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Re: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks

Dear Mr. Lieske and Mr. Tamm:

Thank you for the opportunity to comment on the U.S. Environmental Protection Agency's ("EPA") and National Highway Traffic Safety Administration's ("NHTSA") (collectively, "the Agencies") August 24, 2018 notice of proposed rulemaking for the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks ("Proposed Rule").[1] I write on behalf of the Alliance of Automobile Manufacturers ("Alliance"), a trade association of automobile manufacturers representing approximately seventy percent of all new car and light truck sales in the United States.[2]

In accordance with 49 C.F.R. § 553.21, the Alliance is submitting this 15-page letter as an overview of our comments on the Proposed Rule; analysis and additional materials are being submitted in a series of appendices and attachments. The Alliance requests that the Agencies provide stakeholders with an opportunity to supplement any comments after October 26, 2018 in order to provide any newly available information or materials, and to respond to significant new data or analysis from other stakeholders.

In 2012, NHTSA and EPA, in collaboration with the California Air Resources Board ("CARB"), extended One National Program ("ONP") to regulate light-duty vehicle greenhouse gas ("GHG") emissions and light-duty vehicle Corporate Average Fuel Economy ("CAFE") through model year ("MY") 2025.[3] At that time, it was apparent that in setting standards with such a long lead time,

[1] 83 Fed. Reg. 42,986 (August 24, 2018).
[2] For more information, please visit https://autoalliance.org/.
[3] 77 Fed. Reg. 62,624 (October 15, 2012).

circumstances could change in the future and that standards in the later years of the program might need to be adjusted—upward or downward. As such, a critical component of the ONP extension was the obligation to implement a Mid-Term Evaluation ("MTE") in order to evaluate whether the 2012 assumptions remained valid.[4] Similarly, NHTSA was limited to setting final CAFE standards only for MYs 2017–2021, and accordingly provided augural standards for later years.[5] There is no question that circumstances have changed since 2012, and that many of the assumptions made at that time no longer remain valid. EPA and NHTSA declared that these changes warranted the development of new standards. The Alliance appreciates the Agencies' work to satisfy their regulatory obligations and their willingness to revisit previous assumptions with new, more relevant data.

Last year, Americans purchased over 17 million new light-duty vehicles in the United States. As providers of vehicles to the American driving public, the Alliance knows that customers want it all—autos that are safe, reliable, energy-efficient, clean, smart, and affordable. It is our job to try to meet their needs. Automakers have invested substantially in technologies; consumers in 2018 can choose from approximately 500 models that achieve 30 miles per gallon ("MPG") or more (highway), including 45 hybrid-electric and over 50 plug-in electric and hydrogen fuel cell models, according to www.fueleconomy.gov.

With respect to fuel economy and GHG emissions, automakers are committed to ongoing progress. That commitment has not wavered. At the same time, future government mileage and emission standards need to align with marketplace realities. The CAFE and GHG programs evaluate automakers based on a sales-weighted average of vehicles sold, not on models offered.

Today, there is a large and widening gap between the marketplace decisions made by our millions of customers and the current CAFE and GHG standards. The Alliance urges the federal government to set achievable future standards that continue to advance environmental and energy goals while recognizing marketplace realities, incentivizing innovative new technologies, harmonizing government programs, maintaining a strong auto manufacturing sector, and keeping new vehicles affordable so more Americans can replace older vehicles with newer models that are cleaner, safer, and more energy-efficient.

The Alliance has consistently and actively supported a single national program covering all fifty states that spurs continued improvements in fuel economy and GHG emissions while recognizing marketplace realities such as consumer choice, fuel prices, and technology costs.

I. Appropriate Fuel Economy and Greenhouse Gas Standards Are Needed

The Alliance appreciates NHTSA and EPA issuing a joint Proposed Rule that incorporates the latest data and considers standards for MYs 2021 to 2026. The chief executive officers and leaders of 18 auto companies sent an industry letter to President Trump in February 2017 requesting that

[4] *See* 40 C.F.R. § 86.1818-12(h).
[5] 77 Fed. Reg. 62,623, 62,627 (Oct. 15, 2012) ("The second phase of the CAFE program, from MYs 2022–2025, includes standards that are not final due to the statutory provision that NHTSA shall issue regulations prescribing average fuel economy standards for at least 1 but not more than 5 model years at a time").

a data-driven process be reinstated; this Proposed Rule is another step in maintaining a durable single national program.

As shown by the Alliance in its October 5, 2017 comments[6] on EPA's proposal to reconsider the EPA's Final Determination,[7] the GHG emission standards previously established for MYs 2022–2025 by EPA are not appropriate under Section 202(a) of the Clean Air Act and its implementing regulations.[8] Many of the projections and assumptions upon which those standards were based have proven to be incorrect; the level of technology modeled by the Agencies in 2012 is insufficient to meet the standards, and the actual level of technology that industry projects is needed to comply with the standards is misaligned with market realities. Data from the past few years have also disproven assumptions regarding the market share of cars and trucks, future gas price projections, and the adoption rate of alternative powertrain vehicles. For these reasons, the MY 2021–2025 GHG standards set by EPA and CAFE standards set by NHTSA merit reconsideration. The Agencies should ground this reconsideration on the knowledge gained from the last seven years of actual market and industry performance, and apply updated data that reflect the industry and market realities that we see today. The Alliance appreciates the Agencies' updated analysis as shown in this rulemaking, which uses more recent data and projections. Continuing to reference past targets and expired assumptions in this reconsideration would undermine the purpose of the MTE and risk compromising the achievability of a new path forward.

The Alliance thanks the Agencies for their consideration of the projected fleet performance leading up to MY 2021 as a part of determining the appropriate revision of the standards. For the first few years of ONP, many manufacturers were generally able to out-perform the fleet average fuel economy and GHG standards, enabling them to generate credits. Since MY 2016, however, the auto industry as a whole has not been able to meet the standards without using previously generated credits, despite the fact that the industry has deployed many of the fuel-efficient technologies envisioned by the Agencies. This reliance on credit usage, which is predicted to grow in the near future, is not sustainable over the long term. To be clear, fleet fuel economy and GHG performance continues to improve, but not at the aggressive rate forecasted by the Agencies in 2012. The MTE was agreed to by all stakeholders in order to assess this very issue: marketplace challenges that work against desired fuel economy and GHG emission goals. Market challenges that were not foreseen by the Agencies at the time of their rulemaking in 2012 have since made it difficult for automakers to achieve the required GHG and fuel consumption reductions. Real-time compliance information now available through MY 2016 from both EPA and NHTSA, and from a parallel annual study commissioned by the Alliance and the Association of Global Automakers through MY 2018, illustrates the trajectory of GHG and fuel economy improvement relative to the trajectory of the standards.[9] This data supports the prediction that manufacturers as a whole will be unable to meet the MY 2020 standards without using previously generated credits. Those shortfalls increase despite record use of flexibilities above and beyond the levels originally

[6] Alliance Comments on the Request for Comment on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards (Oct. 5, 2017), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2015-0827-9194.
[7] 82 Fed. Reg. 14,671 (Mar. 22, 2017).
[8] 42 U.S.C. § 7521(a); 40 C.F.R. § 86.1818-12(h).
[9] NOVATION ANALYTICS, MODEL YEARS 2012 TO 2018 BASELINE STUDIES 58, 61 (Oct. 8, 2018 vers. 1.1).

projected by the Agencies.[10] Additionally, according to IHS Markit, compliance challenges will persist into the near future and in MY 2020, the auto industry as a whole will under-perform against projected GHG and CAFE standards by 21 grams per mile ("g/mi") and 1.5 MPG, respectively. [11]

As Figure 1.1 indicates, while fleet CAFE and GHG performance continue to improve, the U.S. fleet was unable to meet CAFE and GHG targets in MYs 2016 to 2018 after over-complying from MYs 2012 to 2015. This shortfall is not restricted to a few manufacturers, either. Over 80% of automakers, with a combined market share of 86% of vehicles sold, were not able to meet the car and/or truck GHG targets in MY 2016 and had to use banked or purchased credits.[12] Ten manufacturers did not meet the CAFE standards for one or more of their compliance fleets for the majority of MYs 2012 to 2016.[13] The inability of the industry as a whole to meet CAFE and GHG targets in recent years has led to the consumption of previously earned credits at an alarming rate.

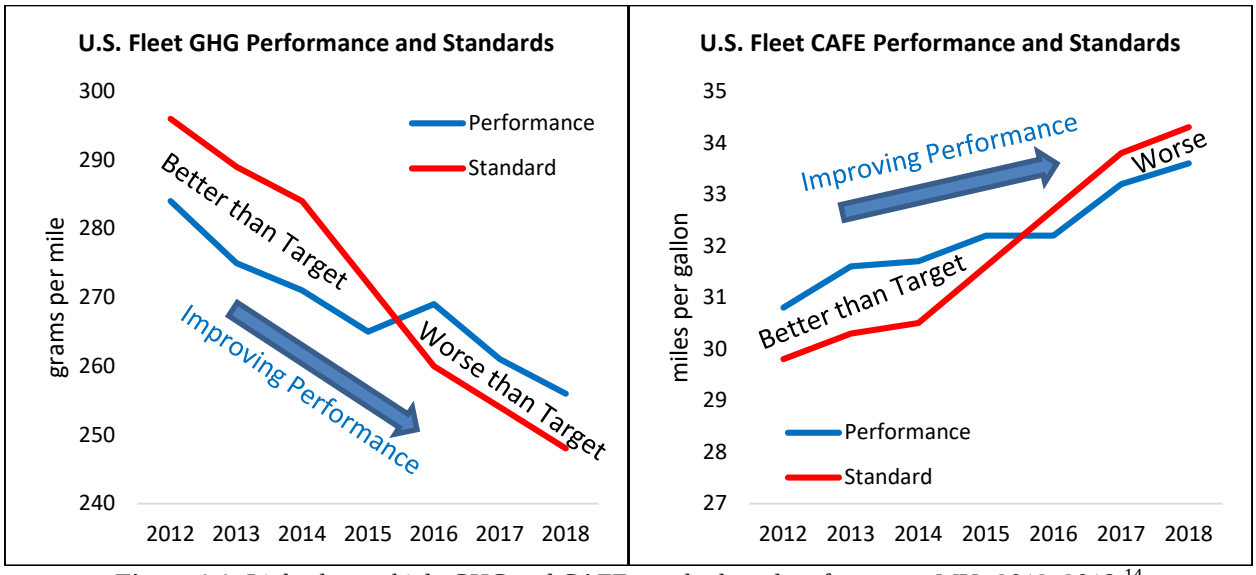

Figure 1.1: Light-duty vehicle GHG and CAFE standards and performance, MYs 2012–2018.[14]

The current and projected shortfalls not only suggest that the fleet is expected to be out of credits by MY 2021, but also indicate that industry will need to accelerate fuel economy improvements well beyond even recent improvement rates in order to meet the Alternatives in the Proposed Rule and to repay any debits from under-compliance. In sum, the fleet will be significantly below the

[10] *Id.* at 68–69.
[11] IHS MARKIT, VEHICLE PERFORMANCE & COMPLIANCE MONITOR (VPAC) (Sept. 2018), https://ihsmarkit.com/products/automotive-vpac.html.
[12] U.S. ENVIRONMENTAL PROTECTION AGENCY, EPA-420-R-18-002, GREENHOUSE GAS EMISSIONS STANDARDS FOR LIGHT-DUTY VEHICLES: MANUFACTURER PERFORMANCE REPORT FOR THE 2016 MODEL YEAR 68, 82 (Jan. 2018), *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100TGIA.pdf.
[13] *CAFE Public Information Center*, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, https://one.nhtsa.gov/cafe_pic/cafe_pic_home.htm (Manufacturer Performance, Model Years 2012-2016).
[14] MANUFACTURER PERFORMANCE REPORT FOR THE 2016 MODEL YEAR, *supra* note 12 (GHG, Model Years 2012-2016); NOVATION ANALYTICS, *supra* note 9 (CAFE and GHG, Model Years 2017-2018); *CAFE Public Information Center*, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, https://one.nhtsa.gov/cafe_pic/cafe_pic_home.htm (CAFE, Model Years 2012-2016). Note: Change in GHG performance between MY 2015 and MY 2016 attributable to elimination of flexible fuel vehicle credits.

projected standards set in the 2012 CAFE and GHG rulemaking and will be required to make significant improvements regardless of the standards ultimately finalized in this rulemaking.

Though manufacturers have made substantial investments in research and development and are aggressively deploying a range of technologies, the average annual increase in CAFE performance has not kept pace with the increased stringency requirements. While technologies are on sale that could raise fuel economy improvement rates more rapidly, consumers are not buying them in large volumes. Therefore, continuing the recent rate of fuel economy increase seen from 2012 to 2018 presents a challenge. As shown in Figure 1.2, the recent rate of fuel economy improvements, when projected beyond MY 2018, shows a significant gap to most of the alternatives in the proposal. Even higher average annual rates of improvement than suggested by the standards themselves would be required to catch up, in order to avoid and/or repay debits associated with under-compliance after credits expire or run out. Furthermore, the Alliance finds that even greater rates of improvement are required for the GHG standards, as explained further in the attached detailed technical comments.

In addition to the possible complete industry depletion of early credits by MY 2021 in both the GHG and CAFE programs, future compliance with the proposed alternatives is challenged by several factors. These factors include, but are not limited to: consumer preference of attributes other than fuel economy; consumer willingness to pay for fuel-saving technology; rising interest rates; the effects of lower gas prices on consumer decisions; the loss of federal tax incentives for plug-in electric and fuel cell electric vehicles as manufacturers reach sales limits; the diminishing returns of fuel economy-improving technology (the less fuel that is used, the less there is left to save); the need to account for the significant decrease of the flex-fuel incentives; and the failure of the Agencies to recognize the increase of renewable fuel in gasoline. All of the above challenges are in addition to the issues addressed in these and prior Alliance comments.

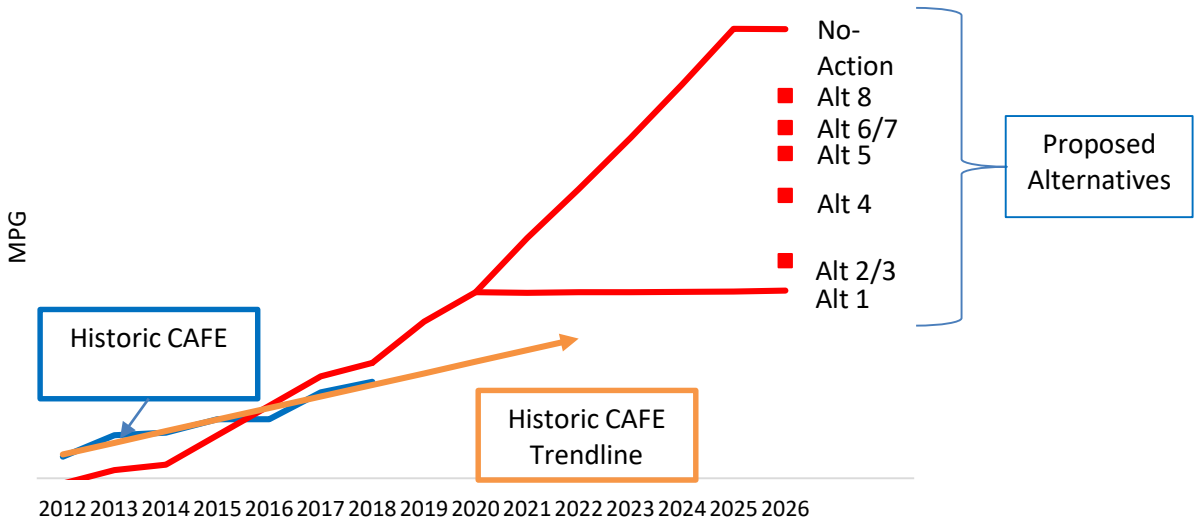

Figure 1.2: CAFE compliance performance improvements necessary to meet projected target values in MY 2026 (MY 2025 for the no-action alternative) starting from MY 2020.[15]

In summary, the Alliance finds that the most current data supports our view that the CAFE and GHG standards originally developed for MYs 2021 to 2025 need to be adjusted to reflect market realities. Further, we continue to support standards requiring appropriate annual fleet average improvements in GHG emissions and fuel economy through the 2026 timeframe covering all 50 states.

II. Maintain One National Program

The Alliance remains committed to supporting One National Program. Our members have consistently cited having One National Program as being the most efficient means of achieving federal and state environmental and energy goals, while simultaneously providing manufacturers with a durable program that will secure future investment and expand consumer choice in cleaner, more efficient vehicles.

ONP was developed in cooperation by NHTSA, EPA, California, and automakers, and was based on the shared recognition that harmonized standards that maintained the authorities of all agencies were the best path forward. The factors that made ONP the preferred solution in 2012 remain relevant today. There are many reasons to continue the ONP framework, including: 1) the efficiencies inherent in allowing manufacturers to comply with a harmonized set of nationwide CAFE and GHG standards; 2) avoidance of the prospect of bifurcated state and federal standards; and 3) avoidance of litigation over federal preemption of state standards. The dissolution of ONP, and the prospect of subsequent litigation between the federal government and California, would create a great deal of regulatory uncertainty for manufacturers regarding MYs 2021 to 2026.

[15] Does not account for additional stringency challenge associated with the removal of credit mechanisms in alternatives 3 and 7.

ONP enables automakers to make predictable investments in a nationwide fleet by providing better certainty and outcomes with respect to consumer choice, costs, and vehicle availability. Without a single national program, manufacturers may elect to change their vehicle availability in certain areas, or may even produce and track two different fleets: one for California and the Clean Air Act Section 177 States (roughly 35% of the U.S. market), and one for the markets under the federal standard. Managing two separate fleets, with one particularly focused on zero emission vehicles ("ZEVs"), would likely mean that manufacturers would have to change their investment and development plans to address sales in two different markets. Not only would this spread capital investment more thinly across two fleets and possibly delay development and deployment of new technologies, it would also decrease the sales volumes through which investments could be recouped.

In addition to allowing manufacturers to make predictable investments, a 50-state program could secure more GHG and fuel use reductions than would be achieved if there were to be a split between the federal and California standards. California and those states adopting California's GHG and ZEV programs may see greater national GHG reductions than under a bifurcated program by taking part in the current federal rulemaking process and pursuing common ground on nationwide fuel economy and GHG standards.[16]

The Alliance is focused on obtaining a feasible and practicable set of GHG and fuel economy standards in a final rule while maintaining One National Program. If ONP dissolves, the federal government may decide to follow through with regulatory actions to preempt GHG-related state standards, as proposed. While NHTSA and EPA have grounds for determining that state GHG standards and ZEV regulations are preempted by the Energy Policy and Conservation Act and the Clean Air Act, respectively, based on today's market realities, the Alliance strongly believes that it is in the interests of all stakeholders to develop workable standards and come together in support of a renewed ONP as part of a final rule.

The automotive industry is optimistic that continued dialogue and information-sharing can enable all stakeholders to find the common ground to continue a single national program with revised standards that reflect market realities and avoid costly uncertainty. The Alliance pledges to continue to work with all stakeholders to develop a set of ONP standards and regulations that can be supported by EPA, NHTSA, CARB, Section 177 States, and industry.

III. Important Criteria for a New Single National Program

When considering the incentives for EPA, NHTSA, and California to develop a single national standard, along with the changes in the marketplace, three years of fleet performance below the standards, the projected depletion and expiration of all early over-performance credits, and the expected widening gap between the standard and fleet performance through MY 2020, the Alliance believes all the following elements are critical for a new and superior alternative are in this Proposed Rule:

[16] The benefits of a higher-stringency California standard nested within a lower stringency federal standard are not the weighted average of the two standards. Instead they would likely approach the federal standard level. *See* Lawrence H. Goulder et al., *Unintended Consequences from Nested State and Federal Regulations: The Case of the Pavley Greenhouse-Gas-Per-Mile Limits*, 63 J. ENVT'L ECON. & MGMT. 187 (2012).

- Substantive adjustments to footprint-based standards for MYs 2021 to 2025 to support continued improvements from actual performance levels while eliminating the increasing compliance gap and its credit deficit implications;
- Revisions to the standards for passenger cars and light-duty trucks that do not create disparate impacts between the fleets—the truck increase rate should be no greater than the car rate of increase and should be the "equivalent task" per fleet;
- Extension and significant expansion of plug-in hybrid electric and battery electric vehicle multipliers in both the CAFE and GHG programs to encourage a transition to these technologies while cost, range, and infrastructure challenges are addressed;
- Support for One National Program; this could mean increasing the EPA GHG-to-NHTSA MPG footprint curve offset to account for all differences that cannot be harmonized between the two programs;
- Expanded flexibilities to counteract the uncertain uptake of the more advanced electrified technologies;
- Continued recognition of the benefits from reduced refrigerant leakage and low global warming potential refrigerant in the GHG program; and
- Permanent removal of the requirement for auto manufacturers to account for upstream electric utility emissions.

A final rule containing all the elements above will better meet all parties' needs than would a final rule supported by only the federal government, which could result in a bifurcated system and/or years of uncertainty from litigation. This new set of standards would preferably build upon historical performance gains and continue stringency increases at an achievable rate supported by updated market and industry data. We envision that a workable set of standards could incorporate continued increases in stringency, falling somewhere between the overall improvement rates of Alternative 8 and Alternative 1, along with the inclusion of appropriate flexibilities.

The final rule should ensure that auto manufacturers do not have to account for upstream emissions produced during electricity generation for electric vehicles. Upstream utility emissions come from power plants, not vehicle tailpipes. Manufacturers have no control over the feedstock used by those power plants and should not be held responsible for their upstream electricity emissions.

Another element that should be addressed in this rule is the revision of the domestic minimum backstop standard using new data. The EPA GHG program is not burdened by this CAFE program statutory constraint, so updating this standard with recent data would improve the harmonization between the two programs. Congress intended for this backstop standard to be set at 92% of the passenger car CAFE standard level, but shifting markets have invalidated previous assumptions.

The Agencies should also modify their approach to vehicle classification or otherwise address the shift in consumer demand to utility vehicles classified as passenger cars. This shift to vehicles with greater road loads, while maintaining the same footprint, creates compliance challenges that were not accounted for when the current footprint-based curves were developed.

Finally, in order to accommodate California's and the Section 177 States' concerns, and to capture all the GHG emissions related to vehicles, it may be necessary to have EPA and NHTSA programs

that are closely aligned but not identical. These differences could include accounting for air conditioning leakage, the treatment of advanced technology vehicles, the ability to compensate for excess CH_4 and N_2O emissions with CO_2, and credit trading inconsistencies. The tailpipe stringency, modeling, model inputs, and maximum feasibility of the GHG and CAFE programs would only differ in the above dimensions if necessary. This is to say that the GHG program elements such as air conditioning leakage, CH_4 and N_2O emissions, and credit trading provisions could be "layered" on top of the CAFE standards, modeled as scenarios in the CAFE modeling, or post-processed using the CAFE model outputs.

IV. Supporting Analyses for the Proposed Rule and Alternatives

A. Use of the Volpe and Autonomie Models

The Alliance applauds the Agencies' use of the Volpe model (also known as the CAFE model) and the Autonomie model to develop revised standards. The Alliance has long stressed the importance of close coordination between NHTSA and EPA and their regulatory programs. The use of a single set of models and inputs is a critical, common-sense step in the effort to reduce duplicative work, which is supported by both the Paperwork Reduction Act and Executive Order 13781. The Volpe and Autonomie models are more transparent and better account for real-world factors than do the available alternatives. Important features of the NHTSA modeling process include:

- The addition of consumer willingness to pay for fuel economy technologies;
- The addition of price effects on sales and fleet turnover;
- Year-by-year analysis and output of compliance pathways for the fleet and for individual manufacturers;
- The acknowledgement and application of real-world limitations on technology application including a limit on the number of engine displacements available to any one manufacturer, application of shared platforms, engines, and transmissions, and the reality that improvements and redesigns of components are not only extended across vehicles but sometimes constrained in implementation opportunity to common vehicle redesign cycles;
- Recognition of the need for manufacturers to follow "technology" pathways that retain capital and implementation expertise, such as specializing in one type of engine or transmission instead of following an unconstrained optimization that would cause manufacturers to leap to unrelated technologies and show overly optimistic costs and benefits;
- The application of specific instead of generic technology descriptions that allow for the above-mentioned real-world constraints;
- The need to accommodate for intellectual property rights in that not all technologies will be available to all manufacturers;
- The ability to run the Volpe and Autonomie models using the supplied documentation without direct agency help or the operation of extra undocumented processes;
- The ability to operate and modify the Volpe model in order to verify NHTSA results and test new ideas;
- The inherent robustness of Autonomie given its over-20-year history of commercial and government use and development;

- The ability of Autonomie to model hybrid vehicles; and
- Improved consideration for maintaining customer-oriented vehicle performance parameters such as acceleration and gradeability.

The Alliance provides further, more specific comments on the Volpe and Autonomie models in the appendices.

B. The Costs and Benefits of the Proposal and Alternatives

The Alliance requested that NERA Economic Consulting and Trinity Consultants perform a separate econometric study to analyze the effects of CAFE and GHG standards for MYs 2021 to 2026. The econometric study assessed the impacts of three of the CAFE standard alternatives from the Proposed Rule (1, 5, and 8) on new vehicle sales, vehicle scrappage, and vehicle miles traveled from 2017 to 2050. At the time the econometric study was designed, it was unclear whether the Agencies would account for price effects in their modeling; because the Agencies did account for price effects in vehicle sales, scrappage, and miles traveled, the econometric study now serves as an independent directional verification of net benefits described in the Proposed Rule.

The econometric study reinforces that all three of the alternatives examined offer positive net benefits when compared to the no-action alternative standards, even if safety benefits are excluded. This is true for all scenarios modeled, including 3% and 7% discount rates, and with national and global social costs of carbon.

The Alliance recommends that the Agencies review the NERA econometric study's methodologies for adoption or to refine their own models. The Alliance appreciates the Agencies' diligence in incorporating the critical factor of price effects into standard-setting. Price effects reflect a portion of the consumer acceptance factor, and reveal the impacts of fleet turnover effects; failing to account for price effects can result in less effective and more expensive standards.

C. Safety Impacts

The Alliance supports the consideration of factors impacting fleet turnover and new vehicle demand in establishing maximum feasible fuel economy and GHG standards. As a general rule, new vehicles are safer, more efficient, and cleaner than the older designs they replace. Maintaining consumer affordability is key to ensuring newer vehicles continue to replace older vehicles in a continuous cycle of fleet turnover so that the promised benefits of this rule are realized. The Alliance also believes, as elaborated in the Appendices, that the use of a 20% rebound rate from fuel economy improvements is appropriate.

The Alliance agrees that safety is one of several elements that NHTSA must consider in setting fuel economy standards. When setting "maximum feasible" fuel economy standards, the Secretary is required to "consider technological feasibility, economic practicability, the effect of other motor vehicle standards of the Government on fuel economy, and the need of the United States to conserve energy."[17] NHTSA interprets these statutory factors to include environmental and safety

[17] 49 U.S.C. § 32902(a), (f).

concerns.[18] The Alliance also understands that if NHTSA were to reweigh these factors or refine the modeled price effects based on comments to this Proposed Rule, the projected safety benefits could affect NHTSA's determination of the maximum feasible standards in the final rule.

V. Flexibilities Are an Important Compliance Tool

Flexibilities are an important compliance tool for automakers, and the Alliance finds that the current level of EPA and NHTSA flexibilities should be maintained and, in fact, built upon. Flexibilities can help accomplish optimal outcomes, incentivize desired behavior, address issues not well-handled by the base standards, and enable manufacturers to cope with year-to-year variables and vehicle redesign schedules. Flexibility mechanisms are also a very important part of maintaining ONP because they incentivize the very solutions needed to meet longer-term California GHG reduction goals, such as advanced technology vehicles.

Flexibilities among the CAFE and GHG programs should be harmonized to the degree possible. Without comparable flexibilities in each, there will be a continued need to have an offset between the CAFE and GHG footprint curves. To this end, the Alliance's 2016 harmonization petition is attached for reference.

Importantly, when considering the potential benefits of new and existing flexibilities, the Agencies should not merely tally up the maximum benefit of all the flexibilities and assume manufacturers could obtain the maximum credit sum even if they so desired. Because added technologies are not free, have their own costs and benefits, and require implementation, manufacturers are likely to compare them to technology improvements that already have a recognized benefit on the CAFE/GHG tests. In addition to competing with "efficiency gains," some of the flexibilities cannot be implemented at the same time on the same vehicles and will require separate Agency approval. For all of these reasons, the Agencies should not allow unfounded concerns with the scope of all the potential flexibilities to restrict the availability of any single flexibility.

A. The Final Rule Should Maintain and Refine Flexibilities

The Alliance supports the extension and expansion of advanced technology multipliers in the GHG program and their extension to the CAFE program. The Alliance supports an electric vehicle multiplier of up to 4.5x; supporting technical comments are in the appendices.

New and improved flexibilities should include expanding the full-size hybrid pick-up incentive to all light-duty trucks, and creating a hybrid car credit in both the GHG and CAFE programs. The Alliance supports a 20 g/mi credit for light-duty trucks and 10 g/mi credit for passenger cars. Hybrid technologies remain an important lever for reducing GHG emissions and improving fuel economy for all vehicles, even though hybridization remains an expensive technology to implement on all types of vehicles, especially when applied to utility vehicles with their greater loads.

[18] *See, e.g., Competitive Enterprise Inst. v. NHTSA*, 956 F.2d 321, 322 (D.C. Cir. 1992) (citing *Competitive Enterprise Inst. v. NHTSA*, 901 F.2d 107, 120 n.11 (D.C. Cir. 1990)); 73 Fed. Reg. 24,352, 24,364 (May 2, 2008).

The Alliance supports continuation of the full air conditioning refrigerant leakage credits under the GHG standards. We also support all the current air conditioning efficiency flexibilities and the proposal to shift all thermal control technologies under the air conditioning efficiency cap. The air conditioning efficiency cap should also be increased according to data provided by the Department of Energy's National Renewable Energy Laboratory, and to account for the addition of thermal control technologies.

The Alliance supports all off-cycle credits in both the NHTSA and EPA programs. The Proposed Rule asked for comment on the off-cycle menu credit cap options of no cap, a 10% cap based on fleet stringency, or a 15 g/mi cap. The Alliance strongly believes that the off-cycle credit menu cap should be removed since the menu values were already conservative estimations of real-world emissions reductions.

The Alliance also identifies a list of additional new technologies with benefits that are not captured in laboratory testing that can be added to the air conditioning efficiency and off-cycle credit menus for use by all vehicle manufacturers. These additional technologies are a testament to the success of the air conditioning and off-cycle credit programs in fostering innovation that further reduces fuel consumption and emissions. Expanding the credits will reward these investments and provide positive signals to the market.

Finally, the Agencies should provide a credit pathway for connected and autonomous vehicles, as well as for crash avoidance and other safety technologies. These technologies, though not conventionally thought of as relating to fuel economy and GHG, in fact help reduce fuel consumption and GHG emissions. Securing America's Future Energy estimates that connected and autonomous technologies such as crash avoidance, by reducing accidents and congestion, could reduce fuel consumption and emissions by up to 25% across the entire fleet while saving 9,000 lives annually.[19] The Agencies should incentivize the adoption of these technologies and provide for possibly additional credit once the benefits beyond the credit values have been confirmed. To enable many of these credit pathways, EPA must amend its regulations[20] to allow GHG credits for technologies that are adopted primarily for safety purposes to give any fuel-saving technology the credit it deserves. Clearly, the encouragement of autonomous, connected, and safety technologies is a win for both the environment and for safety.

B. Improvements to the Credit Application Process

The Alliance also sees a need for the Agencies to fix problems with the process in petitioning for and obtaining the existing flexibilities; an improved process would lead to faster review and better consistency in approval criteria. To ensure fairness and send the proper signals to suppliers and manufacturers, for credits earned through the off-cycle alternative methodology pathway, manufacturers should be allowed to use common data from applications that have already been approved. Such common data would include ambient conditions, general consumer behavior data, and general operating and performance data of similar or the same off-cycle technologies. The Alliance also asks that EPA quickly approve credits for technologies from the menu using simple

[19] Memorandum from Securing America's Future Energy, Fuel Economy Off Cycle Program, Flexibilities and Estimated Fuel Savings (May 14, 2018).
[20] 40 C.F.R. § 86.1866-12(b).

definitions used in the regulations and to not require additional qualification. Finally, the Alliance is appreciative of EPA's correction of the "5 minus 2" credit pathway and the current advanced technology multiplier equations.

VI. Programmatic Changes

A. Methane and Nitrous Oxide

The Alliance supports EPA's proposal to discontinue accounting for methane and nitrous oxide emissions as part of the carbon dioxide emissions standards because this would provide better harmony between the two compliance programs. Not only is emission of these two substances from vehicles a relatively minor contribution to GHG emissions, the Alliance has continuing concern regarding measurement and testing technologies for nitrous oxide.

If the EPA decides instead to continue to regulate methane and nitrous oxide, the Alliance recommends that EPA re-assess whether the levels of the standards remain appropriate and to retain the current compliance flexibilities. Furthermore, in this scenario, the Alliance also recommends that methane and nitrous oxide standards be assessed as a fleet average and as the average of FTP and HFET test cycles.

B. Credit Trading and Accounting

The Alliance recommends that NHTSA should not further restrict the ability to trade CAFE credits, as credits are a critical part of manufacturers' compliance strategies. The trading structure should be retained, but the Alliance strongly suggests that NHTSA should not adopt the proposed credit transaction information reporting requirements, particularly because it would potentially reveal confidential business information and confuse more than inform. These issues are further explained the following appendices. When one asks to improve the transparency of an issue, it is often so that transactions can be compared. CAFE credit trading is complicated, and trying to make comparisons—especially when the compensation is not financial in nature, as NHTSA notes—would be fraught with problems. When credits are traded between fleets, the magnitude of actual credit is dependent upon the performance and credit amount of the fleet from which it originated, and that amount is ultimately converted to a different credit amount that is dependent upon the performance and gap of the fleet into which it is traded. Further complicating this is the time aspect, where credits can be carried forward five years and back three years—a total time window of eight years. Documenting the financial aspect of these transactions, knowing the credit value translation issue and the time difference, would not usefully inform interested parties.

The Alliance does not discuss credit compensation, as credit transactions are private negotiations between manufacturers or any other party that choses to buy and sell credits. Our members have acknowledged that these transactions are privately negotiated and that manufacturers may choose to integrate transacted credits into highly confidential compliance plans. Additionally, compensation in transactions can potentially include technology information, which is considered confidential business information and cannot be publicly released. Just like any other business decision, protecting the sensitive information of each party is necessary to ensure the

competitiveness of manufacturers and fair treatment for all parties. The Alliance supports protecting the privacy of our members' competitive business practices.

Separately, EPA should allow unlimited carry-over of GHG credits without restriction as to how and when GHG credits are used. Automakers have earned these credits and should have the ability to use them in the way that best fits their compliance strategies.

VII. Relevance of International Fuel Economy and GHG Standards

The Alliance recognizes efforts by nations all over the world to establish regulations to control GHG and reduce fuel consumption in their fleets. These efforts are important to deliver on environmental and energy security goals established by those nations. Each of these regulations reflect conditions unique to those markets, such as available taxes and subsidies; technology incentives and mandates; availability, quality, affordability, and price of fuel choices; health of the economy; driving conditions and utilities needed; and consumer preferences, among many others. For example, because fuel prices in Europe are nearly triple those of the United States, examining consumer choices between these two markets may not be helpful. There are many regulatory differences as well, including the prioritization of fuel economy reductions and GHG emissions over criteria emissions; drive cycles and testing procedures; and even varied definitions of "light-duty vehicles." It may be helpful to examine these programs for lessons learned, but the Alliance finds that encouraging the U.S. standards to remain consistent with other countries' standards for the sake of competitiveness is irrational and fails to account for the particularities of the U.S. auto market and, most importantly, the consumer.

VIII. Conclusion

In conclusion, the Alliance believes that revisions to the MY 2021–2025 standards are necessary and warranted, and we support a final rule that enables the One National Program approach to continue. Maintaining, extending, and expanding flexibilities is likely to be an important component to meeting these goals. We offer the following appendices in support and in addition to the comments provided above.

- Appendix I - ADDITIONAL MODELING OF NET BENEFITS OF THE PROPOSED RULE AND OTHER ALTERNATIVES
- Appendix II - CONSIDERATIONS FOR SETTING LIGHT-DUTY VEHICLE CAFE AND GHG STANDARDS
- Appendix III - PREFERRED STRUCTURE OF STANDARDS
- Appendix IV - CONSUMER ACCEPTANCE
- Appendix V - FLEXIBILITIES AND TECHNOLOGY INCENTIVES
- Appendix VI - VEHICLE CLASSIFICATION
- Appendix VII - CAFE REPORTING ISSUES
- Appendix VIII - MODELING SYSTEM USED IN THE PROPOSED RULE
- Appendix IX - HIGH – OCTANE FUEL BLENDS
- Appendix X - REGARDING INTERNATIONAL STANDARDS
- Appendix XI - LEGAL ISSUES
- Appendix XII - MISCELLANEOUS REGULATORY DRAFTING ISSUES

Thank you for your time and consideration. The Alliance remains committed to working with all stakeholders, and would be happy to discuss these issues with you and answer any questions you may have. I may be contacted at 248-281-0070 or cnevers@autoalliance.org.

Yours truly,

Chris Nevers
Vice President, Energy & Environment

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LIST OF ACRONYMS

ALA	American Lung Association
BEV	Battery Electric Vehicle
CAFE	Corporate Average Fuel Economy
CH_4	Methane
CS	Crankcase Suction
CY	Calendar Year
DMS	Domestic Minimum Standard
EPA	Environmental Protection Agency
FCIV	Fuel Consumption Improvement Value
GHG	Greenhouse Gas
GVWR	Gross Vehicle Weight Rating
HEV	Hybrid Electric Vehicle
ICCT	International Council on Clean Transportation
MAC	Mobile Air Conditioning
MPG	Miles Per Gallon
MTE	Mid-Term Evaluation
MY	Model Year
N_2O	Nitrous Oxide
NHTSA	National Highway Traffic Safety Administration
NRDC	Natural Resources Defense Council
NVES	New Vehicle Experience Study (Strategic Vision)
NVMM	New Vehicle Market Model
PHEV	Plug-In Hybrid Electric Vehicle
SCC	Social Cost of Carbon
SUV	Sport Utility Vehicle
VMT	Vehicle Miles Traveled
ZEV	Zero Emission Vehicle

APPENDIX 1 ADDITIONAL MODELING OF NET BENEFITS OF THE PROPOSED RULE AND OTHER ALTERNATIVES

1.1. Evaluation of Alternative Passenger Car and Light-Duty Truck Corporate Average Fuel Economy (CAFE) Standards for Model Years 2021-2026

Prior to the Proposed Rule, the Agencies' did not explicitly model new vehicle sales and fleet scrappage effects associated with CAFE and GHG standards. Therefore, in advance of the release of the Proposed Rule, the Alliance requested that NERA Economic Consulting ("NERA") and Trinity Consultants ("Trinity") prepare such models and perform an analysis of the net benefits of various regulatory alternatives.[1] The resulting NERA-Trinity Assessment estimates the market impacts and resulting social costs and benefits of three of the CAFE standard alternatives presented in the Proposed Rule (Alternatives 1, 5, and 8).[2]

While the NERA-Trinity Assessment's models differ in structure from those presented by the Agencies in the Proposed Rule, they reach similar conclusions. For each of the alternatives studied in the NERA-Trinity Assessment, positive net benefits were calculated relative to the no-action (i.e. current GHG and augural CAFE) standards alternative. Thus, the NERA-Trinity Assessment serves as an independent verification of this aspect of the Agencies' assessment.

The Alliance commends the Agencies for incorporating an assessment of new vehicle sales and fleet turnover impacts of changing vehicle attributes in its modeling of the effects of potential CAFE and GHG standards. Such modeling reveals insights into the potential impacts of various regulatory alternatives, better informing the Agencies' decision-making process.

We encourage the Agencies' to review the results of the NERA-Trinity Assessment and its underlying models' structure and data sources.

1.1.1. *Modeling Approach*

The complete modeling framework structure is shown in Figure 1.1 below. Trinity used the Department of Transportation's CAFE Compliance and Effects Model (a.k.a. "Volpe Model" or "CAFE Model") to estimate changes in fuel economy and vehicle price. The outputs from this model inform NERA's New Vehicle Market Model ("NVMM") and scrappage models that in turn inform NERA's Fleet Population and VMT Models. These resulting fleet and fuel economy information is then applied to the MOVES and GREET models to derive emission impacts. NERA then calculates net benefits from the various inputs and outputs in the modeling.

[1] NERA ECONOMIC CONSULTING AND TRINITY CONSULTANTS, EVALUATION OF ALTERNATIVE PASSENGER CAR AND LIGHT-DUTY TRUCK CORPORATE AVERAGE FUEL ECONOMY (CAFE) STANDARDS FOR MODEL YEARS 2021-2026 (Oct. 2018) (hereinafter "NERA-TRINITY ASSESSMENT"). Available as Attachment 1 to these comments.

[2] The choice of scenarios for the NERA-Trinity Assessment should not be construed as support for any particular alternative or range of alternatives.

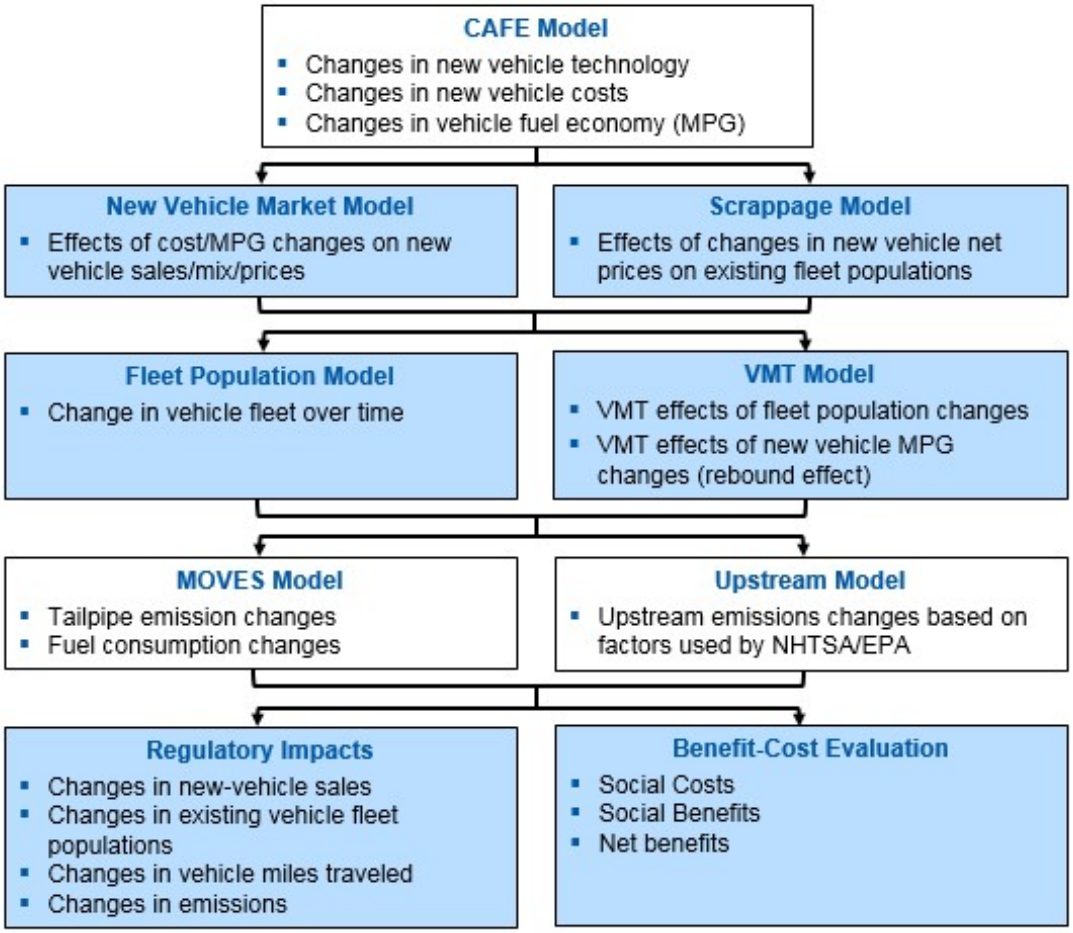

Figure 1.1: NERA-Trinity Assessment model structure.[3]

In the Proposed Rule, the Agencies specifically request comment on the appropriate breadth, depth, and complexity of a consumer choice model,[4] and on methodologies which could appropriately account for the relationships between price increases, fuel economy, and new vehicle sales, and how to appropriately integrate sales and scrappage models into their modeling.[5] NERA-Trinity Assessment's NVMM and scrappage models are responsive to this question. The NVMM estimates new vehicle sales impacts using a nested logit model, a model structure that is been used extensively by economists for motor vehicle markets.[6] NERA finds that their "New Vehicle Market Model" is "an improvement over estimates of the value of fuel economy and new vehicle choice based upon assumed payback periods and other ad hoc approaches."[7] The NERA-Trinity Assessment's scrappage model is based on a conceptual framework established by previous

[3] NERA-TRINITY ASSESSMENT at 10.
[4] 83 Fed. Reg. 42,986, 43,077 (Aug. 24, 2018).
[5] 83 Fed. Reg. at 43,075.
[6] NERA-TRINITY ASSESSMENT at 5.
[7] NERA-TRINITY ASSESSMENT at 5.

researchers and "updated statistical model[ing] relating used-vehicle scrappage rates to new vehicle prices."[8]

The Agencies also requested comments on various questions they have related to incorporating consumer acceptance (e.g. valuation of fuel savings, willingness to pay, trade-offs, etc.) into their modeling.[9] As mentioned above, consumer acceptance was determined using a nested logit structure that predicts future sales based on historic data. Nested logit structures are able to model complex factors such as consumer valuation of fuel savings, considerations of buyers in their purchase decisions (e.g. ownership costs, trade-offs), based on past consumer trends. We encourage the Agencies to refer to the methods and assumptions used by NERA.

1.1.2. *Summary of Results*

1.1.2.1. Market Impacts

The NERA-Trinity Assessment found that under all three alternatives studied, new vehicle sales increased relative to the augural standards, due to increased affordability even after reductions in value related to lower fuel economy (Figure 1.2).

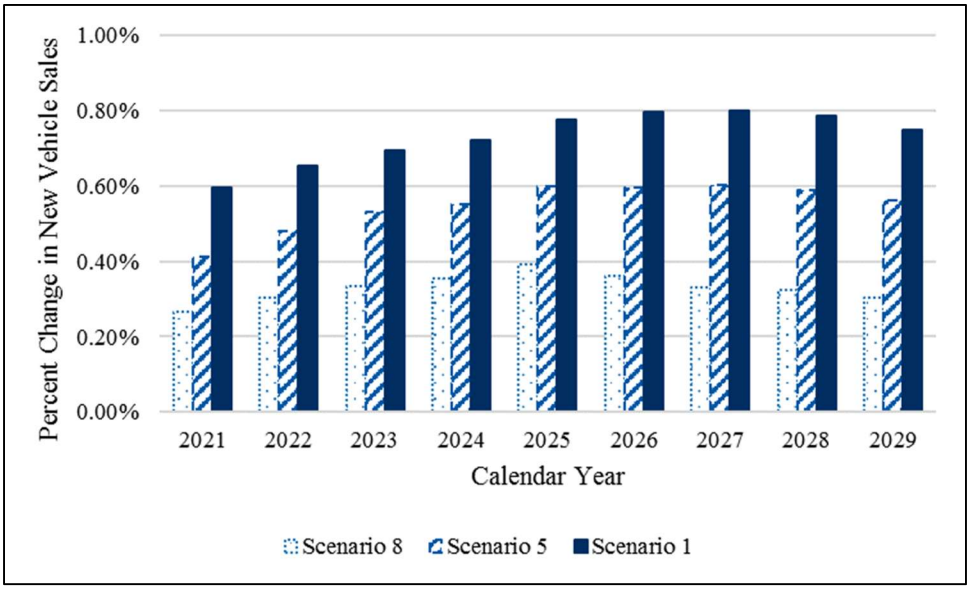

Figure 1.2: Differences in new vehicle sales compared to no-action alternative, MY 2021–2029.[10]

Additionally, the econometric study found that all three alternatives result in a reduction in older vehicles in the in-use fleet (Figure 1.3). For the 2030 CY, NERA found that the pre-2021 MY in-use fleet reduced in size relative to the augural standards, while the post-2021 MY fleet increased in size relative to the augural standards. This is due to affordability. Under the three alternatives studied, more customers are projected to choose to scrap their old vehicles and to replace them with newer vehicles.

[8] NERA-TRINITY ASSESSMENT at 6.
[9] 83 Fed. Reg. at 43,074.
[10] NERA-TRINITY ASSESSMENT at S-5.

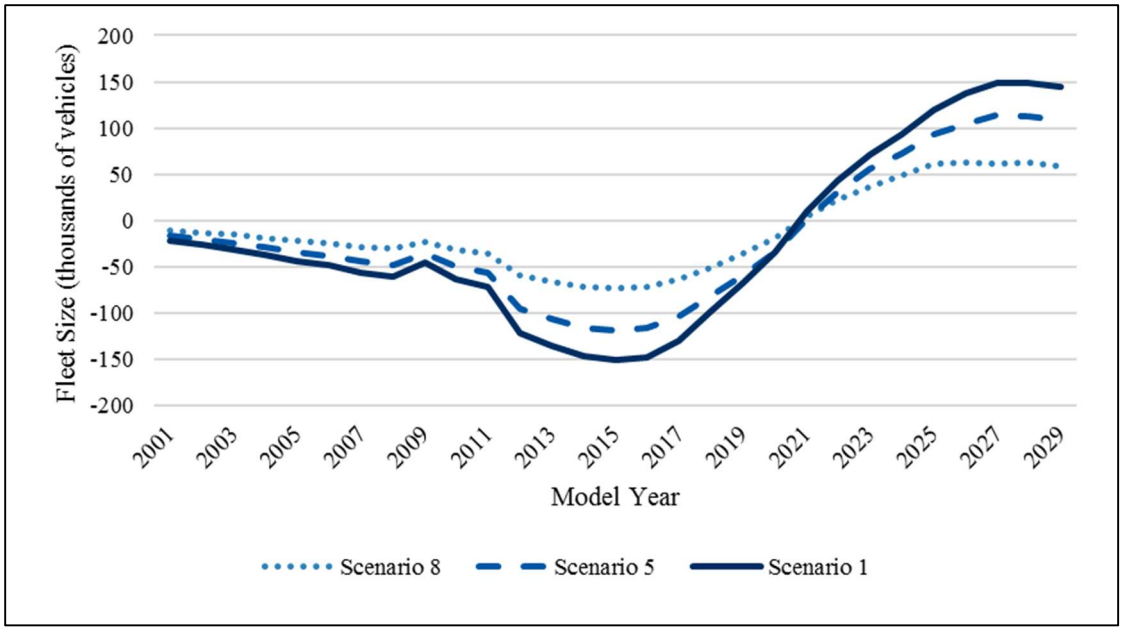

Figure 1.3: Differences in fleet effects compared to no-action alternative by model year, for calendar year 2030.[11]

Under all three scenarios, vehicle miles traveled ("VMT") decreases relative to the augural standards (Figure 1.4). This is due primarily to rebound effects. Because NERA was only examining vehicles through MY 2029, the difference in VMT between the alternatives and the augural standards decreases over time, due to the fact that fewer of the MY 2029 and earlier vehicles are on the road in those later years.

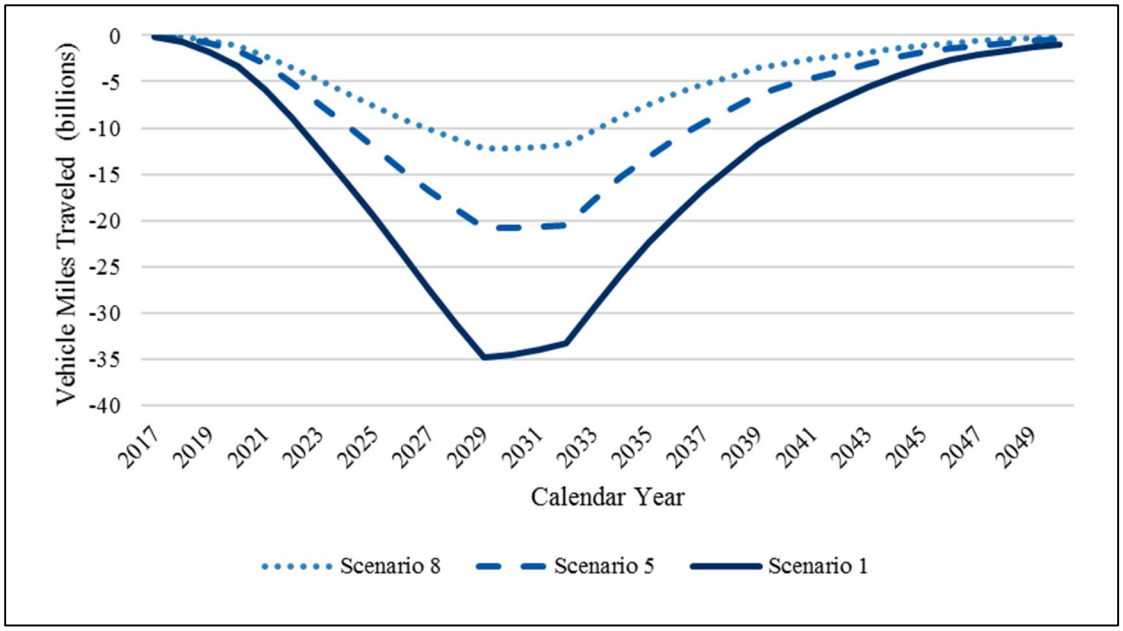

Figure 1.4: Differences in VMT Effects compared to no-action alternative by calendar year.[12]

[11] NERA-TRINITY ASSESSMENT at S-6.
[12] NERA-TRINITY ASSESSMENT at S-7.

1.1.2.2. Social Costs and Benefits

Using the modeling framework described above, NERA and Trinity ultimately developed estimates of the social costs and social benefits of the three alternatives studied. The Agencies generally requested comment on their social cost and benefit analysis. We encourage the Agencies to review the modeling and inputs used in the NERA-Trinity Assessment for potential refinements to their own analysis. While the NERA-Trinity Assessment's modeling approaches differed from the Agencies' in certain respects, the same conclusion can be drawn from both: there are positive net benefits expected under all of the scenarios studied relative to the no-action alternative, and Alternative 1 (the agency-proposed) provides the greatest net benefit. Figure 1.5 summarizes the net benefits results of the NERA-Trinity Assessment.

Table ES-1. Net Benefits Relative to Augural Baseline, Billions of 2016$, 3% Discount Rate

	Scenario 8	Scenario 5	Scenario 1
Social Costs			
Technology Costs	-68.8	-113.9	-170.7
Congestion Costs	-6.3	-10.6	-17.9
Noise Costs	-0.1	-0.2	-0.3
Fatal Crash Costs	-1.1	-1.3	-1.0
Non-Fatal Crash Costs	-1.5	-1.7	-1.3
Total Social Costs	**-77.7**	**-127.7**	**-191.2**
Social Benefits			
Valuation of Fuel Economy Benefits	-28.0	-49.0	-87.2
Fuel Tax Revenue Benefits	4.3	7.4	13.2
Petroleum Market Externality Benefits	-1.3	-2.2	-3.9
GHG Damage Reduction Benefits	-1.6	-2.9	-7.1
NO_x Damage Reduction Benefits	0.0	0.1	0.0
VOC Damage Reduction Benefits	0.0	-0.1	-0.1
PM Damage Reduction Benefits	-0.4	-0.8	-1.7
SO_2 Damage Reduction Benefits	-2.0	-3.4	-6.1
Total Social Benefits	**-29.0**	**-50.9**	**-93.0**
Net Total Benefits	**48.7**	**76.8**	**98.2**

Note: Present values calculated as of January 1, 2017 using a 3 percent discount rate for costs/benefits incurred over the 2017-2050 analysis period. All values are in billions of 2016 dollars, rounded to the nearest $0.1 billion. Damage reduction values for GHG include effects from CO_2 as well as other GHG pollutants, which have been converted to $CO_{2eq.}$

Source: NERA/Trinity calculations as explained in text.

Figure 1.5: Net benefits relative to the no-action alternative, billions of 2016 dollars, 3% discount rate.[13]

[13] NERA-TRINITY ASSESSMENT at S-12.

1.1.3. *Conclusions and Recommendations*

As stated above, we commend the Agencies for their consideration of consumer acceptance in their latest modeling. The NERA-Trinity Assessment confirms the Agencies' findings that Alternatives 1, 5, and 8 result in increased net benefits relative to the no-action alternative augural CAFE standards. We recommend that the Agencies review the NERA-Trinity Assessment to see if any elements of the econometric model could be used to refine the Agencies' modeling further. At a minimum, we encourage the Agencies to rely on the econometric study as a third-party verification of the net benefits of standard adjustments.

1.2. Analysis of the Sensitivity of the Agencies' Net Benefits Analysis to Alternative Fuel Price Projections

The Alliance requested that NERA review the Agencies' fuel price estimates and the sensitivity of the Agencies' net benefits analysis to various fuel price assumptions. The methodology and results for this analysis are documented in NERA's memo, "Retail Gasoline Prices and Implications for NHTSA/EPA's Evaluation of the Net Benefits of Alternative MY 2020-2026 Fuel Economy Standards for Light-Duty Vehicles,"[14] (hereinafter "NERA Fuel Price Memo").

The NERA Fuel Price Memo finds that the Agencies' net benefits analysis is robust to wide range of fuel price estimates (including those from sources other than the Energy Information Administration). In all cases studied the calculated net benefits remain positive for alternatives which consider a lower stringency than the baseline no-action alternative.

The full NERA Fuel Price Memo is available as Attachment 1 to these comments.

1.3. Analysis of the Sensitivity of the Agencies' Net Benefits Analysis to Alternative Social Cost of Carbon Projects

The Alliance requested that NERA review the Agencies' social costs of carbon ("SCC") estimates to determine the sensitivity of the Agencies' net benefits analysis to a broad range of alternative valuations ($1 to $174 per metric ton). NERA provides the results of their analysis in a memo, "Alternative Social Cost of Carbon (SCC) Values and Implications for NHTSA/EPA's Evaluation in the PRIA of the Net Benefits of Alternative MY 2020-2026 Fuel Economy Standards for Light-Duty Vehicles," (hereinafter "NERA SCC Memo").[15]

Most importantly, the NERA SCC Memo finds that, "Estimates of the net benefits of alternative CAFE standards provided in the PRIA would not change sign using this range of SCC values."[16] In other words, the analysis results in positive net benefits even throughout the entire range of SCC values considered by NERA.

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[14] Memorandum from NERA Economic Consulting to the Alliance of Automobile Manufacturers, Retail Gasoline Prices and Implications for NHTSA/EPA's Evaluation of the Net Benefits of Alternative MY 2020-2026 Fuel Economy Standards for Light-Duty Vehicles (Oct. 25, 2018). Available as Attachment 2 to these comments.

[15] Memorandum from NERA Economic Consulting to the Alliance of Automobile Manufacturers, Alternative Social Cost of Carbon (SCC) Values and Implications for NHTSA/EPA's Evaluation in the PRIA of the Net Benefits of Alternative MY 2020-2026 Fuel Economy Standards for Light-Duty Vehicles (Oct. 25, 2018). Available as Attachment 3 to these comments.

[16] *Id.* at 1.

The full NERA SCC Memo including a description of methodology and documentation of various SCC values is available as Attachment 3 to these comments.

APPENDIX 2: CONSIDERATIONS FOR SETTING LIGHT-DUTY VEHICLE CAFE AND GHG STANDARDS

In the past few model years, manufacturers on average have failed to meet annual compliance targets; most manufacturers have relied on previously banked or purchased credits to maintain compliance. Independent analysts project that these shortfalls will continue despite new model introductions, and a sensitivity analysis of various projections by the Alliance suggests the same. The industry average shortfalls have occurred despite increasing penetration of more advanced technologies. Individual models have shown significant improvement, but overall fleet performance has suffered due to fleet mix changes, largely due to lower than expected fuel prices and a strengthening economy that has shifted consumer choices (see Appendix 4). The Agencies could not have predicted these trends in 2011, when the regulations were adopted, which is why a strong Midterm Evaluation ("MTE")—which provided updated information on consumer trends and other external factors, was so vital to the development of this Proposed Rule.

These shortfalls result in a gap between manufacturer average compliance levels and the standards that must also be overcome in meeting future standards. Although others have suggested that existing credit banks are sufficient to cover these shortfalls, this ignores limitations to credit use, and projected credit use while manufacturers remain under-compliant to annual targets. Furthermore, to the extent manufacturers generate compliance debits that cannot be covered by existing credit banks, those debits will drive a need to accelerate improvements beyond those necessary to just meet the standards in order to pay back those debits.

With regard to the current GHG and augural CAFE standards (i.e. the "no-action alternative"), the only technologies that have demonstrated the improvements necessary to meet the MY 2025 standards are strong hybrids, plug-in electric vehicles, and fuel cell electric vehicles. The Agencies' analysis for this Proposed Rule predict the need for significant growth in sales of electrified vehicles, a finding consistent with third-party analyses. While manufacturers generally continue to expand offerings of such products, the market has not followed in turn.

This Appendix explores these trends in greater detail to provide additional context for the Alliance's recommended actions in regard to the standards as a function of vehicle footprint and vehicle classification.

2.1. Historical Trends and Near-Term Projections of Light-Duty Vehicle CAFE and GHG Standards and Compliance

An examination of trends in standards and performance is useful in assessing overall combined technical feasibility and practicability of the standards leading up to the time period under consideration in the rulemaking.

Final data for the entirety of the Phase 1 (MY 2012–2016) coordinated CAFE and GHG standards is now available. Manufacturers have also completed MY 2017 and although MY 2018 vehicle may still be produced through the end of the year, MY 2019 builds have generally started. Model year 2020, the last year before consideration of amended standards in the rulemaking, will begin in less than one year.

Improvements in fuel economy and reductions in GHG emissions in this time frame have been made under binding standards that were required to improve ratably each year. The Phase 1 coordinated CAFE and GHG standards saw the requirements increase on a year-by-year basis at rates not seen since the late 1970s in the early days of CAFE. The extent to which manufacturers were able to improve the U.S. fleet is likely informative of the underlying technical, economic, and market conditions that are difficult to assess in a holistic manner through modeling of technology improvements and fleet optimization models, but which nevertheless ultimately determine the feasibility and practicability of reducing GHG emissions and fuel consumption.

In stark contrast to projections made in the MY 2012–2016 rulemaking, manufacturers are reducing GHG emissions and fuel consumption at a slower rate than that required by the standards. This, in combination with the phase-out of flexible fuel vehicle credits, has resulted in manufacturers falling behind the annual compliance targets. This trend is projected to continue through at least MY 2020, raising concerns with the viability of the no-action alternative.

NHTSA has historically considered compliance "shortfalls" in its assessment of economic practicability when determining maximum feasible standards.[17] The Alliance believes that it is appropriate for EPA to do the same.[18] If the Agencies were to have correctly projected the shortfalls now exhibited and anticipated through 2021, a different decision on the past and future standards may have been made. In evaluating the feasibility of standards for MY 2021–2026, these recent trends are particularly important to consider in determining the maximum feasible standard. The Alliance recommends that the Agencies carefully examine the economic practicability and technological feasibility of improving GHG and CAFE performance at the rates required to first recover from current shortfalls and then to over-perform to offset any debits previously accumulated.

2.1.1. *The Ramp Rate of the Current GHG and No-Action Alternative CAFE Standards is More Than Double That of the Historically Achieved Improvement Rates*

The U.S. auto industry, on average, improved fuel economy and reduced GHG emissions at a rate of approximately 2% or less per year as shown in Table 2.1. Under the MY 2012–2016 greenhouse gas and CAFE standards, manufacturers improved laboratory (unadjusted test) performance by an average of 2.2% per year. Including credits (i.e. compliance performance), manufacturers improved at a rate of about 2.0% to 2.1% per year. This is a significant increase over the 1.4% per year improvement rate (laboratory) observed under the less aggressive MY 2000–2010 standards.

[17] *See* 77 Fed. Reg. 62,623, 63,038 (Oct. 15, 2012) ("If it appears, in our modeling analysis, that a significant portion of the industry cannot meet the standards defined by a regulatory alternative in a model year, given that our modeling analysis accounts for manufacturers' expected ability to produce and sell vehicles (through redesign cadence, technology costs and benefits, etc.), then that suggests that the standards may not be economically practicable").

[18] *See* 42 U.S.C. § 7521(a)(2) ("[Standards] 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") (Note the similarity to NHTSA's reasoning for including projected compliance shortfalls as a consideration of economic practicability as explained at 77 Fed. Reg. at 63,038). For further discussion on this point, please see Appendix 11 at section 11.2.

Model Year	Metric	Sales Weighted Fleet Average	Unweighted Fleet Average
2000–2010	Unadjusted Laboratory Fuel Economy[19]	1.6%	1.4%
	CAFE Compliance (with credits)[20]	1.7%	1.7%
2012-2016	Unadjusted Laboratory Fuel Economy[21]	1.4%	2.2%
	GHG Compliance (with credits)[22]	1.3%	2.1%
	CAFE Compliance (with credits)[23]	1.1%	2.0%

Table 2.1: Compound annual average rate of improvement in fuel economy and greenhouse gas performance for total U.S. fleet, model years 2012-2016.

In contrast, the rate of increase in standards was (and is projected to be under the no-action alternative) much higher (Table 2.2). The CAFE standard stringency increased by 3.1% per year on average (1.6 times the improvement in CAFE performance) and GHG standard stringency increased by 3.8% per year on average (1.8 times the improvement in GHG performance). The difference between the historically achieved rate of improvement and the rate of stringency increases for the no-action alternative standards is even greater—about 2.4 times higher. Achieving such high rates of improvement would likely require significantly higher annual investments in human resources and capital for technology and vehicle development than have previously been economically practicable. Alternatively or in combination with higher annual investments, such high rates of improvement would require significantly higher levels of technologies such as hybrid and plug-in electric vehicles (or a yet-to-be found silver bullet technology) than are currently purchased by consumers, again raising concerns of economic practicability.

[19] Alliance calculations of data from U.S. ENVIRONMENTAL PROTECTION AGENCY, EPA-420-R-18-001, LIGHT-DUTY AUTOMOTIVE TECHNOLOGY, CARBON DIOXIDE EMISSIONS, AND FUEL ECONOMY TRENDS: 1975 THROUGH 2017 at 122 (Jan. 2018), *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100TGDW.pdf ("EPA Unadj. (MPG)") (hereinafter EPA 2018 TRENDS REPORT).

[20] Alliance calculations of data from *CAFE Public Information Center*, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, https://one.nhtsa.gov/cafe_pic/cafe_pic_home.htm (last visited Sept. 13, 2018) (fleet performance area).

[21] Alliance calculations of data from 2018 TRENDS REPORT, *supra* note 19, at 122.

[22] Alliance calculations of data from U.S. ENVIRONMENTAL PROTECTION AGENCY, EPA-420-R-18-002, GREENHOUSE GAS EMISSION STANDARDS FOR LIGHT-DUTY VEHICLES: MANUFACTURER PERFORMANCE REPORT FOR THE 2016 MODEL YEAR at 81 (Jan. 2018), *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100TGIA.pdf ("Compliance" under "Actual") (hereinafter 2016 MANUFACTURER PERFORMANCE REPORT).

[23] Alliance calculations of data from *CAFE Public Information Center*, *supra* note 20.

Model Years	Sales Weighted Fleet Average		Unweighted Fleet Average	
	GHG	CAFE	GHG	CAFE
2012–2016 [24] [25]	3.2%	2.4%	3.8%	3.1%
2016–2021 [26] [27]	4.0%	3.6%	4.0%	3.5%
2021–2025 [28] [29]	4.7%	4.7%	4.8%	4.7%

Table 2.2: Compound annual average rate of fuel economy and greenhouse gas standard stringency increases for the total U.S. fleet, model years 2012-2016, 2016-2021, and 2021-2025 under the no-action alternative.

