017 Glider Vehicles and Associated Benefits

Increased Lifetime NOx Emissions per 1,000 Glider Vehicles	41,500 Tons
Increased Lifetime $PM_{2.5}$ Emissions per 1,000 Glider Vehicles	680 Tons
Premature Mortalities per 1,000 Glider Vehicles	70-160 Persons
Monetized $PM_{2.5}$-related Benefits Associated with Reducing Glider Production by 1,000 Vehicles	$0.3-1.1 Billion

As noted above, the restriction on 2017 production that is being adopted is projected to prevent the use of high polluting pre 2002-engines in 5,000 to 10,000 glider vehicles, and would prevent the emission of 207,500-415,000 tons of NOx and 3,400-6,800 tons of PM over the lifetime of those vehicles and engines. This is estimated to prevent 350 to 1,600 premature mortalities (and achieve $1.5 to 11.0 billion in monetized $PM_{2.5}$-related benefits).

Several commenters argued that EPA is precluded from adopting any controls on installation of high polluting engines in glider vehicles until MY 2021. This could mean the production of 30,000 to 40,000 additional glider vehicles using the older high polluting engines. Using the same assumptions as above, these three additional model years of production are estimated to result in an additional 2,100 to 6,400 premature mortalities, incremental to the premature mortalities.

As described above, this sensitivity analysis uses estimates of the benefits from reducing the incidence of $PM_{2.5}$-related health impacts. These estimates, which are expressed per ton of $PM_{2.5}$-related emissions eliminated by adopting glider vehicle controls, represent the total monetized value of quantified human health benefits (including reduction in both premature mortality and premature morbidity) from reducing each ton of directly emitted $PM_{2.5}$, or its precursors (e.g., NO_X), from on-road mobile sources. Ideally, the human health benefits would be estimated based on changes in ambient $PM_{2.5}$ as determined by full-scale air quality modeling. However, the length of time needed to prepare the necessary emissions inventories, in addition to the processing time associated with the modeling itself, has precluded us from performing air quality modeling for this analysis.

The benefit per-ton technique has been used in previous analyses, including EPA's 2017-2025 Light-Duty Vehicle Greenhouse Gas Rule,[256] the Reciprocating Internal Combustion Engine rules,[257,258] and the Residential Wood Heaters NSPS.[259] The table below shows the quantified $PM_{2.5}$-related benefits captured in the per-ton estimates, as well as unquantified $PM_{2.5}$ effects the per-ton estimates are unable to capture.

Table A-5: Human Health and Welfare Effects of $PM_{2.5}$

POLLUTANT	QUANTIFIED AND MONETIZED IN PRIMARY ESTIMATES	UNQUANTIFIED EFFECTS CHANGES IN:
$PM_{2.5}$	Adult premature mortality Acute bronchitis Hospital admissions: respiratory and cardiovascular Emergency room visits for asthma Nonfatal heart attacks (myocardial infarction) Lower and upper respiratory illness Minor restricted-activity days Work loss days Asthma exacerbations (asthmatic population) Infant mortality	Cancer, mutagenicity, and genotoxicity effects Chronic and subchronic bronchitis cases Strokes and cerebrovascular disease Low birth weight Pulmonary function Chronic respiratory diseases other than chronic bronchitis Non-asthma respiratory emergency room visits Visibility Household soiling

This sensitivity analysis uses per ton benefits estimates taken from the "Technical Support Document Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors," U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle.[260] The procedure for calculating benefit per ton coefficients follows three steps, shown graphically in Figure A-4 below:

[256] U.S. Environmental Protection Agency (U.S. EPA). (2012). *Regulatory Impact Analysis: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*, Assessment and Standards Division, Office of Transportation and Air Quality, EPA-420-R-12-016, August 2012. Available on the Internet at: http://www.epa.gov/otaq/climate/documents/420r12016.pdf.
[257] U.S. Environmental Protection Agency (U.S. EPA). (2013). *Regulatory Impact Analysis for the Reconsideration of the Existing Stationary Compression Ignition (CI) Engines NESHAP*, Office of Air Quality Planning and Standards, Research Triangle Park, NC. January. EPA-452/R-13-001. Available at http://www.epa.gov/ttnecas1/regdata/RIAs/RICE_NESHAPreconsideration_Compression_Ignition_Engines_RIA_final2013_EPA.pdf.
[258] U.S. Environmental Protection Agency (U.S. EPA). (2013). *Regulatory Impact Analysis for Reconsideration of Existing Stationary Spark Ignition (SI) RICE NESHAP*, Office of Air Quality Planning and Standards, Research Triangle Park, NC. January. EPA-452/R-13-002. Available at http://www.epa.gov/ttnecas1/regdata/RIAs/NESHAP_RICE_Spark_Ignition_RIA_finalreconsideration2013_EPA.pdf.
[259] U.S. Environmental Protection Agency (U.S. EPA). (2015). *Regulatory Impact Analysis for Residential Wood Heaters NSPS Revision*. Office of Air Quality Planning and Standards, Research Triangle Park, NC. February. EPA-452/R-15-001. Available at http://www2.epa.gov/sites/production/files/2015-02/documents/20150204-residential-wood-heaters-ria.pdf.
[260] https://www.epa.gov/sites/production/files/2014-10/documents/sourceapportionmentbpttsd.pdf.

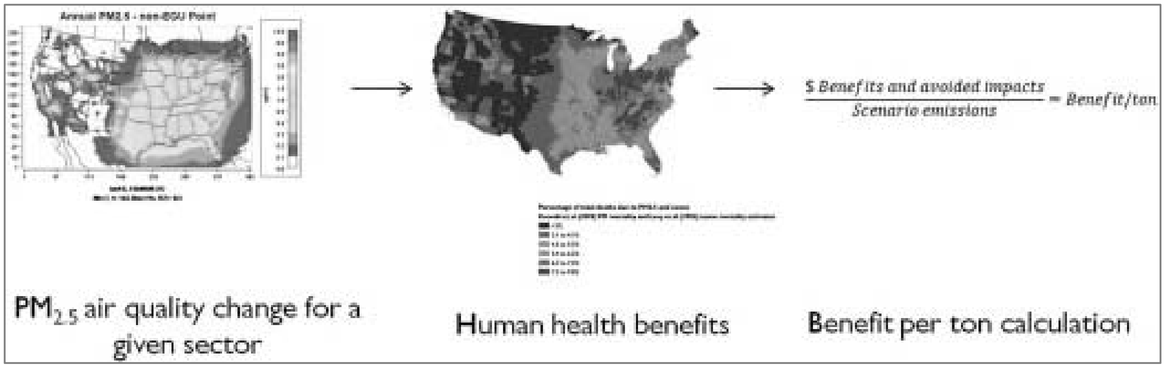
1. Use source apportionment photochemical modeling to predict ambient concentrations of primary PM2.5, nitrate and sulfate attributable to each of 17 emission sectors across the Continental U.S., including on-road mobile sources. The on-road mobile source sector contribution to $PM_{2.5}$ concentrations was estimated using the peer-reviewed model CAMx version 5.30, which includes numerous science modules that simulate the emission, production, decay, deposition and transport of organic and inorganic gas-phase and particle-phase pollutants in the atmosphere (Baker and Scheff, 2007; ENVIRON, 2010; Nobel et al., 2001; Russell, 2008).[261,262,263,264] Particulate matter source apportionment technology (PSAT) implemented in CAMx estimated the contribution from on-road mobile sources to primarily emitted $PM_{2.5}$ and to secondarily formed $PM_{2.5}$ (e.g., nitrate) using reactive tracers to capture nonlinear formation and removal processes (Baker and Foley, 2011; ENVIRON, 2010; Wagstrom et al., 2008).[265,266,267] Mobile source contributions were estimated in CAMx for domains covering the eastern and western United States with 12 km square sized grid cells. The emissions data used in the air quality modeling were based on EPA's 2005 v4 platform.[268]

2. For each sector, estimate the health impacts, and the economic value of these impacts, associated with the attributable ambient concentrations of primary $PM_{2.5}$, sulfate and nitrate $PM_{2.5}$ using the environmental Benefits Mapping and Analysis Program (BenMAP v4.0.66).[269,270] BenMAP is a peer-reviewed Geographic Information System (GIS)-based tool that takes air quality input data (i.e., the CAMx data described in step 1), overlays that with population to estimate exposure, and uses that information to estimate changes in health effects using "health impact functions" derived from the published epidemiology literature.

3. For each sector, divide the $PM_{2.5}$-related health impacts attributable to each type of $PM_{2.5}$, and the monetary value of these impacts, by the level of associated precursor emissions. That is, primary $PM_{2.5}$ benefits are divided by direct $PM_{2.5}$ emissions, and nitrate benefits are divided by NO_X emissions.

[261] Baker K, Scheff P. Photochemical model performance for PM2.5 sulfate, nitrate, ammonium, and precursor species SO2, HNO3, and NH3 at background monitor locations in the central and eastern United States. Atmos Environ 2007;41:6185–95. http://dx.doi.org/10.1016/j.atmosenv.2007.04.006.
[262] ENVIRON. User's guide comprehensive air quality model with extensions version 5.30. www.camx.com. 2010.
[263] Nobel CE, McDonald-Buller EC, Kimura Y, Allen DT. Accounting for spatial variation of ozone productivity in NOx emission trading. Environ Sci Technol 2001;35:4397–407.
[264] Russell AG. EPA supersites program-related emissions-based particulate matter modeling: initial applications and advances. J Air Waste Manage Assoc 2008;58:289–302. http://dx.doi.org/10.3155/1047-3289.58.2.289.
[265] Baker KR, Foley KM. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM2.5. Atmos Environ 2011;45:3758–67. http://dx.doi.org/10.1016/j.atmosenv.2011.03.074.
[266] ENVIRON. User's guide comprehensive air quality model with extensions version 5.30. www.camx.com. 2010.
[267] Wagstrom KM, Pandis SN, Yarwood G, Wilson GM, Morris RE. Development and application of a computationally efficient particulate matter apportionment algorithm in a three-dimensional chemical transport model. Atmos Environ 2008;42:5650–9. http://dx.doi.org/10.1016/j.atmosenv.2008.03.012.
[268] United States Environmental Protection Agency (US EPA). 2005 National Emissions Inventory Data & Documentation. Available at: http://www.epa.gov/ttnchie1/net/2005inventory.html2011.
[269] https://www.epa.gov/benmap.
[270] In this stage we estimate the $PM_{2.5}$-related impacts associated with changes in directly emitted $PM_{2.5}$ and nitrate separately, so that we may ultimately calculate the benefit per ton reduced of the corresponding $PM_{2.5}$ precursor, or directly emitted $PM_{2.5}$, in step 3. When estimating these impacts we apply effect coefficients that relate changes in total $PM_{2.5}$ mass to the risk of adverse health outcomes; we do not apply effect coefficients that are differentiated by $PM_{2.5}$ specie.

Figure A-4: Conceptual Diagram Of The Analytical Process For Calculating Impact And Benefit Per Ton Estimates.



The process described above yields per-ton estimates that relate emission changes to health impacts and monetized benefits. We recommend readers refer to pp. 142-144 of Fann et al. (2012)[271] for a detailed description of the benefit-per-ton methodology.

In this sensitivity analysis, using benefit-per-ton values, EPA only estimates the economic value of the human health benefits associated with the resulting reductions in $PM_{2.5}$ exposure. For example, we do not estimate the change in health risk associated with reductions in diesel PM based on current limitations in methods and available data. Thus, the per-ton estimates do not reflect cancers attributable to exposure to diesel PM exhaust, a likely human carcinogen. See Preamble Section VIII.A.6. However, we capture other benefits related to reductions in diesel PM (chiefly, benefits related to cardiovascular health endpoints) to the extent that diesel PM is included in measured $PM_{2.5}$. Furthermore, due to analytical limitations with the benefit per ton method, this analysis does not estimate reductions in premature mortality and other benefits resulting from reductions in population exposure to other criteria pollutants such as ozone. The air quality modeling that underlies the PM-related benefit per ton values also produced estimates of ozone levels attributable to each sector. However, the complex non-linear chemistry governing ozone formation prevented EPA from developing a complementary array of ozone benefit per ton values. This limitation notwithstanding, we anticipate that the ozone-related benefits associated with reducing emissions of NOx and VOC emitted by glider vehicles using high polluting engines are substantial. Refer to RIA Appendix 8.A for the ozone benefits results from the supplemental CY benefits analysis. Finally, the benefits per-ton method does not monetize all of the potential health and welfare effects associated with reduced concentrations of $PM_{2.5}$.

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[271] Fann, N., Baker, K.R., and Fulcher, C.M. (2012). *Characterizing the PM2.5-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S.*, Environment International, 49, 241-151, Published online September 28, 2012. http://www.sciencedirect.com/science/article/pii/S0160412012001985.

XX.
EPA Documents Relating to Current Regulation of Gliders

3. Excerpts from U.S. EPA & NHTSA, *Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2*, Regulatory Impact Analysis (Aug. 2016)

Segments of the Regulatory Impact Analysis document for the Heavy-Duty Phase 2 rulemaking relevant to this litigation, as listed below, are included in this appendix.

Section of HDP2 Regulatory Impact Analysis	**Document page numbers**	**Starts at Appendix page number**
5.5 Non-Greenhouse Gas Emission Impacts	5-42 – 5-54	616
6.1 Health and Environmental Effects of Non-GHG Pollutants	6-1 – 6-33	629
6.2 Impacts of the Rules on Concentrations of Non-GHG Pollutants	6-33 – 6-44	661
Ch. 12: Final Regulatory Flexibility Analysis, Sections 12.1-12.7	12-1 – 12-5	682
12.7 Regulatory Flexibilities – 12.7.3 Glider Vehicle Manufacturer Flexibilities	12-8 – 12-10	687
12.8.4 Glider Vehicle Manufacturer Economic Effects	12-17 – 12-18	690
12.9 Summary of Economic Effects	12-19	692

Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2

Regulatory Impact Analysis

Office of Transportation and Air Quality
U.S. Environmental Protection Agency

And

National Highway Traffic Safety Administration
U.S. Department of Transportation

EPA-420-R-16-900
August 2016

Table 5-40 Combined Lifetime GHG Reductions and Fuel Savings of Phase 1 and Phase 2 Program using Analysis Method B [a]

	TOTAL GHG REDUCTIONS ($MMT\ CO_2EQ$)	FUEL SAVINGS (BILLION GALLONS)
Phase 1		
MY 2014-2018	338	26
MY 2019-2029	1,081	84
Phase 2		
MY 2018-2029	1,098	82
Combined Total	2,517	192

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

5.5 Non-Greenhouse Gas Emission Impacts

The medium- and heavy-duty vehicle standards will influence the emissions of criteria air pollutants and several air toxics. Similar to Chapter 5.4, the following subsections summarize two slightly different analyses of the annual non-GHG emissions reductions expected from the standards. Chapter 5.5.1 shows the impacts of the final rules on non-GHG emissions using the analytical Method A, relative to two different reference cases – flat and dynamic. Chapter 5.5.2 shows the impacts of the standards, relative to the flat reference case only, using the MOVES model for all heavy-duty vehicle categories.

5.5.1 Impacts of the Final Rules using Analysis Method A

5.5.1.1 Calendar Year Analysis

5.5.1.1.1 Downstream Impacts

Table 5-41 Annual Downstream Impacts of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1b using Analysis Method A [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	1	0.5%	4	3.6%	4	3.4%
Acetaldehyde	-1	0%	-16	-0.7%	-19	-0.8%
Acrolein	0.2	0%	-0.3	-0.1%	-1	-0.4%
Benzene	-2	-0.1%	-13	-1.2%	-13	-1.1%
CO	-9,045	-0.6%	-34,702	-2.8%	-42,095	-3.0%
Formaldehyde	-21	-0.3%	-96	-1.6%	-119	-1.8%
NO_X	-12,082	-1.3%	-53,254	-9.1%	-65,068	-9.9%
$PM_{2.5}$	-58	-0.2%	-363	-2.0%	-453	-2.2%
SO_X	-201	-4.1%	-851	-16.0%	-1,028	-17.0%
VOC	-769	-0.8%	-3,436	-5.3%	-4,128	-5.8%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

Table 5-42 Annual Downstream Impacts of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1a using Analysis Method A [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	1	0.5%	4	3.7%	4	3.5%
Acetaldehyde	-1	0%	-14	-0.7%	-18	-0.8%
Acrolein	0.2	0%	-0.3	-0.1%	-1	-0.4%
Benzene	-2	-0.2%	-13	-1.2%	-14	-1.2%
CO	-8,944	-0.6%	-34,502	-2.8%	-41,880	-3.0%
Formaldehyde	-20	-0.3%	-91	-1.6%	-113	-1.7%
NO_X	-13,368	-1.5%	-60,594	-10.2%	-74,206	-11.0%
$PM_{2.5}$	-78	-0.2%	-473	-2.6%	-591	-2.9%
SO_X	-219	-4.5%	-941	-17.0%	-1,138	-19.0%
VOC	-831	-0.8%	-3,736	-5.8%	-4,499	-6.3%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

5.5.1.1.2 Upstream Impacts

Table 5-43 Annual Upstream Impacts of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1b using Analysis Method A [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	-1	-4.9%	-4	-18.0%	-5	-19.0%
Acetaldehyde	-3	-4.4%	-14	-15.0%	-16	-16.0%
Acrolein	-0.4	-4.6%	-2	-16.0%	-2	-17.0%
Benzene	-23	-4.8%	-88	-16.0%	-105	-18.0%
CO	-3,785	-4.9%	-14,714	-17.0%	-17,629	-19.0%
Formaldehyde	-18	-4.9%	-71	-17.0%	-86	-19.0%
NO_X	-9,255	-4.9%	-35,964	-17.0%	-43,089	-19.0%
$PM_{2.5}$	-975	-4.9%	-3,850	-18.0%	-4,618	-19.0%
SO_X	-5,804	-4.9%	-22,550	-17.0%	-27,019	-19.0%
VOC	-4,419	-4.8%	-14,857	-15.0%	-17,385	-16.0%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

Table 5-44 Annual Upstream Impacts of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1a using Analysis Method A [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	-1	-5.3%	-4	-20.0%	-5	-21.0%
Acetaldehyde	-4	-4.6%	-15	-16.0%	-17	-17.0%
Acrolein	-0.4	-4.9%	-2	-17.0%	-2	-18.0%
Benzene	-25	-5.1%	-96	-18.0%	-115	-19.0%
CO	-4,142	-5.4%	-16,298	-19.0%	-19,558	-20.0%
Formaldehyde	-20	-5.3%	-79	-19.0%	-95	-20.0%
NO_X	-10,124	-5.4%	-39,813	-19.0%	-47,779	-20.0%
$PM_{2.5}$	-1,065	-5.3%	-4,258	-19.0%	-5,117	-21.0%
SO_X	-6,349	-5.4%	-24,961	-19.0%	-29,958	-20.0%
VOC	-4,810	-5.2%	-16,218	-16.0%	-19,004	-17.0%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

5.5.1.1.3 Total Impacts

Table 5-45 Annual Total Impacts (Upstream and Downstream) of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1b using Analysis Method A [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	0.3	0.1%	0.1	0.1%	-0.4	-0.3%
Acetaldehyde	-4	-0.1%	-30	-1.3%	-35	-1.4%
Acrolein	-0.2	0%	-2	-0.7%	-3	-0.9%
Benzene	-25	-1.2%	-101	-6.3%	-118	-6.7%
CO	-12,830	-0.9%	-49,416	-3.7%	-59,724	-4.0%
Formaldehyde	-39	-0.5%	-167	-2.7%	-205	-2.9%
NO_X	-21,337	-2.0%	-89,218	-11.0%	-108,157	-12.0%
$PM_{2.5}$	-1,033	-2.0%	-4,213	-10.0%	-5,071	-11.0%
SO_X	-6,005	-4.9%	-23,401	-17.0%	-28,047	-19.0%
VOC	-5,188	-2.7%	-18,293	-11.0%	-21,513	-12.0%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

Table 5-46 Annual Total Impacts (Upstream and Downstream) of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1a using Analysis Method A [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	0.2	0.1%	-0.2	-0.1%	-1.0	-0.5%
Acetaldehyde	-5	-0.2%	-29	-1.3%	-35	-1.4%
Acrolein	-0.2	0%	-2	-0.7%	-3	-1.0%
Benzene	-27	-1.4%	-109	-6.8%	-129	-7.2%
CO	-13,086	-0.9%	-50,800	-3.8%	-61,438	-4.1%
Formaldehyde	-40	-0.5%	-170	-2.7%	-208	-2.9%
NO_X	-23,492	-2.2%	-100,407	-12.0%	-121,985	-14.0%
$PM_{2.5}$	-1,143	-2.2%	-4,731	-12.0%	-5,708	-13.0%
SO_X	-6,568	-5.3%	-25,902	-19.0%	-31,096	-20.0%
VOC	-5,641	-3.0%	-19,954	-12.0%	-23,503	-13.0%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

5.5.1.2 Model Year Lifetime Analysis

Table 5-47 Lifetime Non-GHG Reductions by Heavy-Duty Vehicle Category – Summary for Model Years 2018-2029 using Analysis Method A (US Short Tons) [a]

	FINAL PROGRAM (ALTERNATIVE 3)	
NO-ACTION ALTERNATIVE (BASELINE)	1b (Dynamic)	1a (Flat)
NO_X	492,070	545,780
HD Pickups and Vans	23,702	26,297
Vocational	42,621	42,621
Tractor/Trailers	425,747	477,021
$PM_{2.5}$	27,605	30,594
HD Pickups and Vans	2,164	2,385
Vocational	4,436	4,436
Tractor/Trailers	21,005	23,773
SO_X	157,579	172,952
HD Pickups and Vans	17,477	19,214
Vocational	25,082	25,082
Tractor/Trailers	115,020	128,656

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

5.5.2 Impacts of the Final Rules using Analysis Method B

5.5.2.1 Calendar Year Analysis

5.5.2.1.1 Downstream Impacts

After all the MOVES runs[R] and post-processing were completed, the flat reference (Alternative 1a) and control case (Alternative 3) inventories were aggregated for all vehicle types and emission processes to estimate the total downstream non-GHG impacts of the program. Table 5-48 summarizes these downstream non-GHG impacts of final program for calendar years 2025, 2040 and 2050, relative to Alternative 1a. The results are shown both in changes in absolute tons and in percent reductions from the flat reference to alternatives for the heavy-duty sector.

The agencies expect the Phase 2 program to impact the downstream emissions of non-GHG pollutants. These pollutants include oxides of nitrogen (NO_X), oxides of sulfur (SO_X), volatile organic compounds (VOC), carbon monoxide (CO), fine particulate matter ($PM_{2.5}$), and

[R] For non-GHGs, MOVES was run only for January and July and the annual emissions were extrapolated by scaling up each month by a factor of 5.88 for all pollutants except particulate matter (PM). For PM, to offset the disproportionate effect of the cold temperature on January results, a scaling factor of 4.3 was applied to January and 7.5 to July; these factors were determined based on analysis of annual PM emissions during modeling for the RFS2 rule. Note that for GHGs, MOVES was run for all months.

air toxics. The agencies expect reductions in downstream emissions of NO_X, $PM_{2.5}$, VOC, SO_X, CO, and air toxics. Much of these estimated net reductions are a result of the agencies' anticipation of increased use of auxiliary power units (APUs) in combination tractors during extended idling; APUs emit these pollutants at a lower rate than on-road engines during extended idle operation, with the exception of $PM_{2.5}$. As discussed in Section III.C.3, EPA is adopting Phase 1 and Phase 2 requirements to control $PM_{2.5}$ emissions from APUs installed in new tractors and therefore, eliminate the unintended consequence of increases in $PM_{2.5}$ emissions from increased APU use.

The downstream emission reductions of non-GHG pollutants estimated in the final rulemaking are significantly less than what was estimated for the proposal, mainly because of the changes in projected use of auxiliary power units (APUs) during extended idling. The idle reduction adoption rates were reassessed and projected to be lower (Table 5-14) than what was assumed in the proposal, as described in Section III.D.1.a of the Preamble. Lower penetration of APUs assumed in the final program results in lower downstream reductions of criteria pollutants and air toxics, compared to the proposal.

Furthermore, in response to the public comments received on the proposal, the MOVES emission rates for extended idle were lowered significantly for criteria pollutants based on the analyses of the latest test programs that reflect the current prevalence of clean idle certified engines.[24] For example, the extended idle rate for NO_X was changed from 203 g/hr to 42.6 g/hr for model year 2013 and later. This change resulted in smaller differences between emission rates for extended idle and APUs for all criteria pollutants. Therefore, the emissions benefits of using APUs during extended idle, instead of the main engine, are lower for non-GHGs in the final rulemaking than the proposal.

Additional reductions in tailpipe emissions of NO_X and CO and refueling emissions of VOC will be achieved through improvements in engine efficiency and reduced road load (improved aerodynamics and tire rolling resistance), which reduces the amount of work required to travel a given distance and increases fuel economy.

For vehicle types not affected by road load improvements, such as HD pickups and vans[S], non-GHG emissions will increase very slightly due to VMT rebound. In addition, brake wear and tire wear emissions of $PM_{2.5}$ will also increase very slightly due to VMT rebound. The agencies estimate that downstream emissions of SO_X will be reduced, because they are roughly proportional to fuel consumption.

[S] HD pickups and vans are subject to gram per mile (distance) emissions standards, as opposed to larger heavy-duty vehicles which are certified to a gram per brake horsepower (work) standard.

Table 5-48 Annual Downstream Impacts of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1a using Analysis Method B [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	-1	-0.2%	-3	-1.5%	-3	-1.8%
Acetaldehyde	-3	-0.1%	-18	-0.8%	-23	-0.9%
Acrolein	-0.1	0%	-1	-0.3%	-1	-0.4%
Benzene	-5	-0.2%	-22	-1.4%	-26	-1.6%
CO	-9,445	-0.4%	-35,710	-2.4%	-43,642	-2.7%
Formaldehyde	-20	-0.2%	-97	-1.5%	-120	-1.7%
NO_X	-13,396	-1.4%	-60,681	-9.7%	-74,362	-10.8%
$PM_{2.5}$	-73	-0.2%	-462	-2.2%	-580	-2.5%
SO_X	-252	-4.7%	-1,122	-18.5%	-1,341	-20.1%
VOC	-1,071	-0.8%	-5,060	-5.9%	-6,013	-6.6%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

As noted above, EPA is adopting Phase 1 and Phase 2 requirements to control $PM_{2.5}$ emissions from APUs installed in new tractors. In the NPRM, an unintended increase in downstream $PM_{2.5}$ emissions was projected because engines powering APUs are currently required to meet less stringent PM standards (40 CFR 1039.101) than on-road engines (40 CFR 86.007-11) and because the increase in emissions from APUs more than offset the reduced tailpipe emissions from improved engine efficiency and road load. However, with the new requirements for APUs, the final program is projected to lead to reduced downstream $PM_{2.5}$ emissions of 462 tons in 2040 and 580 tons in 2050 (Table 5-48). As shown in Table 5-49, the net reductions in national $PM_{2.5}$ emissions with further PM control on APUs are 927 tons and 1,114 tons in 2040 and 2050, respectively. For additional details on EPA's PM emission standards for APUs, see Section III.C.3 of the Preamble. The development of APU emission rates with PM control is documented in the memorandum to the docket.[25]

Table 5-49 Projected Impact on $PM_{2.5}$ Emissions of Further $PM_{2.5}$ Control on APUs using Analysis Method B[a]

CY	BASELINE NATIONAL HEAVY-DUTY VEHICLE $PM_{2.5}$ EMISSIONS (TONS)	FINAL HD PHASE 2 PROGRAM NATIONAL $PM_{2.5}$ EMISSIONS WITHOUT FURTHER PM CONTROL (TONS)	FINAL HD PHASE 2 PROGRAM NATIONAL $PM_{2.5}$ EMISSIONS WITH FURTHER PM CONTROL (TONS)	NET IMPACT ON NATIONAL $PM_{2.5}$ EMISSION WITH FURTHER PM CONTROL ON APUS (TONS)
2040	20,939	21,403	20,476	-927
2050	22,995	23,529	22,416	-1,114

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

It is worth noting that the emission reductions shown in Table 5-48 are not incremental to the emissions reductions projected in the Phase 1 rulemaking. This is because the agencies have revised their assumptions about the adoption rate of APUs. This final rule assumes that without the Phase 2 program (i.e., in the Phase 2 baselines), the APU adoption rate will be 9 percent for model years 2010 and later, which is lower than the value used in both the Phase 1 control case and Phase 2 proposal. This decision was based on the agencies' assessment of how the current level of automatic engine shutdown and idle reduction technologies are used by the tractor manufacturers to comply with the 2014 model year CO_2 and fuel consumption standards. To date, the manufacturers are meeting the 2014 model year standards without the use of this technology. Compared to Phase 1, the final program projects lower and much delayed penetration of APUs (including both diesel- and battery-powered) and other idle reduction technologies starting in model year 2021 (Figure 5-4).

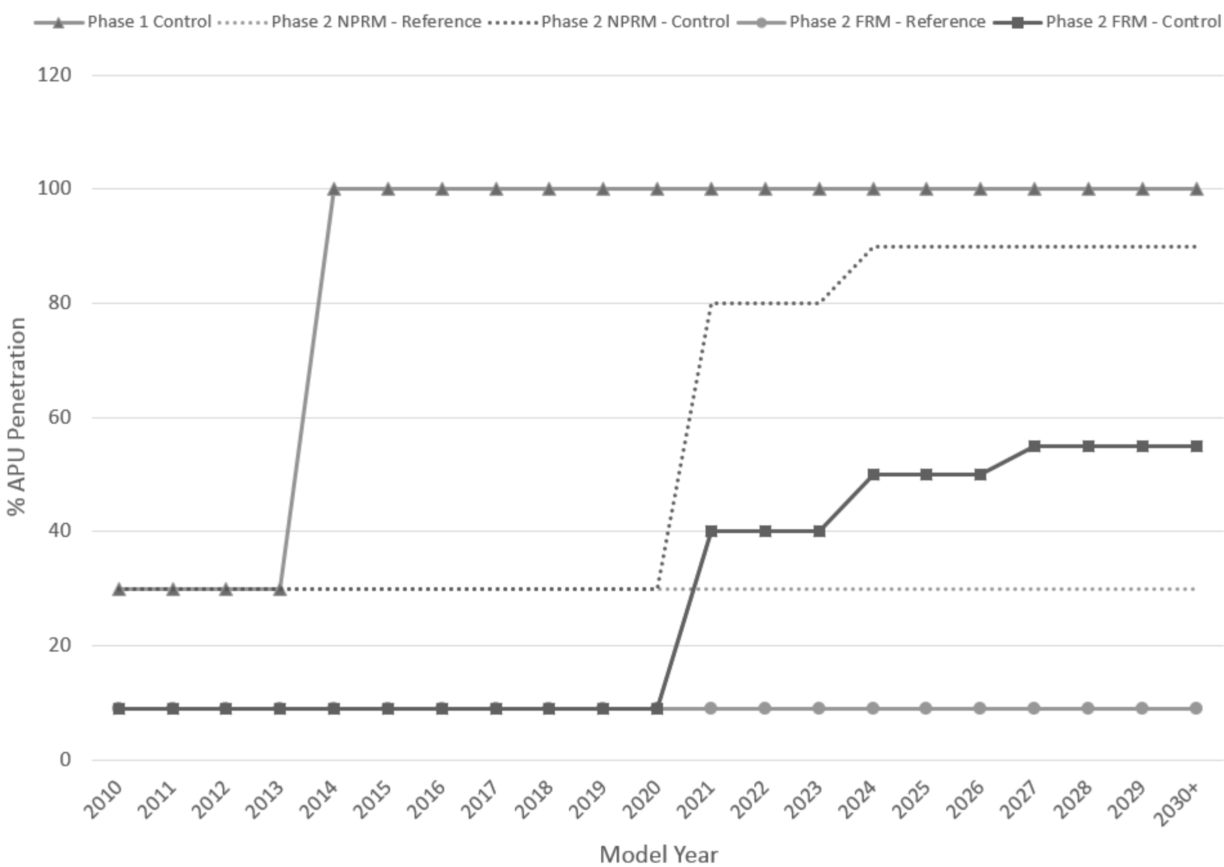

Figure 5-4 Comparison of Assumed Diesel and Battery-Powered APU Use during Extended Idle in Phase 1 and Phase 2

Considering the change in assumptions about APU use and the magnitude of impact of APUs on criteria emissions, and the revised extended idle rates, EPA conducted an analysis estimating the combined impacts of the Phase 1 and Phase 2 programs on downstream emissions for NO_X, VOC, SO_X and $PM_{2.5}$ in calendar year 2050. The analysis estimated the combined Phase 1 and Phase 2 emissions impacts by comparing the Phase 2 control case inventories to the Phase 1 reference case inventories. To be consistent with the emissions modeling done for this program, the emissions inventories for Phase 1 reference case were estimated using the same version of MOVES used for the Phase 2 final rulemaking.[T] The results are shown in Table 5-50. The differences in downstream reduction estimates between Phase 2 alone (Table 5-48) and combined Phase 1 and Phase 2 (Table 5-50) reflect the improvements in road loads from Phase 1. For NO_X and $PM_{2.5}$ only, we also estimated the combined Phase 1 and Phase 2 downstream and upstream emissions impacts for calendar year 2025, and project that the two rules combined will reduce NO_X by up to 55,000 tons and $PM_{2.5}$ by up to 33,000 tons in that year.

Table 5-50 Combined Phase 1 and Phase 2 Annual Downstream Emissions Impacts in Calendar Year 2050 using Analysis Method B [a]

CY	NO_X	VOC	SO_X	$PM_{2.5}$ [b]
2050	-100,878	-10,067	-2,249	-1,001

Notes:

[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

5.5.2.1.2 Upstream Impacts

The final program is projected to reduce the upstream emissions associated with fuel production and distribution because the projected fuel savings of the program will reduce the demands for gasoline and diesel. Table 5-51 summarizes the annual upstream reductions of the final program for criteria pollutants and individual air toxic pollutants in calendar years 2025, 2040 and 2050, relative to Alternative 1a. The results are shown both in changes in absolute tons and in percent reductions from the flat baseline for the heavy-duty sector.

Table 5-51 Annual Upstream Impacts of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1a using Analysis Method B [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	-1	-4.8%	-5	-19.0%	-6	-20.6%
Acetaldehyde	-7	-3.2%	-35	-14.5%	-38	-15.9%
Acrolein	-1	-3.5%	-3	-15.2%	-4	-16.7%
Benzene	-30	-3.8%	-143	-16.1%	-166	-17.6%
CO	-3,809	-4.8%	-16,884	-18.9%	-20,227	-20.5%
Formaldehyde	-20	-4.6%	-90	-18.3%	-107	-19.9%
NO_X	-9,314	-4.8%	-41,280	-18.9%	-49,462	-20.5%
$PM_{2.5}$	-1,037	-4.7%	-4,619	-18.7%	-5,520	-20.3%
SO_X	-5,828	-4.8%	-25,811	-18.9%	-30,941	-20.5%
VOC	-4,234	-3.7%	-20,010	-15.9%	-23,240	-17.4%

Note:

[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

[T] The emissions modeling for Phase 1 was performed using MOVES2010a.

5.5.2.1.3 Total Impacts

As shown in Table 5-52, the agencies estimate that this program will result in overall net reductions of NO_X, VOC, SO_X, CO, $PM_{2.5}$, and air toxics emissions. The results are shown both in changes in absolute tons and in percent reductions from the flat baseline for the heavy-duty sector.

Table 5-52 Annual Total Impacts (Upstream and Downstream) of Heavy-Duty Non-GHG Emissions in Calendar Years 2025, 2040 and 2050 – Final Program vs. Alt 1a using Analysis Method B [a]

POLLUTANT	CY2025		CY2040		CY2050	
	US Short Tons	% Change	US Short Tons	% Change	US Short Tons	% Change
1,3-Butadiene	-2	-0.5%	-8	-3.7%	-9	-4.1%
Acetaldehyde	-10	-0.3%	-53	-2.0%	-61	-2.1%
Acrolein	-1	-0.1%	-4	-1.3%	-5	-1.3%
Benzene	-35	-1.1%	-165	-6.8%	-192	-7.5%
CO	-13,254	-0.6%	-52,594	-3.3%	-63,869	-3.8%
Formaldehyde	-40	-0.5%	-187	-2.7%	-227	-2.9%
NO_X	-22,710	-1.9%	-101,961	-12.1%	-123,824	-13.3%
$PM_{2.5}$	-1,110	-1.9%	-5,081	-11.1%	-6,100	-12.1%
SO_X	-6,080	-4.8%	-26,933	-18.9%	-32,282	-20.5%
VOC	-5,305	-2.2%	-25,070	-11.9%	-29,253	-13.0%

Note:
[a] For an explanation of analytical Methods A and B, please see Preamble Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Preamble Section X.A.1

5.5.2.2 Model Year Lifetime Analysis

In addition to the annual non-GHG emissions reductions expected from the final program, the combined (downstream and upstream) non-GHG impacts for the lifetime of the impacted vehicles were estimated by heavy-duty vehicle category. Table 5-53 shows the fleet-wide reductions of NO_X, $PM_{2.5}$ and SO_X from the final program, relative to Alternative 1a, through the lifetime[U] of heavy-duty vehicles.

[U] A lifetime of 30 years is assumed in MOVES.

Table 5-53 Lifetime Non-GHG Reductions by Heavy-Duty Vehicle Category – Summary for Model Years 2018-2029 using Analysis Method B (US Short Tons) [a]

	FINAL PROGRAM (ALTERNATIVE 3)
NO-ACTION ALTERNATIVE (BASELINE)	1a (Flat)
NO_X	549,881
HD Pickups and Vans	30,239
Vocational	42,621
Tractor/Trailers	477,021
$PM_{2.5}$	32,251
HD Pickups and Vans	4,042
Vocational	4,436
Tractor/Trailers	23,773
SO_X	175,202
HD Pickups and Vans	21,464
Vocational	25,082
Tractor/Trailers	128,656

Note:
[a] For an explanation of analytical Methods A and B, please see Section I.D; for an explanation of the flat baseline, 1a, and dynamic baseline, 1b, please see Section X.A.1.

5.5.2.3 Comparison between Emission Inventories for Air Quality Modeling and Final Rule Inventories

Emissions and air quality modeling decisions are made early in the analytical process because of the time and resources associated with full-scale photochemical air quality modeling. As a result, it was necessary to use emissions from the proposed program to conduct the air quality modeling for this action. The air quality inventories and the final inventories are consistent in many ways but exhibit several important differences, as illustrated by the comparison presented in Table 5-54. The final program emission reductions shown in the table reflect updates to underlying assumptions, modeling inputs, and program standards, but the largest differences between these inventories and the air quality modeling inventories can be specifically attributed to changes in our assumptions about APU use and additional requirements to control $PM_{2.5}$ emissions from APUs. For example, as described in Preamble Section III.C.3, EPA is adopting Phase 1 and Phase requirements to control $PM_{2.5}$ emissions from APUs installed in new tractors, so we do not expect increases in downstream $PM_{2.5}$ emissions from the Phase 2 program; however, the air quality inventories do not reflect these requirements for APUs, and therefore show increases in downstream $PM_{2.5}$ emissions. Assumptions about the penetration of APUs also differ between the air quality inventories and the final rule inventories; as shown in Figure 5-4, the air quality (proposal) inventories assumed more widespread penetration of APUs than was assumed for the final program (see Chapter 5.3.2.3.1.1 of this RIA and Preamble Section III.D.1.a for more detail on the APU assumptions).

Furthermore, because of the differences in methodology between the national inventories and air quality inventories, particularly the treatment of local variables, such as vehicle populations, VMT, age distributions, vehicle speed distributions, and the handling of the temperature effects in MOVES, the more detailed approach used for the air quality inventory produced different emission estimates than those described in the national inventory section above.

Table 5-54 Emissions Reductions from the AQ Inventory and the Final Program Inventory

		AQ INVENTORY	FINAL PROGRAM INVENTORY
NO_X	Downstream	-244,904	-60,681
	Upstream	-9,871	-41,280
	Total	**-254,785**	**-101,961**
$PM_{2.5}$	Downstream	1,674	-462
	Upstream	-2,202	-4,619
	Total	**-528**	**-5,082**
VOC	Downstream	-29,207	-5,060
	Upstream	-11,297	-20,010
	Total	**-40,504**	**-25,071**
SO_X	Downstream	-891	-1,122
	Upstream	-8,972	-25,811
	Total	**-9,863**	**-26,933**

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[20] Craig Harvey, EPA, "Calculation of Upstream Emissions for the GHG Vehicle Rule." 2009. Docket No. EPA-HQ-OAR-2009-0472-0216.
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[22] Eastern Research Group. "A Study of R134a Leaks in Heavy Duty Vehicles." CARB Contract 06-342. Presented during CARB Seminar on January 6, 2011.
[23] Memorandum to the Docket "Emission Inventories for Air Quality Modeling Technical Support Document" Docket No. EPA-HQ-OAR-2016. July, 2016.

Chapter 6: Health and Environmental Impacts

6.1 Health and Environmental Effects of Non-GHG Pollutants

6.1.1 Health Effects Associated with Exposure to Non-GHG Pollutants

Along with reducing GHGs, the Phase 2 standards also have an impact on non-GHG (criteria and air toxic pollutant) emissions. As discussed in Chapter 5, the standards will impact exhaust emissions of these pollutants from vehicles and will also impact emissions that occur during the refining and distribution of fuel (upstream sources).

In this section we will discuss the health effects associated with non-GHG pollutants, specifically: particulate matter, ozone, nitrogen oxides (NO_X), sulfur oxides (SO_X), carbon monoxide and air toxics. These pollutants will not be directly regulated by the standards, but the standards will affect emissions of these pollutants and precursors.

6.1.1.1 Particulate Matter

6.1.1.1.1 *Background on Particulate Matter*

Particulate matter (PM) is a highly complex mixture of solid particles and liquid droplets distributed among numerous atmospheric gases which interact with solid and liquid phases. Particles range in size from those smaller than 1 nanometer (10^{-9} meter) to over 100 micrometers (µm, or 10^{-6} meter) in diameter (for reference, a typical strand of human hair is 70 µm in diameter and a grain of salt is about 100 µm). Atmospheric particles can be grouped into several classes according to their aerodynamic and physical sizes. Generally, the three broad classes of particles include ultrafine particles (UFPs, generally considered as particulates with a diameter less than or equal to 0.1 µm [typically based on physical size, thermal diffusivity or electrical mobility]), “fine” particles ($PM_{2.5}$; particles with a nominal mean aerodynamic diameter less than or equal to 2.5 µm), and “thoracic” particles (PM_{10}; particles with a nominal mean aerodynamic diameter less than or equal to 10 µm). Particles that fall within the size range between $PM_{2.5}$ and PM_{10}, are referred to as “thoracic coarse particles” ($PM_{10\text{-}2.5}$, particles with a nominal mean aerodynamic diameter less than or equal to 10 µm and greater than 2.5 µm). EPA currently has standards that regulate $PM_{2.5}$ and PM_{10}.[A]

Particles span many sizes and shapes and may consist of hundreds of different chemicals. Particles are emitted directly from sources and are also formed through atmospheric chemical reactions; the former are often referred to as “primary” particles, and the latter as “secondary” particles. Particle concentration and composition varies by time of year and location, and, in addition to differences in source emissions, is affected by several weather-related factors, such as temperature, clouds, humidity, and wind. A further layer of complexity comes from particles’

[A] Regulatory definitions of PM size fractions, and information on reference and equivalent methods for measuring PM in ambient air, are provided in 40 CFR Parts 50, 53, and 58. With regard to national ambient air quality standards (NAAQS) which provide protection against health and welfare effects, the 24-hour PM_{10} standard provides protection against effects associated with short-term exposure to thoracic coarse particles (i.e., $PM_{10\text{-}2.5}$).

ability to shift between solid/liquid and gaseous phases, which is influenced by concentration and meteorology, especially temperature.

Fine particles are produced primarily by combustion processes and by transformations of gaseous emissions (e.g., sulfur oxides (SO_X), nitrogen oxides (NO_X) and volatile organic compounds (VOCs)) in the atmosphere. The chemical and physical properties of $PM_{2.5}$ may vary greatly with time, region, meteorology, and source category. Thus, $PM_{2.5}$ may include a complex mixture of different components including sulfates, nitrates, organic compounds, elemental carbon and metal compounds. These particles can remain in the atmosphere for days to weeks and travel through the atmosphere hundreds to thousands of kilometers.[1]

6.1.1.1.2 *Health Effects of Particulate Matter*

Scientific studies show exposure to ambient PM is associated with a broad range of health effects. These health effects are discussed in detail in the Integrated Science Assessment for Particulate Matter (PM ISA), which was finalized in December 2009.[2] The PM ISA summarizes health effects evidence for short- and long-term exposures to $PM_{2.5}$, $PM_{10-2.5}$, and ultrafine particles.[B] The PM ISA concludes that human exposures to ambient $PM_{2.5}$ are associated with a number of adverse health effects and characterizes the weight of evidence for broad health categories (e.g., cardiovascular effects, respiratory effects, etc.).[C] The discussion below highlights the PM ISA's conclusions pertaining to health effects associated with both short- and long-term PM exposures. Further discussion of health effects associated with PM can also be found in the rulemaking documents for the most recent review of the PM NAAQS completed in 2012.[3,4]

EPA has concluded that "a causal relationship exists" between both long- and short-term exposures to $PM_{2.5}$ and premature mortality and cardiovascular effects and that "a causal relationship is likely to exist" between long- and short-term $PM_{2.5}$ exposures and respiratory effects. Further, there is evidence "suggestive of a causal relationship" between long-term $PM_{2.5}$ exposures and other health effects, including developmental and reproductive effects (e.g., low birth weight, infant mortality) and carcinogenic, mutagenic, and genotoxic effects (e.g., lung cancer mortality).[D]

As summarized in the Final PM NAAQS rule, and discussed extensively in the 2009 PM ISA, the available scientific evidence significantly strengthens the link between long- and short-

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[B] The ISA also evaluated evidence for PM components, but did not reach causal determinations for components.
[C] The causal framework draws upon the assessment and integration of evidence from across epidemiological, controlled human exposure, and toxicological studies, and the related uncertainties that ultimately influence our understanding of the evidence. This framework employs a five-level hierarchy that classifies the overall weight of evidence and causality using the following categorizations: causal relationship, likely to be causal relationship, suggestive of a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship (U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F, Table 1–3).
[D] These causal inferences are based not only on the more expansive epidemiological evidence available in this review of the PM NAAQS but also reflect consideration of important progress that has been made to advance understanding of a number of potential biologic modes of action or pathways for PM-related cardiovascular and respiratory effects (U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F, Chapter 5).

term exposure to $PM_{2.5}$ and premature mortality, while providing indications that the magnitude of the $PM_{2.5}$- mortality association with long-term exposures may be larger than previously estimated.[5,6] The strongest evidence comes from recent studies investigating long-term exposure to $PM_{2.5}$ and cardiovascular-related mortality. The evidence supporting a causal relationship between long-term $PM_{2.5}$ exposure and mortality also includes consideration of studies that demonstrated an improvement in community health following reductions in ambient fine particles.[7]

Several studies evaluated in the 2009 PM ISA have examined the association between cardiovascular effects and long-term $PM_{2.5}$ exposures in multi-city studies conducted in the U.S. and Europe. These studies have provided new evidence linking long-term exposure to $PM_{2.5}$ with an array of cardiovascular effects such as heart attacks, congestive heart failure, stroke, and mortality. This evidence is coherent with studies of short-term exposure to $PM_{2.5}$ that have observed associations with a continuum of effects ranging from subtle changes in indicators of cardiovascular health to serious clinical events, such as increased hospitalizations and emergency department visits due to cardiovascular disease and cardiovascular mortality.[8]

As detailed in the 2009 PM ISA, extended analyses of seminal epidemiological studies, as well as more recent epidemiological studies conducted in the U.S. and abroad, provide strong evidence of respiratory-related morbidity effects associated with long-term $PM_{2.5}$ exposure. The strongest evidence for respiratory-related effects is from studies that evaluated decrements in lung function growth (in children), increased respiratory symptoms, and asthma development. The strongest evidence from short-term $PM_{2.5}$ exposure studies has been observed for increased respiratory-related emergency department visits and hospital admissions for chronic obstructive pulmonary disease (COPD) and respiratory infections.[9]

The body of scientific evidence detailed in the 2009 PM ISA is still limited with respect to associations between long-term $PM_{2.5}$ exposures and developmental and reproductive effects as well as cancer, mutagenic, and genotoxic effects. The strongest evidence for an association between $PM_{2.5}$ and developmental and reproductive effects comes from epidemiological studies of low birth weight and infant mortality, especially due to respiratory causes during the post-neonatal period (i.e., 1 month to 12 months of age). With regard to cancer effects, ''[m]ultiple epidemiologic studies have shown a consistent positive association between $PM_{2.5}$ and lung cancer mortality, but studies have generally not reported associations between $PM_{2.5}$ and lung cancer incidence.''[10,11]

In addition to evaluating the health effects attributed to short- and long-term exposure to $PM_{2.5}$, the 2009 PM ISA also evaluated whether specific components or sources of $PM_{2.5}$ are more strongly associated with specific health effects. An evaluation of those studies resulted in the 2009 PM ISA concluding that "many [components] of PM can be linked with differing health effects and the evidence is not yet sufficient to allow differentiation of those [components] or sources that are more closely related to specific health outcomes."[12]

For $PM_{10-2.5}$, the 2009 PM ISA concluded that available evidence was "suggestive of a causal relationship" between short-term exposures to $PM_{10-2.5}$ and cardiovascular effects (e.g., hospital admissions and ED visits, changes in cardiovascular function), respiratory effects (e.g., ED visits and hospital admissions, increase in markers of pulmonary inflammation), and premature mortality. The scientific evidence was "inadequate to infer a causal relationship" between long-term exposure to $PM_{10-2.5}$ and various health effects. [13,14,15]

For UFPs, the 2009 PM ISA concluded that the evidence was "suggestive of a causal relationship" between short-term exposures and cardiovascular effects, including changes in heart rhythm and vasomotor function (the ability of blood vessels to expand and contract). It also concluded that there was evidence "suggestive of a causal relationship" between short-term exposure to UFPs and respiratory effects, including lung function and pulmonary inflammation, with limited and inconsistent evidence for increases in ED visits and hospital admissions. Scientific evidence was "inadequate to infer a causal relationship" between short-term exposure to UFPs and additional health effects including premature mortality as well as long-term exposure to UFPs and all health outcomes evaluated.[16,17]

The 2009 PM ISA conducted an evaluation of specific groups within the general population potentially at increased risk for experiencing adverse health effects related to PM exposures.[18,19,20,21] The evidence detailed in the 2009 PM ISA expands our understanding of previously identified at-risk populations and lifestages (i.e., children, older adults, and individuals with pre-existing heart and lung disease) and supports the identification of additional at-risk populations (e.g., persons with lower socioeconomic status, genetic differences). Additionally, there is emerging, though still limited, evidence for additional potentially at-risk populations and lifestages, such as those with diabetes, people who are obese, pregnant women, and the developing fetus.[22]

6.1.1.2 Ozone

6.1.1.2.1 *Background on Ozone*

Ground-level ozone pollution is typically formed through reactions involving VOCs and NO_X in the lower atmosphere in the presence of sunlight. These pollutants, often referred to as ozone precursors, are emitted by many types of pollution sources such as highway and nonroad motor vehicles and engines, power plants, chemical plants, refineries, makers of consumer and commercial products, industrial facilities, and smaller area sources.