2.1.2. *Manufacturers, On Average, Have Fallen Behind Annual Compliance Targets*

In MY 2016, for the first time ever in the 40-year history of the CAFE program, manufacturers (on average) failed to meet the combined passenger car and light truck CAFE standards.[30] Similarly, for the first time ever in the (albeit shorter) history of the light-duty vehicle GHG program, manufacturers failed to meet the combined passenger car and light truck GHG standards.[31]

NHTSA projects the same trend to continue for CAFE compliance in model years 2017 and 2018 in its own "Manufacturer Projected Fuel Economy Performance Report."[32] Overall U.S. fleet

[24] Alliance calculations for GHG data from 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at 81 ("Target" under "Actual").
[25] Alliance calculations for CAFE data from *CAFE Public Information Center*, *supra* note 20.
[26] Alliance calculations for GHG data from *Compliance and Effects Modeling System: Volpe Model*, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, https://www.nhtsa.gov/corporate-average-fuel-economy/compliance-and-effects-modeling-system (last visited Sept. 13, 2018) ("Central Analysis" under "2018 Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks" under "Downloads", see Central Analysis folder, output_CO2 subfolder, CO2 subfolder, reports-csv subfolder, compliance_report.csv file, column A value "0", column D value "Total", column L).
[27] Alliance calculations for CAFE data from *Compliance and Effects Modeling System*, *supra* note 26 ("Central Analysis" under "2018 Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks" under "Downloads", see Central Analysis folder, output_CAFE subfolder, CAFE subfolder, reports-csv subfolder, compliance_report.csv file, column A value "0", column D value "Total", column I).
[28] Alliance calculations for GHG data from *Compliance and Effects Modeling System*, *supra* note 26 ("Central Analysis" under "2018 Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks" under "Downloads", see Central Analysis folder, output_CO2 subfolder, CO2 subfolder, reports-csv subfolder, compliance_report.csv file, column A value "0", column D value "Total", column L).
[29] Alliance calculations for CAFE data from *Compliance and Effects Modeling System*, *supra* note 26 ("Central Analysis" under "2018 Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks" under "Downloads", see Central Analysis folder, output_CAFE subfolder, CAFE subfolder, reports-csv subfolder, compliance_report.csv file, column A value "0", column D value "Total", column I).
[30] *CAFE Public Information Center*, *supra* note 20 (comparison of "Total Fleet" "FE Performance" to "Fleet Standard"); NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, SUMMARY OF FUEL ECONOMY PERFORMANCE (Dec. 15, 2014), *available at* https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/performance-summary-report-12152014-v2.pdf (calculation from data located on pp. 3-5).
[31] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at 81 (Table A-4, comparison of "Compliance" to "Target" for "Actual" values).
[32] NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, MANUFACTURER PROJECTED FUEL ECONOMY PERFORMANCE REPORT at 3 (Apr. 30, 2018), *available at* https://one.nhtsa.gov/cafe_pic/MY_2017_and_2018_Projected_Fuel_Economy_Performance_Report.pdf (Table 2, comparison of Total CAFE to Total Standard).

annual CAFE performance is projected to fall 0.7 mpg short of standard in MY 2017 and 0.8 mpg short of standard in MY 2018.

Furthermore, a recent report from Novation Analytics, "Model Years 2012 to 2018 Baseline Studies," (hereinafter "2018 Baseline Study") supports the NHTSA projections using more recent data from automobile manufacturers.[33] The 2018 Baseline Study reports that manufacturers (on average) are likely to report a MY 2016 CAFE shortfall of 0.6 mpg for MY 2017 and a shortfall of 0.7 mpg for MY 2018. The study also projects shortfalls of 7 g/mi (MY 2017) and 8 g/mi (MY 2018) for GHG compliance.

The combined final compliance performance and standards for MYs 2012–2016, and the Novation Analytics assessment of performance and standards is shown in Figure 2.1. The U.S. fleet has made steady improvements, but has fallen behind the standards as the standards increase at a faster rate than manufacturers (on average) have improved their compliance performance.

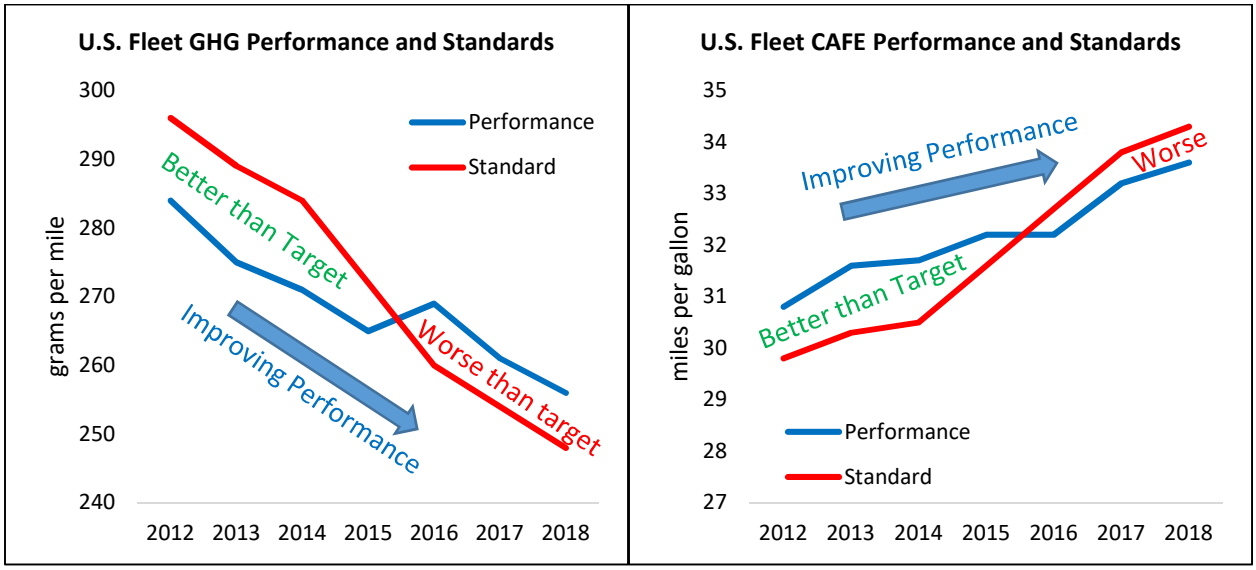

Figure 2.1: Light-duty vehicle GHG and CAFE standards and performance, MYs 2012-2018.[34]

Figure 2.2 shows the U.S. fleet average difference to annual target (i.e. "compliance margin") since the inception of joint GHG and CAFE standards in MY 2012. Positive values indicate compliance better than standard (i.e. credit-generating) and negative values indicate compliance worse than standard (i.e. credit-using / debit-generating). U.S. fleet manufacturers on average had a positive

[33] NOVATION ANALYTICS, MODEL YEARS 2012 TO 2018 BASELINE STUDIES (Oct. 2018). Available as Attachment 4 to these comments. The 2018 Baseline Study relies on final model year compliance data for MY 2017 projections and uses a combination of mid-model year compliance data and IHS Markit / Polk volume projections for MY 2018. The Alliance previously performed a retrospective analysis of the accuracy of the Novation Analytics baseline studies through MY 2015 (see Regulations.gov, docket ID EPA-HQ-OAR-2015-0827-9194, p. 15). The analysis determined that the Novation Analytics reported values were all 0.4% or less different than the final EPA-reported values for calculations of fleet targets, and 1.3% or less different for calculation of fleet compliance values.

[34] *Id.*; 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22; *CAFE Public Information Center, supra* note 20. Note: Change in GHG performance between MY 2015 and MY 2016 attributable to elimination of flexible fuel vehicle credits.

CAFE compliance margin of 1.0 mpg or better in 2012–2014.[35] In MY 2015 that margin dropped to 0.6 mpg on average, becoming negative in MY 2016 and becoming more negative thereafter. Similar trends are observed in GHG compliance margin with an ongoing negative trend for MY 2016–2018.

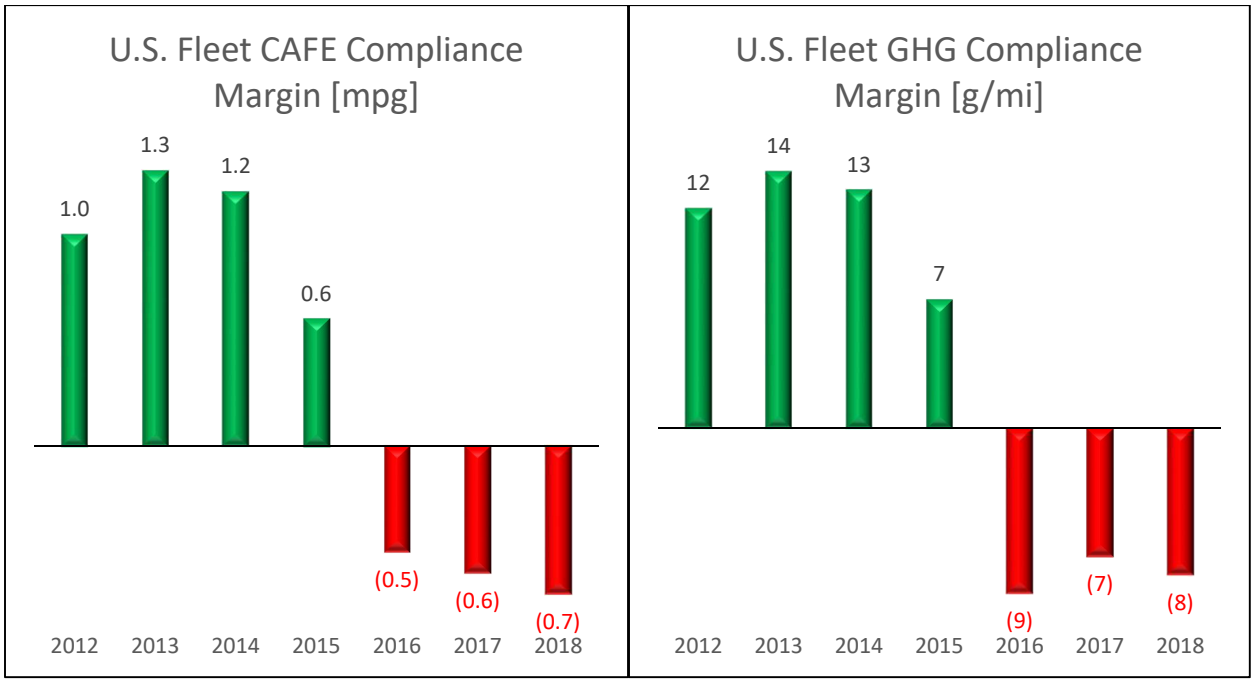

Figure 2.2: Light-duty vehicle CAFE and GHG compliance margin, model years 2012-2018.[36]

2.1.3. *Other Observed Compliance Trends*

The following observations are made regarding greenhouse gas compliance in MY 2016:

- Over 80% of manufacturers failed to meet annual GHG compliance targets for passenger car or light truck fleets in MY 2016.[37]
- The manufacturers which failed to meet annual GHG compliance targets represented over half of the passenger car fleet volume and over 80% of the light truck fleet production volume in the United States.[38]
- Two manufacturers have exhausted their previously banked and purchased GHG credits and carried a deficit forward. An additional manufacturer's positive GHG credit balance after MY 2016 appears entirely attributable to credits purchased from other manufacturers.[39]

[35] Significantly less than the 2.3 mpg average compliance margin for MY 2004–2011. (Alliance calculation based on fleet compliance data in the *CAFE Public Information Center, supra* note 20.
[36] *CAFE Public Information Center, supra* note 20 (CAFE, Model Years 2012-2016); 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22 (GHG, Model Years 2012-2016); NOVATION ANALYTICS, *supra* note 33 (CAFE and GHG, Model Years 2017-2018).
[37] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at 68 (Table 3-35).
[38] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, combining data at 68 (Table 3-35) and at 82 (Table B-1).
[39] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at 73 (Table 5-1).

- Several manufacturers struggled to meet annual compliance targets for most, or in the case of two manufacturers, the entirety of the 2012-2016 light-duty vehicle greenhouse gas program.[40]

Similarly, regarding CAFE compliance:

- In MY 2016, 38% of manufacturers failed to meet domestic car targets, 65% failed to meet import car targets, and 63% failed to meet light truck targets.[41] Two manufacturers failed to meet domestic minimum passenger car standards.[42]
- Ten manufacturers have failed to meet light truck annual targets for the majority of the 2012-2016 model years.[43]
- Manufacturers are carrying forward negative credit balances (debits) in ten compliance fleets after MY 2016.[44]

2.1.4. *Manufacturers Are Projected to Remain Under-Compliant to Annual CAFE and GHG Targets in MY 2020 and MY 2021*

Despite anticipated manufacturer product redesigns in MYs 2019 and 2020, the shortfall to annual compliance targets is anticipated to remain and grow.

2.1.4.1. IHS Markit Vehicle Performance and Compliance Monitor Projection

Data provided by IHS Markit in its Vehicle Performance and Compliance ("VPaC") Monitor projects that manufacturers on average will under-comply with GHG standards by 21 g/mi and

[40] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at 73 (Table 5-1), referring to those manufacturers which earned negative credits (i.e. debits) related to under-compliance in model years 2012-2016.
[41] *CAFE Public Information Center, supra* note 20, at "Manufacturer Performance" tab (data as of April 30, 2018).
[42] *CAFE Public Information Center, supra* note 20, at "Manufacturer Performance" tab (data as of April 30, 2018).
[43] *CAFE Public Information Center, supra* note 20, at "Manufacturer Performance" tab (data as of April 30, 2018).
[44] *CAFE Public Information Center, supra* note 20, at "Credit Status" tab (data as of May 31, 2018).

will under-comply with CAFE standards by 2.5 mpg in 2020.[45] The shortfall is projected to grow to 28 g/mi (GHG) and 3.8 mpg (CAFE) in 2021.[46]

2.1.4.2. Alliance Projections and Sensitivity Analysis

The Alliance developed additional projections and a sensitivity analysis of the shortfall between U.S. fleet average greenhouse gas and CAFE compliance and standards to supplement the IHS Markit projections.[47] Five projections of fleet performance were examined, and three projections of GHG standards were examined.

Projections of fleet average GHG performance:

- IHS Markit VPaC projection
- 1.3% improvement per year from MY 2018 performance (the average rate of improvement in 2-cycle laboratory fuel economy performance over the 2000–2011 time period after removing car/truck mix effects)
- 2.0% improvement per year from MY 2018 performance (the average rate of improvement in 2-cycle laboratory fuel economy performance over the 2005–2017 time period after removing car/truck mix effects)
- A linear best fit (using the Microsoft Excel trendline feature) projection based on MY 2012-2018 industry average GHG and CAFE performance.[48]

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[45] Includes content supplied by IHS MARKIT, VEHICLE PERFORMANCE & COMPLIANCE MONITOR (VPAC) (Sept. 2018), https://ihsmarkit.com/products/automotive-vpac.html). The IHS Markit reports, data, and information referenced herein (the "IHS Markit Materials") are the copyrighted property of IHS Markit Ltd. and its subsidiaries ("IHS Markit") and represent data and research published by IHS Markit, and are not representations of fact. The IHS Markit Materials speak as of the original publication date thereof and not as of the date of this document. The information provided in the IHS Markit Materials is subject to change without notice and IHS Markit has no duty or responsibility to update the IHS Markit Materials. Moreover, while the IHS Markit Materials reproduced herein are from sources considered reliable, the accuracy and completeness thereof are not warranted, nor are the opinions and analyses which are based upon it. Opinions, statements, estimates, and projections in this message or other media are solely those of the individual author(s). They do not reflect the opinion of IHS Markit or any of its affiliates ("IHS Markit"). IHS Markit has no obligation to update, modify, or amend this message or other media, or to otherwise notify a recipient thereof, in the event that any matter stated herein, or any opinion, projection, forecast or estimate set forth herein, changes or subsequently becomes inaccurate. Any content, information, and materials provided in this message or other media is on an "as is" basis. IHS Markit makes no warranty, expressed or implied, as to its accuracy, completeness, or timeliness, or as to the results to be obtained by recipients, and shall not in any way be liable to any recipient for any inaccuracies, errors, or omissions herein. Without limiting the forgoing, IHS Markit shall have no liability whatsoever to a recipient of any message or media, whether in contract, in tort (including negligence), under a warranty, under statute or otherwise, in respect of any loss of damage suffered by such recipient as a result of or in connection with any actions, opinions, recommendations, forecasts, judgments, or any other conclusions, or any course of action determined, by it or any third party, whether or not based on the content, information or materials contained herein. IHS Markit and R.L. Polk & Co. are trademarks of IHS Markit. Other trademarks appearing in the IHS Markit Materials are the property of IHS Markit or their respective owners.

[46] IHS MARKIT, *supra* note 45.

[47] Calculation details available upon request.

[48] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22 (MY 2012–2016 data); NOVATION ANALYTICS, *supra* note 33 (MY 2017–2018 data) and *CAFE Public Information Center, supra* note 20 (NHTSA (CAFE)).

Projections of fleet average GHG standards:

- IHS Markit VPaC projection
- Proposed Rule Volpe Model outputs for GHG assessment
- Proposed Rule Volpe Model outputs for GHG assessment adjusted to AEO 2018 car/truck mix.

In all cases studied, a substantial shortfall is forecasted to remain in MY 2020 and 2021. The range of performance and standard projections indicate an estimated shortfall of 18 to 23 g/mi (GHG) and 1.5 to 3.0 mpg (CAFE) in MY 2020. In MY 2021, the shortfall is estimated to be in the range of 28 to 35 g/mi (GHG) and 2.8 to 4.5 mpg (CAFE) (Figure 2.3).

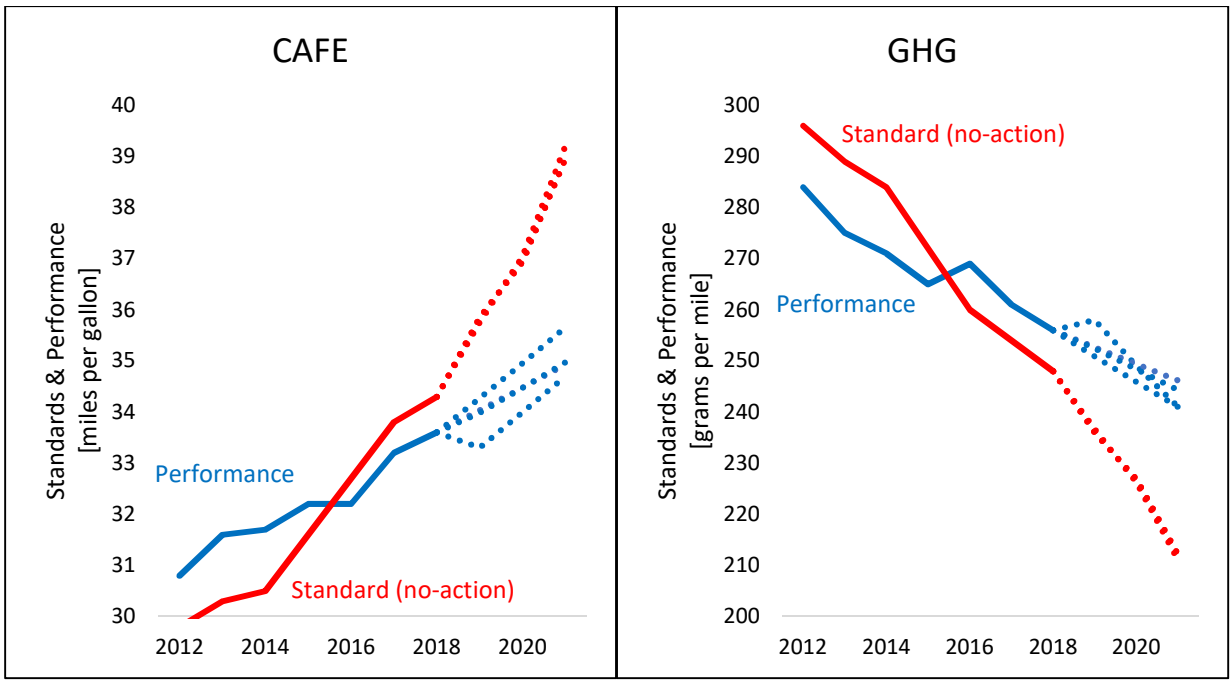

Figure 2.3: CAFE and GHG performance and standards, MY 2012-2018; sensitivity analysis for projected CAFE and GHG performance and standards MY 2019-2021. In all cases, a significant shortfall to standard is predicted in MYs 2020 and 2021 in both the CAFE and GHG programs.[49]

These analyses lead the Alliance to the inescapable conclusion that the U.S. fleet as a whole is likely to have a shortfall to annual GHG and CAFE compliance targets in MY 2020 that would have to be overcome.

2.2. Analysis of the Impacts of Existing Credit Banks

In the near-term, the U.S. fleet has banked GHG and CAFE credit from over-compliance in prior years. However, these credit banks are already depleted for some manufacturers. Moreover, even with an unrealistic assumption that banked credits are freely traded amongst manufacturers to

[49] *CAFE Public Information Center, supra* note 20 (MY 2012-2016 CAFE data) (Fleet Performance Page); 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22 (MY 2012-2016 GHG data); NOVATION ANALYTICS, *supra* note 33 (MY 2017 CAFE and GHG data). MY 2019-2021 standards and performance as described in text.

enable U.S. fleet average compliance as long as possible the total U.S. credit bank would be significantly depleted by MY 2020. Even if they were not depleted, current statutes and regulations prevent the use of existing credit banks past MY 2021. These trends and analyses are described in further detail below.

2.2.1. *Current Credit Banks Cannot Be Used Past MY 2021*

Final compliance data (including credit banks) is currently only available for model years through 2016.

In the CAFE program, credits can only be carried forward a maximum of five years (i.e. through MY 2021 for MY 2016 credits).[50] NHTSA is constrained by statute regarding the degree to which credits can be carried forward, making any near-term changes to credit banking provisions unlikely. Therefore, any discussion of CAFE credit banked through MY 2016 in the context of MY 2022 or later standards is inapposite.[51]

The GHG program also has credit carry-forward limitations; credits earned between MY 2012 and MY 2016 can only be carried forward through MY 2021.[52] Hence, discussion of GHG credits banked through MY 2016 is also inapplicable to consideration of standards in MY 2022 or later.

EPA may choose to extend its carry-forward provisions.[53] If such a provision is finalized, additional considerations as described below also apply, mitigating consideration of credit banks in the context of this rulemaking.

2.2.2. *Manufacturers (On Average) Are Not Generating Credits That Could Be Used Past MY 2021 and Credit Banks Are Projected to Be Depleted Over the Next Several Years*

As described above, manufacturers on average have been, and are projected to continue to perform at a level worse than the annual compliance targets. As a result, manufacturers on average are not generating any credits to bank past MY 2021.

Not only are credits not being generated to bank for future use, but the existing credit banks are also being depleted as manufacturers under-perform to annual targets. An analysis by the Alliance of Automobile Manufacturers estimates that by MY 2020, the U.S. fleet's GHG credit bank in aggregate would be reduced to less than half of the MY 2016 value by the end of MY 2020 (Figure 2.4).[54] This projection is optimistic because it assumes all manufacturers freely draw from one pool of credit even though credits are actually disproportionally distributed among manufacturers and some manufacturers have already depleted their reserves.

[50] 49 U.S.C. § 32903(a).
[51] NHTSA is also prohibited by statute from considering such banked credits. *See* 49 U.S.C. § 32903(h)(3).
[52] 40 C.F.R. § 86.1865-12(k)(6).
[53] 83 Fed. Reg. at 43,464 ("EPA requests comments on extending credit carry-forward beyond the current five years, including unlimited credit life").
[54] Calculations available upon request.

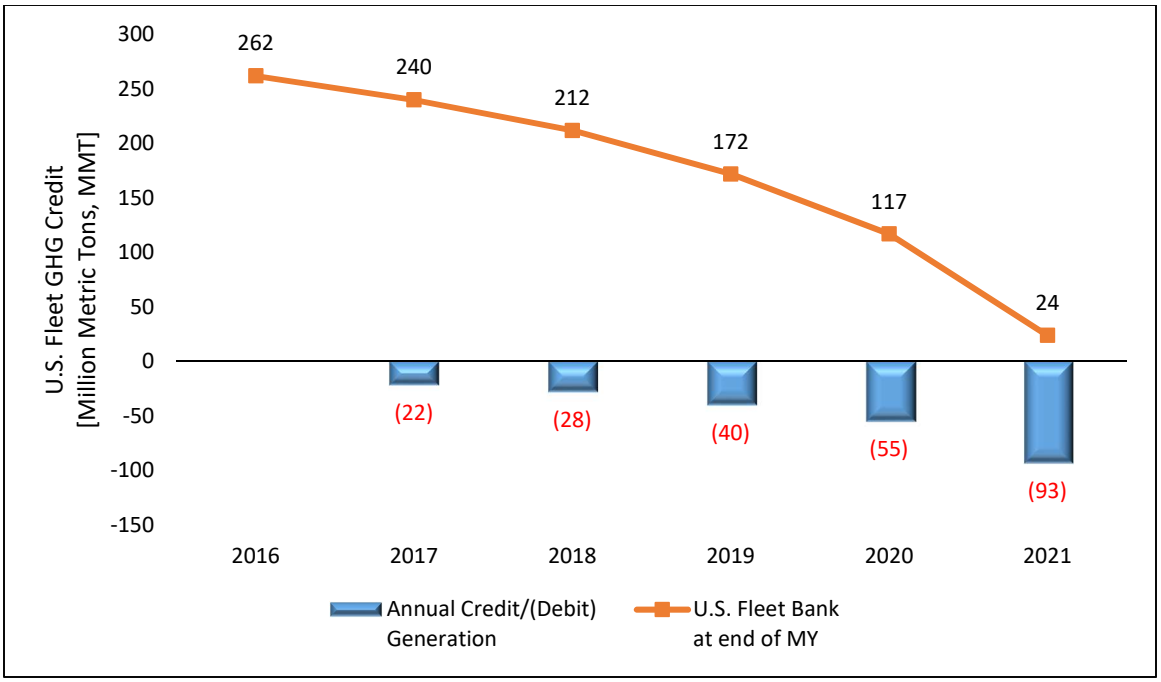

Figure 2.4: Projection of U.S. fleet GHG credit bank assuming perfect trading between manufacturers (highly optimistic), Proposed Rule-projected GHG standards and volumes (MY 2017-2021) under the no-action alternative, and 2% improvement rate per year over MY 2018 GHG performance.

2.3. Impact of Projected Manufacturer Compliance Trends and Credit Banks on Future Rates of Improvement Required

The Proposed Rule describes eight alternatives considered by the Agencies. Other than the no-action alternative, each of the alternatives is described in terms of percentage GHG and CAFE standard stringency increases relative to either MY 2020 (alternatives 1-4 and 6-7) or MY 2021 (alternatives 5 and 8). From the basis of MY 2020 standards to MY 2025, the no-action alternative would require annual improvements averaging 4.6% per year for passenger cars, 5.1% per year for light trucks, and 4.8% overall. [55]

2.3.1. *The Projected MY 2020 Compliance Shortfall Results in Greater Rates of Improvement Required Than Simple Analysis of the Standards Themselves Suggests*

In these comments the Alliance notes that through MY 2018 manufacturers' (on average) performance is worse than the annual compliance targets for both GHG and CAFE standards. Furthermore, the Alliance demonstrates that this situation is likely to continue to at least MY 2020. Therefore, in returning to a neutral compliance level (i.e. one in which compliance performance is equal to the standard) manufacturers must increase the rate of performance improvement beyond that suggested by the standards alone.

[55] MY 2020 was chosen for consistency with the majority of the alternatives analyzed by the agencies. Calculation based on U.S. fleet standards projected in the Proposed Rule Volpe Model Analysis, *Compliance and Effects Modeling System*, *supra* note 26 (Central_Analysis.7z\Central Analysis\output_CAFE\CAFE\reports-csv\compliance_report.csv) ("Downloads", "2018 Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks," "Central Analysis").

If the U.S. fleet were to continue at the same pace of improvements as exhibited under the binding CAFE and GHG standards of MY 2012-2018, they would only barely return to a neutral compliance position by MY 2026 even assuming the least stringent alternative under consideration (Figures 2.5 and 2.6).

Although the Proposed Rule describes the various alternatives in terms of percentage annual improvements, the percentages provided are based on the standards themselves, effectively assuming that manufacturers will somehow have greatly increased the rate of compliance improvements than have previously been exhibited as technologically feasible and economically practicable. For manufacturers to return to a neutral compliance position by MY 2020 from anticipated MY 2018 levels, they would need to achieve an average annual improvement rate of 5.8% (GHG) and 3.7% (CAFE) for model years 2019 and 2020.[56] To achieve a neutral compliance position by MY 2021 they would need to achieve an average annual improvement rate of 6.1% (GHG) and 4.4% (CAFE).

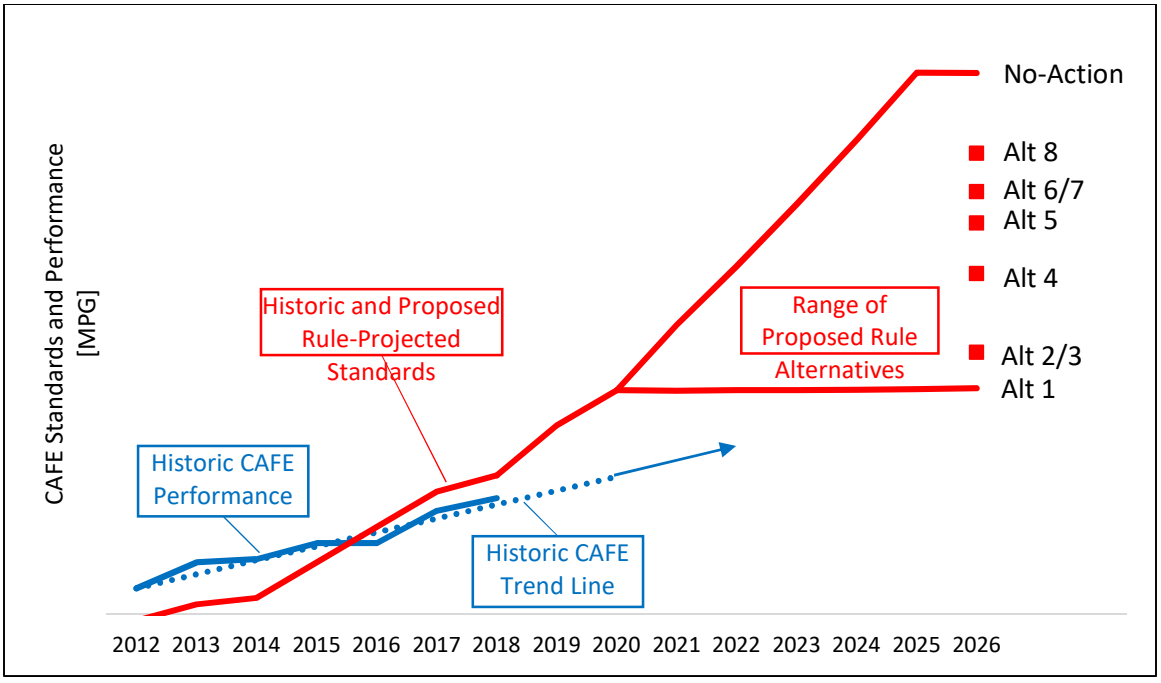

Figure 2.5: CAFE standards and performance with linear trend line based on MY 2012-2018 performance improvements, MY 2012-2026. Manufacturers on average must increase the rate of CAFE improvement beyond historic norms to return to a neutral compliance level.[57]

[56] Assessment based on information from NOVATION ANALYTICS, *supra* note 33, and the Volpe Model projected standards for the Proposed Rule's analysis.

[57] *CAFE Public Information Center, supra* note 20 (MY 2012-2016 standards and performance) (Fleet Performance page); NOVATION ANALYTICS, *supra* note 33, at 61 (MY 2017-2018 standards and performance); *Compliance and Effects Modeling System*, *supra* note 26 (MY 2019–2026 standards) (Central Analysis for 2018 Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, Central_Analysis.7z\Central Analysis\output_CAFE\CAFE\reports-csv\compliance_report.csv; Linear performance projection: Linear best fit line of MY 2012-2018 performance data using Microsoft Excel).

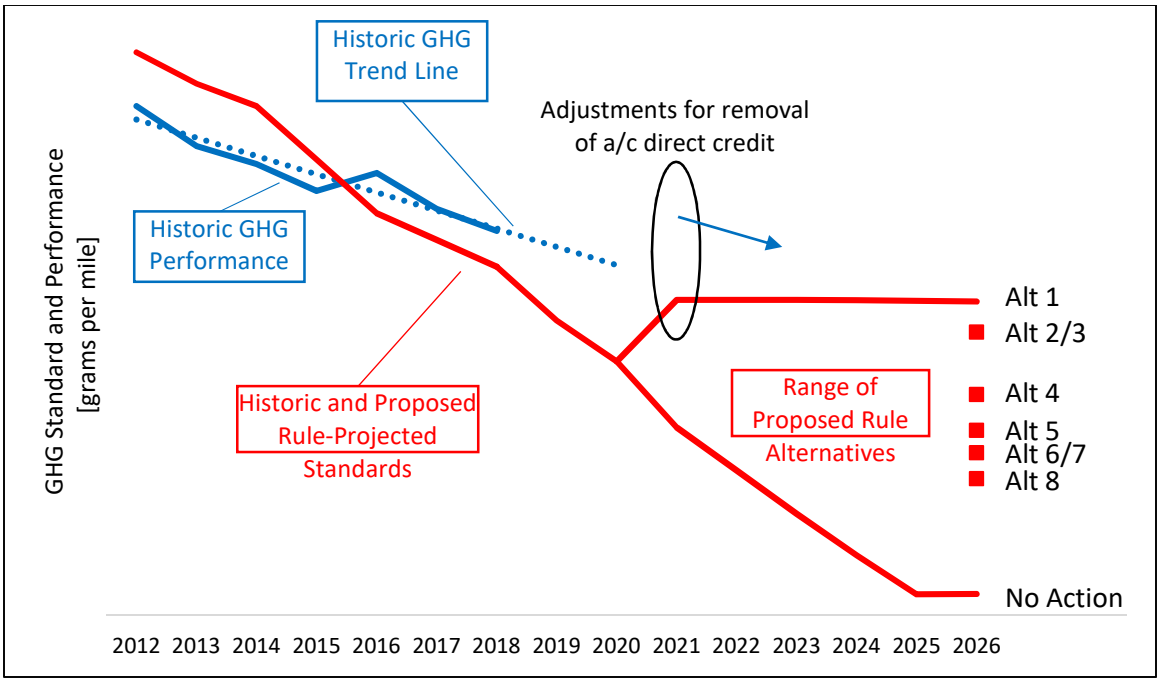

Figure 2.6: GHG standards and performance with linear trend line based on MY 2012-2018 performance improvements, MY 2012-2026. Manufacturers on average must increase the rate of GHG improvement beyond historic norms to return to a neutral compliance level.[58]

2.3.2. *The Rate of Performance Increase Required to Meet the Future Standards is Further Increased by the Need to Satisfy Any Debits Resulting from Under-Compliance in the Near- to Mid-Term*

The analysis described above assumes that manufacturers (on average) can start from estimated MY 2020 compliance levels below standard and improve in each year at a constant pace, eventually meeting returning to a neutral compliance position in the last year of annual increases in the standard envisioned by the alternatives presented in the Proposed Rule. However, this is unlikely to happen in practice. Manufacturers must satisfy any credit deficits (debits) within three years of their generation.[59] Thus, after running out of previously banked credits, manufacturers must first return to compliance neutrality and then exceed the standard to generate credits to satisfy any debits incurred in the ensuing years. This concept is demonstrated in Figure 2.7. This must all occur within the three-year time period allowed for over-compliance credits to be carried back for the purposes of satisfying prior shortfalls.

[58] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22 (MY 2012-2016 standards and performance); NOVATION ANALYTICS, *supra* note 33 (MY 2017-2018 standards and performance); *Compliance and Effects Modeling System*, *supra* note 26 (MY 2019-2026 standards) (Central Analysis for 2018 Proposed Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, Central_Analysis.7z\Central Analysis\output_CO2\CO2\reports-csv\compliance_report.csv; Linear performance projection: Linear best fit line of MY 2012-2018 performance data using Microsoft Excel). The best-fit line was translated 15 g/mi higher in MY 2021 to account for the average direct air conditioning credit level in MY 2025/2026 as included in the modeling analysis.

[59] *See* 49 U.S.C. § 42903(b); 86 C.F.R. § 86.1865-12(k)(8).

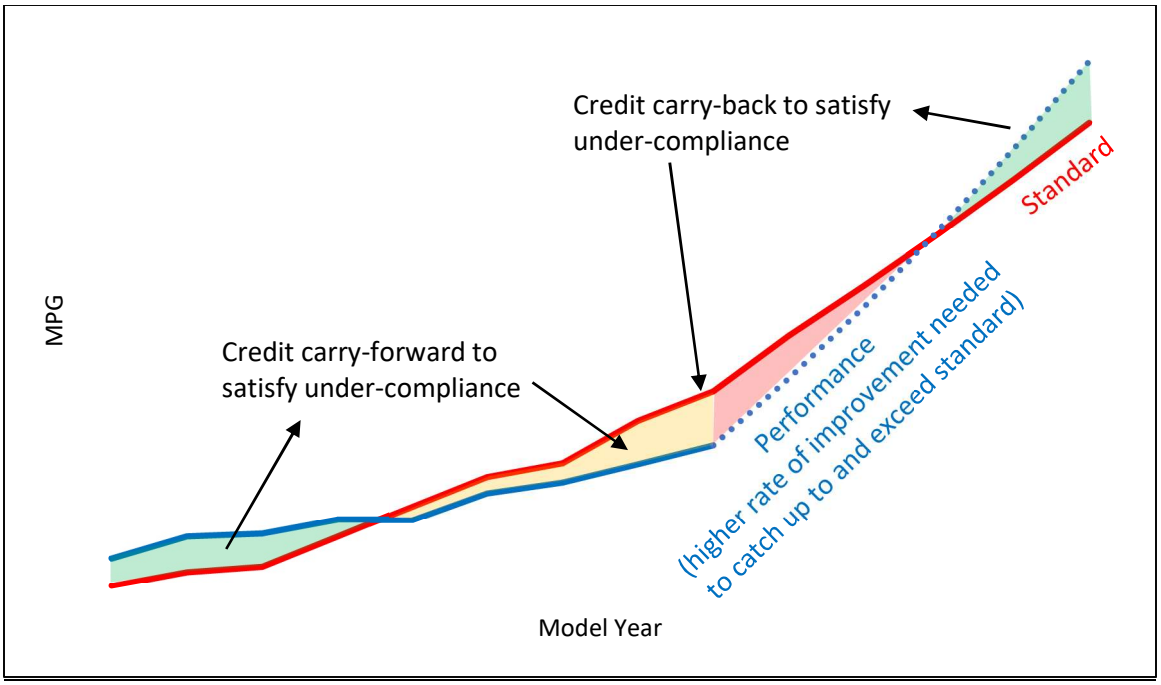

Figure 2.7: Conceptual demonstration of higher average annual rate of improvement required to meet future standards when starting from a negative compliance position and needing to satisfy debits from under-compliance.

2.3.3. *Other Regulatory Headwinds Will Increase the Challenge to Maintain and Increase the Annual Rate of Compliance Improvements*

Manufacturers are also facing additional challenges to improving CAFE and GHG compliance performance:

- Each incremental improvement requires the application of increasingly expensive technologies. High annual rates of improvement will likely require the application of technologies that provide compliance performance significantly better than the standards (e.g. strong electrification).
- A number of current compliance flexibilities expire in MY 2021 or earlier. Credit for flexible fuel vehicles are phased-out in the CAFE program, and were completely removed from the GHG program in MY 2016. Advanced technology vehicle incentives and incentives for more efficient pick-up trucks expire after MY 2021. Current regulations may require some manufacturers to add electric power generation emissions to their vehicles' tailpipe emissions. This Proposed Rule itself proposes to remove credits for lower global warming potential refrigerants, and in some alternatives under consideration, also remove credits for air conditioning system efficiency improvements and for off-cycle technologies. The Alliance acknowledges that the Proposed Rule also requests comment on extending and/or expanding some flexibilities, but unless and until such actions are adopted, decreasing flexibilities will create additional challenges.

- The Alliance anticipates that EPA will propose to add an adjustment to measured tailpipe CO2 for vehicles tested on E10 (Tier 3) certification fuel that will make all GHG test results higher (i.e. less compliant).[60]

These issues should be taken into consideration when adjusting the footprint standards and available flexibilities for meeting them.

2.4. How the Historical and Current Market for Electrification Compares to Projected Technologies Required for the No-Action Alternative

2.4.1. *Historical Market for Electrified Vehicles*

The market share for electrified vehicles remains very small. Accordingly, although these vehicles generally have much lower emissions and higher fuel economy, they have historically had little leverage for overall CAFE and GHG compliance in the U.S. fleet.

2.4.1.1. Hybrid-Electric Vehicles

After reaching a market share of 3.9% in the third quarter of 2013, the market share of hybrid electric vehicle ("HEVs") has retreated. In the second quarter of 2018, hybrid market share was at 2.5%, up a small amount from the preceding quarters (Figure 2.8).

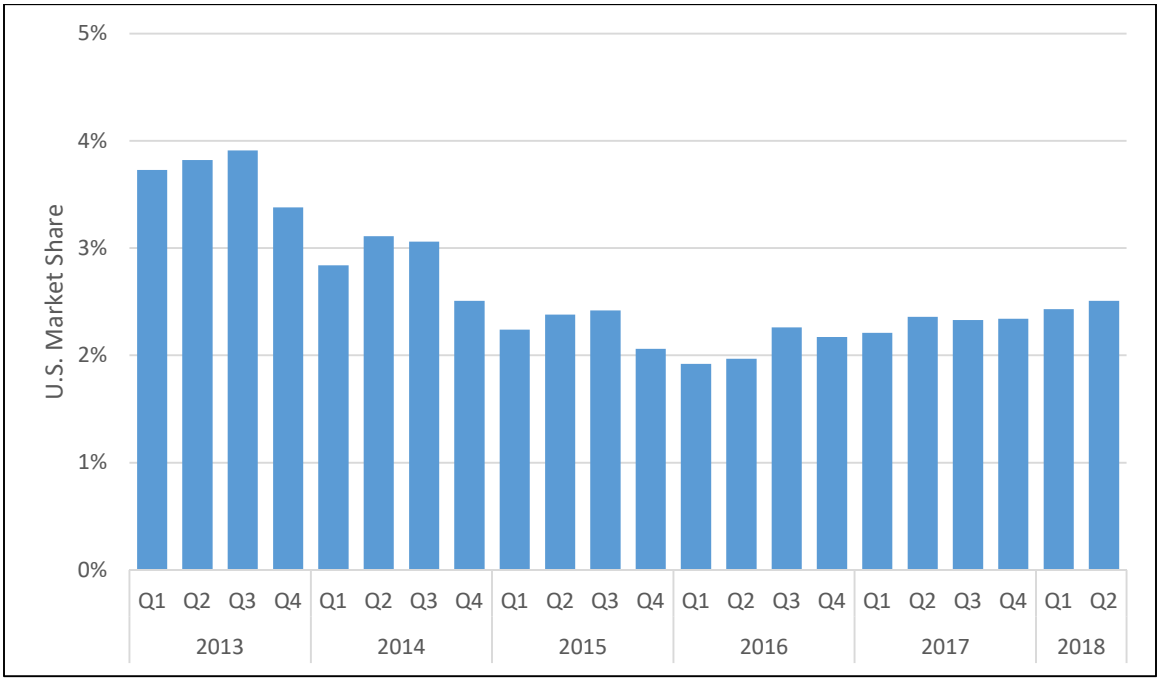

Figure 2.8: U.S. market share for HEVs.[61]

[60] *Fall 2018 Unified Agenda of Regulatory and Deregulatory Actions: RIN 2060-AT21*, OFFICE OF INFORMATION AND REGULATORY AFFAIRS, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201810&RIN=2060-AT21 (last visited Oct. 25, 2018).

[61] *Advanced Technology Vehicle Sales Dashboard*, ALLIANCE OF AUTOMOBILE MANUFACTURERS, https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/ (last updated Aug. 23, 2018) (data compiled by the Alliance of Automobile Manufacturers using information provided by IHS Markit).

2.4.1.2. Plug-In and Fuel Cell Electric Vehicles

The market share for plug-in vehicles has grown slowly over the past several years, reaching a high of 1.66% of the U.S. market in the second quarter of 2018. Fuel cell electric vehicle market share remains extremely low (less than 0.01% market share in the second quarter of 2018) with very limited model offerings, geographic availability and refueling infrastructure (Figure 2.9).

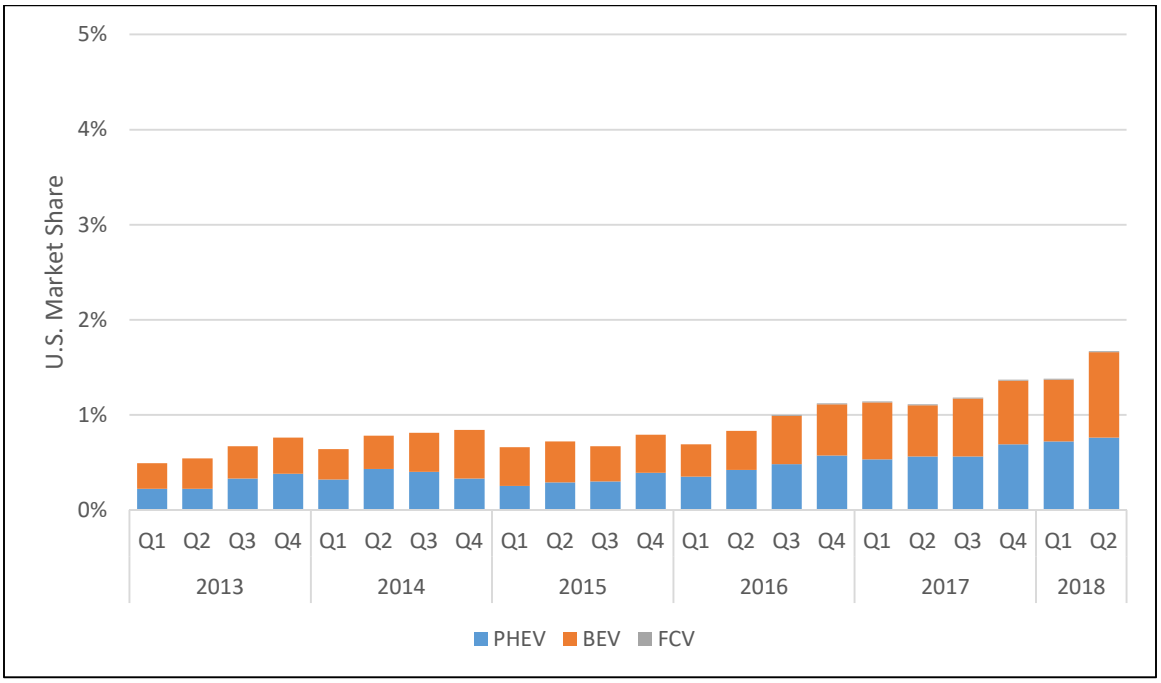

Figure 2.9: U.S. market share for plug-in and fuel cell electric vehicles.[62]

2.4.2. *Predictions for Electrification Under the No-Action Alternative*

In response to the 2016 Draft Technical Assessment Report ("DTAR"),[63] 2016 EPA Proposed Determination,[64] and 2017 MTE Reconsideration,[65] the Alliance of Automobile Manufacturers submitted comments describing that much higher electrification than is currently economically

[62] *Advanced Technology Vehicle Sales Dashboard*, *supra* note 61.
[63] Alliance of Automobile Manufacturers, Alliance of Automobile Manufacturers Comments on Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025 (EPA-420-D-16-900, July 2016) at ii (Sept. 26, 2016), *available at* Regulations.gov at Docket ID EPA-HQ-OAR-2015-0827-4089 and NHTSA-2016-0068-0072 (hereinafter "Alliance DTAR Comments") at ii.
[64] Alliance of Automobile Manufacturers, Alliance of Automobile Manufacturers Comments on Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation at 4 (Dec. 30, 2016), *available at* Regulations.gov at Docket ID EPA-HQ-OAR-2015-0827-6156 (hereinafter "Alliance 2016 EPA Proposed Determination Comments").
[65] Alliance Comments on the Request for Comment on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards at 17, 42, and 52 et seq. (Oct. 5, 2017), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2015-0827-9194 (hereinafter "Alliance MTE Reconsideration Comments").

supportable in the market will be needed to meet the current GHG and augural CAFE standards for model years 2022-2025 (i.e. the no-action alternative).

These views are supported by the analysis provided with the Proposed Rule, Figure 2.10. From a baseline of less than 3% electrification (including mild hybrids) in 2016, the Volpe Model projects that manufacturers will need to expand the market for electric vehicles to over 55% market share under the no-action alternative. Strong hybrids (<2% market share in the MY 2016 baseline) grow to over 16%.[66] Belt-integrated starter generator (BISG) systems increase to 19% of the market by MY 2020 as compared to a market with virtually no penetration today. Additional strong electrification required to meet the zero emission vehicle ("ZEV") mandate was not modeled and would likely temper the need for strong and mild hybrid vehicles in favor of plug-in electric vehicles if included in the modeling.

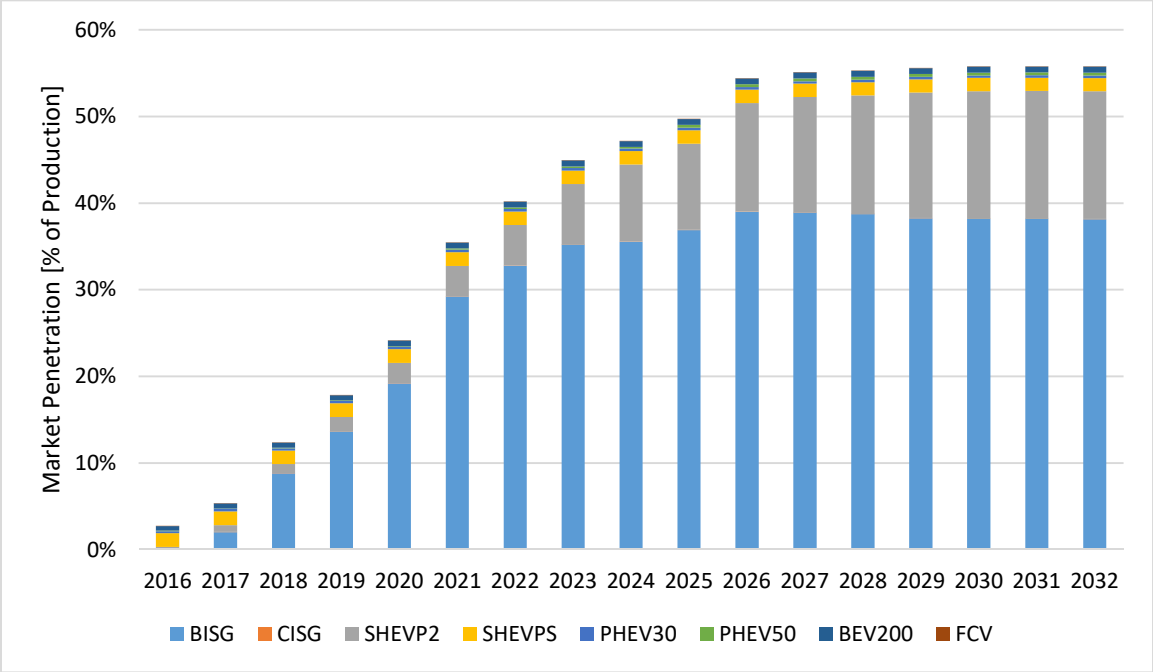

Figure 2.10: Projection of vehicle electrification under the no-action alternative CAFE standards.[67]

Other sources also support the Proposed Rule analysis that the no-action alternative will require significant increases in vehicle electrification. These include materials from Novation Analytics, HD-Systems, and Fiat Chrysler.

At the SAE International High-Efficiency IC Engine Symposium in April 2018, Greg Pannone (Novation Analytics) described the CAFE potential of an ICE-dominated future fleet. One of his slides shows the U.S. fleet achieving roughly the same CAFE level in MY 2025 as the CAFE standards require in MY 2021 (Figure 2.11). Also, in peer-reviewed research, Pannone et al. found

[66] We further note that strong hybrid penetration grows to 24% for the rulemaking (EPCA-constrained) CAFE analysis. 83 Fed. Reg. at 43,267 tbl.VII-6.
[67] Volpe Model output files, unconstrained CAFE central analysis technology utilization report.

that, "The U.S. future standards cannot be achieved without higher levels of electrification than has been previously estimated by NHTSA and EPA."[68]

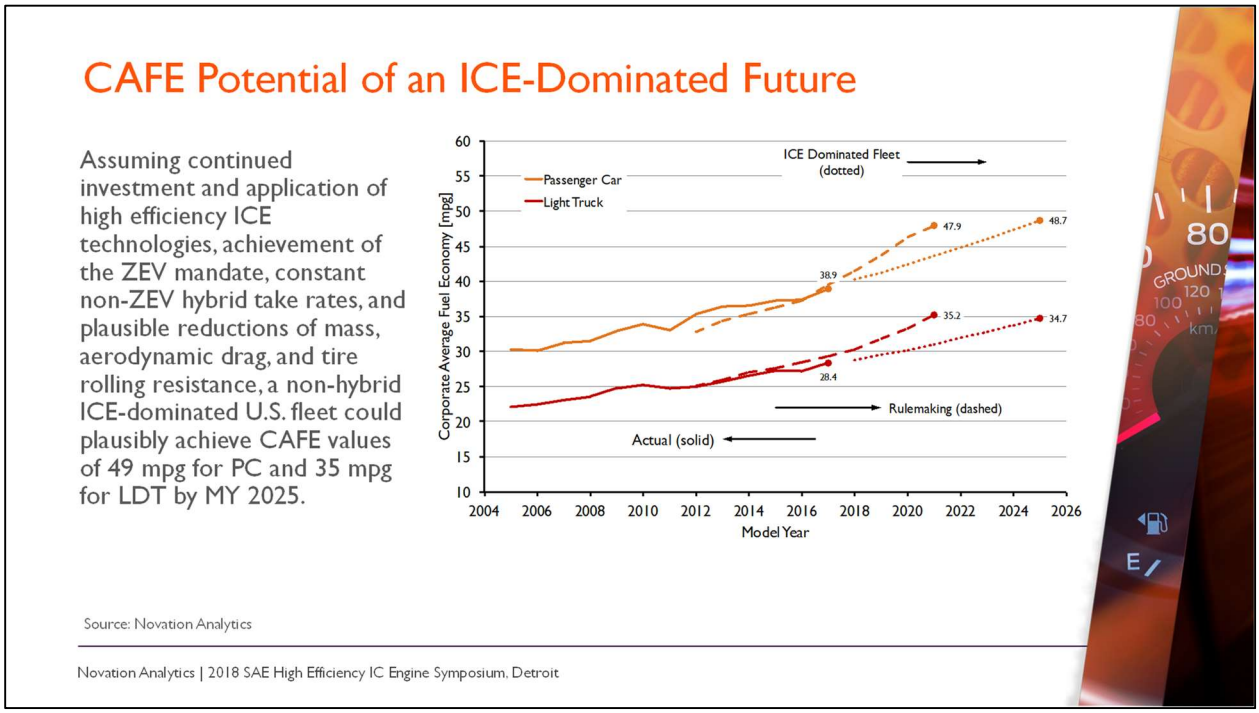

Figure 2.11: Excerpt from "What's the Role of the ICE Going Forward" showing that an ICE-dominant fleet in MY 2025 will achieve a CAFE performance level roughly equal to MY 2021 standards.[69]

K.G. Duleep (HD-Systems) also describes:[70]

- "…our recent analysis of manufacturers' product plans here at H-D Systems suggest that a large number of new hybrid and electric models must be introduced in the near future in order for firms to comply…
- "…if all conventional technology must be used to meet the 2025 requirements on the base vehicle, as EPA and NAS predict, then accounting for sales of many high line models means that conventional technology will fall short of the requirements.
- "…additional technologies will include more hybrid-electric vehicles and all-electric or other renewable fueled vehicles.
- "Luxury car manufacturers face the same issue on all their models.
- "We find that the ability to continue to sell high line, luxury, and sports cars, as well as increased volumes of smaller SUVs, will require hybrid sales to increase modestly to 2020 but

[68] Gregory Pannone et al., *Decomposing Fuel Economy and Greenhouse Gas Regulatory Standards in the Energy Conversion Efficiency and Tractive Energy Domain*, 10 SAE INT. J. FUELS LUBR. 202 (2017), *available at* https://doi.org/10.4271/2017-01-0897. The reference to previous estimations refers to certain EPA and NHTSA assessments made prior to the Proposed Rule.

[69] Gregory Pannone, What's the Role of the ICE Going Forward, Presentation at SAE International High Efficiency IC Engine Symposium at 17 (Apr. 8, 2018). Used with permission of Novation Analytics.

[70] K.G. Duleep, *Complying with the CAFE Standards: Will It Be More Difficult Than Predicted?,* RESOURCES FOR THE FUTURE (Feb. 11, 2016) http://www.rff.org/blog/2016/complying-cafe-standards-will-it-be-more-difficult-predicted.

sharply by 2025, when the market penetration of hybrid and electric vehicles will have to exceed 15 percent for many manufacturers.

- "…with the exception of Toyota, such vehicles make up less than 3 percent of sales for most manufacturers today."

2.5. The Only Vehicles That Currently Meet the MY 2025 Standards Under the No-Action Alternative Are Hybrids, Plug-In Electric Vehicles, and Fuel Cell Electric Vehicles

Continuing the trend from past years, the only MY 2018 vehicles that meet the MY 2025 no-action alternative standards are equipped with hybrid, plug-in electric, or fuel cell technology (Figure 2.12). Their collective market share in MY 2018 is approximately 3%. The 3% number even assumes that off-cycle credits are applied according to Agency projections.

In the past, others have expressed a belief that the presence of vehicles compliant with future model year standards is indicative of the appropriateness of the current GHG and augural standards (i.e. the Proposed Rule no-action alternative). However, such comments fail to recognize that in any given model year there is likely to be a wide range of fuel economy and greenhouse gas performance around any specific vehicle's individual target. Vehicles that are over-compliant to target for a given model year (i.e. those that are also compliant with future model year targets) are necessary to average against vehicles that are under-compliant to the current model year target for a given model year. Novation Analytics describes, "Assuming a normal distribution of unit sale versus CO2 and fuel economy performance, approximately 50% of the vehicles will need to achieve or exceed the footprint standards (with credits) in order for the fleet to achieve in-year compliance."[71] Therefore, the mere existence of vehicles which comply with future model year standards is not particularly informative as to whether a future standard is achievable or not.

[71] NOVATION ANALYTICS, *supra* note 33, at 71.

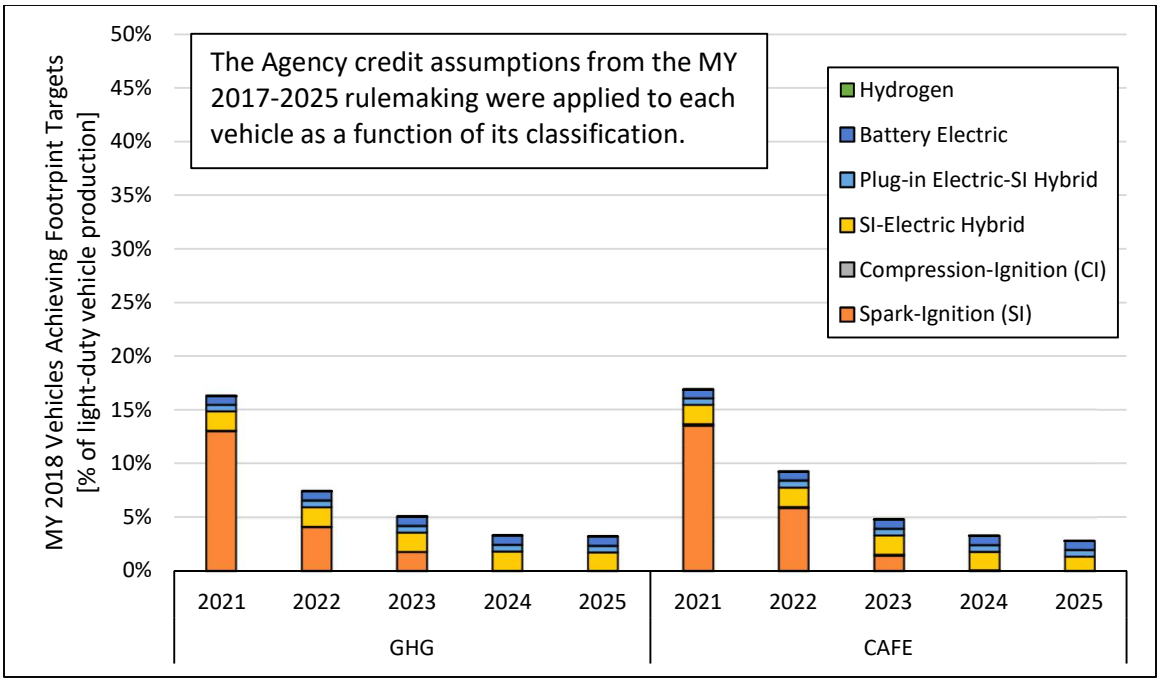

Figure 2.12: Percentage of MY 2018 vehicle production meeting the no-action alternative future model year standards by vehicle technology type.[72]

Of greater importance is the types of technologies that vehicles must utilize in the future to achieve a given level of performance and the consumer acceptance of those technologies. Also, potentially more indicative of the feasibility of the standards is the percentage of compliant vehicles produced a given number of years in the future, e.g. five years ahead. In MY 2015, the last year in which manufacturers were over-compliant to annual targets, almost 18% of vehicle production also met MY 2020 CAFE standards (five years ahead). Even at that rate and with a compliant fleet in MY 2015, manufacturers on average fell behind in MY 2016-2018 as described elsewhere in these comments. In comparison, in MY 2018 approximately 5% of vehicle production meets the MY 2023 standards (five years ahead).[73]

2.6. Critique of *Supplying Ingenuity II: U.S. Suppliers of Key Clean, Fuel-Efficient Technologies* (BlueGreen Alliance, Natural Resources Defense Council)

The BlueGreen Alliance and Natural Resources Defense Council ("NRDC") have previously described their study *Supplying Ingenuity II: U.S. Suppliers of Key Clean, Fuel Efficient Technologies* in support of the current GHG and augural CAFE standards.[74]

[72] Data from NOVATION ANALYTICS, *supra* note 33, at 75, 81, reformatted by the Alliance of Automobile Manufacturers.
[73] NOVATION ANALYTICS, *supra* note 33, at 81.
[74] NATURAL RESOURCES DEFENSE COUNCIL & BLUEGREEN ALLIANCE, SUPPLYING INGENUITY II: U.S. SUPPLIERS OF KEY CLEAN, FUEL EFFICIENT TECHNOLOGIES (May 2017), *available at* https://www.nrdc.org/sites/default/files/supplying-ingenuity-clean-vehicle-technologies-report.pdf (hereinafter SUPPLYING INGENUITY II).

At the request of the Alliance, NERA Economic Consulting ("NERA") and Trinity Consultants ("Trinity") reviewed this study to assess its claims and the underlying support for them.[75] These consultants also reviewed the related report from BlueGreen Alliance titled *Driving Investment: How Fuel Efficiency is Rebuilding American Manufacturing*.[76] In its review, NERA and Trinity find that *Supplying Ingenuity II* fails to support its central claim that "strong" federal GHG and CAFE standards have created and will create significant job growth in the automobile industry.[77] In addition, Trinity and NERA identified serious shortcomings with the empirical information provided in support of Supplying Ingenuity II. The complete Review of Supplying Ingenuity II is included as Attachment 5 to these comments.

For these reasons and those more thoroughly explained in the *Review of Supplying Ingenuity II*, the Agencies should not rely upon *Supplying Ingenuity II* and the related *Driving Investment* studies in assessing maximum feasible fuel economy and GHG standards for MY 2021–2026 vehicles.

[75] Trinity Consultants and NERA Economic Consulting, Review of *Supplying Ingenuity II*, Prepared by BlueGreen Alliance and Natural Resources Defense Council (Mar. 27, 2018) (hereinafter REVIEW OF SUPPLYING INGENUITY II). Available as Attachment 5 to these comments.

[76] BlueGreen Alliance, Driving Investment: How Fuel Efficiency is Rebuilding American Manufacturing (Jan. 2018), *available at* https://www.bluegreenalliance.org/wp-content/uploads/2018/01/Driving-Investment-report-v7.pdf (hereinafter DRIVING INVESTMENT).

[77] REVIEW OF SUPPLYING INGENUITY II, *supra* note 75, at E-1.

APPENDIX 3: PREFERRED STRUCTURE OF STANDARDS

3.1. One National Program

The Alliance would prefer final standards that are supportable by automakers, the Agencies, and California to enable the continuation of One National Program. There are many positive reasons for doing this as described in our transmission letter. Here the Alliance provides additional analysis regarding potential outcomes if the One National Program approach is not preserved.

3.1.1. *A Bifurcated California and Federal Program Would Likely Result in Minimal Improvements in Automotive GHG Emissions in California and Other States Following California Standards*

A 50-state program not only allows manufacturers to make predictable investments, it could secure more GHG and fuel reductions than under a possible split between Federal and California standards. Even using a mathematical average, or weighting, of two different standards does not provide a clear picture of what the resulting tons or gallons saved or cost of the programs would be.

When one takes into account the leakage between two GHG programs and one program is nested within the other, the encompassing program can have a greater effect on the final compliance values than the inset program.[78] Indeed, the inset program serves mainly to create a heterogeneous mix of vehicles across the two programs and could serve to increase cost while providing little benefit. One estimate put the leakage between a split California and Federal programs at roughly 65%. In layman's terms, one paper estimates leakage due mainly to sales in non-CA-LEV states will offset the gains in the CA-LEV states by 65% beyond the sales weighted average of the CA-LEV and non- CA-LEV states. This same paper also calculates that a split program will result in net welfare changes in the CA-LEV adopting regions to be negative while the non-adopting regions will see a welfare benefit. In addition, for the need to provide automakers with predictable investment decisions, One National Program will also lock-in GHG and Fuel Economy gains without the very real concerns of leakage, disparate welfare benefits across states, and possible decreases in vehicle choice by region.

3.2. Two-Wheel Drive Utility Vehicle Standard Adjustment

The last several years have witnessed an organic shift in consumer buying patterns away from higher-fuel economy small and mid-size passenger cars toward more capable crossovers and utility vehicles. Industry and regulators clearly did not anticipate this market shift when regulations were finalized in 2012. The forecasts referenced by the Agencies at that time showed cars increasing from 50% to 57% of annual vehicle sales by 2025. Instead, passenger cars have significantly dropped to 38% of the total fleet by 2017—the opposite of the expected trend. Over that same period, the utility vehicle market share has grown from 30% to over 40%.[79]

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[78] *See* Lawrence H. Goulder et al., *Unintended Consequences from Nested State and Federal Regulations: The Case of the Pavley Greenhouse-Gas-Per-Mile Limits*, 63 J. ENVT'L ECON. & MGMT. 187 (2012).
[79] NOVATION ANALYTICS, *supra* note 33, at 24.

This shift in consumer preference presents a compliance challenge, even in a system with footprint-based standards. A two-wheel drive ("2WD") utility or crossover vehicle with a gross vehicle weight rating ("GVWR") of less than 6,000 pounds ("lbs") is not allowed by regulation to be in the light-duty truck fleet, while a similar vehicle over 6,000 lbs GVWR would be permitted in the light-duty truck fleet. One of these smaller 2WD utility or crossover vehicles, with the same powertrain and technology as a sedan with a smaller footprint, gets 2–4 fewer miles per gallon ("mpg") without adjustment to its standard (see Figure 3.1).[80] With U.S. gas prices remaining low, consumers are showing that they are willing to make a fuel economy trade-off for the versatility of a crossover or sport utility vehicle ("SUV"). This is a significant contributing factor to the growing industry compliance gap, which needs to be addressed in this rulemaking.

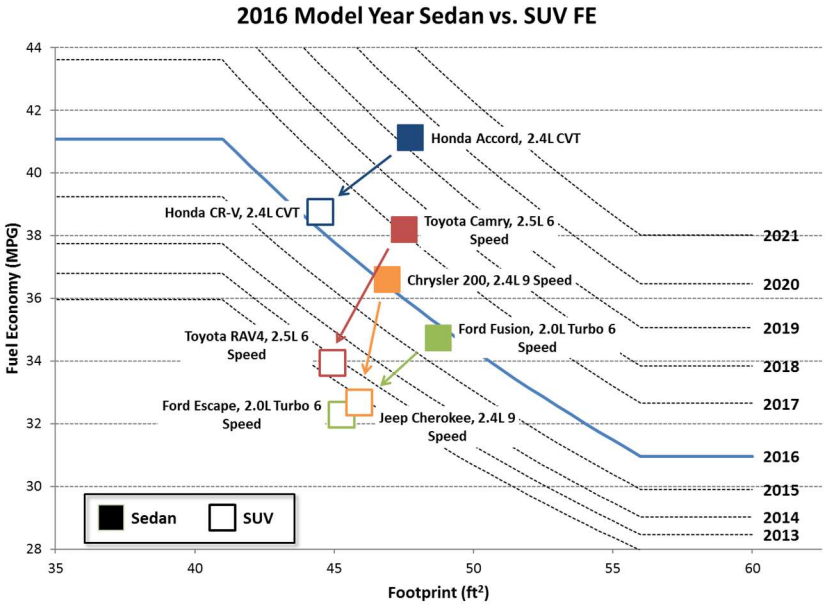

Figure 3.1: Passenger car & 2WD SUV comparison.

Given the magnitude of the compliance challenge for these vehicle types, manufacturers may choose to change the drivelines available in the vehicles they offer customers in order to comply with the more appropriate light-duty truck standard. This may be more affordable compared to the investment in fuel-saving technologies for crossover and SUV vehicles to achieve compliance with the passenger car standards. Alternatively, increasing the vehicle size and/or load capacity to achieve a GVWR of at least 6,000 lbs is another means of shifting the compliance requirement to the light-duty truck standard. Both options have the unintended consequences of burning more fuel and emitting more CO_2.

Additionally, the industry mix shift towards SUV and crossover vehicles increases the difficulty of meeting the Domestic Minimum Standard ("DMS") since the smaller 2WD utility and crossover

[80] Footprint data from *Compliance and Effects Modeling System*, *supra* note 26 (CAFE Model for 2018 Proposed Rule for Model years 2021-2026 Passenger Cars and Light Trucks Central Analysis, 2018_Proposed Rule_market_inputs_ref.xlsx); Fuel Economy data from *Download Fuel Economy Data,* U.S. DEPARTMENT OF ENERGY, https://www.fueleconomy.gov/ (2016 FE Guide for DOE-OK to release-no-sales-4-27-2017Mercedesforpublic.xlsx) (last visited Oct. 26, 2018)..

vehicles tend to reduce the overall compliance of the passenger car fleet. The DMS is currently established based on a forecast model mix, and does not adjust for a customer-driven shift in that mix.

Ultimately, these smaller 2WD SUVs and crossover vehicles have a combination of truck-like characteristics that customers prefer—elevated/off-road ground clearance and seating position coupled with expanded cargo carrying ability.

There are two possible solutions to address the conflict between consumer desires and the current regulation.

3.2.1.1. Preferred Solution: Revise the Light-Duty Truck Classification

One solution to the 2WD utility and crossover vehicle challenge is a shift of these vehicles to the light-duty truck fleet. In the Proposed Rule, NHTSA notes that:

> [Certain] vehicles that DOT "decides by regulation [are] manufactured primarily for transporting not more than 10 individuals" are, by statute, passenger automobiles . . . . NHTSA's regulation on vehicle classification, contains requirements for vehicles to be classified as light trucks either on the basis of off-highway capability or on the basis of having "truck-like characteristics." Over time, NHTSA has refined the light truck vehicle classification by revising its regulations and issuing legal interpretations. However, based on agency observations of current vehicle design trends, compliance testing and evaluation, and discussions with stakeholders, NHTSA has become aware of vehicle designs that complicate light truck classification determinations for the CAFE and CO_2 programs.[81]

We agree that NHTSA has the flexibility to consider regulatory changes to the truck-like characteristics of a vehicle, and that the exclusion of small SUVs and crossovers from the light truck classification is a complication. Including these vehicles in the light-duty truck fleet would simplify the situation by aligning standards with capability, similar to how their four-wheel drive variants and the larger 2WD versions are regulated. The elevated/off-road ground clearance and seating position, coupled with expanded cargo-carrying capacity of today's small SUVs and crossovers, reflect the truck-like characteristics that NHTSA can use in determining new regulations.

The Alliance proposes adding new criteria to 49 C.F.R. § 523.5(a) as follows:

> (6) Permit expanded use of the automobile for cargo-carrying and other non-passenger-carrying purposes through:
>
> (i) An extended roof-line and expanded cargo capacity with at least one row of seats that fold or stow to create a flat, leveled cargo surface extending from the forward most point of installation of those seats to the rear of the automobile's interior, and

[81] 83 Fed. Reg. at 43,438.

(ii) Less than 6000lb GVWR and meets 4 out of 5 off-road criteria as defined in paragraph (b)(2) of this section.

This change would address both the mismatch of the standards with this type of vehicle, and industry concerns with achieving the DMS requirement.

3.2.1.2. Alternative Solution: Provide Passenger Car Fleet Adjustment

While the Alliance sees no issue with a regulatory change that would determine small SUVs and crossovers to be non-passenger automobiles, we have an alternative proposal if reclassification is problematic.

To account for the unique capabilities of this customer-demanded segment, the Agencies could provide an adjustment to the CO_2 and fuel economy requirements, either directly by easing the standard by approximately 40 g/mi, or indirectly through an offset of the model type footprint by about 12 square feet, see Figure 3.2.

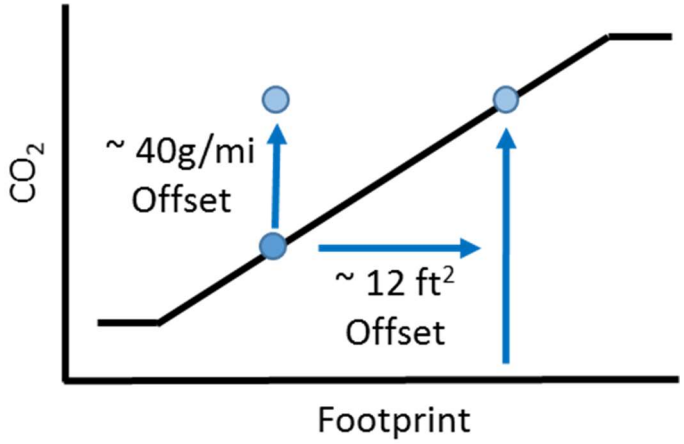

Figure 3.2: Proposed footprint standard adjustment for 2WD SUVs and crossovers in the passenger car fleet.

Although this proposed method applies an offset in CO_2 by 40 g/mi, it is independent of the actual difference in standards between the passenger car and light-duty truck compliance curves at a given footprint. A regulatory offset to the footprint has an additional complication in that the modified footprint may land in the upper flat standard portion of the curve and thus achieve less than the intended CO_2 relief.

For these reasons, this method is less preferred than the proposed shift of this segment to the light-duty truck fleet.

In conclusion, a CO_2 adjustment of footprint offset would help account for the higher fuel consumption and CO_2 emissions of this customer-demanded segment, and should be considered if NHTSA cannot revise the regulations that define the truck-like characteristics of vehicle classifications.

3.3. Structure of Standards and Flexibilities

The ultimate stringency of any standard is a combination of the footprint-based targets and flexibilities.[82] To the degree flexibilities and incentives are not completely aligned between the CAFE and GHG programs, there must be an offset in the associated footprint-based targets to account for those differences. Some areas of particular concerns are air conditioning refrigerant credits, and incentives for advanced technology vehicles. The Alliance urges the Agencies to seek harmonization of the standards and flexibilities to the greatest extent possible, while also seeking to identify pathways to a mutually agreeable One National Program.

3.4. The Standard Set Should Take into Account the Necessity of Any Stringency Changes Arising from the Tier 3 Change to E10 Test Fuels

The Alliance most recently addressed the issue of incomplete regulations for implementing the Tier 3 final rule change to test fuels (the "MY 2020 Cliff") in its October 5, 2017 comments to EPA on the reconsideration of the final determination.[83] In 2013, EPA finalized the Tier 3 light-duty vehicle emissions final rule regulations, which require the use of 10% ethanol ("E10") test fuel for fuel economy and CAFE testing by MY 2020; however, EPA still has not issued the regulatory changes necessary to enable such testing. This delay has eroded the needed lead time for this changeover, making the MY 2020 deadline infeasible. The lack of a defined phase-in also creates considerable uncertainty in manufacturers' product development and compliance planning processes.

Industry, in written comments to EPA, has proposed several ways to address the incomplete regulations, ranging from the issuance of a test procedure adjustment concurrent with the Tier 3 final rule to, more recently, the issuance of a stand-alone, limited-scope rulemaking to postpone the MY 2020 deadline for the test fuel changeover. In August 2018, industry requested that EPA release a letter that would have the effect of assuring no adverse action against industry in the absence of EPA updating the testing regulations. Industry urges EPA to address test procedure adjustments in this final rule because there are no provisions in existing regulations to test on zero percent ethanol ("E0") or E10 starting in MY 2020, industry requested that EPA issue an extension of the Tier 2 testing provisions (using E0) in 40 C.F.R. § 600.117 past their current expiration date at the end of MY 2019.

The provisions of 40 C.F.R. § 600.117 were put in the Tier 3 rule as a stopgap measure until EPA could incorporate the necessary changes to allow E10 testing for fuel economy and GHG emissions via new rulemaking. EPA did not intend for a lack of new updated regulations to create the current situation where the MY 2020 regulations do not permit testing for fuel economy and GHG reporting on either fuel (E0 or E10).

[82] This is not to say that the Agencies should assume that any given manufacturer (or manufacturers as a whole) will be able to make full use of all flexibilities in combination or individually. Each manufacturer is more likely to make use of various flexibilities as they fit into their particular product, technology, and market plans. As such, to the extent possible, the Agencies should keep "flexibilities" as optional ways to comply and not unduly assume that each flexibility allows additional stringency of footprint-based standards.

[83] Alliance MTE Reconsideration Comments, *supra* note 65, at 79.

When EPA releases updated test procedure regulations, they should include an adequate phase-in period for the new requirements. There would be a great testing burden for manufacturers if the new regulations did not adequately provide for reasonable carry-over and sequencing of tests or for the unnecessarily added complexity to adjust only certain test results. While the Alliance is appreciative of EPA staff's acknowledgement of the need for a phase-in as it promulgates the new test procedures, the Alliance requests that EPA require that the new test procedures apply only to new vehicles (not carry-over vehicles) to reduce test burden and unnecessary retesting of previously certified vehicles.

In addition, the Alliance requested that the EPA provide manufacturers with an updated recommended method for calculating the Net Heating Value and Carbon Weight Fraction of federal Tier 3 emissions gasoline. EPA has recognized in previous guidance letters that corrections to the Net Heating Value and Carbon Weight Fraction methods published in the Code of Federal Regulations are required.[84,85] The Alliance asks that EPA apply updates to the methods from letter CD-95-09 and adopt the use of modified ASTM International ("ASTM") Test Methods D3338 and D3343 for fuels containing ethanol rather than MTBE in the forthcoming rulemaking. Again, the Alliance is appreciative of EPA staff's acknowledgement of the need to adopt the use of these modified methods.

Finally, as EPA and NHTSA evaluate and arrive at a final preferred regulatory alternative, the Agencies should determine if there is a need to explicitly take into account any stringency adjustment for the Tier 3 change to E10 test fuels for fuel economy GHG and CAFE testing. The Agencies should undertake this determination within this rulemaking because considerations that could affect stringency should not be considered as separate issues but should be handled together through a comprehensive evaluation. Performing this evaluation within the current rulemaking reduces the need for additional rulemakings in accordance with Presidential Executive Orders 13777 and 13781, and is the most logical and efficient approach to evaluating the necessity of stringency adjustments or otherwise adding CO_2 to vehicle test results.

3.5. Domestic Passenger Car Minimum Standards Should Be Adjusted

The Alliance supports NHTSA's proposal that the domestic minimum standard be determined as a range during rulemaking and resolved into a final value after the model year is completed. This will lead to more accurate DMS values, and will correct the currently high DMS value.

[84] EPA recognized that the methods contained in 40 C.F.R. § 600.113 are not applicable to Phase II test fuel and other oxygenated fuels. Letter from Robert E. Maxwell, Director of the Certification Division, Office of Mobile Sources, U.S. Environmental Protection Agency, to Manufacturers, CD-94-16, Protocol for MPG Calculations for Vehicles Tested on Phase II Gasoline (Aug. 5, 1994), *available at* https://iaspub.epa.gov/otaqpub/display_file.jsp?docid=14096&flag=1.

[85] EPA provided in this guidance revised NHV and CWF calculations based on ASTM D3338 and D3343 for MTBE containing fuels. This provides a precedent for revising the fuel economy equations for Net Heating Value and Carbon Weight of Fuel. Letter from Robert E. Maxwell, Director of the Certification Division, Office of Mobile Sources, U.S. Environmental Protection Agency, to Manufacturers, CD-95-09, MPG Calculations for Certification Vehicles Tested on California Phase 2 Gasoline (June 1, 1995), *available at* https://iaspub.epa.gov/otaqpub/display_file.jsp?docid=14107&flag=1.

The Alliance notes that the error leading to a higher DMS was not an error in NHTSA's methods; it is simply a manifestation of the market shift that has occurred since the standards were promulgated in 2012. This drift in projections is the same phenomenon that NHTSA observed in the DTAR where the combined fleet target was predicted to fall from the 48.7 mpg determined in the 2012 final rule to 46.3 mpg under the same augural standard scenario. The change in target was simply due to a market shift toward larger-footprint vehicles.

Figure 3.3 below shows the error that has developed in the DMS due to it being developed from a projection in 2012 using MY 2008 and 2010 fleets. The error in MY 2018, based in pre-model year reports, is expected to be 1.1 mpg.

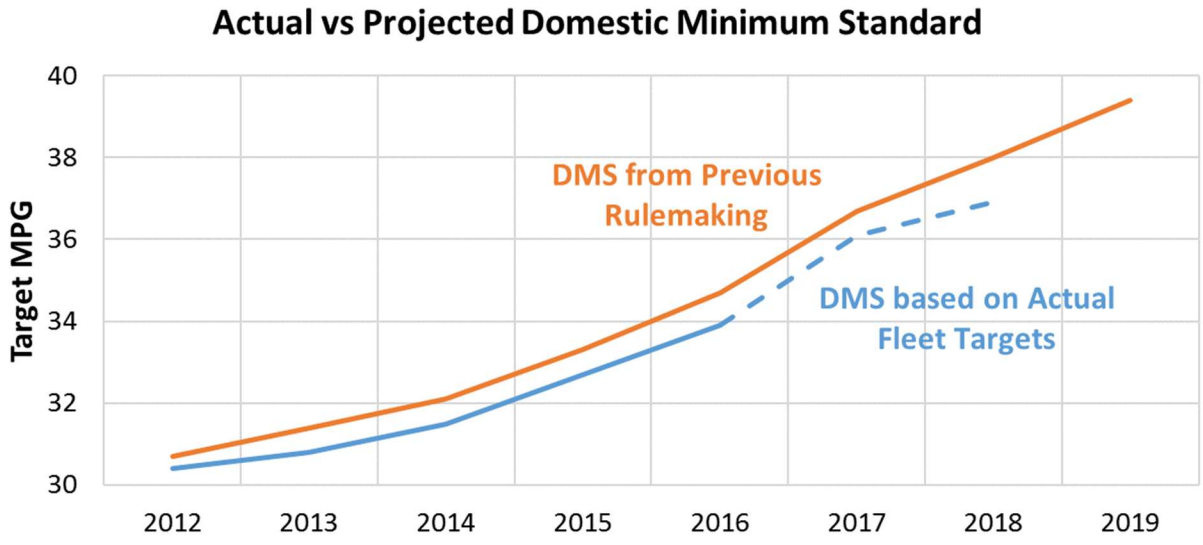

Figure 3.3: Actual versus project minimum standard.

A significant question here is whether the DMS is subject to the 18-month lead time requirement. The Alliance previously commented that the 18-month lead time requirement should apply to the DMS[86]; however, the Alliance now finds that interpretation to have been incorrect.

EPCA requires NHTSA to prescribe fuel economy standards at least eighteen months before the beginning of the model year.[87] The standards that are promulgated during rulemaking, however, are the footprint target curves—not the single numerical value against which any fleet's average fuel economy value is compared. That value cannot be determined until after the model year is completed.

There is no dispute that NHTSA is fulfilling its statutory obligations by publishing only the footprint target curves during rulemaking. The final standard for individual fleets, as such, is not subject to the 18-month lead time requirement. The same logic should apply to the DMS.

It is appropriate and required by statute that NHTSA project the DMS during rulemaking so that manufacturers can plan accordingly, but the Alliance does not find that the 18-month lead time

[86] 75 Fed. Reg. 25,323, 25,614 (May 7, 2010).
[87] 49 U.S.C. § 32902(a).

requirement should be more restrictive of the DMS than any other fleet target. Therefore, the Alliance requests that NHTSA not only establish a range for the DMS in future rulemakings, but that it also correct the DMS after the model year is completed, for all model years moving forward.

3.6. Methane and Nitrous Oxide Standards

EPA seeks comment on whether to proceed with its proposal to discontinue accounting for methane (CH_4) and nitrous oxide (N_2O) emissions as part of the CO_2 emissions standards, in order to provide for better harmony with the CAFE program, or to continue to consider these elements as factors toward compliance and retain them as a feature that differs between the programs. EPA is also asking for comment in consideration of a more-realistic proposed standard derived from updated data.

Specifically, in the Proposed Rule[88] EPA seeks comment on whether to change the existing CH_4 and N_2O standards that were finalized in the 2012 rule.[89] EPA seeks information on whether the existing CH_4 and N_2O emissions standards are appropriate, or whether they should be revised to be less stringent or more stringent based on any updated data. EPA further proposes, if it moves forward with its proposal to eliminate these factors, to consider whether it is appropriate to initiate a new rulemaking to regulate these programs independently, which could include an effective date that would result in no lapse in regulation of emissions of CH_4 and N_2O.

3.6.1. *Discontinuation of Accounting for CH_4 and N_2O Emissions*

The Alliance supports EPA's proposal to discontinue accounting for CH_4 and N_2O emissions as part of the CO_2 emissions standards. As explained by the Agencies, this would provide better harmony with the CAFE program.

This position is consistent with the Alliance's recommendation to the EPA, made in comments to the proposed rule issued in 2012, that, based on actual emission levels, CH_4 and N_2O should not be regulated as GHG emissions.[90] The Alliance notes that data from the 2016 EPA report on light-duty vehicle emissions supports the position that CH_4 and N_2O have minimal impact on total GHG emissions, reporting only 0.045% in exceedance of the standard.[91] This new information makes it apparent that CH_4 and N_2O contribute a *de minimis* amount to GHG emissions. Additionally, gasoline CH_4 and N_2O performance is within the current standards. Finally, the main producers of CH_4 and N_2O emissions are flex fuel (E85) and diesel vehicles, and these vehicles have been declining in sales as compared to gasoline-fueled vehicles.

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[88] 83 Fed. Reg. at 43,193; Technical Memorandum to Docket No. EPA-HQ-OAR-2018-0823, NHTSA-2018-0067, Air Conditioning Leakage Credits and Corresponding CO_2 Target Offsets (Aug. 2018), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2018-0283-0248.

[89] 75 Fed. Reg. at 25,422.

[90] *See* Letter from Julie C. Becker, Vice President of Environmental Affairs at the Auto Alliance, to the Air and Radiation Docket of the Environmental Protection Agency, and the Docket Management Facility of the U.S. Department of Transportation at 31–42 (Nov. 20, 2009), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2009-0472-6952.

[91] Calculated from data in 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at tbls.B-1, 3-23, 3-27, 3-28.

The Agencies should also note that CH_4 and N_2O have minimal opportunities to be catalytically treated, as N_2O is generated in the catalyst and CH_4 has a low conversion efficiency compared to other emissions. EPA did not intend that additional hardware should be required to comply with the CH_4 or N_2O standards on any vehicle, including flex fuel, plug-in hybrid electric, diesel, or compressed natural gas vehicles.

The Alliance comments from the 2012 rulemaking also noted that the technologies that could be used to measure N_2O were still evolving, and that some technologies represented a large increase in test burden as a result of the measurement process being an "offline" type of method that is not suited for use in a high-throughput testing environment like those found at auto manufacturer test labs.[92] The Alliance's previous comments on measurement burden concerns continue to be valid today, and the Alliance reiterated the need for relief in its comments to EPA on excessive regulatory burdens.[93]

Given the minimal impact of CH_4 and N_2O on overall GHG emissions, and to incentivize flex fuel, plug-in hybrid electric, diesel, and compressed natural gas vehicles for their GHG benefits, EPA should take this opportunity to discontinue the CH_4 and N_2O standards requirements and achieve harmony between programs.

3.6.2. *If EPA Does Not Discontinue Accounting for CH_4 and N_2O*

The Alliance recommends that EPA discontinue accounting for CH_4 and N_2O; however, if EPA decides not to do so, the Alliance recommends that the Agency take a number of actions.

3.6.2.1. EPA Should Reevaluate the Level of the CH_4 and N_2O Standards and Revisit the Underpinning Analyses

If EPA does not discontinue accounting for CH_4 and N_2O, then the Alliance requests that the level of the CH_4 and N_2O standards in grams per mile be reevaluated for appropriateness. EPA was guided by two principles in setting the CH_4 and N_2O standards.

In setting an N_2O standard in the 2012–2016 GHG Final Rule, EPA relied on an EPA test report of 17 tests on 12 flex fuel vehicles certified at EPA's lab in 2008 and 2009.[94] Based on those test results, EPA set the N_2O standard at two times the anticipated actual emissions level.[95] EPA noted several times that the N_2O standard was being set based on limited data on current vehicles,

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[92] *See* Letter from Julie C. Becker, Vice President of Environmental Affairs at the Auto Alliance, to the Air and Radiation Docket of the Environmental Protection Agency, and the Docket Management Facility of the U.S. Department of Transportation at 38–42 (Nov. 20, 2009), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2009-0472-6952.

[93] *See* Letter from Christopher Nevers, Vice President of Energy & Environment at the Auto Alliance, to Samantha K. Dravis, Regulatory Reform Officer and Associate Administrator of the Office of Policy at the Environmental Protection Agency 38–42 (May 15, 2017), *available at* Regulations.gov at Docket ID No. EPA-HQ-OA-2017-0190-37160.

[94] 75 Fed. Reg. at 25,422; Antonio Fernandez, Memorandum to Docket No. Docket EPA-HQ-OAR-2009-0472, N_2O Data from NVFEL Tests on Flex Fuel Vehicles Operating on E85 (Mar. 30, 2010), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2009-0472-11566.

[95] 75 Fed. Reg. at 25,422 ("The level of the N2O standard is approximately two times the average N2O level of current gasoline passenger cars and light-duty trucks that meet the Tier 2 NOX standards").

including limited recent EPA test data contained in the test report submitted to the docket.[96] Despite these data limitations, EPA went on to express confidence that "most if not all" vehicles would meet the set standard, because the standard would represent a level 100% higher than the average current N_2O level (as shown by the "limited" recent EPA test data).

EPA's March 30, 2010 test report provides evidence that some of the tested vehicles (namely, vehicles 2, 14, 15, and 17) shown in the graph would not be able to comfortably meet the proposed N_2O standard, including compliance margin. In retrospect, the 2010 EPA test report shows that the current standard did not achieve EPA's goals of setting a capping standard and not forcing reductions relative to today's low levels.

In fact, EPA acknowledged that advanced diesel or lean-burn gasoline vehicles of the future may face greater challenges meeting the CH_4 and N_2O standards than will the rest of the fleet.[97]

Furthermore, other concerns with the conclusions from EPA's test program used to set GHG standards for CH_4 and N_2O should be reevaluated:

- The INNOVA analyzers used in the program were not suited for measuring N_2O, as they exhibited excessive amounts of cross-interference from other constituents;
- The four non-zero data points in the "N2O from FFVs (E85) FTP City" chart were not included in setting a 0.010 g/mi cap standard, and as such do not conform to EPA's stated goal in setting the standard at such a level as to provide an adequate 50% margin of headroom for vehicle compliance; and
- The assumptions used for fuel usage for flex fuel vehicles, from 100% of ethanol-fueled operation, should be more accurately set at 1% ethanol-fueled operation.

3.6.2.2. Agencies Should Consider Implementing Alternative Forms of the Standard

If EPA continues accounting for CH_4 and N_2O, the Agencies should additionally, or as an alternative, consider supplemental changes to amend the methodology of compliance to minimize unnecessary compliance burdens. The Alliance recommends that the compliance methodology be changed to a fleet average program, with averaging, banking, and trading ("AB&T") of CH_4 and N_2O credits, allowing for accounting for under- and over-compliance with the standards, similar to other mechanisms already in place in the GHG standards. Such a structure would provide the flexibility to offset lower-performing applications. In addition, the value against which the standard should be evaluated should be an average of both FTP and HFET test cycles, in line with how CO_2 is established for the GHG standards.

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[96] 75 Fed. Reg. at 25,422. ("EPA has not previously regulated N2O emissions, and available data on current vehicles is limited. However, EPA derived the standard from a combination of emission factor values used in modeling light duty vehicle emissions and limited recent EPA test data.194 195 Because the standard represents a level 100 percent higher than the average current N2O level, we continue to believe that most if not all Tier 2 compliant gasoline and diesel vehicles will easily be able to meet the standards").

[97] *See* 75 Fed. Reg. at 25,422.

3.6.2.3. Agencies Should Keep Flexibilities Available

If despite the Alliance's recommendation EPA does not discontinue accounting for CH_4 and N_2O, and instead chooses to continue to regulate these substances either in the current manner or independently through a new rulemaking, then EPA should offer the flexibilities recommended by the Alliance as stated above. The availability of flexibilities to compensate for CH_4 and N_2O emissions with fleet averaging with AB&T, along with averaged FTP and HFET cycles, is a valuable strategy for achieving compliance with the standards. While not a preferred outcome, if EPA were to regulate CH_4 and N_2O through a separate new rulemaking, the proposed flexibilities would need to be included to allow a seamless transition of compliance for industry.

Considering the minimal contribution of CH_4 and N_2O emissions and the associated testing and reporting burdens, the Alliance suggests that the Agencies' goals can be achieved without regulation in this area. If this is not possible, the Alliance supports leaving CH_4 and N_2O in the current GHG regulations, with consideration of the above-mentioned adjustments to standards and supplemental flexibilities. The Alliance will work with the Agencies on any viable solution that addresses regulatory burden while providing a flexible solution.

APPENDIX 4: CONSUMER ACCEPTANCE

As the Alliance had said in our past comments to the DTAR, the Proposed Determination, and the Reconsideration of the Final Determination, consumer acceptance is a key consideration in determining the appropriate level of standards. The auto industry is committed to making continued technology improvements that reduce CO_2 emissions and increase fuel economy, but in order to deliver these technologies, the vehicles must still be affordable for consumers, and consumers must be willing to pay for the technologies. If consumer demand for new vehicles slows, vehicles with higher CO_2 emissions could remain in the in-use vehicle fleet longer.

4.1. The Alliance Supports a More Thorough Analysis of Consumer Acceptance

In the DTAR and Prior Final Determination, the Agencies neglected the potential impacts of consumer affordability and willingness to pay. The Alliance, as well as other stakeholders, submitted comments requesting a more thorough consideration of consumer acceptance, since the success of the standards relies on consumers purchasing vehicles with higher fuel economy and lower CO_2 emissions. The Alliance commends EPA and NHTSA for carefully considering the feedback they received from stakeholders, and updating their analyses to take a more rigorous look at this key factor.

In the Proposed Rule, the Agencies highlight how consumer affordability and willingness-to-pay impacted their overall decision on the standards. The Agencies' comments echo statements that other stakeholders, such as the Alliance, have said in previous comments. Technology costs for achieving the current standards are higher than were originally projected in the 2012 rulemaking, and fuel prices are lower than were previously projected. This results in consumers having to pay more up front, for less long-term benefit. Furthermore, as fleet-wide efficiency improves, the incremental benefit to consumers via gas savings decreases further. "Put simply, a one mpg increase for vehicles with low fuel economy will result in far greater savings than an identical 1 mpg increase for vehicles with higher fuel economy, and the cost for achieving a one-mpg increase for low fuel economy vehicles may be far less than for higher fuel economy vehicles."[98] The Agencies assert that consumers tend not to purchase vehicles that they do not want or need, which could ultimately result in lower sales volumes. This could negatively impact the overall program goals—resulting in consumers staying in older, less efficient vehicles longer. The Alliance agrees that these factors lacked adequate consideration in the DTAR and Prior Final Determination. We are appreciative that the Agencies put more consideration into consumer acceptance in the Proposed Rule.

The Agencies have also made significant strides toward improving their modeling of consumer behavior by adding new modules to estimate new vehicle sales and in-use vehicle scrappage in response to changes to new vehicle prices. The Alliance agrees that the Agencies should consider price effects on new vehicle sales and resultant vehicle scrappage impacts for the final rule and future rulemakings. The prior versions of the Agencies' models were very simplistic, focusing on payback period as the method for determining consumer willingness to pay; therefore, the Alliance has advocated for a more comprehensive analysis of consumer acceptance. We commend the

[98] 83 Fed. Reg. at 42,991.

Agencies for their efforts toward modeling such a complicated issue. As the Agencies continue to improve their modeling of consumer acceptance, the Alliance recommends that the Agencies review the methodologies used by NERA Economic Consulting and Trinity Consultants, as described in the report *Evaluation of Alternative Passenger Car and Light-Duty Truck Corporate Average Fuel Economy (CAFE) Standards for Model Years 2021-2026*, referenced in Appendix 1 in our comments. NERA Economic Consulting and Trinity Consultants used a state-of-the-art methodology and framework to estimate the market impacts and social impacts, resulting from three alternatives in the Proposed Rule relative to the no-action alternative. The Alliance encourages the Agencies to refer to this report as they continue developing modeling that best addresses this complex issue.

4.2. Affordability

The Alliance appreciates the Agencies' consideration of the potential impact of the standards on consumer affordability. Increases in vehicle prices, as well as other factors, are making new vehicles less and less affordable for some consumers, which can result in slower fleet turnover. The Agencies have specifically requested comment on the effect that increased prices, interest rates, and financing terms are expected to have on the new vehicle market.

As the Alliance has stated in our past comments, the average transaction price for new light-duty vehicles in the United States continues to climb. The estimated average transaction price for light vehicles in the U.S. in July 2018 was $35,359, up $985 since July 2017.[99] This increase is due in part to technology required to meet regulations. At the same time, interest rates have been rising, and are expected to increase even more into 2019,[100] which will increase monthly auto loan payments further. However, data shows that consumers are unwilling, or unable, to increase the share of their monthly budgets allocated to transportation costs. The portion of household budgets allocated to car payments has gone down, as shown in Figure 4.1 below, indicating that in general, consumers are not willing to increase the portion of their budget going toward a new car purchase. If, as a result of the need to add technology, vehicle prices increase further, consumers must either postpone vehicle purchases, buy used vehicles, or stretch out their loan period.

A number of journalists have also analyzed and described vehicle affordability concerns based on data from various independent sources. The Alliance directs the Agencies' attention to the example articles in the attached Bibliography of Articles Regarding Vehicle Affordability Concerns.

[99] *Demand Quickly Backing Away from Cars, Pushing Average New-Car Transaction Prices UP for July 2018, According to Kelley Blue Book*, KELLEY BLUE BOOK (Aug. 1, 2018), https://mediaroom.kbb.com/2018-08-01-Demand-Quickly-Backing-Away-from-Cars-Pushing-Average-New-Car-Transaction-Prices-Up-for-July-2018-According-to-Kelley-Blue-Book.

[100] *0 Percent Interest Deals Face Sunset*, AUTOMOTIVE NEWS (Sept. 3, 2018 12:01 AM), http://www.autonews.com/article/20180903/FINANCE_AND_INSURANCE/180909954/auto-financing-interest-rates-climb.

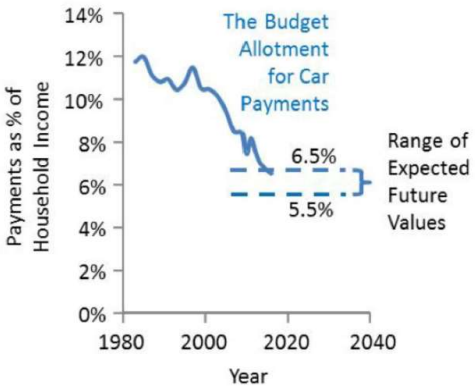

Figure 4.1: Budget allocation to car payments.[101]

Furthermore, some manufacturers, recognizing that consumers may not be willing or able to pay for this continued increase in fuel economy, have had to take measures to ensure they can be compliant with corporate average standards, such as offering incentives or reducing sticker prices. In the July 2018 article "How the $100,000 Pickup Came to Be,"[102] Bob Lutz asserts that this trend has negative implications, because when manufacturers cut prices of low fuel economy vehicles such as hybrids or electrified products, they must offset it somehow, and in some cases do so by increasing prices of larger vehicles, such as trucks and large SUVs.

> EVs and hybrids, despite breathless, unrelenting media hype, are not in great demand. . . . But sadly, these must be sold, and in sufficient quantity to satisfy the government. That means low prices, low lease rates, and, in almost all cases, losses for the manufacturer. . . . Full-size SUVs, large crossovers, anything high and with all-wheel drive is hot. Car companies need to remain solvent, so they adapt: "If we lose money on those, we'll compensate by pricing more on these." And the public, so far, accepts it.[103]

As the Agencies work toward a final rule, the goal must be to keep new vehicles affordable so that more Americans can replace older vehicles with newer models that are cleaner, safer, and more fuel-efficient.

4.3. Consumer Willingness-to-Pay

Beyond affordability, some consumers may not be willing to pay for fuel efficient technologies. In periods when gas prices are low as they are presently, consumers may not be willing to make an investment in a fuel efficient vehicle such as a hybrid, since it could take many years before they see a payback on their investment. Instead of investing in fuel economy, consumers tend to invest in other features, such as performance and vehicle safety.

As noted before, the 2015 National Academy of Sciences report on fuel economy technologies concluded that the best possible insight on future customer decision-making comes from customers

[101] Defour Group personal communication to the Alliance of Automobile Manufacturers.
[102] Bob Lutz, *How the $100,000 Pickup Came to Be,* ROAD & TRACK (July 25, 2018), https://www.msn.com/en-us/autos/autos-trucks/how-the-dollar100000-pickup-came-to-be/ar-BBL38YR?ocid=spartanntp.
[103] *Id.*

themselves.[104] The panel referred to the New Vehicle Experience Study ("NVES") conducted by Strategic Vision, a study involving more than 300,000 recent new car buyers annually, as "the most reliable information about consumer preferences."[105] The most recent NVES of 2017 car buyers shows that out of more than 140,000 NVES survey respondents, 41% ranked fuel economy as a top consideration in their purchase; this ranks well below other features, such as performance, which 57% of respondents considered a top purchase reason.

Rank	Purchase Reasons	*Percent*
1	Overall Safety of the Vehicle	62%
2	Safety Features	60%
3	Overall Driving Performance	57%
4	Overall Value for the Money	57%
5	Price/Deal Offered	56%
6	Braking	56%
7	Overall Impression of Durability/Reliability	52%
8	Riding Comfort	51%
9	Warranty Coverage	49%
10	Road Holding Ability	48%
11	Haul Cargo in Bed (pickup only)	48%
12	Overall Seat Comfort	47%
13	Overall Thoughtful Engineering	47%
14	Driver Seat Adjustability	46%
15	Fun To Drive	44%
16	Past Experience With Brand	43%
17	Overall Experience with the Selling Dealership	43%
18	Driving Distance on Full Tank/Charge	43%
19	Front Seat Roominess	42%
20	Overall Experience with the Service Department (if applicable)	42%
21	Overall Power and Pickup	42%
22	Reputation/Prestige of Manufacturer	42%
23	Overall Exterior Workmanship	41%
24	Gas or Electric Mileage (Fuel Economy)	41%

Source: NVES 2017 Survey

Table 4.1: Most important reason for purchasing a vehicle.[106]

In 2015, after reviewing the Strategic Vision survey results, the National Academy of Sciences panel concluded that, "…while consumers value fuel economy, they do so in the context of other attributes they also value… they look for the most fuel-efficient version of a vehicle they already

[104] NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES, COST, EFFECTIVENESS, AND DEPLOYMENT OF FUEL ECONOMY TECHNOLOGIES FOR LIGHT-DUTY VEHICLES 9-26 (2015), *available at* https://www.nap.edu/catalog/21744/cost-effectiveness-and-deployment-of-fuel-economy-technologies-for-light-duty-vehicles.

[105] *Id.*

[106] STRATEGIC VISION, NEW VEHICLE EXPERIENCE STUDY (2017), *available at* https://www.strategicvision.com/nves.

want to purchase… Consumers are buying fuel efficient versions of vehicles that suit their wants and needs."[107]

Some claim that one reason why sales of electric vehicles are not rapidly increasing is that automakers are not advertising electric vehicles or fuel economy attributes enough. One recently released white paper claims that consumers want fuel economy and that automaker advertising is not responding to consumer demand.[108] However, NVES survey results from hundreds of thousands of actual buyers call this claim into question. While vehicle advertising undoubtedly has many purposes, to insist that its main purpose should be to communicate an attribute that is specifically ranked below other desired attributes seems illogical. Advertising of messages that do not reinforce known attributes that the customers are interested in falls under the rubric of general advertising that is not specifically aimed at driving purchasing messaging, i.e., messages that resonate with customers wishing to purchase automobiles.

Auto manufacturers have been promoting electric vehicles and fuel economy in general in their advertisements and in non-traditional advertising channels, sometime with exceptional emphasis that does not always go noticed. For instance, General Motors notes that:

> In 2017, the Chevrolet Bolt EV led Chevy vehicles in total media spend per vehicle and was number three in overall advertising spend, even though the Bolt EV ranks only 10th in sales volume among Chevrolet vehicles. This spending supported a full multimedia campaign, exposure programs for dealers, a customer relationship management program, ride and drive opportunities for influencers and customers and the Chevy EV Life website, designed to answer questions about driving electric for all levels of EV customers. Partnerships with GM Fleet, as well as the popularity of Bolt EVs with Maven customers, are further increasing interest—since February 2017, Bolt EVs in ride-sharing services across seven cities have given over 1 million rides to consumers who otherwise may not have had any exposure to EVs.[109]

In addition, as catalogued in the recently released whitepaper[110], Figure E.1. Theme Frequency, shows that, as a category of ads, "Fuel Economy/Green" is advertised by automakers more prevalently than "Comfort and Convenience", "Luxury", "Passenger/Cargo Capacity" and even "Reliability and Durability." While the white paper may disagree that advertising other subjects such as "Other Emotion," "Performance" and "Sales and Price" more prevalently than the prevalence accorded "Fuel Economy/Green," other points of view would support favoring the advertising of themes that on their surface resonate more with would-be buyers, including electric vehicle buyers.

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[107] NATIONAL RESEARCH COUNCIL, *supra* note 104, at 9-28.
[108] Jeff Plungis, *Automakers Sell Performance, but Consumers Want Fuel Economy and Safety,* CONSUMER REPORTS (Oct. 19, 2018), https://www.consumerreports.org/cro/buying-a-car/automakers-sell-performance-consumers-want-fuel-economy-and-safe.
[109] *Drive EV Demand Through Marketing*, GENERAL MOTORS: 2017 SUSTAINABILITY REPORT, https://www.gmsustainability.com/act/products/marketing.html (last visited Oct. 26, 2018).
[110] Jeff Plungis, *supra* note 108.

4.4. Fuel Prices

As stated by the Alliance in previous comments,[111] consumer acceptance of greater fuel economy is closely tied to fuel prices. In a persistently high fuel price environment, such as market conditions ten or more years ago, data suggest that consumers place a greater value on fuel economy. Consequently, they are more willing to pay for vehicle efficiency improvements if their monetary investment in more expensive technology will pay back within a reasonable timeframe (e.g., two to three years).[112]

The decline in gasoline prices observed through the end of 2016 through mid-2017 resulted in a decline in the relative importance of fuel economy in the priorities of consumer options and choices. For example, as shown in Figure 4.2 below, the electrified vehicle share of new vehicle sales tends to be higher in higher gasoline price environments (for instance, July 2013), but their share declines as prices decline.

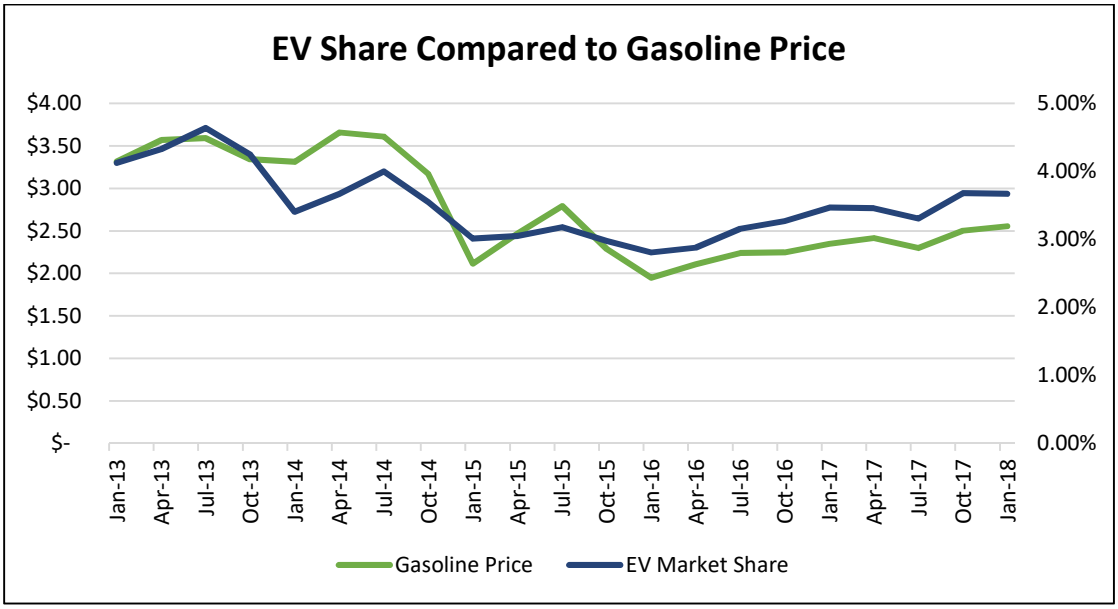

Figure 4.2: Electric vehicle market share of new vehicle sales compared to gasoline price.[113]

[111] Alliance DTAR Comments, *supra* note 63, at 140.

[112] *See* SANYA CARLEY ET AL., INDIANA UNIVERSITY SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS, RETHINKING AUTO FUEL ECONOMY POLICY: TECHNICAL AND POLICY SUGGESTIONS FOR THE 2016-17 MIDTERM REVIEWS at 34 (Feb. 2016), *available at* https://spea.indiana.edu/doc/research/working-groups/fuel-economy-policy-022016.pdf. Short payback periods (e.g. 2 years) for trucks are typically used by business/fleet customers in investment calculations. CALSTART, SAVING FUEL, SAVING MONEY: AN ASSESSMENT OF FLEET COST SAVINGS FROM HIGH EFFICIENCY TRUCKS at 5 (May 2010), *available at* https://www.ucsusa.org/sites/default/files/legacy/assets/documents/clean_vehicles/Saving-Fuel-Saving-Money-Assessment-of-Fleet-Cost-Savings-from-High-Efficiency-Trucks.pdf.

[113] "EV Market Share" includes HEVs, PHEVs, and BEVs. Gasoline prices sourced from U.S. EIA. EV share from *Advanced Technology Vehicle Sales Dashboard*, *supra* note 61.

4.4.1. *Recent Fuel Price Trends*

Gasoline prices have risen from their recent lows, which could lead to the inference that consumers will now purchase vehicles with greater fuel economy. This is misleading for the following reasons.

First, consumer willingness-to-pay for greater fuel economy typically requires sustained changes in fuel costs over a sustained period of time. Although consumer behavior could shift in the near-term as a result of fuel price spikes, long term consumer acceptance relies on sustained fuel price increases, as noted in the economic paper "How Do Gasoline Prices Affect Fleet Fuel Economy[114]?":

> We find that gasoline prices have statistically significant effects . . . but that their combined effect results in only modest impacts on fleet fuel economy . . . . Recall that record-high gasoline prices in 1970s only led to short-lived increases in fleet fuel economy and failed to induce any long-term solution such as fuel-saving technology innovations in the industry.

Second, rising interest rates over this same period could impact the cost of vehicles through higher monthly financing payments, as noted by Charlie Chesbrough, Senior Economist at Cox Automotive, in a Bloomberg article in January of this year: "Consumers could face slightly higher costs for all of their borrowing: credit-card balances, student loans, financing a house or a car."[115] Consumers may not be able to spend more on a fuel-efficient vehicle when faced with other factors, such as interest rates, which are increasing consumers' monthly vehicle payments.

More time is needed to determine the likely trajectory of these near-term, economy-wide influences, and whether they will sustain themselves into the future. We therefore urge the Agencies to avoid making inferences about future consumer willingness-to-pay based on very recent fuel price trends. Gasoline prices need to increase significantly for an extended period of time for customers to receive meaningful payback on their investment.

4.4.2. *Use of Fuel Price Projections in Evaluating Consumer Acceptance*

Gasoline price and consumer acceptance are highly correlated. Therefore, we support the Agencies' evaluation of scenarios using alternative fuel price projections. The U.S. Energy Information Administration ("EIA") Annual Energy Outlook ("AEO") is the commonly accepted source of such projections. Although EIA projections have not always projected future fuel prices accurately, EIA updates their projections each year to account for new data and market trends. The Alliance requested that NERA Economic Consulting examine the sensitivity of the Agencies' net benefits analysis to alternative fuel price assumptions. As part of this work, NERA obtained

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[114] Shanjun Li et al., *How Do Gasoline Prices Affect Fleet Fuel Economy?*, 1:2 Am. Econ. J.: Econ. Pol'y 113, 15 (2009), *available at* http://li.dyson.cornell.edu/pdf/AEJ_2009.pdf.

[115] Jamie Butters, *Fed Rate Hikes Expected to Hurt Car Sales in 2018*, BLOOMBERG (Jan. 2, 2018 10:47 AM), https://www.bloomberg.com/news/articles/2018-01-02/fed-outlook-for-higher-rates-dims-u-s-auto-sales-view-for-2018.

alternative fuel price projections from IHS Markit. These projections fell within the range of the EIA AEO 2017 High and Low Oil Price cases.

The Alliance recognizes that projections of fuel prices are necessary in modeling for the MY 2021 to 2026 standards, but urges EPA and NHTSA to avoid drawing conclusions about future consumer willingness-to-pay solely from fuel price projections. Instead, the Alliance recommends using a more comprehensive modeling approach to predict future consumer behavior, such as the NERA-Trinity Assessment described in Appendix 1 of these comments. The NERA-Trinity Assessment is a nested logit model, which incorporates data on vehicle prices and characteristics over many model years to determine the "revealed" value that consumers place on fuel economy as well as other attributes. This type of modeling is more robust than simply assuming projected fuel price increases will result in increased consumer acceptance of efficiency-improving technologies.

4.5. Other Docketed Materials

4.5.1. *Studies*

Several entities have submitted studies to the Agencies' dockets on the subject of consumer acceptance and willingness-to-pay. For instance, EPA submitted a report to their docket titled *Consumer Willingness to Pay for Vehicle Characteristics: What Do We Know?*,[116] in which EPA concludes that there is wide variation in the willingness-to-pay studies, and therefore no strong conclusions about willingness-to-pay can be drawn. Rather than considering the issue too complicated to understand, the Alliance instead urges the Agencies to consider using a consumer choice model, such as the NERA and Trinity econometric study referenced earlier in these comments, to draw conclusions about consumer behavior. The econometric study estimates the social and market impacts of the different regulatory scenarios presented in the Proposed Rule. It uses up-to-date and accurate data, applies a methodology that is considered state-of-the-art amongst experts in the field of economics, and is objective and balanced in its use of data and assumptions driving the analysis. The Alliance therefore urges the Agencies to rely on this type of model in its decision regarding the standards.

4.5.2. *Surveys*

4.5.2.1. Use of Survey Data to Understand Consumer Acceptance

Several entities submitted comments to the RFD, EIS, and Proposed Determination dockets that referenced certain consumer surveys as supporting consumer acceptance of technologies that increase fuel economy. Surveys of consumers who have recently purchased a vehicle can be useful for gauging consumer acceptance of fuel efficient technologies and other preferences. Such surveys can capture the competing priorities consumers face when purchasing a new vehicle (e.g. cost, performance, safety, fuel economy). Surveys like the NVES can result in stronger conclusions about purchase decisions because they capture a consumer's exhibited behavior as opposed to intended behavior. EPA has acknowledged the potential benefits of surveying new

[116] David Greene et al., Consumer Willingness to Pay for Vehicle Characteristics: What Do We Know? (Mar. 2017), *available at* https://www.epa.gov/sites/production/files/2017-03/documents/sbca-mtg-will-to-pay-2017-03-16.pdf.

vehicle buyers. In the DTAR, EPA stated that they have "been pursuing access to one of these survey data sets. [Their] goal would be to look for associations between the existence of fuel-saving technologies and consumer responses to vehicle attributes."[117]

Some commenters, however, have submitted general population consumer surveys, which could be inherently misleading because they are asking a general audience, rather than tapping into what moves consumers towards one vehicle feature over another. Additionally, some of these surveys ask leading questions which point a consumer towards one response over another. The Alliance recommends that in evaluating the comments on the Proposed Rule, EPA and NHTSA are cautious about drawing conclusions about consumer acceptance from general population surveys. The following section provides more details on the specific methodological issues with three specific surveys:

- National Resources Defense Council 2016, *Attitudes Toward Air Pollution, Transportation, and Fuel Efficiency.*
- Consumers Union 2016, *National Vehicle Fuel Economy Poll*.
- American Lung Association survey 2018, *Voters Overwhelmingly Support Strong Fuel Efficiency Standards.*

4.5.2.1.1. Consumer Opinion versus Consumer Behavior

Most stakeholders in this regulatory process would agree that it is important to assess the impact that standards have on consumers, as well as the impact of consumers on the standards. This line of analysis, however, demands a distinction between two aspects of consumer studies: consumer opinion versus consumer behavior.

Consumer opinion comprises the set of beliefs held by consumers in general. It is informed by media and interaction with society, and expressed in private conversations and at the voting booth. It is associated with highly varied levels of expertise with relevant topics.

Consumer behavior is the set of choices made by consumers of specific products. It is informed partially by consumer opinion, partially by psychology and economics, and partially by the circumstances of the market. Consumer behavior is assessed by automakers and other product-providing firms, in order to tailor the specifics of their products to the demands of the buyers. Consumer behavior is a highly diverse topic, encompassing acceptance of technologies (consumer acceptance), time-discounting, externalities and signaling, et cetera. In the context of assessing the economic practicability of CAFE/GHG standards, consumer behavior is a highly relevant factor.

At the current point in the regulatory process, consumer behavior should be the leading concern. The current question before the agencies is not, "should we enact standards?" but, "what is the maximum feasible level of standards under the statutory criteria?" Consumer behavior actively informs answers to this question, while consumer opinion does not.

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[117] U.S. ENVIRONMENTAL PROTECTION AGENCY, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, CALIFORNIA AIR RESOURCES BOARD, EPA-420-D-16-900, DRAFT TECHNICAL ASSESSMENT REPORT: MIDTERM EVALUATION OF LIGHT-DUTY VEHICLE GREENHOUSE GAS EMISSION STANDARDS AND CORPORATE AVERAGE FUEL ECONOMY STANDARDS FOR MODEL YEARS 2022-2025 at 6-12 through 6-13 (July 2016) (hereinafter DTAR).

The NRDC Survey focuses entirely on consumer opinion, and does not at all analyze actual consumer behavior. Its questions only determine that consumers are supportive of standards in general, and does not inform what level of standards are appropriate or how buyers will react in response to the standards. The Consumers Union ("CU") and ALA studies face the same problems.

The Alliance recommends that the Agencies utilize studies that are based on exhibited consumer behavior, rather than studies that meter expressed consumer opinion.

NRDC Question 4

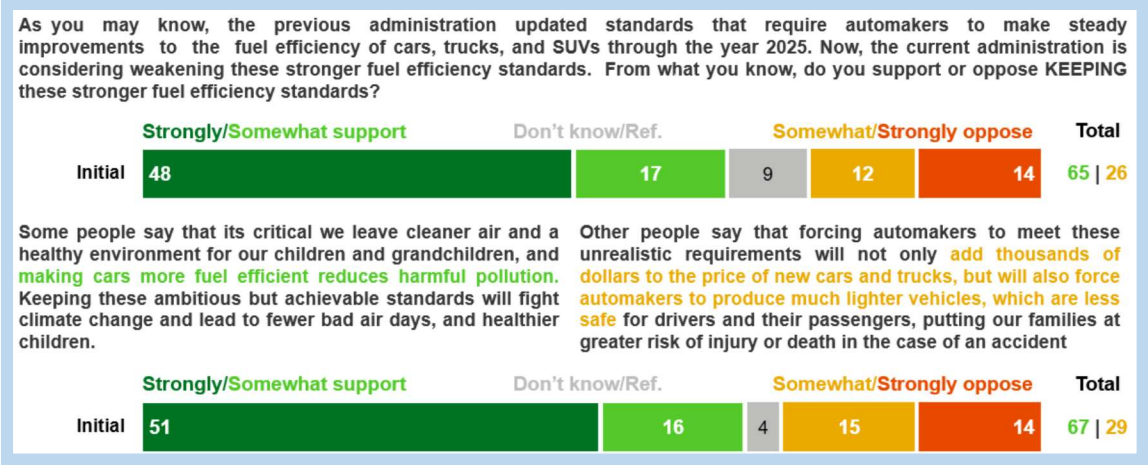
The U.S. government should continue to increase fuel efficiency standards and enforce them.

Total	(n=1,012)
Agree	79%
Disagree	20%
DON'T KNOW	2%

4.5.2.1.2. The Questions of Regulation Are Too Complicated to Be Represented in a Single Survey

In attempting to simplify the complex issues surrounding fuel economy regulations into questions that can be understood by respondents, some surveyors crossed over into leading the respondent to answer in a certain way. For instance, the American Lung Association ("ALA") provided the following clearly leading questions as being representative of the regulatory issue:

Figure 1: Details and Results of the ALA Survey



ALA has simplified the current regulatory situation so that the reader might believe things about the current administration that are not true. This description leaves out the following critical facts:

- That the previous Administration agreed with the need to reassess the standards with a MTE and that this rulemaking is an extension of that process;
- It is unclear and undecided at this point of the Federal rulemaking process what the final standards will be. That the CAFE and GHG standards are not intended to control smog-forming criteria pollutants;
- That the Agencies are already required by statute to set the standards at maximum feasible levels, considering technological feasibility and economic practicability.

This representation influences the answers given by the respondents of the survey, increasing the likelihood that they react strongly against a proposed "weakening of stronger standards." For this reason, its results should be taken with skepticism.

Consumers Union caused a similar misrepresentation by failing to incorporate cost into their questions. Only one survey question in their long survey implied that an increase in fuel economy would demand an increase in cost, and no question revealed the potential magnitude of the cost. A survey by NRDC saw the same problems, asking whether the government should continue to increase fuel efficiency standards without stating the alternatives.

CU Question 9.5

Increasing average fuel economy from 25 MPG today to 40 MPG by 2025 is a worthwhile goal.

Total	(n=1,035)
Agree	75%
Disagree	13%
DON'T KNOW	11%

Survey responses are highly susceptible to question structure effects. Insofar as the Agencies wish to implement public opinion polls into the rulemaking, they should determine whether the survey questions represent the issues neutrally.

4.5.2.1.3. Surveys That Lack Detail Show Only Low-Resolution Information

The surveys referenced here suffer from very low amounts of detail, resulting in blurry understandings of consumer opinion. Only the ALA study measures degree of agreement with a statement, while the others use only "Agree" / "Disagree" responses. All of the studies simplify the regulatory issues, leaving out key facts that could influence the respondents' opinions. The studies do break down their respondents and weight them by demographic characteristics, but do not include the highly relevant category of "new car buyer."

Furthermore, many of these survey questions ask for consumer opinions of matters of fact. An NRDC question asked how much they believe light duty vehicles contributes to air pollution. While the public's knowledge of that statistic might be interesting to environmental awareness groups, the agencies should account for it based on engineering data. A Consumers Union question asked consumers whether automakers would be able to attain an average of 40 MPG by 2025. Even the most informed experts have a difficult time determining whether that standard will be feasible.

NRDC Question 1

How much would you say cars and trucks contribute to the problem of air pollution?

Total	(n=1,012)
A great deal	38%
Somewhat	39%
A minor amount	17%
Or, not at all	5%
DON'T KNOW	1%

Such low-resolution views at consumer opinion have little value to those determining the details of stringency and compliance.

4.5.2.1.4. Recommended Methods for Evaluating Consumer Acceptance

Although certain consumer surveys aim to answer the complex question of the extent to which consumers value fuel economy, we have seen that broad population surveys can oversimplify this topic. The NRDC and CU surveys are prime examples of this oversimplification, and should not

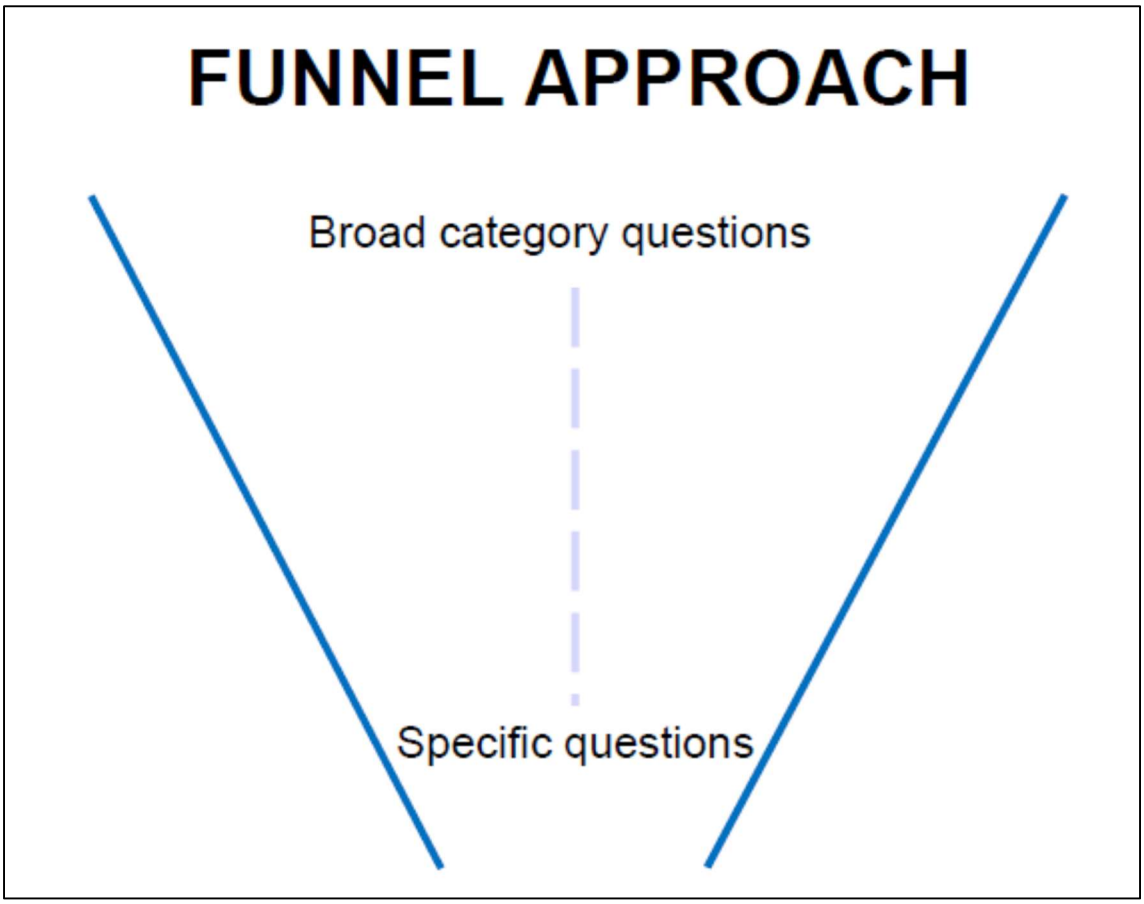
be given excessive regard when deciding the appropriate levels of the MY 2021 through MY 2026 standards. Instead, we recommend that when consumer opinions are used by the Agencies in the regulatory process, the Agencies should focus on consumer acceptance of both the costs and trade-offs faced when purchasing a vehicle.

To this purpose, the Alliance recommends utilizing post-purchase revealed preference data that will more accurately reflect the demands of the customers,[118] as well as state-of-the-art modeling that can capture these micro- and macroeconomic effects.

To the extent that the agencies do wish to evaluate public opinion in regulatory matters, they should consider surveys that are designed more rigorously than the surveys provided by NRDC and CU. The Alliance would like to suggest agencies utilizing following tips in determining a "rigorously" designed surveys.

Tip #1: Start Broad, Work Down to Narrow

When creating surveys, be sure to start with very broad questions and then work your way down to more narrow, specific questions towards the end of the survey. This helps ensure earlier questions don't influence respondents' responses to later questions.



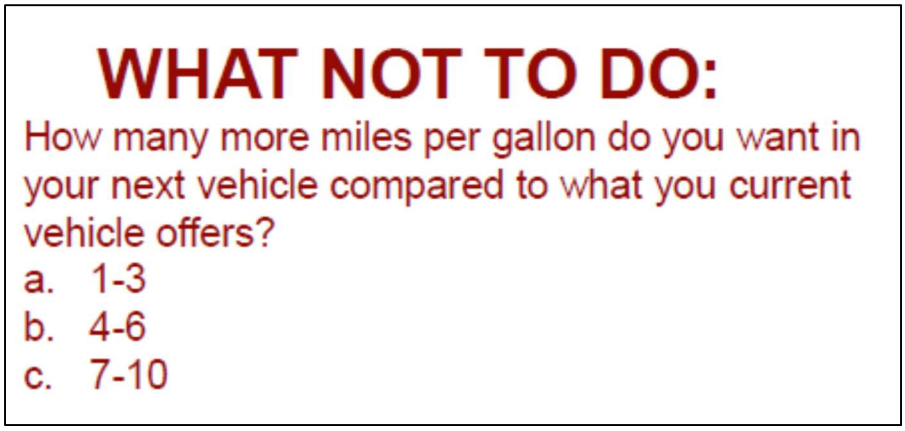
[118] E.g., NEW VEHICLE EXPERIENCE STUDY, *supra* note 106.

Tip #2: Avoid Leading Questions or Set-up Language

When designing specific questions, be sure to avoid using leading questions or language that could prompt or bias a respondent. This not only includes the way questions are phrased, but also specific language that is used. Specifically, using emotional words like "threaten" or "good person" can be all considered leading. Additionally, be sure any set-up instructions or language does not lead or bias respondents.

Tip #3: Avoid Asking Questions that may be Beyond Consumer Ability

Questions about things or issues that may not be a "natural" way of thinking for consumers should be avoided. Consumers often don't know what the response options would equate to for their everyday life. Therefore, consumers usually pick the "best" or the "most" option because it sounds or look better.



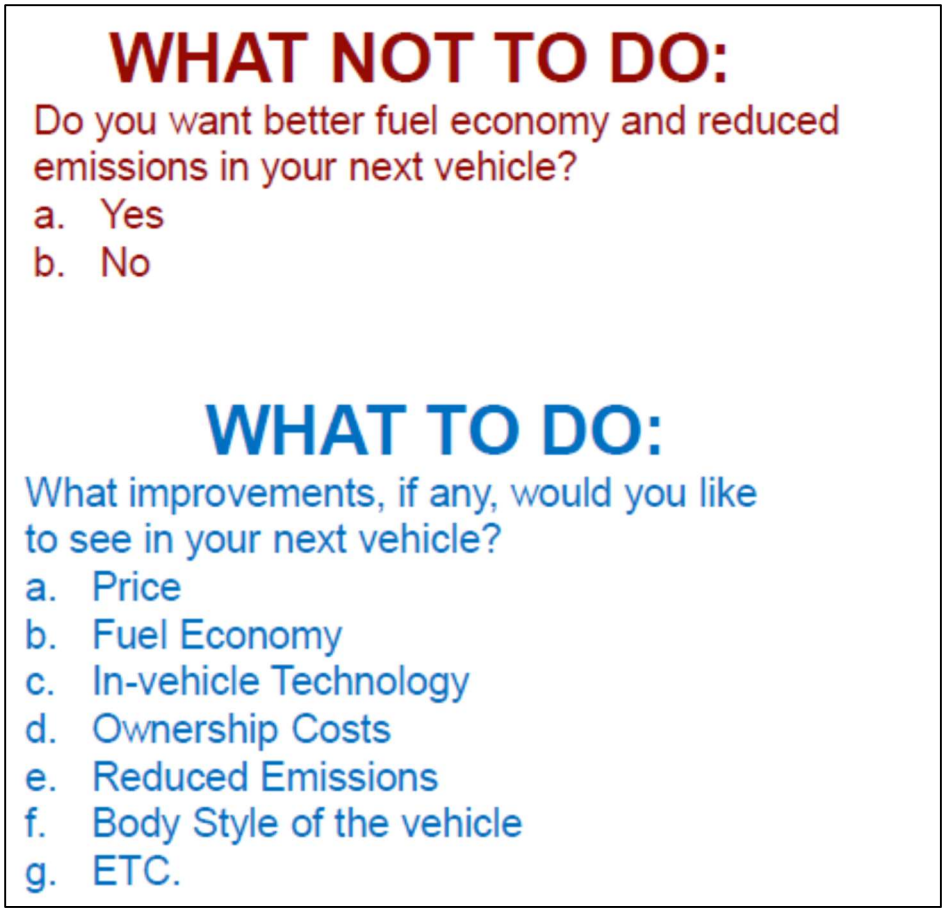
If the goal is to understand specific questions related to desired mileage or willingness to pay for powertrain, a different survey design (i.e. MaxDiff) or advanced statistical approach (i.e. Conjoint) is recommended over directly asking the respondent. These approaches, just two examples among many, go beyond stated importance and reveal true drivers impacting consumer choice.

Tip #4: Use Consumer Friendly Language

With surveys, be cautious of using language or abbreviations that might be familiar to you (particularly when using language that is common in a certain industry like "EPA" or "MPGe") as it may not be common vernacular to consumers. Same caution would also apply in any set-up or instructions within survey

Tip #5: Beware of "Double Barrel" Questions

Do not load more than one topic in a single question as it would overwhelm respondents and / or lead to biased responses.



4.5.2.2. Consumers Union: *Auto Buyers' Valuation of Fuel Economy*

Dr. Christine Kormos and Dr. Reuven Sussman authored a study entitled *Auto Buyers' Valuation of Fuel Economy: A Randomized Stated Choice Experiment* published by Consumers Union ("the CU Study").[119] The CU Study is a stated-preference study which looks at respondent willingness-to-pay ("WTP") for vehicle attributes based on responses to hypothetical vehicle purchase decisions. The Alliance recommends that the findings of the CU Study should not be relied upon to determine a consumer's WTP for fuel economy because of the shortcomings described below.

The CU Study finds extreme WTP values of $10,730 for $1,000 in fuel savings per year. Such extreme values are not in line with concepts of decreasing marginal utility and represent a ratio of spending to savings that cannot be scaled indefinitely, nor aligned with other studies, nor aligned with accepted payback periods for the average consumer. For instance, the high end of reported WTP results of $8,587 (assuming $3 per gallon and 12,000 VMT per year) equates to a 26.5-year payback period. Even the lowest amount of $3,330 exceeds a 9-year payback interval. The validity of these WTP results is questioned by the CU Study authors themselves, who go so far as to recommend that the findings should not be relied upon:

[119] Christine Kormos & Reuven Sussman, *Auto Buyers' Valuation of Fuel Economy: A Randomized Stated Choice Experiment* (June 12, 2018), *available at* https://consumersunion.org/wp-content/uploads/2018/06/FINAL-Kormos-and-Sussman-2018-–-Auto-buyers-valuation-of-fuel-economy.pdf.

> "Due to the possibility of hypothetical bias, WTP values from the choice experiment may exceed what a consumer would actually be willing-to-pay. Hypothetical bias is not always present in stated choice experiments, although it can result in WTP values that exceed the actual value by a factor of two to three (Loomis, 2011). Thus, it is necessary to use caution in interpreting these pooled valuation findings, as these findings may not translate directly into real-world WTP values."[120]

The CU Study by design incorrectly selected a base of respondents who are not representative of new car buyers who have gone, are going, or intend to go through the car-buying process. For instance, 25% of respondents used their vehicle to commute to school, which would imply that 25% of the sample are students and that the authors used a highly biased sampling methodology. Also, the questionnaire used by the study is not at all similar to the actual car-buying process, since the vehicle options lack many qualities of vehicles that buyers find important; the survey decision is not framed within a wider financial or personal situation; the purchase decision does not occur within the context of a typical sales situation; and the intent of the survey is transparent, causing potential bias toward certain answers.

The CU Study also contains significant mathematical errors and statistical process errors. This is due to different sets of questions being given to different respondents based on selected class of vehicle but then blending the results from multiple classes. Each class should be considered a sub-study, yet the CU Study incorrectly mathematically merges their results. Additionally, the CU Study incorrectly conflates two separate studies (testing of presentation method and testing of people's responses to fuel economy) together as one study by incorrectly assuming negligible interaction effects between the two tests and not maintaining the tests as linearly independent. Further, the CU Study's efficiency (D-efficiency) was only 60%, significantly lower than accepted good practice to not schedule anything below 100%. Also, it is not clear that the results of the sub-samples would even be statistically significant since the sub-sample population would (assuming an even distribution of the sample across the levels) be only 59 out of the total sample population of 1,883. For these reasons, the Agencies should not rely on the CU Study in evaluating the appropriateness of various standards for their final decision.