The science of ozone formation, transport, and accumulation is complex. Ground-level ozone is produced and destroyed in a cyclical set of chemical reactions, many of which are sensitive to temperature and sunlight. When ambient temperatures and sunlight levels remain high for several days and the air is relatively stagnant, ozone and its precursors can build up and result in more ozone than typically occurs on a single high-temperature day. Ozone and its precursors can be transported hundreds of miles downwind of precursor emissions, resulting in elevated ozone levels even in areas with low VOC or NO_X emissions.

The highest levels of ozone are produced when both VOC and NO_X emissions are present in significant quantities on clear summer days. Relatively small amounts of NO_X enable ozone to form rapidly when VOC levels are relatively high, but ozone production is quickly limited by removal of the NO_X. Under these conditions NO_X reductions are highly effective in reducing ozone while VOC reductions have little effect. Such conditions are called "NO_X-limited." Because the contribution of VOC emissions from biogenic (natural) sources to local ambient ozone concentrations can be significant, even some areas where man-made VOC emissions are relatively low can be NO_X-limited.

Ozone concentrations in an area also can be lowered by the reaction of nitric oxide (NO) with ozone, forming nitrogen dioxide (NO_2). As the air moves downwind and the cycle continues, the NO_2 forms additional ozone. The importance of this reaction depends, in part, on the relative concentrations of NO_X, VOC, and ozone, all of which change with time and location. When NO_X levels are relatively high and VOC levels relatively low, NO_X forms inorganic nitrates (i.e., particles) but relatively little ozone. Such conditions are called "VOC-limited." Under these conditions, VOC reductions are effective in reducing ozone, but NO_X reductions can actually increase local ozone under certain circumstances. Even in VOC-limited urban areas, NO_X reductions are not expected to increase ozone levels if the NO_X reductions are sufficiently large. Rural areas are usually NO_X-limited, due to the relatively large amounts of biogenic VOC emissions in such areas. Urban areas can be either VOC- or NO_X-limited, or a mixture of both, in which ozone levels exhibit moderate sensitivity to changes in either pollutant.

6.1.1.2.2 *Health Effects of Ozone*

This section provides a summary of the health effects associated with exposure to ambient concentrations of ozone.[E] The information in this section is based on the information and conclusions in the February 2013 Integrated Science Assessment for Ozone (Ozone ISA).[23] The Ozone ISA concludes that human exposures to ambient concentrations of ozone are associated with a number of adverse health effects and characterizes the weight of evidence for these health effects.[F] The discussion below highlights the Ozone ISA's conclusions pertaining to health effects associated with both short-term and long-term periods of exposure to ozone.

For short-term exposure to ozone, the Ozone ISA concludes that respiratory effects, including lung function decrements, pulmonary inflammation, exacerbation of asthma, respiratory-related hospital admissions, and mortality, are causally associated with ozone exposure. It also concludes that cardiovascular effects, including decreased cardiac function and increased vascular disease, and total mortality are likely to be causally associated with short-term exposure to ozone and that evidence is suggestive of a causal relationship between central nervous system effects and short-term exposure to ozone.

For long-term exposure to ozone, the Ozone ISA concludes that respiratory effects, including new onset asthma, pulmonary inflammation and injury, are likely to be causally related with ozone exposure. The Ozone ISA characterizes the evidence as suggestive of a causal relationship for associations between long-term ozone exposure and cardiovascular effects, reproductive and developmental effects, central nervous system effects and total mortality. The

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[E] Human exposure to ozone varies over time due to changes in ambient ozone concentration and because people move between locations which have notable different ozone concentrations. Also, the amount of ozone delivered to the lung is not only influenced by the ambient concentrations but also by the breathing route and rate.

[F] The ISA evaluates evidence and draws conclusions on the causal relationship between relevant pollutant exposures and health effects, assigning one of five "weight of evidence" determinations: causal relationship, likely to be a causal relationship, suggestive of a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship. For more information on these levels of evidence, please refer to Table II in the Preamble of the ISA.

evidence is inadequate to infer a causal relationship between chronic ozone exposure and increased risk of lung cancer.

Finally, interindividual variation in human responses to ozone exposure can result in some groups being at increased risk for detrimental effects in response to exposure. In addition, some groups are at increased risk of exposure due to their activities, such as outdoor workers and children. The Ozone ISA identified several groups that are at increased risk for ozone-related health effects. These groups are people with asthma, children and older adults, individuals with reduced intake of certain nutrients (i.e., Vitamins C and E), outdoor workers, and individuals having certain genetic variants related to oxidative metabolism or inflammation. Ozone exposure during childhood can have lasting effects through adulthood. Such effects include altered function of the respiratory and immune systems. Children absorb higher doses (normalized to lung surface area) of ambient ozone, compared to adults, due to their increased time spent outdoors, higher ventilation rates relative to body size, and a tendency to breathe a greater fraction of air through the mouth. Children also have a higher asthma prevalence compared to adults. Additional children's vulnerability and susceptibility factors are listed in Section XIV of the Preamble.

6.1.1.3 Nitrogen Oxides

6.1.1.3.1 *Background on Nitrogen Oxides*

Oxides of nitrogen (NO_X) refers to nitric oxide (NO) and nitrogen dioxide (NO_2). For the NO_X NAAQS, NO_2 is the indicator. Most NO_2 is formed in the air through the oxidation of nitric oxide (NO) emitted when fuel is burned at a high temperature. NO_X is also a major contributor to secondary $PM_{2.5}$ formation. The health effects of ambient PM are discussed in Chapter 6.1.1.1.2. NO_X along with VOCs are the two major precursors of ozone. The health effects of ozone are covered in Chapter 6.1.1.2.2.

6.1.1.3.2 *Health Effects of Nitrogen Oxides*

The most recent review of the health effects of oxides of nitrogen completed by EPA can be found in the 2016 Integrated Science Assessment for Oxides of Nitrogen - Health Criteria (Oxides of Nitrogen ISA).[G] The primary source of NO_2 is motor vehicle emissions, and ambient NO_2 concentrations tend to be highly correlated with other traffic-related pollutants. Thus, a key issue in characterizing the causality of NO_2-health effect relationships was evaluating the extent to which studies supported an effect of NO_2 that is independent of other traffic-related pollutants. EPA concluded that the findings for asthma exacerbation integrated from epidemiologic and controlled human exposure studies provided evidence that is sufficient to infer a causal relationship between respiratory effects and short-term NO_2 exposure. The strongest evidence supporting an independent effect of NO_2 exposure comes from controlled human exposure studies demonstrating increased airway responsiveness in individuals with asthma following ambient-relevant NO_2 exposures. The coherence of this evidence with epidemiologic findings for asthma hospital admissions and ED visits as well as lung function

[G] U.S. EPA. Integrated Science Assessment for Oxides of Nitrogen – Health Criteria (2016 Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-15/068, 2016.

decrements and increased pulmonary inflammation in children with asthma describe a plausible pathway by which NO_2 exposure can cause an asthma exacerbation. The 2016 ISA for Oxides of Nitrogen also concluded that there is likely to be a causal relationship between long-term NO_2 exposure and respiratory effects. This conclusion is based on new epidemiologic evidence for associations of NO_2 with asthma development in children combined with biological plausibility from experimental studies.

In evaluating a broader range of health effects, the 2016 ISA for Oxides of Nitrogen concluded evidence is "suggestive of, but not sufficient to infer, a causal relationship" between short-term NO_2 exposure and cardiovascular effects and mortality and between long-term NO_2 exposure and cardiovascular effects and diabetes, birth outcomes, and cancer. In addition, the scientific evidence is inadequate (insufficient consistency of epidemiologic and toxicological evidence) to infer a causal relationship for long-term NO_2 exposure with fertility, reproduction, and pregnancy, as well as with postnatal development. A key uncertainty in understanding the relationship between these non-respiratory health effects and short- or long-term exposure to NO_2 is co-pollutant confounding, particularly by other roadway pollutants. The available evidence for non-respiratory health effects does not adequately address whether NO_2 has an independent effect or whether it primarily represents effects related to other or a mixture of traffic-related pollutants.

The 2016 ISA for Oxides of Nitrogen concluded that people with asthma, children, and older adults are at increased risk for NO_2-related health effects. In these groups and lifestages, NO_2 is consistently related to larger effects on outcomes related to asthma exacerbation, for which there is confidence in the relationship with NO_2 exposure.

6.1.1.4 Sulfur Oxides

6.1.1.4.1 *Background*

Sulfur dioxide (SO_2), a member of the sulfur oxide (SO_X) family of gases, is formed from burning fuels containing sulfur (e.g., coal or oil), extracting gasoline from oil, or extracting metals from ore. SO_2 and its gas phase oxidation products can dissolve in water droplets and further oxidize to form sulfuric acid which reacts with ammonia to form sulfates, which are important components of ambient PM. The health effects of ambient PM are discussed in Chapter 6.1.1.1.2.

6.1.1.4.2 *Health Effects of Sulfur Oxides*

This section provides an overview of the health effects associated with SO_2. Additional information on the health effects of SO_2 can be found in the 2008 Integrated Science Assessment for Sulfur Oxides – Health Criteria (SO_X ISA).[24] Following an extensive evaluation of health evidence from epidemiologic and laboratory studies, EPA has concluded that there is a causal relationship between respiratory health effects and short-term exposure to SO_2. The immediate effect of SO_2 on the respiratory system in humans is bronchoconstriction. Asthmatics are more sensitive to the effects of SO_2 likely resulting from preexisting inflammation associated with this disease. In addition to those with asthma (both children and adults), potentially at-risk groups include all children and the elderly. In free-breathing laboratory studies involving controlled human exposures to SO_2, respiratory effects have consistently been observed following 5-10 min exposures at SO_2 concentrations ≥ 400 ppb in asthmatics engaged in moderate to heavy levels of exercise, with respiratory effects occurring at concentrations as low as 200 ppb in some asthmatics. A clear concentration-response relationship has been demonstrated in these studies following exposures to SO_2 at concentrations between 200 and 1000 ppb, both in terms of increasing severity of respiratory symptoms and decrements in lung function, as well as the percentage of asthmatics adversely affected.

In epidemiologic studies, respiratory effects have been observed in areas where the mean 24-hour SO_2 levels range from 1 to 30 ppb, with maximum 1 to 24-hour average SO_2 values ranging from 12 to 75 ppb. Important new multicity studies and several other studies have found an association between 24-hour average ambient SO_2 concentrations and respiratory symptoms in children, particularly those with asthma. Generally consistent associations also have been observed between ambient SO_2 concentrations and emergency department visits and hospitalizations for all respiratory causes, particularly among children and older adults (≥ 65 years), and for asthma. A limited subset of epidemiologic studies has examined potential confounding by co-pollutants using multipollutant regression models. These analyses indicate that although co-pollutant adjustment has varying degrees of influence on the SO_2 effect estimates, the effect of SO_2 on respiratory health outcomes appears to be generally robust and independent of the effects of gaseous and particulate co-pollutants, suggesting that the observed effects of SO_2 on respiratory endpoints occur independent of the effects of other ambient air pollutants.

Consistent associations between short-term exposure to SO_2 and mortality have been observed in epidemiologic studies, with larger effect estimates reported for respiratory mortality than for cardiovascular mortality. While this finding is consistent with the demonstrated effects of SO_2 on respiratory morbidity, uncertainty remains with respect to the interpretation of these observed mortality associations due to potential confounding by various co-pollutants. Therefore, EPA has concluded that the overall evidence is suggestive of a causal relationship between short-term exposure to SO_2 and mortality. Significant associations between short-term exposure to SO_2 and emergency department visits and hospital admissions for cardiovascular diseases have also been reported. However, these findings have been inconsistent across studies and do not provide adequate evidence to infer a causal relationship between SO_2 exposure and cardiovascular morbidity.

6.1.1.5 Carbon Monoxide

6.1.1.5.1 *Background*

Carbon monoxide (CO) is a colorless, odorless gas emitted from combustion processes. Nationally, particularly in urban areas, the majority of CO emissions to ambient air come from mobile sources.[25]

6.1.1.5.2 *Health Effects of Carbon Monoxide*

Information on the health effects of carbon monoxide (CO) can be found in the January 2010 Integrated Science Assessment for Carbon Monoxide (CO ISA).[26] The CO ISA presents conclusions regarding the presence of causal relationships between CO exposure and categories of adverse health effects.[H] This section provides a summary of the health effects associated with exposure to ambient concentrations of CO, along with the ISA conclusions.[I]

Controlled human exposure studies of subjects with coronary artery disease show a decrease in the time to onset of exercise-induced angina (chest pain) and electrocardiogram changes following CO exposure. In addition, epidemiologic studies observed associations between short-term CO exposure and cardiovascular morbidity, particularly increased emergency room visits and hospital admissions for coronary heart disease (including ischemic heart disease, myocardial infarction, and angina). Some epidemiologic evidence is also available for increased hospital admissions and emergency room visits for congestive heart failure and cardiovascular disease as a whole. The CO ISA concludes that a causal relationship is likely to exist between short-term exposures to CO and cardiovascular morbidity. It also concludes that available data are inadequate to conclude that a causal relationship exists between long-term exposures to CO and cardiovascular morbidity.

Animal studies show various neurological effects with in-utero CO exposure. Controlled human exposure studies report central nervous system and behavioral effects following low-level CO exposures, although the findings have not been consistent across all studies. The CO ISA concludes the evidence is suggestive of a causal relationship with both short- and long-term exposure to CO and central nervous system effects.

A number of studies cited in the CO ISA have evaluated the role of CO exposure in birth outcomes such as preterm birth or cardiac birth defects. There is limited epidemiologic evidence of a CO-induced effect on preterm births and birth defects, with weak evidence for a decrease in birth weight. Animal toxicological studies have found perinatal CO exposure to affect birth weight, as well as other developmental outcomes. The CO ISA concludes the evidence is suggestive of a causal relationship between long-term exposures to CO and developmental effects and birth outcomes.

Epidemiologic studies provide evidence of associations between short-term CO concentrations and respiratory morbidity such as changes in pulmonary function, respiratory symptoms, and hospital admissions. A limited number of epidemiologic studies considered co-pollutants such as ozone, SO_2, and PM in two-pollutant models and found that CO risk estimates were generally robust, although this limited evidence makes it difficult to disentangle effects attributed to CO itself from those of the larger complex air pollution mixture. Controlled human exposure studies have not extensively evaluated the effect of CO on respiratory morbidity. Animal studies at levels of 50-100 ppm CO show preliminary evidence of altered pulmonary vascular remodeling and oxidative injury. The CO ISA concludes that the evidence is suggestive of a causal relationship between short-term CO exposure and respiratory morbidity, and

[H] The ISA evaluates the health evidence associated with different health effects, assigning one of five "weight of evidence" determinations: causal relationship, likely to be a causal relationship, suggestive of a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship. For definitions of these levels of evidence, please refer to Section 1.6 of the ISA.

[I] Personal exposure includes contributions from many sources, and in many different environments. Total personal exposure to CO includes both ambient and non-ambient components; and both components may contribute to adverse health effects.

inadequate to conclude that a causal relationship exists between long-term exposure and respiratory morbidity.

Finally, the CO ISA concludes that the epidemiologic evidence is suggestive of a causal relationship between short-term concentrations of CO and mortality. Epidemiologic evidence suggests an association exists between short-term exposure to CO and mortality, but limited evidence is available to evaluate cause-specific mortality outcomes associated with CO exposure. In addition, the attenuation of CO risk estimates which was often observed in co-pollutant models contributes to the uncertainty as to whether CO is acting alone or as an indicator for other combustion-related pollutants. The CO ISA also concludes that there is not likely to be a causal relationship between relevant long-term exposures to CO and mortality.

6.1.1.6 Diesel Exhaust

6.1.1.6.1 *Background on Diesel Exhaust*

Diesel exhaust consists of a complex mixture composed of particulate matter, carbon dioxide, oxygen, nitrogen, water vapor, carbon monoxide, nitrogen compounds, sulfur compounds and numerous low-molecular-weight hydrocarbons. A number of these gaseous hydrocarbon components are individually known to be toxic, including aldehydes, benzene and 1,3-butadiene. The diesel particulate matter present in diesel exhaust consists mostly of fine particles (< 2.5 µm), of which a significant fraction is ultrafine particles (< 0.1 µm). These particles have a large surface area which makes them an excellent medium for adsorbing organics and their small size makes them highly respirable. Many of the organic compounds present in the gases and on the particles, such as polycyclic organic matter, are individually known to have mutagenic and carcinogenic properties.

Diesel exhaust varies significantly in chemical composition and particle sizes between different engine types (heavy-duty, light-duty), engine operating conditions (idle, acceleration, deceleration), and fuel formulations (high/low sulfur fuel). Also, there are emissions differences between on-road and nonroad engines because the nonroad engines are generally of older technology. After being emitted in the engine exhaust, diesel exhaust undergoes dilution as well as chemical and physical changes in the atmosphere. The lifetime for some of the compounds present in diesel exhaust ranges from hours to days.

6.1.1.6.2 *Health Effects of Diesel Exhaust*

In EPA's 2002 Diesel Health Assessment Document (Diesel HAD), exposure to diesel exhaust was classified as likely to be carcinogenic to humans by inhalation from environmental exposures, in accordance with the revised draft 1996/1999 EPA cancer guidelines.[27,28] A number of other agencies (National Institute for Occupational Safety and Health, the International Agency for Research on Cancer, the World Health Organization, California EPA, and the U.S. Department of Health and Human Services) had made similar hazard classifications prior to 2002. EPA also concluded in the 2002 Diesel HAD that it was not possible to calculate a cancer unit risk for diesel exhaust due to limitations in the exposure data for the occupational groups or the absence of a dose-response relationship.

In the absence of a cancer unit risk, the Diesel HAD sought to provide additional insight into the significance of the diesel exhaust cancer hazard by estimating possible ranges of risk that might be present in the population. An exploratory analysis was used to characterize a range of possible lung cancer risk. The outcome was that environmental risks of cancer from long-term diesel exhaust exposures could plausibly range from as low as 10^{-5} to as high as 10^{-3}. Because of uncertainties, the analysis acknowledged that the risks could be lower than 10^{-5}, and a zero risk from diesel exhaust exposure could not be ruled out.

Noncancer health effects of acute and chronic exposure to diesel exhaust emissions are also of concern to EPA. EPA derived a diesel exhaust reference concentration (RfC) from consideration of four well-conducted chronic rat inhalation studies showing adverse pulmonary effects. The RfC is 5 $\mu g/m^3$ for diesel exhaust measured as diesel particulate matter. This RfC does not consider allergenic effects such as those associated with asthma or immunologic or the potential for cardiac effects. There was emerging evidence in 2002, discussed in the Diesel HAD, that exposure to diesel exhaust can exacerbate these effects, but the exposure-response data were lacking at that time to derive an RfC based on these then-emerging considerations. The EPA Diesel HAD states, "With [diesel particulate matter] being a ubiquitous component of ambient PM, there is an uncertainty about the adequacy of the existing [diesel exhaust] noncancer database to identify all of the pertinent [diesel exhaust]-caused noncancer health hazards." The Diesel HAD also notes "that acute exposure to [diesel exhaust] has been associated with irritation of the eye, nose, and throat, respiratory symptoms (cough and phlegm), and neurophysiological symptoms such as headache, lightheadedness, nausea, vomiting, and numbness or tingling of the extremities." The Diesel HAD noted that the cancer and noncancer hazard conclusions applied to the general use of diesel engines then on the market and as cleaner engines replace a substantial number of existing ones, the applicability of the conclusions would need to be reevaluated.

It is important to note that the Diesel HAD also briefly summarizes health effects associated with ambient PM and discusses EPA's then-annual $PM_{2.5}$ NAAQS of 15 $\mu g/m^3$. In 2012, EPA revised the annual $PM_{2.5}$ NAAQS to 12 $\mu g/m^3$. There is a large and extensive body of human data showing a wide spectrum of adverse health effects associated with exposure to ambient PM, of which diesel exhaust is an important component. The $PM_{2.5}$ NAAQS is designed to provide protection from the noncancer health effects and premature mortality attributed to exposure to $PM_{2.5}$. The contribution of diesel PM to total ambient PM varies in different regions of the country and also, within a region, from one area to another. The contribution can be high in near-roadway environments, for example, or in other locations where diesel engine use is concentrated.

Since 2002, several new studies have been published which continue to report increased lung cancer risk with occupational exposure to diesel exhaust from older engines. Of particular note since 2011 are three new epidemiology studies which have examined lung cancer in occupational populations, for example, truck drivers, underground nonmetal miners and other diesel motor-related occupations. These studies reported increased risk of lung cancer with exposure to diesel exhaust with evidence of positive exposure-response relationships to varying degrees.[29,30,31] These newer studies (along with others that have appeared in the scientific literature) add to the evidence EPA evaluated in the 2002 Diesel HAD and further reinforces the concern that diesel exhaust exposure likely poses a lung cancer hazard. The findings from these newer studies do not necessarily apply to newer technology diesel engines since the newer engines have large reductions in the emission constituents compared to older technology diesel engines.

In light of the growing body of scientific literature evaluating the health effects of exposure to diesel exhaust, in June 2012 the World Health Organization's International Agency for Research on Cancer (IARC), a recognized international authority on the carcinogenic potential of chemicals and other agents, evaluated the full range of cancer-related health effects data for diesel engine exhaust. IARC concluded that diesel exhaust should be regarded as "carcinogenic to humans."[32] This designation was an update from its 1988 evaluation that considered the evidence to be indicative of a "probable human carcinogen."