[120] *Id.* at 33.

APPENDIX 5: FLEXIBILITIES AND TECHNOLOGY INCENTIVES

The 2017–2025 EPA light-duty vehicle GHG standards and corresponding NHTSA CAFE standards were set at very challenging levels based on ambitious forward-looking assumptions about fuel economy technologies and consumer acceptance. Industry support for these regulations relied heavily on the inclusion of various flexibility mechanisms that would allow automobile manufacturers to comply with the regulations even if the technology assumptions in the Agencies' feasibility analyses could not be fully realized. Over the past five years, however, market realities have increasingly diverged from the forecasts that formed the basis for the EPA and NHTSA standards. Fuel prices have been lower than expected, U.S. consumers are moving away from small cars and into crossover vehicles, and traditional fuel economy technologies have not realized the assumed levels of effectiveness and consumer acceptance. Consequently, flexibility mechanisms have played an important part in compliance over the past several years, and may even need to have an increasing role moving forward.

Although these flexibility mechanisms require updating, they have made critical contributions toward the goals of the CAFE and GHG programs. Manufacturers have implemented the technologies on the pre-approved off-cycle and air conditioner credit lists faster than anticipated in Agency analyses, since the manufacturers were aware that compliance would become increasingly difficult over time. As market realities have confounded expected progress toward achieving traditional city and highway fuel economy improvements, flexibility mechanisms have become increasingly important to achieving GHG reductions and increased fuel economy. Further development of unconventional and non-traditional fuel economy technologies will play a key role in both compliance with these standards and in further improvements in GHG reductions and energy use. Flexibility mechanisms should incentivize those developments.

The Alliance welcomes the current reexamination of the standards in view of this fact, considering the current flexibility provisions are not sufficient to bridge the widening gap between the standards and actual fuel economy and GHG emissions—as demonstrated by the under-compliance of the industry for MYs 2016 and 2017. Therefore, the current flexibility mechanisms should be modified and improved so that they can continue to play an important role in aiding and supplementing future regulatory compliance and real-world emissions reductions. Additional pre-defined and pre-approved credits should be included in the regulations. Credit caps in the regulations also require revision—either removing the caps altogether, or increasing the caps to accommodate new credits to accommodate increased penetration of these technologies. Finally, administrative processes should be simplified to make flexibility credits more predictable and attainable.

Table 5.1 provides a summary of the recommendations the Alliance makes on various flexibilities; remaining sections of this appendix explain these recommendations in further detail. Attachment 7 provides supporting descriptions of certain technologies which provide additional off-cycle benefits.

Flexibility Mechanism	Recommendations to NHTSA	Recommendations to EPA
Credit averaging, banking, and trading provisions	• Maintain the credit trading program. • Separate credit banks for flexibility-based credits from fleet average-based credits. • Apply the fuel savings adjustment factor for credit carry-forward/back within the same fleet. • Harmonize lifetime mileage estimates used in the calculation of the adjustment factor with EPA's • Revise credit transfer provisions for greater consistency with EPA's	• Eliminate expiration of carry-forward credit. At minimum, expand credit carry-forward such that MY 2010-2020 credit can be used through MY 2026. • Separate credit banks for flexibility-based credits from fleet average-based credits.
Upstream electricity emissions		• Eliminate requirements to add upstream electricity utility emissions
Advanced technology vehicle incentives	• Apply a Fuel Consumption Improvement Value ("FCIV") equivalent to the EPA multiplier for CAFE.	• Extend and increase incentive multipliers for battery electric vehicles (to 4.5x) and PHEVs (to 4.8x).
High-efficiency pick-up truck incentives	• Extend high-efficiency full-size pick-up truck incentives through MY 2026. • Eliminate minimum penetration rate requirements. • Expand incentives to all light-duty trucks at the same levels as provided to full-size pick-up trucks. • Expand mild and strong hybrid electric vehicle incentives for passenger cars at half the level applied to light-duty trucks.	
A/C direct (refrigerant) credits		• Keep the credits in the light-duty vehicle greenhouse gas program. • Modify the calculation to remove the low-leak rate credit cap and high-leak rate disincentives.

A/C indirect (efficiency) credits	• Keep the A/C efficiency credits in the CAFE and GHG programs. • Remove the solar/thermal control technologies from the off-cycle credit menu and add them to the A/C efficiency credit menu. • Combine the caps on A/C efficiency and solar/thermal control technologies and raise the combined cap to 13.1 g/mi (for cars) and 18.9 g/mi (for trucks). • Add additional technologies to the credit table. • Create a new off-cycle credit provision allowing manufacturers to apply for credit for A/C and solar/thermal control technologies that would explicitly not require inclusion under the menu cap. • Eliminate A-to-B test requirements for use of the menu.
Off-cycle credits	• Eliminate the credit table cap or increase to 10% or greater of each manufacturer's fleet target. Increase to 15 g/mi at minimum. • Add additional technologies to the off-cycle credit table. • Specify solar/thermal control technology caps apply at the fleet level, not individual vehicle level. • Make technical corrections to the 5-cycle methodology including calculation changes and clarifications for interpretation. • Fix the alternative methodology application process • Develop and off-cycle credit analytical "toolbox." • Allow suppliers to apply for off-cycle credits • Clarify that off-cycle technologies should demonstrate off-cycle benefits without requirements to demonstrate benefit beyond current technologies. • Allow off-cycle credits for the CAFE program in MY 2010-2016. • Develop credits for autonomous, connected vehicle, and safety technologies; start with adaptive cruise control at 2.0 g/mi. • Add off-cycle credit provisions for heavy-duty vehicles and align them to actions taken for light-duty vehicles.

Table 5.1: Summary of Alliance recommendations regarding various flexibilities.

5.1. Credit Banking, Trading, and Transferring Provisions

5.1.1. *The Alliance Supports an Expansion of GHG Credit Carry-Forward Provisions*

EPA requests comment on extending credit carry-forward beyond the current five years limit.[121] Three potential approaches are described by EPA. First, credits earned from MY 2010 and later could have their credit life extended through MY 2025. Second, the lifetime for all credits could be extended to a longer fixed period greater than the current five-year lifetime. Third, GHG credits could have an indefinite lifetime.

[121] 83 Fed. Reg. at 43,464.

In Appendix 2, the Alliance provides an analysis of the depletion of industry-average credit banks over the next several years. However, that analysis assumes that the total bank of GHG credits belongs to all manufacturers collectively and that they can each draw from it as needed. In practice, the GHG credits are not equally distributed and belong to individual manufacturers as shown in Figure 5.1. Each of the manufacturers will add or subtract credit from their credit bank based on their individual compliance levels in each year. Therefore, some manufacturers are likely to run out of credit more rapidly, and conversely some manufacturers are likely to still have credit that would otherwise expire unused in MY 2021.

Credit Balances at Conclusion of the 2016 Model Year (Mg)[1]

(including credit transfers & trades)[2]

Manufacturer	Credits Carried to 2017	Manufacturer	Credits Carried to 2017
Toyota	78,078,963	Mercedes	2,991,505
Honda	36,024,476	Mitsubishi	1,755,470
Nissan	26,682,834	Suzuki*	428,242
Ford	22,084,139	Karma Automotive*	58,852
Hyundai	20,583,544	BYD Motors*	4,824
GM	19,666,700	Tesla	576
Subaru	14,498,843	Volvo	(9,218)
Mazda	9,424,551	Jaguar Land Rover	(1,387,781)
Kia	6,011,615	*FCA†*	*19,217,792*
BMW	3,202,342	*Volkswagen†*	*2,438,608*
All Manufacturers			**261,759,183**

†FCA and Volkswagen are listed separately in this table due to an ongoing investigation and/or corrective actions. These data are based on initial certification data, and are included in industry-wide or "All" values. Should the investigation and corrective actions yield different CO_2 data, any relevant changes will be used in future reports.

*Although these companies produced no vehicles for the U.S. market in the most recent model year, the credits generated in previous model years continue to be available.

[1] The Megagram (Mg) is a unit of mass equal to 1000 kilograms. It is also referred to as the metric ton or tonne.

[2] This table does not include unused credits from the 2009 model year, which expired at the end of the 2014 model year. See Section 2 for more information.

Figure 5.1: Manufacturer GHG credit balances at the conclusion of MY 2016.[122]

EPA states that "longer credit life would provide manufacturers with additional flexibility to further integrate banked credits into their product plans, potentially reducing costs."[123] The Alliance agrees with this reasoning. Each credit provides a manufacturer with compliance planning flexibility, which as evident from recent model year performance, can prove valuable for long-term planning.

Furthermore, we note that credits are earned when manufacturers achieve lower GHG fleet average emissions than otherwise required by regulation in any given model year. This typically results

[122] U.S. Environmental Protection Agency, "Greenhouse Gas (GHG) Emission Standards for Light-Duty Vehicles: Manufacturer Performance Report," https://www.epa.gov/regulations-emissions-vehicles-and-engines/greenhouse-gas-ghg-emission-standards-light-duty-vehicles (accessed October 25, 2018).
[123] 83 Fed. Reg. at 43,464.

from actions taken by a manufacturer to deploy specific models or more efficient technology than required, often at a higher cost. Such technologies reduce the amount of GHG emissions released into the atmosphere over the life of the vehicle, which could be over several decades. The resulting credit earned by a manufacturer for having made the product or technology investment that resulted in the reduced emissions shouldn't be limited to five years.

Additionally, it is helpful to look at emissions crediting and banking provisions in other EPA programs to see the successes in non-prescriptive credit life provision. Specifically, in stationary source emission regulations credit banking is not restricted because of the long term environmental and economic benefits of the displaced and reduced emissions. [124] This shows the importance of credit banking provisions as a unique opportunity to provide both flexibility and stability in emission credit markets. This supports the rationale that banking should have limited (if any) bounds when it comes to a GHG emissions credit market and there should be an inherent flexibility in credit life when it comes to the credits as the emission impact has a long lifespan.

Below, the Alliance provides comment on each of the three approaches described by EPA and recommends that GHG credit life be extended at minimum such that all currently unexpired GHG credits can be carried forward through at least the last model year affected by this rulemaking. All of the potential approaches described in the Proposed Rule better recognize the long-term nature of improvements represented by the credits, would improve flexibility, and reduce compliance costs.

The Alliance supports the approach of unlimited credit life and believes that it should be applied to credit earned in MY 2010 or later. This approach most clearly acknowledges the long lifetime of GHG emissions and the desire to avoid GHG emissions as early as possible. This is also the cleanest approach to credit accounting. Removing the need to track individual model years associated with credits for the purposes for credit carry-forward would significantly simplify compliance planning and ease administrative burdens. This approach also has the added benefit of allowing the regulatory text to be simplified by removing special provisions for credit carry-forward and applying one provision to be consistently applied to future and current credits. One potential concern with this approach is that manufacturers with excess credit may be less likely to engage in credit trading and instead indefinitely preserve the credit for their own use.

Regarding an approach of extending the general lifetime of credits to something longer than five years, the Alliance would propose a minimum ten-year lifetime. Ten years may strike a reasonable compromise between extending credit life and ensuring credits are used within a reasonable time period after their generation. This is consistent with the basis upon which EPA is considering an extended credit carry-forward provision. However, if this approach is taken, we also would recommend that EPA adopt a special carry-forward provision allowing all currently unexpired GHG credits to be used through MY 2026.

[124] Banking is allowed with no credit expiration in EPA stationary source programs including the Acid Rain Program for SO_2, CAIR for NO_X and CSAPR. Additionally, banking is allowed in State programs with no credit expiration provisions under the Regional Greenhouse Gas Initiative (RGGI) and California's AB-32.

The Alliance would also support the approach of providing a special carry-forward provision to extend MY 2010 and later credit life through MY 2026. However, we recommend that this approach be clarified as applying to MY 2010-2021 credits and that credits earned for MY 2021 and later would then revert to the existing five-year lifetime. EPA should not shorten the lifetime of MY 2022 and later credits. This nuance is not clear in the preamble discussion of the Proposed Rule. Further, the Alliance recommends that, under this approach, the existing special carry-forward provisions for MY 2010-2015 credits be replaced. This would ensure that regardless of the timing of a final rule (and any subsequent actions that might delay its implementation), the credits that would have otherwise expired in MY2021 would still be available through MY 2025. This clarity will help with any planning incorporating such earlier credits.

Finally, the Alliance recommends that any approach chosen be equally applicable for all credits regardless of whether they have been retained by the original generating manufacturer or subsequently traded between manufacturers. This equal treatment is consistent with existing rules for credit trading. The Alliance sees no programmatic benefits that unequal treatment would produce.

5.1.2. *CAFE Credit Trading Should Be Maintained as a Flexibility in the CAFE Program*

The Alliance recommends that credit trading be maintained as a flexibility in the CAFE program without modification.

Credit trading provides a compliance flexibility for manufacturers regulated under CAFE. For example, credits can be used as a mechanism to help offset compliance shortfalls in cases where sales of higher fuel efficiency vehicles may not have materialized as originally planned. Such events can occur in cases when fuel prices are low, or when consumers reject certain technologies due to higher costs or other concerns. Other cases could include delays in the introduction of models due to unforeseen development issues or manufacturing problems. Credit trading may also help manufacturers address compliance plans when it is not technically feasible or economically practicable to add additional technology to vehicles. Such events could occur when manufacturers have limited funds for additional investments in a given year, or when consumer valuation of the features offered is not sufficient to cover the cost of those features. Traded compliance credits also can provide manufacturers with additional flexibility in developing compliance plans if a manufacturer chooses to alter vehicle deployment timing or availability for market or other reasons. Credit trading can also help smooth year-by-year compliance irregularities.

Trading of credits is commonly allowed in many current emissions regulations in the US. We see no evidence of market failures or complications that have arisen following the introduction of credit trading for CAFE.

The Alliance supports continuing to include credit trading as a compliance flexibility in the CAFE program. To date, manufacturers have previously engaged in and presumably continue to explore, credit transactions with other manufacturers.

5.1.3. *Separate Flexibility-Based Credits from Fleet Averages*

In a 2016 petition for rulemaking, the Alliance and Global Automakers requested that EPA "refrain from imposing unnecessary restrictions on the use of credit.[125] For the Agencies' convenience, the Harmonization Petition is attached to these comments. On December 28, 2016, NHTSA granted the petition in part.[126] The described request remains pertinent in the context of this rulemaking.

In its Grant of Harmonization Petition, NHTSA stated that this issue "does not appear applicable or relevant to the CAFE program," and invited clarification if that understanding was not correct.[127] The Alliance believes that this issue is applicable to both the EPA GHG and NHTSA CAFE programs. As NHTSA incorporates separate credits for off-cycle technologies and air conditioning efficiency improvements beginning with model year 2017 (or earlier if other requests in the Harmonization Petition are granted),[128] similar considerations for how credit may be carried forward, back, transferred, or traded apply.

The Alliance hereby incorporates the explanation of this issue and associated recommendation contained in the Harmonization Petition by reference in these comments.

5.1.4. *Apply the Fuel Savings Adjustment Factor Across Model Years*

In the Harmonization Petition, the trade associations requested that NHTSA apply the fuel savings adjustment factors across model years.[129] The explanation and applicability of this issue remain as described in the Harmonization Petition. The Alliance hereby incorporates that description and associated recommendations by reference in these comments. As previously noted, NHTSA committed to addressing this and other issues in its proposal for setting future CAFE standards.[130]

5.1.5. *Harmonize Vehicle Lifetime Mileage Estimates Used in Calculation of Fuel Savings Adjustment Factors*

NHTSA has tentatively denied the Alliance and Association of Global Automakers' petition to adjust vehicle lifetime mileage estimates ("VLM") for MYs 2011-2016. We note that the purpose of One National Program was for NHTSA to consider fuel savings and for EPA to consider GHG emission for the same set of vehicles. These vehicles drive a certain number of miles over their lifetime and it does not make sense that NHTSA's program assumes different VLM for the purposes of calculating the gallons value of compliance credits. Further, we disagree that a MY

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[125] Letter from Mitch Bainwol, President and CEO, Alliance of Automobile Manufacturers and John Bozzella, President and CEO, Association of Global Automakers to Mark Rosekind, Administrator, National Highway Traffic Safety Administration and Gina McCarthy, Administrator, United States Environmental Protection Agency, Petition for Direct Final Rule with Regard to Various Aspects of the Corporate Average Fuel Economy Program and the Greenhouse Gas Program, at 15 (June 20, 2016), *available at* https://www.epa.gov/sites/production/files/2016-09/documents/petition_to_epa_from_auto_alliance_and_global_automakers.pdf (hereinafter Harmonization Petition).
[126] *See* 81 Fed. Reg. 95,553 (Dec. 28, 2016).
[127] *Id.*
[128] *See* 49 C.F.R. § 600.510-12(c)(1)(ii).
[129] Harmonization Petition, *supra* note 125, at 10.
[130] 81 Fed. Reg. 95,553.

2011 vehicle would drive 23% fewer miles in its lifetime than a MY 2017 vehicle. The practical solution for MYs 2012-2016 is the same as NHTSA assumed for MYs 2017-2025 – that is to equate the VLMs to EPA's values. The Alliance believes there would be minimal harm in this action because manufacturers were generally CAFE compliant during this time frame.

Furthermore, to the degree the Agencies consider modifications to the vehicle lifetime mileage estimates used to calculate megagrams of GHG credit (EPA) and fuel savings adjustment factors (NHTSA), the Alliance recommends that the Agencies each use the same factors. Doing so would improve harmonization between the separate regulatory programs.

5.1.6. *Revise NHTSA Credit Transfer Definition to Be More Consistent with EPA*

In the Harmonization Petition, the trade associations requested that NHTSA revise its definition of "transfer" at 49 C.F.R. § 536.3 to be more consistent with credit transfer provisions provided by EPA.[131] The explanation and applicability of this issue remains as described in the Harmonization Petition. The Alliance herby incorporates that description and associated recommendations by reference in these comments.

5.2. Advanced Technology Vehicles

5.2.1. *Need for Incentives*

With approximately 500 models that achieve 30 MPG or more (highway) available for sale in 2018, including 45 hybrid-electric and over 50 plug-in electric and hydrogen fuel cell vehicle models in all sizes and ranges,[132] consumers have more fuel-efficient vehicle options than ever. Eighty-five plug-in electric vehicle models are expected by MY 2021.[133] Regardless of increasing availability and infrastructure advances, sales of plug-in electric vehicles remain modest, with approximately 1.2% of all vehicles sold in 2017—less than 200,000 units—being electric vehicles; this increased to 1.5% for the first six months of 2018.[134] As elaborated on further in Appendix 4, fuel economy and gas prices are only one piece of the puzzle when consumers are considering vehicle purchases and they often prioritize safety, comfort, and performance over the cost of fuel.[135] Furthermore, when gas prices fall there is less desire from consumers to seek alternative powertrains.

Electric vehicle adoption remains a critical component for compliance with the MY 2021–2025 fuel economy and GHG standards. Automakers are projected to rely on a greater share of hybrid and plug-in electric vehicles to comply with the standards.[136] The current electric vehicle buying audience is limited and lacks natural demand in the current market. Plug-in hybrid electric ("PHEV") and battery electric vehicle ("BEV") sales are around 1.5% of industry sales, while

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[131] Harmonization Petition, *supra* note 125, at 13.
[132] *www.fueleconomy.gov*, U.S. DEPARTMENT OF ENERGY, https://www.fueleconomy.gov/.
[133] California Air Resources Board, Assessment of a Zero Emission Vehicle Requirement for Light and Heavy-Duty Vehicle Fleets at 13 (Aug. 30, 2018), *available at* https://www.arb.ca.gov/msprog/zev_fleet_workshop_presentation_083018.pdf.
[134] *Advanced Technology Vehicle Sales Dashboard*, *supra* note 61.
[135] NEW VEHICLE EXPERIENCE STUDY, *supra* note 106.
[136] See discussion at Appendix 2, sections 2.4 and 2.5.

HEV sales have stagnated around 2.5% of the market despite being a technology available for nearly two decades.[137] This may be due to perceived concerns related to adopting new technologies, such as availability of charging infrastructure and increased costs for vehicle purchase and battery replacement. Regardless of the specific reasons that consumer acceptance of electrified vehicles remains low, we observe that with the combined bundle of attributes offered by vehicles available today, gasoline vehicles continue to be the most attractive to customers and there is a significantly lower consumer willingness to purchase electrified vehicles.

The limited market for plug-in electric vehicles is not for lack of manufacturer research and development, investment, advertising, or customer incentives. Increased manufacturer incentives have yet to motivate non-premium plug-in electric vehicle ("PEV") customers. Automakers have been applying significant discounts before the manufacturer's suggested retail price ("MSRP"), in addition to tax-based incentives to spur PEV sales. In tandem, automakers are investing in outreach campaigns which promote PEV education programs, infrastructure deployment and consumer incentive programs for state adoption.[138]

For the majority of PHEV, HEV, BEV, and fuel cell electric vehicles ("FCEVs") offered, competitive pricing has not stimulated purchases. Low familiarity with new technology, concerns with battery ranges, and lifestyle compromises (size, payload, towing capabilities, etc.) appear to continue to limit consumer willingness to embrace these technologies. Customers are prioritizing vehicle attributes such as safety, driving performance, and functional utility over fuel economy.

In EPA's final rulemaking for MYs 2017–2025, the Agency created a schedule of multipliers to encourage commercialization of PEVs and FCEVs since these technologies were judged by the Agency to "have the potential to achieve game-changing emissions reductions in the future" [internal quotation marks omitted].[139] EPA provided these multipliers through MY 2021, after which they expire and are no longer available.[140] Consistent with EPA's intention to incentivize these technologies in order to enable the market to achieve longer-term GHG reduction benefits, EPA should extend the advanced technology vehicle multipliers through at least MY 2026.

5.2.1.1. Market

The Agencies have revised their predictions for electric vehicle adoption since the DTAR and proposed and final determinations. The shift in consumer preferences toward SUVs and light-duty trucks leads to higher overall fleet averages and CO_2 emissions. Despite increasing utility options and battery ranges available, most consumers still choose traditional powertrains when making vehicle choices. Most consumers have limited experience with electric vehicles, and market conditions favor gasoline vehicles, creating long-standing barriers to electric vehicle adoption. The Agencies have historically underestimated the large growth in electrified vehicle market acceptance needed to achieve the current GHG and augural CAFE standards in MY 2025. There

[137] *Advanced Technology Vehicle Sales Dashboard*, *supra* note 61.
[138] *E.g., see* Patrick Sission, *New Campaign Promotes Electric Cars, With Help From States and Automakers*, CURBED (Mar. 29, 2018 5:20 PM), https://www.curbed.com/2018/3/29/17177812/ev-electric-car-charging-station-drive-electric-campaign.
[139] 77 Fed. Reg. at 62,811.
[140] *See* 40 C.F.R. § 86.1866-12.

still remains high consumer acceptance risk and additional costs associated with marketing and incentives to achieve the necessary volumes of these vehicles.

5.2.1.2. Infrastructure

As part of the MTE, the Agencies prepared an assessment of the state of alternative fuel infrastructure as an indicator of the viability of electric and fuel cell vehicles in the marketplace. The assessment relied on three key initial assumptions: 1) the requirements can be met with only a small percentage of electric vehicles; 2) infrastructure and vehicle requirements are evenly distributed; and 3) today's customers and vehicles will not change.[141] As part of the MTE, EPA was required to consider actual and projected availability of public and private infrastructure for electric vehicles. While the electric vehicle marketplace may see modest growth, infrastructure implementation and strategic placement remains a significant barrier to adoption. A JD Powers 2017 study recently showed that the number one concern of customers considering the purchase of an electric vehicle was the lack of available charging stations.[142]

Comprehensive strategies for charging infrastructure remain elusive for future electric vehicle marketplace growth. While over 70% of electric vehicles charge at home, technology advances that increase the battery capacity and range will likely require higher power home charger installations in order to meet the needs of these vehicles. This will require additional consumer cost for adoption of an electric vehicle, especially if any utility upgrades are necessary for the home installation. In addition, a comprehensive public charging network is necessary for electric vehicle adoption. Further analysis has shown that 60% of potential EV customers do not see a charging station on their daily route.[143] Therefore, public and workplace charging infrastructure becomes increasingly more important with increasing electric vehicle adoption, especially for consumers that live in multi-unit dwellings that do not have designated locations to park. Without coordinated and targeted infrastructure investment from the public and private sectors, consumer demand for electric vehicles will be hindered by inadequate charging solutions that may increase range anxiety and increase electric vehicle cost of ownership to charge.

We additionally refer the Agencies to our comments on PEV fueling infrastructure submitted in response to the 2016 DTAR and hereby incorporate them by reference.[144]

5.2.1.3. Cost

The Agencies conducted an analysis of manufacturer data regarding the costs, revenues, and profitability of electrified vehicle lines. The Agencies correctly concluded that manufacturers cannot sustain the practice of passing on indefinitely the incremental costs of hybrid, plug-in hybrid, and battery electric vehicles to buyers of those vehicles. The gap between a customer's willingness-to-pay for those technologies and the cost to produce them must be recovered from buyers of other vehicles in a manufacturer's portfolio, sacrificed from profits—at the corporate

[141] DTAR, *supra* note 117, at 9-1 *et seq.*
[142] Chris Malott, *Mobility Disruptors: What Happened to "Charging" Into the Future?*, J.D. POWER (June 1, 2017), http://www.jdpower.com/resource/mobility-disruptors-what-happened-to-charging-into-the-future.
[143] *Id.*
[144] Alliance DTAR Comments, *supra* note 63, at 186 et seq.

and dealership level, or supplemented through a combination of state and federal incentives.[145] Until the time when the gap between customers' willingness-to-pay and the cost to produce these vehicles closes, the Agencies should continue to incentivize market introduction of electric vehicle technologies.

In continued consideration of these market conditions, the Alliance advocates for extending and increasing advanced technology incentives. The Alliance requests that the Agencies extend the multipliers from MY 2021 through the end of the regulatory period to MY 2026. Lack of adoption of these advanced technologies in the middle of the program warrants expanding the program through MY 2026, rather than phasing out incentives in MY 2021 as planned. Please review the Alliance's proposal for multiplier incentives in the sections that follow and adopt the proposed formula, extension of multiplier availability and expansion to NHTSA's CAFE program.

5.2.2. *Upstream Emissions: Automakers Should Not Be Required to Account for Another Industry's Emissions*

There is no justification for regulating automakers for the upstream emissions involved with powering advanced technology vehicles ("ATVs"). Automakers have no control over the feedstock that power plants use to generate electricity, nor do automakers have control over the conversion or transportation processes, or where and when a vehicle owner recharges a vehicle. Rather, the entities with control over electricity generation emissions are the federal and state agencies that regulate power plant operation and performance, the power companies that buy and sell power from various energy sources, and the vehicle operators who decide when and where to recharge their vehicles. Assigning upstream emission factors to grid-powered vehicles would be inefficient. The entity that should be responsible for upstream electricity generation emissions is the utility having control over that generation—not the downstream user, and certainly not the companies developing the products that use the electricity.

The Proposed Rule does not suggest any revisions to the upstream emissions accounting requirements for ATVs found at 40 C.F.R. § 86.1866-12(a). The Agencies state in the Proposed Rule that "incentives" such as zero upstream accounting could "distort the market."[146] The Agencies did, however, request comment on whether incentives should be allowed to expire, and whether any of the flexibilities in their current regulations should be amended, revised, or deleted. The Alliance recommends that the Agencies do not allow 0 g/mi upstream emission accounting to expire. Upstream emissions from electricity generation outside the vehicle should be 0 g/mi, and this should be the case for all model years and all vehicle volumes. Although the Agencies are classifying 0 g/mi as an "incentive" for ATVs, this is the way that the regulation should have been structured initially. Automakers should not have been required to account for these emissions. Therefore, removing upstream accounting is not an incentive for ATVs; rather, it should be seen as a correction that will remove responsibility for these emissions from an entity that has no control over them.

[145] *See* Bob Lutz, *supra* note 102.
[146] 83 Fed. Reg. at 42,998.

Other stakeholders have historically supported, and continue to support, zero upstream accounting for reasons that are similar to those of the Alliance. The National Coalition for Advanced Transportation ("NCAT") sent a letter to the Agencies earlier this year that requested zero upstream emission accounting as a part of regulatory reforms.[147] The Electric Drive Transportation Association asserted in their comments on the proposed rulemaking in 2012 on fuel economy standards that "the proposal to include upstream emissions exceeds EPA's authority under Title II of the Clean Air Act."[148] A 0 g/mi upstream emission accounting is supported by a wide variety of interests in this rulemaking.

Furthermore, EPA noted that "upstream emissions associated with production and distribution of the [conventional] fuel are addressed by comprehensive regulatory programs focused on the upstream sources of those emissions."[149] If EPA decides that the upstream emissions from ATVs must be regulated, as is done for conventional fuels, EPA should turn to regulatory programs focused on those upstream sources.

In fact, arguably the Clean Air Act does not grant EPA the authority to regulate these upstream emissions. Section 202(a) directs EPA to set "standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines."[150] Upstream emissions are not emitted from the tailpipes of vehicles or from engines; they are emitted by power plants and other facilities involved in generating electricity that is used for a number of purposes, including to power ATVs. Therefore, EPA's GHG standards should not factor in upstream emissions.

Another important consideration is that requiring upstream accounting could impede the development of BEVs or PHEVs. Including the upstream emissions for these vehicles in their CO_2 accounting degrades the CO_2 performance of BEVs down to the performance level currently associated with PHEVs, and that of PHEVs down to the level of a conventional HEV. As a result, ATVs and similar technologies are disincentivized.

Figure 5.2 below depicts how upstream emission accounting can disincentivize PHEVs in the compact car category, for instance. This chart uses MY 2018 data from fueleconomy.gov to estimate what upstream emissions would be for MY 2021 under the current GHG standards (not those proposed in the Proposed Rule). This chart demonstrates that accounting for PHEV upstream emissions degrades PHEVs to a compliance performance level similar to a HEV. Similar trends are seen with BEVs, in which BEVs are degraded to emissions of a PHEV without upstream

[147] Letter from Robert A. Wyman and Devin O'Connor, Counsel to the National Coalition for Advanced Transportation, to Elaine L. Chao, Secretary of the U.S. Department of Transportation, Heidi King, Deputy Administrator of the National Highway Traffic Safety Administration, and Scott Pruitt and William Wehrum, Administrator and Assistant Administrator, Air and Radiation, of the U.S. Environmental Protection Agency (May 2, 2018), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2015-0827-11412.
[148] Letter from Genevieve Cullen, Vice President of the Electric Drive Transportation Association, to the Air and Radiation Docket of the Environmental Protection Agency, and the Docket Management Facility of the U.S. Department of Transportation (Feb. 13, 2012), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2010-0799-9449.
[149] 76 Fed. Reg. 74,854, 75,010 (Dec. 1, 2011).
[150] 42 U.S.C. § 7521(a).

emissions. PHEVs and BEVs require significant investment over their hybrid counterparts. By requiring upstream accounting, the Agencies would be further disincentivizing these technologies.

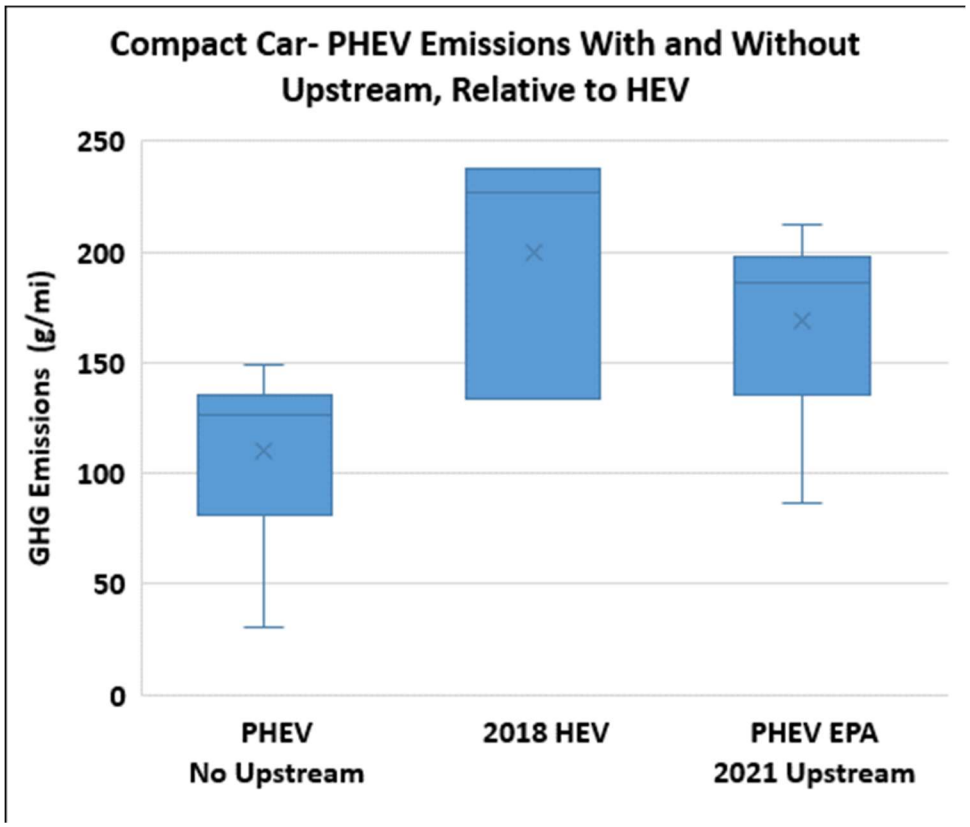

Figure 5.2: Federal upstream GHG accounting impact on compact car PHEVs in MY 2021.[151]

The Alliance therefore requests that EPA revise its standards so that manufacturers are not required to account for upstream emissions from ATVs. This should be the case for all model years and all vehicle volumes. Removal of upstream emissions from the regulations should be accomplished by removing the section related to upstream emissions from 40 C.F.R. § 86.1866-12(a) and by removing upstream CREE from the calculation in 40 C.F.R. § 600.113-12(n).

5.2.3. *Advanced Technology Vehicle Multipliers Should Be Extended and Increased*

In the Proposed Rule, the Agencies asked for comments on extending and expanding the use of ATV multipliers.[152]

The Alliance supports extending the use of ATV multipliers past MY 2021 and increasing them to 4.5 as soon as possible.

[151] Calculation of emissions based on unadjusted combined kWh/100 mi. 40 C.F.R. § 600.113-12(n); *www.fueleconomy.gov*, U.S DEPARTMENT OF ENERGY, https://www.fueleconomy.gov/ (MY 2018 PHEVs data as of May 8, 2018).
[152] 83 Fed. Reg. at 43,461.

The Alliance finds a calculation supplied by CARB to be instructive on the matter of multiplier values. CARB commented during the rulemaking for EPA's Phase 2 heavy-duty vehicle rule that "multipliers were not widely used [in Phase 1] because they were insufficient to address the costs and risks inherent in developing new technology."[153] CARB also demonstrated a method of calculating an appropriate technology multiplier based on the cost/benefit of advanced technology versus the cost/benefit of conventional technology. CARB's equation is shown here:

$$Incentive\ Multiplier = Adjustment\ Factor\ x\ \frac{\left({Adv.Tech.Cost}/{Adv.Tech.Benefit}\right)}{\left({Conv.Tech.Cost}/{Conv.Tech.Benefit}\right)}$$

For example, one of the cases considered in CARB's comments was for class 2B/3 trucks. In their analysis, the incremental cost for a class 2B/3 BEV was $25,000, which would eliminate 545 g/mi of emissions. The conventional technology would cost $1,340 and reduce emissions by 87 g/mi. The cost-benefit ratios are then:

$$3.0 = \frac{\left(\$25{,}000/545\ \text{g/mi}\right)}{\left(\$\,1{,}340/87\ \text{g/mi}\right)}$$

The final, recommended incentive multiplier for BEVs was 4.5, which implies an adjustment factor of 1.5. CARB proposed incentive multipliers higher than the calculated cost ratios, noting that "[a] multiplier that exactly balanced the additional cost would be less likely to incentivize technology development."

Applying CARB's method to light-duty vehicles, the Alliance proposes the following analysis using numbers from the GHG analysis from the Volpe model. The average vehicle emits 258.8 g/mi in MY 2016.[154] This would be reduced to zero with a battery electric powertrain at a cost of $20,791 in MY 2021.[155] Conventional technology could be used to reduce CO_2 emissions by 61.3 g/mi at a cost of $1,659.[156] As seen in the equation below, using the same adjustment factor that CARB used for class 2B/3 trucks yields an ATV multiplier of 4.5.

[153] Letter from Michael Carter, Assistant Division Chief of the Mobile Source Control Division, California Air Resources Board, to Gina McCarthy, Administrator of the U.S. Environmental Protection Agency, and Mark R. Rosekind, Administrator of the U.S. Department of Transportation (June 16, 2016), *available at* Regulations.gov at Docket ID No. EPA-HQ-OAR-2014-0827-1968.

[154] Baseline CO2, Conventional Technology Costs, and Conventional Technology Benefits from compliance_report.csv from CO2 central analysis, augural standard scenario, all vehicle classes, all manufacturers.

[155] NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION AND U.S. ENVIRONMENTAL PROTECTION AGENCY, PRELIMINARY REGULATORY IMPACT ANALYSIS (Oct. 16, 2018), *available at* https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_co2_nhtsa_2127-al76_epa_pria_181016.pdf (hereinafter PRIA) (Battery Costs from Table 6-29, Learning Curve Schedules from Table 9-94, Electrification Technology Costs from Tables 6-32 and 6-33).

[156] Difference between all vehicle, all manufacturer CO2 and technology cost in MYs 2021 and 2016. Augural standard scenario from CO2 central analysis.

$$Light\ Duty\ BEV\ Incentive\ Multiplier = 1.5\ x\ \frac{\left(\$20{,}791/258.8\ \text{g/mi}\right)}{\left(\$1{,}659/61.3\ \text{g/mi}\right)} = \mathbf{4.5}$$

The same analysis can be performed with PHEV systems. In spite of their reduced battery costs, having two powertrains makes PHEVs nearly as expensive as BEVs with a powertrain cost of $15,554[157] resulting in a CO_2 reduction of 181.1 g/mi[158] for an average vehicle; however, the reduced benefit means that the process yields an even higher ATV multiplier of 4.8 for PHEVs than for BEVs. While pure electric vehicles may be the preferred long-term solution, incentivizing PHEVs makes sense until such time that range anxiety can be resolved with a significantly increased number of plug-in vehicle charging stations.

$$Light\ Duty\ PHEV\ Incentive\ Multiplier = 1.5\ x\ \frac{\left(\$15{,}554/181.1\ \text{g/mi}\right)}{\left(\$1{,}659/61.3\ \text{g/mi}\right)} = \mathbf{4.8}$$

The Alliance also recommends that NHTSA apply ATV multipliers in its CAFE program.[159] Notwithstanding previous comments from NHTSA that EPCA/EISA precludes the agency from

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[157] PRIA, *supra* note 155 (Battery Costs from Table 6-29, Learning Curve Schedules from Table 9-94, Electrification Technology Costs from Tables 6-32 and 6-33).

[158] Assumed benefit of 181.1 g/mi is 70% of the baseline 258.8 g/mi for a PHEV50.

[159] In issuing the 2012 Final Rule, NHTSA refused to include an incentive multiplier for electric vehicles as part of its CAFE standards, on the ground that it "currently interprets EPCA and EISA as precluding it from offering additional incentives for the alternative fuel operation of EVs." 77 Fed. Reg. at 62,651. The Alliance respectfully submits that this interpretation of EPCA and EISA was mistaken and should be reconsidered. Nothing in the text of EPCA or EISA says anything whatsoever about prohibiting NHTSA from including an incentive multiplier for electric vehicles as part of the CAFE program, and no court has ever interpreted the statute in that way. Instead, the only reason given in the 2012 Final Rule for interpreting EPCA and EISA to preclude such multipliers was that other statutory provisions already provide other incentives for electric vehicles, and so (NHTSA concluded) an additional multiplier for electric vehicles "would not be consistent with Congress' intent." *Id.* at 62,651 n.87. But the fact that Congress provided certain incentives for electric vehicles hardly indicates that Congress intended to constrain NHTSA's ability to incorporate other appropriate incentives. On the contrary, the "force of any negative implication" from the incentives that Congress did provide "depends on context." *NLRB v. Sw. Gen., Inc.*, 137 S. Ct. 929, 940 (2017). And the force of that implication is especially weak here, because "in an administrative setting … Congress is presumed to have left to reasonable agency discretion questions that it has not directly resolved." *Adirondack Med. Ctr. v. Sebelius*, 740 F.3d 692, 697 (D.C. Cir. 2014); *cf. AARP v. EEOC*, 267 F. Supp. 3d 14, 27 (D.D.C. 2017) (agency is free to adopt appropriate incentives where no statute "directly prohibits the use of incentives" or "speaks to the level of permissible incentives at all"). Here, the fact that Congress provided *some* incentives for electric vehicles shows that Congress *did* intend to increase the development and use of electric vehicle technology. If anything, that reinforces the conclusion that Congress also left NHTSA the discretion to adopt additional incentive multipliers for electric vehicles as part of the CAFE program, as an appropriate additional mechanism to promote the same ultimate goal. Moreover, given the recognized need to achieve uniformity between the CAFE program and the GHG standards issued by EPA, there is every reason to believe Congress would have intended NHTSA to have the authority to adopt incentive multipliers for electric vehicles that will align the CAFE program with EPA's coordinated GHG standards.

using incentive multipliers,[160] we believe that the statute provides the appropriate flexibility for EPA to include the incentive multipliers when calculating average fuel economy for a fleet.[161] Using the same incentive multipliers as EPA is important to maintain a harmonized national program. The Alliance also notes that advanced technology vehicles use of locally produced fuel, such as electricity, hydrogen, or compressed natural gas, that increases the nation's energy security—which meets the original intent of the statute.

The incentive multipliers could be treated in CAFE with a fuel consumption improvement value (FCIV) similar to how off-cycle and air conditioning ("A/C") efficiency credits are handled[162]. EPA's recent Proposed Rule describing technical corrections to the Advanced Technology Multiplier[163] proposes regulations that would require manufacturers to calculate the mega-grams of CO2 credits with and without the ATV multipliers for each fleet. The difference between these values would be mega-grams of CO2 attributable to the Advance Technology Multipliers.

Once the ATV mega-grams are known, the FCIV can be calculated as:

$$FCIV_{ATV}\left({}^{gal}/_{mi}\right) = \frac{(Mg\ of\ ATV\ Credits\ x\ 1{,}000{,}000)}{(VLM\ x\ Production\ x\ 8887)}$$

The $FCIV_{ATV}$ can then be included in the average fuel economy calculation along with the other FCIVs:

$$Average\ MPG = \frac{1}{\left(\frac{1}{MPG} - (FCIV_{AC} + FCIV_{OC} + FCIV_{PU} + FCIV_{ATV})\right)}$$

5.2.4. *Incentives for Hybrid-Electric Vehicles and Other Highly Efficient Vehicles*

Hybrid technology will be a necessity across the entire fleet in order to attain compliance with any of the Proposed Rule's Alternatives, from flat standards through the no-action scenario, with a key difference being technology penetration rates between the various proposals. The full-size pick-up truck segment has substantially lagged passenger car segments in market penetration of hybrid offerings. General Motors offered a micro hybrid system on full-sized pick-up trucks from MYs 2004 to 2007, and then a strong hybrid full-sized pick-up truck from MYs 2009 to 2013. Neither of these offerings were accepted on a large enough scale in the market to justify continued production, and each offering was subsequently discontinued. The incentives in the current rule have resulted in two different manufacturers now offering mild hybrid systems on three different full-size pick-up truck powertrains available today, with likely more hybrid options in the development pipeline.

Full-size pick-up truck buyers tend to be more resistant to change, especially with powertrain technologies, than buyers of any other class of vehicle, and thus it will take substantial time for these technologies to gain significant penetration rates and become accepted by the majority of

[160] 77 Fed. Reg. at 62,628.
[161] *See* 49 U.S.C. § 32904(a)(1)(A).
[162] 40 C.F.R. § 600.510-2.
[163] 83 Fed. Reg. 49,349 (Oct. 1, 2018).

buyers. All of the full-size pick-up credits—strong hybrid, mild hybrid, 20% better performance, and 15% better performance—should be extended in full throughout the duration of this rulemaking window through MY 2026. Minimum penetration rate requirements for individual years should also be eliminated. It would be more appropriate to consider a maximum threshold above which a technology's stability in the market would be considered to no longer warrant an incentive. This program needs to bridge the gap between what the full-size pick-up market will currently accept, and eventually getting these technologies accepted by a majority of buyers. Mechanisms that eliminate these credits before these technologies are able to gain widespread acceptance, through either premature termination or required penetration rates, could cause these product offerings to be discontinued. This could leave a stigma on these technologies as not fit for full-size pick-up applications, further inhibiting future attempts to bring these technologies back into this segment.

To provide meaningful incentives to help further advance these technologies, increase fleet penetration rates, and build meaningful economies of scale, these incentives should also be applied to all light-duty trucks. This segment has historically lagged the passenger car fleet with adoption of hybrid technologies because the cost premiums for hybrid technology increase exponentially with increased vehicle weight and utility requirements. Figure 5.3 shows this through hybrid vehicle sales by segment.

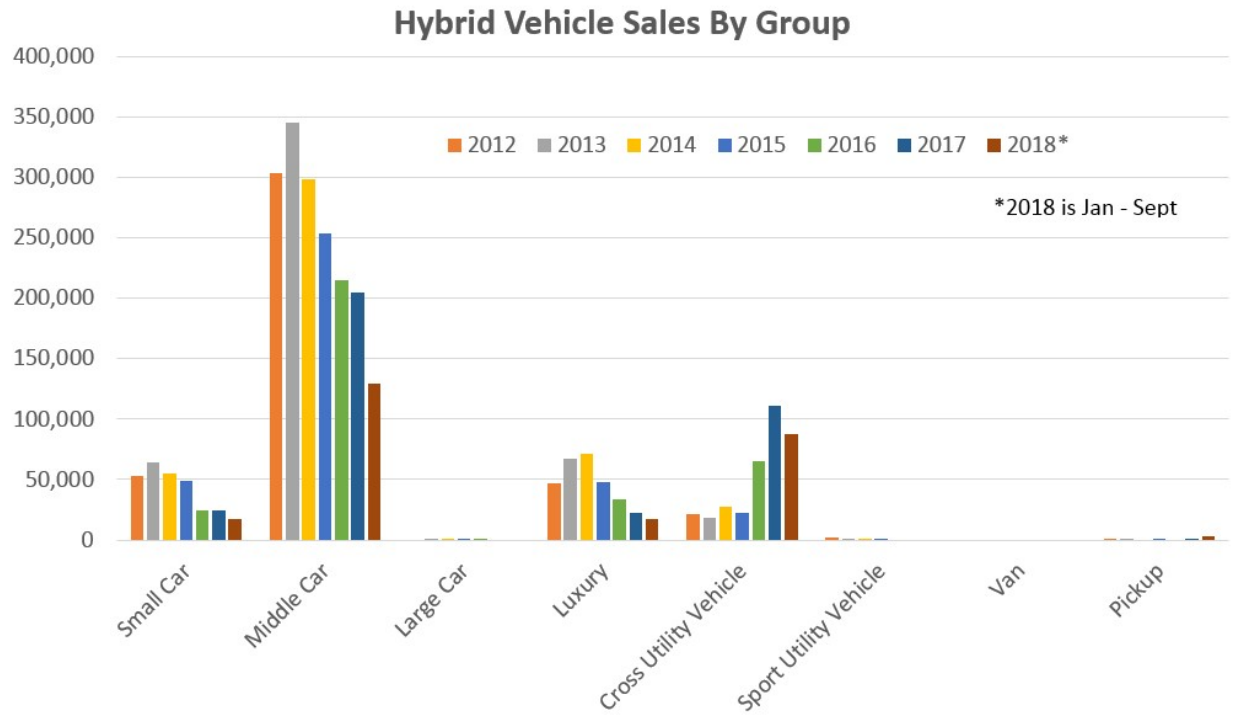

Figure 5.3: Hybrid sales by vehicle segment.[164]

[164] Ward's Intelligence, U.S. Light Vehicle Sales, December 2012, 2014, 2016, 2017, and U.S. Light Vehicle Sales, September 2018.

Promoting hybrid technology in the entire light-duty truck segment is needed. The Agencies contend that smaller footprint light-duty trucks fall on the lower part of the truck curve, which has a higher rate of improvement (in stringency) than larger trucks, thus making those trucks more comparable to passenger cars in terms of technology access and effectiveness. However, cost remains a hurdle for acceptance of hybrids in the smaller, lighter truck segments. All of this warrants some level of incentive for hybrids beyond the large pick-up truck segment as a way to encourage the growth and proliferation of hybrid technology that has been largely confined to the passenger car segment.

The Agencies also asked for comments on whether these flexibilities should be expanded to passenger cars as well. Although hybrid powertrains have proliferated into passenger cars at a much higher rate when compared to light-duty trucks, the overall penetration rates are still very low. The Alliance supports flexibilities applied to mild and strong hybrid passenger cars at half the level of light-duty trucks to encourage their widespread acceptance.

5.3. Refrigerant Program: Air Conditioning Leakage and Refrigerant Global Warming Potential Credit

Mobile Air Conditioner ("MAC") direct credits are related to leakage of vehicle air conditioner refrigerants and the associated global warming impact of those compounds. MAC direct credits have been successful at accelerating real-world GHG emissions reductions through the introduction of low global warming potential ("GWP") refrigerants, especially R-1234yf, and of improvements in the air conditioner systems' hardware components to reduce leakage. R-1234yf was introduced in new vehicles in the United States beginning in the 2013 MY, and many of the new light-duty vehicles sold in the United States now use it.

R-1234yf has a GWP defined in the regulation as 4, though more recent estimates place the figure closer to 1. Since there is a range of only one to three pounds of refrigerant in the typical vehicle air conditioner system, and that refrigerant load supports operation over many years, the use of a refrigerant with a GWP as low as that of R-1234yf essentially removes vehicle air conditioner refrigerants from the list of meaningful GHG emission concerns.

The transition to low-GWP vehicle air conditioner refrigerants in new light-duty vehicles can be considered a major success that resulted from the credits incorporated into the EPA GHG regulation. The credit has accelerated the U.S. hydrofluorocarbon (HFC) reduction program into a leading position worldwide by driving the phase-down of high-GWP automotive refrigerants. The simplicity and reliability of the refrigerant credit provisions shows the successes possible for flexibilities when properly structured.

The Alliance supports retention of the credits for refrigerant leak reductions, including credits for low-GWP refrigerants, in MY 2021 and beyond. Retaining these credits will ensure that the transition to low-GWP refrigerants continues without disruption, and will provide a reliable and stable regulatory framework to support the large investments that have been made in this transition. Retaining the refrigerant credit program in this regulation will also provide an effective nationwide regulatory framework for these gases, obviating any need for divergent regulation of them by individual states. Maintaining the MAC direct credits in the federal light-duty vehicle GHG

program helps avoid a potential patchwork of state regulations and/or the need for additional federal regulation. The Alliance therefore recommends that EPA retain the credits for low-GWP refrigerants at the same maximum levels that have been previously allowed: 13.8 g CO_2/mi for passenger cars and 17.2 g CO_2/mi for light-duty trucks. Retaining the refrigerant credits will continue to recognize the environmental benefits of low-GWP refrigerants and encourage further implementation.

5.3.1. *Low-Leak Credit Cap Removal*

If the MAC direct credit program is retained in the regulation, there are opportunities to make improvements that would assist in providing continued future success. One example is the credit cap on the low-leak credits for R-134a systems; this cap eliminates the incentive to use leak reduction technologies to the maximum extent possible. The leakage scores are calculated according to SAE standard J2727, which estimates leakage based on factors such as the lengths of air conditioner hose in the system, hose materials, number of joints, types of seals used for each joint, and the type of compressor shaft seal. The current credit formula effectively caps the credits by specifying minimum-allowed leak scores that can be used in the formula of 8.3g/year for cars 10.4g/year for trucks, (4.1g/year and 5.2g/year respectively with an electric compressor).

An examination of the J2727 scoring system shows that it is possible to use the best technologies in each of the above categories and achieve leak rates that are below the minimum-allowed leak score level that currently defines the maximum EPA MAC low-leak emission credit.

Therefore, the minimum-allowed leak score should be eliminated, which would effectively remove the cap on these credits and thereby provide appropriate recognition of manufacturer efforts to attain the maximum achievable emission reduction in this area.

5.3.2. *High-Leak Disincentive Removal*

The high-leak disincentive penalty should also be eliminated.

The high-leak disincentive penalty of up to 1.8 grams CO_2 per mile (g CO_2/mi) for passenger cars and 2.1 g CO_2/mi for light-duty trucks was put into the regulation for systems that use R-1234yf (or other low-GWP refrigerants), and is assessed when vehicles exceed certain refrigerant leakage levels (e.g., a penalty is incurred for a vehicle with a leak score above 11.0 grams per year if the vehicle has a refrigerant charge size under 733 grams).

This penalty is excessive when considering the *de minimis* GWP impact of the refrigerant that could possibly leak. For example, the maximum high leak disincentive penalty would be incurred for rates above 14.3 grams of refrigerant per year for systems with a charge size of under 733 grams of refrigerant. But with the GWP of R-1234yf rated at 4 or less, the global warming impact of a 15 gram-per-year leak rate over a vehicle's lifetime would only be equal to approximately one kilogram of CO_2 emissions—or even less. The impact of a 15 gram-per-year leak rate compared to the baseline leak rate of 11.0 grams (where no penalty would be assessed) is only 4 grams per year, equating to less than a third of a kilogram of marginal CO_2-equivalent increase over the

vehicle's lifetime. In comparison, the regulatory high leak disincentive penalty would be equal to 351 kilograms of CO_2 emissions for a passenger car and 474 kilograms for a light-duty truck. Clearly, the penalty size is vastly out of proportion to the possible emissions impact of a low-GWP refrigerant such as R-1234yf.

EPA created the disincentive to ensure that high air conditioning leakage rates of low-GWP refrigerants would not result in a do-it-yourself mechanic refilling the system with a higher-GWP refrigerant that would subsequently leak out again.[165] However, the fundamental problem with the high leak disincentive provisions is that the penalty system, created to maintain high levels of MAC system integrity, is simply not needed considering the high cost of R-1234yf refrigerant[166] coupled with the current state of air conditioner hardware technology. Due to the high cost of R-1234yf, the industry has adopted demanding specifications for R-1234yf system integrity in order to reduce warranty and other costs. Thus, the high leak disincentive penalty system as currently structured is largely a reporting burden that does not create sufficient real-world benefits to justify the administrative costs.

For these reasons, the Alliance recommends removal of the high leak disincentive term from the equations used to calculate air conditioning refrigerant credits for systems with low-GWP refrigerants.

5.4. Air Conditioning Efficiency

EPA created a list of air conditioning efficiency technologies that earn a pre-defined and pre-approved credit in grams per mile CO2 in the 2012-2016 light-duty GHG and CAFE regulation.[167] The efficiency technologies were termed "indirect" MAC credits where the vehicle emissions improvements were an indirect consequence of reduced fuel consumption as a result of the more efficient MAC system. The baseline for these credits was EPA's estimate of the total fuel usage from light-duty mobile air conditioner usage in the United States, which EPA estimated to be 14.3 grams CO2 per mile, or 3.9% of total national light-duty vehicle fuel usage.[168]

The technologies identified for pre-approved credits and the percentage efficiency improvement estimates for these technologies came primarily from the Improved Mobile Air Conditioner (IMAC) industry-government Cooperative Research Program conducted through SAE International. IMAC was a partnership between EPA, DOE and 28 corporate sponsors, which published its final report in 2007. The IMAC program demonstrated an improvement of 36.4% in MAC efficiency using best-of-the best designs for these technologies on a test vehicle, compared

[165] U.S. ENVIRONMENTAL PROTECTION AGENCY & NATIONAL HIGHWAY TRANSPORTATION SAFETY ADMINISTRATION, JOINT TECHNICAL SUPPORT DOCUMENT: FINAL RULEMAKING FOR 2017-2025 LIGHT-DUTY VEHICLE GREENHOUSE GAS EMISSION STANDARDS AND CORPORATE AVERAGE FUEL ECONOMY STANDARDS at 5-9 (Aug. 2012).

[166] For example, as of October 15, 2018, 36 oz. of R-134a can be obtained for $19.95. R-1234yf costs $163.00 for 32 oz. *Compare* AMAZON, https://tinyurl.com/HFC134a, with https://tinyurl.com/Honeywell-R1234yf (last visited Oct. 15, 2018).

[167] *See* 75 Fed. Reg. 25,427 et seq.

[168] U.S. ENVIRONMENTAL PROTECTION AGENCY, EPA-420-R-10-009, FINAL RULEMAKING TO ESTABLISH LIGHT-DUTY VEHICLE GREENHOUSE GAS EMISSION STANDARDS AND CORPORATE AVERAGE FUEL ECONOMY STANDARDS REGULATORY IMPACT ANALYSIS at 2-30 (Apr. 2010).

to a baseline MAC system using a defined list of typical technologies in production at that time, such as a fixed displacement compressor.[169]

EPA estimated from the IMAC work that a 40% reduction in emissions was possible when employing the indirect A/C menu technologies in the study. That reduction equates to a 5.7 g/mi CO2 reduction (0.40 X 14.3 g/mi CO2) which then became the capped credit value for employing the technologies on the indirect A/C menu from the "Final Rule for Model Year 2012 - 2016 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards."[170] The cap was modified for the 2017 final rule to better align the efficiency improvement credit values based on the physics of cars and trucks. The 2017 menu cap for passenger cars was modified to 5.0 g/mi CO2 and 7.2 g/mi CO2 for trucks.

The pre-defined and pre-approved MAC indirect credit menu has proven to be highly successful. Air conditioning efficiency technologies were not heavily deployed in U. S. market vehicles when the indirect MAC credits first came into effect. The industry claimed an average of 1 g/mi CO2 in indirect A/C credits in 2009 or roughly 20% of the available menu cap at that time. Since then the MAC efficiency technologies have been widely deployed in the U. S. vehicle fleet, averaging nearly 4 g/mi CO2 of indirect A/C credits in 2016 or about 70% of the maximum menu credit cap.

The current rulemaking is an opportunity to build on the success of the MAC credit program. The MAC efficiency community has steadily advanced the reduction of MAC emissions since the time of the first rule. New work performed by the National Renewable Energy Laboratory ("NREL") shows that the U.S. average CO_2 emissions associated with MAC operation are much higher than those assumed by EPA when the credit values of the indirect MAC technology menu were derived.[171] Therefore, the benefits of those technologies are undervalued at their current values and should be updated.

The Proposed Rule requests feedback on the government's proposal to merge the Solar Thermal Menu technologies with the Indirect A/C Menu technologies. The Alliance supports removing the Solar Thermal Menu technologies from the Off-Cycle Menu and adding them to the Indirect A/C Menu. The Alliance also supports raising the cap by the sum of the two menu values.

Rapid technology deployment following the introduction of the indirect MAC credit menu and the Denso SAS compressor have spawned new innovations in the MAC efficiency field. Other compressor manufacturers have developed competing technologies to the Denso SAS compressor that can be quickly deployed.

Other leaders in this field have innovated based on the idea that further reductions in fuel use due to MAC system operation are possible. System innovations such as the Ejector Evaporator Cycle

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[169] *Id.* at 2-30.
[170] *Id.* at 2-40.
[171] *See* Kreutzer et al., National Renewable Energy Laboratory, U.S. Light-Duty Vehicle Air Conditioning Fuel Use and the Impact of Four Solar/Thermal Control Technologies, presentation at SAE 2017 Thermal Management Systems Symposium (Oct. 2017). Comparing NREL 2016 assessment of 23.5 g CO_2/mile (p. 40) to EPA derivation based on 14.3 g CO_2/mile. FINAL RULEMAKING TO ESTABLISH LIGHT-DUTY VEHICLE GREENHOUSE GAS EMISSION STANDARDS AND CORPORATE AVERAGE FUEL ECONOMY STANDARDS REGULATORY IMPACT ANALYSIS at 2-30 (Apr. 2010).

and Zone Control further reduce MAC emissions in addition to the technologies included in the indirect MAC credit menu.

The Life Cycle Climate Performance ("LCCP") model originally pioneered by EPA and industry continues to improve with updated climate data for many more cities in the world. SAE specifications have been developed to test the validity of MAC emissions reduction technologies. The Agencies and the automotive industry remain committed in partnership to developing, implementing and improving the tools needed to continue the beneficial impact in MAC system efficiency improvements for the future when the next generation of technologies will deliver passenger comfort in innovative ways.

MAC indirect credits continue to play a critical role in industry compliance with the light-duty vehicle greenhouse gas and CAFE regulations and achieving emissions and fuel consumption reductions that would not otherwise have been.

The current rulemaking should be used as an opportunity to build on the success touted above and achieve additional real-world emissions reductions. This can be done by adding new technologies as discussed below to the combined menu with pre-approved credit values and revising the credit caps based on the recent NREL work. In the following passages, we propose a reorganization and rationalization of the indirect MAC and off-cycle credits to reflect new information that has been gathered since the creation of these regulatory provisions. The recommended reforms would:

- Raise the air conditioner efficiency and thermal control technology caps by 64% (commensurate with NREL assessments of on-road air conditioning system emission impacts), and combine them into a single cap covering both types of technologies;
- Raise some existing air conditioner efficiency and thermal control technology credits by up to 64%;
- Create new regulatory provisions to handle further new air conditioner and thermal technology developments;
- Transfer certain air conditioner credits for electrical technologies into the off-cycle credit list, instead of the air conditioner list; and
- Remove AC17 testing requirements for claiming MAC system efficiency credits.

5.4.1. *MAC System Efficiency Program Retention*

As the Agencies' analysis shows, the automotive industry is able to achieve its environmental and energy goals more cost effectively if it can use flexibility mechanisms such as air conditioner efficiency credits to assist compliance. Therefore, although we recommend many improvements to these regulatory provisions, we request in general that these credit mechanisms be retained in the MY 2021–2026 regulations.

5.4.2. *MAC System Efficiency and Solar-Thermal Credit Menu Combination*

Automobile manufacturers are already well on the way to reaching the existing MAC indirect credit caps using the technologies on the existing pre-approved credit list, with the MY 2018

industry average already at approximately 80% of the cap.[172] Future technology improvements would therefore have a small impact on emissions reduction plans if the caps are not also revised to accommodate the newly available technologies. Fortunately, it appears that this is both possible and technically correct, and that the caps can and should be revised, thereby enabling additional incentives for implementation and acceleration of improved technologies.

EPA based its MAC efficiency credits on estimates of each technology's percentage impact on the total fuel usage by vehicle air conditioner systems in the U.S. However, EPA's 14.3 grams CO_2 per mile estimate of baseline air conditioner energy usage (3.9% of total light-duty fuel consumption) was well below the estimates of others, such as researchers from the National Renewable Energy Laboratory (over 6%) and Oak Ridge National Laboratory, as well as longstanding benchmarks used by industry.

This baseline used by EPA, which was as low as half the baseline MAC energy usage estimated by the other major sources, resulted in MAC efficiency credits and an associated credit cap which are far below the actual real-world fuel savings and CO_2 reductions that are resulting from these technologies.

More recent estimates of baseline U.S. energy usage for light-duty vehicle air conditioners, using updated and refined models, have continued to significantly exceed the EPA baseline. In a series of studies released in 2017 by scientists from the National Renewable Energy Laboratory, the baseline MAC energy usage was calculated to be 30.0 gallons of gasoline per vehicle per year, equivalent to 23.5 grams of CO2 per mile.[173]

The updated estimate from NREL of 23.5 grams CO2 per mile is 64% greater than the EPA baseline of 14.3 grams CO2 per mile.

5.4.3. *Combined MAC System and Solar-Thermal Menu Credit Adjustments*

The underestimated EPA baseline for MAC energy usage also impacts the credit caps and credit amounts created in the off-cycle credit provisions for the various solar/thermal control technologies, such as solar reflective paint, solar reflective glass, ventilated seats, and active or passive cabin ventilation. These thermal control technologies should ideally have been analyzed and administered in combination with the MAC efficiency technologies from the earliest stages of the light-duty greenhouse gas regulation since they both address energy usage to power the air conditioning system.

The Alliance therefore proposes that the MAC indirect credit caps and the thermal control technology off-cycle caps be combined, and that the two lists of technologies be administered under a single set of caps. The Alliance further proposes that the combined set of caps should be revised to reflect a 64% higher baseline energy usage for air conditioner energy, as shown below.

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[172] NOVATION ANALYTICS, *supra* note 33, at 50.

[173] C. Kreutzer et al., U.S. Light-Duty Vehicle Air Conditioning Fuel Use and the Impact of Four Solar/Thermal Control Technologies, SAE Thermal Management Systems Symposium at 23 (Oct. 10-12, 2017); C. Kreutzer et al., Impact of Active Climate Control Seats on Energy Use, Fuel Use and CO2 Emissions: Test and Analysis", SAE Thermal Management Systems Symposium at 26–27 (Oct. 10-12, 2017).

The new NREL data reinforces the already ample justification for raising the EPA credit caps for air conditioner efficiency and thermal control technologies. Based on an adjustment of approximately 64% to reflect the higher NREL estimate of baseline MAC energy usage, beginning with MY 2021 the caps would become:

MAC Indirect and Thermal Control Caps Adjusted for NREL Baseline (g CO_2/mi)						
	Current			Revised		
	MAC Indirect	Thermal Control	Total	MAC Indirect	Thermal Control	Total
Car	5.0	3.0	8.0	8.2	4.9	13.1
Truck	7.2	4.3	11.5	11.8	7.1	18.9

Table 5.2: Current and recommended MAC indirect and thermal control credit caps.

5.4.4. *Combined MAC System and Solar-Thermal Menu Existing Technology Credit Additions and Adjustments*

In Attachment 7, the Alliance describes a number of technologies that should be added to the MAC indirect credit list.

Taking into account the new baseline of 23.5 g CO_2/mi for air conditioner energy usage, and incorporating the new technologies described further in Attachment 7, the rescaled preapproved list of MAC indirect credits would be as shown in Table 5.3 beginning with MY 2021 or sooner. Because the NREL analysis cited above showed lower effectiveness for the active and passive cabin ventilation technologies, the credits for these two technologies are not increased in the following proposed new preapproved credit table. The credit for internal heat exchangers has also not been increased, based on the most recent evaluations of this technology.

Updated Air Conditioner Indirect and Thermal Control Preapproved Credit List (g CO_2/mi per vehicle)				
	Current		Revised	
	Car	Truck	Car	Truck
Reduced Reheat (EVDC)	1.5	2.2	2.5	3.6
Reduced Reheat (fixed)	1.0	1.4	1.6	2.3
Scroll Compressor	NA	NA	2.5	3.6
Default to Recirc (closed loop)	1.5	2.2	2.5	3.6
Default to Recirc (open loop)	1.0	1.4	1.6	2.3
Internal Heat Exchanger	1.0	1.4	1.0	1.4
Improved Evaporators / Condensers	1.0	1.4	1.6	2.3
Oil Separator	0.5	0.7	0.8	1.1
High-Efficiency Blower Control	0.8	1.1	Moved	Moved
Compressor with Variable Crankcase Suction Valve	None	None	1.1	1.1
Glass	Up to 2.9	Up to 3.9	Up to 4.8	Up to 6.4
Paint	0.4	0.5	0.7	0.8
Active Seat Ventilation	1.0	1.3	1.6	2.1
Active Climate Control Seat	None	None	3.5	4.5
Passive Cabin Ventilation	1.7	2.3	1.7	2.3
Active Cabin Ventilation	2.1	2.8	2.1	2.8

Table 5.3: Updated air conditioning indirect and solar-thermal control pre-approved credit list.

Note also that the updated MAC indirect credit list includes the new credit for scroll compressors and compressors with variable crankcase suction ("CS") valves (both under the cap), but removes the credit for high-efficiency blower controls from the indirect MAC/thermal cap, and moves this credit to the off-cycle credit list. These two changes roughly offset each other with respect to the coverage of the combined MAC indirect/thermal control technology cap.

The recommended new credit values in the above table reflect the 64% higher baseline for air conditioner fuel consumption, as estimated by NREL, and the original EPA modeling of the technologies. In contrast, the NREL study revised both the fuel consumption baseline as well as the analytical techniques used to model each technology. Based on the NREL modeling (and without including the higher NREL air conditioning baseline), some technologies did even better than in the EPA modeling (e.g., active engine warm-up, active transmission warm-up, and ventilated seats). Some technologies did the same (e.g., reflective paint), and some did worse than the EPA modeling (e.g., active and passive cabin ventilation and solar reflective glass). The NREL modeling for active and passive cabin ventilation was so much lower than the original EPA modeling that the Alliance recommendations for these technologies do not ask for any increases above the current credit levels, even though we shift to the higher air conditioning baseline for the other technologies.