6.1.1.7 Air Toxics

Heavy-duty vehicle emissions contribute to ambient levels of air toxics that are known or suspected human or animal carcinogens, or that have noncancer health effects. The population experiences an elevated risk of cancer and other noncancer health effects from exposure to the class of pollutants known collectively as "air toxics."[33] These compounds include, but are not limited to, benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, polycyclic organic matter, and naphthalene. These compounds were identified as national or regional risk drivers or contributors in the 2011 National-scale Air Toxics Assessment and have significant inventory contributions from mobile sources.[34]

6.1.1.7.1 *Health Effects of Benzene*

EPA's IRIS database lists benzene as a known human carcinogen (causing leukemia) by all routes of exposure, and concludes that exposure is associated with additional health effects, including genetic changes in both humans and animals and increased proliferation of bone marrow cells in mice.[35,36,37] EPA states in its IRIS database that data indicate a causal relationship between benzene exposure and acute lymphocytic leukemia and suggest a relationship between benzene exposure and chronic non-lymphocytic leukemia and chronic lymphocytic leukemia. EPA's IRIS documentation for benzene also lists a range of 2.2×10^{-6} to 7.8×10^{-6} per $\mu g/m^3$ as the unit risk estimate (URE) for benzene.[J,38] The International Agency for Research on Cancer (IARC) has determined that benzene is a human carcinogen and the U.S. Department of Health and Human Services (DHHS) has characterized benzene as a known human carcinogen.[39,40]

A number of adverse noncancer health effects including blood disorders, such as preleukemia and aplastic anemia, have also been associated with long-term exposure to benzene.[41,42] The most sensitive noncancer effect observed in humans, based on current data, is the depression of the absolute lymphocyte count in blood.[43,44] EPA's inhalation reference concentration (RfC) for benzene is 30 $\mu g/m^3$. The RfC is based on suppressed absolute lymphocyte counts seen in humans under occupational exposure conditions. In addition, recent work, including studies sponsored by the Health Effects Institute (HEI), provides evidence that

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[J] A unit risk estimate is defined as the increase in the lifetime risk of an individual who is exposed for a lifetime to 1 µg/m3 benzene in air.

biochemical responses are occurring at lower levels of benzene exposure than previously known.[45,46,47,48] EPA's IRIS program has not yet evaluated these new data. EPA does not currently have an acute reference concentration for benzene. The Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Level (MRL) for acute exposure to benzene is 29 $\mu g/m^3$ for 1-14 days exposure.[49,K]

6.1.1.7.2 *Health Effects of 1,3-Butadiene*

EPA has characterized 1,3-butadiene as carcinogenic to humans by inhalation.[50,51] The IARC has determined that 1,3-butadiene is a human carcinogen and the U.S. DHHS has characterized 1,3-butadiene as a known human carcinogen.[52,53,54] There are numerous studies consistently demonstrating that 1,3-butadiene is metabolized into genotoxic metabolites by experimental animals and humans. The specific mechanisms of 1,3-butadiene-induced carcinogenesis are unknown; however, the scientific evidence strongly suggests that the carcinogenic effects are mediated by genotoxic metabolites. Animal data suggest that females may be more sensitive than males for cancer effects associated with 1,3-butadiene exposure; there are insufficient data in humans from which to draw conclusions about sensitive subpopulations. The URE for 1,3-butadiene is 3×10^{-5} per $\mu g/m^3$.[55] 1,3-butadiene also causes a variety of reproductive and developmental effects in mice; no human data on these effects are available. The most sensitive effect was ovarian atrophy observed in a lifetime bioassay of female mice.[56] Based on this critical effect and the benchmark concentration methodology, an RfC for chronic health effects was calculated at 0.9 ppb (approximately 2 $\mu g/m^3$).

6.1.1.7.3 *Health Effects of Formaldehyde*

In 1991, EPA concluded that formaldehyde is a carcinogen based on nasal tumors in animal bioassays.[57] An Inhalation URE for cancer and a Reference Dose for oral noncancer effects were developed by the agency and posted on the Integrated Risk Information System (IRIS) database. Since that time, the National Toxicology Program (NTP) and International Agency for Research on Cancer (IARC) have concluded that formaldehyde is a known human carcinogen.[58,59,60]

The conclusions by IARC and NTP reflect the results of epidemiologic research published since 1991 in combination with previous animal, human and mechanistic evidence. Research conducted by the National Cancer Institute reported an increased risk of nasopharyngeal cancer and specific lymphohematopoietic malignancies among workers exposed to formaldehyde.[61,62,63] A National Institute of Occupational Safety and Health study of garment workers also reported increased risk of death due to leukemia among workers exposed to formaldehyde.[64] Extended follow-up of a cohort of British chemical workers did not report evidence of an increase in nasopharyngeal or lymphohematopoietic cancers, but a continuing statistically significant excess in lung cancers was reported.[65] Finally, a study of embalmers reported formaldehyde exposures to be associated with an increased risk of myeloid leukemia but not brain cancer.[66]

[K] A minimal risk level (MRL) is defined as an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure.

Health effects of formaldehyde in addition to cancer were reviewed by the Agency for Toxics Substances and Disease Registry in 1999[67], supplemented in 2010,[68] and by the World Health Organization.[69] These organizations reviewed the scientific literature concerning health effects linked to formaldehyde exposure to evaluate hazards and dose response relationships and defined exposure concentrations for minimal risk levels (MRLs). The health endpoints reviewed included sensory irritation of eyes and respiratory tract, reduced pulmonary function, nasal histopathology, and immune system effects. In addition, research on reproductive and developmental effects and neurological effects were discussed along with several studies that suggest that formaldehyde may increase the risk of asthma – particularly in the young.

EPA released a draft Toxicological Review of Formaldehyde – Inhalation Assessment through the IRIS program for peer review by the National Research Council (NRC) and public comment in June 2010.[70] The draft assessment reviewed more recent research from animal and human studies on cancer and other health effects. The NRC released their review report in April 2011[71] (http://www.nap.edu/catalog.php?record_id=13142). EPA is currently developing a revised draft assessment in response to this review.

6.1.1.7.4 *Health Effects of Acetaldehyde*

Acetaldehyde is classified in EPA's IRIS database as a probable human carcinogen, based on nasal tumors in rats, and is considered toxic by the inhalation, oral, and intravenous routes.[72] The URE in IRIS for acetaldehyde is 2.2×10^{-6} per $\mu g/m^3$.[73] Acetaldehyde is reasonably anticipated to be a human carcinogen by the U.S. DHHS in the 13th Report on Carcinogens and is classified as possibly carcinogenic to humans (Group 2B) by the IARC.[74,75] EPA is currently conducting a reassessment of cancer risk from inhalation exposure to acetaldehyde. Acetaldehyde is currently listed on the IRIS Program Multi-Year Agenda for reassessment within the next few years.

The primary noncancer effects of exposure to acetaldehyde vapors include irritation of the eyes, skin, and respiratory tract.[76] In short-term (4 week) rat studies, degeneration of olfactory epithelium was observed at various concentration levels of acetaldehyde exposure.[77,78] Data from these studies were used by EPA to develop an inhalation reference concentration of 9 $\mu g/m^3$. Some asthmatics have been shown to be a sensitive subpopulation to decrements in functional expiratory volume (FEV1 test) and bronchoconstriction upon acetaldehyde inhalation.[79]

6.1.1.7.5 *Health Effects of Acrolein*

EPA most recently evaluated the toxicological and health effects literature related to acrolein in 2003 and concluded that the human carcinogenic potential of acrolein could not be determined because the available data were inadequate. No information was available on the carcinogenic effects of acrolein in humans and the animal data provided inadequate evidence of carcinogenicity.[80] The IARC determined in 1995 that acrolein was not classifiable as to its carcinogenicity in humans.[81]

Lesions to the lungs and upper respiratory tract of rats, rabbits, and hamsters have been observed after subchronic exposure to acrolein.[82] The agency has developed an RfC for acrolein of 0.02 μg/m^3 and an RfD of 0.5 μg/kg-day.[83]

Acrolein is extremely acrid and irritating to humans when inhaled, with acute exposure resulting in upper respiratory tract irritation, mucus hypersecretion and congestion. The intense irritancy of this carbonyl has been demonstrated during controlled tests in human subjects, who suffer intolerable eye and nasal mucosal sensory reactions within minutes of exposure.[84] These data and additional studies regarding acute effects of human exposure to acrolein are summarized in EPA's 2003 Toxicological Review of Acrolein.[85] Studies in humans indicate that levels as low as 0.09 ppm (0.21 mg/m^3) for five minutes may elicit subjective complaints of eye irritation with increasing concentrations leading to more extensive eye, nose and respiratory symptoms. Acute exposures in animal studies report bronchial hyper-responsiveness. Based on animal data (more pronounced respiratory irritancy in mice with allergic airway disease in comparison to non-diseased mice[86]) and demonstration of similar effects in humans (e.g., reduction in respiratory rate), individuals with compromised respiratory function (e.g., emphysema, asthma) are expected to be at increased risk of developing adverse responses to strong respiratory irritants such as acrolein. EPA does not currently have an acute reference concentration for acrolein. The available health effect reference values for acrolein have been summarized by EPA and include an ATSDR MRL for acute exposure to acrolein of 7 μg/m^3 for 1-14 days exposure; and Reference Exposure Level (REL) values from the California Office of Environmental Health Hazard Assessment (OEHHA) for one-hour and 8-hour exposures of 2.5 μg/m^3 and 0.7 μg/m^3, respectively.[87]

6.1.1.7.6 *Health Effects of Polycyclic Organic Matter (POM)*

The term polycyclic organic matter (POM) defines a broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAHs). One of these compounds, naphthalene, is discussed separately below. POM compounds are formed primarily from combustion and are present in the atmosphere in gas and particulate form. Cancer is the major concern from exposure to POM. Epidemiologic studies have reported an increase in lung cancer in humans exposed to diesel exhaust, coke oven emissions, roofing tar emissions, and cigarette smoke; all of these mixtures contain POM compounds.[88][89] Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and alimentary tract and liver tumors from oral exposure to benzo[a]pyrene.[90] In 1997 EPA classified seven PAHs (benzo[a]pyrene, benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) as Group B2, probable human carcinogens.[91] Since that time, studies have found that maternal exposures to PAHs in a population of pregnant women were associated with several adverse birth outcomes, including low birth weight and reduced length at birth, as well as impaired cognitive development in preschool children (3 years of age).[92,93] These and similar studies are being evaluated as a part of the ongoing IRIS reassessment of health effects associated with exposure to benzo[a]pyrene.

6.1.1.7.7 *Health Effects of Naphthalene*

Naphthalene is found in small quantities in gasoline and diesel fuels. Naphthalene emissions have been measured in larger quantities in both gasoline and diesel exhaust compared with evaporative emissions from mobile sources, indicating it is primarily a product of combustion. Acute (short-term) exposure of humans to naphthalene by inhalation, ingestion, or dermal contact is associated with hemolytic anemia and damage to the liver and the nervous system.[94] Chronic (long term) exposure of workers and rodents to naphthalene has been reported to cause cataracts and retinal damage.[95] EPA released an external review draft of a reassessment of the inhalation carcinogenicity of naphthalene based on a number of recent animal carcinogenicity studies.[96] The draft reassessment completed external peer review.[97] Based on external peer review comments received, a revised draft assessment that considers all routes of exposure, as well as cancer and noncancer effects, is under development. The external review draft does not represent official agency opinion and was released solely for the purposes of external peer review and public comment. The National Toxicology Program listed naphthalene as "reasonably anticipated to be a human carcinogen" in 2004 on the basis of bioassays reporting clear evidence of carcinogenicity in rats and some evidence of carcinogenicity in mice.[98] California EPA has released a new risk assessment for naphthalene, and the IARC has reevaluated naphthalene and re-classified it as Group 2B: possibly carcinogenic to humans.[99]

Naphthalene also causes a number of chronic non-cancer effects in animals, including abnormal cell changes and growth in respiratory and nasal tissues.[100] The current EPA IRIS assessment includes noncancer data on hyperplasia and metaplasia in nasal tissue that form the basis of the inhalation RfC of 3 $\mu g/m^3$.[101] The ATSDR MRL for acute exposure to naphthalene is 0.6 mg/kg/day.

6.1.1.7.8 *Health Effects of Other Air Toxics*

In addition to the compounds described above, other compounds in gaseous hydrocarbon and PM emissions from vehicles will be affected by the rules. Mobile source air toxic compounds that would potentially be impacted include ethylbenzene, propionaldehyde, toluene, and xylene. Information regarding the health effects of these compounds can be found in EPA's IRIS database.[102]

6.1.1.8 Exposure and Health Effects Associated with Traffic

In addition to health concerns resulting from specific air pollutants, a large number of studies have examined the health status of populations near major roadways. These studies frequently have employed exposure metrics that are not specific to individual pollutants, but rather reflect the large number of different pollutants found in elevation near major roads.

In this section of the RIA, information on health effects associated with air quality near major roads or traffic in general is summarized. Generally, the section makes use of publications that systematically review literature on a given health topic. In particular, this section makes frequent reference of a report of by the Health Effects Institute (HEI) Panel on the Health Effects of Traffic-Related Air Pollution, published in 2010 as a review of relevant studies.[L,103] Other systematic reviews of relevant literature are cited were appropriate.

[L] It should be noted that there are no peer reviewed EPA-authored reviews of traffic-related health studies. The HEI panel primarily used epidemiology studies for inferring whether there was sufficient evidence of a causal association

6.1.1.8.1 *Populations near Major Roads*

Numerous studies have estimated the size and demographics of populations that live near major roads. Other studies have estimated the number of schools near major roads, and the populations of students in such schools.

Every two years, the U.S. Census Bureau's American Housing Survey (AHS) has reported whether housing units are within 300 feet of an "airport, railroad, or highway with four or more lanes." The 2009 survey reports that over 22 million homes, or 17 percent of all housing units in the U.S., were located in such areas. Assuming that populations and housing units are in the same locations, this corresponds to a population of more than 50 million U.S. residents in close proximity to high-traffic roadways or other transportation sources. According to the Central Intelligence Agency's World Factbook, in 2010, the United States had 6,506,204 km or roadways, 224,792 km of railways, and 15,079 airports. As such, highways represent the overwhelming majority of transportation facilities described by this factor in the AHS.

The AHS reports are published every two years, and until 2011 recorded whether homes were located near highways with four or more lanes, railroads, or airports. As such, trends in the AHS can be reported to describe whether a greater or lesser proportion of homes are located near major roads over time. Figure 6-1 depicts trends in the number and proportion of homes located near major transportation sources, which generally indicate large roadways. As the figure indicates, since 2005, there has been a substantial increase in the number and percentage of homes located near major transportation sources. As such, the population in close proximity to these sources, which may be affected by near-road air quality and health concerns, appears to have increased over time.

exists between a particular health effect and traffic-related air pollution. In its weight-of-evidence determinations, the panel also placed "considerable weight" on controlled human exposure studies. However, it restricted consideration of other toxicological studies to whether or not the studies provided "general mechanistic support" for the inferences of causality made on the basis of epidemiology.

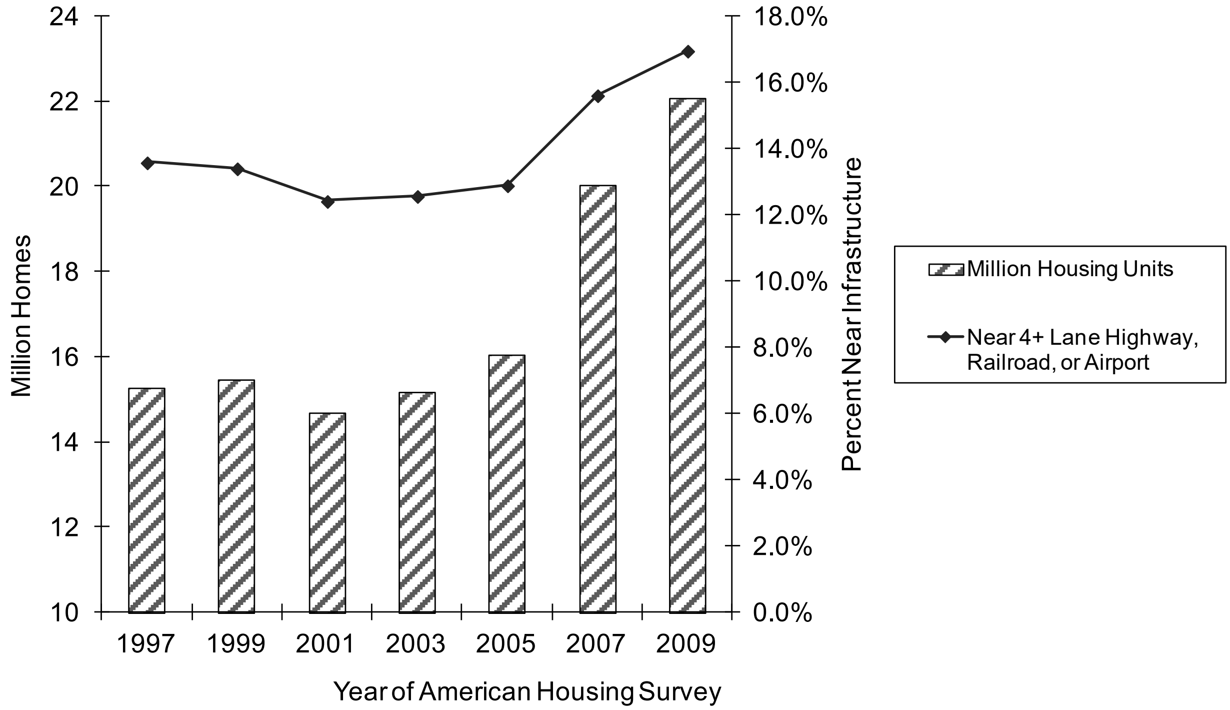

Figure 6-1 Trends in Populations near Large Highways, Railroads, and Airports

Furthermore, according to data from the 2008 American Time Use Survey (ATUS), conducted by the Bureau of Labor Statistics (BTS), Americans spend more than an hour traveling each day, on average.[104] Although the ATUS does not indicate their mode of travel, the majority of trips undertaken nationally is by motor vehicle.[105] As such, daily travel activity brings nearly all residents into a high-exposure microenvironment for part of the day.

6.1.1.8.2 *Premature Mortality*

The HEI panel report concluded that evidence linking traffic-associated air pollution with premature mortality from all causes was "suggestive but not sufficient" to infer a causal relationship. This conclusion was based largely on several long-term studies that "qualitatively" examined whether or not someone was exposed to traffic-associated air pollution. In addition, based on several short-term studies of exposure, the panel concluded that there was "suggestive but not sufficient" evidence to infer a causal relation between traffic-related exposure and cardiovascular mortality.

6.1.1.8.3 *Cardiovascular Effects*

6.1.1.8.3.1 Cardiac Physiology

Exposure to traffic-associated pollutants has been associated with changes in cardiac physiology, including cardiac function. One common measure of cardiac function is heart rate variability (HRV), an indicator of the heart's ability to respond to variations in stress, reflecting the nervous system's ability to regulate the heart.[M] Reduced HRV is associated with adverse cardiovascular events, such as myocardial infarction, in heart disease patients. The HEI panel concluded that available evidence provides evidence for a causal association between exposure to traffic-related pollutants and reduced control of HRV by the nervous system. Overall, the panel concluded that the evidence was "suggestive but not sufficient" to infer a causal relation between traffic-related pollutants and cardiac function. Studies suggest that the HRV changes from traffic-related air pollution result in changes to heart rhythms, which can lead to arrhythmia.[106,107]

6.1.1.8.3.2 Heart Attack and Atherosclerosis

The HEI panel concluded that epidemiologic evidence of the association between traffic-related pollutants and heart attacks and atherosclerosis was "suggestive but not sufficient" to infer a causal association. In addition, the panel concluded that the toxicology studies they reviewed provided "suggestive evidence that exposure to traffic emissions, including ambient and laboratory-generated [PM] and diesel- and gasoline-engine exhaust, alters cardiovascular function." The panel noted there are few studies of human volunteers exposed to real-world traffic mixture, which were not entirely consistent. The panel notes that the studies provide consistent evidence for exposure to PM and impaired cardiovascular responses. In addition to the HEI study, several other reviews of available evidence conclude that there is evidence supporting a causal association between traffic-related air pollution and cardiovascular disease.[108]

A number of mechanisms for cardiovascular disease are highlighted in the HEI and AHA report, including modified blood vessel endothelial function (e.g., the ability to dilate), atherosclerosis, and oxidative stress. The HEI review cites "two well executed studies" in which hospitalization for acute myocardial infarction (i.e., heart attack) were associated with traffic exposures and a prospective study finding higher rates of arterial hardening and coronary heart disease near traffic.

6.1.1.8.4 *Respiratory Effects*

6.1.1.8.4.1 Asthma

Pediatric asthma and asthma symptoms are the effects that have been evaluated by the largest number of studies in the epidemiologic literature on the topic. In general, studies consistently show effects of residential or school exposure to traffic and asthma symptoms, and the effects are frequently statistically significant. Studies have employed both short-term and long-term exposure metrics, and a range of different respiratory measures. HEI Special Report 17 (HEI Panel on the Health Effects of Traffic-Related Air Pollution, 2010) concluded that there is sufficient evidence for a causal association between exposure to traffic-related air pollution and exacerbation of asthma symptoms in children.

[M] The autonomic nervous system (ANS) consists of sympathetic and parasympathetic components. The sympathetic ANS signals body systems to "fight or flight." The parasympathetic ANS signals the body to "rest and digest." In general, HRV is indicative of parasympathetic control of the heart.

While there is general consistency in studies examining asthma incidence in children, the available studies employ different definitions of asthma (e.g., self-reported vs. hospital records), methods of exposure assessment, and population age ranges. As such, the overall evidence, while supportive of an association between traffic exposure and new onset asthma, are less consistent than for asthma symptoms. The HEI report determined that evidence is between "sufficient" and "suggestive" of a causal relationship between exposure to traffic-related air pollution and incident (new onset) asthma in children (HEI Panel on the Health Effects of Traffic-Related Air Pollution, 2010). A recent meta-analysis of studies on incident asthma and air pollution in general, based on studies dominated by traffic-linked exposure metrics, also concluded that available evidence is consistent with HEI's conclusion (Anderson et al., 2011). The study reported excess main risk estimates for different pollutants ranging from 7-16 percent per 10 $\mu g/m^3$ of long-term exposure (random effects models). Other qualitative reviews (Salam et al., 2008; Braback and Forsberg, 2009) conclude that available evidence is consistent with the hypothesis that traffic-associated air pollutants are associated with incident asthma.

6.1.1.8.4.2 Chronic Obstructive Pulmonary Disease (COPD)

The HEI panel reviewed available studies examining COPD in the context of traffic-associated air pollution. Because of how the panel selected studies for inclusion in review, there were only two studies that they used to review the available evidence. Both studies reported some positive associations, but not for all traffic metrics. The small number of studies and lack of consistency across traffic metrics led the panel to conclude that there is insufficient evidence for traffic-associated air pollution causing COPD.

6.1.1.8.4.3 Allergy

There are numerous human and animal experimental studies that provides strongly suggestive evidence that traffic-related air pollutants can enhance allergic responses to common allergens.[109,110,111] However, in its review of 16 epidemiologic studies that address traffic-related air pollution's effect on allergies, the HEI expert panel (HEI, 2010) reported that only two such studies showed consistently positive associations. As a result, despite the strongly suggestive experimental evidence, the panel concluded that there is "inadequate/insufficient" evidence of an association between allergy and traffic-associated air pollution. As noted above, the HEI panel considered toxicological studies only based on whether or not they provide mechanistic support for observations and inferences derived from epidemiology.

6.1.1.8.4.4 Lung Function

There are numerous measurements of breathing (spirometry) that indicate the presence or degree of airway disease, such as asthma and chronic obstructive pulmonary disease (COPD). Forced vital capacity (FVC) is measured when a patient maximally fills their lungs and then blows their hardest in completely exhaling. The peak expiratory flow (PEF) is the maximum air flow achievable during exhalation. The forced expiratory volume in the first second of exhalation is referred to as FEV_1. FEV_1 and PEF reflect the function of the large airways. FVC and FEV_1, along with their ratio (FVC/FEV_1) are used to classify airway obstruction in asthma and COPD. Measurements of air flow at various times during forced exhalation, such as 25 percent, 50 percent, and 75 percent, are also used. The flow at 75 percent of forced exhalation (FEF_{75}) reflects the status of small airways, which asthma and COPD affect.

The HEI panel concluded that the available literature suggests that long-term exposure to traffic-related air pollution is associated with reduced lung function in adolescents and young adults and that lung function is lower in populations in areas with high traffic-related air pollutant levels. However, the panel noted the difficulty of disentangling traffic-specific exposures from urban air pollution in general. The studies reviewed that were more specifically oriented toward traffic were not consistent in their findings. As a result, the panel found that the evidence linking lung function and traffic exposure is "inadequate and insufficient" to infer a causal relationship.

6.1.1.8.5 *Reproductive and Developmental Effects*

Several studies have reported associations between traffic-related air pollution and adverse birth outcomes, such as preterm birth and low birth weight. At the time of the HEI review, the panel concluded that evidence for adverse birth outcomes being causally associated with traffic-related exposures was "inadequate and insufficient." Only four studies met the panel's inclusion criteria, and had limited geographic coverage. One study provided evidence of small but consistently increased risks using multiple exposure metrics. No studies were at the time available that examined traffic-specific exposures and congenital abnormalities. Since then, several studies investigating birth outcomes have been published, but no new systematic reviews. One new meta-analysis of air pollution and congenital abnormalities has been published, though none of the reviewed studies includes traffic-specific exposure information.

The HEI panel also reviewed toxicological studies of traffic-related air pollutants and fertility. While numerous studies examining animal or human exposure and sperm count have been published, the panel concluded that the generally high exposure concentrations employed in the studies limited the applicability to typical ambient concentrations. Because there was no overlap in the effects studied by epidemiology and toxicology studies, no synthesis review of the combined literature was undertaken.

Since the HEI panel's publication, a systematic review and meta-analysis of air pollution and congenital abnormalities was published.[112] In that review, only one study directly included nearby traffic in its exposure analysis. As such, there are no systematic reviews that specifically address traffic's impact on congenital abnormalities.

6.1.1.8.6 *Cancer*

6.1.1.8.6.1 Childhood Cancer

In 2014, Boothe et al. published a systematic review and meta-analysis of studies of childhood leukemia risks associated for populations near major roads.[113] The study concluded that childhood leukemia was positively associated with residential exposure during childhood, but not during the prenatal period. Other literature reviews have not concluded that available evidence supports an association between childhood leukemia and traffic exposure.[114,115] For example, the HEI panel concluded that the available epidemiologic evidence was "inadequate and insufficient" to infer a causal relationship between traffic-related air pollution and childhood cancer.

6.1.1.8.6.2 Adult Cancer

Several studies have examined the risk of adult lung cancers in relation to exposure to traffic-related air pollutants. The HEI panel evaluated four such studies, and rated the available evidence as "inadequate and insufficient" to infer a causal relation for non-occupational lung cancer.

6.1.1.8.7 *Neurological Effects*

The HEI panel found that current toxicologic and epidemiologic literature on the neurotoxicity of traffic-related air pollution was inadequate for their evaluation. The panel noted that there were a number of toxicologic studies of traffic-associated pollutants, but found them to have diverse exposure protocols, animal models, and endpoints, making them unsuitable for systematic evaluation.

6.1.2 Environmental Effects Associated with Exposure to Non-GHG Pollutants

Along with reducing GHGs, the Phase 2 standards also have an impact on non-GHG (criteria and air toxic pollutant) emissions. As discussed in Chapter 5, the standards will impact exhaust emissions of these pollutants from vehicles and will also impact emissions that occur during the refining and distribution of fuel (upstream sources).

In this section we will discuss the environmental effects associated with non-GHG pollutants, specifically: particulate matter, ozone, NO_X, SO_X and air toxics.

6.1.2.1 Visibility Degradation

Visibility can be defined as the degree to which the atmosphere is transparent to visible light.[116] Visibility impairment is caused by light scattering and absorption by suspended particles and gases. Fine particles with significant light-extinction efficiencies include sulfates, nitrates, organic carbon, elemental carbon, and soil.[117] Visibility is important because it has direct significance to people's enjoyment of daily activities in all parts of the country. Individuals value good visibility for the well-being it provides them directly, where they live and work, and in places where they enjoy recreational opportunities. Visibility is also highly valued in significant natural areas, such as national parks and wilderness areas, and special emphasis is given to protecting visibility in these areas. For more information on visibility see the final 2009 PM ISA.[118]

The extent to which any amount of light extinction affects a person's ability to view a scene depends on both scene and light characteristics. For example, the appearance of a nearby object (e.g., a building) is generally less sensitive to a change in light extinction than the appearance of a similar object at a greater distance. See Figure 6-2 for an illustration of the important factors affecting visibility.

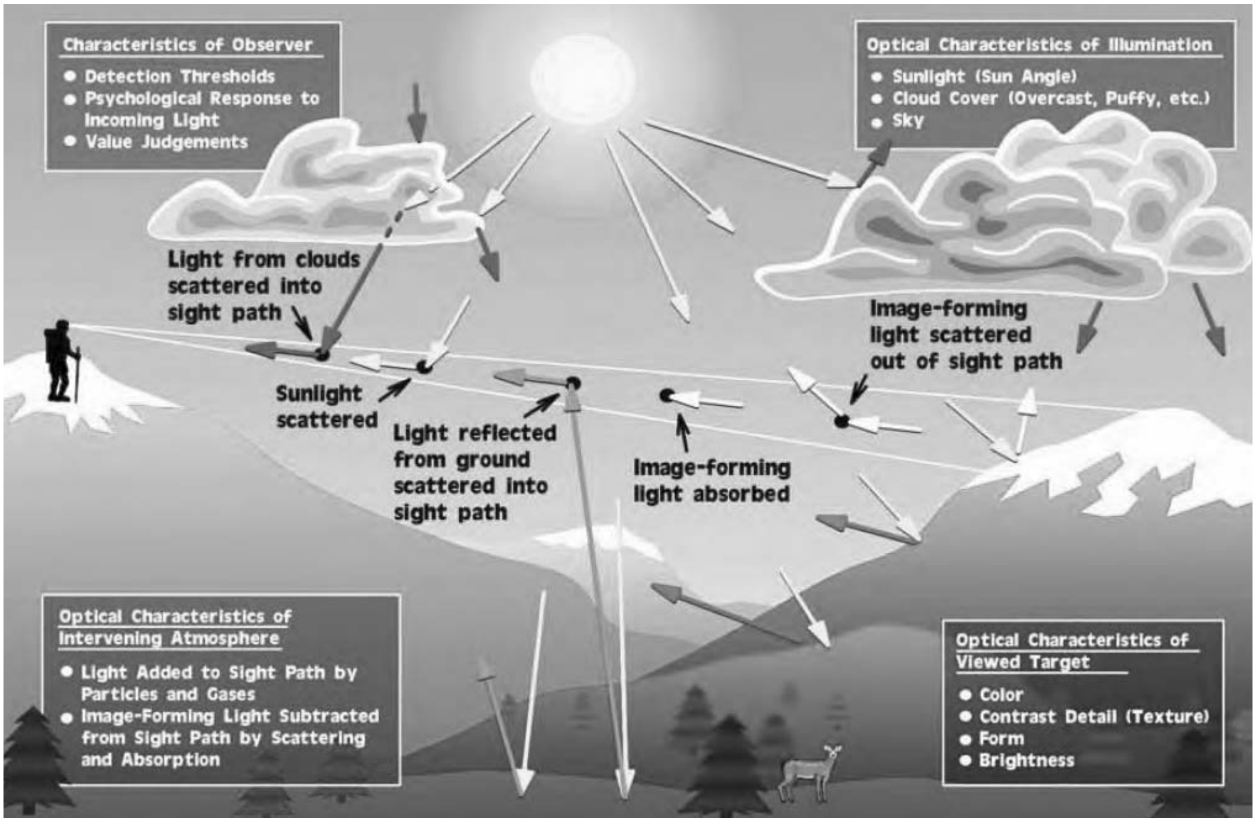

Figure 6-2 Important Factors Involved in Seeing a Scenic Vista (Malm, 1999)

EPA is working to address visibility impairment. Reductions in air pollution from implementation of various programs associated with the Clean Air Act Amendments of 1990 (CAAA) provisions have resulted in substantial improvements in visibility and will continue to do so in the future. Because trends in haze are closely associated with trends in particulate sulfate and nitrate due to the relationship between their concentration and light extinction, visibility trends have improved as emissions of SO_2 and NO_X have decreased over time due to air pollution regulations such as the Acid Rain Program.[119]

In the Clean Air Act Amendments of 1977, Congress recognized visibility's value to society by establishing a national goal to protect national parks and wilderness areas from visibility impairment caused by manmade pollution.[N] In 1999, EPA finalized the regional haze program (64 FR 35714) to protect the visibility in Mandatory Class I Federal areas. There are 156 national parks, forests and wilderness areas categorized as Mandatory Class I Federal areas (62 FR 38680-38681, July 18, 1997). These areas are defined in CAA section 162 as those national parks exceeding 6,000 acres, wilderness areas and memorial parks exceeding 5,000 acres, and all international parks which were in existence on August 7, 1977. Figure 6-3 shows the location of the 156 Mandatory Class I Federal areas.

[N] See Section 169(a) of the Clean Air Act.

Figure 6-3 Mandatory Class I Federal Areas in the U.S.

EPA has also concluded that $PM_{2.5}$ causes adverse effects on visibility in other areas that are not targeted by the Regional Haze Rule, such as urban areas, depending on $PM_{2.5}$ concentrations and other factors such as dry chemical composition and relative humidity (i.e., an indicator of the water composition of the particles). EPA revised the $PM_{2.5}$ standards in December 2012 and established a target level of protection that is expected to be met through attainment of the existing secondary standards for $PM_{2.5}$.

6.1.2.2 Visibility Monitoring

In conjunction with the U.S. National Park Service, the U.S. Forest Service, other Federal land managers, and State organizations in the U.S., EPA has supported visibility monitoring in national parks and wilderness areas since 1988. The monitoring network was originally established at 20 sites, but it has now been expanded to 110 sites that represent all but one of the 156 Mandatory Federal Class I areas across the country (see Figure 6-3). This long-term visibility monitoring network is known as IMPROVE (Interagency Monitoring of Protected Visual Environments).

IMPROVE provides direct measurement of fine particles that contribute to visibility impairment. The IMPROVE network employs aerosol measurements at all sites, and optical and scene measurements at some of the sites. Aerosol measurements are taken for PM_{10} and $PM_{2.5}$ mass, and for key constituents of $PM_{2.5}$, such as sulfate, nitrate, organic and elemental carbon OC and EC), soil dust, and several other elements. Measurements for specific aerosol constituents are used to calculate "reconstructed" aerosol light extinction by multiplying the mass for each constituent by its empirically-derived scattering and/or absorption efficiency, with adjustment for the relative humidity. The IMPROVE program utilizes both an “original” and a “revised” reconstruction formula for this purpose, with the latter explicitly accounting for sea salt concentrations. Knowledge of the main constituents of a site's light extinction "budget" is critical for source apportionment and control strategy development. In addition to this indirect method of assessing light extinction, there are optical measurements which directly measure light extinction or its components. Such measurements are made principally with a nephelometer to measure light scattering, some sites also include an aethalometer for light absorption, or a few sites use a transmissometer, which measures total light extinction. Scene characteristics are typically recorded using digital or video photography and are used to determine the quality of visibility conditions (such as effects on color and contrast) associated with specific levels of light extinction as measured under both direct and aerosol-related methods. Directly measured light extinction is used under the IMPROVE protocol to cross check that the aerosol-derived light extinction levels are reasonable in establishing current visibility conditions. Aerosol-derived light extinction is used to document spatial and temporal trends and to determine how changes in atmospheric constituents would affect future visibility conditions.

Annual average visibility conditions (reflecting light extinction due to both anthropogenic and non-anthropogenic sources) vary regionally across the U.S. Visibility is typically worse in the summer months, and the rural East generally has higher levels of impairment than remote sites in the West. Figures 9-9 through 9-11 in the PM ISA detail the percent contributions to particulate light extinction for ammonium nitrate and sulfate, EC and OC, and coarse mass and fine soil, by season.[120]

6.1.2.3 Plant and Ecosystem Effects of Ozone

The welfare effects of ozone can be observed across a variety of scales, i.e. subcellular, cellular, leaf, whole plant, population and ecosystem. Ozone effects that begin at small spatial scales, such as the leaf of an individual plant, when they occur at sufficient magnitudes (or to a sufficient degree) can result in effects being propagated along a continuum to larger and larger spatial scales. For example, effects at the individual plant level, such as altered rates of leaf gas exchange, growth and reproduction, can, when widespread, result in broad changes in ecosystems, such as productivity, carbon storage, water cycling, nutrient cycling, and community composition.

Ozone can produce both acute and chronic injury in sensitive species depending on the concentration level and the duration of the exposure.[121] In those sensitive species[O], effects from repeated exposure to ozone throughout the growing season of the plant tend to accumulate, so that even low concentrations experienced for a longer duration have the potential to create chronic stress on vegetation.[122,P] Ozone damage to sensitive species includes impaired photosynthesis and visible injury to leaves. The impairment of photosynthesis, the process by which the plant makes carbohydrates (its source of energy and food), can lead to reduced crop yields, timber production, and plant productivity and growth. Impaired photosynthesis can also

[O] 73 FR 16491 (March 27, 2008). Only a small percentage of all the plant species growing within the U.S. (over 43,000 species have been catalogued in the USDA PLANTS database) have been studied with respect to ozone sensitivity.

[P] The concentration at which ozone levels overwhelm a plant's ability to detoxify or compensate for oxidant exposure varies. Thus, whether a plant is classified as sensitive or tolerant depends in part on the exposure levels being considered.

lead to a reduction in root growth and carbohydrate storage below ground, resulting in other, more subtle plant and ecosystems impacts.[123] These latter impacts include increased susceptibility of plants to insect attack, disease, harsh weather, interspecies competition and overall decreased plant vigor. The adverse effects of ozone on areas with sensitive species could potentially lead to species shifts and loss from the affected ecosystems[Q], resulting in a loss or reduction in associated ecosystem goods and services.[124] Additionally, visible ozone injury to leaves can result in a loss of aesthetic value in areas of special scenic significance like national parks and wilderness areas and reduced use of sensitive ornamentals in landscaping.[125]

The Integrated Science Assessment (ISA) for Ozone presents more detailed information on how ozone affects vegetation and ecosystems.[126] The ISA concludes that ambient concentrations of ozone are associated with a number of adverse welfare effects and characterizes the weight of evidence for different effects associated with ozone.[R] The ISA concludes that visible foliar injury effects on vegetation, reduced vegetation growth, reduced productivity in terrestrial ecosystems, reduced yield and quality of agricultural crops, and alteration of below-ground biogeochemical cycles are causally associated with exposure to ozone. It also concludes that reduced carbon sequestration in terrestrial ecosystems, alteration of terrestrial ecosystem water cycling, and alteration of terrestrial community composition are likely to be causally associated with exposure to ozone.

6.1.2.4 Deposition of Particulate Matter, Nitrogen and Sulfur

Particulate matter contributes to adverse effects on vegetation and ecosystems, and to soiling and materials damage. These welfare effects result predominantly from exposure to excess amounts of specific chemical species, regardless of their source or predominant form (particle, gas or liquid). The following characterizations of the nature of these environmental effects are based on information contained in the 2009 PM ISA and the 2008 Integrated Science Assessment for Oxides of Nitrogen and Sulfur- Ecological Criteria (secondary NO_X/SO_X ISA).[127, 128]

6.1.2.4.1 *Deposition of Nitrogen and Sulfur*

Nitrogen and sulfur interactions in the environment are highly complex as shown in Figure 6-4. Both nitrogen and sulfur are essential, and sometimes limiting, nutrients needed for growth and productivity of ecosystem components (e.g. algae, plants). In terrestrial and aquatic ecosystems excesses of nitrogen or sulfur can lead to acidification and nutrient enrichment.[129] In addition, in aquatic ecosystems, sulfur deposition can increase mercury methylation.

[Q] Per footnote above, ozone impacts could be occurring in areas where plant species sensitive to ozone have not yet been studied or identified.

[R] The Ozone ISA evaluates the evidence associated with different ozone related health and welfare effects, assigning one of five "weight of evidence" determinations: causal relationship, likely to be a causal relationship, suggestive of a causal relationship, inadequate to infer a causal relationship, and not likely to be a causal relationship. For more information on these levels of evidence, please refer to Table II of the ISA.

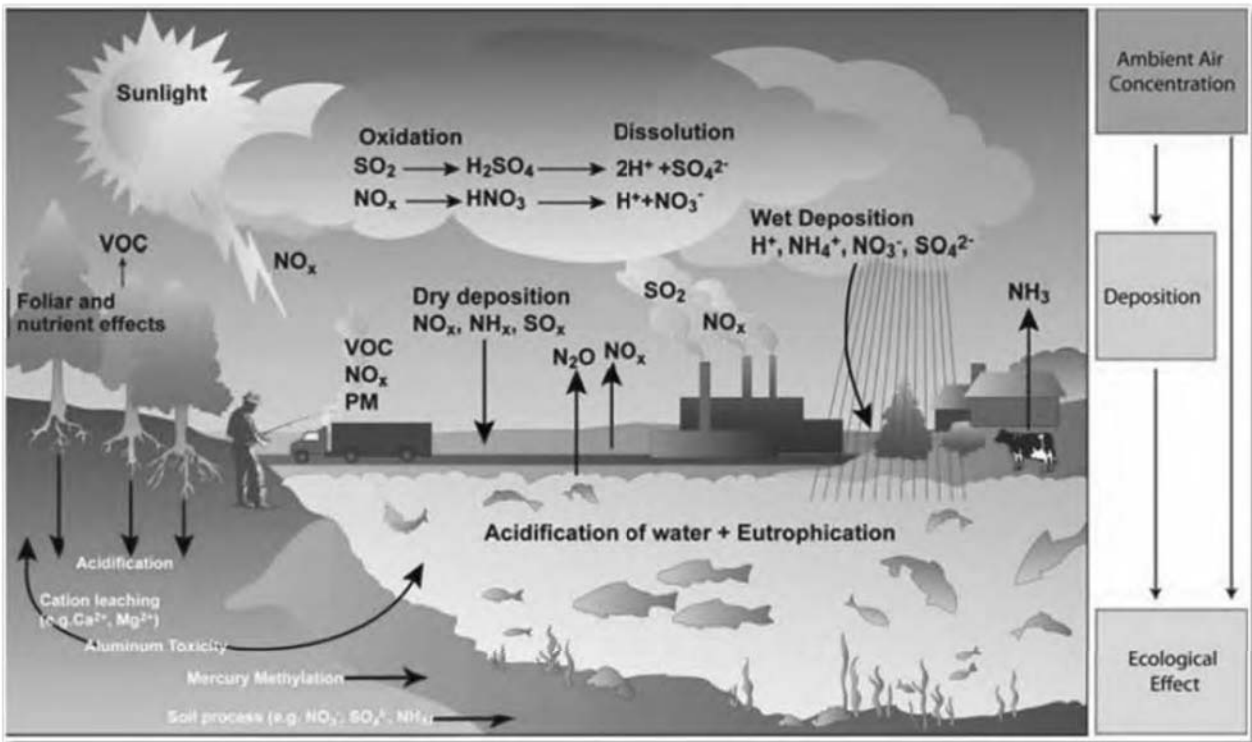

Figure 6-4 Nitrogen and Sulfur Cycling, and Interactions in the Environment

Source: U.S. EPA, 2008c

6.1.2.4.1.1 Ecological Effects of Acidification

Deposition of nitrogen and sulfur can cause acidification, which alters biogeochemistry and affects animal and plant life in terrestrial and aquatic ecosystems across the U.S. Soil acidification is a natural process, but is often accelerated by acidifying deposition, which can decrease concentrations of exchangeable base cations in soils.[130] Biological effects of acidification in terrestrial ecosystems are generally linked to aluminum toxicity and decreased ability of plant roots to take up base cations.[131] Decreases in the acid neutralizing capacity and increases in inorganic aluminum concentration contribute to declines in zooplankton, macro invertebrates, and fish species richness in aquatic ecosystems.[132]

Geology (particularly surficial geology) is the principal factor governing the sensitivity of terrestrial and aquatic ecosystems to acidification from nitrogen and sulfur deposition.[133] Geologic formations having low base cation supply generally underlie the watersheds of acid-sensitive lakes and streams. Other factors contribute to the sensitivity of soils and surface waters to acidifying deposition, including topography, soil chemistry, land use, and hydrologic flow path.[134]

6.1.2.4.1.1.1 Aquatic Acidification

Aquatic effects of acidification have been well studied in the U.S. and elsewhere at various trophic levels. These studies indicate that aquatic biota have been affected by acidification at virtually all levels of the food web in acid sensitive aquatic ecosystems. Effects have been most clearly documented for fish, aquatic insects, other invertebrates, and algae. Biological effects are primarily attributable to a combination of low pH and high inorganic aluminum concentrations. Such conditions occur more frequently during rainfall and snowmelt that cause high flows of water and less commonly during low-flow conditions, except where chronic acidity conditions are severe. Biological effects of episodes include reduced fish condition factor[A], changes in species composition and declines in aquatic species richness across multiple taxa, ecosystems and regions.

Because acidification primarily affects the diversity and abundance of aquatic biota, it also affects the ecosystem services, e.g., recreational and subsistence fishing, that are derived from the fish and other aquatic life found in these surface waters. In the northeastern United States, the surface waters affected by acidification are a source of food for some recreational and subsistence fishermen and for other consumers with particularly high rates of self-caught fish consumption, such as the Hmong and Chippewa ethnic groups.[135,136]

6.1.2.4.1.1.2 Terrestrial Acidification

Acidifying deposition has altered major biogeochemical processes in the U.S. by increasing the nitrogen and sulfur content of soils, accelerating nitrate and sulfate leaching from soil to drainage waters, depleting base cations (especially calcium and magnesium) from soils, and increasing the mobility of aluminum. Inorganic aluminum is toxic to some tree roots. Plants affected by high levels of aluminum from the soil often have reduced root growth, which restricts the ability of the plant to take up water and nutrients, especially calcium.[137] These direct effects can, in turn, influence the response of these plants to climatic stresses such as droughts and cold temperatures. They can also influence the sensitivity of plants to other stresses, including insect pests and disease leading to increased mortality of canopy trees.[138] In the U.S., terrestrial effects of acidification are best described for forested ecosystems (especially red spruce and sugar maple ecosystems) with additional information on other plant communities, including shrubs and lichen.[139]

Both coniferous and deciduous forests throughout the eastern U.S. are experiencing gradual losses of base cation nutrients from the soil due to accelerated leaching from acidifying deposition. This change in nutrient availability may reduce the quality of forest nutrition over the long term. Evidence suggests that red spruce and sugar maple in some areas in the eastern U.S. have experienced declining health because of this deposition. For red spruce, (*Picea rubens*) dieback or decline has been observed across high elevation landscapes of the northeastern U.S., and to a lesser extent, the southeastern U.S., and acidifying deposition has been implicated as a causal factor.[140]

6.1.2.4.1.2 Ecological Effects from Nitrogen Enrichment

6.1.2.4.1.2.1 Aquatic Enrichment

Eutrophication in estuaries is associated with a range of adverse ecological effects including low dissolved oxygen (DO), harmful algal blooms (HABs), loss of submerged aquatic vegetation (SAV), and low water clarity. Low DO disrupts aquatic habitats, causing stress to fish and shellfish, which, in the short-term, can lead to episodic fish kills and, in the long-term, can damage overall growth in fish and shellfish populations. Low DO also degrades the aesthetic qualities of surface water. In addition to often being toxic to fish and shellfish, and leading to fish kills and aesthetic impairments of estuaries, HABs can, in some instances, also be harmful to human health. SAV provides critical habitat for many aquatic species in estuaries and, in some instances, can also protect shorelines by reducing wave strength; therefore, declines in SAV due to nutrient enrichment are an important source of concern. Low water clarity is in part the result of accumulations of both algae and sediments in estuarine waters. In addition to contributing to declines in SAV, high levels of turbidity also degrade the aesthetic qualities of the estuarine environment.

An assessment of estuaries nationwide by the National Oceanic and Atmospheric Administration (NOAA) concluded that 64 estuaries (out of 99 with available data) suffered from moderate or high levels of eutrophication due to excessive inputs of both N and phosphorus.[141] For estuaries in the Mid-Atlantic region, the contribution of atmospheric deposition to total N loads is estimated to range between 10 percent and 58 percent.[142] Estuaries in the eastern United States are an important source of food production, in particular fish and shellfish production. The estuaries are capable of supporting large stocks of resident commercial species, and they serve as the breeding grounds and interim habitat for several migratory species. Eutrophication in estuaries may also affect the demand for seafood after well-publicized toxic blooms, water-based recreation, and erosion protection provided by SAV.