5.4.5. *Technology Implementation Barriers*

5.4.5.1. Indirect MAC Technology Off-Cycle Applications and EPA Guidance

EPA has introduced guidance and interpretations concerning the MAC indirect and thermal control technology caps that have created severe obstacles to further progress. For example, EPA first asserted in the 2016 Technical Assessment Report for the Midterm Review that any new air conditioner efficiency technologies approved for off-cycle credit would fall under the same credit cap that had been established initially in the 2012 regulation based on the known air conditioner efficiency technologies at that time, which were all included on the predefined and preapproved credit list for air conditioner efficiency technologies beginning in 2012. Putting emerging new technologies under the 2012-based credit cap essentially excludes further improvements in vehicle air conditioners and related passenger comfort systems, despite the existence of known emerging technologies written into the 2012 list. This interpretation regarding the application of that cap is impacting investment plans, slowing implementation of new technologies, and thereby frustrating the goals of the regulation. These caps contradict and undermine EPA's statements that MAC technology developments will continue to expand and play an increasing role in overall vehicle GHG reductions.

The analyses submitted by General Motors and subsequently by other automobile manufacturers for the off-cycle credit for the Denso SAS compressor with variable crankcase suction ("CS") valve technology clearly showed that the energy savings were incremental to a baseline compressor (the SBU compressor) that had all of the compressor efficiency technologies on the MAC indirect credit preapproved menu. In addition, there have been many new efficiency improvement technologies presented in various technical forums, such as at the SAE World Congress and the SAE Thermal Management System Symposium, which would increase

efficiency significantly beyond the MAC indirect credit menu (such as zonal MAC systems). Evaluations of some of these new technologies have been presented by national laboratories such as NREL and Oak Ridge, in addition to presentations by OEMs and MAC suppliers. These additional MAC efficiency technologies offer substantial additional GHG reductions, and the Agencies' policies should try to encourage and incentivize rapid implementation of these improvements.

In general, credit caps are counterproductive since they impede greater technology implementation. Certainly, in the case of new MAC (or other off-cycle) technologies that have been specifically demonstrated to be incremental to the technologies on the preapproved list, the caps created based on the preapproved list should not be strictly applied. On the proposed new credit list above, the credit for a compressor with variable CS valve technology has been put under the cap, but with room for it provided by the transfer of the credit for high-efficiency blower controls to the off-cycle list of credits, where this credit related to the electrical system more appropriately belongs.

While these proposed changes accommodate the improvements from the variable CS valve technology added to a conventional air conditioner system, the regulations need a more general provision that can accommodate more radical changes and improvements in thermal and cabin comfort as architectures. This new regulatory section would potentially accommodate such emerging technologies as microclimate seats and/or smart zonal air conditioner systems, which only expend energy to cool small areas around occupied locations within the cabin. In an extreme example, an autonomous vehicle in the future might have no glass windows. These emerging technologies have the potential to completely eliminate, or at least dramatically downsize, the conventional components of a vehicle air conditioner. Since these conventional components are the basis for the existing preapproved credit list, there needs to be some regulatory provision to account for the new technologies that replace the conventional components or dramatically change their energy consumption.

In view of these considerations, a new section should be created in the off-cycle credit portion of the regulation. This new section would allow automobile manufacturers to petition for off-cycle credit for new advanced thermal system or passenger comfort architectures. Under this new regulatory section, the caps on credits from the preapproved lists for air conditioner efficiency and/or thermal control technologies would explicitly not apply. Instead, an automobile manufacturer (or potentially a supplier) could use a methodology to establish the energy consumption of the new advanced system, and achieve credit for its improvements without the restriction of these caps.

5.4.5.2. Credit Validation

To maintain the momentum of the industry in making improvements to the efficiency of thermal comfort systems, the Alliance proposes the elimination of the A-to-B AC 17 test requirements to claim efficiency menu credits that are set to begin with MY 2020. Automotive manufacturers have been strongly against this testing requirement for two reasons. First, it is difficult to consistently measure small improvements during vehicle testing, due to test-to-test variation. This variation

can be seen in the round robin testing of a single vehicle tested at four facilities. As shown in the figure below, the test results varied by up to 10 g/mi, which is greater than the value of all the technologies on the air conditioning menu. Second, there is typically no good baseline vehicle designed or built (i.e., no identical vehicle is built without the efficiency technologies that get the credits). The AC17 test requirement therefore creates uncertainty over the future value of these credits and potentially undermines the success that the pre-approved list of credits has achieved in stimulating implementation of improved technologies.

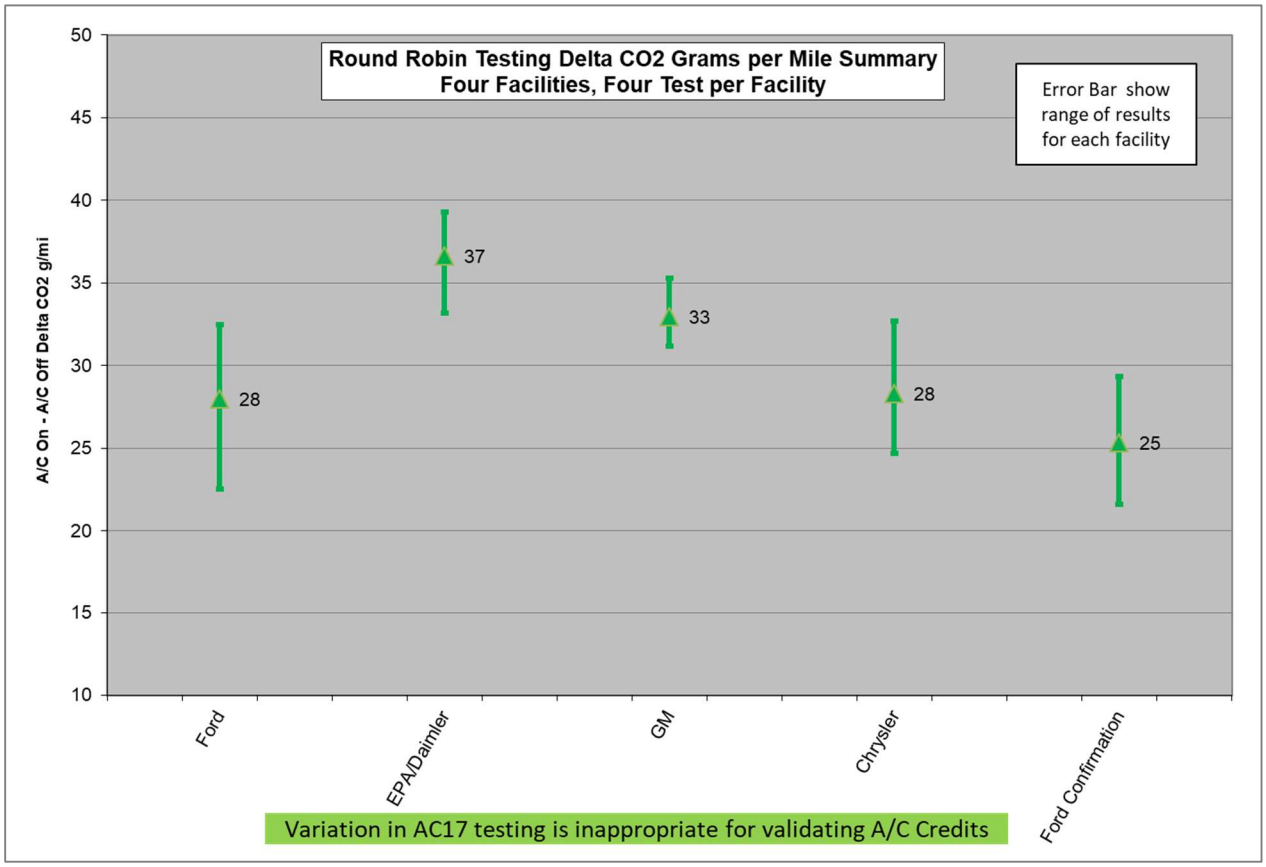

Figure 5.4: Variation of AC17 round robin testing.[174]

5.4.5.3. AC17 Testing

Instead of attempting A-to-B AC17 testing on every vehicle platform every year, the Alliance proposes a cooperative industry-government program (like the previous IMAC cooperative research program) to reanalyze the benefits of the technologies on the preapproved credit list, including some vehicle testing. Reexamination of the air conditioner efficiency credits could revalidate the real-world benefits of these technologies, and reconfirm the credit list, thereby providing a reliable basis for eliminating the existing AC17 A-to-B test requirement in the regulation.

The proposed cooperative research program would be superior to the existing AC17 A-to-B test requirement for several reasons. The AC17 MAC efficiency test has not proven that it is

[174] Courtesy of Ford Motor Co.

sufficiently accurate to play the role that EPA envisioned for it in its GHG regulation beginning in MY 2020, when the A-to-B AC17 tests would need to show a differential sufficiently large for a manufacturer to apply the indirect MAC credit from the list of preapproved technologies. There are too many testing difficulties for the AC17 test procedure to function on a standalone basis in the way that traditional emissions certification tests measure compliance compared to a standard. Instead, the experience gained over the past few years with the AC17 procedure shows that it can, at best, be used as a supplement to evaluations of the efficiency of an air conditioner technology, rather than as the sole basis for measuring efficiency.

Therefore, it can be expected that in almost every compliance submission beginning in MY 2020, manufacturers will need to submit an engineering analysis (rather than straightforward AC17 test results) in order to meet the A-to-B comparison requirements to justify their MAC indirect credits. This engineering analysis may or may not be supplemented with AC17 A-to-B testing of some or all of the technologies in the credit requests for each vehicle.[175]

To support this effort, activities have been conducted through SAE to define other methodologies to support these A-to-B engineering analyses, such as SAE standards for bench testing the efficiency of an internal heat exchanger, an oil separator, an improved evaporator or condenser, or a blower controller. Automobile manufacturers continue to support this and similar future activities.

In conclusion, the preapproved credit lists for MAC efficiency technologies and thermal control technologies have worked very well over the past several years to accelerate implementation of more efficient technologies that reduce GHG emissions. Due to its low baseline for MAC energy usage, the EPA methodology for creating these preapproved credits was very conservative, and real-world emissions reductions have likely greatly exceeded the credited amounts. Viewed from this perspective, the upcoming A-to-B testing requirements pose more of a threat to these emissions reductions than they create an opportunity for improving the program. The MY 2020 AC17 A-to-B test requirement could create uncertainty over full achievement of MAC indirect credits that could hinder investment in MAC efficiency technologies. The future success of the MAC credit program in generating emissions reductions will depend to a large extent on the manner in which it is administered by EPA, especially with respect to making the AC17 A-to-B provisions function smoothly, without becoming a prohibitive obstacle to fully achieving the MAC indirect credits.

5.4.6. *Inclusion of A/C Efficiency Credit for CAFE Compliance in MYs 2012–2016*

NHTSA has tentatively denied the Alliance and Association of Global Automaker's petition to include indirect MAC credits for MYs 2010-2016. When A/C efficiency credits (or FCIVs) were

[175] The same logic applies to other uses of the AC17 test, such as for evaluating new MAC efficiency technologies as potential off-cycle credits, as was done by General Motors using the Denso SAS compressor with variable CS valve technology. The AC17 test can supplement these evaluations, but should not be used as an essential requirement for every credit submission. For example, the AC17 test only covers a limited set of the conditions that can occur in the real world, whereas future technologies may be developed that only provide their benefits in these other conditions not experienced in the AC17 test. Engineering analysis using bench test data or other approaches may be sufficient, or even superior, for these evaluations.

added to the CAFE program for MYs 2017-2025, NHTSA declined to retroactively add these credits to the MY 2012-2016 program stating that they did not take them into account when adopting the CAFE standards for those model years.[176] NHTSA implies that if it had included them, they could have made the standards more stringent.

It is for this reason that the petition only sought credits in the CAFE program for exceeding the assumed credits used to determine the GHG stringency. In other words, had NHTSA considered A/C efficiency credits when determining maximum feasible, and had they used the same level of credits that EPA assumed, they would have promulgated standards that were higher than those used in MYs 2012-2016. But under the mechanisms described in the petition, manufacturers would only earn credits for exceeding that higher level of stringency that NHTSA would have considered if A/C efficiency credits were included in NHTSA's MY 2012–2016 standards.

We note that A/C efficiency credits are for technologies that provide real fuel savings, can be included in average fuel economy with the fuel consumption improvement values as is done for MYs 2017-2025, and would further harmonize the programs.

5.5. Off-Cycle Technology Credit Program

Phases 1 and 2 of the EPA GHG regulation and Phase 2 of the NHTSA fuel economy regulation enable flexibilities in the form of off-cycle technologies[177] which are an important part of manufacturers' pathways to compliance as they allow credit for technologies that improve customer's on-road fuel economy, even though the fuel economy improvements from these technologies may not be observed in the laboratory. The off-cycle credit program, while in need of improvement, has been supported by the Agencies and automotive industry stakeholders. There are three unique pathways for claiming off-cycle credit that encourage technology implementation; the predefined technology table, the 5-cycle methodology, and the alternative methodology.

The first of the three paths for claiming off-cycle credits, the predefined technology table has proven to be the most useful. The predefined table of technologies allows manufacturers that add technology meeting the defined requirements to claim a predetermined credit values from the table. The bulk of the off-cycle credits earned to date are from the predefined table, as manufacturers are assured of receiving credit when they deploy the technologies from the table. Below, the Alliance identifies several ways that this very useful tool can be further improved.

The second path to claiming off-cycle credits, the 5-cycle pathway, allows OEMs to quantify the benefit of technologies that are not realized or only partially realized on laboratory 2-cycle testing. The Alliance applauds the EPA for undertaking a separate technical rulemaking that, when complete, will make this pathway useable. Up until this point, the agency has not recognized technologies through this method.

The third path is based on manufacturer-defined and EPA-approved alternative methodologies. Manufacturers identify a technology, demonstrate the value of the technology with testing and

[176] 77 Fed. Reg. at 62,840; 83 Fed. Reg. at 43,456.
[177] 40 C.F.R. § 86.1869-12.

data, and submit an application to the EPA to acquire credit for the technology. The process incorporates public scrutiny and comment before the process is approved by EPA. Currently, this pathway works poorly. Below, the Alliance recommends several steps the agencies should take to improve this process that would enable automobile manufacturers and suppliers to take advantage of this method and deploy more fuel saving technologies.

5.5.1. *Recommendations for the Pre-Approved List of Off-Cycle Credit Technologies*

5.5.1.1. Expand the Off-Cycle Table Credit Cap

From 2012-16MY, industry's application of off-cycle technologies to the U.S. fleet tripled[178] (2X on car fleet and 4X on truck fleet) to 3 g/mi. Manufacturers have rapidly deployed technology in response to this all new regulatory mechanism – a recognition of the cost-effectiveness of these technologies, that have on-road FE/GHG benefits which are not completely captured during laboratory conditions. Given this early success, the Alliance expects industry adoption of off-cycle technologies will at a minimum continue at the current rate or more likely accelerate. In the MY2021-2026 timeframe of the proposed rule, it is likely that manufacturers will hit the existing 10 g/mi cap.

Knowing that this regulatory mechanism incentivizes industry innovation, manufacturers need regulatory certainty to fund the needed investment in technology. The draft rule seeks comment on past industry requests to remove the 10 g/mi off-cycle table cap completely, and the Alliance supports this proposal which will unleash industry innovation. Left in place, the cap is stifling the deployment of fuel saving technologies.

While the Alliance members do not prefer a cap, the Agencies proposed a cap in a range of 5-10% of an individual OEM's fleet standard. The Alliance only supports a cap set to 10% or greater, in order to fully encourage deployment of these technologies. We acknowledge that this path works much like attribute-based standards, where a given technology could have a greater gram/mile savings if the base vehicle had higher fuel consumption (i.e., a large versus small vehicle). This arrangement would also gradually taper the magnitude of the credit as vehicles continue to improve their CAFE/GHG performance.

The Agencies also seek comment on increasing the cap to 15 g/mi. While the Alliance supports any expansion of the off-cycle table cap, this is the least preferred of the alternatives in the proposed rule.

5.5.1.2. Revise the Off-Cycle Technologies in the Existing Table

The Alliance proposes additions to the predefined off-cycle technology table. The additions are proposed in two forms: transfer of approved alternative methodology applications, and addition of new proposed technologies. Other technologies would be removed the tables as the Alliance supports the proposal to move thermal control technologies to the A/C efficiency table.

[178] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at tbl.3.17.

5.5.1.2.1. Transfer Approved Alternative Methodology Applications to the Table

Many OEMs have generated alternative methodology off-cycle technology applications for the same technology (e.g., high efficiency alternators and lighting), and have had them approved. These applications represent a duplication of effort as the methodologies are generally the same and yield the same credit value. The Alliance proposes that many of these technologies can be standardized and added to the predefined off-cycle table technology list.

Doing so will eliminate the time spent by the Agencies evaluating essentially the same application submitted by a different OEM that lead to the same result. An excellent example would be to add a standardized formula for high efficiency alternators based on VDA efficiency as already approved for Ford, GM and FCA. The Agencies should standardize the calculations and add the formula to the menu. Doing this will improve the process for OEMs to claim the credit as the table is the most certain and efficient way of taking credit.

The Alliance supports a process that takes new and approved off-cycle applications and adds them to the off-cycle table. This process will free up scarce resources at both the Agencies and OEMs for evaluating these technologies and will speed their deployment. Implementing a process like this would take a technology proposal and, if approved, the credit would be available for use by all within a year. Given that OEMs need certainty for investment and that product decisions can take years to implement, this process is needed to incentivize the quick and widespread deployment of GHG emissions and fuel saving technologies. Turning these new technologies into table items, still with appropriate agency and public review, is a winning process for all stakeholders. The OEMs get the needed certainty to make the investment, and the public benefits with more on-road fuel savings.

5.5.1.2.2. Move Thermal Control Technologies to the Air Conditioning Efficiency Table

The Alliance agrees with the Agencies' proposal to restructure off-cycle credits by removing the solar-thermal technologies such as glass, paint, cabin ventilation, and ventilated seats and combining them with the air conditioning efficiency technologies. The off-cycle credits discussed here pertain to efficiency improvements unrelated to the air conditioning and solar-thermal technologies. The menu should reflect this.

5.5.1.2.3. Add New Off-Cycle Technologies to the Table

The Alliance proposes the addition of the following technologies to the predefined table. The supporting technical details for each the above technologies are discussed separately in Attachment 7.

- Transmission Thermal Bypass Valve – Active Warm-Up
- Rear Axle Active Warm-Up
- Exhaust Heat Recirculation System (EHRS) Active Warm-Up
- Cooled Exhaust Gas Recirculation (CEGR) Active Warm-Up
- EHRS/CEGR Combined

- Engine Encapsulation/Powertrain Bay Heat Retention
- Electrical Load Reduction
- High Efficiency Alternator (Alt Methodology Transfer to Table)
- PWM/DC Blower Controllers
- Brushless Motors
- Engine Stop-Start Idle with Cold Storage

5.5.1.2.4. Overview of a New Off-Cycle Table

The Alliance proposes the following revised off-cycle table based on:

- Transferring approved alternative methodology applications to the table;
- Moving thermal control technologies to the A/C efficiency (indirect) table; and
- Implementing newly proposed technologies.

Technology	Passenger Car Credit CO_2 (g/mi)	Light-Duty Truck Credit CO_2 (g/mi)
High-efficiency exterior lights	Up to 1.0 based on system	
Waste heat recovery per 100W (scalable)	0.7	
Efficient electrical device credit (real-world)	0.32 per W	
Solar roof panels for battery charging with or without active cabin	2.5 (with active cabin) 3.3 (without active cabin)	
Active aero per 1% Cd improvement (scalable)	0.1936	0.3316
Engine idle stop/start without or with heater circulation system	1.5 (without) 2.5 (with)	2.9 (without) 4.4 (with)
Active transmission warm-up	1.5	3.2
Active engine warm-up	1.5	3.2
Thermal bypass valve warm-up	0.5	1.0
Rear axle active warm-up	1.5	3.2
Exhaust heat recirculation system	20% multiplier*	
Cooled exhaust gas recirculation	10% multiplier*	
Powertrain bay heat retention and engine encapsulation	1.5 (powertrain bay heat retention) 3.0 (engine encapsulation)	
High-efficiency alternator	(VDA-67) * 0.16	
PWM-controlled blower	1.3	1.8
Brushless blower motors	Scalable based on motor efficiency	
Brushless engine fan motor	0.5	1.0
Engine stop-start idle with cold storage	1.0	1.5
Adaptive cruise control	2.0	

Table 5.4: Updated off-cycle table.

* multiplier based on any combinations of active engine, transmission, or axle heating warm-up

5.5.2. *Thermal Control Technology Credit Accounting*

The regulation at 40 C.F.R. § 86.1869 as released in the Federal Register notice[179] did not specify that the thermal control technology credit caps were applicable on a per vehicle basis. That interpretation was not disclosed until EPA released the guidance letter CD-15-25 on November 4, 2015 three years after the regulation was released and after manufacturers had already submitted credits, forcing manufacturers to restate previously claimed credits.

This interpretation has proven to be particularly troublesome to implement since the database and accounting systems for compliance reporting have not typically been constructed to check whether credit caps have been reached on each individual vehicle. Instead, these systems are typically constructed to compile fleet totals and fleet averages for each type of technology feature, and these totals can be compared relatively easily to a fleet average cap. In contrast, checking the cap on each vehicle requires going back to each vehicle VIN to check the individual equipment level for each vehicle, which is a laborious task that can be expected to become increasingly difficult as rising technology implementation brings more vehicles to the cap. The EPA interpretation of how to implement thermal control technology credit caps should be revised to partially alleviate the counterproductive constraints from the caps by implementing the cap on a fleet average basis, instead of implementing the cap on each vehicle.

This guidance letter EPA released was an overly broad and aggressive interpretation of EPA's language and directly contradicts EPA's own language in other sections of the preamble. The regulation and preamble do describe that credits are to be earned on a per vehicle basis, but never directly discuss the subject that the maximum credit caps should also be applied on a per vehicle basis. The discussion related to earning credit on a per vehicle basis is related to quantifying the benefits of the additional technologies and the arguments that minimum penetrations levels are counterproductive. On the contrary when discussing credit availability on electrified products the preamble clearly states that these credits will be accounted for at the fleet level: "EV/PHEV/FCVs can earn air conditioner efficiency, air conditioner refrigerant, and off-cycle credits. EPA will be accounting for these credits at the manufacturer fleet level, not at the individual vehicle model level . . . ."[180]

Furthermore, historic reporting has traditionally been handled on a model type basis with caps being implemented at the fleet level. These issues become extremely burdensome when managing off cycle technologies. Unlike major powertrain level differences that are specified in the regulatory definition of a model type, off cycle technologies are not always implemented based on differences in powertrain criteria. Certain off cycle technologies like those in the thermal control technology category, high efficiency lighting, and other technologies can be implemented on vehicles based on the trim level, which can cross multiple model types. Due to these challenges the Alliance requests that these technologies be capped at the fleet level similar to the application of similar regulatory limits.

[179] 77 Fed. Reg. at 62,833.
[180] 77 Fed. Reg. at 62,833.

5.5.2.1. Changes to 5-Cycle Method

EPA has proposed, in a separate rule, a technical correction regarding how to calculate off-cycle credits that are determined via 5-cycle methodology. The regulations were inadvertently not changed to require that the 2-cycle benefit be subtracted from the 5-cycle benefit when demonstrating benefits using the 5-cycle technology demonstration methodology. This arithmetic correction would help ensure that credits derived from the 5-cycle methodology are calculated properly.

Additionally, the Alliance believes that EPA needs to further address two areas in the technical correction. First EPA should clarify that it will award all technologies that have a difference between 5-cycle and 2-cycle testing methodology as long as the OCC credit value is equal to or greater than .05 g/mile, regardless of the observed benefit using the 2-cycle method. The Alliance believes that some technologies have been overlooked in the past because of this incorrect implementation of the intent of the rule. Second the EPA should clearly define the term "baseline technology (item and efficiency)". Clarifying this term will help manufacturers determine what a baseline technology is and the associated baseline OCC value.

Therefore, the Alliance agrees with the intent of the correction and will submit additional comments on the technical correction proposal. The Alliance believes incorporating these changes will allow the program to be implemented as originally intended, is a simple correction to the regulatory language, and supports the intent of the technical correction proposal.

5.5.3. *Off-Cycle Alternative Methodology Enhancements*

The Alliance supports several enhancements to the off-cycle application process as given in 40 C.F.R. 86.1869-12(d). These enhancements will shorten the time it takes to process applications.

5.5.3.1. Fix the Approval Process

The Alliance supports all actions that would work to shorten the time it takes the agencies to evaluate and decision alternative methodology off-cycle applications. Off-cycle application submissions can take a year or longer to be published in the Federal Register despite the current process noted in 40 C.F.R. § 86.1869-12(d). The agencies need to identify and implement internal process improvements needed to evaluate and decision applications in a timelier fashion.

The Alliance proposes that the regulations also be revised to force action if the agencies cannot maintain the timeline identified in the regulations. We propose that all off-cycle alternative methodology applications be automatically approved after 90 days if the agency has not reviewed the application for completeness or published a complete application in the federal register.

Without consistent, agency response, obtaining the needed funding to explore additional fuel saving technologies is challenging. When companies have certainty in timely agency response to off-cycle applications, more technologies can make it to market faster and on a broader scale.

5.5.3.2. Develop an Off-Cycle Analytical Toolbox

For manufacturer planning purposes, clarity and certainty can also be improved through the development by the Agencies of an endorsed "toolbox" of analytical methodologies that can be applied to the analysis of off-cycle credit opportunities. It can often require substantial resources just to launch the projects to investigate new technologies which might offer potential off-cycle energy savings and emission reductions. These projects typically involve work by advanced engineering and/or R&D, including vehicle and component testing. Turning this technical work into an actual credit application requires additional resources, including the efforts from planning, legal, and regulatory affairs to actually write the credit application and bring it through the approval process. In order to achieve the commitment of these resources, it would be helpful to bolster confidence in the credit approval process by establishing a firmer base of pre-approved analytical methodologies on which the industry could rely. It would also help to speed the credit approval process if relatively standardized analytical approaches are used. Finally, it would provide assistance in international markets to have this analytical toolbox endorsed by the U.S. regulatory agencies, since overseas regulators are addressing the same issues.

Some items for the "toolbox" can be identified in successful recent off-cycle approvals. For example, the Lifecycle Climate Change Performance models (the GREEN-MAC LCCP model, and the updated IMAC-GHG LCCP model) and the associated SAE J2765 standard for compressor efficiency bench testing have played a role in many analyses of the energy savings from air conditioner technologies. The AC17 test has also been used to evaluate some of these air conditioner technologies. Additional air conditioner component efficiency ratings techniques have been created through SAE, such as the SAE J3109 standard for the efficiency assessment of PWM HVAC Blower Controllers and BLDC Motor Controllers, the SAE J3094 standard for the efficiency measurement of Internal Heat Exchangers, and the SAE J3112 effectiveness test for A/C Compressor Oil Separators. These can be used as inputs for the SAE J3174 recommended practice standard for an engineering analysis for A/C efficiency credits. The VDA bench test procedure for alternator/generator efficiency has become the norm for credit assessment for that component. Credit assessments for ventilated seats and climate controlled seats have used the family of analytical models developed at NREL, including Coolcalc, Coolsim and FASTSim. EPA analyses have often used the ALPHA vehicle simulations model developed at EPA, but the Autonomie model developed at Argonne National Lab could be a comparable alternative.

It would be helpful for the Agencies to provide some endorsement of these analytical tools as a part of the current rulemaking. In addition, further support can be established going forward through guidance letters and the decision documents that are issued for each method 3 (alternative methodologies) off-cycle credit approval. These techniques would not be considered to be an exhaustive or exclusive list of required analytical methodologies that could be used in requests for credits. Rather, they would provide a set of procedures that manufacturers could use with a heightened level of confidence.

5.5.3.3. Allow a Supplier-Led Application Process

The Alliance supports the proposal to allow a supplier to lead the application process for new off-cycle or air conditioning efficiency technology credits as long as it is in conjunction with at least

one vehicle manufacturer partner. These applications should be assessed in the same way that applications submitted by vehicle manufacturers are assessed.

The Alliance does not support the Agencies provisional credit concept proposal. That is where a supplier demonstrated credit value (with a vehicle manufacturer partner) would be available provisionally, for a limited period of time in order to collect more data that would support the continued use of the credits. This type of program could get technologies designed into new vehicles, tooled up, and put into production only to find that the technology does not actually achieve the benefits originally claimed by the supplier. Vehicle manufacturers need certainty that the off-cycle and air conditioning efficiency benefits will be granted when justifying the costs to develop technologies and put them into production.

Given the problems noted with a provisional credit option, the Alliance proposes an additional option similar to the eco-innovation program in Europe, for a supplier-led application process that would not require a vehicle manufacturer partner. Under this proposal, if a supplier is able to demonstrate benefit at a minimum threshold of 1 g/mi for passenger cars or 1.4 g/mi for light-duty trucks through the existing EPA approved alternative methodology option, then a vehicle manufacturer partner would not be required. The approved credit would then be available to any manufacturer that chooses to put the approved technology into production.

Once a technology is in production, a manufacturer would have the option to demonstrate to the Agencies that their implementation of the technology actually achieves a higher benefit, and then claim a higher credit. The Alliance finds that this structure could achieve the same intended goal of the proposed provisional option, but in a way that requires a more thorough vetting of the technology prior to claiming the benefit. The minimum threshold values would act to focus this application option on technologies that have a substantial benefit, thus reducing the risk of wasting agency time analyzing nuisance applications for technologies with marginal benefit. A cap for these particular credits, separate from any other credit caps, could be placed at 5 g/mi for passenger cars and 7 g/mi for light-duty trucks for technologies claimed through supplier-only applications. If a vehicle manufacturer subsequently submits and receives approval of their own application demonstrating a higher benefit, it would no longer fall under the cap. The combination of a minimum threshold and a cap should encourage suppliers to claim the minimum threshold value for technologies that easily over-perform the minimums. The cap proposal would limit usage to a maximum of five technologies per vehicle approved in this manner before the cap would saturate and allow no further benefit. Setting the benefit for any given technology at the lower end of its potential creates a path for individual manufacturers to demonstrate higher values, thus removing them from the supplier technology cap and creating space under that cap to be filled with new technologies. Technologies that are being used by vehicle manufacturers while they are still under the supplier technology cap would fill the same role as the provisional credit proposal, but would be a much more robust program that will aid in getting many more technologies that have real-world fuel economy benefits into production.

5.5.3.4. Credit Granted Under Alternative Method Required to Demonstrate Benefits, Not Improvements Beyond Current Technology

The off-cycle program is intended to provide credit for technologies that provide more fuel economy and GHG emissions reduction benefit in the real world than is realized in FTP and HFET on-cycle testing. At times EPA has suggested that manufacturers needed to demonstrate how a new technology provided more benefit than a previous technology; however, such a demonstration is not needed. The only necessary demonstration is the incremental off-cycle benefit. Therefore the Alliance recommends that 40 C.F.R. § 86.1869-12(d) be modified as follows (modifications shown as red text).

> (d) *Technology demonstration using alternative EPA-approved methodology.* (1) This option may be used only with EPA approval, and the manufacturer must be able to justify to the Administrator why the 5-cycle option described in paragraph (c) of this section insufficiently characterizes the effectiveness of the off-cycle technology. In cases where the EPA 5-cycle methodology described in paragraph (c) of this section cannot adequately measure the emission reduction attributable to an off-cycle technology, the manufacturer may develop an alternative approach. Prior to a model year in which a manufacturer intends to seek these credits, the manufacturer must submit a detailed analytical plan to EPA. The manufacturer may seek EPA input on the proposed methodology prior to conducting testing or analytical work, and EPA will provide input on the manufacturer's analytical plan. The alternative demonstration program; does not require comparison to other/prior technology, must be approved in advance by the Administrator, and should:
>
> (i) Use modeling, on-road testing, on-road data collection, or other approved analytical or engineering methods only to demonstrate the benefit of technology on-road versus the on-cycle tests;
>
> (ii) Be robust, verifiable, and capable of demonstrating the real-world emissions benefit with strong statistical significance;
>
> (iii) Result in a demonstration of technology benefits ~~baseline and controlled emissions~~ over a wide range of driving conditions and number of vehicles such that issues of data uncertainty are minimized;
>
> (iv) Result in data on a model type basis unless the manufacturer demonstrates that another basis is appropriate and adequate.

In the preamble of the MY 2017–2025 2012 final rule, EPA recognized that the value of the program was in accounting for the off-cycle benefit of technology, not for the technology benefit beyond current levels:

> EPA believes it is appropriate to provide credit opportunities for off-cycle technologies that achieve significant real world reductions beyond those measured

> under the two-cycle test without further making (somewhat subjective) judgments regarding the newness and innovativeness of the technology. Therefore, as proposed, EPA is implementing this program change for new MY 2012–2016 credits as well as for MY 2017–2025.[181]

The above regulatory change clarifies the data requirements to be consistent with the intent of the rule.

5.5.4. *Inclusion of Off-Cycle Credits in CAFE Program MY 2010–2016*

NHTSA has tentatively denied the Alliance/Global's petition to include off-cycle credits for MYs 2010-16. When off-cycle credits (or FCIVs) were added to the CAFE program for MYs 2017-25, NHTSA declined to retroactively add these credits to the MYs 2012-16 program stating that they did not take them into account when adopting the CAFE standards for those model years.[182] The suggestion is that if NHTSA had included them, they could have made the standards more stringent.

We note, however, that EPA *did* consider off-cycle credits for MYs 2012-16 and concluded that there wasn't sufficient information to include them in their stringency. There is no practical difference between NHTSA not considering off-cycle credits for stringency and EPA considering them but assigning them a value of zero. Therefore, the Alliance believes that NHTSA would not be retroactively violating its requirement to promulgate maximum feasible standards.

We note that off-cycle credits are for technologies that provide real fuel savings, can be included in average fuel economy with the fuel consumption improvement values as is done for MYs 2017-25, and would further harmonize the programs.

Similar arguments are applicable to A/C efficiency credits. This subject is a somewhat more complicated than off-cycle credits because EPA did add A/C efficiency credits to their stringency. It is for this reason that the Alliance/Global petition only sought credits in the CAFE program for exceeding the assumed credits used to determine the GHG stringency. In other words, had NHTSA considered A/C efficiency credits when determining maximum feasible, and had they used the same level of credits that EPA assumed, they would have promulgated standards that were higher than used in MYs 2012-16. But under the mechanisms described in the petition, manufacturers would only earn credits for exceeding that higher level of stringency.

NHTSA has also tentatively denied the Alliance/Global petition request to adjust VMTs for MYs 2011-16. We note that the purpose of One National Program was for NHTSA to consider fuel savings and for EPA to considers GHG emission for the same set of vehicles. These vehicles drive a certain number of miles over their lifetime and it doesn't make sense that NHTSA's program consider the fuel savings over fewer miles. Further, we disagree that a MY2011 vehicle would drive 23% fewer miles in its lifetime than a MY2017 vehicle. The practical solution for MYs 2012-16 is the same as NHTSA assumed for MYs 2017-25. That is to equate the VMTs to EPA's values.

[181] 77 Fed. Reg. at 62,835.
[182] 77 Fed. Reg. at 62,840; 83 Fed. Reg. at 43,456.

The Alliance believes there would be minimal harm in this action because manufacturers were generally CAFE compliant during this time frame.

5.5.5. *Rebuttal of ICCT Paper* How Will Off-Cycle Credits Impact U.S. 2025 Efficiency Standards[183]

In March 2018, the International Council on Clean Transportation (ICCT) published a white paper critiquing many aspects of the Agencies' light-duty GHG off-cycle program titled, "How Will Off-Cycle Credits Impact U.S. 2025 Efficiency Standards?"[184] The paper presents a series of inaccurate claims, incorrect citations, and fundamentally flawed logical steps to reach four faulty conclusions:

1. Off-cycle credit use could increase by 3 to 8 times, amounting to a 10-to-25 g CO_2/mi reduction by 2025;
2. The off-cycle credit program is based on technologies that are still largely without validated real-world benefits;
3. Up to 34% of the projected increase in passenger car fuel economy, and 42% of the projected increase in light-duty truck fuel economy, could be lost to off-cycle credit technologies; and
4. A growing off-cycle program that encourages off-cycle technology adoption discourages and delays a shift to electric vehicles.

The Alliance provides here a rebuttal to these claims.

5.5.5.1. Conclusion 1: Off-Cycle Credit

The first major conclusion in the white paper is that off-cycle credit use in 2025 will be dramatically greater than in 2016.[185] While the Alliance agrees that off-cycle credit use will likely increase as time passes, ICCT exaggerates this claim using projections based on incorrectly cited EPA data. In 2016, the combined fleet-wide average off-cycle credit use was 3.0 g CO_2/mi, and the authors outline low, mid-range, and high scenarios for their 2025 projections: 10.0, 17.5, and 25.0 g CO_2/mi, respectively. The authors justify this low scenario by aligning it with the preapproved off-cycle credit cap, and they justify the high scenario by aligning it with the sum of

[183] Sources for this section: 77 Fed. Reg. 62,623; 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22; U.S. ENVIRONMENTAL PROTECTION AGENCY, EPA-420-R-16-014, GREENHOUSE GAS EMISSION STANDARDS FOR LIGHT-DUTY VEHICLES: MANUFACTURER PERFORMANCE REPORT FOR THE 2015 MODEL YEAR (Nov. 2016), *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi/P100PKP1.PDF?Dockey=P100PKP1.PDF; U.S. ENVIRONMENTAL PROTECTION AGENCY, EPA-420-R-16-021, PROPOSED DETERMINATION ON THE APPROPRIATENESS OF THE MODEL YEAR 2022-2025 LIGHT-DUTY VEHICLE GREENHOUSE GAS EMISSIONS STANDARDS UNDER THE MIDTERM EVALUATION: TECHNICAL SUPPORT DOCUMENT (Nov. 2016), *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100Q3L4.pdf; 2018 TRENDS REPORT, *supra* note 19; NIC LUTSEY & AARON ISENSTADT, INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION, HOW WILL OFF-CYCLE CREDITS IMPACT U.S. 2025 EFFICIENCY STANDARDS? (Mar. 2018), *available at* https://www.theicct.org/sites/default/files/publications/Off-Cycle-Credits_ICCT-White-Paper_vF_20180327.pdf.

[184] LUTSEY & ISENSTADT, *supra* note 183.

[185] *Id.* at 34.

the CO_2 credit for today's leading auto manufacturer in each technology area (see Figure 5.5). The valuation for the mid-range scenario is the average of the low and high scenarios.[186] ICCT data supporting the high scenario are reproduced below.

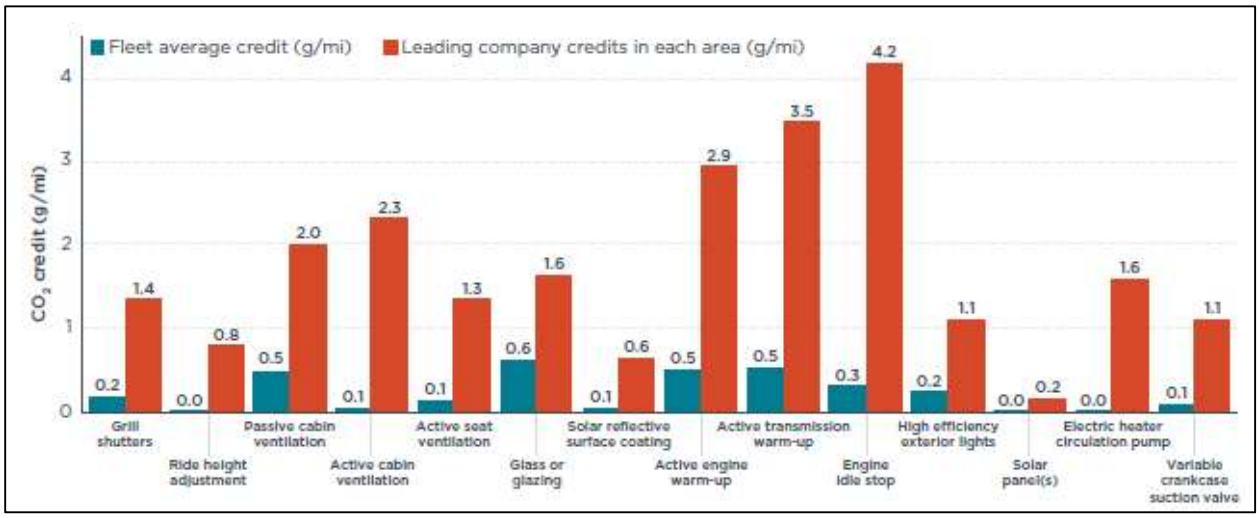

Figure 5.5: Data produced by ICCT representing the fleet-wide average and leading company credits for 14 technology areas used to justify the high scenario.[187] Of the 14 values for leading company credits, 12 are incorrectly cited.

The rationale behind the figure for the high scenario is that by 2025, the average automaker will have a combined fleet-wide average off-cycle credit value equivalent to the sum of the leaders of each individual technology area in 2016.[188] This assumption is counterfactual because of the 14 technology areas shown in Figure 5.5, the credit quantity of 12 of the leading automakers were incorrectly cited. ICCT uses the 2015 and 2016 EPA Manufacturer Performance Reports as the source of their data[189]; however, 10 of these values differ from those found in table 3-21 in both Manufacturer Performance Reports. Two other values, for the electric heater circulation pump and variable CS valve, are not listed in table 3-21.

The electric heater circulation pump is a technology that facilitates efficient cabin heating in cold temperatures while the engine is temporarily off during stop events. Without an electric heater circulation pump, engine idle stop is worth 1.5 g/mi on cars and 2.9 g/mi on light-duty trucks; with the addition of an electric heater circulation pump, the credit calculation increases to 2.5 g/mi on cars and 4.4 g/mi on light-duty trucks (EPA, 2012, p. 62737). It is clear that ICCT is double-counting electric heater circulation pump credits in Figure 5.5 because if the technologies are counted separately, the maximum possible fleetwide average credits would 2.9 g/mi for engine idle stop and 1.5 g/mi for electric heater circulation pump if the fleet mix was 100% trucks with 100% deployment. In Figure 5.5, engine idle stop must represent the combination of engine idle stop with an electric heater circulation pump, like how the data is presented in the Manufacturer Performance Reports. The ensuing discussion of Conclusion I will also consider engine idle stop

[186] *Id.* at 25–26.
[187] *Id.* at 12 fig.3.
[188] *Id.* at 26.
[189] *Id.* at 11.

to be the combination of engine idle stop with an electric heater circulation pump, and eliminate electric heater circulation pump as an individual category.

The variable CS valve is a technology that improves A/C efficiency by optimizing refrigerant flow. It was awarded a 1.1 g/mi credit to General Motors (GM) above and beyond the traditional A/C efficiency credits because it enables additional benefits that the EPA did not project when the GHG program was created. ICCT cited 1.1 g/mi as the fleetwide value, which can only be true with 100% deployment. GM appears to be a credit leader in 2015 (348,102 Mg) and 2016 (309,604 Mg) for the variable CS valve (EPA, 2016a, p. 48; EPA, 2018a, p. 52). With roughly a 50% penetration rate, the impact of these credits is approximately 0.6 g/mi on the GM fleet in 2016.

While the electric heater circulation pump and variable CS valve have unique circumstances, the remaining technologies in Figure 5.5 have more straight-forward applications, and the Alliance is unsure how ICCT gathered their data. The remaining 10 technologies with incorrect citations, in addition to the two correctly-cited technologies, are listed below in Table 5.5, which compares ICCT claims in Figure 5.5 against the data found in the Manufacturer Performance Reports.

Technology Area	ICCT Value (g/mi)	EPA Value (g/mi)
Grill shutters	1.4	1.0
Ride height adjustment	0.8	0.0
Passive cabin ventilation	2.0	2.0
Active cabin ventilation	2.3	2.1
Active seat ventilation	1.3	0.6
Glass or glazing	1.6	1.6
Solar reflective surface coating	0.6	0.1
Active engine warm-up	2.9	1.5
Active transmission warm-up	3.5	1.6
Engine idle stop	4.2	3.6
High efficiency exterior lights	1.1	0.9
Solar panel(s)	0.2	0.0
~~Electric heater circulation pump~~	~~1.6~~	~~N/A~~
Variable CS valve	1.1	0.6
Sum	**24.6**	**15.6**

Table 5.5: Comparison of ICCT claimed values used in Figure 5.5 against the cited EPA source.[190]

ICCT uses incorrect values which sum to 24.6 g/mi, but the correct values sum to 15.6 g/mi. Furthermore, a vehicle cannot physically be equipped with both passive cabin ventilation and active cabin ventilation. If passive cabin ventilation, the lesser of the two credits, is subtracted from the sum of correct values, the result becomes 13.6 g/mi. Thus, if the scenarios are rewritten combining EPA data, physical limitations, and the authors' original logic, the corrected valuations would be 10.0 g/mi, 12.0 g/mi, and 14.0 g/mi for the low, midrange, and high scenarios, respectively. During discussions of Conclusion III, these two new calculations will be referred to as the revised midrange (12.0 g/mi) and the revised high (14.0 g/mi) scenarios. The low scenario remains the same.

[190] 2016 MANUFACTURER PERFORMANCE REPORT, *supra* note 22, at 50 tbl.3-21.

Furthermore, ICCT justifies the high scenario by assuming: a more streamlined off-cycle credit application process, approval to receive off-cycle credits for connected and autonomous technology, and the removal of credit caps for preapproved and thermal technology (p.26). This is demonstrated in the above tabulation where the five thermal technologies have an EPA value sum of 6.4 g/mi, surpassing the thermal credit caps of 3.0 g/mi for cars and 4.3 g/mi for light-duty trucks. While the broad observation that off-cycle credit use will grow by 2025 is likely true, the scale of their projections cannot at all be justified based on past industry performance. The values for the three scenarios are used as inputs in later ICCT analyses.

5.5.5.2. Conclusion 2: The Off-Cycle Credit Program is Based on Technologies That Are Still Largely Without Validated Real-World Benefits

The second major conclusion by ICCT is that the off-cycle technologies have not been properly validated by the EPA for real-world fuel economy and CO_2 benefits (pp. 34-35). This argument serves as the basis for the supporting analysis of Conclusion III wherein off-cycle technologies are treated as having no real-world fuel economy benefit. ICCT dedicates one paragraph to defend this position where they state:

> The assumption to exclude off-cycle credits from the fleet average consumer fuel economy label might seem somewhat controversial. This is appropriate for a variety of reasons. The intent is certainly there for off-cycle credits to translate to increased consumer fuel economy; however, based on the preceding assessment, it does not appear appropriate to count off-cycle credits as equivalent to consumer fuel economy improvement. In terms of the practical accounting for the credits, the efficiency and CO2 benefits for the off-cycle technology are calculated separately as credits, rather than in complete fuel economy consumer label reporting as shown in EPA data (2018c). In addition, the credits are based on estimated and simulated impacts from entirely different vehicle models, and from a much smaller pool of vehicles than those that are getting the credits. Furthermore, to date, there has not been transparency on which variants of vehicle models have the off-cycle credit technologies and are receiving the credits with the purported benefits. Finally, the off-cycle technologies, as shown above, have fuel economy benefits that have not been validated for real-world benefit under comprehensive statistically representative conditions. As previously shown, some of their credits appear to be substantially under- and overcounted. (p. 30)

From the excerpt above, aspects of ICCT's justification to exclude off-cycle credits from the calculated consumer label fuel economy can be segmented into the practical accounting of credits, the basis for the calculations, the perceived lack of transparency regarding technology deployment, and recent credit calculations by EPA-affiliated laboratories.

First, ICCT is critical of the rules wherein the CO_2 benefits of off-cycle technologies are calculated separately as credits as opposed to as part of a complete vehicle fuel economy label. It is unclear how ICCT could use this broad observation as a justification for discounting the real-world fuel economy benefit of off-cycle technology, but it should be noted that the EPA chose to orchestrate

the off-cycle program in this manner so that it could operate alongside the traditional 2-cycle testing that is fundamental to the entire CAFE/GHG program.

Regarding the basis for the calculations, ICCT is wary of the CO_2 values because they are based on engineering estimates and simulations on a portion of the fleet as opposed to extensive testing on every vehicle model and trim package. In a perfect world, their suggestion would make a more robust off-cycle program. In reality, such a requirement would place an undue burden on the automakers and effectively shut down the off-cycle program. Using engineering analysis to arrive at a conservative estimate is the most appropriate way to balance scientific accuracy with program feasibility. The Alliance welcomes input from ICCT regarding improved calculation methods that maintain program feasibility.

Third, ICCT is critical of the perceived lack of transparency regarding off-cycle technology use because model-level and trim-level deployment details are not published; however, the EPA Manufacturer Performance Reports (EPA, 2016a, pp. 33-46; EPA, 2018a, pp. 39-50) epitomize transparency by publishing key data such as:

1. A/C leakage credits by manufacturer, model year, and fleet
2. A/C efficiency credits by manufacturer, model year, and fleet
3. Off-cycle credits by manufacturer, model year, and fleet
4. Off-cycle credits by technology and fleet
5. Technology penetration by manufacturer
6. Off-cycle credits by manufacturer and technology

It is unclear how this level of transparency can be used to justify the assumption that off-cycle technologies bear no real-world CO_2 benefit.

Finally, ICCT attempts to cast doubt on the EPA calculations and the validity of off-cycle credits overall by discussing a series of recent studies by the National Renewable Energy Laboratory (NREL), a Department of Energy entity, which assert updated benefit calculations for several off-cycle technologies. Table 5.6 below describes the data basis for each original calculation in addition to conclusions from the latest NREL studies (ICCT, 2018, p. 20). The following discussion and analysis of Conclusion II will focus exclusively on the light-duty truck fleet to remain aligned with the values in Table 5.6.

Technology[a] (adopted regulatory credit)	New data[b]	Data basis for original credit decision[c]
Active aerodynamics–grill shutters (1.2 g/mi)	-	• Effectiveness: EPA vehicle simulation; 5-cycle and 2-cycle tests • Vehicle use: EPA MOVES • Vehicle solar and thermal load data: NREL
Active aerodynamics–ride height adjustment (0.5 g/mi)	-	
Thermal control–passive cabin ventilation (2.3 g/mi)	• Improved real-world national vehicle use data: Credit overestimated by **10 times** based on NREL (Kreutzer, Kekelia et al., 2017)	
Thermal control–active cabin ventilation (2.8 g/mi)	• Improved real-world national vehicle use data: Credit overestimated by **20 times** based on NREL (Kreutzer, Kekelia et al., 2017)	
Thermal control–active seat ventilation (1.3 g/mi)	• Improved real-world national vehicle use data: If seats are actively cooled rather than ventilated, credit could be **greater by 70%** based on NREL (Kreutzer, Rugh et al., 2017)	
Thermal control–glass or glazing (3.9 g/mi)	• Improved real-world national vehicle use data: Credit overestimated by **50%–100%** based on NREL (Kreutzer, Kekelia et al., 2017)	
Thermal control–solar reflective surface coating (0.5 g/mi)	• Improved real-world national vehicle use data: Credit underestimated **by 40%–50%** based on NREL (Kreutzer, Kekelia et al., 2017)	
Active engine warm-up (3.2 g/mi) Active transmission warm-up (3.2 g/mi)	• Improved real-world national vehicle use data: Credit is **similar or could be greater** (up to 5.3 g/mi real world if with heat retention) (Gonder, 2016)	
Engine idle stop (4.4 g/mi)	• Mercedes requested **3–4 times more credit** (up to 7–9 g/mi for cars and 17–19 g/mi for trucks) due to higher idle time (23% vs 13.8%) and higher technology effectiveness.	
High efficiency lights (1 g/mi)	-	
Waste heat recovery (1 g/mi)	-	
Solar panel(s) (3.3 g/mi)	-	
Electric heat circulation pump	• GM received credit for approximately **2.6 g/mi** for cars with this technology (petition/data not reported on EPA site)	• No off-cycle credit originally
Variable crankcase suction valve for air-conditioning compressor	• GM request for **1.1 g/mi** of new credits based on greater improvement than from air-conditioning credit • Hyundai request for **1.4 g/mi** of new credits based on greater improvement than offered in air-conditioning credit system	• No off-cycle credit originally (included in air-conditioning credits)
High efficiency alternator	• Ford requests up to **1.9 g/mi** in new credits for greater efficiency (from base 67% to 80%) based on handling greater electric loads • Improved real-world national vehicle use data: Credit overestimated **by 100%** (less benefit in real world than on test cycle from accessory load reduction) based on NREL (Gonder, 2016)	• No off-cycle credit originally (data deemed insufficient for predefined list)

Notes: g/mi = gram CO_2 per mile; W = watt; MOVES = Motor Vehicle Emission Simulator; NREL = National Renewable Energy Laboratory; EPA = U.S. Environmental Protection Agency.
[a] Numbers shown for g/mi are the general upper bound and depend on technical specifications.
[b] Green suggests credits underestimate, and red suggests credits overestimate, real-world benefits. Blue indicates new or different from the menu technology credit.
[c] See EPA and NHTSA, 2012a; CARB, 2012.

Table 5.6: Data basis summary by ICCT for the original credit calculations and the latest NREL studies.

Of the 13 off-cycle technologies with original credit calculations, 7 have new NREL data to support increasing or decreasing credit values. Table 5.7 below summarizes these calculations.

Technology	Original calculation (g/mi)	Latest NREL calculation (g/mi)
Thermal control- passive cabin ventilation	2.3	0.2
Thermal control- active cabin ventilation	2.8	0.1
Thermal control- active seat ventilation	1.3	2.0
Thermal control- glass or glazing	3.9	2.0
Thermal control- solar reflective surface coating	0.5	0.8
Active engine warm-up	3.2	5.3
Active transmission warm-up	3.2	5.3

Table 5.7: A summary of the original and new NREL off-cycle credit calculations for light-duty trucks.

While the authors' intention was to use the discrepancies between the original calculations and the latest NREL data to create a false narrative that off-cycle technologies have no real-world benefit, the evidence solidifies a counter-narrative; if the values from the latest NREL studies are applied to how automakers deployed off-cycle technologies according to the 2015 Manufacturer Performance Report, then the total number of credits approximately remains the same (EPA, 2016a, p. 43). This is demonstrated below in Table 5.8.

Technology	Fleetwide credits, original calculations (Mg)	Fleetwide credits, latest NREL calculations (Mg)
Active aerodynamics- grill shutters	237,232	237,232
Active aerodynamics- ride height adjustment	7,718	7,718
Thermal control- passive cabin ventilation	1,155,743	100,499
Thermal control- active cabin ventilation	55,107	1,968
Thermal control- active seat ventilation	341,314	525,098
Thermal control- glass or glazing	1,665,290	853,995
Thermal control- solar reflective surface coating	96,799	154,878
Active engine warm-up	1,202,927	1,992,348
Active transmission warm-up	1,036,414	1,716,561
Engine idle stop	251,370	251,370
High efficiency lights	276,634	276,634
Solar panel(s)	0	0
Sum	**6,326,548**	**6,118,302**

Table 5.8: Comparison of fleetwide light-duty truck credits from the 2015 Manufacturer Performance Report using current credit calculations versus credit calculations based on the latest published NREL studies.

Table 5.8 shows that in model year 2015, automakers earned approximately 6.3 million megagrams of off-cycle credits for light-duty trucks. If the tabulations are altered such that the value of each technology reflects the latest NREL calculations, as cited by ICCT, then the new total would be approximately 6.1 million megagrams, equivalent to a decrease of 3%. This result starkly contrasts the narrative from the ICCT report in which these new credit calculations would render the off-cycle technologies without any real-world benefit.

None of these claims, individually or summed as part of a larger argument, truthfully justify the position to fully discount the real-world fuel economy benefits of off-cycle credits. ICCT fails to reference that the off-cycle program was created to credit automakers that deploy technology that improves real-world fuel economy which is not represented on the 2-cycle test. The EPA and its industry partners use state-of-the-art modeling technology and conservative engineering estimates to publish a value that is fair to the automakers, the environment, and the American consumer. With greater time and resources, surely there are improvements which can be made to the off-cycle program; however, it is unfair and unjustified to highlight these imperfections as a means of completely disqualifying the off-cycle technologies from having a real-world fuel economy benefit.

5.5.5.3. Conclusion 3: Up to 34% of the Projected Increase in Car Fuel Economy, and 42% of the Projected Increase in Light-Duty Truck Fuel Economy, Could Be Lost to Off-Cycle Credit Technologies

A consequence of the first two conclusions is that over a third of the projected increases in fuel economy from 2016 – 2025 will vanish as a byproduct of off-cycle technology (ICCT, 2018, p. 35). This discussion of Conclusion III deconstructs the mathematical methods used by ICCT to arrive at these values, and shows how the results precipitously change once the assumptions are modified appropriately. Figure 5.6 below, reproduced from the ICCT report, illustrates consumer label fuel economy values for 2016 and projected values for 2025 (p. 29). This serves as the basis for the third conclusion and will be referenced throughout this discussion.

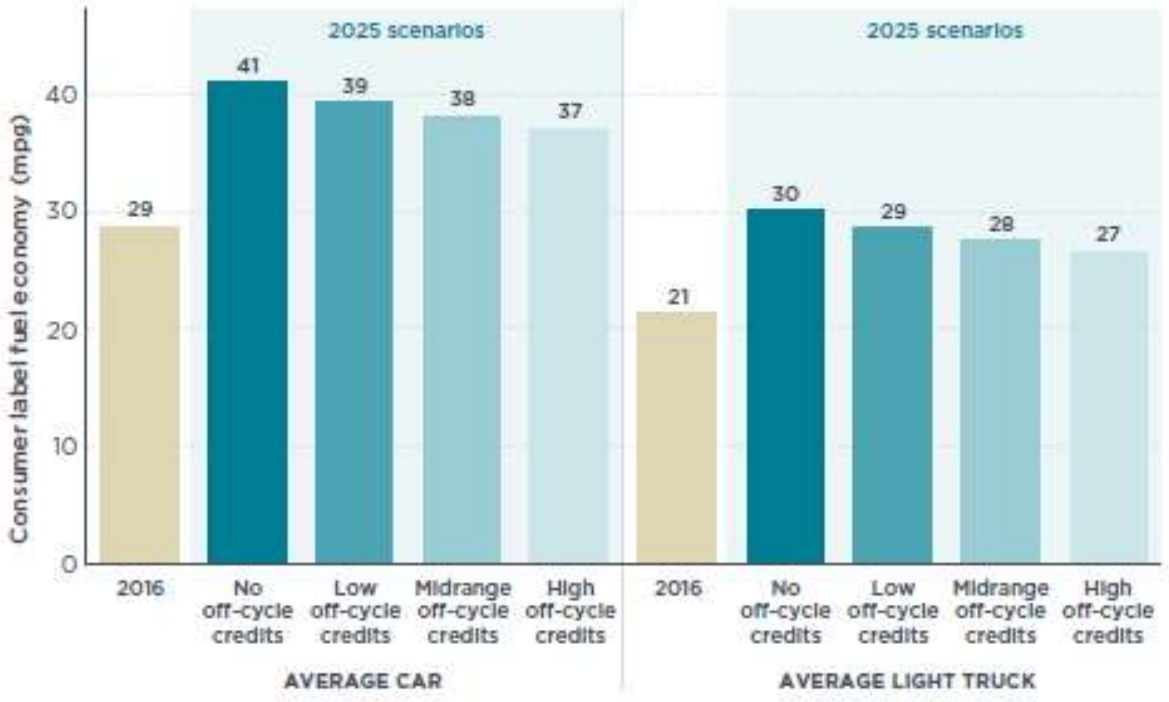

Figure 5.6: Data from ICCT representing the 2016 and 2025 projected fuel economy values by fleet (p.29, figure 5). These figures were calculated without accounting for the real-world fuel economy benefit of off-cycle technology.

To calculate the values shown in Figure 5.6 above, ICCT makes five key assumptions, four of which are not disputed by the Alliance. First, regarding A/C credits, 10 g/mi is assumed for 2016 whereas 18.8 g/mi and 24.4 g/mi are assumed for 2025 cars and light-duty trucks, respectively. Second, each gallon of gasoline contains 8,887 grams of CO_2. Third, when discussing the low, midrange, and high scenarios, it is assumed that cars will be allocated 25% fewer credits than the projection, and that light-duty trucks will be allocated 25% more credits than the projection; this is done to approximate the difference between credit calculations for cars and light-duty trucks for the same off-cycle technology. Fourth, ICCT utilizes EPA data for average footprint and fleet mix: 55% cars in 2016 and 53% cars in 2025 (p. 28).

The final assumption, which the Alliance contests, regards the translation from a 2-cycle tested fuel economy to a "real-world consumer label" fuel economy. ICCT calculates "real-world consumer label" fuel economy by reducing the 2-cycle test result by 23%, which is problematic because it fails to account for off-cycle credits. The EPA defines three data types for CO_2 and fuel economy, none of which are called "real-world consumer label" fuel economy. The first, unadjusted laboratory fuel economy, is the basis for automaker compliance with the standards and is based on the standard 2-cycle test. The second, label fuel economy, is for consumers when comparing vehicles and is usually calculated using the 5-cycle test; the weighting for label fuel economy is 55% city and 45% highway. The third, adjusted fuel economy, is a best estimate of real-world performance, and is calculated using the 5-cycle test; the weighting for adjusted fuel economy is 43% city and 57% highway (EPA, 2018b, pp. 127-133). When ICCT discusses "real-world consumer label" fuel economy, it is not clear if they intend to analyze label or adjusted fuel economy; however, the Alliance maintains that any calculation of a "real-world consumer label" fuel economy that begins with the 2-cycle test result must account for off-cycle credits in some form.

A simple example helps illustrate this position. Two vehicles, Car A and Car B, are produced in the same year with the same footprint and have a GHG standard of 300 g/mi. Car A has no off-cycle technology and achieves a 2-cycle test result of 300 g/mi. Car B has 10 g/mi of off-cycle technology and achieves a 2-cycle test result of 310 g/mi. Both vehicles are equally in compliance. Via the 23% reduction, ICCT would calculate the "real-world consumer label" fuel economy of Car A to be 22.8 mpg and of Car B to be 22.1 mpg. This is shown below in Equations 1 (Car A) and 2 (Car B):

$$\frac{8887\ \frac{g}{gal}}{300\frac{g}{mi}} \times (1 - 23\%) = 22.8\ mpg \quad (1)$$

$$\frac{8887\ \frac{g}{gal}}{310\frac{g}{mi}} \times (1 - 23\%) = 22.1\ mpg \quad (2)$$

The reason that the ICCT-calculated "real-world consumer label" fuel economy of Car B is 0.7 mpg lower than Car A is because the off-cycle credits that were used to achieve compliance are not represented on the 2-cycle test result, and thus are not accounted for in the 23% reduction. The

Alliance believes that one fair method of analysis would be to account for off-cycle credits following the 23% reduction. This method is demonstrated below for Car B in Equations 3 and 4, and results in a "real-world consumer label" fuel economy of 22.6 mpg:

$$\frac{8887\ \frac{g}{gal}}{22.1\ mpg} - 10\frac{g}{mi} = 392.6\frac{g}{mi} \quad (3)$$

$$\frac{8887\ \frac{g}{gal}}{392.6\frac{g}{mi}} = 22.6\ mpg \quad (4)$$

In the following analysis, the only off-cycle credits that cannot be counted as positively affecting real-world fuel economy are the A/C credits for refrigerant leakage (maximum 13.8 g/mi for cars and 17.2 g/mi for trucks in 2025) because they do not count towards CAFE compliance; however, A/C efficiency credits (5 g/mi for cars and 7.2 g/mi for trucks in 2025) do count for both CAFE and GHG, and should be accounted for in these fuel economy calculations. A recalculation of the 2025 projections shown in Figure 5.6, in addition to the revised midrange and high scenarios as discussed in Conclusion I, are shown below as Figure 5.7 using the fair calculation method outlined above. For clarity, the scenario for no off-cycle credits in 2025 includes full A/C credits, but no additional off-cycle credits. The 2016 scenarios were also recalculated using 5.0 g/mi and 8.0 g/mi of A/C leakage credits for cars and trucks, respectively, and 4.0 g/mi of A/C efficiency credits for both cars and trucks based on EPA data (EPA, 2018a, pp. 37-40).

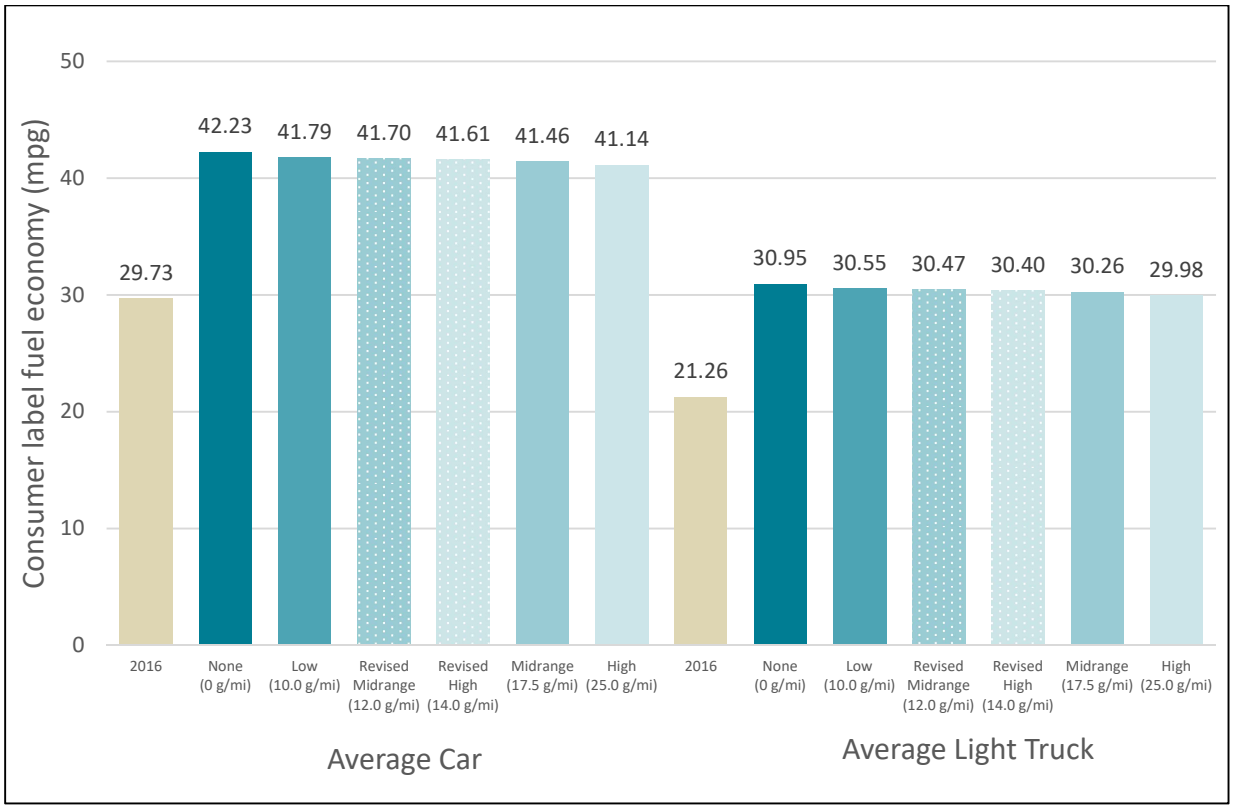

Figure 5.7: A recalculation of Figure 5.6, which displays consumer label fuel economy values that include the real-world fuel economy benefits of off-cycle technology using the first fair method of analysis.

When the results are presented in this manner, it becomes clear that the conclusion by ICCT that "up to 34% of the projected increase in car fuel economy, and 42% of the projected increase in light truck fuel economy, could be lost to off-cycle credit technologies" is no longer valid (p. 35). To reach the values from the excerpt above, it appears that that ICCT used Equation 5 below:

$$\frac{No\ credits\ (mpg) - High\ credits(mpg)}{No\ credits\ (mpg) - 2016\ (mpg)} = Lost\ Fuel\ Economy\ Gains\ (\%) \qquad (5)$$

To support this theory, the integer number values from Figure 5.6 are recalculated using the original ICCT method to produce real number values. This makes it possible to understand if Equation 5 was used by ICCT, which cannot be done properly using the integer number values. Table 5.9 below displays the real number values alongside their corresponding integer number values from Figure 5.6.

2025 Projection	Integer Number Value	Real Number Value
Average Car: 2016	29	29.00*
Average Car: No credits	41	41.25
Average Car: Low credits	39	39.47
Average Car: Midrange credits	38	38.23
Average Car: High credits	37	37.06
Average Truck: 2016	21	21.38*
Average Truck: No credits	30	30.19
Average Truck: Low credits	29	28.61
Average Truck: Midrange credits	28	27.54
Average Truck: High Credits	27	26.53

Table 5.9: Real number values calculated for Figure 2 using ICCT methodology.[191]

Using real number values from Figure 2 in Equation 5 results in lost fuel economy gains of 34.2% for cars and 41.5% for trucks, and demonstrates that Equation 5 was most likely used as the method by ICCT to make this erroneous claim. If the values from Figure 3 are used instead, which include the real-world fuel economy benefits of off-cycle technology, the lost fuel economy gains diminish: 8.7% for cars and 10.0% for trucks under the high (25.0 g/mi) scenario. The lost fuel economy gains for other scenarios are calculated using Equation 5 and shown below in Table 5.10.

[191] The 2016 car and truck integer number values were not recalculated like the 2025 projections because the Alliance could not determine what standard ICCT was using for 2016. The 2016 car integer number value of 29 mpg did not need to be recalculated as a real number value to test Equation 5. When 29.00 mpg is used alongside the real number values for 2025 car projections, Equation 5 yields the proper result. On the other hand, the 2016 truck integer number value of 23 mpg does not yield the proper result when used alongside the real number values for 2025 truck projections, thus it was assigned a real number value that rounds to the integer number value and produces the proper result from Equation 5. The 2025 standards, used by the Alliance and validated against ICCT data, are 60.4 mpg for cars and 43.9 mpg for light-duty trucks. These standards are based on EPA projected average footprints (EPA, 2016b, p. I-21).

2025 Projection: Car	Lost Fuel Economy Gains (%)	2025 Projection: Light-Duty Truck	Lost Fuel Economy Gains (%)
Low	3.5	Low	4.1
Revised mid-range	4.2	Revised mid-range	5.0
Revised high	5.0	Revised high	5.7
Mid-range	6.2	Mid-range	7.1
High	8.7	High	10.0

Table 5.10: The lost fuel economy gains resulting from off-cycle credits when accounting for the real-world fuel economy benefit of off-cycle technology.

Several related assertions made by ICCT can also be refuted. First, "The increased use of off-cycle credits to 10–25 g/mi would displace 11%–26% of the CO2 reduction otherwise needed from test-cycle improvements in the 2016–2025 regulations" is a problematic statement because it insinuates that off-cycle technologies are not a scientifically justifiable means of reducing CO_2 emissions (p. 35). Test-cycle improvements and off-cycle credits are equally valid means of achieving compliance. Nonetheless, the "11%–26%" figure in the ICCT excerpt above can be explained via Equations 6 and 7 which utilize 268 g/mi and 173 g/mi as the 2016 and 2025 combined fleetwide CO_2 values. The fact that off-cycle credits will be used as one of several strategies to achieve compliance is not problematic when it is acknowledged that these technologies produce real-world benefits.

$$\frac{10\frac{g}{mi}}{268\frac{g}{mi} - 173\frac{g}{mi}} = 11\% \tag{6}$$

$$\frac{25\frac{g}{mi}}{268\frac{g}{mi} - 173\frac{g}{mi}} = 26\% \tag{7}$$

A similar statement, "Considering just the later regulation years 2022–2025 that are being investigated in the MTE, this increased use of off-cycle credits would amount to up to 26%–65% of the expected CO2 reduction" is equally problematic (p.35). The "26%–65%" figure can be explained via Equations 8 and 9:

$$\frac{10\frac{g}{mi}}{211\frac{g}{mi} - 173\frac{g}{mi}} = 26\% \tag{8}$$

$$\frac{25\frac{g}{mi}}{211\frac{g}{mi} - 173\frac{g}{mi}} = 65\% \tag{9}$$

Finally, the claim that, "Increased use of off-cycle credits could effectively reduce the average fuel economy improvement from 4% to 2.8% per year from 2016 through 2025" is incorrect because it uses values from Figure 2 which do not include the real-world fuel economy benefit of off-cycle technology (p. 35). ICCT most likely reached 4.0% as its value for the annual fuel economy improvement without off-cycle credits and 2.8% as its value for the annual fuel economy improvement in the high scenario for the nine years from 2016 – 2025 using Equation 10, a simple growth rate formula:

$$\% = \left(\frac{2025\ mpg}{2016\ mpg}\right)^{1/9} - 1 \quad (10)$$

The combined result is a weighted average of 55% for cars and 45% for trucks. Using values from Figure 3, which include the real-world fuel economy benefit of off-cycle technology, the fuel economy improvement without off-cycle credits barely changes from 4.0% to 4.1%, while the fuel economy improvement in the high scenario changes from 2.8% to 3.8%. Furthermore, the fuel economy improvement in the revised midrange scenario is 3.9%. Once again, ICCT's result is proven to be an exaggeration because it does not consider the real-world fuel economy benefits of off-cycle technology.

In addition to the first method of calculating "real-world consumer label" fuel economy as described above, a second fair method exists. This second method would account for off-cycle credits in the 2-cycle test result such that Car A and Car B, as described in an earlier example, would both be treated as having an equivalent 300 g/mi 2-cycle test result. If the above analysis were redone using this method, no amount of off-cycle credits apart from A/C leakage credits, which are capped, could positively or negatively affect the calculated "real-world consumer label" fuel economy. In other words, the calculated "real-world consumer label" fuel economy for vehicles with and without off-cycle credits would be nearly identical. Utilization of this second calculation method would further undermine the quantitative arguments put forth by ICCT.

5.5.5.4. Conclusion 4: A Growing Off-Cycle Program That Encourages Off-Cycle Technology Adoption Discourages and Delays a Shift to Electric Vehicles

This final conclusion by ICCT that off-cycle technologies are displacing on-cycle technologies is not incorrect, but it is overstated (p. 35). Similar to earlier statements by ICCT regarding the deployment of off-cycle technologies and their detrimental effect on on-cycle CO_2 reductions, Conclusion IV can only be interpreted as a negative statement when it is assumed that off-cycle technology yields no real-world CO_2 benefit. Without that mistaken assumption, Conclusion 4 presents no threat to the technological advancement of the automotive industry and the continued journey of fleetwide CO_2 reductions.

The CAFE/GHG program was written to avoid picking technological winners and losers, thereby providing automakers the innovative freedom to achieve compliance in whatever manner they choose. This idea is fundamental to a well-regulated free-market economy which all stakeholders strive to maintain. In comments submitted by ICCT for the 2017 – 2025 Proposed Rule, they state, "While the ICCT strongly supports the development of electrical and fuel cell vehicles, one of our core principles is that efficiency and greenhouse gas emissions standards should be technology neutral" (EPA, 2012, p. 62812). This excerpt was published in the 2017-2025 Final Rulemaking in a section devoted to the appropriateness of regulatory incentives, such as off-cycle credits. Thus, according to their 2012 statement, ICCT agrees that technological winners and losers should not be chosen. This contrasts with their 2018 paper, which appears to favor electric vehicles over conventional technologies that provide equivalent emissions reductions.

5.5.5.5. Summary

The ICCT white paper, "How Will Off-Cycle Credits Impact U.S. 2025 Efficiency Standards?" uses flawed assumptions to create a misleading narrative that the off-cycle program is detrimental to the fidelity of the CAFE and GHG programs. To do this, ICCT first incorrectly cites EPA data to propose three scenarios for 2025 off-cycle credit use. Next, ICCT attempts to justify the false claim that off-cycle credits have no real-world fuel economy benefit via several related arguments, none of which sum to a meaningful justification. Third, ICCT uses the results from the first two conclusions to generate misleading notions that off-cycle credits significantly negatively impact expected annual fuel economy gains. Finally, ICCT reverses its own principle of technological neutrality by criticizing off-cycle technology for delaying the deployment of on-cycle and electrification technology.

In summary, the off-cycle program is a meaningful component of the CAFE and GHG programs because it gives automakers the opportunity to accelerate deployment of cost-effective efficiency technologies. The 2-cycle and 5-cycle tests do not fully illustrate real-world conditions, and they cannot and should not be the only ways of assessing regulatory compliance. The real-world benefits of off-cycle technology cannot be discounted, and a robust off-cycle program results in a more perfect regulatory environment. This ICCT white paper does not provide an accurate perspective on the off-cycle program or a reliable basis for regulatory decisions by EPA and NHTSA.

5.5.6. *Positions on Credit for Connected and Autonomous Vehicles*

As the industry implements new technologies like autonomous and connected vehicles and new business models for the "sharing economy," there are great opportunities to leverage these non-traditional technologies to achieve emission reductions. This rulemaking should be used as an opportunity to provide more compliance flexibility in the regulations, so that the rules better account for the realities of the marketplace today. This rulemaking should also be used as an opportunity to incentivize these beneficial new autonomous technologies and the related new business models, in order to accelerate their implementation.

A growing body of modeling results, as well as real-world driving statistics, show that current autonomous driving technologies improve real-world fuel efficiency and reduce GHG emissions. On average, the computers simply drive more efficiently than do human operators. This can be attributed to factors such as more moderate rates of acceleration (which helps the most in city driving) and reduced aerodynamic drag through platooning closely behind a leading vehicle (which helps the most in highway driving). However, the current technologies in the marketplace have not yet been fully optimized for fuel economy, and are only a first step towards the future vision of highly capable, fully autonomous vehicles. For example, adaptive cruise control (ACC) on current vehicles is considered only a Level 1 autonomous technology, since ACC provides the braking and acceleration capabilities needed for many circumstances, but does not provide other driving capabilities. Given the limits of its Level 1 capabilities, ACC utilization rates are relatively low, since it is not commonly used at low speeds or in city or congested driving conditions. Utilization rates can be expected to increase as autonomous systems gain the capabilities to operate

under a wider range of conditions, such that Level 2 systems will have higher utilization rates than Level 1 systems, and fully autonomous Level 5 systems will operate the vehicle as much as 100% of the time (possibly without even having driver controls such as steering wheels to allow any manual operation).

Clearly, rising utilization rates will increase the fuel economy value of autonomous technologies in the future. In addition, the fuel savings benefits of each level of autonomous technology can be improved over time as the systems are optimized, especially if automobile manufacturers can expect that their fuel efficiency improvements will result in favorable credits to assist regulatory compliance. In view of these considerations, we propose that a conservative pre-approved default off-cycle credit for Level 1 ACC be provided through the current rulemaking, based on the benefits that can already be demonstrated for current ACC systems. This would accelerate implementation of these beneficial Level 1 ACC systems, as well as more capable autonomous driving systems, while also beginning a process whereby automobile manufacturers prioritize fuel economy in the designs of their autonomous driving systems, based on an expectation that the off-cycle credits from these technologies can be expanded as the systems demonstrate enhanced fuel economy capabilities. Through the off-cycle credit program, EPA and NHTSA can influence the development and implementation of these autonomous driving technologies to reduce real-world GHG emissions and improve fuel economy.

The current proposal for credits for autonomous driving technologies is fundamentally different than previous consideration by EPA of off-cycle credits for autonomous driving technologies during the 2017–2025 light duty GHG rulemaking process. In that rulemaking, it was suggested that the safety benefits of various technologies could reduce collisions, thereby reducing the CO_2 emissions associated with the traffic congestion caused by collisions. As explained in more detail below, EPA declined at that time to create off-cycle credits for the "indirect" effects of a technology on traffic generally, stating that off-cycle credits would be only for "direct" improvements on a vehicle that could be "reliably verified." The current analysis supporting credits for these technologies is not related to any potential safety benefits of the technologies, and is instead related to the "direct" fuel consumption effects of the technology on the performance of the vehicle in which it is installed. In the current analysis, autonomous driving technologies such as ACC are evaluated solely as fuel economy technologies, without regard to any potential safety benefit. The anticipated safety benefits as well as environmental benefits from reduced congestion would be "indirect" co-benefits that would result from these off-cycle credits, but the proposed credits themselves would be based on a conservative, "reliably verified" assessment of the "direct" benefits of the technology. For the Agencies' review, the Alliance submits the attached memo from Securing America's Future Energy that discusses various technologies and flexibility mechanisms that could provide safety and fuel benefits simultaneously.[192]

[192] Memorandum from Securing America's Future Energy, Fuel Economy Off Cycle Program, Flexibilities and Estimated Fuel Savings (May 14, 2018).

5.5.6.1. Additional Resources Regarding the Potential Environmental and Energy Conservation Benefits of Connected and Autonomous Vehicles

There are a number of researchers engaged in assessing the potential benefits of connected and autonomous vehicles. The Alliance directs the Agencies' attention to the following potential sources of additional information.

Center for Automotive Research, *The Potential Environmental Benefits of Connected and Automated Vehicles*:[193]

- "The automotive industry is only in the early stages of the development and deployment of connected and automated vehicle (CAV) technology, but already an extensive body of research investigates the potential environmental impacts of these technologies.
- "On the plus side, we can point to several paths by which CAVs can help mitigate the environmental impacts of the transportation system. These include smart routing, self-parking, and eco-driving (making optimum driving decisions and smoothing the acceleration cycle), all of which have the potential to reduce tailpipe emissions (NOx, SOx, and CO2) and lower overall fuel consumption.
- "Some vehicle automation features, such as platooning, eco-driving, enhanced vehicle performance, and improved crash avoidance, either enable or complement CAV technology, and the combination of these features could considerably decrease overall vehicle energy consumption. CAVs might also prove to be more fuel efficient with lower emissions through efforts to reduce the overall mass of the vehicle or by shedding unnecessary weight with the omission of entire components for human control such as the steering wheel or brake pedal."

Securing America's Future Energy, *Using Fuel Efficiency Regulations to Conserve Fuel and Save Lives by Accelerating Industry Investment in Autonomous and Connected Vehicles*:[194]

- "…the industry is entering a phase that – if ushered in successfully – can both increase fuel economy and enhance safety benefits in a manner through which these goals reinforce each other.
- "While [autonomous vehicle technologies] are under development and the extent of their benefits is still emerging, test results offer the promise of substantially increased efficiency and improved safety through vehicle- and system-level improvements.
- "…parties should agree to allow automakers to earn compliance credits (for 3-5 years) as part of a research program to deploy autonomous and connected vehicle technology, collect data about the technology's performance, and share the data with regulators so that the can together evaluate the effectiveness of this emerging technology. To the extent that the

[193] *The Potential Environmental Benefits of Connected and Automated Vehicles*, CENTER FOR AUTOMOTIVE RESEARCH (Apr. 4, 2018), https://www.cargroup.org/the-potential-environmental-benefits-of-connected-and-automated-vehicles/.

[194] SECURING AMERICA'S FUTURE ENERGY, USING FUEL EFFICIENCY REGULATIONS TO CONSERVE FUEL AND SAVE LIVES BY ACCELERATING INDUSTRY INVESTMENT IN AUTONOMOUS AND CONNECTED VEHICLES (April 2018), *available at* http://secureenergy.org/wp-content/uploads/2018/04/LDV-FE-Fuel-Economy-and-Autonomous-Vehicles-Issue-Brief-FINAL2018-04-09.pdf (last visited Oct. 26, 2018).

testing demonstrates improvement in efficiency, lower emissions and increased safety, regulators can use the data to support permanently accounting for such efficiencies in future compliance periods.

- "There are several different pathways for new AV technology to improve vehicle efficiency and reduce fuel consumption.
- "Some examples of technologies with vehicle level benefits are: Advanced Driver Assistance System… prominent examples include Automatic Emergency Braking and Lane Keeping Assist. An initial review of data collected from a fleet testing ADAS systems demonstrated more than a two percent improvement in fuel efficiency, and preliminary evidence suggests the considerably higher gains are possible. [citing Dish Network Data from Pilot Program; and SAFE interviews with industry; "Case Study: Dish saves fuel with Mobileye technology", FleetOwner (May 6, 2016).
- "The wide-scale adoption of collision reduction technology and vehicle connectivity can be major sources of energy savings: Cooperative Adaptive Cruise Control… Collision Avoidance Technology… Vehicle to Vehicle and Infrastructure Communication.
- "To examine the impact of these emerging autonomous and connected vehicle technologies, SAFE contracted Air Improvement Resource to model the potential fuel economy savings if these technologies were widely deployed in the fleet… Most of the savings are additive and, together, identify the potential to reduce fuel consumption by 18 to 25 percent if deployed throughout the fleet."

University of Michigan, *How even one automated, connected vehicle can improve safety and save energy in traffic*:[195]

- "Connected cruise control uses vehicle-to-vehicle communication to let automated vehicles respond to multiple cars at a time in an effort to save energy and improve safety.
- "An automated vehicle utilizing connected cruise control was able to brake with 60 percent less of the G-force required by a car with a human driver.
- "And that smoother transition from braking to accelerating improved energy efficiency by as much as 19 percent for the automated vehicle equipped with V2V. It also surpassed the performance of other automated vehicles operating without V2V.
- "Automated cars utilizing V2V data will not only perform better, but they can also foster a friendlier environment where few safety hazards sneak into traffic and higher efficiency is possible for all cars on the road," said Gabor Orosz, a U-M associate professor of mechanical engineering who led the research.
- "even human-driven cars following the automated vehicle can save up to 7 percent energy, thanks to the smoother speed profile."

[195] *How Even One Automated, Connected Vehicle Can Improve Safety and Save Energy in Traffic*, UNIVERSITY OF MICHIGAN (May 9, 2018), https://news.umich.edu/how-even-one-automated-connected-vehicle-can-improve-safety-and-save-energy-in-traffic/.

5.5.7. *Credits Should Be Added for Heavy-Duty Vehicles*

The off-cycle credit program should be extended to heavy-duty vehicles. The technologies included in the light-duty off-cycle credit program could be applied to heavy duty vehicles. These fuel saving technologies which are now being deployed in the light-duty segment need regulatory recognition to enable deployment in the heavy-duty segment, as the off-cycle technologies recognized in the light-duty program have associated costs. If such a program were enacted, manufacturers and suppliers could realize economies of scale which would help further expand deployment of these technologies in both light- and heavy-duty vehicles.

We believe that the conservative credit values established for light-duty vehicles would be even more conservative for heavy-duty vehicles, serving as a bridge until more accurate values could be established. Similarly, the alternative methodology off-cycle credit application process could also be applied, allowing manufacturers to demonstrate greater benefits than those on the off-cycle credit table.

APPENDIX 6: VEHICLE CLASSIFICATION

NHTSA raises a number of questions in the Proposed Rule regarding vehicle classifications, particularly with respect to truck-like characteristics and off-road capability. The Alliance provides the following information in response.

6.1. Truck-Like Characteristics

One methodology for determining whether a vehicle is a non-passenger automobile is to identify vehicles that have expanded use for cargo-carrying purposes.[196] To confirm the expanded use, the forward-most point of installation of the second row of seats must be established. This is normally the forward-most point of attachment of the seat structure to the vehicle floor. NHTSA seeks comment on how to identify the "forward most point of installation" for second-row seats that are sliding. The Alliance argues that some flexibility is needed in making this determination in order to ensure that vehicles with sliding second-row seats are still appropriately classified as non-passenger automobiles.

The Alliance proposes two rationales. First, the forward-most attachment point of the seat structure to the floor is still a viable method, even when there is a sliding track between the floor attachment point and the seat. Second, the seat attachment point to the sliding track in any manufacturer-designated position should also be an acceptable method. This is consistent with NHTSA's observation that "the market demand for increased rear seat leg room and the installation of rear seat air bag systems has resulted in the introduction of adjustable second row seats," and that the "seats provide adjustable leg room by sliding forward or backward on sliding tracks and aim to provide expanded cargo carrying room by moving forward against the back of the front seats."[197] The Alliance posits that the above proposed expanded determination of the installation point for sliding seats allows for customer-demanded comfort and safety while still meeting the spirit of the expanded cargo carrying requirement.

NHTSA also asks whether it should establish a minimum amount of cargo surface area for seats that remain in the vehicle or a minimum amount of usable cargo-carrying volume when the seats fold flat. The Alliance argues that area or volume requirements are not needed, as those attributes speak to overall vehicle size and shape—which should remain a consumer choice. The requirements for expanded cargo or other non-passenger-carrying purposes are fully met in the existing regulation, which requires a flat, leveled cargo surface with two rows of seats that are folded or stowed.

Finally, NHTSA asks a few questions regarding the cargo surface and the "flat and level" requirement. These include:

- Does the cargo surface need to be flat and level in exactly the same plane, or does it fulfill the intent of the criterion and provide appropriate cargo-carrying functionality for the cargo surface to be other than flat and level in the same plane?

[196] 49 C.F.R. § 523.5(a)(5).
[197] 83 Fed. Reg. at 43,438.

- Does the cargo surface need to be flat and level across the entire surface, or are (potentially large) gaps on that surface consistent with the intent of the criterion and providing appropriate cargo-carrying functionality? Should panels to fill gaps be required?

Additional requirements for flatness, gaps, and other cargo surface design detail does not allow manufacturers to individualize their designs. Manufacturers should be allowed to determine the methodology for providing appropriate cargo-carrying functionality without NHTSA stipulating additional requirements for flat and level surfaces, or gaps and gap-filling panels. These potential requirements would likely be interpreted and executed differently across manufacturers, and could narrow the choice of engineering solutions and negatively affect other important vehicle attributes.

6.2. Off-Road Capability

NHTSA asks whether the regulations should be modified to allow design data instead of physical measurements for manufacturer determination of the five characteristics (approach angle, breakover angle, departure angle, running clearance, and axle clearance) indicative of off-road operation. Design data should be allowed because vehicle design is now conducted in a virtual world, and physical prototypes are often not produced until relatively close to vehicle production. The existing rules, allowing only for physical measurements, are carried over from the time before digital designs were commonplace. Accordingly, at that time there was less control over vehicle tolerances, and there were many more prototype vehicle phases to confirm many aspects of a design, including off-road capability. Now that a significant portion of vehicle attributes are validated in the virtual world, it only makes sense that NHTSA allow manufacturers to provide design data as confirmation of off-road capability.

The Proposed Rule also questions whether there is a need to change from the current method of using static loaded radius arc for determination of approach, breakover, and departure angles. The proposed alternatives are either 1) a line tangent to the outside perimeter of the tire, or 2) measurement from the geometric center of the tire contact patch. While the proposed alternatives may be easier for a field measurement, only a measurement from the static loaded arc radius reasonably reflects the tire condition during off-road events that approach, breakover, and departure angles are quantifying. For example, when approaching an off-road obstacle such as a rock, the most challenging condition will be the moment when the tire contacts the obstacle and starts to conform to it. The static loaded arc radius best reflects the actual condition that exists, versus outside tire diameter (which under-represents the challenge) or center of contact patch (which over-represents the challenge). As noted by NHTSA in the Proposed Rule, "[t]he static loaded radius arc is easy to measure,"[198] and the Alliance agrees. The Alliance suggests that the off-road criteria remain tied to the static loaded arc radius.

NHTSA also identifies potential concerns regarding running clearance with fixed and flexible components. The Alliance agrees with NHTSA that no change is needed for the 20-centimeter (cm) running clearance requirement for fixed features of the vehicle—all fixed components must have 20cm of running clearance. The Alliance further agrees with NHTSA's interpretation that flexible components that bend without breaking and return to their original position do not count

[198] 83 Fed. Reg. at 43,439.

against the 20cm running clearance requirement. NHTSA notes, however, that these requirements should be for all "vehicles with standard and optional equipment installed, at time of first retail sale."[199] The Alliance disagrees with the first retail sale requirement, and proposes that the requirement should instead be 'as shipped to the dealer.' Dealers are independent businesses and may negotiate with the final customer to install additional equipment on the vehicle for which manufacturers cannot be held responsible. The Alliance further notes that NHTSA should make a specific allowance for vehicles that have adjustable ride height, such as air suspension, and permit the running clearance and other off-road clearance measurements to be made in the lifted or off-road mode.

In the Proposed Rule, NHTSA highlights a concern with axle clearance measurements due to the shift from solid axles to independent suspension. NHTSA seeks comment on whether to revise the axle clearance definition. Axle clearance is currently defined as "the vertical distance from the level surface on which an automobile is standing to the lowest point on the axle differential of the automobile."[200] The Alliance finds that no change is needed to this definition, regardless of whether the differential is sprung or unsprung, as the bottom of the differential is the vulnerable component. Other unsprung components of the suspension or axle will move with wheel travel and are therefore unlikely to be a factor in off-road operation. NHTSA also asks whether the definition should be modified to account for axles without differentials. The Alliance finds that there is no need to further modify the definition. Two-wheel drive vehicles that have only one differential should have only one axle clearance measurement.

Additionally, NHTSA seeks comment on whether axle subframes that are mounted to the vehicle unibody should be considered in the allowable running clearance. The Alliance does not think a single criterion is needed and prefers to keep the existing regulation. If NHTSA does not agree, the Alliance would be willing and interested to discuss the merits of various proposals before NHTSA takes action.

6.3. Attribute-Based Standards Work Because They Adjust to Consumer Demand

The Alliance supports the existing footprint-based structure of the standards as they allow the market to determine which size of vehicles to purchase, but encourage each vehicle to be fuel efficient for its size. In the MY 2012–2016 final rule, the Agencies noted:

> [T]he shapes of the curves, including the "flattening" at the largest footprint values, tend to avoid or minimize regulatory incentives for manufacturers to upsize their fleet to change their compliance burden. Given the way the curves are fit to the data points (which represent vehicle models' fuel economy mapped against their footprint), the agencies believe that there is little real benefit to be gained by a manufacturer upsizing their vehicles.[201]

The Alliance agrees with the Agencies' conclusion that the footprint-based approach to standards that has been in use since MY 2011 (and optional for MY 2008–2010 light-duty trucks) do not

[199] 83 Fed. Reg. at 43,440.
[200] 49 C.F.R. § 523.2.
[201] 75 Fed. Reg. at 25,369.

provide an incentive to upsize vehicles. However, some argue that backstop standards are needed for the import car and light-duty truck fleet to avoid larger vehicles. In the MY 2017–2025 rule, NHTSA further noted that:

> If we determined that backstops for imported passenger cars and light trucks were necessary, it would be because consumers are choosing different (likely larger) vehicles in the future than the agencies assumed in this rulemaking analysis. Imposing additional backstop standards for those fleets would require manufacturers to build vehicles which the majority of consumers (under this scenario) would presumably not want. Vehicles that cannot be sold are the essence of economic impracticability, and vehicles that do not sell cannot save fuel or reduce emissions, because they are not on the roads, and thus do not meet the need of the nation to conserve fuel.[202]

NHTSA's argument that a backstop standard could force manufacturers to build vehicles that consumers do not want is sound, and for this reason the Alliance is also opposed to backstop fuel economy and GHG standards. Fortunately, since MY 2012 there has been ample time to assess whether manufacturers have intentionally designed larger footprint vehicles—the primary concern driving requests to implement backstop standards. Novation Analytics recently published "Model Years 2012 to 2018 Baseline Studies," which includes a comparison of footprint data by fleet and model year, revealing essentially no change in footprint as seen in Figure 6.1 below.

[202] 77 Fed. Reg. at 63,022.

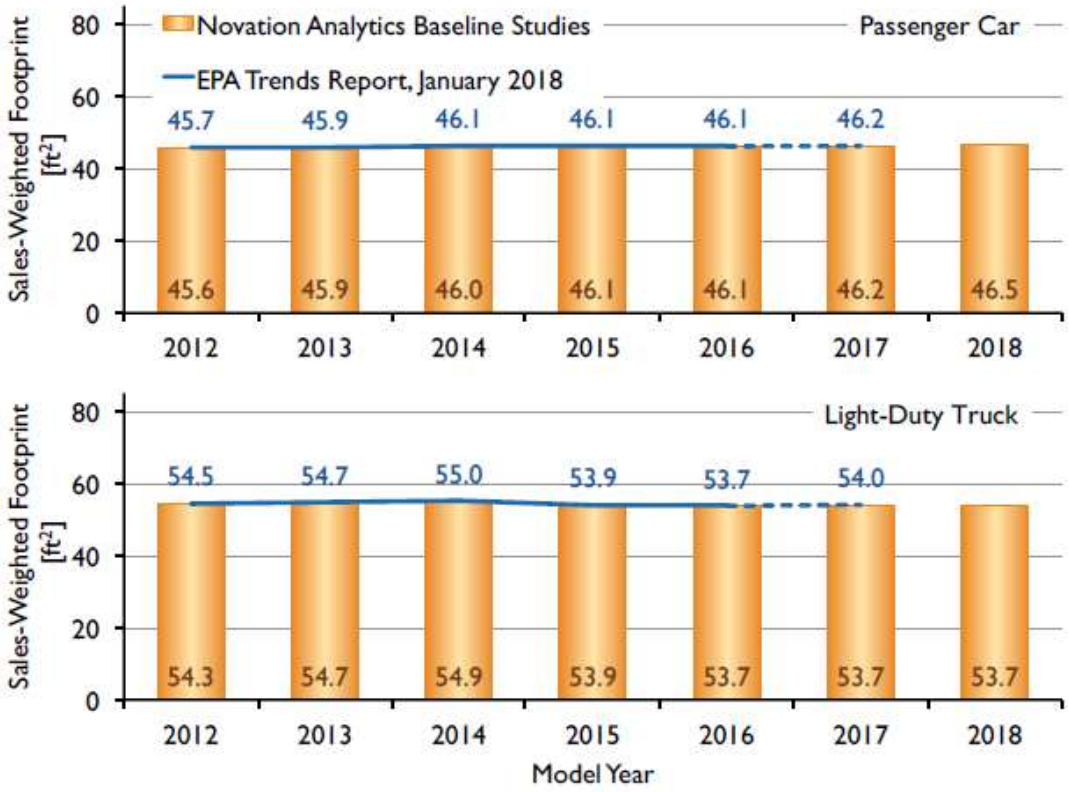

Figure 6.1: Novation Analytics footprint analysis.[203]

CARB also analyzed footprint trends in their midterm review and they observed that:

> The largest influence appears to be a higher share of truck sales that generally have a larger footprint than cars rather than a significant increase in the average footprint within the car or truck segment itself.[204]

CARB's conclusion is consistent with the Novation Analytics analysis, which also shows that the small shift in footprint is due to changing market mix towards trucks, versus earlier concerns voiced by others that manufacturers would simply build larger vehicles. The consistency of footprint within each segment and the mix shift, primarily from passenger cars to truck SUVs, can be seen in Figure 6.2 below.

[203] NOVATION ANALYTICS, *supra* note 33, at 23.
[204] CALIFORNIA AIR RESOURCES BOARD, CALIFORNIA'S ADVANCED CLEAN CARS MIDTERM REVIEW at ES-24 (Jan. 18, 2017).

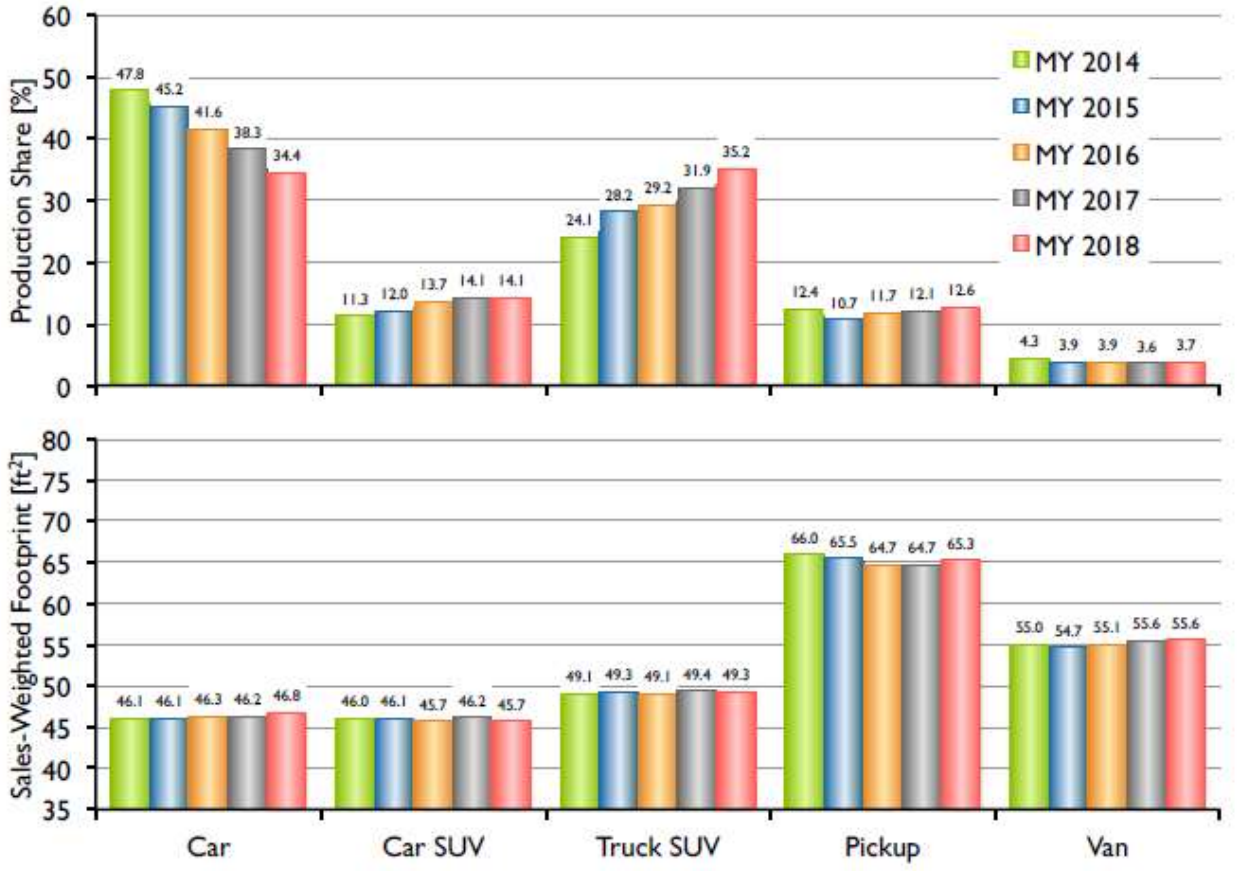

Figure 6.2: Production share and footprint by segment.[205]

6.3.1. *There Is No "Gaming" With Current Footprint-Based Standards*

While consumer preference has changed regarding the types of vehicles demanded, the footprint in each of the segments has remained relatively constant. The data above shows there are no systemic footprint increases (or any type of target manipulation) occurring. This simply confirms that the Agencies' footprint-based standards are an effective attribute for establishing GHG and fuel economy requirements in the Light-Duty Vehicle segment. Given the consistency of footprints over time, there is no reason to pursue consumer choice limiting backstop standards that would undermine the purpose of footprint-based standards.

As reported in the Novation Analytics Baseline Study, the production share of Cars has been dropping while the share of Car SUVs and Truck SUVs has been expanding (Figure 6.3). The "Car" category remains the largest portion of the passenger car fleet (73% in MY 2017). The Truck SUV category has also been increasing, and remains the majority share of the light-duty truck fleet (67% in MY 2017).

[205] NOVATION ANALYTICS, *supra* note 33, at 24.

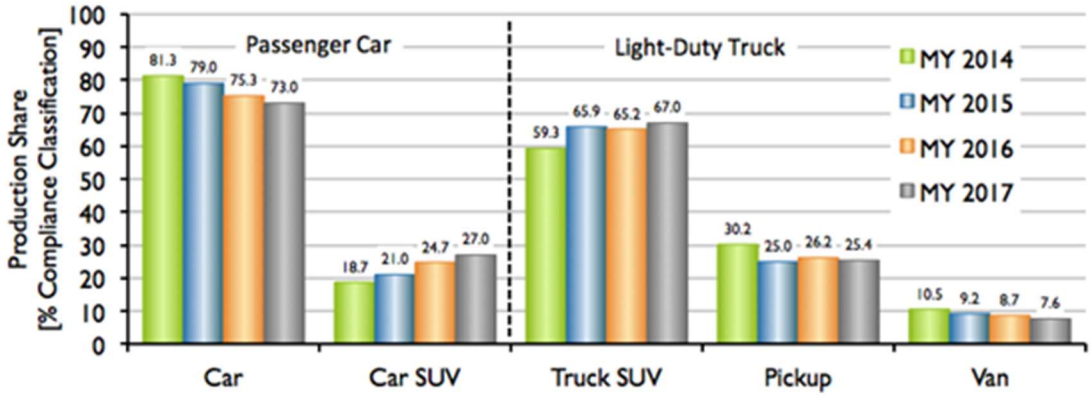

Figure 6.3: Passenger car and light-duty truck production share.[206]

Figure 1:

6.3.2. *Removing the "Mix Shift Effects" From Footprint Analysis*

To further demonstrate this point, industry compliance was analyzed for MY 2014–2017 with segment mix and size held constant at the MY 2014 level. As shown in Figure 6.4 below, the passenger car fleet would have performed 3 g CO_2/mi better in MY 2017, relative to its standard, if the fleet mix had remained constant from MY 2014. Since car and car SUVs have similar footprints (Figure 6.2), the footprint standards would not have changed. However, with a lower share of car SUVs, the tailpipe CO_2 would have been 3 g CO_2/mi lower. This essentially means that the car standards are approximately 3 g CO_2/mi more difficult than originally expected.

Conversely, the same type of analysis on the Light-Duty Truck fleet shows the impact is nearly zero. In this case, the shifts in share yielded a more stringent footprint standard (due to the smaller footprint of the Truck SUV). However, the Truck SUVs have lower tailpipe CO_2 compared to Pick-ups and Vans. Consequently, the increased stringency due to the increased share of smaller trucks was offset by lower tailpipe CO_2 of the smaller trucks; effectively what the footprint standards were meant to accommodate. For MY 2017, the footprint standard would have been 3 g/mile less stringent (298 g/mile vs. 295 g/mile) had the vehicle category shares remained constant, but the tailpipe CO_2 would have been 3 g/mile higher, which yields a near zero change in compliance.

[206] Novation Analytics personal communication to the Alliance of Automobile Manufacturers.

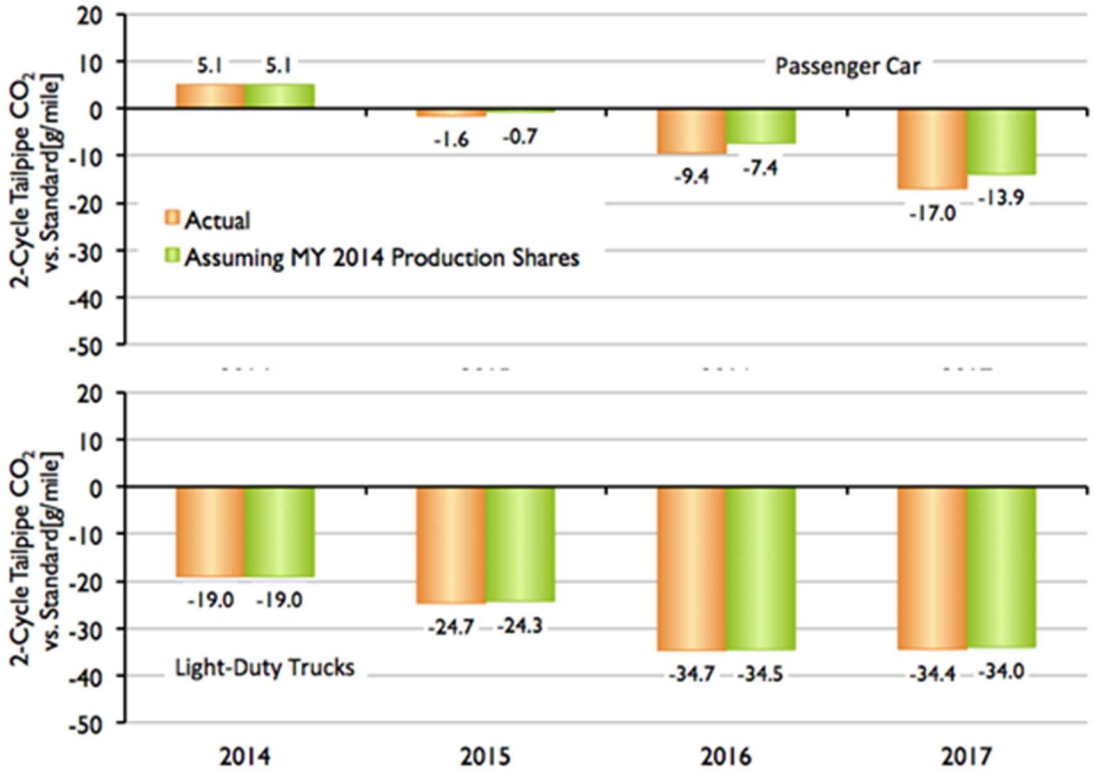

Figure 6.4: CO_2 compliance with MY 2014 production share.[207]

6.4. Compliance Burden by Segment: Classification is Working Except for Two-Wheel Drive Utility Vehicles

The current vehicle classifications, except for the inclusion of small 2WD SUVs in the passenger car fleet, are appropriate. All vehicles currently in the Light-Duty Truck fleet, plus the 2WD SUV's currently in the passenger car fleet, have truck-like characteristics. As required by EPCA/EISA, passenger cars and light trucks are subject to different standards consistent with their different capabilities. Some have expressed concern that vehicles in the truck fleet are not sufficiently challenged by the standards and should be in the car fleet. This is completely incorrect. Since 2012, the small 2WD SUVs, and the light-duty truck fleet have been the most challenged segments to comply with the rule, even while comparable fuel-saving technologies continue to be implemented across the fleet.

6.4.1. *Vehicles with Truck Features are "Over-Tasked"*

CO_2 performance-to-standard by category is shown in Figure 6.5**Figure 6.5:** CO2 performance-to-standard. Car SUVs, Truck SUVs, Pick-ups, and Vans have all been worse than standard from MY 2014–2017. For the passenger car fleet, an increasing share of Car SUVs has negatively impacted the compliance situation, which demonstrates that increasing consumer demand for this segment has a disparate compliance impact for manufacturers of these vehicles. On the other hand, for the

[207] Novation Analytics personal communication to Alliance.

light-duty truck fleet, an increasing share of Truck SUVs vs pick-up trucks will not necessarily impact the compliance situation because all of these segments are challenged to comply.

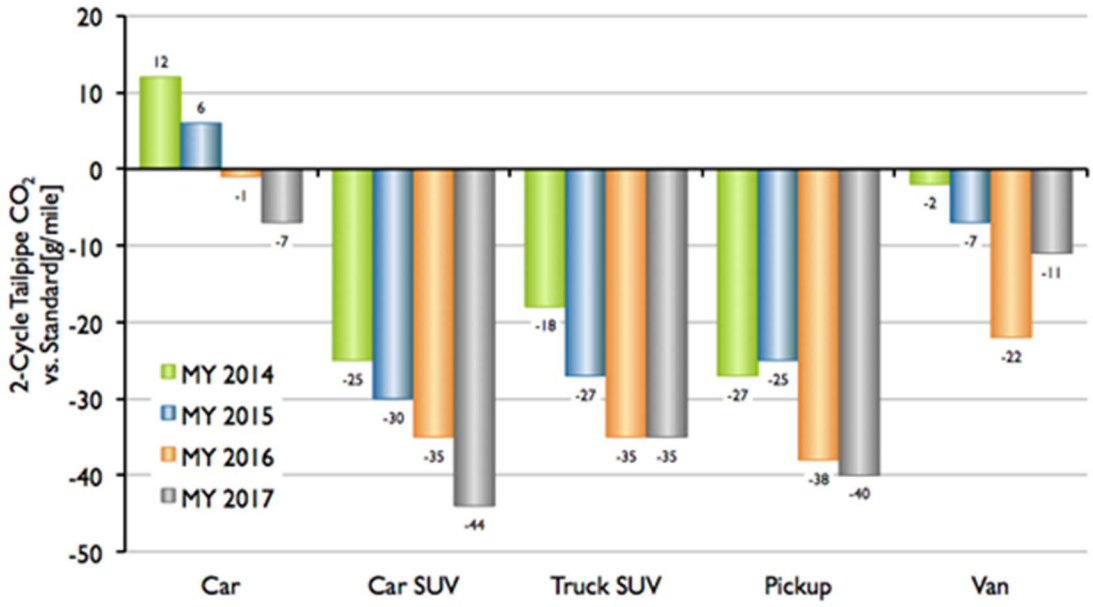

Figure 6.5: CO2 performance-to-standard.[208]

This next chart, Figure 6.6, shows the CO_2 performance-to-standard weighted by production. That is, the overall compliance contribution to industry's combined fleet performance.

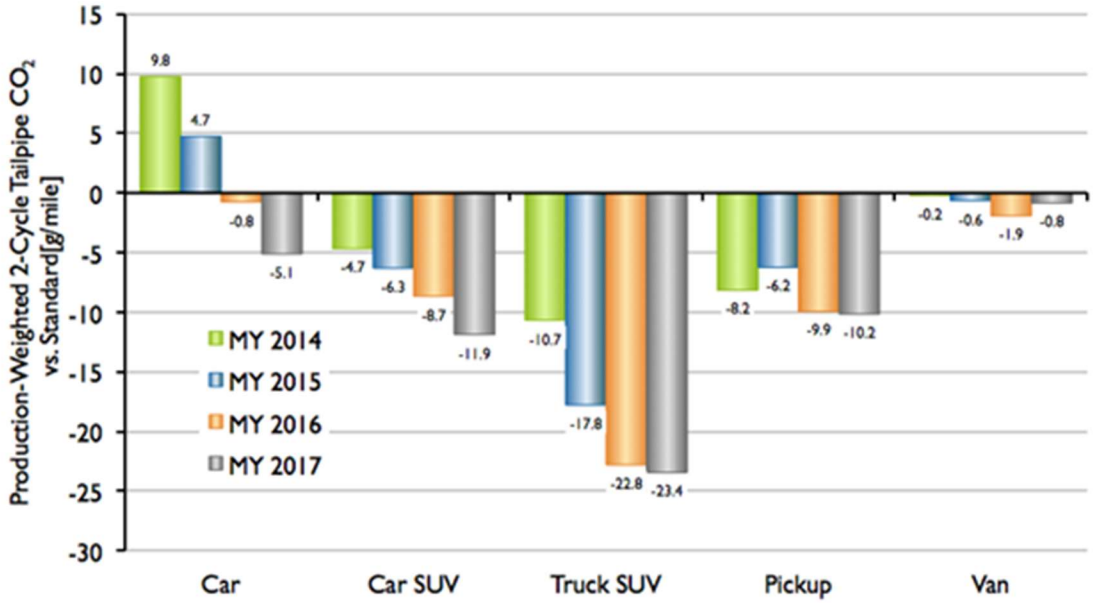

Figure 6.6: Production weighted CO_2 performance-to-standard.[209]

All evidence demonstrates that the current vehicle classification system challenges all of the vehicle segments. As can be seen, the Car and Truck SUVs are the largest deficit generators to

[208] Novation Analytics personal communication to Alliance.
[209] Novation Analytics personal communication to Alliance.

industry compliance, but their growing popularity clearly shows that these are the types of vehicles that consumers are demanding.

6.4.2. *Technology Is Being Added to Utility Vehicles at a Rate Exceeding Passenger Cars*

Some might question whether this compliance challenge is a sign that industry failed to apply technology to the small 2WD SUVs and light-duty truck truck fleet, but this is not the case. As seen in EPA's 2017 Fuel Economy Trends data shown in Table 6.1 below, Car and Truck SUVs improved by 43 g/mi (12.7%) and 45 g/mi (11.3%) respectively. In this same timeframe passenger cars improved by only 19 g/mi (6.3%).

	Car (non-SUV)		Car SUV		Pickup		Truck SUV		Minivan/Van	
Model Year	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)	Adj Fuel Economy (MPG)	Adj CO_2 (g/mi)
2012	27.6	322	23.3	381	17.2	516	20.0	445	21.3	418
2013	28.4	313	24.3	365	17.5	509	20.8	427	21.1	422
2014	28.4	313	24.4	364	18.0	493	21.6	412	21.3	418
2015	29.0	306	25.1	353	18.8	474	21.9	406	21.8	408
2016	29.2	303	26.2	338	18.9	471	22.2	400	21.7	410

Table 6.1: EPA fuel economy trends: fuel economy and CO2 by segment.[210]

6.4.3. *Vehicle Energy Efficiency is Consistent Across Segments*

Another way of looking at the appropriateness of the vehicle classifications is to evaluate whether the vehicles in the various vehicle segments are relatively equally efficient given the differences between the segments. The vehicle efficiency can be assessed with a metric called tractive efficiency. Tractive efficiency compares the fuel efficiency (in fuel energy consumed divided by drive cycle distance) emitted vs. vehicle tractive energy (energy required to move the vehicle through the drive cycle divided by drive cycle distance). Figure 6.7 below reveals that all vehicle segments all have similar levels of efficiency, though small 2WD SUVs are the most efficient.

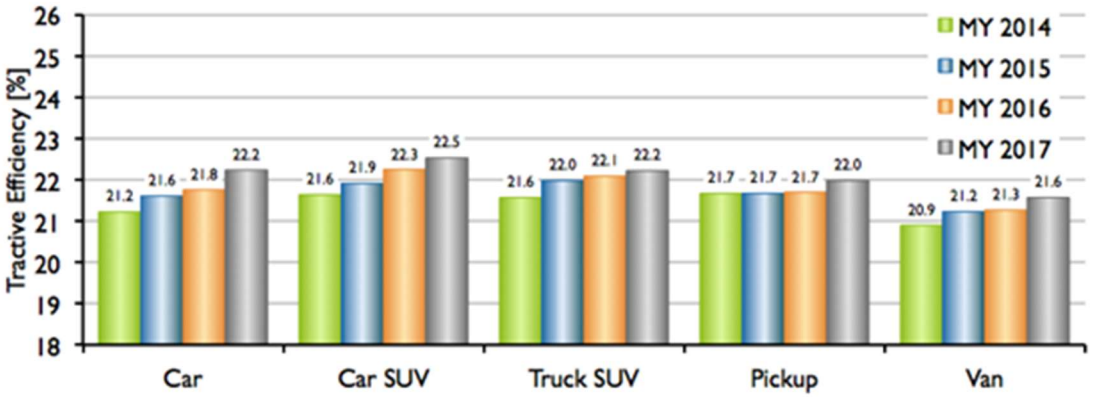

Figure 6.7: Tractive Efficiency by Segment.[211]

[210] 2018 TRENDS REPORT, *supra* note 19, at 22.
[211] Novation Analytics personal communication to Alliance.

Unfortunately, the compliance burden by segment shown in Figure 6.5 is misaligned with the underlying physics shown in Figure 6.7 above. The Agencies are imposing more stringent standards on the truck fleet. The small 2WD UVs that fall in the car fleet are also penalized. The Agencies need to correct this disparity in current rulemaking when resetting footprint curve standards. Moving the small 2WD UVs back to the truck fleet, by updating NHTSA's vehicle classification to recognize the truck-like characteristics of these vehicles, is a logical solution. This and other potential solutions are discussed in Appendix 3.

APPENDIX 7: CAFE REPORTING ISSUES

7.1. CAFE Projections Reporting Template

Manufacturers have enjoyed an extended period during which NHTSA and EPA have worked cooperatively in the CAFE reporting space. Working together, the Agencies have historically allowed companies to generate one final CAFE report and know with confidence that it meets the expectations of both. The Alliance's primary desire is to see this relationship continue, to help minimize the compliance and reporting burdens of regulations that involve both Agencies. The Alliance prefers that NHTSA and EPA continue to accept a single, common reporting format to satisfy CAFE reporting for both Agencies. The Alliance believes that whatever the benefits of dissimilar CAFE reporting formats may be to each agency, they would not justify the additional cost and burden imposed upon manufacturers to collect additional information and to modify data processing systems and databases in order to generate two separate CAFE reports.

NHTSA's proposed format differs in many ways from the current final CAFE report shared with EPA. The NHTSA proposal requests a significant amount of additional information—approximately one-quarter more—than is currently required for the final CAFE report submitted into EPA's VERIFY system. Requested data includes the length and width of the open cargo bed, battery configuration, distributor calibration, choke, and emission control device; however, these terms lack any sort of formal definition or common reporting standard for EPA submission. Most significantly, there is an inconsistency in how off-cycle and air conditioning credits are currently reported to EPA VERIFY, which if reported as proposed by NHTSA would increase by a factor of ten or more the number of reporting entries to comprehend combinations of these technologies generating credits at the model level. While it is possible to make these changes given appropriate lead time, one member of the Alliance conservatively estimates that the necessary information technology changes would cost more than $1 million to implement and could not be completed prior to MY 2021.

For these reasons, the Alliance recommends that NHTSA retain the current final CAFE reporting format commonly submitted to EPA's VERIFY system.

7.2. NHTSA Should Not Add Requirements for Disclosure of CAFE Credit Trade Transaction Information

As further discussed in Appendix 5, the Alliance supports continuing to include credit trading as a compliance flexibility in the CAFE program. Manufacturers have previously engaged in, and are expected to continue to explore, credit transactions with other manufacturers.

Credit trades are business-to-business transactions and can contain both financial and non-financial compensation between the buyer and seller. The Alliance views these transactions as being similar in nature to other competitive purchase agreements, and they are likely to include features such as non-disclosure terms and strict confidentiality with regards to costs and compensation. When engaging in such activity, manufacturers compete with one another for access to CAFE credits, just as they compete with other manufacturers for access to fuel-saving technologies. To that end, manufacturers maintain confidentiality during negotiations and in the transaction terms in order to

protect the sensitive business practices of both the buyer and the seller. Revealing confidential purchase terms could result in a competitive disadvantage for both parties. Just as manufacturers do not and cannot disclose contract pricing for technologies from their suppliers, manufacturers also do not disclose purchase prices for CAFE credits—even after the transaction has occurred.

Based on the text of the Proposed Rule, it appears that NHTSA has been approached by "entities wishing to trade credits"[212] and that these entities have cited a lack of transparency in the compensation terms of transactions as inhibiting them from determining the valuation of credits. Having access to this financial information would apparently help inform a decision by these entities to possibly buy or sell credits. In response, NHTSA is seeking comment on whether entities that have engaged in credit transactions should be required to provide unfettered access to confidential financial, or non-financial, compensation terms embedded within confidential credit transaction contracts. Put more simply, the question is whether businesses should be required to disclose otherwise confidential prices for goods bought and sold in order to enable new entrants into a marketplace.

The Alliance does not support disclosure of confidential compensation terms for credit transactions and believes this is inconsistent with standard purchasing and selling practices. Such disclosure could result in potentially uncompetitive outcomes in the credit market.

Compliance plans, which may or may not include the use of purchased or earned credits, are not publicly disclosed. CAFE credit transaction contracts may contain similar information for the purposes of valuing credits that are subject to an adjustment factor that changes credit values depending on terms such as the model year in which the credit was generated and the model year to which a manufacturer applies the credit.[213] NHTSA and other agencies clearly understand that compliance plans are protected confidential business information. Just as NHTSA does not require manufacturers to post transaction prices for turbochargers, 8-speed transmissions, or battery packs, the Alliance sees no reason to reveal transaction terms for credits. A manufacturer who integrates compliance flexibilities, such as credits, within an overall compliance plan should not be required to reveal the financial or other data used to inform that internal planning. Disclosure of credit trade financial information may also provide other manufacturers with insights into the trading manufacturers' compliance plans or even affect manufacturer valuation. For example, financial terms that appear more favorable to a seller may indicate a greater degree of need on the part of a purchaser or vice-versa based on simple supply-and-demand economics.

The Proposed Rule is not clear on whether these other entities seeking access to the financial data are vehicle manufacturers who are also be regulated under the CAFE standards. If so, then revealing financial terms would appear to create a conflict of interest as these manufacturers could then use the financial information as part of their planning or to influence negotiations that they may later enter into with the manufacturers that were forced to divulge transaction data. Manufacturers compete in the marketplace, and access to costs paid by other competitors, either for credits or turbochargers, would provide an unfair competitive advantage.

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[212] *See* 83 Fed. Reg. at 43,449.
[213] *See* 49 C.F.R. § 536.4(c).

NHTSA already publishes credit movements for each model year. This information already provides some data to entities who may wish to engage in buying and selling credits in the market. NHTSA has never required, or expressed any interest in requiring, manufacturers to disclose the sensitive and confidential financial terms behind these transactions. Other agencies in the United States involved in mobile source regulation with programs that include credit trading do not require credit pricing to be revealed.

APPENDIX 8: MODELING SYSTEM USED IN THE PROPOSED RULE

8.1. Modeling Tools

Modeling to support the development of fuel economy and GHG regulations takes two forms: 1) vehicle modeling to determine how effective various technologies are at reducing fuel consumption; and 2) fleet modeling to predict how manufacturers would employ these technologies to meet their compliance targets.

NHTSA has long used the Volpe model (a.k.a. the CAFE model) for fleet modeling and, beginning with the DTAR, used the Autonomie model (operated by Argonne National Laboratory) for full vehicle simulations. Full vehicle simulations are the best method of vehicle modeling.

Meanwhile, EPA has been developing the ALPHA vehicle model and the OMEGA model for fleet analysis. Like Autonomie, the ALPHA model also runs full vehicle simulations, but since the ALPHA model is still in development, EPA also has to rely on its Lumped Parameter Model ("LPM") (a less-refined model) as an intermediate tool to fill in the blanks between ALPHA results.

These modeling systems (NHTSA's Volpe and Autonomie models, and EPA's ALPHA, OMEGA, and LPM models) answer essentially the same questions. Using both systems leads to inconsistencies and conflicts, and is inefficient and counterproductive. Using both also ignores the intent of Executive Order 13781 to improve government efficiency, effectiveness, and accountability. It only makes sense that the Agencies should settle on one set of tools.

Figure 8.1 shows the confusion generated by the Agencies' use of different modeling tools with different assumptions. In this case from the DTAR, the estimated costs of compliance are significantly different for essentially equivalent standards. Not only do the average fleet costs differ by hundreds of dollars, some manufacturers' costs differ by over $1,000 per vehicle. Interpreting the results and commenting on them is twice as difficult as they should be, and the conclusions are less clear.

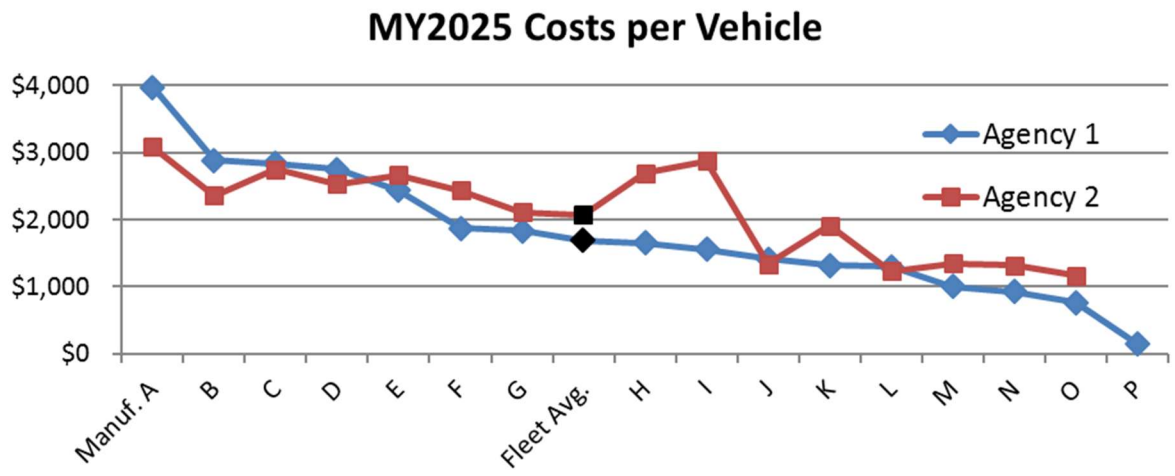

Figure 8.1: MY 2025 costs per vehicle as estimated by both NHTSA and EPA.[214]

The Alliance finds that, at least at this time, NHTSA's modeling systems are superior to EPA's. As such, we support the Agencies' decision to use NHTSA's modeling tools for this rulemaking and recommend that both Agencies continue on this path. We encourage Agencies to work together to provide input to the single common set of tools.

The following sections provide comments on changes to NHTSA's modeling since the DTAR, and a more detailed comparison to EPA's tools.

8.2. Improvements in the Autonomie and Volpe Models

The Alliance will continue to offer comments and criticisms on modeling in this and future rulemakings, but we would also like to recognize the significant improvements made in the Autonomie and Volpe models since the DTAR.

- Volpe Model
  - The passenger car fleet has been appropriately separated into domestic and import passenger car fleets.
  - Dynamic estimates of vehicle sales and scrappage in response to price changes replace unrealistic static sales and scrappage numbers.
  - The model has new capability to perform GHG analysis with GHG program flexibilities.
  - The baseline fleet has been appropriately updated based on both public and manufacturer data to reflect the technologies already applied, particularly tire rolling resistance.
  - Some technologies have been appropriately restricted. For example, low rolling resistance tires are no longer allowed on performance vehicles, and aero improvements are limited to maximum levels of 15% for trucks and 10% for minivans.

[214] DTAR, *supra* note 117, at tbls.12.97, 13.21.

- Autonomie
  - The benefits of virtually all technologies and their synergistic effects are now determined with full vehicle simulations.
  - Vehicle categories have been increased to 10 to better recognize the range of 0–60 performance characteristics within each of the 5 previous categories, in recognition of the fact that many vehicles in the baseline fleet significantly exceeded the previously assumed 0–60 performance metrics. This provides better resolution of the baseline fleet and more accurate estimates of the benefits of technology.
  - New technologies (like advanced cylinder deactivation) are included, while unproven combinations (like Atkinson engines with 14:1 compression, cooled EGR, and cylinder deactivation in combination) have been removed.
  - Consistent with the recommendation of the National Academy of Sciences and manufacturers, gradeability has been included as a performance metric used in engine sizing. This helps prevent the inclusion of small displacement engines that are not commercially viable and that would artificially inflate fuel savings.

8.3. Comparing the Autonomie and ALPHA Models

The Alliance believes NHTSA's tools (Autonomie/Volpe) are superior to EPA's (APLHA/LPM/OMEGA). This is not surprising since NHTSA's tools have had a significant head start in development.

The Autonomie model was developed at Argonne National Lab with funding from the Department of Energy going back to the PNGV (Partnership for Next Generation Vehicles) program in the 1990s. Autonomie was developed from the start to address the complex task of combining 2 power sources in a hybrid powertrain. It is a physics-based, forward looking, vehicle simulator, fully documented with available training.

EPA's ALPHA model is also a physics-based, forward looking, vehicle simulator. However, it has not been validated or used to simulate hybrid powertrains. The model has not been documented with any instructions making it difficult for users outside of EPA to run and interpret the model.

8.4. Comparing the CAFE and OMEGA Models

NHTSA's Volpe model also predates EPA's OMEGA model. More importantly, the new Volpe model considers several factors that make its results more realistic.

- The Volpe model includes estimates of the redesign and refresh schedules of vehicles based on historical trends, whereas the OMEGA model uses a fixed, and too short, time interval during which all vehicles are assumed to be fully redesigned.
- The Volpe model allows users to phase-in technology based on year of availability, platform technology sharing, phase-in caps, and to follow logical technology paths per vehicle.

- The Volpe model produces a year-by year analysis from the baseline model year through many years in the future, whereas the OMEGA model only analyzes a fixed time interval.
- The Volpe model recognizes that vehicles share platforms, engines, and transmissions, and that improvements to any one of them will likely extend to other vehicles that use them. The OMEGA model treats each vehicle as an independent entity.
- The Volpe model now includes sales and scrappage effects.
- The Volpe model is now capable of analyzing for CAFE and GHG compliance, each with unique program restrictions and flexibilities.
- The Alliance also identified a number of other concerns with the OMEGA model in its comments on the MTE reconsideration.[215] We hereby incorporate those comments here.

For all of the above reasons and to avoid duplicate efforts, the Alliance recommends that the Agencies continue to use DOT's Volpe and Autonomie modeling system, rather than continuing to develop two separate systems. EPA has demonstrated through supporting Volpe model code revisions and by supplying engine maps for use in the Autonomie model that their expertise can be properly represented in the rulemaking process without having to develop separate or new tools.

8.5. General Comments on Modeling

8.5.1. *Baseline Fleet Assessment*

As discussed above, the baseline fleet has been updated with appropriate ratings of rolling resistance and aerodynamic improvements. In the DTAR, vehicles were generally considered to have unimproved tires and little aerodynamic improvement. That being the case, the Volpe model would add these improvements in spite of the fact that manufacturers had already made significant improvements in these areas and that there was little remaining opportunity for more. This ultimately led to the Volpe model under-predicting how much powertrain technology was required for compliance.

It is possible to estimate the rolling resistance and aerodynamic features of a vehicle using road load coefficients, but this process requires various assumptions and is not very accurate. Instead the Volpe Center, in developing the new Volpe model, used confidential business information from manufacturers to understand how much progress had been made in these areas so that the vehicles could be correctly baselined. The Alliance believes this is an accurate and practical solution and supports this improvement.

8.5.2. *Emissions Test Weight Bins*

When considering mass reduction, the Alliance previously requested that the Agencies also consider that vehicles are tested according to test weight bins, and mass reduction only affects on-cycle performance if the mass reduction is substantial enough to drop the vehicle one or more test weight bins (with the exception of a small road-load effect). The PRIA included a glider mass reduction study on a 2014 Chevrolet Silverado full-sized pick-up truck.[216] In it, the vehicle curb

[215] Alliance MTE Reconsideration Comments, *supra* note 65, at 48 *et seq.*
[216] PRIA, *supra* note 155, at 396.

weight was 5,362 lbs., and the base glider was 3,945 lbs. This results in a powertrain weight of 1,417 lbs. Table 8.1 shows the impact of mass reduction levels MR1 (5%) through MR5 (20%) applied to the glider on both this base vehicle as well as two other variants of the same vehicle but with a different cab, bed, or optional equipment variations. The same powertrain weight is used for all variants to not confound the results.

	Base Vehicle	Variant 1	Variant 2
Curb Weight	5,362	5,300	5,200
Equivalent Test Weight	5,250	5,250	5,250
Glider Weight	3,945	3,883	3,783
Glider Weight MR1	3,748	3,689	3,594
Glider Weight MR2	3,649	3,592	3,500
Glider Weight MR3	3,551	3,495	3,405
Glider Weight MR4	3,354	3,301	3,216
Glider Weight MR5	3,156	3,107	3,027
Equivalent Test Weight MR1	5,250	5,000	5,000
Equivalent Test Weight MR2	5,000	5,000	5,000
Equivalent Test Weight MR3	5,000	5,000	4,750
Equivalent Test Weight MR4	4,750	4,750	4,500
Equivalent Test Weight MR5	4,500	4,500	4,500

Table 8.1: Equivalent test weight results for mass reduction levels.[217]

All three vehicles before any mass reduction has taken place will all be tested in the 5,250 lb. weight bin, even though they do not have the same mass. Applying the MR1 reduction of 5% to the gliders, both variant 1 and variant 2 drop one test bin, but the base vehicle will not. Applying the MR2 reduction of 7.5% to the gliders, the base vehicle has finally dropped down one weight bin, but the other two variants show no improvement over MR1. This stair-step approach continues through MR3 (10%), MR4 (15%), and MR5 (20%), with some variants dropping a further weight bin with each level, while others do not.

Between these three variants, assume a volume split of 50% for the base vehicle, 30% for variant 1, and 20% for variant 2. To implement the MR1 package to this platform will result in a cost applied to all vehicles, but an on-cycle benefit only seen on 50% of the volume, thus halving the compliance benefit but maintaining the full cost. By applying the MR2 package, a benefit can be realized on 100% of the volume, but half of that volume is getting the same benefit as the MR1 package, but at a higher cost. The incremental benefit of moving from the MR2 package to the MR3 package would only impact 20% of the vehicles in this platform, and thus have a very high cost-to-benefit ratio. Moving from MR3 to MR4 shows an additional weight bin drop for all vehicles, where the move from MR4 to MR5 only affects 80% of the vehicles.

A single vehicle platform can support a variety of passenger car, utility vehicle, and/or light-duty truck variants with curb weight spanning several test weight bins. Applying mass reduction to the platform results in this uneven effect, in which the whole platform must bear the cost while only a

[217] Based vehicle curb weight and glider weight from PRIA, *supra* note 155, at 401, tbl.6-41 (kilograms converted to pounds for consistency with equivalent test weight system). Variants 1 and 2 are hypothetical examples. Equivalent test weights assigned based on curb weight. Glider weights at mass reduction levels calculated by Alliance of Automobile Manufacturers.

fraction of the variants realizes a compliance benefit in dropping down one or more test weight bins, thus making the cost of these improvements more expensive when compared to other technologies that can help all variants of a platform. As mass reduction is one of the primary technology paths considered by the Volpe model, it is important that the Agencies not over-predict its benefits. The Alliance continues to find that it is necessary and appropriate for the Agencies to consider how mass reduction affects a vehicle's test weight bins when determining the benefits of mass reduction. Without proper consideration, the benefits will be inflated. If the Agencies had considered this effect, it would likely have increased the estimated costs of compliance.