6.1.2.4.1.2.2 Terrestrial Enrichment

Terrestrial enrichment occurs when terrestrial ecosystems receive N loadings in excess of natural background levels, through either atmospheric deposition or direct application. Atmospheric N deposition is associated with changes in the types and number of species and biodiversity in terrestrial systems. Nitrogen enrichment occurs over a long time period; as a result, it may take as much as 50 years or more to see changes in ecosystem conditions and indicators. One of the main provisioning services potentially affected by N deposition is grazing opportunities offered by grasslands for livestock production in the Central U.S. Although N deposition on these grasslands can offer supplementary nutritive value and promote overall grass production, there are concerns that fertilization may favor invasive grasses and shift the species composition away from native grasses. This process may ultimately reduce the productivity of grasslands for livestock production.

Terrestrial enrichment also affects habitats, for example the Coastal Sage Scrub (CSS) and Mixed Conifer Forest (MCF) habitats which are an integral part of the California landscape. Together the ranges of these habitats include the densely populated and valuable coastline and the mountain areas. Numerous threatened and endangered species at both the state and federal levels reside in CSS and MCF. Fire regulation is also an important regulating service that could be affected by nutrient enrichment of the CSS and MCF ecosystems by encouraging growth of more flammable grasses, increasing fuel loads, and altering the fire cycle.

6.1.2.4.1.3 Vegetation Effects Associated with Gaseous Sulfur Dioxide

Uptake of gaseous sulfur dioxide in a plant canopy is a complex process involving adsorption to surfaces (leaves, stems, and soil) and absorption into leaves. SO_2 penetrates into leaves through the stomata, although there is evidence for limited pathways via the cuticle.[143]

Pollutants must be transported from the bulk air to the leaf boundary layer in order to get to the stomata. When the stomata are closed, as occurs under dark or drought conditions, resistance to gas uptake is very high and the plant has a very low degree of susceptibility to injury. In contrast, mosses and lichens do not have a protective cuticle barrier to gaseous pollutants or stomates and are generally more sensitive to gaseous sulfur and nitrogen than vascular plants.[144] Acute foliar injury usually happens within hours of exposure, involves a rapid absorption of a toxic dose, and involves collapse or necrosis of plant tissues. Another type of visible injury is termed chronic injury and is usually a result of variable SO_2 exposures over the growing season. Besides foliar injury, chronic exposure to low SO_2 concentrations can result in reduced photosynthesis, growth, and yield of plants.[145] These effects are cumulative over the season and are often not associated with visible foliar injury. As with foliar injury, these effects vary among species and growing environment. SO_2 is also considered the primary factor causing the death of lichens in many urban and industrial areas.[146]

6.1.2.4.1.4 Mercury Methylation

Mercury is a persistent, bioaccumulative toxic metal that is emitted in three forms: gaseous elemental Hg (Hg^0), oxidized Hg compounds (Hg^{+2}), and particle-bound Hg (Hg_P). Methylmercury (MeHg) is formed by microbial action in the top layers of sediment and soils, after Hg has precipitated from the air and deposited into waterbodies or land. Once formed, MeHg is taken up by aquatic organisms and bioaccumulates up the aquatic food web. Larger predatory fish may have MeHg concentrations many times, typically on the order of one million times, that of the concentrations in the freshwater body in which they live. The NO_X SO_X ISA—Ecological Criteria concluded that evidence is sufficient to infer a causal relationship between sulfur deposition and increased mercury methylation in wetlands and aquatic environments.[147] Specifically, there appears to be a relationship between SO_4^{2-} deposition and mercury methylation; however, the rate of mercury methylation varies according to several spatial and biogeochemical factors whose influence has not been fully quantified. Therefore, the correlation between SO_4^{2-} deposition and MeHg cannot yet be quantified for the purpose of interpolating the association across waterbodies or regions. Nevertheless, because changes in MeHg in ecosystems represent changes in significant human and ecological health risks, the association between sulfur and mercury cannot be neglected.[148]

6.1.2.4.2 *Deposition of Metallic and Organic Constituents of PM*

Several significant ecological effects are associated with deposition of chemical constituents of ambient PM such as metals and organics.[149] The trace metal constituents of PM include cadmium, copper, chromium, mercury, nickel, zinc, and lead. The organics include persistent organic pollutants (POPs), polyaromatic hydrocarbons (PAHs) and polybromiated diphenyl ethers (PBDEs). Exposure to PM for direct effects occur via deposition (e.g., wet, dry or occult) to vegetation surfaces, while indirect effects occur via deposition to ecosystem soils or surface waters where the deposited constituents of PM then interacts with biological organisms. While both fine and coarse-mode particles may affect plants and other organisms, more often the chemical constituents drive the ecosystem response to PM.[150] Ecological effects of PM include direct effects to metabolic processes of plant foliage; contribution to total metal loading resulting in alteration of soil biogeochemistry and microbiology, plant and animal growth and reproduction; and contribution to total organics loading resulting in bioaccumulation and biomagnification.

Particulate matter can adversely impact plants and ecosystem services provided by plants by deposition to vegetative surfaces.[151] Particulates deposited on the surfaces of leaves and needles can block light, altering the radiation received by the plant. PM deposition near sources of heavy deposition can obstruct stomata limiting gas exchange, damage leaf cuticles and increase plant temperatures.[152] Plants growing on roadsides exhibit impact damage from near-road PM deposition, having higher levels of organics and heavy metals, and accumulate salt from road de-icing during winter months.[153] In addition, atmospheric PM can convert direct solar radiation to diffuse radiation, which is more uniformly distributed in a tree canopy, allowing radiation to reach lower leaves.[154] Decreases in crop yields (a provisioning service) due to reductions in solar radiation have been attributed to regional scale air pollution in other counties with especially severe regional haze.[155]

In addition to damage to plant surfaces, deposited PM can be taken up by plants from soil or foliage. Copper, zinc, and nickel have been shown to be directly toxic to vegetation under field conditions.[156] The ability of vegetation to take up heavy metals is dependent upon the amount, solubility and chemical composition of the deposited PM. Uptake of PM by plants from soils and vegetative surfaces can disrupt photosynthesis, alter pigments and mineral content, reduce plant vigor, decrease frost hardiness and impair root development.

Particulate matter can also contain organic air toxic pollutants, including PAHs, which are a class of polycyclic organic matter (POM). PAHs can accumulate in sediments and bioaccumulate in freshwater, flora and fauna. The uptake of organics depends on the plant species, site of deposition, physical and chemical properties of the organic compound and prevailing environmental conditions.[157] Different species can have different uptake rates of PAHs. For example, zucchini (Cucurbita pepo) accumulated significantly more PAHs than related plant species.[158] PAHs can accumulate to high enough concentrations in some coastal environments to pose an environmental health threat that includes cancer in fish populations, toxicity to organisms living in the sediment and risks to those (e.g., migratory birds) that consume these organisms.[159,160] Atmospheric deposition of particles is thought to be the major source of PAHs to the sediments of Lake Michigan, Chesapeake Bay, Tampa Bay and other coastal areas of the U.S.[161]

Contamination of plant leaves by heavy metals can lead to elevated concentrations in the soil. Trace metals absorbed into the plant, frequently bind to the leaf tissue, and then are lost when the leaf drops. As the fallen leaves decompose, the heavy metals are transferred into the soil.[162,163] Many of the major indirect plant responses to PM deposition are chiefly soil-mediated and depend on the chemical composition of individual components of deposited PM. Upon entering the soil environment, PM pollutants can alter ecological processes of energy flow and nutrient cycling, inhibit nutrient uptake to plants, change microbial community structure and, affect biodiversity. Accumulation of heavy metals in soils depends on factors such as local soil characteristics, geologic origin of parent soils, and metal bioavailability. Heavy metals, such as zinc, copper, and cadmium, and some pesticides can interfere with microorganisms that are responsible for decomposition of soil litter, an important regulating ecosystem service that serves as a source of soil nutrients.[164] Surface litter decomposition is reduced in soils having high metal concentrations. Soil communities have associated bacteria, fungi, and invertebrates that are essential to soil nutrient cycling processes. Changes to the relative species abundance and community composition are associated with deposited PM to soil biota.[165]

Atmospheric deposition can be the primary source of some organics and metals to watersheds. Deposition of PM to surfaces in urban settings increases the metal and organic component of storm water runoff.[166] This atmospherically-associated pollutant burden can then be toxic to aquatic biota. The contribution of atmospherically deposited PAHs to aquatic food webs was demonstrated in high elevation mountain lakes with no other anthropogenic contaminant sources.[167] Metals associated with PM deposition limit phytoplankton growth, affecting aquatic trophic structure. Long-range atmospheric transport of 47 pesticides and degradation products to the snowpack in seven national parks in the Western U.S. was recently quantified indicating PM-associated contaminant inputs to receiving waters during spring snowmelt.[168]

The recently completed Western Airborne Contaminants Assessment Project (WACAP) is the most comprehensive database on contaminant transport and PM depositional effects on sensitive ecosystems in the Western U.S.[169] In this project, the transport, fate, and ecological impacts of anthropogenic contaminants from atmospheric sources were assessed from 2002 to 2007 in seven ecosystem components (air, snow, water, sediment, lichen, conifer needles and fish) in eight core national parks. The study concluded that bioaccumulation of semi-volatile organic compounds occurred throughout park ecosystems, an elevational gradient in PM deposition exists with greater accumulation in higher altitude areas, and contaminants accumulate in proximity to individual agriculture and industry sources, which is counter to the original working hypothesis that most of the contaminants would originate from Eastern Europe and Asia.

6.1.2.4.3 *Materials Damage and Soiling*

Building materials including metals, stones, cements, and paints undergo natural weathering processes from exposure to environmental elements (e.g., wind, moisture, temperature fluctuations, sunlight, etc.). Pollution can worsen and accelerate these effects. Deposition of PM is associated with both physical damage (materials damage effects) and impaired aesthetic qualities (soiling effects). Wet and dry deposition of PM can physically affect materials, adding to the effects of natural weathering processes, by potentially promoting or accelerating the corrosion of metals, by degrading paints and by deteriorating building materials such as stone, concrete and marble.[170] The effects of PM are exacerbated by the presence of acidic gases and can be additive or synergistic due to the complex mixture of pollutants in the air and surface characteristics of the material. Acidic deposition has been shown to have an effect on materials including zinc/galvanized steel and other metal, carbonate stone (as monuments and building facings), and surface coatings (paints).[171] The effects on historic buildings and outdoor works of art are of particular concern because of the uniqueness and irreplaceability of many of these objects.

6.1.2.5 Environmental Effects of Air Toxics

Emissions from producing, transporting and combusting fuel contribute to ambient levels of pollutants that contribute to adverse effects on vegetation. Volatile organic compounds (VOCs), some of which are considered air toxics, have long been suspected to play a role in vegetation damage.[172] In laboratory experiments, a wide range of tolerance to VOCs has been observed.[173] Decreases in harvested seed pod weight have been reported for the more sensitive plants, and some studies have reported effects on seed germination, flowering and fruit ripening. Effects of individual VOCs or their role in conjunction with other stressors (e.g., acidification, drought, temperature extremes) have not been well studied. In a recent study of a mixture of VOCs including ethanol and toluene on herbaceous plants, significant effects on seed production, leaf water content and photosynthetic efficiency were reported for some plant species.[174]

Research suggests an adverse impact of vehicle exhaust on plants, which has in some cases been attributed to aromatic compounds and in other cases to nitrogen oxides.[175,176,177] The impacts of VOCs on plant reproduction may have long-term implications for biodiversity and survival of native species near major roadways. Most of the studies of the impacts of VOCs on vegetation have focused on short-term exposure and few studies have focused on long-term effects of VOCs on vegetation and the potential for metabolites of these compounds to affect herbivores or insects.

6.2 Impacts of the Rules on Concentrations of Non-GHG Pollutants

Along with reducing GHGs, the Phase 2 standards also have an impact on non-GHG (criteria and air toxic pollutant) emissions. As discussed in Chapter 5, the standards will impact exhaust emissions of these pollutants from vehicles and will also impact emissions that occur during the refining and distribution of fuel (upstream sources).

This section first discusses current concentrations of non-GHG pollutants and then discusses the projected impacts of the standards on ambient concentrations of non-GHG pollutants in 2040. Additional information on the air quality modeling methodology and results of the air quality modeling can be found in Appendix 6A.

6.2.1 Current Concentrations of Non-GHG Pollutants

Nationally, levels of $PM_{2.5}$, ozone, NO_X, SO_X, CO and air toxics are declining.[178] However as of April 22, 2016, more than 125 million people lived in counties designated nonattainment for one or more of the NAAQS, and this figure does not include the people living in areas with a risk of exceeding the NAAQS in the future.[S] Many Americans continue to be exposed to ambient concentrations of air toxics at levels which have the potential to cause adverse health effects.[179] In addition, populations who live, work, or attend school near major roads experience elevated exposure concentrations to a wide range of air pollutants.[180]

[S] Data come from Summary Nonattainment Area Population Exposure Report, current as of April 22, 2016 at: https://www3.epa.gov/airquality/greenbk/popexp.html.

6.2.1.1 Current Concentrations of Particulate Matter

As described in Chapter 6.1, PM causes adverse health effects, and EPA has set national standards to provide requisite protection against those health effects. There are two primary NAAQS for $PM_{2.5}$: an annual standard (12.0 micrograms per cubic meter ($\mu g/m^3$)) and a 24-hour standard (35 $\mu g/m^3$), and two secondary NAAQS for $PM_{2.5}$: an annual standard (15.0 $\mu g/m^3$) and a 24-hour standard (35 $\mu g/m^3$). The initial $PM_{2.5}$ standards were set in 1997 and revisions to the standards were finalized in 2006 and in December 2012.

There are many areas of the country that are currently in nonattainment for the annual and 24-hour $PM_{2.5}$ NAAQS. In 2005 the EPA designated 39 nonattainment areas for the 1997 $PM_{2.5}$ NAAQS.[181] As of April 22, 2016, more than 23 million people lived in the 7 areas that are still designated as nonattainment for the 1997 annual $PM_{2.5}$ NAAQS. These $PM_{2.5}$ nonattainment areas are comprised of 33 full or partial counties. In December 2014 EPA designated 14 nonattainment areas for the 2012 $PM_{2.5}$ NAAQS.[182] As of April 22, 2016, 9 of these areas remain designated as nonattainment, and they are composed of 20 full or partial counties with a population of over 23 million. On November 13, 2009 and February 3, 2011, the EPA designated 32 nonattainment areas for the 2006 24-hour $PM_{2.5}$ NAAQS.[183] As of April 22, 2016, 16 of these areas remain designated as nonattainment for the 2006 $PM_{2.5}$ NAAQS, and they are composed of 46 full or partial counties with a population of over 32 million. In total, there are currently 24 $PM_{2.5}$ nonattainment areas with a population of more than 39 million people.[T] Nonattainment areas for the $PM_{2.5}$ NAAQS are pictured in Figure 6-5.

[T] The 39 million total is calculated by summing, without double counting, the 1997, 2006 and 2012 $PM_{2.5}$ nonattainment populations contained in the Summary Nonattainment Area Population Exposure report (https://www3.epa.gov/airquality/greenbk/popexp.html). If there is a population associated with more than one of the 1997, 2006 and 2012 nonattainment areas, and they are not the same, then the larger of the populations is included in the sum.

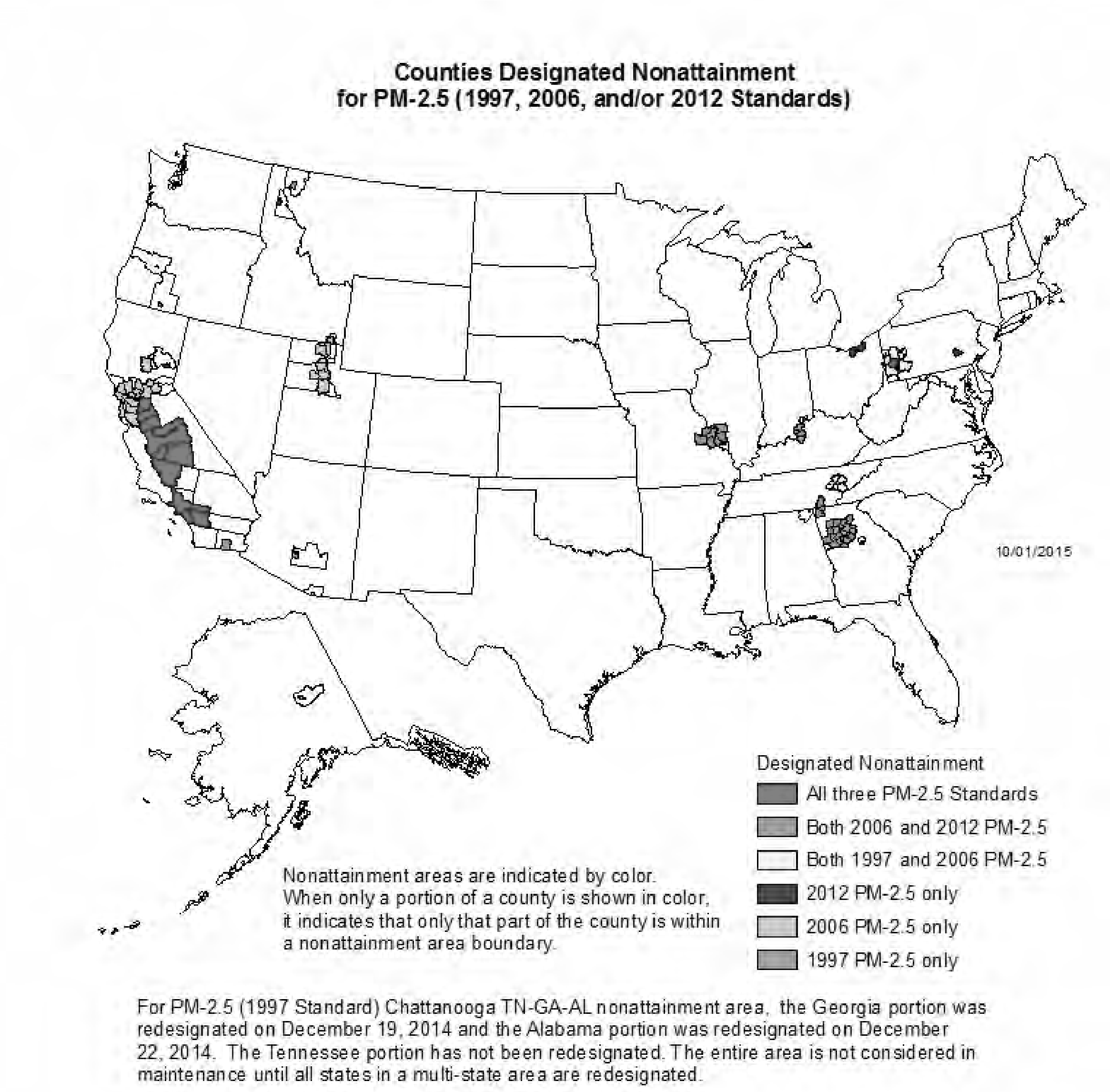

Figure 6-5 $PM_{2.5}$ Nonattainment Areas

The EPA has already adopted many mobile source emission control programs that are expected to reduce ambient PM concentrations. As a result of these and other federal, state and local programs, the number of areas that fail to meet the $PM_{2.5}$ NAAQS in the future is expected to decrease. However, even with the implementation of all current state and federal regulations, there are projected to be counties violating the $PM_{2.5}$ NAAQS well into the future. States will need to meet the 2006 24-hour standards in the 2015-2019 timeframe and the 2012 primary annual standard in the 2021-2025 timeframe. The emission reductions and improvements in ambient $PM_{2.5}$ concentrations from this action, which will take effect as early as model year 2018, will be helpful to states as they work to attain and maintain the $PM_{2.5}$ NAAQS.[U] The standards can assist areas with attainment dates in 2018 and beyond in attaining the NAAQS as

[U] The final Phase 2 trailer standards and PM controls for APUs begin with model year 2018.

expeditiously as practicable and may relieve areas with already stringent local regulations from some of the burden associated with adopting additional local controls.

6.2.1.2 Current Concentrations of Ozone

As described in Chapter6.1, ozone causes adverse health effects, and EPA has set national ambient air quality standards to protect against those health effects. The primary and secondary NAAQS for ozone are 8-hour standards with a level of 0.07 ppm. The most recent revision to the ozone standards was in 2015; the previous 8-hour ozone primary standard, set in 2008, had a level of 0.075 ppm. Nonattainment designations for the 2008 ozone standard were finalized on April 30, 2012, and May 31, 2012.[184] As of April 22, 2016, there were 44 ozone nonattainment areas for the 2008 ozone NAAQS, composed of 216 full or partial counties, with a population of more than 120 million. Nonattainment areas for the 2008 ozone NAAQS are pictured in Figure 6-6. In addition, EPA plans to finalize nonattainment areas for the 2015 ozone NAAQS in October 2017.

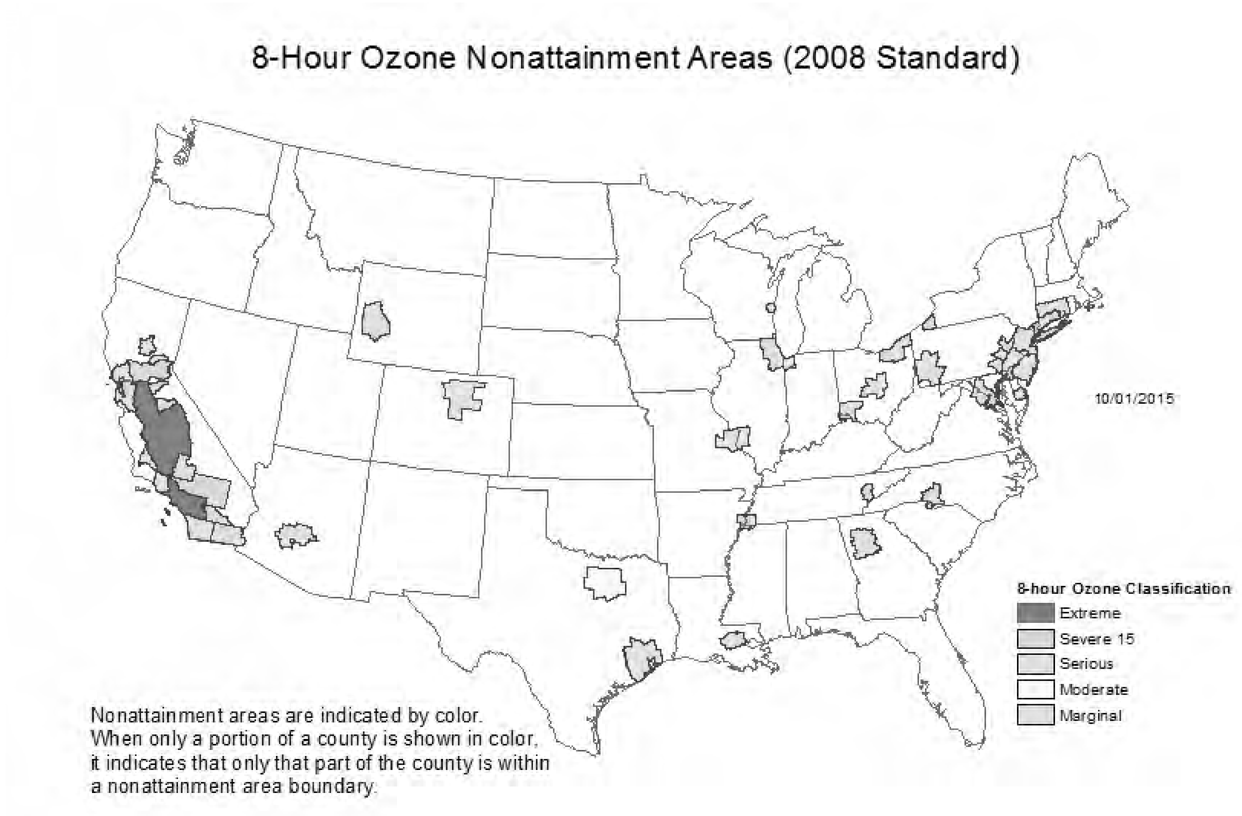

Figure 6-6 8-hour Ozone Nonattainment Areas (2008 Standard)

States with ozone nonattainment areas are required to take action to bring those areas into attainment. The attainment date assigned to an ozone nonattainment area is based on the area's classification. Most ozone nonattainment areas were required to attain the 1997 8-hour ozone NAAQS in the 2007 to 2013 time frame and then to maintain it thereafter. The attainment dates for areas designated nonattainment for the 2008 8-hour ozone NAAQS are in the 2015 to 2032 timeframe, depending on the severity of the problem in each area. Nonattainment area attainment dates associated with areas designated for the 2015 NAAQS will be in the 2020-2037 timeframe, depending on the severity of the problem in each area.[185]

EPA has already adopted many emission control programs that are expected to reduce ambient ozone levels. As a result of these and other federal, state and local programs, 8-hour ozone levels are expected to improve in the future. However, even with the implementation of all current state and federal regulations, there are projected to be counties violating the ozone NAAQS well into the future. The emission reductions from this action, which will take effect as early as model year 2018, will be helpful to states as they work to attain and maintain the ozone NAAQS.[V] The standards can assist areas with attainment dates in 2018 and beyond in attaining the NAAQS as expeditiously as practicable and may relieve areas with already stringent local regulations from some of the burden associated with adopting additional local controls

6.2.1.3 Current Concentrations of Nitrogen Oxides

EPA most recently completed a review of the primary NAAQS for NO_2 in January 2010. There are two primary NAAQS for NO_2: an annual standard (53 ppb) and a 1-hour standard (100 ppb). EPA promulgated area designations in the Federal Register on February 17, 2012. In this initial round of designations, all areas of the country were designated as "unclassifiable/attainment" for the 2010 NO_2 NAAQS based on data from the existing air quality monitoring network. EPA and state agencies are working to establish an expanded network of NO_2 monitors, expected to be deployed in the 2013-2017 time frame. Once three years of air quality data have been collected from the expanded network, EPA will be able to evaluate NO_2 air quality in additional locations.[186,187]

6.2.1.4 Current Concentrations of Sulfur Oxides

EPA most recently completed a review of the primary SO_2 NAAQS in June 2010. The current primary NAAQS for SO_2 is a 1-hour standard of 75 ppb. EPA finalized the initial area designations for 29 nonattainment areas in 16 states in a notice published in the Federal Register on August 5, 2013. In this first round of designations, EPA only designated nonattainment areas that were violating the standard based on existing air quality monitoring data provided by the states. The agency did not have sufficient information to designate any area as "attainment" or make final decisions about areas for which additional modeling or monitoring is needed (78 FR 47191, August 5, 2013). On March 2, 2015, the U.S. District Court for the Northern District of California accepted, as an enforceable order, an agreement between the EPA and Sierra Club and Natural Resources Defense Council to resolve litigation concerning the deadline for completing designations.[W] The court's order directs the EPA to complete designations for all remaining areas in the country in up to three additional rounds: the first round by July 2, 2016, the second round by December 31, 2017, and the final round by December 31, 2020.