8.6. Consideration of Tier 3 and LEV III Emissions Rules

8.6.1. *Tier 3 Emissions*

The Tier 3 and LEV III emissions requirements were promulgated after the MY 2017–2025 fuel economy and GHG standards were finalized, so they were not considered in the standard-setting process during the 2012 rulemaking. The Alliance has previously commented on the failure to include the impact of the Tier 3 and LEV III rulemakings in the prior final determination, because the aggressive cold-start emission strategies that must be employed to meet Super Ultra-Low Emission Vehicle (SULEV30/Bin 30) fleet average emissions that began in MY 2017 will be detrimental to both CO_2 emissions and fuel economy. Additionally, the "zero" evaporative emissions standards associated with these rules will also negatively impact fuel economy and GHG compliance, particularly for engine stop-start and HEV applications, where the engine-off time is constrained by the need to purge the canister. For these reasons, the Alliance supports the decision to include Tier 3 and LEV III emissions considerations in the Proposed Rule analysis.

8.6.2. *Tier 3 Regular-Grade Octane E10 Test Fuel*

The Tier 3 and LEV III emissions regulations also introduced a new E10 test fuel. This fuel has a lower octane rating (91 research octane number ("RON")) than the previous Tier 2 test fuel (96+ RON "premium"). Although the new E10 test fuel is currently used only for emissions certification testing, it will be used for fuel economy and GHG testing in the MY 2020–2025 timeframe.[218] Despite this fact, previous EPA modeling incorrectly used "premium" octane fuel to predict the benefits of future engine technology. Since the fuel efficiency benefits of higher-octane fuel are well-known (and are described in the Alliance comments on the DTAR), this error undoubtedly overstated the fuel efficiency gains that will be achievable when using regular-grade octane Tier 3 fuel. Fortunately, this oversight has been corrected in the Proposed Rule modeling, and the Alliance commends the decision to update the core engine maps used to the correct Tier 3 test fuel.

8.7. Split of Different Vehicle Categories

The Alliance supports the inclusion of performance classes to the original five vehicle classes used in the DTAR. This change allows better technology selection and more accurate estimates of technology benefits without degrading the original performance of the vehicle.

[218] *See* 40 C.F.R. § 600.117.

8.8. Gradeability and Performance Concerns

The Alliance supports adding top-gear gradeability to the performance metrics. Performance metrics related to vehicle operation in top gear are just as critical to customer acceptance as are performance metrics such as 0-60 mph times that focus on performance in low-gear ranges. As engine downsizing levels increase, top-gear gradeability becomes more and more important.

8.9. Atkinson Cycle Engines

The Alliance provided significant comments to the DTAR and proposed determination detailing concerns of feasibility and effectiveness of the non-hybrid Atkinson engine technology packages, including cooled exhaust gas recirculation ("CEGR") and cylinder deactivation.[219] These comments noted that the modeling projected an implausibly rapid fleet penetration of this complex engine technology and overestimated its effectiveness, due largely to modeling with high-octane fuel and the theoretical addition of CEGR plus cylinder deactivation. The Proposed Rule has recognized many of the Alliance's concerns with the modeling of high compression ratio ("HCR") HCR1 and HCR2 technology. The Alliance agrees with the more restrained application of HCR1 in the Proposed Rule—including restrictions on 8- and some 6-cylinder engines—and agrees with the rationale provided by the Agencies, including:

- Packaging and emission constraints associated with intricate exhaust manifolds needed to mitigate high load/low revolutions per minute knock;
- Inherent performance limitations of Atkinson cycle engines; and
- Extensive capital and resources required for manufacturers to shift to HCR from other established technology pathways (e.g. downsized turbocharging).

Additionally, the Alliance supports the decision to exclude the speculative HCR2 technology from the analysis. As previously documented in Alliance comments, the inexplicably high benefits ascribed to this theoretical combination of technologies has not been validated by physical testing.

8.10. Gasoline Turbocharged Direct Injected and Cooled Exhaust Gas Recirculation Technologies

Previous Alliance comments noted that the fuel efficiency improvements modeled for downsized, turbocharged engine technologies were highly optimistic. Use of high-octane fuel, engine fuel maps that grossly underestimated engine fuel flow at light loads, and impractical engine downsizing all contributed to these optimistic projections.

This Proposed Rule improves on Turbo1/2 and CEGR1/2 modeling in several respects. The most notable change is updated engine maps that use the correct, regular-octane test fuel. This fuel will be required by regulation in the timeframe under consideration for this review, so it was not appropriate in previous modeling to use fuel with a higher octane rating when projecting the future benefits of turbo technology.

[219] Alliance DTAR Comments, *supra* note 63, at 45 et seq.

Additionally, the platform and engine sharing methodology in the model better replicates reality by making available to each manufacturer only a finite number of engine displacements, helping to prevent unrealistically "over-optimized" engine sizing by vehicle model.

Finally, the modeling recognizes that higher-brake mean effective pressure ("BMEP") turbocharged engines coupled with CEGR2 provides little or no benefit when practical performance and drivability factors are considered, and this technology package is appropriately excluded from the analysis.

8.11. Cylinder Deactivation and Advanced Cylinder Deactivation

In the previous analysis, the projected effectiveness and penetration of cylinder deactivation technologies was too high, particularly when combined with turbo and ATK2 technologies. The Proposed Rule assessment better matches industry experience and expectations regarding this technology. In particular, the Alliance supports the decision to model advanced cylinder deactivation separately from other advanced powertrain pathways (turbo, HCR, ADSL).

8.12. Electrified Powertrain Technologies

The Alliance supports the implementation of electrification technologies in the latest modeling efforts. The Volpe model includes separate costs and benefits for crank integrated starter generators ("CISG") and belt integrated starter generators ("BISG") mild hybrid technologies, P2 hybrids/power split strong hybrid technologies, and for 30-mile/50-mile PHEV technologies. These distinctions are important to capture the architectural differences between two different technologies, which can have separate packaging requirements, efficiency potentials, and vehicle applications. Additionally, the Alliance supports the inclusion of accounting for consumers' willingness to pay for electrification technologies, and recognition within the Proposed Rule that manufacturers cannot pass on the entire incremental costs of hybrid, plug-in hybrid, and battery electric vehicles to the buyers of those vehicles. The separation of electrification hardware costs and battery costs is a positive change to the modeling, allowing for separate learning rates and costs differentiation between the two distinct pieces of any electrification technology implementation. While the costs of installing chargers and charger convenience were not taken into account within the Volpe model, as noted in Appendix 4, these factors will continue to have an impact on the overall penetration of electrification technologies that the market will be willing to accept.

8.12.1. *Volpe model Electrification Cost Error: Incorrect Model Results*

The 2018 Proposed Rule version of the Volpe model contains a component cost error in the electrification path that, when corrected, increases the auto manufacturers' estimated cost of compliance by nearly $13 billion if the no-action alternative was to be put into place.

8.12.1.1. Technology Paths

There are a total of 19 technology paths available in the Volpe model to demonstrate possible fuel efficiency improvements available to industry. The Volpe model, within many constraints,

attempts to identify the lowest cost path to compliance for industry. One technology pathway is electrification, and is highlighted below in Figure 8.2.

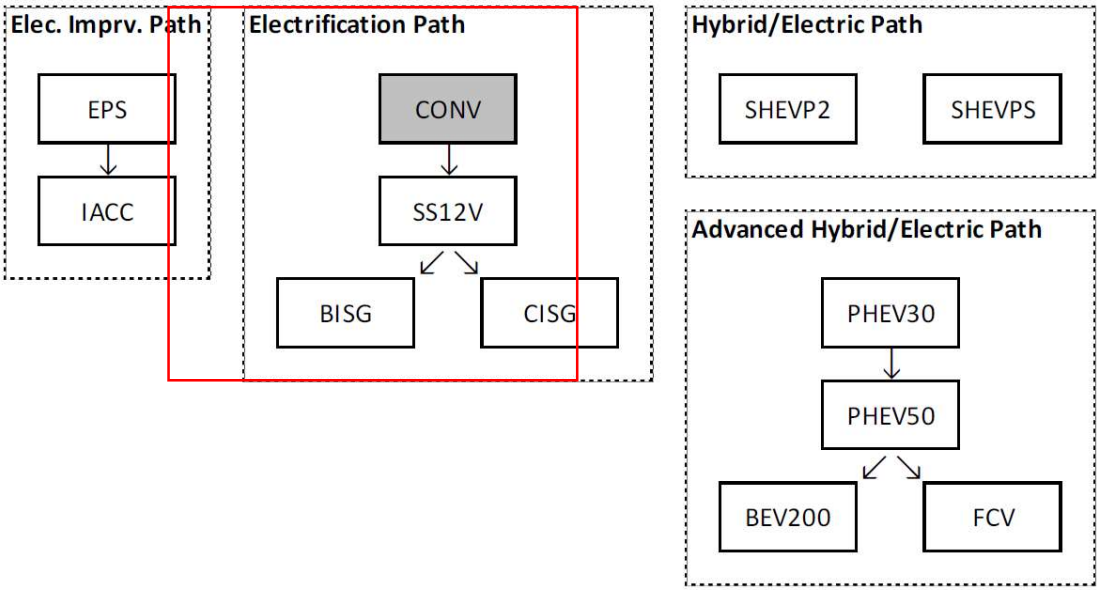

Figure 8.2: Vehicle level electrification paths.[220]

8.12.1.2. Implausible Electrification Path Costs

The electrification path incremental costs, not including the battery, are shown below in Table 8.2. As can be seen, there is a very distinctive and implausible change in costs for BISG and CISG for all variants of medium SUV and pick-up trucks, as compared to the cost of the same technology for small cars/SUVs and medium cars. In particular, the $225 drop in non-battery costs to go from 12V stop-start to BISG is misaligned with industry understanding.

Electrification	Small Car (inc Perf) Med Car (inc Perf) Small SUV (inc Perf) C-2015 Incremental Component Cost ($)		Med SUV (inc Perf) Pickup Pickup HT C-2015 Incremental Component Cost ($)
CONV	0.00		0.00
SS12V	727.91	$\approx$	813.54
BISG	546.82	$\neq$	-225.20
CISG	232.89	$\neq$	1108.04

Table 8.2: Electrification costs.[221]

An analysis of battery costs and cost learning revealed no other cost offset to this apparent error.

[220] NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, DRAFT 2021-2027 CAFE MODEL DOCUMENTATION May 2015).
[221] CAFE Model Input File, 2018_Proposed Rule_technologies_ref.xlsx

8.12.1.3. Volpe modeling of Adjusted Electrification Costs

To explore what impact the component cost error had on the compliance cost, the Volpe model was rerun with technology input file costs modified. The medium SUV and pick-up truck electrification costs were changed to be identical to the small car/SUV and medium car costs for SS12V, BISG, and CISG.

The results were analyzed for the no-action standards and for Alternative 1 in order to explore the full range of program cost changes, and are summarized in Table 8.3.

	Cumulative Tech Cost ($)	**Cost/Vehicle ($)**
2016-2026 Augural Standard	$12,976.0M	$67.84
2016-2026 Alternative 1	$12.1M	$0.06

Table 8.3: Estimated incremental electrification technology costs.

The cumulative incremental technology cost for the no-action alternative from MY 2016–2026 are nearly $13 billion, or $68 per vehicle. For Alternative 1 from 2016–2026, the cumulative cost is miniscule at approximately $12 million, or $0.06 per vehicle.

The Volpe model must be updated to correct this so that the cost of compliance is properly reflected in the results.

8.13. Transmissions

The Alliance strongly objected to the transmission modeling methodology used in EPA's proposed determination. This approach lumped fundamentally different transmission technologies—planetary gear, continuously variable transmissions ("CVTs"), and dual clutch transmissions ("DCTs")—into bundles with identical costs and efficiencies, making it impossible to fully comprehend the rationale for the high effectiveness projections.

The Alliance supports the abandonment of this approach in the Proposed Rule, which instead explicitly and transparently models the cost and effectives for different transmission technologies. The analysis also appropriately restricts the application of CVT technology on larger vehicles.

8.14. Variable Compression Ratio Engines

The Alliance supports the exclusion of variable compression ratio engines from the analysis. This technology is still in early development, and too speculative to be included at this time. It is also unlikely to attain significant penetration in the MY 2026 timeframe due to intellectual property protection associated with early implementations and its likely application primarily to high-performance vehicles. At least one source also indicates a steep price to this technology— "at least $3,000 more to produce than a standard 16-valve double-overhead-camshaft four-cylinder."[222]

[222] Richard Truett, *The Octane Game: Auto Industry Lobbies for 95 as New Regular*, AUTOMOTIVE NEWS (Apr. 17, 2018), http://www.autonews.com/article/20180417/BLOG06/180419780/auto-industry-lobbies-for-95-octane-as-new-regular.

8.15. Cost Assessments

The Alliance supports the use of retail price equivalents in the compliance cost modeling to estimate the indirect costs associated with the additional added technology required to meet a given future standard.

The alternative indirect cost multiplier ("ICM") approach is not sufficiently developed for use in rulemaking. As noted by the National Research Council, the indirect cost multipliers previously developed by EPA have not been validated with empirical data.[223] Furthermore, in reference to the memorandum documenting the development of ICMs previously used by EPA, Exponent Failure Analysis Associates found that,

> Large variations were observed between questionnaire responses found in an August 2009 memorandum (average coefficient of variations across all cost contributors was greater than 1, indicating potential disagreement between the experts on the relative impact of the different cost contributors), and review of the respondents' comments indicates confusion and lack of expertise in some areas. The discrepancies between questionnaire responses from the EPA experts, and these experts' potential lack of understanding of the different cost contributors, are not consistent with a rigorous and scientifically sound analysis.[224]

8.16. The Alliance Supports NHTSA's Use of 20% for the Rebound Effect

Rebound effect, in the context of the Proposed Rule, is the additional vehicle miles traveled ("VMT") that arises from improved fuel economy, which reduces the cost of driving each additional mile. Improvements in fuel economy, as reflected in higher MPG, decrease the cost of driving and thus lead to greater driving. The rebound effect is defined as the elasticity of VMT with respect to fuel efficiency improvements, i.e., the percentage change in VMT associated with a one-percent change in fuel efficiency. Elasticity of VMT with respect to changes in fuel price is a related topic but is separate from the rebound due to increased vehicle fuel efficiency.

The NERA-Trinity Assessment includes an evaluation of rebound effect estimates at its Appendix E. Based on this assessment, NERA concludes that a VMT rebound effect of 20 percent most accurately represents the range of relevant estimates.[225]

Specifically, NERA finds that for the studies identified, the median rebound value is 22 percent and the mean value is 26 percent.[226] Contrary to the Agencies' assessment in the DTAR that recent

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[223] NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES, COST, EFFECTIVENESS, AND DEPLOYMENT OF FUEL ECONOMY TECHNOLOGIES FOR LIGHT-DUTY VEHICLES 9-26 (2015), *available at* https://www.nap.edu/catalog/21744/cost-effectiveness-and-deployment-of-fuel-economy-technologies-for-light-duty-vehicles ("…the empirical basis for such multipliers is still lacking, and, since their application depends on expert judgment, it is not possible for to determine whether the Agencies' ICMs are accurate or not").

[224] EXPONENT FAILURE ANALYSIS ASSOCIATES, INC., ASSESSMENT OF GREENHOUSE GAS (GHG) AND CORPORATE AVERAGE FUEL ECONOMY (CAFE) TECHNOLOGY COST ASSUMPTIONS: TECHNICAL MEMORANDUM (Sept. 26, 2017) (hereinafter EXPONENT MEMORANDUM). Available at Regulations.gov, Docket ID EPA-HQ-OAR-2015-0827-9194, attachment "Attachment 4 - GHG CAFE Technology Cost Estimates." ([Internal citations omitted.])

[225] NERA-Trinity Assessment at E-4.

[226] *Id*. at E-3.

studies suggest a decrease in the rebound effect,[227] the studies identified by NERA to be relevant do not indicate a clear temporal trend. For studies published between 1990 and 1999, the average rebound effect is 24 percent. This number increases to 31 percent for studies published between 2000 and 2009 before declining to 25 percent for years 2010 through 2017.

The lack of the temporal effect cited by EPA is also supported by Figure 8.3 below, which is from the Strata comments to NHTSA's DEIS NOI,[228] and which graphs the results of the studies EPA found to be relevant for the TAR.[229] Clearly, an estimate of 10% (as was used in the DTAR) falls outside of the range of most of the data points.

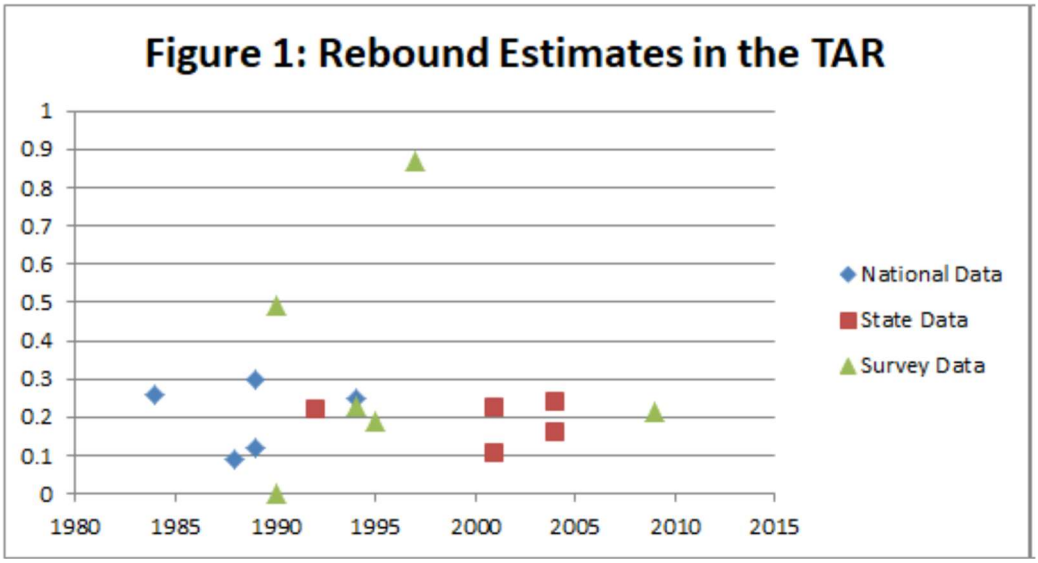

Figure 8.3: Rebound effect estimates in the DTAR.

Some recent comments posted in response to the Proposed Rule urge the Agencies to reduce their reliance on several studies of the cited studies as relevant to their determination that 20% is the correct value to use for rebound effect in its rulemaking.[230] For instance, Professor Small comments that "A better characterization of the most recent study [the Hymel and Small 2015 update] would be that it finds a long-run rebound effect of 18% under a simpler model but 4.0 percent or 4.2 percent under two more realistic models that are supported by the data." Professor Cirillo comments that "Our model [Liu et al., 2014] is constructed in order to study the latter." referring to "…(2) the rebound effect from energy policy aiming at reducing VMT by for example increasing fuel cost." and not "(1) the introduction in the market place of more efficient vehicles and their use…"

[227] DTAR, *supra* note 117, at 10–20.
[228] ARTHUR R. WARDLE & JULIAN MORRIS, STRATA, PUBLIC INTEREST COMMENT FROM REASON FOUNDATION AND STRATA POLICY ON THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT FOR MODEL YEAR 2022-2025 CORPORATE AVERAGE FUEL ECONOMY STANDARDS, *available at* Regulations.gov, Docket ID No. NHTSA-2017-0069-0147.
[229] *Id.*
[230] Letter from Professor Cinzia Cirillo (Oct. 18, 2018); Letter from Professor Kenneth Small (Sept. 14, 2018).

We support NHTSA's assessment of which studies, and which specific findings within those studies, that it chose as valid to make its determination to use 20% as the correct rebound effect due to fuel economy improvement. For instance, NHTSA in the Proposed Rule showed necessary sophistication in assessing the Hymel and Small 2015 by identifying a need to reduce its reliance on the Hymel and Small 2015 study for wholly separate reasons.[231] For instance, the Agencies showed necessary sophistication in assessing the Hymel and Small 2015 by identifying a need to reduce its reliance on the Hymel and Small 2015 study for wholly separate reasons.[232] The Agencies also demonstrated a full understanding of the various analyses undertaken by and within the various papers it studied by separating fuel price from fuel economy analyses.[233] All these are evidence to us that the Agencies did in fact undertake a fulsome, detailed, nuanced, sophisticated, and knowledgeable review of fuel economy rebound studies and that did in fact arrive at a reasonable and defensible rebound value of 20% to use in the Proposed Rule.

[231] 83 Fed. Reg. at 43,105 ("Further, the issues with state-level measures of vehicle use, fuel consumption, and fuel economy identified previously raise some doubt about the reliability of these studies' estimates of the rebound effect").

[232] 83 Fed. Reg. at 43, 105 ("These authors' results indicate that the decline in the fuel economy rebound effect with income reported in Small & Van Dender (2007) and subsequent research results entirely from a reduction in drivers' sensitivity to fuel prices as their incomes rise rather than from any effect of rising income on the sensitivity of vehicle use to fuel economy itself").

[233] 83 Fed. Reg. at 43,105 ("…the continued increases in income that were anticipated to produce a continued decline in the rebound effect have not materialized").

APPENDIX 9: High-Octane Fuel Blends

The Alliance has long supported two goals regarding the octane (anti-knock) properties of gasoline: 1) the availability of cost effective higher-octane fuels, greater than 95 Research Octane Number (RON) and 2) the immediate elimination of subgrade fuel less than 87 anti-knock index (AKI). Historically, when the first vehicle emissions standards and exhaust catalysts were introduced in the 1970s, unleaded fuels became essential and were made available. With a further reduction of vehicle emissions standards in the 1980s and the introduction of Tier 1 standards in the 1990s, simple and complex models for reformulated gasoline were introduced. In the 2000s, with Tier 2 vehicle standards, lower sulfur standards for fuels were introduced to enable greater and necessary vehicle catalyst system efficiency and durability. Current light-duty fuel economy and GHG standards require very aggressive increases in volumetric fuel economy and decreases in GHG emissions. In light of these very challenging standards, it is essential that vehicles and their fuels be treated as a system. Fuels should continue to evolve to enable greater vehicle efficiency, lower emissions, and ultimately better consumer and societal value. The last time industry considered octane rating in market fuel was half a century ago, and it has been steady since then. The time has come to address market fuel octane rating.

The United States, as a major developed country, should have a mandatory minimum gasoline octane rating in order to support higher engine efficiencies. Currently the United States is one of only a few major countries that lack a minimum market fuel octane rating requirement. The U.S.-based Alliance of Automobile Manufacturers, working with automakers worldwide, is a contributor to the Worldwide Fuel Charter. In 2013, the Fifth Edition of the Worldwide Fuel Charter outlined use of a minimum 95 RON for markets with advanced requirements for emission control and fuel efficiency. Many developed markets, including Europe, already have a mandatory 95 RON minimum.

Since the advent of the Cooperative Fuels Research engine in 1929, fuel knock resistance has been quantified in terms of RON and Motor Octane Number (MON). In the United States, fuel is marketed based on the AKI, defined as AKI = (RON + MON) / 2. In most other countries, fuel is marketed based on RON. Numerous studies indicate that RON is more relevant than MON or AKI for representing the octane requirement of modern engines.[234] For these reasons, the Alliance comments focus on RON and not AKI.

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[234] *See* Arjun Prakash et al., *Understanding the Octane Appetite of Modern Vehicles*, 9 SAE INT. J. FUELS LUBR. 345 (2016), *available at* http://papers.sae.org/2016-01-0834/; Bradley et al., *Relevance of Research and Motor Octane Numbers to the Prediction of Engine Autoignition* (Soc'y Auto. Eng'rs, Technical Paper No. 2004-01-1970), *available at* http://papers.sae.org/2004-01-1970; Kalghatgi, *Auto-Ignition Quality of Practical Fuels and Implications for Fuel Requirements of Future SI and HCCI Engines* (Soc'y Auto. Eng'rs, Technical Paper No. 2005-01-0239), *available at* http://papers.sae.org/2005-01-0239; Kalghatgi, *Fuel Anti-Knock Quality – Part II, Vehicle Studies: How Relevant is Motor Octane Number (MON) in Modern Engines?* (Soc'y Auto. Eng'rs, Technical Paper No. 2001-01-3585), *available at* http://papers.sae.org/2001-01-3585; Kalghatgi et al., *Octane Appetite Studies in Direct Injection Spark Ignition (DISI) Engines* (Soc'y Auto. Eng'rs, Technical Paper No. 2005-01-0244), *available at* http://papers.sae.org/2005-01-0244; Mittal & Heywood, *The Relevance of Fuel RON and MON to Knock Onset in Modern SI Engines* (Soc'y Auto. Eng'rs, Technical Paper No. 2008-01-2414), *available at* http://papers.sae.org/2008-01-2414; Mittal & Heywood, *The Shift in Relevance of Fuel RON and MON to Knock Onset in Modern SI Engines Over the Last 70 Years* (Soc'y Auto. Eng'rs, Technical Paper No. 2009-01-2622),

9.1. Support Higher Minimum Octane

The Alliance has long advocated for the availability of cost-effective, higher octane fuel. The Alliance also believes the Agencies should require a transition to a higher minimum-octane gasoline (minimum 95–98 RON). There are several ways to produce higher octane-grade gasoline, such as expanding the ethanol availability, but the Alliance does not promote any sole or particular pathway. The higher-octane fuel that is available today is sold as a premium grade. To support future engine technologies, the approach taken with today's premium fuel option would not be expected to provide an attractive value proposition to the customer; therefore, a new higher minimum-octane gasoline, 95–98 RON, is needed to achieve anticipated performance. In addition, the implementation of higher octane-rated gasoline in the marketplace would be a cost-effective means of immediately improving fuel economy for the existing light-duty vehicle fleet.

The widespread availability of higher octane-rated regular-grade gasoline (with increased knock resistance) is a key enabler for the next phase of advanced engines expected to dominate the fleet. Higher-octane gasoline enables opportunities for the use of key energy-efficient technologies, including higher compression-ratio engines, lighter and smaller engines, improved turbocharging, optimized engine combustion phasing and timing, and low-temperature combustion strategies (such as homogenous charge compression ignition (HCCI) engines). All of these technologies, when paired with higher-octane gasoline, permit smaller engines to meet the demands of the consumer while at the same time providing higher efficiencies; furthermore, depending on its composition, high-octane fuel is "backwards compatible" with existing vehicles. Figure 9.1 shows the relative efficiency gain enabled by higher octane-rated fuel for various air intake and fuel injection technologies. Fuel octane ratings of 95–98 RON can provide 2–6% relative efficiency gain via an increased compression ratio.

available at http://papers.sae.org/2009-01-2622; Orlebar et al., *The Effects of Octane, Sensitivity and K on the Performance and Fuel Economy of a Direct Injection Spark Ignition Vehicle* (Soc'y Auto. Eng'rs, Technical Paper No. 2014-01-1216), *available at* http://papers.sae.org/2014-01-1216; Coordinating Research Council, *Fuel Antiknock Quality: Engine Response to Ron versus MON* (Report No. 660) (2011).

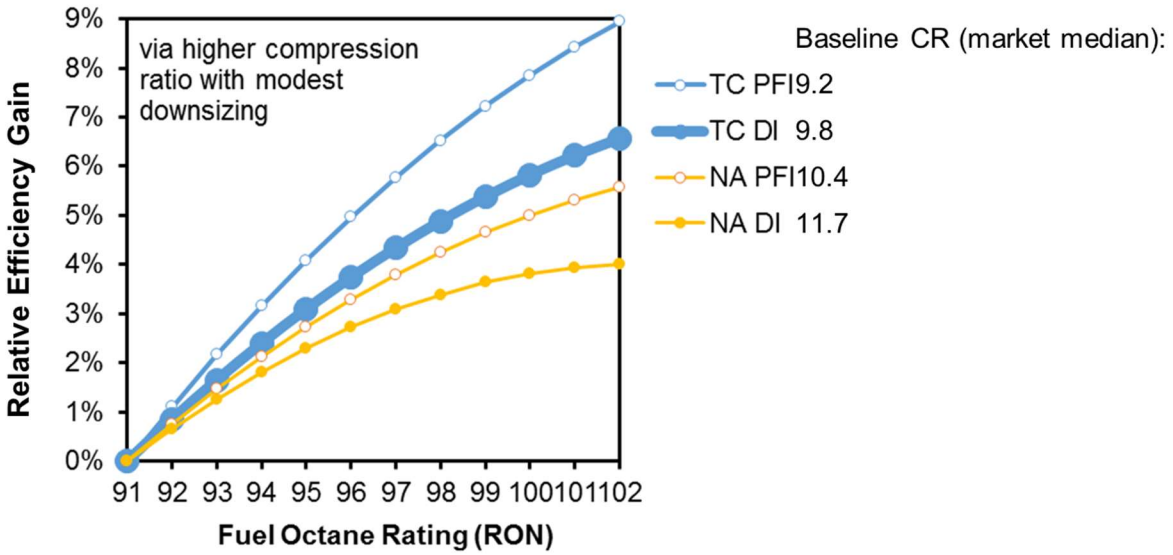

Figure 9.1: Higher fuel octane rating (RON) → Raise compression ratio (CR) → Improve engine efficiency.[235]

While Figure 9.1 shows the engine efficiency benefits of higher octane-rated fuels with higher compression ratio engines, optimal market fuel octane levels should be determined based on a "well-to-wheels" (WTW) analysis. WTW analysis accounts for both the benefits of a higher compression ratio and the slightly higher refinery CO_2 emissions and cost of higher-octane fuels. Several studies show that a transition to higher-octane gasoline in the United States, with light-duty vehicles optimized for the fuel, would yield significant net reductions in overall GHG emissions, including both vehicle and refinery emissions.

A recent WTW study performed by the Massachusetts Institute of Technology (MIT) modeled a vehicle fleet transition from regular to higher-octane gasoline.[236] The study factored in a policy decision period of about three years in order to put in place a revised octane rating system, and an additional three to five years for manufacturers to redesign engines to meet the new standards. The researchers estimated the environmental and economic impacts of such a scenario by running simulations of the oil-refining process and vehicle performance, and performing a life-cycle analysis of the resulting carbon dioxide emissions. The MIT team found that vehicles running on higher-octane fuel would be more efficient, consuming 3–4.5% less gasoline, for a projected savings of up to $6.4 billion per year by 2040. Based on its oil refinery modeling, the group found that producing higher-octane fuel would increase an oil refinery's emissions by 6%—an increase that is minor when compared with the balance of emissions from fuel production and combustion. When assessing the emissions produced by everything from extracting crude oil, to transporting it to refining it, to burning it in car engines, the study estimated that a higher-octane fuel supply would reduce overall CO_2 emissions by 35 million tons per year—a decrease that stems mostly from implementing more efficient engines. Overall, switching to higher-octane fuel (around 98

[235] Thomas G. Leone et al., *The Effect of Compression Ratio, Fuel Octane Rating, and Ethanol Content on Spark-Ignition Engine Efficiency*, 49 ENVT'L SCI. & TECH. 10,778 (2015), *available at* https://pubs.acs.org/doi/10.1021/acs.est.5b01420.

[236] Raymond L. Speth et al., *Economic and Environmental Benefits of Higher-Octane Gasoline*, 48 ENVT'L SCI. & TECH. 6561 (2014), *available at* https://pubs.acs.org/doi/10.1021/es405557p.

RON for regular-grade gasoline) decreased CO_2 emissions by 3–4%, all at a negative cost (i.e., et savings"). The study concluded that increasing the minimum octane level in the fuel is one of the few things society can do to decrease CO_2 emissions while saving money at the same time.

In another paper, Hirshfeld and his co-authors analyzed the refining economics, crude oil use, CO_2 emissions, and gasoline pool properties of raising the average octane of the U.S. gasoline pool by increasing the octane rating of refinery-produced hydrocarbon blendstocks for oxygenate blending and/or the ethanol content of the finished gasoline.[237] The study utilized refinery linear programming modeling to estimate the effects on the U.S. refining sector of producing a single future national gasoline. The study found a transition to higher-octane (95 RON, E10) gasoline was technically feasible without considerable increases for refineries in cost, CO_2 emissions, or petroleum consumption. The study also found that higher ethanol gasoline blends (E20 or E30) could provide a pathway for even higher-octane gasoline (e.g., 98 RON). The authors also noted that for vehicle manufacturers to optimize engine designs to realize the efficiency and performance benefits enabled by higher-octane fuels, these fuels would have to be readily available nationwide and competitively priced. They also state that a transition to higher-octane fuels would require concerted actions by multiple stakeholders, and that such transitions have been accomplished in the past (such as the transition to unleaded gasoline).

9.2. Eliminate Sub-Grade Octane Retail Gasoline

Low-octane fuels are a barrier to the introduction of more fuel-efficient engines, and so the Alliance has long urged national abolition of "sub-grade" octane retail gasoline (less than 87 AKI), which is still prevalent in the Rocky Mountain region and border states. Low-octane fuel in mountainous states was originally justified based on the knock performance of carbureted engines that ran richer at altitude. All modern automotive engines deploy feedback control of the air-fuel ratio, and require the same fuel octane regardless of altitude. Ongoing availability of sub-grade octane gasoline constrains automakers' abilities to implement efficient new technologies because these technologies cannot accommodate sub-grade fuels while optimizing performance. As ASTM D4814-18 points out,

> New vehicles have sensors to measure and engine management computers which take into account such conditions as air charge temperature and barometric pressure. These vehicles are designed to have the same antiknock requirement at all altitudes and a reduced sensitivity to changes in ambient temperature. This more sophisticated control technology began to be used extensively in 1984.[238]

Pre-1984 vehicles are no longer common on the road, and the fuel applicable only to those vehicles must be removed from the market.

EPA recognizes the importance of octane, as demonstrated by the close control of the AKI ((RON + MON) / 2) in Tier 3 certification fuel. The 87–88.4 range allowed by the specification is as

[237] David S. Hirshfeld et al., *Refining Economics of U.S. Gasoline: Octane Ratings and Ethanol Content*, 48 ENVT'L SCI. & TECH. 11,064 (2014), *available at* https://pubs.acs.org/doi/10.1021/es5021668.
[238] ASTM INTERNATIONAL, NO. D4814-14, STANDARD SPECIFICATION FOR AUTOMOTIVE SPARK-IGNITION ENGINE FUEL, *available at* https://www.astm.org/DATABASE.CART/HISTORICAL/D4814-18.htm.

narrow as the test methods will allow. EPA should mandate that market fuels introduced into vehicles certified on Tier 3 test fuel must have a minimum of 87 AKI, consistent with EPA's Tier 3 standards. Eliminating less than 87 AKI gasoline from the marketplace will remove a critical barrier to implementation of more efficient engine systems.

9.3. The Clean Air Act Allows for Regulation of Fuels to Prevent GHG Emissions

Under current law, the Clean Air Act provides statutory authority for EPA to regulate GHGs, which can "cause, or contribute to, air pollution which may reasonably be anticipated to endanger the public health or welfare."[239] Section 211 of the Clean Air Act provides EPA with the authority to regulate motor vehicle fuels in furtherance of the Act's goals. Specifically, Section 211(c) authorizes EPA to set new national fuel standards, including octane rating, under the following circumstances:

> [I]f, in the judgment of the Administrator, any fuel or fuel additive or any emission product of such fuel or fuel additive causes, or contributes, to air pollution . . . that may reasonably be anticipated to endanger the public health or welfare, or . . .if emission products of such fuel or fuel additive will impair to a significant degree the performance of any emission control device or system which is in general use, or which the Administrator finds has been developed to a point where in a reasonable time it would be in general use were such regulation to be promulgated.[240]

It is important to note that the addition of GHGs to the list of Clean Air Act "pollutants" is changing how one thinks of emissions control. For purposes of considering EPA's authority under Section 211(c)(1)(B), it is important to realize that the phrase "any emission control device or system" must be understood more broadly than it once was. With this recognition, it is easy to see that a new, more efficient engine offers emission control benefits. However, low-octane fuel acts as a barrier to these efficiency benefits. EPA has the authority and must stand firmly on the side of removing these barriers and providing manufacturers with a full menu of options for striving to meet the future GHG standards.

In light of increasing fuel economy and GHG requirements, it continues to be essential for vehicles and the fuels on which they operate to be treated as a system and developed in tandem. Prospective fuels should enable greater vehicle efficiency and lower emissions, optimize the consumer experience, and fulfill societal values. Technology is in place to produce advanced engines; however, without a promulgated higher-octane fuel standard, the advanced engines cannot optimize their potential operational efficiency. It is now timely for EPA to undertake an accelerated process to implement and synchronize the market introduction of a higher minimum-octane fuel that will enable the benefits of advanced technologies and support manufacturer investment. EPA has the authority to regulate national commercial gasoline octane specifications

[239] *Massachusetts v. EPA*, 549 U.S. 497 (2007); 42 U.S.C. § 7521(a)(1).
[240] 42 U.S.C. § 7545(c)(1).

under the Clean Air Act. EPA should initiate a fast-track process to assure higher-octane gasoline that meets the market and timing needs of new vehicle technology for the U.S. commercial supply.

APPENDIX 10 REGARDING INTERNATIONAL STANDARDS

Policymakers and other stakeholders often compare numeric targets from different regulatory structures around the world and use those values to assess and assert some degree of regulatory stringency. This type of comparison, while well-intentioned, is flawed for two fundamental reasons.

First, there are other regulatory differences between the regulatory structures of the United States and of other nations that influence numeric performance, such as the focus of vehicle regulations and the test methodologies required.

Second, and maybe more importantly, in order to accurately assess regulatory stringency, one must examine not just the regulatory framework but also the market differences between the regions. For example, if a government put in place market signals that encourage a specific consumer action (e.g., buying smaller vehicles), that nation would have higher fuel economy levels than another that did not have those same market signals, regardless of regulatory structure. While manufacturers have some influence on consumers, U.S. consumers demand a wide range of product offerings, and their ultimate purchase decisions balance many of their own vehicle needs and wants.

A common criticism of fuel economy standards in the United States is that they appear to be less stringent than those in other regions, such as Europe or China. The Alliance comments below on a variety of factors that often get minimized, or outright ignored, when making comparisons of fuel economy standards between countries. These factors include prioritization of criteria-based versus GHG emissions standards; vehicle mass-based versus footprint-based fuel economy targets; differences in drive cycles and testing requirements; and the market signals that differ by region and work to encourage fuel-efficient vehicle purchases.[241]

10.1. Regulatory Frameworks

When looking at both criteria and fuel economy/GHG regulations, the United States has historically prioritized lower criteria emissions, while Europe has prioritized lower GHG emissions. Comparing the current U.S. Tier 3 standard against Euro 6 illustrates this point. In the United States, the standard for NMOG + NO_x requirement for 2018 is 0.079 g/mi for light-duty vehicles and light light-duty trucks regardless of fuel type; in Europe, the standard is 0.209 g/mi for gasoline engine M1 category vehicles, and a more relaxed requirement of 0.274 g/mi for diesel engine M1 category vehicles. Recalling the understood trade-off between CO_2 and NO_x emissions, the more relaxed criteria emission regulations in Europe have allowed powertrain development and, more importantly, calibration strategies to further optimize fuel economy than is allowed for vehicles certified to U.S. Tier 3 emissions standards. Many European vehicles cannot be homologated for sale in the United States because they will not meet these more stringent criteria emission standards. In Europe, these higher NO_x requirements have allowed for higher light-duty diesel penetrations, which further helps lower GHG emissions, whereas the

[241] In its examination of these market signals, the Alliance is not advocating for additional consumer taxes; instead, we aim simply to highlight that different regulatory and market signals make a numerical comparison of only the regulatory targets myopic and flawed.

United States requires both diesel and gasoline engines to meet the same fleet average requirements.

The regulatory metric used to calculate fuel economy and GHG emission targets also varies by country and region. The United States uses a footprint-based standard, whereas Europe uses a mass-based standard. Other parts of the world follow one of these two formats. Canada, Mexico, and the Gulf Cooperation Council nations in the Middle East follow the U.S. footprint-based standards; China, Brazil, and South Korea follow mass-based standards. A footprint-based standard does not force the size of the vehicle to shrink to meet increasing fuel economy targets but instead encourages manufacturers to reduce the mass of a given-size vehicle, which helps to keep the size of vehicles aligned with the buying preferences of U.S. consumers. On the other hand, a mass-based system does not reward mass reduction comparably, so manufacturers often focus more on other vehicle attributes or technologies that attain a higher reward. For example, smaller vehicles with less frontal area would have lower vehicle demand energy due to aerodynamic drag. This aligns well with consumer preferences in Europe for smaller vehicles that fit their narrower streets.

Countries also use different drive cycle baselines to measure fuel economy. The United States uses the FTP-75 and HFET cycles, while Europe uses the quasi-steady state NEDC cycle and is currently transitioning to a more FTP-75-like cycle in the WLTP. Japan at first used the 10-15 Mode cycle, which was similar to the NEDC, before transitioning to the JC08 cycle, and will move to the WLTP on the future. China has adopted the NEDC. Brazil uniquely uses the U.S. test cycles but sets a mass-based standard instead of a footprint-based standard. South Korea, most distinctly, uses a mass-based standard for all light-duty vehicles but has a split testing program: gasoline-fueled light-duty vehicles are held to CARB emissions standards and tested over the U.S. drive cycles, while diesel light-duty vehicles are held to Euro 6 standards and tested over the NEDC cycle. There are many different testing procedures interwoven to develop standards based on either vehicle footprint or mass, all of which affect the vehicle demand energy requirements to which the vehicles are designed and against which they are tested.

Finally, vehicle weight classifications are different as well. The light-duty vehicle fuel economy and GHG regulations in the United States cover vehicles up to 8,500 pounds (3,856 kilograms) gross vehicle weight rating (GVWR). In Europe, the maximum weights for a light-duty vehicle is 3,500 kilograms, and in China it is only 2,500 kilograms. These lower weight thresholds remove some of the larger vehicles that are part of the light-duty fleet in the United States, and put them into categories, such as light commercial vehicles, that are covered by different regulatory programs. Removing the heaviest vehicles from a compliance fleet will increase the level of stringency that the fleet is able to achieve, but will do nothing to improve the fuel economy and GHG emission footprint of the total on-road vehicle fleet.[242] Therefore, comparisons with fuel economy and GHG emission targets for fleets in these regions are difficult to make because the

[242] In introducing this discussion, the Alliance is not asking for any changes to the 8,500-pound weight limit for light-duty vehicles, but merely highlighting differences in how light-duty vehicles are defined in other parts of the world.

vehicle fleets are regulated such that there are different vehicle mixes, regardless of consumer choice.

10.2. Market Signals

Governments across the world use tax policy to send market signals that align with their fuel economy regulatory policies, which then cause consumer to place greater emphasis on fuel economy over other vehicle attributes. However, these sorts of market signals are largely absent in the United States. These tax policy tools often take one of two forms: 1) fuel excise taxes, or 2) one-time purchase or annually recurring taxes based on fuel economy or GHG emissions, engine displacement, or engine power.

The Alliance undertook an analysis to compare the impact of tax policies used in multiple countries as incentives to encourage consumer acceptance of highly fuel-efficient vehicles. Conditions in the United States were compared with those in Germany, France, Italy, Sweden, the United Kingdom, China, and Mexico. These countries were chosen because they are large markets with significant domestic automotive production. Mexico is the exception; it was chosen because it has similar fuel economy regulatory policy to that of the United States, but has a median annual income (MAI) that is approximately one-quarter of that of the United States. Analyzing the effects of tax policies as market signals is much more meaningful when normalized by each country's MAI to represent the financial impact to the 50^{th} percentile consumer in each country.

10.2.1. *Fuel Excise Taxes*

A direct challenge to fuel economy and GHG emission regulation is the fact that U.S. consumers enjoy some of the lowest fuel prices in the world, due in part to some of the lowest fuel tax rates in the world. Figure 10.1 shows the average tax on a per-gallon basis for gasoline, converted to U.S. dollars, for the target countries. The U.S. tax is $0.47 per gallon, which reflects the national average of the $0.184 federal tax plus individual state taxes. The gasoline tax in Mexico is nearly double this, at $1.14 per gallon. China is $1.30 per gallon, while the five European countries are significantly higher.

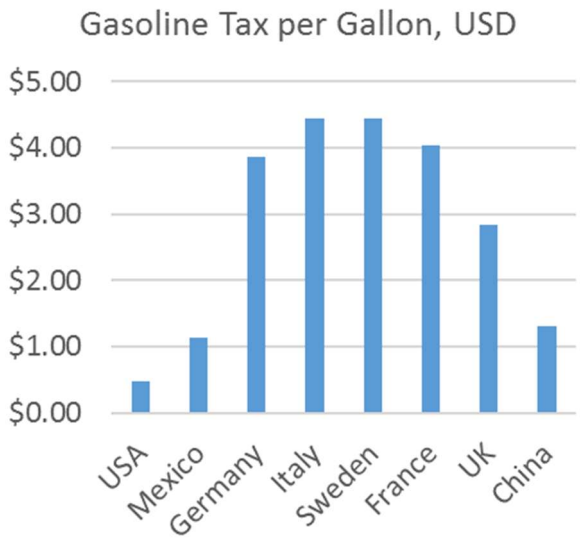

Figure 10.1: Gasoline tax per gallon in U.S. dollars by target country.[243]

Using this information, annual vehicle miles traveled (VMT) was then used to determine the financial impact of the fuel taxes in each country. Figure 10.2 shows the VMT values for each country. VMT was the highest in the United States, at 13,476 miles annually per vehicle. Mexico was the lowest, at 3,212 miles. Sweden, France, the United Kingdom, and China were all above 10,000 miles, while Germany was slightly above 8,000 miles, and Italy near 6,000 miles annually per vehicle. In the United States, the high VMT values and corresponding larger amounts of time spent in vehicles causes U.S. consumers to place higher value on large, comfortable vehicles over smaller, less-comfortable vehicles.

[243] *Frequently Asked Questions: How Much Tax Do We Pay on a Gallon of Gasoline and a Gallon of Diesel Fuel?*, U.S. ENERGY INFORMATION ADMINISTRATION, https://www.eia.gov/tools/faqs/faq.php?id=10&t=10 (last updated Sept. 7, 2018) (United States); EUROPEAN AUTOMOBILE MANUFACTURERS ASSOCIATION, 2018 ACEA TAX GUIDE 99, 106, 146, 231, 243 *available at* https://www.acea.be/uploads/news_documents/ACEA_Tax_Guide_2018.pdf (France, Germany, Italy, Sweden, United Kingdom); GlobalPetroPrices.com, https://www.globalpetrolprices.com/ (China); Ernst & Young, Indirect Taxes and Customs Implications for Downstream in Mexico (Mar. 27, 2017), *available at* https://www.api.org/~/media/Files/Policy/17-March-Customs-Conference/Indirect-Taxes-Customs-implications-for-downstream-Mexico.pdf.

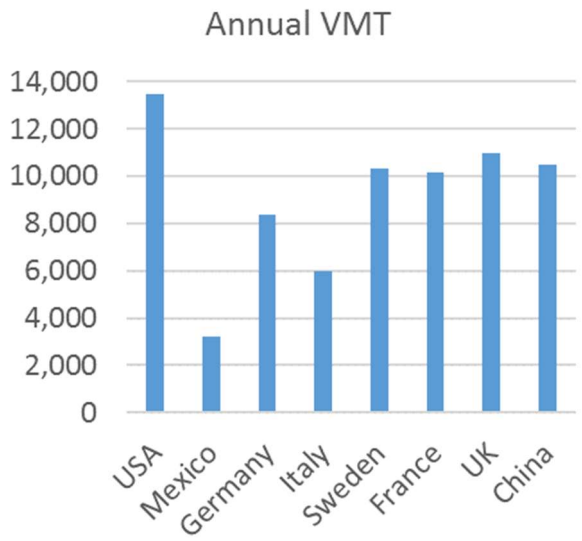

Figure 10.2: Annual VMT by target country.[244]

To assess the impact of these fuel taxes, four different light-duty vehicles were examined. These included a full-size pick-up truck with a V8 engine (17 MPG combined), a large SUV with a V6 engine (21 MPG combined), a mid-size SUV with a large I4 engine (25 MPG combined), and a compact car with a small I4 engine (29 MPG combined). These vehicles represent four different segments of the U.S. light-duty vehicle market and each have distinctively different engine displacements, engine power output, and vehicle fuel efficiency. Figure 10.3 shows the result of applying the fuel taxes in Figure 10.1 to the VMT from Figure 10.2 for each of these four vehicles. To normalize between the different drive cycles, U.S. label fuel economy was used for the comparison. Obviously, the more fuel-efficient vehicles incurred a lower tax burden, while less fuel-efficient vehicles incurred a higher tax burden. The spread in the United States between the compact car ($218.50) and the pick-up ($372.23) is only $154.23. Annualized over a year, this amount is insignificant compared to the additional utility and capability a full-size pick-up truck offers over a compact car to most consumer. However, in a country like Sweden, the gap is well over $1,000.

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[244] *OHPI: Average Annual Miles per Driver by Age Group*, U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, https://www.fhwa.dot.gov/ohim/onh00/bar8.htm (last updated Mar. 29, 2018) (United States); *Vehicle Travel by Selected Country (Metric)*, U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION (Apr. 2010), https://www.fhwa.dot.gov/policyinformation/statistics/2008/pdf/in5.pdf (Mexico); *Sectoral Profile – Transport,* ODYSSEE-MURE, http://www.odyssee-mure.eu/publications/efficiency-by-sector/transport/distance-travelled-by-car.html (last visited Oct. 4, 2018) (Italy); *OHPI: Annual Automobile Vehicle Miles of Travel (VMT) per Capita and Number of Automobiles per Capita 1997*, U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, https://www.fhwa.dot.gov/ohim/onh00/bar4.htm (last updated Mar. 29, 2018), scaled to 2009 using trends from INTERNATIONAL TRANSPORT FORUM, PEAK TRAVEL, PEAK CAR AND THE FUTURE OF MOBILITY: EVIDENCE, UNRESOLVED ISSUES, POLICY IMPLICATIONS, AND A RESEARCH AGENDA (Oct. 2012), *available at* https://www.itf-oecd.org/sites/default/files/docs/dp201213.pdf (Germany, Sweden, United Kingdom, and France); Hong Huo et al., *Vehicle-Use Intensity in China: Current Status and Future Trend*, 43 ENERGY POL'Y 6-16 (2012) (China).

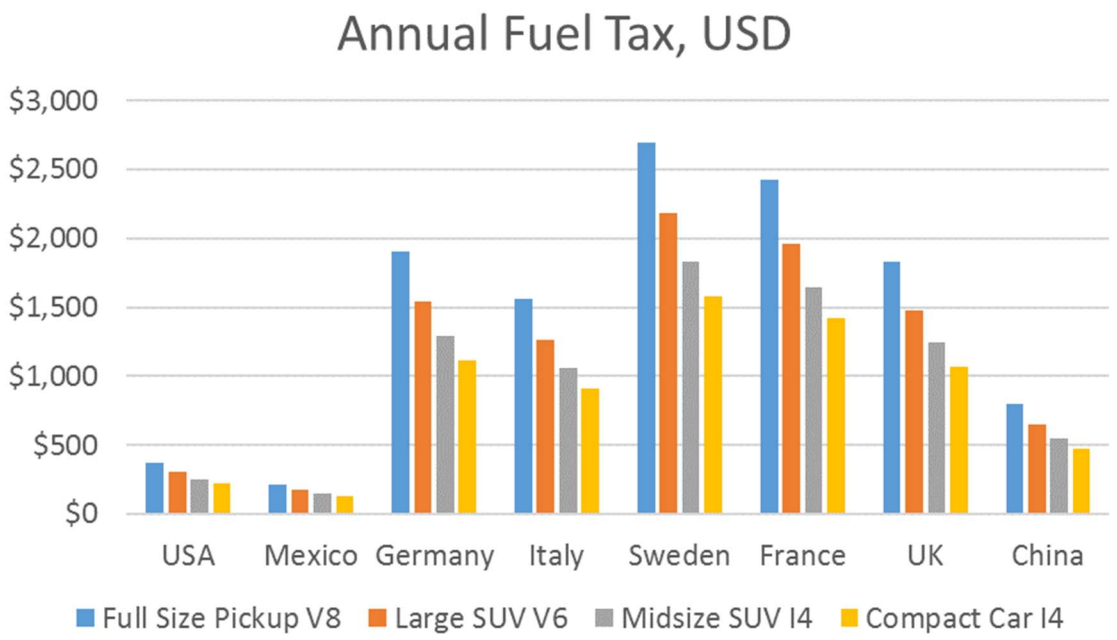

Figure 10.3: Annual fuel tax amount in U.S. dollars.

10.2.2. *Taxes Based on Fuel Economy, Engine Displacement, or Engine Power*

One-time or annual taxes based on fuel economy, engine displacement, or engine power are another set of policy tools used in other countries to incentivize consumer preferences for vehicles with higher fuel economy. Figure 10.4 shows the magnitude of these taxes for the four vehicles. Germany has an annual vehicle registration tax based on both engine displacement and fuel economy (g CO_2/km). Italy has an annual tax proportional to engine power above 53 kW. Sweden has a two-tiered annual tax based on fuel economy, with one rate for vehicles that emit 95–140 g CO_2 per kilometer and a higher rate for vehicles above 140 g CO_2 per kilometer. France has an annual tax on high-powered vehicles that uses a formula based on both engine power and CO2 emissions. That tax impacts on the pick-up truck in this analysis, but to a very substantial degree. France also has a bonus-malus program where the malus payment is made only at the time of purchase; that program impacts all the vehicles except the compact car. China has two different tax programs based on engine displacement that are incurred at the time of vehicle purchase. The costs shown in Figure 12.4 are amortized over five years of ownership, providing a better comparison to the other countries that have annual fuel economy-based taxes. Even with this amortization, costs in China exceed $11,000 for the pick-up and are nearly $5,000 for the large SUV. Generic sales taxes not tied to fuel economy or GHG performance are not included in this analysis, nor are value-added taxes on the vehicle purchase, which commonly exceed 20%.

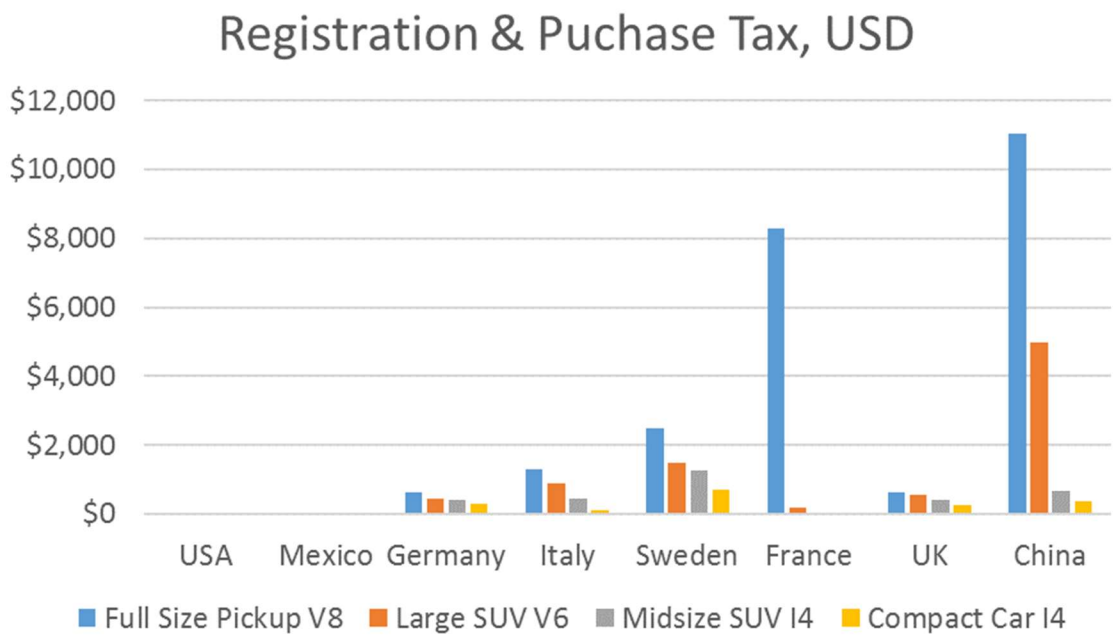

Figure 10.4: Registration and purchase-based fuel economy taxes in U.S. dollars.

Comparing the sum of fuel taxes and registration or purchase-based fuel economy or GHG taxes shows the strong market signals used by other governments to incentivize fuel-efficient vehicle purchases. Figure 10.5 shows the combined magnitude of these two policy tools. The magnitude of the annual cost increases caused by these policies are substantially higher for the European countries and China. Reviewing from the most fuel-efficient vehicle to the least, the increase can be fairly linear from the compact car to the mid-size SUV and then the large SUV, and there is an even larger increase shifting to the pick-up in Sweden and France. A similar large increase occurs in China when shifting from the mid-size SUV to the large SUV.

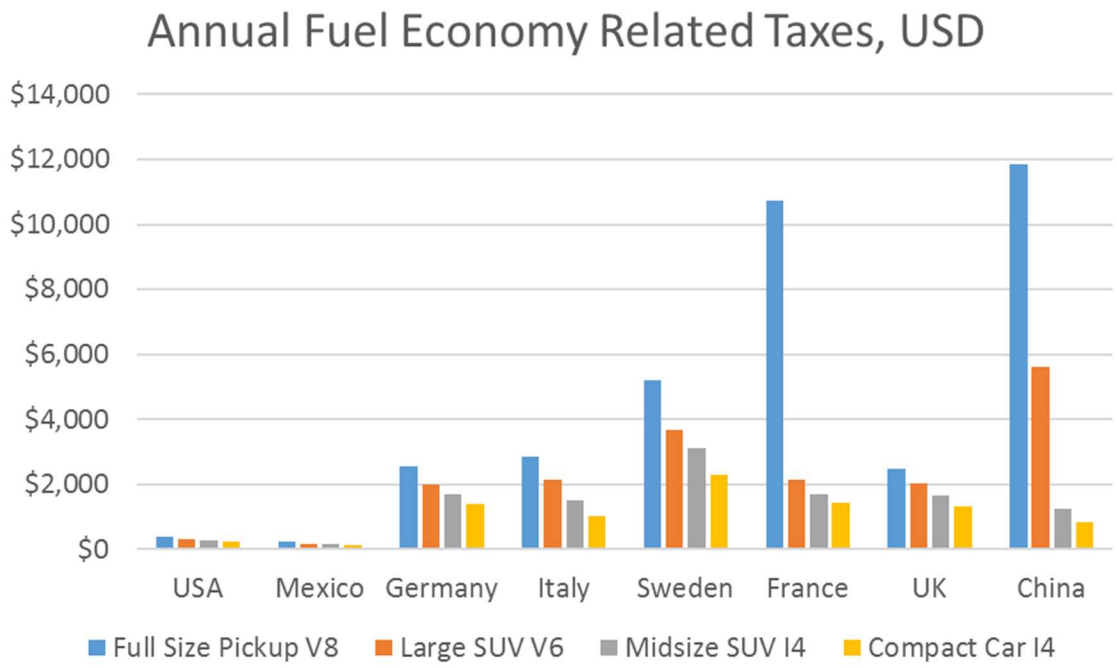

Figure 10.5: Annual fuel economy-related taxes in U.S. dollars.

Viewing these results purely in terms of the costs can be a bit misleading because of economic disparity between the countries. Instead, framing the results as a percentage of MAI is a good method to normalize them and show the true cost pressures that these policies put on consumers. Figure 10.6 shows the same tax levels presented in Figure 10.5 divided by each country's MAI. The values for the United States are barely visible in the top chart, and so Figure 12.6 zooms in to make them clearer. The costliest vehicles are the pick-up and the large SUV in China, at 192% and 91%, respectively, of MAI. A consumer in China earning the median wage would need to spend 1.9 times their annual salary just to pay the annual cost of fuel economy-related taxes. In Italy, Sweden, and France, some vehicles exceed 10% of MAI. Again, the costs discussed are only those related to fuel economy—they do not consider vehicle purchase price, non-tax fuel costs, insurance, or other vehicle-related costs. Through these financial policy tools, many of the vehicles that are popular with consumers in the United States are financially disincentivized to the point that they are not economically feasible to own and operate in other countries.

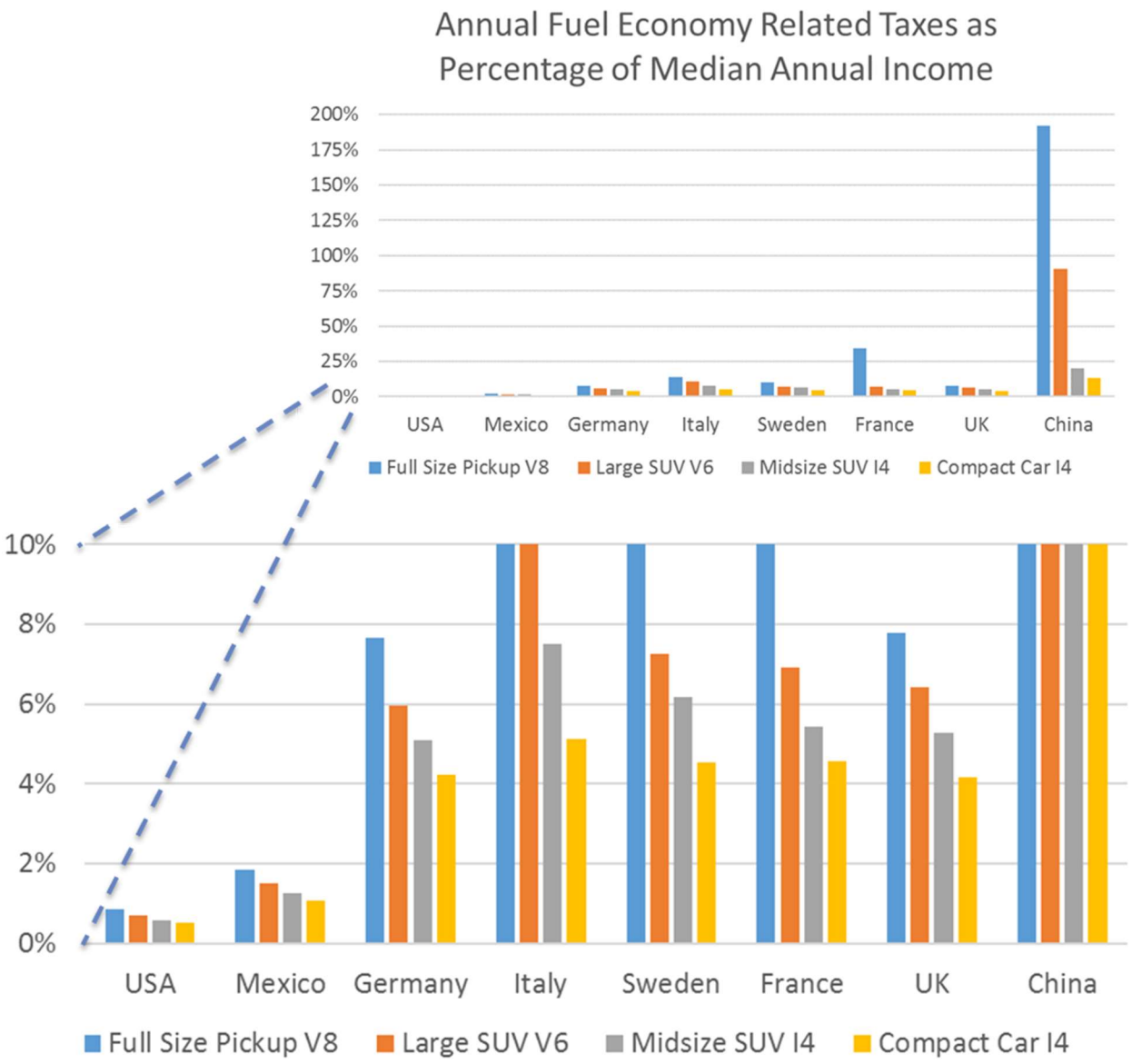

Figure 10.6: Annual fuel economy-related taxes in U.S. dollars, normalized by MAI.[245]

Finally, the best way to view the MAI-normalized data at a macroeconomic level is to further normalize the exemplar countries against the United States. Figure 10.7 shows this with the United States as a baseline. Because of the great disparity between countries, this data must be displayed on a logarithmic scale, and thus the 100% level for the United States is represented by columns of zero height. The analysis shows that the United States, Mexico, Germany, Sweden, the United Kingdom, and to a lesser extent Italy, in fact tax fuel economy fairly evenly, with neither overly progressive nor regressive schemes. The big difference between these five is the magnitude of the nearly flat rate tax placed upon fuel economy across all vehicles. Mexico has twice the tax-based incentive to choose vehicles with high fuel economy as compared with the United States, and the

[245] *Worldwide, Median Household Income About $10,000*, GALLUP (Dec. 16, 2013), https://news.gallup.com/poll/166211/worldwide-median-household-income-000.aspx.

incentives in Germany and the United Kingdom are nearly eight times as high. Policies in Italy and Sweden lead to incentives nine to sixteen times those in the United States. In France, the incentive is on par with Germany's, Sweden's, and the United Kingdom's for the compact car and SUVs, but spikes to nearly forty times higher for the pick-up than is the case in the United States. In China, the incentive is 27 to 34 times that of the United States for the compact car and mid-size SUV, respectively, but is 131 times as high for the large SUV, and 224 times as high for the pick-up truck.

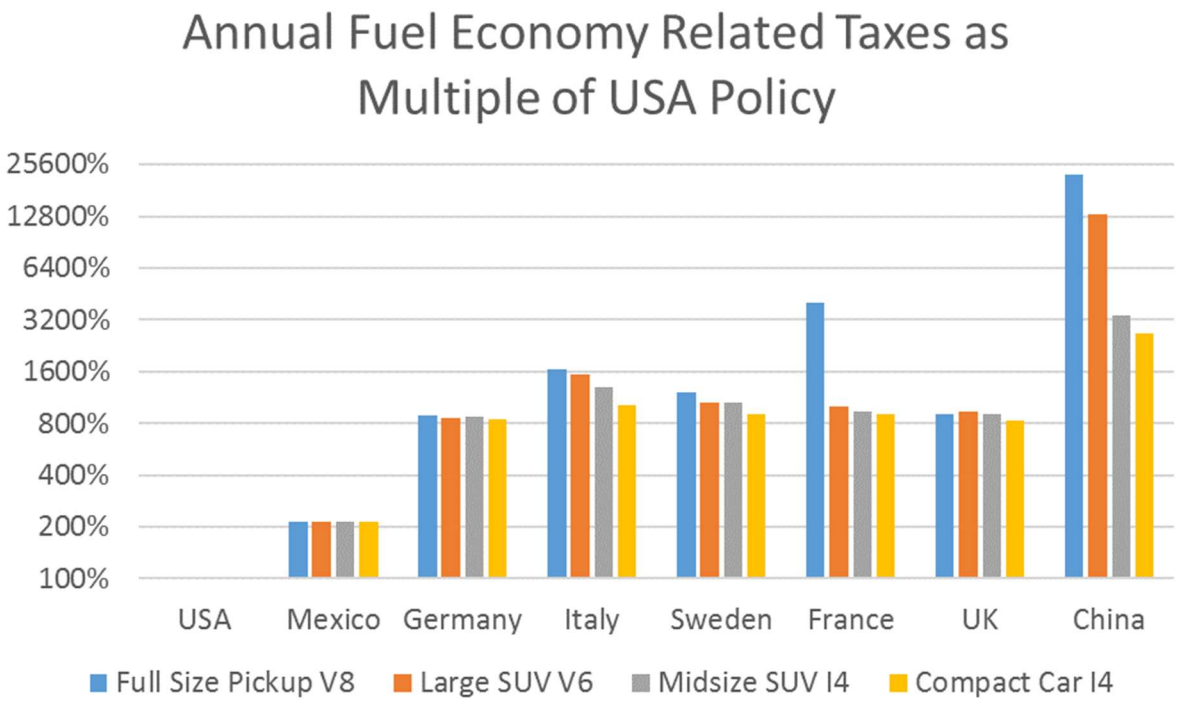

Figure 10.7: Fuel economy-related taxes in U.S. dollars, normalized by MAI and relative to the United States.

This analysis clearly shows why it is inappropriate to compare numerical fuel economy and GHG regulatory targets between countries. The United States is a roughly 17 million-unit market with its own unique regulatory, economic, and market differences that make drawing any conclusions based on such a comparison highly misleading. The Alliance is not advocating for tax-based market signals to accompany regulations in the United States, but they are used as implementation tools in other regions to align consumer demand with regulations.