[V] The final Phase 2 trailer standards begin with model year 2018.
[W] *Sierra Club v. McCarthy*, No. 3-13-cv-3953 (SI) (N.D. Cal. Mar. 2, 2015).

6.2.1.5 Current Concentrations of Carbon Monoxide

There are two primary NAAQS for CO: an 8-hour standard (9 ppm) and a 1-hour standard (35 ppm). The primary NAAQS for CO were retained in August 2011. There are currently no CO nonattainment areas; as of September 27, 2010, all CO nonattainment areas have been redesignated to attainment. The designations were based on the existing community-wide monitoring network. EPA is making changes to the ambient air monitoring requirements for CO. The new requirements are expected to result in approximately 52 CO monitors operating near roads within 52 urban areas by January 2015 (76 FR 54294, August 31, 2011).

6.2.1.6 Current Concentrations of Diesel Exhaust PM (DPM)

Because DPM is part of overall ambient PM and cannot be easily distinguished from overall PM, we do not have direct measurements of DPM in the ambient air. DPM concentrations are estimated using ambient air quality modeling based on DPM emission inventories. DPM emission inventories are computed as the exhaust PM emissions from mobile sources combusting diesel or residual oil fuel. DPM concentrations were recently estimated as part of the 2011 NATA.[188]

Concentrations of DPM were calculated at the census tract level in the 2011 NATA. Figure 6-7 below summarizes the distribution of ambient DPM concentrations at the national scale. Areas with high concentrations are clustered in the Northeast, Great Lake States, California, and the Gulf Coast States, and are also distributed throughout the rest of the U.S. Table 6-1 presents a distribution of ambient DPM concentrations across the country. The median DPM concentration calculated nationwide is 0.76 μg/m^3. Half of the DPM can be attributed to heavy-duty diesel vehicles.

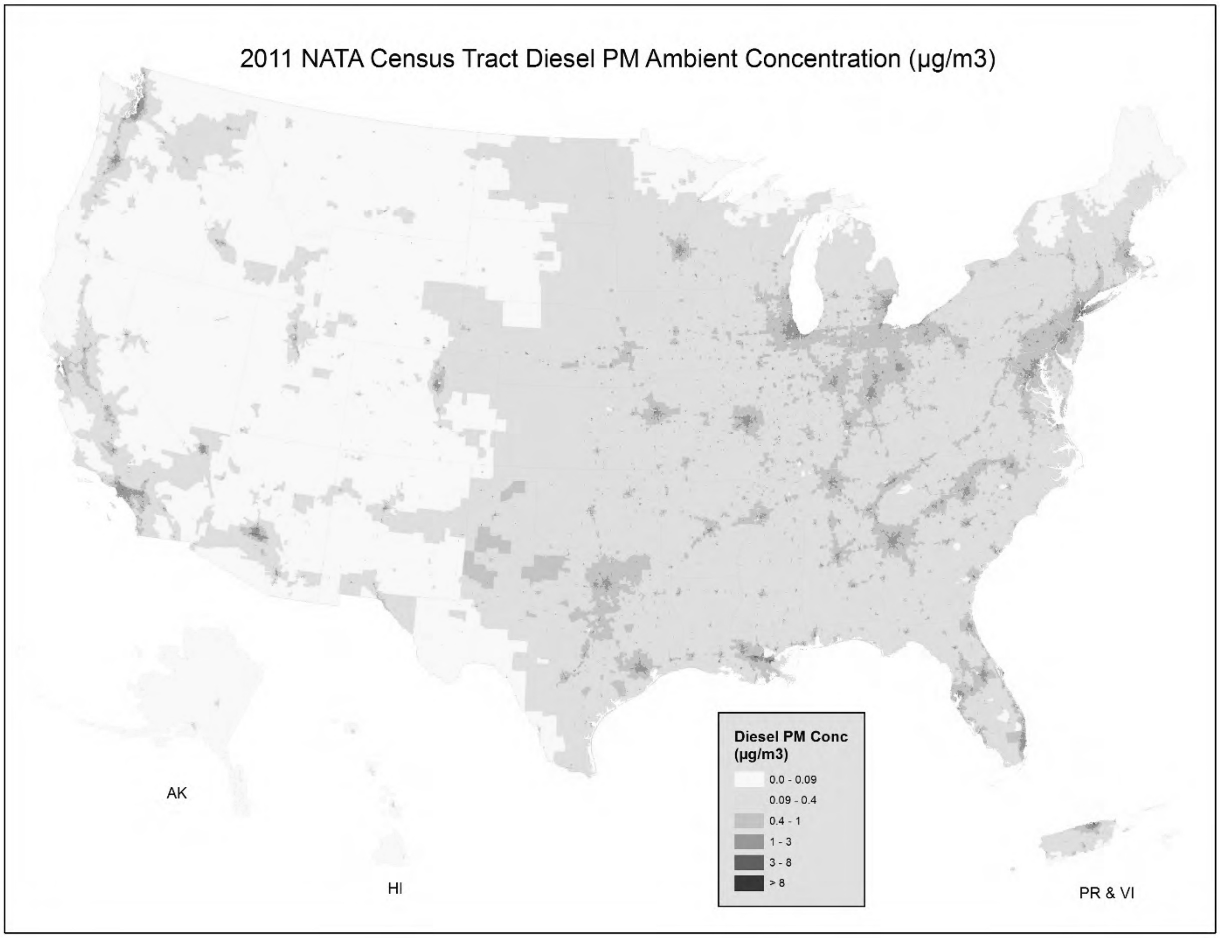

Figure 6-7 Estimated County Ambient Concentration of Diesel Particulate Matter

Table 6-1 Distribution of Census Tract Ambient Concentrations of DPM at the National Scale in 2011 NATA[a]

	AMBIENT CONCENTRATION (MG/M^3)
5th Percentile	0.15
25th Percentile	0.39
50th Percentile	0.76
75th Percentile	1.24
95th Percentile	2.37
Heavy-Duty Vehicle Contribution to Median Census Tract Concentrations	50%

Note:
[a] This table is generated from data contained in the diesel particulate matter Microsoft Access database file found in the results section of the 2011 NATA webpage (https://www3.epa.gov/national-air-toxics-assessment/2011-nata-assessment-results#pollutant).

6.2.1.7 Current Concentrations of Air Toxics

The majority of Americans continue to be exposed to ambient concentrations of air toxics at levels which have the potential to cause adverse health effects.[189] The levels of air toxics to which people are exposed vary depending on where people live and work and the kinds of activities in which they engage, as discussed in detail in EPA's most recent Mobile Source Air Toxics (MSAT) Rule.[190] In order to identify and prioritize air toxics, emission source types and locations which are of greatest potential concern, EPA conducts the National-Scale Air Toxics Assessment (NATA). The most recent NATA was conducted for calendar year 2011, and was released in December 2015.[191] NATA for 2011 includes four steps:

1) Compiling a national emissions inventory of air toxics emissions from outdoor sources

2) Estimating ambient concentrations of air toxics across the United States

3) Estimating population exposures across the United States

4) Characterizing potential public health risk due to inhalation of air toxics including both cancer and noncancer effects

According to the NATA for 2011, mobile sources were responsible for 50 percent of outdoor anthropogenic toxic emissions and were the largest contributor to cancer and noncancer risk from directly emitted pollutants.[X,192] Mobile sources are also large contributors to precursor emissions which react to form secondary concentrations of air toxics. Formaldehyde is the largest contributor to cancer risk of all 71 pollutants quantitatively assessed in the 2011 NATA. Mobile sources were responsible for more than 25 percent of primary anthropogenic emissions of this pollutant in 2011 and are major contributors to formaldehyde precursor emissions. Benzene is also a large contributor to cancer risk, and mobile sources account for almost 80 percent of ambient exposure. Over the years, EPA has implemented a number of mobile source and fuel controls which have resulted in VOC reductions, which also reduced formaldehyde, benzene and other air toxic emissions.

6.2.1.8 Current Visibility Levels

Designated $PM_{2.5}$ nonattainment areas indicate that, as of October 1, 2015, over 46 million people live in nonattainment areas for the $PM_{2.5}$ NAAQS. Thus, at least these populations would likely be experiencing visibility impairment, as well as many thousands of individuals who travel to these areas. In addition, while visibility trends have improved in Mandatory Class I Federal areas, these areas continue to suffer from visibility impairment.[193,194] Calculated from light extinction efficiencies from Trijonis et al. (1987, 1988), annual average visual range under natural conditions in the East is estimated to be 150 km ± 45 km (i.e., 65 to 120 miles) and 230 km ± 35 km (i.e., 120 to 165 miles) in the West.[195,196,197] In summary, visibility impairment is

[X] NATA also includes estimates of risk attributable to background concentrations, which includes contributions from long-range transport, persistent air toxics, and natural sources; as well as secondary concentrations, where toxics are formed via secondary formation. Mobile sources substantially contribute to long-range transport and secondarily formed air toxics.

experienced throughout the U.S., in multi-state regions, urban areas, and remote Mandatory Class I Federal areas.

6.2.1.9 Current Levels of Nitrogen and Sulfur Deposition

Over the past two decades, the EPA has undertaken numerous efforts to reduce nitrogen and sulfur deposition across the U.S. Analyses of long-term monitoring data for the U.S. show that deposition of both nitrogen and sulfur compounds has decreased over the last 25 years. The data show that reductions were more substantial for sulfur compounds than for nitrogen compounds. At 34 long-term monitoring sites in the eastern U.S., where data are most abundant, average total sulfur deposition decreased by 75 percent between 1989-1991 and 2011-2013, while average total nitrogen deposition decreased by 39 percent over the same time frames. [198] Although total nitrogen and sulfur deposition has decreased over time, many areas continue to be negatively impacted by deposition.

6.2.2 Projected Concentrations of Non-GHG Pollutants

Reductions in emissions of NO_X, VOC, $PM_{2.5}$ and air toxics expected as a result of the Phase 2 standards will lead to improvements in air quality, specifically decreases in ambient concentrations of $PM_{2.5}$, ozone, NO_2 and air toxics, as well as better visibility and reduced deposition.

Emissions and air quality modeling decisions are made early in the analytical process because of the time and resources associated with full-scale photochemical air quality modeling. As a result, the inventories used in the air quality modeling and the benefits modeling are different from the final emissions inventories. The air quality inventories and the final inventories are consistent in many ways, but there are some important differences which are discussed in Chapter 6.2.2.3. Chapter 5.5.2.3 of the RIA also has more detail on the differences between the air quality and final inventories.

6.2.2.1 Air Quality Modeling Results

This section summarizes the results of our air quality modeling, and more detail is available in Appendix 6.A to the RIA. Specifically, for the year 2040 we compare a reference scenario (a scenario without the standards) to a control scenario that includes the standards in the air quality inventory. The standards in the air quality inventory are based on the Phase 2 proposal. As mentioned above, the inventories used for the air quality modeling and the final inventories are consistent in many ways but there are some important differences. For example, the air quality modeling inventory predicted increases in downstream $PM_{2.5}$ emissions that we do not expect to occur. The air quality modeling inventory also predicts larger reductions in NOx emissions than the final inventory. The implications of these differences are noted in the following discussion of the air quality modeling results.

6.2.2.1.1 *Particulate Matter*

The air quality modeling indicates that for the majority of the country, annual and 24-hour $PM_{2.5}$ design values (DV) will decrease due to these standards. The magnitude of $PM_{2.5}$

reductions that will actually result from the final standards is difficult to predict because of the differences between the air quality modeling inventory and the final inventory. However, we do expect reductions in ambient concentrations of $PM_{2.5}$, because the final standards will decrease primary $PM_{2.5}$, NO_X, SO_X and VOC emissions.

As described in Section 5.5.2.3, the air quality modeling used inventories that do not reflect the new requirements for controlling $PM_{2.5}$ emissions from APUs installed in new tractors and therefore show increases in downstream $PM_{2.5}$ emissions that we now do not expect to occur. Although in most areas this direct $PM_{2.5}$ increase is outweighed by reductions in secondary $PM_{2.5}$, the air quality modeling does predict ambient $PM_{2.5}$ increases in a few places. We do not expect these increases in $PM_{2.5}$ DV to actually occur, because there will be no increases in downstream $PM_{2.5}$ emissions. The air quality inventories and the final rule inventories also have different assumptions about the usage of diesel-powered APUs. The air quality inventories assumed more widespread usage of diesel-powered APUs than was assumed for the final rule. As a result, the NO_X reductions in the air quality inventories are larger than we expect to occur, and the air quality modeling overestimates the reductions in ambient $PM_{2.5}$ due to secondary nitrate formation.

6.2.2.1.2 *Ozone*

EPA expects reductions in ambient ozone concentrations due to these final standards. Air quality modeling results indicate that 8-hour ozone DV will be reduced across the country. However, the magnitude of the reductions that will actually result from the final standards is difficult to estimate because the air quality modeling inventories included larger NOx emission reductions than we now expect to occur. As described in Chapter 5.5.2.3, the air quality inventories and the final rule inventories make different assumptions about the usage of diesel-powered APUs. The air quality inventories assumed more widespread usage of diesel-powered APUs than was assumed for the final rule, and as a result the NOx reductions and 8-hour ozone reductions are overestimated in the air quality modeling. While we expect the reductions in upstream and downstream NOx and VOC emissions to result in decreased 8-hour ozone DVs, the complex and non-linear chemistry governing ozone formation prevents us from estimating the magnitude without additional air quality modeling.

Maps and summary tables of the projected impacts of the air quality inventories on 8-hour ozone DV are included in Appendix 6.A.

6.2.2.1.3 *Nitrogen Dioxide*

EPA expects reductions in ambient nitrogen dioxide (NO_2) concentrations due to these final standards. Air quality modeling results indicate that annual average NO_2 concentrations will be reduced across the country. However, the magnitude of the reductions that will actually result from the final standards is difficult to estimate because the air quality modeling inventories included larger NOx emission reductions than we now expect to occur. As described in Chapter 5.5.2.3, the air quality inventories and the final rule inventories make different assumptions about the usage of diesel-powered APUs. The air quality inventories assumed more widespread usage of diesel-powered APUs than was assumed for the final rule, and as a result the reductions in ambient NO_2 concentrations are overestimated in the air quality modeling. Appendix 6A includes maps of absolute and percent change in NO_2 concentrations using air quality inventories.

6.2.2.1.4 *Air Toxics*

In this section, we describe results of our modeling of air toxics concentrations in 2040 with the Phase 2 standards included in the air quality inventory. Although there are a large number of compounds which are considered air toxics, we focused on those which were identified as national and regional-scale cancer and noncancer risk drivers in the 2011 NATA assessment and were also likely to be more significantly impacted by the standards. These compounds include benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein.

Our modeling indicates that the standards will have relatively little impact on national average ambient concentrations of the modeled air toxics. Annual absolute changes in ambient concentrations are generally less than 0.2 $\mu g/m^3$ for benzene, formaldehyde, and acetaldehyde and less than 0.005 $\mu g/m^3$ for acrolein and 1,3-butadiene. Naphthalene changes are in the range of 0.005 $\mu g/m^3$ along major roadways and in urban areas.

Appendix 6A includes air toxics concentration maps as well as population metrics, including the population living in areas with increases or decreases in concentrations of various magnitudes.

6.2.2.1.5 *Visibility*

Air quality modeling was used to project visibility conditions in 135 Mandatory Class I Federal areas across the U.S. The results show that in 2040 all the modeled areas would continue to have annual average deciview levels above background.[Y] As described in Chapter 5.5.2.3, the air quality modeling used inventories that do not reflect the new requirements for controlling $PM_{2.5}$ emissions from APUs installed in new tractors and therefore show increases in downstream $PM_{2.5}$ emissions that we now do not expect to occur. Although in most areas this direct $PM_{2.5}$ increase is outweighed by reductions in secondary $PM_{2.5}$, the air quality modeling does predict visibility to decrease in one area. We do not expect this decrease in visibility to actually occur, because there will be no increases in downstream $PM_{2.5}$ emissions. The air quality inventories and the final rule inventories also have different assumptions about the usage of diesel-powered APUs. The air quality inventories assumed more widespread usage of diesel-powered APUs than was assumed for the final rule. As a result, the NO_X reductions in the air quality inventories are larger than we expect to occur, and the air quality modeling overestimates the reductions in ambient $PM_{2.5}$ due to secondary nitrate formation. Appendix 6A contains the full visibility results from 2040 for the 135 analyzed areas.

[Y] The level of visibility impairment in an area is based on the light-extinction coefficient and a unit less visibility index, called a "deciview," which is used in the valuation of visibility. The deciview metric provides a scale for perceived visual changes over the entire range of conditions, from clear to hazy. Under many scenic conditions, the average person can generally perceive a change of one deciview. The higher the deciview value, the worse the visibility. Thus, an improvement in visibility is a decrease in deciview value.

6.2.2.1.6 *Deposition of Nitrogen and Sulfur*

Air quality modeling results indicate that nitrogen and sulfur deposition will be reduced in many areas of the country. The decreases in nitrogen and sulfur deposition are likely due to the projected reductions in emissions. As described in Chapter 6.2.2.3.1, the NO_X reductions assumed in the air quality inventories are larger than we expect to occur and reductions in nitrogen deposition are over-estimated in the air quality modeling. While the magnitude of the reductions in nitrogen deposition from the final rule is difficult to estimate, EPA does expect reductions in nitrogen deposition due to these final standards.

Maps of the projected impacts of the air quality inventories on nitrogen and sulfur deposition are included in Appendix 6.A.

6.3 Changes in Atmospheric CO_2 Concentrations, Global Mean Temperature, Sea Level Rise, and Ocean pH Associated with the Program's GHG Emissions Reductions

6.3.1 Introduction

The impact of GHG emissions on the climate has been reviewed in the 2009 Endangerment and Cause or Contribute Findings for Greenhouse Gases under section 202(a) of the Clean Air Act, the 2012-2016 light-duty vehicle rulemaking, the 2014-2018 heavy-duty vehicle GHG rulemaking, and the 2017-2025 light-duty vehicle rulemaking. See 74 FR at 66496; 75 FR at 25491; 76 FR at 57294; 77 FR at 62894. This section briefly discusses again some of the climate impact context for transportation emissions.

Once emitted, GHGs that are the subject of this regulation can remain in the atmosphere for decades to millennia, meaning that 1) their concentrations become well-mixed throughout the global atmosphere regardless of emission origin, and 2) their effects on climate are long lasting. GHG emissions come mainly from the combustion of fossil fuels (coal, oil, and gas), with additional contributions from the clearing of forests, agricultural activities, cement production, and some industrial activities. Transportation activities, in aggregate, were the second largest contributor to total U.S. GHG emissions in 2010 (27 percent of total emissions).[Z]

EPA Administrator relied on thorough and peer-reviewed assessments of climate change science prepared by the Intergovernmental Panel on Climate Change ("IPCC"), the United States Global Change Research Program ("USGCRP"), and the National Research Council of the National Academies ("NRC") [AA] as the primary scientific and technical basis for the Endangerment and Cause or Contribute Findings for Greenhouse Gases under section 202(a) of the Clean Air Act (74 FR 66496, December 15, 2009). These assessments comprehensively address the scientific issues EPA Administrator had to examine, providing her both data and information on a wide range of issues pertinent to the Endangerment Finding. These

[Z] U.S. EPA (2012) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2010. EPA 430-R-12-001. Available at http://epa.gov/climatechange/emissions/downloads12/US-GHG-Inventory-2012-Main-Text.pdf

[AA] For a complete list of core references from IPCC, USGCRP/CCSP, NRC and others relied upon for development of the TSD for EPA's Endangerment and Cause or Contribute Findings see Section 1(b), specifically, Table 1.1 of the TSD. (Docket EPA-HQ-OAR-2010-0799).

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[5] 78 FR 3086 (January 15, 2013) pages 3103-3104.
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Chapter 12: Final Regulatory Flexibility Analysis

This chapter discusses the agencies' Final Regulatory Flexibility Analysis (FRFA) that evaluates the potential impacts of the final standards on small entities. The Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Pursuant to this requirement, we have prepared an FRFA for the final rule.

Throughout the process of developing the FRFA, EPA conducted outreach and held meetings with representatives from the various small entities that could be affected by the rulemaking to gain feedback, including recommendations, on how to reduce the impact of the rule on these entities. The small business recommendations stated here reflect the comments of the small entity representatives (SERs) and members of the Small Business Advocacy Review Panel (SBAR Panel, or 'the Panel'). NHTSA maintains obligations to evaluate small business impacts under the Regulatory Flexibility Act, but is not required to convene a SBAR Panel. As a joint rulemaking, EPA and NHTSA have coordinated formulation of standards, including flexibilities for small businesses.

12.1 Overview of the Regulatory Flexibility Act

In accordance with section 609(b) of the Regulatory Flexibility Act (RFA), EPA convened an SBAR Panel before conducting the FRFA. A summary of the Panel's recommendations is presented in the Preamble of this final rulemaking. Further detailed discussion of the Panel's outreach, advice and recommendations is found in the Final Panel Report contained in the docket for this final rulemaking.[1]

Section 609(b) of the RFA directs the Panel to report on the comments of small entity representatives and make findings on issues related to elements of a FRFA under section 603 of the RFA. Those elements of a FRFA are:

- A description of, and where feasible, an estimate of the number of small entities to which the final rule will apply
- A description of projected reporting, record keeping, and other compliance requirements of the final rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record
- An identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the final rule
- A description of any significant alternatives to the final rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the final rule on small entities

The RFA was amended by SBREFA to ensure that concerns regarding small entities are adequately considered during the development of new regulations that affect those entities. Although EPA is not required by the Clean Air Act to provide special treatment to small businesses, the RFA requires EPA to carefully consider the economic impact that our rules will have on small entities. The recommendations made by the Panel may serve to help lessen these economic impacts on small entities when consistent with the Clean Air Act requirements.

12.2 Need for Rulemaking and Rulemaking Objectives

Heavy-duty vehicles are classified as those with gross vehicle weight ratings (GVWR) of greater than 8,500 lb. Section 202(a) of the Clean Air Act (CAA) requires EPA to promulgate emission standards for pollutant emissions from new motor vehicles and engines which emissions cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. In 2009, EPA found that six greenhouse gases (GHGs) were anticipated to endanger public health or welfare, and that new motor vehicles and new motor vehicle engines contribute to that pollution which endangers. As explained in Section I of the Preamble to the final rule, the D.C. Circuit upheld this endangerment finding in its entirety (a judgment the Supreme Court declined to review), and further held that EPA had a mandatory duty to promulgate standards for emissions of the pollutant which contributes to the endangerment: GHGs from new motor vehicles and engines.

The Energy Independence and Security Act of 2007 (EISA) directs NHTSA to develop regulations to increase fuel efficiency for commercial medium- and heavy-duty on-highway vehicles and work trucks. Fundamentally, EISA seeks energy conservation. In 2010, total fuel consumption and GHG emissions from medium- and heavy-duty vehicles accounted for 23 percent of total U.S. transportation-related GHG emissions.

EPA and NHTSA's Phase 1 Heavy-Duty Engines and Vehicles Program, which was finalized in September 2011 (76 FR 57106), marked the first greenhouse gas emissions and fuel efficiency standards for heavy-duty vehicles and engines. The program addressed medium- and heavy-duty GHG emissions and fuel efficiency through the adoption of performance-based standards that allow manufacturers to determine the optimal mix of technologies to achieve the necessary reductions for their vehicle fleets and engines.

Building on the Phase 1 rule, this final Phase 2 rule will reduce GHG emissions and fuel consumption associated with the transportation of goods across the United States post-2017. The final Phase 2 rulemaking considers changes to existing engine, GHG, and fuel efficiency standards, as well as regulatory standards and certification requirements for previously-unregulated new trailers pulled by semi-tractors. Manufacturers of heavy-duty engines, chassis, vehicles and trailers will be required to incorporate GHG-reducing and fuel-saving technologies in order to comply with the agencies' performance-based standards.

12.3 Definition and Description of Small Businesses

The RFA defines small entities as including "small businesses," "small governments," and "small organizations" (5 U.S.C. 601) and references the Small Business Administration for the definition of "small businesses" using size standards based on the North American Industry

Classification System (NAICS) (13 CFR 121.201). The standards being considered by EPA for this rulemaking are expected to affect a variety of small businesses. A listing of the NAICS codes identified as relevant to the potential rulemaking, along with their respective SBA size thresholds, is located in Table 12-1, below. In the period between the convening of the SBAR Panel (and Initial Regulatory Flexibility Analysis) and issuing the final rule, SBA finalized new size standards for small business classification.[2] We have updated our analysis to reflect the new size standards and noted the changes in Table 12-1.

The agencies expect that the same industries affected by the Phase 1 rulemaking will also be affected by the final Phase 2 rulemaking. In addition, small businesses and trailer manufacturers are also included in the final Phase 2 rule. EPA and NHTSA used the criteria for small entities developed by SBA as a guide to identifying Small Entity Representatives (SERs) for this rulemaking. Table 12-1 lists industries potentially directly affected by the regulation. The NAICS code and size thresholds are shown as well.

Table 12-1 Industry Sectors Potentially Affected by the Agencies' Action

INDUSTRY EXPECTED IN RULEMAKING	NAICS CODE	NAICS DESCRIPTION	SBA SIZE THRESHOLD (LESS THAN OR EQUAL TO)	
			IRFA	FRFA
Alternative Fuel Engine Converters	333999	Misc. General Purpose Machinery	500 employees	
	811198	All Other Auto Repair & Maintenance	$7.0M (annual receipts)	$7.5M (annual receipts)
HD Pick-up Trucks & Vans	336111	Automobile Manufacturing	1,000 employees	1,500 employees
Vocational Chassis, Class 7 & 8 Tractors	336120	Heavy-Duty Truck Manufacturing	1,000 employees	1,500 employees
Trailers	336212	Truck Trailer Manufacturing	500 employees	1,000 employees
HD Spark-Ignition Engines	336310	Motor Vehicle Gasoline Engine & Engine Parts	750 employees	1,000 employees
HD Compression-Ignition Engines	333618	Other Engine Equipment Manufacturing	1,000 employees	1,500 employees

12.4 Summary of Small Entities to which the Rulemaking will Apply

Using the information from Table 12-1, with the agencies' certification data and employment information from the Hoover's online business information database, EPA and NHTSA have determined that there are small business in the following affected industries: heavy-duty truck manufacturers (vocational chassis and glider vehicle manufacturers), heavy-duty engine manufacturers, alternative fuel engine converters, and trailer manufacturers. The agencies believe there are about 178 trailer manufacturers of which 147 qualify as small entities with 1,000 employees or less. EPA and NHTSA identified ten heavy-duty engine manufacturers that are currently certifying natural gas engines. The agencies believe nine of these companies are small businesses. About 60 companies have filed paperwork with EPA as alternative fuel converters. Many of these service only light-duty vehicles and light-duty trucks; we estimate that there are 20-30 companies performing aftermarket fuel conversions with heavy-duty vehicles and heavy-duty engines, all of which are likely to qualify as small businesses under the Phase 2 program. Currently, 20 manufacturers that make chassis for vocational vehicles certify with EPA under the Phase 1 program and the agencies have identified an additional 19 small vocational chassis manufacturers that are not currently certifying under Phase 1.

Glider vehicles are a subset of vehicles that will be regulated under the Phase 2 rulemaking (including for regulation of criteria emissions). Glider vehicle manufacturers traditionally manufacture or purchase new vehicle bodies (vocational vehicles or Class 7 and 8 tractors) for use with older powertrains. These engineless vehicle bodies are often referred to as "glider kits" and to the extent glider vehicle manufacturers rely on glider kits, they can be referred to as assemblers and well as manufacturers. The agencies were aware of four glider vehicle manufacturers (for whom glider vehicle production was a primary business) during the SBAR Panel process and we identified three of these manufacturers as small entities. We are not aware of any small businesses that produce glider *kits* for others to assemble.[1] Public comments on the proposed rule indicated that there are more than 1,200 purchasers of glider kits, and we presume they would all meet the Act's definition of "manufacturer," which includes anyone who assembles motor vehicles. See Preamble Section I.E.(1)(c). This large number of businesses that were not accounted for during the SBAR Panel is largely a result of our focus on glider manufacturers for whom glider vehicle production is a primary business. We note that almost every repair shop that is capable of overhauling truck engines is also capable of assembling a glider vehicle. Perhaps most have, at some point, installed a used highway engine in a glider kit. Producing glider vehicles is quite clearly not a major business focus for most of these additional companies. Nevertheless, we believe that a clear majority of the companies assembling glider vehicles, including those that do so as a side business, qualify as small businesses.

12.5 Related Federal Rules

The Phase 1 rulemaking continues to be in effect in the absence of this final rule. The Panel noted that it was aware that the final Phase 2 rule would be a joint action by EPA and the Department of Transportation (DOT), through NHTSA, as in the Phase 1 rulemaking. We are also aware of other state and Federal rules related to heavy-duty vehicles and to the final Phase 2 rule under consideration. NHTSA has safety requirements for medium- and heavy-duty vehicles located at 49 CFR part 571. California adopted its own greenhouse gas initiative, which places aerodynamic requirements on trailers used in long-haul applications. None of these existing regulations were found to conflict with the final rulemaking.

12.6 Projected Reporting, Recordkeeping, and Other Compliance Requirements

For any emission control program, EPA must have assurances that the regulated products will meet the standards. Certification and in use requirements are explicit statutory requirements. See e.g. CAA section 203 (a). The program that EPA and NHTSA are adopting for manufacturers subject to this rule includes testing, reporting, and recordkeeping requirements. Testing requirements for these manufacturers includes use of EPA's Greenhouse gas Emissions Model (GEM) vehicle simulation tool to obtain the overall CO_2 emissions rate for

[1] Although this discussion is written based on the assumption that no small businesses produce glider kits for others to assemble, the conclusions would also be valid with respect to small entities that produce glider kits for sale, should they exist.

certification of vocational chassis and trailers, aerodynamic testing to obtain aerodynamic inputs to GEM for some trailer manufacturers, and engine dynamometer testing for alternative fuel engine converters to ensure their conversions meet the CO_2, CH_4 and N_2O engine standards. Reporting requirements include emissions test data or model inputs and results, technical data related to the vehicles, and end-of-year sales information. Manufacturers will have to keep records of this information.

12.7 Regulatory Flexibilities

The Panel developed a range of regulatory flexibilities intended to mitigate the impacts of the final rulemaking on small businesses, and recommended that EPA propose and seek comment on the flexibilities. The Panel's findings and discussions are based on the information that was available during the term of the Panel and issues that were raised by the SERs during the outreach meetings and in their written comments. It was agreed that EPA should consider the issues raised by the SERs (and issues raised in the course of the Panel) and that EPA should consider the comments on flexibility alternatives that would help to mitigate any negative impacts on small businesses.

Alternatives discussed throughout the Panel process include those offered in the development of the upcoming rule. Though some of the recommended flexibilities may be appropriate to apply to all entities affected by the rulemaking, the Panel's discussions and recommendations are focused mainly on the impacts, and ways to mitigate adverse impacts, on small businesses. A summary of the Panel's recommendations, along with those provisions that we are finalizing in this action, are detailed below. A full discussion of the regulatory alternatives and hardship provisions discussed and recommended by the Panel, all written comments received from SERs, and summaries of the two outreach meetings that were held with the SERs can be found in the SBREFA Final Panel Report, located in the rulemaking docket.[3] In addition, all the flexibilities that are being adopted in the rulemaking for small businesses, as well as those for all entities that may be affected by the rulemaking, are described in the Preamble to the final rule.

12.7.1 Heavy-Duty Highway Engine Manufacturers and Engine Converter Flexibilities

12.7.1.1 SBAR Panel Recommendations

Based on the comments received from SERs, the Panel recommended not having separate standards for small business natural gas engine manufacturers. The Panel believed this would discourage entrance into this emerging market by adding unnecessary costs to a technology that has the potential to reduce CO_2 tailpipe emissions. In addition, the Panel stated that it believes additional leakage requirements beyond a sealed crankcase for small business natural gas-fueled CI engines and requirements to follow industry standards for leakage could be waived for small businesses with minimal impact on overall GHG emissions.

To reduce the compliance burden of small business engine converters who convert engines in previously-certified complete vehicles, the Panel recommended allowing engine compliance to be sufficient for certification. This would mean the converted vehicle would not produce a total of less than 6,000 terminal tractors per year, 70 percent of which are fully off-road vehicles.

In considering these comments, the agencies are adopting a custom chassis program for which all manufacturers are eligible. The program includes less stringent standards and a simplified GEM process, where the technology packages have been tailored to specific vehicle applications, and each technology has been determined to be feasible and effective for those vehicles. See Section V of the Preamble for more details.

12.7.3 Glider Vehicle Manufacturer Flexibilities

12.7.3.1 SBAR Panel Recommendations

The Panel stated that it believes that the number of vehicles produced by small business glider vehicle manufacturers is too small to have a substantial impact on the total heavy-duty GHG inventory.[2] The Panel also stated that there should be an allowance to produce some number of glider kits for legitimate purposes, such as for newer vehicles badly damaged in crashes. The Panel therefore recommended proposing an explicit allowance for existing small businesses to continue assembling glider vehicles without having to comply with the GHG requirements. The Panel also recommended that any regulations for glider production be flexible enough to allow sales levels as high as the peak levels in the 2010-2012 timeframe.

12.7.3.2 What We Proposed

The exemption that the agencies proposed for glider vehicle manufacturers was expected to encompass small glider manufacturers. Small manufacturers who assemble 300 or fewer gliders per year would be exempt from certification, up to each company's documented production volumes from 2010-2014. Any additional gliders produced would have to meet the vehicle and engine standards for their respective regulatory categories in the current model year. For instance, tractor gliders would have to meet the tractor standards and vocational chassis would meet the vocational standards, and for both, the engines would need to meet all applicable GHG and criteria emission standard for the year the glider vehicle is completed.

We believed the flexibilities offered to custom chassis vocational vehicles would also reduce the requirements of any small businesses that manufacturer vocational gliders, such as cement mixers and emergency vehicles.

12.7.3.3 Public Comments Received on the NPRM and What We're Finalizing

Engine and vehicle manufacturers took opposing positions. Some supported the proposed approach. Others stated that the proposed provisions exceeded EPA's authority to set emission standards for new engines and new vehicles, in addition to objecting to the detailed provisions as a matter of policy. See Preamble Section I.E. and Response to Comments (RTC) Section 14.2. However, the most helpful comments were those that allowed EPA to target

[2] The Panel did not have accurate data on annual glider vehicle production at the time of the report, but it believed the production to be less than 5,000 per year, which is half of the current rate or less. The Panel also addressed only GHG impacts, not impacts of vast increases in criteria pollutant emissions.

flexibility for glider vehicles that serve an arguably legitimate purposes (such as reclaiming relatively new powertrains from vehicles chassis that fail prematurely), without causing substantial adverse environmental impacts.

We are finalizing the proposed glider-related provisions but have made several revisions in recognition of the differences between gliders produced to circumvent the 2010 criteria pollutant emission standards and those manufactured for other more legitimate purposes. The provisions being finalized are intended to allow a transition to a long-term program in which manufacture of glider vehicles from glider kits is permissible consistent with the original reason OEM manufacturers began to offer glider kits – to allow the reuse of relatively new powertrains from damaged vehicles. The long-term program as well as the transitional program are summarized below. See Section XIII.B of the FRM for a complete description of these provisions.

Under the provisions being finalized for the long-term program, all glider vehicles will need to be covered by both vehicle and engine certificates. The vehicle certificate will require compliance with the GHG vehicle standards of 40 CFR part 1037. The engine certificate will require compliance with the GHG engine standards of 40 CFR part 1036, plus the criteria pollutant standards of 40 CFR part 86. Used engines (including rebuilt/remanufactured engines) may be installed in the gliders without meeting engine standards applicable for the year of glider assembly, provided the engines are within their regulatory useful life (or meet similar criteria).

EPA is also finalizing a transitional program that will allow glider kit/vehicle manufacturers additional flexibility. The first step allows significant production of glider vehicles under the Phase 1 approach, but limits each manufacturer's combined production of glider kits and glider vehicles at the manufacturer's highest annual production of glider kits and glider vehicles for any year from 2010 to 2014. All vehicles within this cap will remain subject to the existing Phase 1 requirements (for both engines and vehicles). Any glider kits or glider vehicles produced beyond this cap will be subject to all requirements applicable to new engines and new vehicles for MY 2017. Other than the 2017 production limit, EPA will continue the Phase 1 approach until January 1, 2018. This allows small businesses to produce glider kits up to the production limit without new constraints. Large manufacturers producing complete glider vehicles remain subject to the 40 CFR part 1037 GHG vehicle standards, as they have been since the start of Phase 1. However large manufacturers may provide exempted glider kits to small businesses during this time frame, and they would not be required to obtain a vehicle certificate for them. However, these exempted glider kits would count against the glider *kit* manufacturers' production cap for 2017.

Effective January 1, 2018, the long-term program begins generally, but with certain transitional flexibilities. In other words, except for the following allowances, glider vehicles will need to comply with the long-term program. The exceptions are:

- Small businesses may produce a limited number of glider vehicles without meeting either the engine or vehicle standards of the long-term program. Larger vehicle manufacturers may provide glider kits to these small businesses without the assembled vehicles meeting the applicable vehicle standards. This number is limited to the small vehicle manufacturer's highest annual production volume in 2010 through 2014 or 300, whichever is less.

- Model year 2010 and later engines are not required to meet the Phase 1 GHG engine standards.
- Glider vehicles conforming to the previously certified vehicle configuration of the donor vehicle do not need to be recertified to current vehicle standards.

These 2018 allowances mostly continue after 2020, but effective January 1, 2021, the completed vehicle will need to meet the vehicle standards, even if the engine is exempt under the small manufacturer provisions. In practice, this will likely mean that the large manufacturers providing glider kits to small manufacturers will need to meet the vehicle standards for the completed vehicle by obtaining a certificate and delegating final assembly to the assembler.

This transitional program combined with the additional flexibility in the long-term program will achieve the stated goal of the Panel, which was to have any regulations for glider production be flexible enough to allow sales levels as high as the peak levels in the 2010-2012 timeframe.

12.7.4 Trailer Manufacturer Flexibilities

12.7.4.1 SBAR Panel Recommendations

12.7.4.1.1 Box Trailers

Box trailer manufacturers have the benefit of relying on the aerodynamic technology development initiated through EPA's voluntary SmartWay program. The Panel acknowledged EPA's plan to adopt a simplified compliance program for all manufacturers, in which aerodynamic device manufacturers have the opportunity to test their devices and register their data with EPA as technologies that can be used by trailer manufacturers in their trailer certification. This pre-approved data strategy is intended to provide all trailer manufactures a means of complying with the standards without testing. Upon the completion of the SBREFA Panel process, it was unclear if this strategy would be available indefinitely, or if it would be an interim flexibility to allow manufacturers to ease into a testing-only compliance program. The Panel recommended that, in the event that this strategy is limited to the early years of the trailer program for all manufacturers, small manufacturers should continue to be given the option to use pre-approved devices in lieu of testing.

The Panel stated its belief that, in the event that small trailer manufacturers adopt pre-approved aerodynamic technologies and the appropriate tire technologies for compliance, it would not be necessary to require the use of a vehicle emissions model, such as GEM, for certification. Instead, the Panel stated that it could be possible for manufacturers to simply report to EPA that all of their trailers include approved technologies.

collect and submit. Additionally, we are allowing electric vehicle manufacturers to certify without the use of GEM.

We did not assume the same costs for every year of the program. Instead, the first year is expected to require more capital costs and time from employees. Subsequent years include very few capital costs and less time. We are basing our analysis on an 8-year average cost, which includes the hourly cost of engineers, managers, attorneys, administrative and information technology support. We project that the average cost of compliance to be $47,000 for custom chassis manufacturers and $13,000 for electric vehicle manufacturers.

We compared these costs to the revenue information we collected from Hoovers for the 19 small business vocational chassis manufacturers. With all of the flexibilities adopted in this rulemaking, only two small vocational chassis manufacturers (11 percent) are projected to have an economic impact greater than one percent and no companies are projected to have an impact greater than three percent. Table 12-2 summarizes the small business vocational chassis results.

Table 12-2 Summary of Impacts on Small Business Vocational Chassis Manufacturers

	Number/Fraction of Entities with Economic Impact of…		
	< 1 %	1% to 3%	≥ 3%
Number of Small Businesses	17	2	0
Fraction of Small Businesses	89%	11%	0%

12.8.4 Glider Vehicle Manufacturer Economic Effects

As described in Chapter 12.4, there are large numbers of small businesses that produce vehicles from glider kits. The large majority of these are truck-repair facilities that occasionally find themselves in a situation where a customer wants to install an existing engine or powertrain into a glider kit. Under the final program, such companies that qualify as small businesses and that sold glider vehicles in 2014 may continue to produce vehicles from glider kits up to their historical levels over the 2010-2014 time frame, or up to 300 units, whichever is less. Almost all these companies will therefore not be constrained by the new provisions requiring additional glider vehicles beyond the applicable threshold to meet emission standards based on the date of the vehicle (i.e. the glider kit) into which an engine is installed . These companies will have no change in their business practice other than the requirement to notify EPA initially, submit an annual report with their production volumes, and add a label to their vehicles. These costs are much less than 1 percent of revenue even if production is limited to a single new vehicle.

The remaining assessment is for companies that produced more than 300 annual units. These companies would be subject to emission standards and would need to install newer engines in the glider vehicles they produce beyond the 300 cap. We would expect many customers in these circumstances to purchase a freshly manufactured vehicle instead of opting for a glider vehicle with compliant engines, so it is possible that they may see a drop in sales. However, any loss in sales would only be relative to recent years, and is not likely to drop below pre-2007 levels. Thus, it is not straightforward to determine how to quantify a cost burden for companies in this situation; however, it is apparent that any such companies should be characterized as having a cost burden that exceeds 3 percent of annual revenue. We are aware of one small business that produces more than 300 vehicles from glider kits. Nevertheless, this company has previously acknowledged that they could "make a profit at 300 a year."[4]

There are clearly fewer than 100 companies with sufficient production volumes such that their cost burden from the rule exceeds 1 or 3 percent of annual revenue.

12.8.5 Trailer Manufacturer Economic Effects

For trailers, EPA identified 147 companies that met SBA's small business threshold of 1,000 employees or fewer. As mentioned previously, we are limiting the non-box trailer program to tanks, flatbeds and container chassis, and exempting all other types of non-box trailers. As a result, 73 small business trailer manufacturers have zero burden from this rulemaking. The economic burden for the remaining 74 small business trailer manufacturers depends on which type of trailers they manufacture. Three companies exclusively manufacture box trailers, 69 only manufacture non-box trailers and two manufacturer both non-box and box trailers.

Prior to the start of the regulations, we projected that trailer manufacturers would incur some start-up costs to prepare for compliance. We assumed trailer manufacturers would purchase new computer systems to track sales and store compliance records, and new equipment for emissions labeling. We also assumed box trailer manufacturers would build an additional warehouse to store aerodynamic devices. We based this analysis on the assumption that all small box trailer manufacturers would take advantage of the pre-approved aerodynamic data option and would not perform any testing. We do assume a small engineering cost for engineers and managers to review the test procedures and become familiar with the requirements so they can appropriately evaluate available technologies. We also assume continuous costs associated with review of the regulations and guidance documents, evaluating aerodynamic and tire technologies, creating user manuals, calculating compliance values, generating applications and reports for compliance, and maintaining records.

We did not assume the same costs for every year of the program. Instead, the first year is expected to require more capital costs and time from employees. Subsequent years include very few capital costs and less time. We are basing our analysis on an 11-year average cost (the trailer program begins three years earlier than the other heavy-duty sectors in the Phase 2 rules), which includes the hourly cost of engineers, managers, attorneys, administrative and IT support. We project that the average cost of compliance to be $76,000 for trailer manufacturers that are certifying box and non-box trailers, $67,000 for manufacturers of box trailers only, and $23,000 for non-box trailer manufacturers. We compared these costs to the revenue information we collected from Hoovers for the 147 small business trailer manufacturers. With all of the flexibilities adopted in this rulemaking, only 18 small trailer manufacturers (12 percent) are projected to have an economic impact greater than one percent. Table 12-3 summarizes the small business trailer results.[5]

Table 12-3 Summary of Impacts on Small Business Trailer Manufacturers

	Number/Fraction of Entities with Economic Impact of…		
	< 1 %	1% to 3%	≥ 3%
Number of Small Businesses	129	15	3
Fraction of Small Businesses	88%	10%	2%

12.9 Summary of Economic Effects

The agencies identified five general heavy-duty industries that would be potentially affected by this rulemaking: alternative fuel engine converters, heavy-duty engine manufacturers, vocational vehicle chassis manufacturers, glider manufacturers, and trailer manufacturers. The agencies proposed and sought comment on the recommendations from the Panel. The flexibilities proposed for the engine manufacturers, engine converters, vocational vehicle manufacturers, and glider manufacturers are adopted in the final rule (with increased flexibility in some cases) and fewer than 20 percent of the small entities in those sectors are estimated to incur a burden greater than one percent of their annual revenue. In addition to the flexibilities proposed for the trailer program, the agencies also reduced the number of small entities regulated by the final rules by limiting the non-box trailer program to three distinct trailer types. As a result, more than half of the small business trailer manufacturers have zero burden from this rulemaking. Of the remaining small business trailer manufacturers, only 12 percent are estimated to have an economic impact greater than one percent of their annual revenue. As a result of these findings, EPA believes it can certify that these rules will not have a significant economic impact on a substantial number of small entities under the RFA.

References

[1] Final Report of the Small Business Advocacy Review Panel on EPA's Planned Proposed Rule: Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles: Phase 2. Signed on January 15, 2015. Available in docket at: EPA–HQ–OAR–2014–0827.
[2] Small Business Size Standards for Manufacturing. Small Business Administration. Docket ID: SBA-2014-0011. Available online at: https://www.regulations.gov/docket?D=SBA-2014-0011.
[3] Final Report of the Small Business Advocacy Review Panel on EPA's Planned Proposed Rule: Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles: Phase 2. Signed on January 15, 2015. Available in docket at: EPA–HQ–OAR–2014–0827.
[4] http://www.truckinginfo.com/article/story/2013/04/the-return-of-the-glider.aspx., accessed July 16, 2016.
[5] Memorandum to Docket EPA-HQ-OAR-2014-0827: "Small Business Economic Burden Calculations for Trailer SISNOSE Analysis." July 2016.