APPENDIX 11 LEGAL ISSUES

11.1. NHTSA Has the Legal Authority and Sufficient Evidence to Set New and Different CAFE Standards for MY 2021–2026

As described in the Proposed Rule, NHTSA proposes to revise the CAFE standards for MY 2021 to the same level as the current MY 2020 standards, and to set the new standards for MYs 2022–2026 at that same level as well.[246] The Proposed Rule also considers a wide range of alternative proposals, including seven other possible alternative fuel economy levels for the CAFE standards for MY 2021–2026.[247]

The Alliance believes that fuel economy and GHG emissions from new automobiles should be regulated through a unified federal and state framework that not only promotes energy conservation and protects the environment, but also ensures coordinated and consistent standards across all jurisdictions within the United States. The Alliance agrees with NHTSA that the current MY 2021 CAFE standards, and the augural standards that NHTSA announced in 2012 for MY 2022–2025, exceed the maximum feasible average fuel economy standards for those model years. The Alliance believes that it would be appropriate to set the CAFE standards for MY 2021–2026 that provide for continuing increases in fuel economy performance at a manageable rate.[248] In light of the discretion that Congress has given NHTSA to balance the relevant factors in determining the appropriate level at which to set CAFE standards, and the extensive factual record supporting the standards that NHTSA has proposed, the Alliance believes that the agency has the legal authority and sufficient evidence to set standards at the level that it determines to be the maximum feasible, including the levels set forth in its proposed options.

11.1.1. *NHTSA Has Strong Grounds for its Decision to Revise the MY 2021 Standards and Not Adopt the Augural MY 2022–2025 Standards*

To begin with, the Alliance strongly agrees with NHTSA's view that the MY 2021 standards and augural MY 2022–2025 standards that the agency announced in 2012 are no longer feasible. The evidence demonstrates that many of the projections and assumptions on which those standards were based are outdated and do not realistically reflect existing circumstances. Although those standards may be technologically possible for an individual vehicle, applying the standards to the entire automobile fleet would eliminate consumer choice and distort the automobile market in ways that make them not economically practicable, and may have safety implications. NHTSA is therefore correct to indicate that those standards are no longer feasible under EPCA and so cannot be used as the CAFE standards for MY 2021–2025.

Under the Energy Policy and Conservation Act of 1975 ("EPCA"), as amended by the Energy Independence and Security Act of 2007 ("EISA"), NHTSA is required to set CAFE standards for passenger cars and light trucks for each model year.[249] The statute directs NHTSA to set those

[246] *See* 83 Fed. Reg. at 42,988.
[247] *See id.* at 42,990 tbl.I-4 (summarizing regulatory alternatives under consideration).
[248] As stated in our main comments, while we do not believe any of the specific alternatives proposed in the Proposed Rule are optimal, we envision that a workable set of standards could incorporate annual increases in stringency falling somewhere between the overall improvement rates of Alternative 8 and Alternative 1, along with the inclusion of appropriate flexibilities.
[249] 49 U.S.C. § 32902(a)-(b).

standards based on "the maximum feasible average fuel economy level that [NHTSA] decides the manufacturers can achieve in that model year."[250] If conditions change, NHTSA may also amend existing standards to set them at the maximum feasible level in light of those changed conditions.[251] In determining the "maximum feasible average fuel economy level," NHTSA is required to consider "technological feasibility, economic practicability, the effect of other motor vehicle standards of the Government on fuel economy, and the need of the United States to conserve energy."[252]

As the Proposed Rule notes, it is well established that NHTSA also has the authority to consider other relevant factors in determining the maximum feasible average fuel economy level.[253] For instance, NHTSA "has always taken passenger safety into account" in determining the maximum feasible fuel economy standard, and courts have repeatedly affirmed its discretion to do so.[254] NHTSA is also free to revise its assessment of the relevant factors and the weight that it places on each factor, as long as it "provide[s] a reasoned explanation for the change."[255]

Under that settled law, and in light of the economic and technological developments that have taken place since NHTSA set the MY 2021 and augural MY 2022–2025 standards in 2012, the reasons set out in the Proposed Rule fully support the agency's authority to conclude that those standards are no longer feasible.

11.1.1.1. NHTSA Has Fully Explained the Relevant Factual Developments

The factual foundations on which NHTSA relied in its 2012 rulemaking have drastically shifted since that time. As the Proposed Rule explains, although the technology options available to improve fuel economy have not changed dramatically, the optimistic predictions about the costs and effectiveness of many of those technologies have not come to pass.[256]

In addition, experience has demonstrated that consumers often prefer vehicles that take advantage of technological advances to improve attributes other than fuel economy, and the market as a whole has developed since 2012 to reflect those preferences.[257] As a result, it has become increasingly difficult to achieve additional improvements in fuel economy while also delivering the vehicle features that consumers desire and have come to expect.[258] Indeed, as the Proposed Rule notes, most manufacturers have shifted over the last several years to managing their CAFE compliance

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[250] *Id.* § 32902(a).
[251] *Id.* § 32902(g).
[252] *Id.* § 32902(f).
[253] 83 Fed. Reg. at 43,206.
[254] *Competitive Enterprise Inst. v. NHTSA* ("*CEI II*"), 956 F.2d 321, 322 (D.C. Cir. 1992); *see, e.g.*, *Center for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1203-04 (9th Cir. 2008) (upholding NHTSA analysis of vehicle safety issues in connection with CAFE rulemaking).
[255] *Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2125 (2016); *see, e.g.*, *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009).
[256] 83 Fed. Reg. at 42,991.
[257] *Id.*; *see also* Appendix 4 on Consumer Acceptance.
[258] That problem is compounded by the inescapable problem of diminishing returns. As the base level of fuel economy improves, each incremental addition to that base level costs more and more and delivers less and less. 83 Fed. Reg. at 42,991-92.

obligations through use of credits, because consumers have chosen to buy vehicles that are not as fuel-efficient as the existing CAFE standards envisioned.[259]

As the Proposed Rule also explains, the shifts in the market have been amplified by the changes since 2012 in domestic fuel prices and the global oil market.[260] In setting the MY 2021 and augural MY 2022-2025 standards, NHTSA assumed that oil prices would rise significantly from 2012 on; in fact, fuel prices have been much lower than anticipated, and are expected to remain low.[261] Relatedly, NHTSA assumed in 2012 that the United States would continue to rely heavily on imported oil; instead, the United States is now expected to become a net petroleum exporter in the next decade.[262] These unforeseen developments have spurred corresponding changes in consumer preferences. Despite full information about the fuel economy benefits of different vehicles, consumers today are demonstrating a consistent preference for other vehicle attributes at the expense of fuel efficiency.[263]

11.1.1.2. NHTSA Has Fully Explained its Analytical Changes

In addition to (and largely in response to) those factual changes, NHTSA has also made analytical changes regarding its understanding of the relevant factors and how they should be balanced.[264] As described above, NHTSA has discretion to revise its approach to balancing the relevant factors in setting CAFE standards, as long as it acknowledges and adequately explains the change.[265] NHTSA has met that standard here, and fully justified its decision to revise the MY 2021 standards and not adopt the augural MY 2022–2025 standards.

First, NHTSA recognizes that it has made a significant change in its approach to weighing "the need of the United States to conserve energy,"[266] which is both one of the factors that NHTSA must consider in setting CAFE standards and also the primary purpose behind EPCA as a whole.[267] In its 2012 rulemaking, NHTSA placed heavy weight on that factor, reading it as a one-way ratchet that "always pushes the balancing toward greater stringency."[268] In the current Proposed Rule, by contrast, NHTSA takes a more flexible approach to that factor; while continuing to recognize that energy conservation is the "overarching purpose of EPCA," it explains that it "no longer view[s] the need of the U.S. to conserve energy as nearly infinite."[269] Instead, in keeping with the common understanding of the word "conserve," NHTSA proposes to determine that this factor is satisfied as long as its proposed standard "conserves" energy by avoiding "wasteful or destructive" energy consumption.[270]

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[259] 83 Fed. Reg. at 43,217; *see also* Appendix 2 on compliance matters, and at section 2.2 on credits in particular.
[260] 83 Fed. Reg. at 42,993.
[261] *Id.*; *compare* 77 Fed. Reg. at 62,715 (predicting gasoline fuel price of $3.63 per gallon in 2017), *with Annual Energy Outlook 2018*, U.S. Energy Information Administration, at 57 (actual gasoline fuel price of $2.53 in 2017).
[262] *Id.*
[263] *See* Appendix 4 at section 4.4 for information on fuel prices and their impact on consumer behavior.
[264] *See* 83 Fed. Reg. at 43,213 ("Not only do we believe that the facts before us have changed, but … the balancing of the EPCA factors and other considerations must also change.")
[265] S*ee Encino*, 136 U.S. at 2125.
[266] 49 U.S.C. § 32902(f).
[267] 83 Fed. Reg. at 43,213.
[268] 77 Fed. Reg. at 63,038-39.
[269] 83 Fed. Reg. at 43,213, 43,216.
[270] *Id.*

NHTSA has given a detailed explanation for this change in approach, relying not only on the statutory language but also on the substantial changes in the global oil market since EPCA was enacted (and even since 2012).[271] As the agency recounts, the "original intent for the CAFE program" was to avoid gasoline price shocks and supply shortages like those seen during the OPEC oil embargo in the early 1970s.[272] At the time EPCA was enacted, the United States was especially vulnerable to changes in the global oil supply, because it consumed nearly a third of all oil production worldwide and because it relied heavily on oil from a small number of foreign oil-producing states.[273] Today, by contrast, the United States consumes a much smaller share of the world's oil, and the number of suppliers in the market has grown.[274] Moreover, the United States has substantially increased its domestic oil production, and is close to becoming a net oil exporter.[275] The United States is thus far less vulnerable to sudden oil price shocks and supply shortages, reducing the potential "need for the United States to conserve energy" that Congress envisioned in enacting EPCA.[276] That reasoned explanation of the changed circumstances readily justifies NHTSA's change in its approach to this factor.[277]

The second significant change in NHTSA's approach to the statutory factors is its revised assessment of economic practicability.[278] In this context, the Proposed Rule reflects a considered decision to place greater emphasis on the negative impacts of more stringent CAFE standards on consumer choice and vehicle affordability. As the Proposed Rule explains, the experience of recent years demonstrates that consumers have shown a consistent preference for vehicle attributes other than fuel economy, and sales of the most efficient vehicles have lagged despite record sales overall.[279] Given that fuel prices are expected to remain low, NHTSA reasonably predicts that those consumer preferences will remain stable for the foreseeable future.[280] As a result, NHTSA concludes that the increasing stringency of the MY 2021–2025 CAFE standards would force manufacturers to cross-subsidize prices for fuel-efficient vehicles to a greater and greater degree in order to increase sales of fuel-efficient vehicles—and increase the price of less fuel-efficient vehicles (which consumers actually want) to the point where they may become unaffordable for entry-level or low-income buyers.[281] And if manufacturers try to avoid losing sales by internalizing the additional costs of higher CAFE standards, those unsustainable additional

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[271] *Id.* at 43,213-16.
[272] *Id.* at 43,213.
[273] *Id.* at 43,213-14.
[274] *Id.*
[275] *Id.* at 43,214.
[276] *Id.* at 43,214-15.
[277] *US Oil Production and Imports in Millions of Barrels per Day*, ENERGY.GOV, https://www.energy.gov/maps/us-crude-oil-production-surpasses-net-imports (last visited Oct. 25, 2018). See *Encino Motorcars*, 136 S. Ct. at 2126; *Fox*, 556 U.S. at 515. As the Proposed Rule also explains, these changes in the oil market undermine any argument that the agency should put greater weight on energy conservation in order to reduce consumer costs, since consumers today are unlikely to face sudden price shocks and can be expected to value future fuel savings accurately. 83 Fed. Reg. at 43,216. The minimal impact of the standards at issue on global climate change likewise undermines any argument that NHTSA should be required to place greater weight on energy conservation for environmental reasons. *Id.* at 43,215-16; *see also* 83 Fed. Reg. at 42,996.
[278] *See* 83 Fed. Reg. at 43,216-26.
[279] *Id.* at 43,217, 43,221-22.
[280] *Id.* at 43,217.
[281] *Id.* at 43,222-24; *see also id.* at 42,993-94.

expenses will risk serious adverse economic consequences for the industry and the hundreds of thousands of people that it employs.[282]

NHTSA has also revised its analysis of the net savings to consumers from more stringent CAFE standards, finding (in contrast to its 2012 analysis) that consumer savings increase as stringency decreases.[283] The Proposed Rule explains that this change reflects a number of alterations in its analysis, including its update to a 2016-based analysis fleet rather than the 2008- or 2010-based fleet (used in the 2012 rule) and the use of updated fuel price forecasts.[284] Once again, that change in analysis represents an informed decision backed by more adequate up-to-date evidence, and further supports the determination that the standards announced in 2012 are not economically practicable.

Third, NHTSA has improved its understanding of the safety implications of imposing more stringent CAFE standards. According to the Proposed Rule, more stringent CAFE standards may affect highway safety by increasing vehicle prices, which discourages consumers from switching to new (and safer) cars, and by increasing the total number of miles traveled.[285] Although safety is not specifically mentioned in EPCA as one of the factors NHTSA must consider in setting CAFE standards, it is well established that NHTSA has discretion to do so, and the agency has traditionally taken safety impacts into account.[286] The agency's analysis of the safety implications involved provides additional support for the agency's determination that the standards published in 2012 are no longer feasible.

11.1.1.3. NHTSA Has Fully Supported Its Ultimate Conclusions

NHTSA has also fully explained how these factual and analytical changes have caused it to rebalance the relevant factors as a whole. In granting NHTSA discretion to weigh the appropriate factors to determine the "maximum feasible" average fuel economy level, "Congress recognized that 'maximum feasible' may change over time as the agency assessed the relative importance of each factor."[287] In light of the changes in the global energy market, it is reasonable for NHTSA to conclude that the need of the United States to conserve energy should no longer carry the same relative importance in the statutory balance, and no longer justifies setting CAFE standards just short of the "tipping point that presents [a] risk of significantly adverse economic consequences."[288] The converse is also true: it is entirely appropriate for NHTSA to choose to place more weight now on the economic practicability and safety issues that it has identified in the Proposed Rule, both in light of the changed circumstances since 2012 and as an exercise of informed agency discretion. That analysis continues to respect energy conservation as the overall

[282] *Id.* at 43,225.
[283] 83 Fed. Reg. at 43,225.
[284] *Id.*
[285] *Id.* at 42,995-96, 43,226; *see id.* at 43,106-58.
[286] *See, e.g.*, *CEI I*, 901 F.2d at 120 n.11; *CEI II*, 956 F.2d at 322; 77 Fed. Reg. at 62,670.
[287] 83 Fed. Reg. at 43,226; *see Center for Auto Safety*, 793 F.2d at 1341.
[288] 83 Fed. Reg. at 43,226 (quoting 77 Fed. Reg. at 63,039).

goal of the statutory scheme,[289] while also recognizing that Congress did not intend NHTSA to pursue that goal at all costs.[290]

NHTSA's decision to revise the MY 2021 standards and not adopt the augural MY 2022–2025 standards is also supported by practical reality. In the years since 2012, manufacturers have made their best efforts to comply with their existing CAFE obligations and to improve fuel economy. Nevertheless, in light of the changed factual circumstances described above, the levels envisioned in 2012 have become infeasible. In short, this is not a case where manufacturers have merely "assert[ed] current inability to meet [the] standard"; instead, manufacturers have made "sufficient efforts to improve their fuel economy," including record levels of CAFE and GHG attainment, but those efforts have been "overtaken by unforeseen events whose effects could not be overcome by available means within the time available."[291]

The decision to revise the MY 2021 standards and not adopt the augural MY 2022–2025 standards also does not implicate any "serious reliance interests" from other stakeholders.[292] When agencies impose more burdensome regulations on regulated entities, they may upset settled reliance interests premised on the continued existence of the less burdensome standards. In such cases, agencies should consider whether a safe-harbor provision is necessary to "shelter regulated entities from liability when they act in conformance with previous agency interpretations."[293] Here, by contrast, NHTSA proposes to *reduce* the burden on the regulated entities, and so no serious reliance interests are implicated. On top of that, as the 2012 Final Rule made clear, the augural MY 2022–2025 standards were just a "best estimate" of what fuel economy levels "*might be* maximum feasible" in MY 2022–2025; they did not, and by law could not, carry any binding force.[294] Those tentative predictions (from 2012) cannot support the kind of significant and reasonable reliance that NHTSA would be required to address before revising its approach. And in all events, NHTSA's thorough analysis adequately explains the benefits of setting different MY 2021–2025 standards, which outweigh any potential reliance interests at issue here.

11.1.2. *NHTSA Has the Legal Authority and Sufficient Evidence to Choose the Maximum Feasible Standards for MY 2021–2026 from the Range of Possible Options*

As the previous discussion indicates, the changed factual circumstances since October 2012 provide strong grounds for determining that *some* reduction in stringency from the MY 2021 standards and augural MY 2022–2025 standards is warranted. In light of those changed circumstances, NHTSA must now interpret and balance the relevant factors to determine *how much* that reduction should be. The agency is required to make that determination by balancing both the statutory factors under the CAFE program, and any other relevant non-statutory factors (such as safety) to determine the maximum feasible standards.[295] Given the wide-ranging factors that NHTSA must balance in determining what standards constitute the maximum feasible average

[289] *Center for Biological Diversity*, 538 F.3d at 1195.
[290] *See* 49 U.S.C. § 32902(f); *Center for Auto Safety*, 793 F.2d at 1341 (upholding NHTSA decision to set CAFE standards below the maximum possible level in light of consumer demand).
[291] *Pub. Citizen v. NHTSA*, 848 F.2d 256, 264 (D.C. Cir. 1988).
[292] *Encino Motorcars*, 136 S. Ct. at 2126 (quoting *Fox*, 556 U.S. at 515).
[293] *Perez v. Mortgage Bankers Ass'n*, 135 S. Ct. 1199, 1209 (2015).
[294] 77 Fed. Reg. at 62,627; *see* 49 U.S.C. § 32902(b)(3)(B) (NHTSA may not set standards for more than five years at a time).
[295] 49 U.S.C. § 32902(a), (f); *see CEI II*, 956 F.2d at 322.

fuel levels for a given model year, the agency necessarily has discretion in deciding how to weigh the relevant factors.[296]

Of course, as the Proposed Rule recognizes, NHTSA must choose an overall balance among these factors that will "support the overarching purpose of EPCA," which is "energy conservation."[297] But that does not require NHTSA to prioritize energy conservation above all else, or sacrifice other relevant factors to that goal.[298] On the contrary, Congress specifically required NHTSA to consider additional relevant factors beyond energy conservation alone.[299] And by requiring NHTSA to set standards at the "maximum *feasible* average fuel economy level,"[300] rather than the maximum *possible* level, Congress made clear that CAFE standards are not required to embody the highest level of energy conservation that is physically possible. Instead, Congress fully expected NHTSA to apply its expertise and weigh each of the relevant factors in context in order to determine the maximum feasible average fuel economy level—and fully understood that in some cases, certain standards might be "technologically feasible but still beyond the level that NHTSA determines to be [the] maximum feasible due to consideration of the other relevant factors."[301]

As noted above, NHTSA may also revise its assessment of the relevant factors, and the weight it places on each factor, in setting new standards. Indeed, that flexibility is built into the statutory scheme, which requires NHTSA to set new CAFE standards for each model year and prohibits NHTSA from setting standards for more than five years at a time,[302] and authorizes NHTSA to amend those standards at any time.[303] That flexibility also rests on a fundamental principle of administrative law: that "[a]gencies are free to change their existing policies as long as they provide a reasoned explanation for the change."[304] As the Supreme Court has made clear, an initial agency interpretation "is not instantly carved in stone," and the agency "must consider varying interpretations and the wisdom of its policy on a continuing basis."[305] When an agency does decide to change its policies, it "need not demonstrate to a court's satisfaction that the reasons for the new policy are *better* than the reasons for the old one; it suffices that the new policy is permissible under the statute, that there are good reasons for it, and that the agency *believes* it to be better, which the conscious change of course adequately indicates."[306] In other words, the agency must "'display awareness that it is changing position' and 'show that there are good reasons for the new policy,'" as well as addressing any "serious reliance interests" engendered by its previous

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[296] *See, e.g.*, *Center for Biological Diversity*, 538 F.3d at 1195 (noting that EPCA "gives NHTSA discretion to decide how to balance the statutory factors"); *Center for Auto Safety v. NHTSA*, 793 F.2d 1322, 1341 (D.C. Cir. 1986) (noting that the "balancing process" required in setting CAFE standards was "specifically committed to the agency by Congress").
[297] 83 Fed. Reg. at 43,206; *see Center for Biological Diversity*, 538 F.3d at 1195.
[298] *Cf. Rodriguez v. United States*, 480 U.S. 522, 525-26 (1987) ("[N]o legislation pursues its purposes at all costs … and it frustrates rather than effectuates legislative intent simplistically to assume that *whatever* furthers the statute's primary objective must be the law.").
[299] *See* 49 U.S.C. § 32902(f).
[300] 49 U.S.C. § 32902(a) (emphasis added).
[301] 83 Fed. Reg. at 43,208.
[302] 49 U.S.C. § 32902(a), (b)(3)(B).
[303] *Id.* § 32902(c).
[304] *Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2125 (2016).
[305] *National Cable & Telecomms. Ass'n v. Brand X Internet Servs.*, 545 U.S. 967, 981 (2005) (quoting *Chevron U.S.A. Inc. v. NRDC*, 467 U.S. 837, 863-64 (1984)).
[306] *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009); *see Encino Motorcars*, 136 S. Ct. at 2125-26.

policies.[307] But it does not need to prove to a court that a new policy is "better" than a previous policy, or that it is the "best" option available.

Here, the agency has considered a range of potentially feasible alternatives for the MY 2021–2026 standards. Applying its revised analytical approach to the existing data, NHTSA has determined that applying the MY 2020 standards to MY 2021–2026 will produce the greatest net benefit for consumers and for society—a net benefit that NHTSA estimates at billions of dollars per year.[308] Although the standards that NHTSA has proposed for MY 2021–2026 are not exactly what the Alliance would recommend for those model years, they are within the bounds of reasoned decision-making. NHTSA has thoroughly analyzed the required statutory factors and other relevant considerations, and grounded its regulatory proposal on substantial evidence. Insofar as the current proposal departs from the CAFE standard for MY 2021 and the augural standards for MY 2022–2025 that NHTSA announced in 2012, the agency has more than adequately acknowledged its change of position and explained the reasons for that change. In short, although the Alliance believes that different standards would be more appropriate as a policy matter, the MY 2021–2026 CAFE standards proposed in the Proposed Rule are within the agency's legal authority and supported by sufficient evidence and analysis.

NHTSA has also provided sufficient explanation for its decision not to adopt additional "backstop" standards. As NHTSA recognizes in the Proposed Rule, "the Ninth Circuit has previously held that NHTSA must consider whether a 'backstop' is necessary for the CAFE standards based on the EPCA factors in 49 U.S.C. 32902(f), given that the overarching purpose of EPCA is energy conservation."[309] Here, NHTSA considered whether to include a backstop CAFE standard and ultimately concluded that "additional backstop standards are not necessary."[310] This conclusion is consistent with NHTSA and EPA's similar conclusion in 2010 that "designing an appropriate backstop was likely to be fairly complex and likely to undermine Congress' objective in requiring attribute-based standards."[311] Given that "[n]either the EPCA's language nor structure explicitly requires NHTSA to adopt a backstop,"[312] it is clear that NHTSA has discretion to determine whether backstop standards would be appropriate in light of the relevant circumstances, and NHTSA has adequately set forth its reasons for declining to adopt such standards here. Indeed, backstop standards would be especially inappropriate here in light of the safety implications that NHTSA has identified, since (if triggered) those standards would necessarily skew the careful balance that the agency has set between safety and the need for energy conservation. And insofar as EPA does not propose to adopt similar backstop standards for GHG emissions, the need for agency coordination in regulating the overlapping areas of fuel economy and GHG emissions weighs against NHTSA adopting backstop standards that could create conflicting regulatory requirements.[313]

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[307] *Encino Motorcars*, 136 S. Ct. at 2126 (quoting *Fox*, 556 U.S. at 515).
[308] 83 Fed. Reg. at 42,998. The Alliance's econometric study directionally confirmed this conclusion. See Appendix 1 for a discussion of the study results.
[309] 83 Fed. Reg. 43,227; *see Center for Biological Diversity*, 538 F.3d at 1204-06.
[310] *Id.*
[311] *See* 83 Fed. Reg. 43,227 (discussing NHTSA and EPA's previous discussion of "the concept of backstops in the context of the modern CAFE program" and citing 75 Fed. Reg. at 25,367–70).
[312] *Center for Biological Diversity*, 538 F.3d at 1205 (emphasis omitted).
[313] For technical discussion on this matter, please see Appendix 6 on Vehicle Classifications at sections 6.3 and 6.4.

The Alliance also submits that NHTSA should determine that its proposed MY 2021 standards are severable from its proposed MY 2022–2026 standards. Whether a portion of a regulation is severable from the remainder "depends upon the intent of the agency and upon whether the remainder of the regulation could function sensibly without the stricken provision."[314] While NHTSA has not spoken to this precise question in the Proposed Rule, it appears clear that the proposed standards for MY 2022–2026 would "function sensibly," and provide the benefits that the agency expects, whether or not the revised MY 2021 standards also go into effect. Assuming that NHTSA does indeed intend for the MY 2021 standards to be severable from the MY 2022–2026 standards, it would be useful for the agency to make that intent clear.

11.2. EPA Has the Legal Authority and Sufficient Evidence to Set New and Different GHG Emissions Standards for MY 2021–2026

In coordination with NHTSA, EPA proposes to revise its GHG emissions standards for MY 2021–2025 to the same level as the current MY 2020 standards, and to set the new GHG emissions standards for MY 2026 at that same level as well.[315] Like NHTSA, EPA has also considered a wide range of alternative proposals, including seven other possible alternative levels for its GHG standards for MY 2021–2026.[316]

As explained above, the Alliance believes that the best approach to fuel economy and GHG emissions regulation would be a unified federal and state framework that addresses the concerns of Alliance members. The Alliance agrees with EPA that the existing GHG emissions standards for MY 2021–2025 are no longer appropriate and should be reduced. Although the Alliance believes an alternative package of standards is more appropriate, in light of the extensive administrative record that the agency has assembled and reviewed, and the fact that EPA has put forth a reasoned justification for its proposal based on that record, the Alliance believes that EPA has the legal authority and sufficient evidence to determine the appropriate level at which to set the standards under consideration.

11.2.1. *EPA Has the Legal Authority and Sufficient Evidence to Set New and Different GHG Emissions Standards for MY 2021–2026*

11.2.1.1. EPA Has Strong Grounds for its Decision to Revise the MY 2021–2025 Standards

The Alliance fully agrees with EPA that the GHG emissions standards set in 2012 for MY 2021–2025 are no longer appropriate and should be revised. As the Alliance explained in its comments on EPA's decision to reconsider its first January 2017 determination on the MTE, many of the assumptions on which those standards were based are no longer accurate in light of subsequent developments.[317] The technology options available have not produced the levels of emissions reduction that EPA predicted, and consumers have not gravitated toward low-emissions vehicles in the numbers that EPA expected. In addition, as set forth in the Proposed Rule, EPA has discretion to reconsider the appropriate balance among the relevant factors in light of those

[314] *MD/DC/DE Broadcasters Ass'n v. FCC*, 236 F.3d 13, 22 (D.C. Cir. 2001) (emphasis omitted).
[315] *See* 83 Fed. Reg. at 42,988.
[316] *Id.* at 42,990 tbl.I-4.
[317] *See* Alliance MTE Reconsideration Comments, *supra* note 65.

changed circumstances. The evidence and EPA's analysis provide strong support for the view that the MY 2021–2025 GHG standards must be revised.

Section 202(a)(1) of the Clean Air Act ("CAA") provides that EPA "shall by regulation prescribe (and from time to time revise)" emissions standards for any pollutant that it determines "may reasonably be anticipated to endanger public health or welfare."[318] Section 202(a)(2) then addresses the timing of any such emissions standards, providing that new standards "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."[319] Those subsections leave EPA "significant latitude" to exercise its expert judgment in determining the level at which emissions standards should be set.[320] Unlike other CAA provisions, §202(a)(1) does not require EPA to set standards that will result in the greatest degree of emission reduction achievable.[321] Instead, the statute leaves EPA flexibility to decide what factors are relevant, and how to weigh those factors, in its decision-making process. EPA has considered a wide range of relevant factors in the past in setting emissions standards, such 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-GHGs; the impacts of standards on oil conservation and energy security; the impacts of standards on fuel savings by consumers; the impacts of standards on the auto industry; other energy impacts; as well as other relevant factors such as impacts on safety.[322]

Like NHTSA, EPA has discretion to determine how to balance these various incommensurate factors.[323] And like NHTSA, EPA is free to revise its view of the relevant factors and the weight that it places on each factor, as long as it provides a reasoned explanation for doing so.[324]

EPA also has "significant latitude" regarding the "coordination of its regulations with those of other agencies."[325] That latitude is especially important where, as here, EPA is regulating in a field that overlaps substantially with the regulatory responsibilities assigned to another agency. In that context, EPA has discretion to coordinate with other interested federal agencies in order to produce a consistent regulatory environment.[326] Along similar lines, in evaluating the various factors relevant to its standard-setting process, EPA has discretion to defer to the judgment of other agencies regarding issues within their areas of expertise. As the D.C. Circuit recently remarked, an agency "can be expected to 'respect the views of such other agencies as to those problems' for

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[318] CAA § 202(a)(1), 42 U.S.C. § 7521(a)(1).
[319] CAA § 202(a)(2), 42 U.S.C. § 7521(a)(2).
[320] *See Massachusetts v. EPA*, 549 U.S. 497, 533 (2007).
[321] *Cf., e.g.*, CAA § 202(k), 42 U.S.C. § 7521(k).
[322] 83 Fed. Reg. at 43,227.
[323] *See* 83 Fed. Reg. at 43,228 (noting that the statute "does not specify the degree of weight to apply to each factor, and EPA accordingly has discretion in choosing an appropriate balance among factors").
[324] *Encino Motorcars*, 136 S. Ct. at 2125; *Brand X*, 545 U.S. at 981.
[325] *Massachusetts v. EPA*, 549 U.S. at 533.
[326] *Id.*; *see also, e.g.*, *Nat'l Min. Ass'n v. McCarthy*, 758 F.3d 243, 249 (D.C. Cir. 2014) ("[I]nter-agency consultation and coordination is commonplace and often desirable.").

which those 'other agencies are more directly responsible and more competent."[327] Finally, in carrying out its statutory mandate to regulate air pollutants, EPA should interpret and apply its governing statute in a manner designed to minimize conflicts with other federal statutes to the extent possible.[328]

In accordance with its authority to consider all of the relevant factors, EPA has set out a number of different considerations supporting its proposal to reduce the stringency of the current MY 2021–2025 standards. In some cases, those considerations do not differ from the views that EPA expressed in adopting the 2012 Final Rule; for instance, EPA continues to recognize that the primary purpose of the Clean Air Act is to protect the public health and welfare,[329] and continues to believe that the available technology makes it at least physically possible to build a vehicle that meets the existing standards.[330] With respect to other factors, however, EPA's assessment has changed considerably.

First, the Proposed Rule recognizes that the estimated cost to the automotive industry of compliance with the existing standards is far higher than EPA projected in 2012. As the Proposed Rule explains, compliance with the existing standards would cost the industry an estimated $260 billion more than the proposed standards, translating to an additional per-vehicle cost in MY 2030 of $2,260.[331] In *addition* to those costs of compliance—which might themselves be passed on to consumers in the form of higher prices—the existing standards would also impose increased costs on consumers in the form of changes in maintenance, financing, insurance, taxes, and fees. All together, the total increase in cost would be more than $2,810 in MY 2030 in additional costs relative to the proposed standards.[332] Those costs to the consumer are offset somewhat by the fuel savings associated with the existing standards, but would still leave a net additional cost to consumers of $690 per vehicle.[333] As the agency recognizes, that estimate "contrasts sharply with what EPA projected in 2012 when setting those [existing] standards," due in large part to the unexpected drop in fuel prices. Those changes in the expected costs of the existing standards provide significant reasoned support for EPA's view that the existing standards should be reduced.

In addition to those cost issues, the Proposed Rule also explains that EPA is concerned about the effects of the existing standards on consumer choice. That concern is well-founded. As noted in the CAFE context, in the years since 2012 (and in part due to the unexpected decrease in fuel prices), consumers have demonstrated less interest in high-efficiency/low-emission vehicles than EPA and NHTSA projected in issuing the 2012 Final Rule.[334] As such, compliance with the

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[327] *City of Boston Delegation v. FERC*, 897 F.3d 241, 255 (D.C. Cir. 2018) (quoting *City of Pittsburgh v. Fed. Power Comm'n*, 237 F.2d 741, 754 (D.C. Cir. 1956)); *see EMR Network v. FCC*, 391 F.3d 269, 273 (D.C. Cir. 2004).

[328] *See Cathedral Candle Co. v. U.S. Int'l Trade Comm'n*, 400 F.3d 1352 (Fed. Cir. 2005) (upholding agency interpretation designed to avoid statutory conflict); *cf. Morton v. Mancari*, 417 U.S. 535, 551 (1974) (noting that "when two statutes are capable of co-existence … the rule is to give effect to both if possible").

[329] *See* 83 Fed. Reg. at 43,228.

[330] *Id.* at 43,229.

[331] 83 Fed. Reg. at 43,229.

[332] 83 Fed. Reg. at 43,229.

[333] 83 Fed. Reg. at 43,229-30.

[334] *See* 83 Fed. Reg. at 43,231 (noting that sales of cars with advanced electrification technologies have remained relatively low).

existing standards would require a substantially greater variance than EPA expected from the vehicle fleet that consumers would otherwise choose.

EPA (in coordination with NHTSA) has also significantly revised its view of the projected effects of the existing standards on vehicle safety. As noted, EPA has discretion to consider all the relevant factors in setting appropriate emissions standards under §202(a)(1), including vehicle safety.[335] Moreover, given NHTSA's greater expertise in evaluating motor vehicle safety, it is appropriate for EPA to respect the views of its companion agency on those issues.[336]

The safety analysis in the Proposed Rule indicates that the existing GHG standards are likely to yield increased fatalities and accidents as compared to less stringent standards, by discouraging consumers from buying new vehicles, increasing the number of miles driven, and encouraging vehicle mass reduction.[337] That analysis is far different from EPA's prediction in 2012 that its MY 2021–2025 standards "should not have a negative effect on vehicle safety,"[338] and EPA has explained that difference, noting among other things that its 2012 analysis artificially "limited the amount of mass reduction assumed for certain vehicles, while acknowledging that manufacturers would not necessarily choose to avoid mass reductions in [that] way."[339] The new safety analysis likewise provides support for EPA's conclusion that the MY 2021–2025 GHG standards are not appropriate and should be reduced in stringency. Indeed, given that the "primary purpose" of §202(a)(1) is "the protection of public health and welfare,"[340] EPA would be abdicating its statutory duty if it ignored these concerns.

In addition, the fact that NHTSA proposes to conclude that its MY–2025 CAFE standards are no longer feasible under the criteria set forth in EPCA is itself good reason for EPA to adopt less stringent standards. As noted, EPA has wide latitude to ensure the "coordination of its regulations with those of other agencies,"[341] especially when (as here) its regulations will necessarily overlap with an area (fuel economy) that Congress has assigned another agency to supervise. Indeed, if EPA were to adopt GHG standards that effectively required manufacturers to achieve fuel economy levels beyond what NHTSA considered the "maximum feasible" level, its regulations would create an unnecessary conflict between the two statutory regimes.[342]

EPA states that its existing standards would tend to reduce GHG emissions further than less stringent standards.[343] But the correlation between more stringent standards and greater GHG emissions is not exact; instead, it is mitigated by a number of factors. For instance, as discussed above, more stringent standards lead to higher prices, which in turn lead some consumers to

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[335] Indeed, it would be obviously unreasonable (and contrary to Congress' intent) for EPA to set emissions standards that would require manufacturers to produce and sell unsafe vehicles.
[336] *City of Boston*, 897 F.3d at 255.
[337] 83 Fed. Reg. at 42,995-96, 43,231; *see id.* at 43,106-58.
[338] 77 Fed. Reg. at 62,633.
[339] 83 Fed. Reg. at 43,231. EPA and NHTSA have also explained the reasons for their assessment that the existing standards will affect safety by decreasing fleet turnover and increasing the number of miles driven as compared to less stringent standards. *See* 83 Fed. Reg. at 43,106-07.
[340] 83 Fed. Reg. at 43,228; *see also* 42 U.S.C. § 7206(h) ("effects on welfare" includes "effects on . . . hazards to transportation, as well as effects on economic values and on personal comfort and well-being").
[341] *Massachusetts v. EPA*, 549 U.S. at 533.
[342] *Cf. Morton*, 417 U.S. at 551 (statutes should be interpreted to avoid conflict where possible).
[343] *See* 83 Fed. Reg. at 43,240.

postpone or abandon buying new vehicles and continue driving their existing older models. Just as those older models are generally less safe than new vehicles, they also generally produce more emissions; and so the decreased fleet turnover caused by more stringent standards undercuts the emissions gains from those standards.[344]

In any event, §202(a)(1) of the Clean Air Act (unlike other sections of the same Act) does not require EPA to mandate the greatest degree of emissions reduction achievable. Instead, as explained above, it gives the agency authority to engage in reasoned decision-making, balancing all of the relevant factors in light of the available facts. EPA has done that here, and has provided a reasoned explanation of its determination that the environmental benefits of the existing MY 2021–2025 GHG standards are outweighed by their negative effects on costs and safety.[345] The Alliance fully agrees with EPA that in light of these considerations, the existing MY 2022–2025 GHG standards should be revised.

There are also no serious reliance interests that would warrant keeping the existing standards in place.[346] As with NHTSA and the CAFE standards, the fact that EPA proposes to adopt GHG standards that will reduce the burden on the regulated entities means that the agency will not disrupt any settled reliance interests those entities might have placed in the existing standards. Moreover, when EPA announced its MY 2022–2025 standards in 2012, it made clear that those standards would be reviewed, in conjunction with NHTSA, during the MTE before going into effect, and could well change depending on the results of that evaluation. Although EPA did issue a determination in January 2017 stating that the standards were appropriate and would remain in place, it announced its intent to reconsider that determination just two months later.[347] It then issued a revised final determination about a year later finding the standards inappropriate.[348] Given the obvious uncertainty surrounding these standards, a reasonable stakeholder could not have given them the kind of "significant reliance" that would require additional explanation from the agency to set aside.[349] In any event, EPA has fully explained its reasons for its conclusion that the existing MY 2021–2025 standards are no longer appropriate, and those reasons outweigh any reliance interests that could potentially be implicated.

11.2.1.2. EPA Has the Legal Authority and Sufficient Evidence to Choose Appropriate GHG Standards for MY 2021–2026 from the Range of Possible Options

Given that the existing MY 2021–2025 standards are not appropriate (and that no standards are yet in place for MY 2026), EPA must exercise reasoned judgment to determine what standards will instead be appropriate for those model years. In the view of the Alliance, the most appropriate standards for those years would provide for reductions in GHG emissions as compared to current levels, though not at the infeasible rate embodied in the current standards. At the same time, the

[344] *See Int'l Harvester Co. v. Ruckelshaus*, 478 F.2d 615, 634 (D.C. Cir. 1973) (recognizing this effect).
[345] 83 Fed. Reg. at 43,230-32.
[346] *Cf. Encino Motorcars*, 136 S. Ct. at 2126.
[347] *See* 82 Fed. Reg. 14,671 (Mar. 22, 2017).
[348] *See* 83 Fed. Reg. 16,077 (Apr. 13, 2018).
[349] *Encino*, 136 S. Ct. at 2126.

Alliance recognizes that it is ultimately up to EPA to determine the appropriate level in light of all the relevant factors (including appropriate coordination with NHTSA).[350]

The Alliance believes EPA has given an adequate explanation for its regulatory proposal to demonstrate that it has engaged in the kind of reasoned decision-making that administrative law requires. As the Proposed Rule demonstrates, EPA has considered a range of options for the MY 2021–2026 GHG standards.[351] Although the Alliance believes different standards than the current preferred alternative would be appropriate, it recognizes that this issue is ultimately for EPA to decide, and concludes that the agency has presented sufficient evidence and analysis to justify its current proposal as a legal matter.

The Alliance also submits that EPA should determine that its proposed MY 2021 standards are severable from its proposed MY 2022–2026 standards. As noted above, severability "depends upon the intent of the agency and upon whether the remainder of the regulation could function sensibly without the stricken provision."[352] As with the proposed CAFE standards, it appears clear that the proposed GHG standards for MY 2022–2026 would "function sensibly," and provide the benefits that the agency expects, whether or not they are accompanied by the MY 2021 standards. Assuming that EPA agrees that the MY 2021 standards should be severable from the MY 2022–2026 standards, the Alliance respectfully suggests that EPA should make that intent explicit.

11.3. NHTSA and EPA Should Avoid the Negative Consequences of Competing State and Federal Regulatory Regimes

In addition to proposing amended CAFE standards for MY 2021 and new CAFE standards for MY 2022–2026, the Proposed Rule announces that NHTSA is considering adopting a regulation interpreting EPCA and the CAFE standards issued under that statute to preempt certain state and local GHG standards and zero-emission vehicle (ZEV) mandates. The Proposed Rule also announces that EPA is considering withdrawing its waiver of federal preemption for California's GHG standards for MY 2021–2025 and its ZEV mandate. The Proposed Rule requests comment on these proposals.

Roughly a decade ago, prior to the establishment of One National Program, the auto industry was pursing litigation in various forums seeking to establish that state laws and regulations aimed at regulating motor vehicle GHG emissions are preempted by federal law. The Alliance embarked upon that litigation with the goal of avoiding a patchwork of overlapping and inconsistent federal and state regulations. In that litigation, the Alliance took the position that state laws and regulations pertaining to motor vehicle GHG emissions are expressly and impliedly preempted by EPCA. The Alliance also took the position that such state laws and regulations are not entitled to receive waivers of preemption pursuant to Section 209(a) of the Clean Air Act.

While those cases were moving into the appellate stage, efforts were underway on a parallel path to establish a new framework in which the auto industry would not be subject to three inconsistent and potentially conflicting sets of CAFE/GHG regulations pertaining to motor vehicle fuel economy and GHG emissions. Those efforts ultimately resulted in the creation of the One National

[350] *See* CAA § 202(a)(1)-(2), 42 U.S.C. § 7521(a)(1)-(2); *Massachusetts v. EPA*, 549 U.S. at 533.
[351] 83 Fed. Reg. at 43,232.
[352] *MD/DC/DE Broadcasters Ass'n*, 236 F.3d at 22 (emphasis omitted).

Program framework, in which EPA and NHTSA committed to harmonize their regulations to the maximum extent possible, and CARB (along with other states) committed to refrain from enforcing state-specific GHG standards against auto manufacturers complying with the Federal program. With those commitments, the industry felt that the concerns which had given rise to the preemption litigation were largely resolved. Therefore, the industry committed to dismiss all of the then-pending preemption litigation without prejudice upon implementation of the One National Program framework. Those dismissals occurred prior to any appellate rulings on the merits of the industry's claims.

In light of that background, the Alliance offers the following comments on the proposal in the Proposed Rule to pursue preemption of state laws and regulations pertaining to motor vehicle GHGs.

11.3.1. *NHTSA and EPA Should Work Toward Agreement with Other Stakeholders on a Unified Federal and State Regulatory Program*

As these comments make clear, the Alliance's goal is to achieve the continuation of One National Program under a workable set of GHG standards. One National Program is not perfect, but in general it has proven to be a successful framework for the regulation of motor vehicle GHGs. While the regulations underlying One National Program certainly have room for improvement—many of our suggestions in that regard are addressed elsewhere in these comments—the Alliance believes that One National Program is worth preserving. Our focus throughout the MTE process that was a key aspect of the 2012 joint rule between EPA, DOT, and California has been to 1) participate in a data-driven process to get the standards right going forward, and 2) work cooperatively toward revisions to the One National Program rules based on the outcome of that process. We believe that approach is in the interests of all stakeholders.

Failing to agree on One National Program and pursuing the preemption pathway would almost inevitably result in new litigation, which could result in a number of unintended consequences. For one thing, it appears very likely that at least in the short term, litigation would risk creating a situation in which the federal government and California would be insisting on different sets of emissions standards—the very "two-car" scenario that the One National Program was designed to avoid. That scenario could well undermine the benefits that NHTSA and EPA have calculated from their proposed rules, insofar as more stringent standards in California would reduce the overall impact of those rules on consumer choice, vehicle affordability, and safety (by reducing fleet turnover and increasing total miles driven).[353] A divided regulatory framework would also produce smaller environmental benefits than a weighted average of the two sets of standards would predict, since compliance with the higher standard for part of the fleet would be offset by decreased performance by the remainder of the fleet (a "leakage" effect). Indeed, one study has estimated

[353] As discussed below, the Alliance agrees with NHTSA and EPA that any decision the agencies make on the preemption-related issues in the Proposed Rule are severable from their decision about where to set the MY 2021-2026 standards. That being so, it would be useful for NHTSA and EPA to explain why the overall outcome of their analysis supports the levels at which they choose to set the MY 2021-2026 standards even without their preemption determinations (that is, even if California were to set different standards that were not preempted). Of course, that conclusion follows logically from the fact that the agencies have calculated a net-benefit analysis that shows an improvement in net benefits for any reduction in stringency below the current and augural standards, indicating that revised federal standards would produce some net benefit even if the California standards were to remain more stringent.

the leakage effects from divergent federal and California standards at about 65%.[354] Litigation would also contribute to regulatory uncertainty, since it is difficult for auto manufacturers to engage in product planning with confidence when the regulations underlying the basis of those plans are potentially subject to being stayed, remanded, or vacated by the courts.[355]

The Alliance believes litigation could be avoided by building upon the useful framework that has seen us through the last eight or so model years. Now that One National Program has been in place for a number of years, there is a blueprint that should enable the interested parties to find a way forward. The Alliance urges all key stakeholders, including the federal government and California, to join with us in working toward the continuation of One National Program.

11.3.2. *If Agreement on a Unified Federal and State Regulatory Program is not Possible, NHTSA May Reasonably Conclude that its CAFE Standards Should Supersede State GHG Standards and ZEV Mandates*

With respect to the substance of the preemption discussion in the Proposed Rule, the Alliance continues to believe that the positions it took a decade ago have legal merit. We simply refrained from continuing to pursue those positions in the courts once it became clear that we had an alternative way forward that no longer required litigation. Our previous litigation positions remain valid today, and NHTSA has sufficient grounds to adopt its proposed preemption determination in the unfortunate event that One National Program is dissolved.

As described in the Proposed Rule, NHTSA is considering adopting a regulation interpreting EPCA and the CAFE standards issued under that statute to preempt certain state and local GHG standards and zero-emission vehicle (ZEV) mandates. For the reasons given above, the Alliance prefers to be part of a unified federal and state regulatory framework that takes into consideration the concerns of the Alliance members and the realities of the marketplace. If such a resolution cannot be reached, however, NHTSA may then consider a preemption determination in the interests of ensuring a single national program.

As the agency responsible for administering the CAFE program, NHTSA has the authority under EPCA to adopt regulations interpreting that statute in order to carry out its administrative responsibilities.[356] As a general rule, when an agency adopts a regulation interpreting the statute it administers, that regulation is entitled to judicial deference under the two-step *Chevron* framework. At the first step, if Congress "has directly spoken to the precise question at issue" in the governing statute, then the agency interpretation "must give effect to the unambiguously expressed intent of Congress."[357] At the second step, if the statute is silent or ambiguous regarding

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[354] Lawrence H. Goulder et al., *Unintended consequences from nested state and federal regulations: The case of Pavley greenhouse-gas-per-mile limits*, J. ENVTL. ECON. & MGMT. 63, 187-207 (2012).

[355] That risk of litigation obviously does not undermine the conclusion that on the whole, the current and augural standards must be revised. Nevertheless, it would be useful for NHTSA and EPA to explain why the risk of litigation does not affect the overall outcome of their analysis supporting whatever new MY 2021-2026 standards they choose.

[356] 49 U.S.C. § 32910(d) (authorizing NHTSA to "prescribe regulations to carry out [its] duties … under this chapter").

[357] *Chevron*, 467 U.S. at 842-43.

the precise question at issue, the agency interpretation governs as long as long as it reflects "a permissible construction of the statute."[358]

The Supreme Court has not specifically decided whether *Chevron* deference applies to an agency regulation setting out the agency's interpretation of an ambiguous express preemption provision.[359] Even if NHTSA is not entitled to the full measure of deference envisioned under *Chevron*, however, its views on the impact of state law on federal objectives are at least entitled to persuasive weight.[360]

NHTSA also has the authority to interpret its own regulations, including the CAFE standards themselves.[361] An agency's interpretation of its own regulations is likewise entitled to significant deference, and is controlling unless "plainly erroneous or inconsistent with the regulation."[362]

11.3.2.1. State GHG Standards

According to the Proposed Rule, NHTSA proposes to find that EPCA and the CAFE standards issued under that statute preempt state regulations governing tailpipe emissions of carbon dioxide.[363] That proposal is based on theories of both express preemption and implied preemption. Although the Alliance would prefer a resolution in which the federal government, the states, and other stakeholders would agree on a consistent nationwide federal and state regulatory framework addressing the concerns raised by the Alliance, the Alliance does believe that NHTSA would have adequate grounds to find express or implied preemption, or both, if such a resolution proved to be impossible.

First, as the Proposed Rule explains, EPCA contains an express preemption provision that NHTSA can reasonably interpret as preempting state GHG standards. Under that provision, "a State or a political subdivision of a State may not adopt or enforce a law or regulation related to fuel economy standards or average fuel economy standards for automobiles covered by an average fuel economy standard under this chapter."[364] Insofar as the fuel economy and tailpipe GHG standards are inexorably linked, in that the identical test vehicles, test procedures, raw data, and sales fleet are

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[358] *Id.* at 843.

[359] *Compare Cuomo v. Clearing House Ass'n, L.L.C.*, 557 U.S. 519, 525 (2009) (applying *Chevron* deference to agency interpretation of express preemption clause), *with Wyeth v. Levine*, 555 U.S. 555, 576-77 (2009) (noting that "agencies have no special authority to pronounce on preemption absent delegation by Congress"). Some courts of appeals have held that *Chevron* deference does not apply to preemption questions, *see, e.g.*, *Grosso v. Surface Transp. Bd.*, 804 F.3d 110, 116-17 (1st Cir. 2015), while others have held that the issue is "unsettled," *see, e.g.*, *Bell v. Blue Cross & Blue Shield of Okla.*, 823 F.3d 1198, 1202-03 (8th Cir. 2016).

[360] *Wyeth*, 555 U.S. at 577 (noting that agencies have a "unique understanding of the statutes they administer and an attendant ability to make informed determinations about how state requirements may pose an 'obstacle to the accomplishment and execution of the full purposes and objectives of Congress'").

[361] *See* 49 U.S.C. § 32910(d).

[362] *Auer v. Robbins*, 519 U.S. 452, 461 (1997) (quoting *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 359 (1989)); *see Bowles v. Seminole Rock & Sand Co.*, 325 U.S. 410, 414 (1945). That deference, however, extends only to the agency's interpretation of its regulations and their purposes, not the agency's "ultimate conclusion about whether state law should be pre-empted." *PLIVA v. Mensing*, 564 U.S. 604, 613 n.3 (2011).

[363] 83 Fed. Reg. at 43,234. The Proposed Rule clarifies that NHTSA does not believe EPCA or its CAFE standards preempt state regulation of GHG emissions that have at most an indirect relation to fuel economy, such as state regulation of vehicle air conditioning units that may cause GHG emissions. 83 Fed. Reg. at 43,234-35. That, too, is a reasonable interpretation of EPCA's preemption provision.

[364] 42 U.S.C. § 32919(a).

used to calculate compliance, NHTSA has strong factual grounds for concluding that the statute can reasonably be interpreted as preempting such state laws.

As the Proposed Rule explains, the Supreme Court has interpreted similar language to extend to any law that "has a connection with or refers to" the relevant area.[365] And as the Proposed Rule also explains, regulations limiting tailpipe GHG emissions are "directly related to" (and indeed "mathematically linked to") fuel economy.[366] Because carbon dioxide emissions are a direct and inevitable result of burning gasoline, laws that regulate the emission of carbon dioxide from motor vehicle tailpipes necessarily also regulate fuel economy, and vice versa.[367] Indeed, NHTSA measures and calculates fuel economy for purposes of CAFE compliance by using the same tests, vehicles, sales data, and emissions measurements that the EPA uses to measure carbon dioxide and tailpipe GHG emissions.[368] As such, NHTSA's proposal to interpret the EPCA preemption provision to reach state GHG standards is plainly a "permissible construction of the statute."[369]

Second, NHTSA could also conclude that state GHG emissions standards are preempted by EPCA and by its CAFE standards under the doctrine of implied preemption. It is well established that a state law is preempted if it "stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress,"[370] and that federal regulations "have no less pre-emptive effect than federal statutes."[371] As the Proposed Rule explains, Congress directed NHTSA to balance the relevant statutory and non-statutory factors and determine maximum feasible fuel economy standards on a uniform nationwide basis.[372] By delegating those duties to NHTSA, Congress indicated a purpose to make that agency alone—not the fifty states and their countless municipalities—responsible for conducting that balancing. Given that context, NHTSA can reasonably read EPCA and its CAFE standards as intended "not only to bar what they prohibit but to allow what they permit,"[373] and specifically as intended to prevent states from adopting more stringent local GHG standards that would reflect a different balance of the relevant factors and undermine the uniform fuel economy program Congress intended.

11.3.2.2. State ZEV Mandates

A similar analysis applies to NHTSA's proposed determination that EPCA and its CAFE standards preempt state ZEV mandates. Again, the Alliance would prefer a resolution in which the federal government, the states, and other stakeholders would agree on a consistent nationwide federal and state regulatory framework for fuel economy and GHG emissions standards addressing the concerns raised by the Alliance.

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[365] 83 Fed. Reg. at 43,233 (quoting *Shaw v. Delta Airlines, Inc.*, 463 U.S. 85, 97 (1983)).
[366] *Id.* at 43,324.
[367] *Id.*
[368] *Id.*
[369] *Chevron*, 467 U.S. at 843. The Alliance also agrees with NHTSA that a waiver of preemption under section 209(b) of the Clean Air Act, 42 U.S.C. § 7543(b), does not affect EPCA preemption. *See* 83 Fed. Reg. at 43,235-37.
[370] *Hines v. Davidowitz*, 312 U.S. 52, 67 (1941).
[371] *Fidelity Fed. Sav. & Loan Ass'n v. de la Cuesta*, 458 U.S. 141, 153 (1982).
[372] 83 Fed. Reg. at 43,237.
[373] *Crosby v. Nat'l Foreign Trade Council*, 530 U.S. 363, 380 (2000).

As with the state GHG standards, both express preemption and implied preemption doctrine could allow NHTSA to find that EPCA and its CAFE standards preempt state ZEV mandates.[374] With respect to express preemption, as described above, EPCA preempts any state regulation "related to fuel economy standards" for automobiles covered by a CAFE standard.[375] ZEV mandates require that a certain number or percentage of vehicles sold within a state produce no emissions—and so effectively require that those vehicles use no fuel, given that "the only feasible means to eliminate tailpipe CO_2 emissions is by eliminating the use of petroleum fuel."[376] In fact, the very purpose of state ZEV programs is "to affect fuel economy."[377] Thus state ZEV mandates are "related to" fuel economy standards, since requiring manufacturers to sell a certain number of vehicles that burn no petroleum plainly "has a connection with or refers to" fuel economy.[378]

With respect to implied preemption, NHTSA finds that state ZEV mandates "interfere with achieving the goals of EPCA" and the CAFE program.[379] As described above, Congress has instructed NHTSA to consider and balance the relevant factors to set uniform federal CAFE standards. Like state GHG standards, state ZEV mandates represent an attempt to revisit and revise that federal balancing and impose additional local fuel economy-related requirements beyond those that NHTSA has deemed appropriate, undermining the nationwide uniformity of the federal scheme.

As the Proposed Rule explains, the California ZEV mandate "involves implementation of some of the most expensive and advanced technologies in the automotive industry, regardless of consumer demand."[380] These additional costs will jeopardize, if not prevent, compliance with the CAFE standards by "forc[ing] investment in specific technology (electric and fuel cell technology) rather than allowing manufacturers to improve fuel economy through more cost-effective technologies that better reflect consumer demand."[381]

In sum, NHTSA could find that state ZEV mandates "interfere[] with NHTSA's balancing of statutory factors in establishing maximum feasible fuel economy standards," by forcing manufacturers to adopt a specific design approach (unlike the performance-based CAFE standards Congress envisioned) and to expend "further expensive investments in fuel-saving technology than NHTSA has determined appropriate to require in setting fuel economy standards."[382]

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[374] *See* 83 Fed. Reg. at 43,238.
[375] 49 U.S.C. § 32919.
[376] 83 Fed. Reg. at 43,238.
[377] *Id.* at 43,238. For instance, as the Proposed Rule notes, the California ZEV program regulations initially included numerous references to fuel economy, and only removed those references after a 2002 lawsuit raised preemption concerns. 83 Fed. Reg. at 43,238 (citing *Fact Sheet: 2003 Zero Emission Vehicle Program*, California Air Resources Board (Mar. 18, 2004), *available at* https://www.arb.ca.gov/msprog/zevprog /factsheets/2003zevchanges.pdf).
[378] *Shaw*, 463 U.S. at 97.
[379] 83 Fed. Reg. at 43,238.
[380] 83 Fed. Reg. at 43,239; *see id.* at 43,239 n.547 (citing study finding that by 2025, the cost of complying with CAFE and ZEV requirements will be around $600 higher per vehicle than complying with CAFE requirements alone).
[381] 83 Fed. Reg. at 43,239.
[382] 83 Fed. Reg. at 43,329.

The Alliance also agrees with NHTSA that its proposed preemption determination is severable. As above, whether a regulation is severable "depends upon the intent of the agency and upon whether the remainder of the regulation could function sensibly without the stricken provision."[383] NHTSA has made clear that it intends its proposed CAFE standards and its preemption determination to be severable from each other,[384] and it is wholly clear that either of those two portions of the proposed regulation could function without the other. The requirements for severability are therefore met.

11.3.3. *If Agreement on a Unified Federal and State Regulatory Program is Not Possible, EPA Has a Legal Basis to Conclude that its Waiver of Preemption for the California GHG Standards and ZEV Mandate Should Be Withdrawn*

The Proposed Rule also includes a proposal by EPA to withdraw its January 9, 2013 waiver of federal preemption for California's Advanced Clean Car program, ZEV mandate, and greenhouse gas standards for MY 2021–2025.[385] As stated above, the Alliance believes it would be preferable for the federal government, interested states, and other stakeholders to voluntarily agree on a unified regulatory approach that addresses the Alliance's concerns, especially due to the underlying agreement in 2012 in which the MTE was envisioned to be the mechanism to adjust (up or down) future CAFE and GHG standards based on the most up-to-date information.

11.3.3.1. Withdrawal of Section 209(b) Waivers Generally

The Clean Air Act ("CAA") includes an express preemption provision that prohibits states and their subdivisions from adopting "any standard relating to the control of emissions from new motor vehicles."[386] However, it also permits EPA to waive application of that preemption provision to standards set by California if California determines that its standards "will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards."[387] EPA must grant such a waiver unless it finds that (1) California's determination that its standards will be as least as protective as federal standards is arbitrary and capricious; (2) California does not need such standards to meet compelling and extraordinary conditions; or (3) California's standards and accompanying enforcement procedures are not consistent with CAA §202(a).[388]

Although the Clean Air Act does not include an express provision authorizing EPA to withdraw a waiver of preemption, this authority "is implicit in section 209(b)."[389] As the legislative history makes clear, Congress understood this provision to give EPA the authority "to withdraw the waiver at any time [if] after notice and opportunity for public hearing he finds that the State of California no longer complies with the conditions of the waiver."[390] EPA has consistently adopted the same

[383] *MD/DC/DE Broadcasters Ass'n*, 236 F.3d at 22 (emphasis omitted).
[384] *See* 83 Fed. Reg. at 43,239.
[385] 83 Fed. Reg. at 43,240.
[386] CAA § 209(a), 42 U.S.C. § 7543(a).
[387] CAA § 209(b), 42 U.S.C. § 7543(a).
[388] CAA § 209(b), 42 U.S.C. § 7543(b)(1); 42 U.S.C. § 7521(a) (authorizes EPA to prescribe emissions standards)
[389] 83 Fed. Reg. at 43,242.
[390] S. Rep. No. 50-403, at 34 (1967).

understanding, and indeed has relied on that understanding to justify issuing §209(b) waivers on the assumption that those waivers can be withdrawn if circumstances change.[391]

As the Proposed Rule notes, that understanding is also consistent with "the judicial principle that agencies possess inherent authority to reconsider their decisions."[392] Moreover, that understanding makes eminent practical sense. Given the statutory context, and the factors relevant to the waiver determination, it would be very odd if §209(b) waivers were a one-way ratchet that could be granted but never rescinded. For instance, as noted above, §209(b) prohibits EPA from granting a waiver if California does not need the standards at issue to meet compelling and extraordinary conditions.[393] For example, it would run contrary to the statutory scheme to require EPA to leave a waiver in place even after the compelling and extraordinary conditions that justified the waiver are fully addressed. Likewise, it would make little sense to require EPA to leave a waiver in place when federal standards are revised to require greater reductions in emissions than the state standards for which preemption has been waived. Finally, to the extent there is any statutory ambiguity as to whether EPA has the authority to withdraw a waiver, its interpretation of the statute to permit that action is entitled to *Chevron* deference.[394]

11.3.3.2. Withdrawal of the Section 209(b) Waiver for the MY 2021–2025 GHG and ZEV Regulations in Particular

The Proposed Rule sets out three grounds for EPA's decision to withdraw the waiver. First, EPA proposes to conclude that state standards that are preempted under EPCA cannot be granted a §209(b) waiver. While the Alliance believes this could potentially be an adequate ground for granting a §209(b) waiver, EPA's discussion of this ground in the Proposed Rule is relatively brief. EPA recognizes that it "has historically declined to consider as part of the waiver process whether California standards are … legal under other Federal statutes apart from the Clean Air Act,"[395] thereby "display[ing] awareness that it is changing position" on this issue (a necessary step in providing an adequate explanation for the change).[396] However, if EPA intends to rely on this ground to defend its decision to withdraw the waiver, it would be useful to provide more discussion of *why* EPA has decided to depart from its historical practice in the "unique situation" presented here.[397]

Second, EPA proposes to withdraw the waiver covering the standards at issue because California "does not need such State standards to meet compelling and extraordinary conditions."[398] As EPA recognizes, this proposed finding reflects two changes in its interpretation of the requirement

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[391] *See, e.g.*, 74 Fed. Reg. at 32,752 ("If federal greenhouse gas standards are promulgated in the future, and if such standards bring this [waiver] determination into question, then EPA can revisit this decision at that time.").
[392] 83 Fed. Reg. at 43,242; *see, e.g.*, *Ivy Sports Medicine v. Burwell*, 767 F.3d 81, 86 (D.C. Cir. 2014); *The Last Best Beef, LLC v. Dudas*, 506 F.3d 333, 340 (4th Cir. 2007); *Macktal v. Chao*, 286 F.3d 822, 825-26 (5th Cir. 2002).
[393] 42 U.S.C. § 7543(b)(1)(B).
[394] *Chevron*, 467 U.S. at 842-43. For the same reasons, the Alliance also agrees with EPA that the agency has the authority to withdraw the preemption waiver only in part. *See* 83 Fed. Reg. at 43,243.
[395] 83 Fed. Reg. at 43,240.
[396] *Encino Motorcars*, 136 S. Ct. at 2126 (quoting *Fox*, 556 U.S. at 515).
[397] 83 Fed. Reg. at 43,240; *see Fox*, 556 U.S. at 515 (agency that changes policy must "show that there are good reasons for the new policy").
[398] CAA § 209(b)(1)(B), 42 U.S.C. § 7543(b)(1)(B).

imposed by this statutory subsection: one relating to the scope of the analysis necessary under this subsection, and one relating to the substance of that analysis.[399]

With respect to the scope of the analysis, as the Proposed Rule explains, the statute is ambiguous as to whether EPA should evaluate the particular standards at issue in the waiver request to determine whether California "need[s] such State standards to meet compelling and extraordinary conditions," or should instead consider California's motor vehicle program in the aggregate in making that determination.[400] In the past, EPA has fluctuated between these two approaches. It applied the aggregate approach to all waiver requests sought by California from the 1977 Clean Air Act Amendments until 2008, none of which involved GHG standards.[401] When California filed its first request for a waiver for state GHG standards, however, EPA adopted the standard-by-standard approach to address the unique considerations presented by that context, as explained in its 2008 decision to deny that waiver request.[402] A year later, however, EPA reversed course, and applied the aggregate approach in the GHG context in its decision reconsidering the 2008 denial.[403]

The Proposed Rule now proposes to return to the view that EPA adopted when it first confronted California GHG standards in 2008, finding that the statute is ambiguous and applying the standard-by-standard approach to determine whether California needs the particular standards covered by the 2013 waiver.[404] The agency has acknowledged that this constitutes a change from its approach since 2008.[405] It has also given reasons for making that change, including the fact that the §209(a) preemption provision itself applies individually to each state standard, and the fact that an aggregate approach could reduce the statutory requirement to a nullity as long as California needed some part (no matter how small) of its motor vehicle program to address compelling conditions.[406] EPA has thus satisfied its responsibility to provide an adequate explanation for this change in position.[407]

With respect to the substance of the analysis, the statute is also ambiguous as to whether the phrase "compelling and extraordinary conditions" refers to conditions specific to California, or whether it can include conditions that are similar on a global scale.[408] Once again, EPA has fluctuated

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[399] *See* 83 Fed. Reg. at 43,246-48.
[400] 83 Fed. Reg. at 43,246.
[401] *See* 83 Fed. Reg. at 43,240-41.
[402] *See* 73 Fed. Reg. 12,156 (Mar. 6, 2008).
[403] *See* 74 Fed. Reg. 32,744 (July 9, 2009); *see also* 83 Fed. Reg. at 43,240-41 (recounting this history).
[404] *See* 83 Fed. Reg. at 43,241, 43,247-50.
[405] *See* 83 Fed. Reg. at 43,241.
[406] *See* 83 Fed. Reg. at 43,246. At the same time, EPA proposes to continue to "examine California's program as a whole" in evaluating waiver requests for standards that are "designed to address local or regional air pollution problems." 83 Fed. Reg. at 43,247. As the Proposed Rule explains, that approach is reasonable insofar as the waiver provision is "designed in part to permit California to adopt standards for some criteria pollutants that are less stringent than the Federal standards as a trade-off for standards for other criteria pollutants" at the local level. *Id.* No such trade-off is involved in setting GHG standards, which are designed to address global problems rather than issues specific to California. *See id.* While this rationale is apparent in the analysis applied in the Proposed Rule, EPA should consider explaining in more detail why it is appropriate to apply the aggregate approach in analyzing standards that address local problems and the standard-by-standard approach in analyzing standards that address global problems.
[407] *See Fox*, 556 U.S. at 515.
[408] 83 Fed. Reg. at 43,247.

between these two interpretations, applying the former in its 2008 waiver denial and the latter in reconsidering that denial.[409] The Proposed Rule proposes to adopt the former interpretation. It acknowledges that EPA is changing its position, and gives reasons for doing so—including the normal meaning of the word "extraordinary," and legislative history showing that Congress intended the waiver provision to address California's "peculiar local conditions."[410] That is again sufficient to carry EPA's burden to explain its decision.[411]

Applying those interpretations, EPA proposes to conclude that the 2013 waiver was not appropriate under §209(b)(1)(B) because California does not need its GHG and ZEV standards to meet any compelling and extraordinary conditions. Because the GHG and ZEV standards are directed at a *global* problem rather than a local one,[412] and because that global problem has similar significant effects across the country (and around the world), EPA could determine that California does not face any "extraordinary" conditions that would set it apart from the rest of the country and warrant different GHG emissions standards.[413]

Moreover, insofar as the available evidence shows that the GHG and ZEV standards at issue would not have any significant impact on global climate change (or on the effects of global climate change in California), EPA could take the position that California does not "need" those standards to resolve conditions that those standards "will not meaningfully address."[414] Indeed, as the Proposed Rule notes, the plain language of the statute itself is enough to justify the view that California does not "need" standards "that would not meaningfully address the problem."[415] That said, to the extent this analysis differs from EPA's view in 2009 that "there is no need to delve into the extent to which the GHG standards at issue … would address climate change" in deciding whether to grant a waiver,[416] and that any minimal reduction in GHG emissions can be sufficient to justify a waiver, it would be useful for EPA to discuss the reasons for its change in analysis in more detail.[417] Even without that additional explanation, however, the analysis and evidence that EPA has set out on these issues in the Proposed Rule is sufficient to meet EPA's obligation to "examine the relevant data and articulate a satisfactory explanation for its action."[418]

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[409] *See id.* at 43,241 (recounting this history).
[410] 83 Fed. Reg. at 43,247; *see* S. Rep. No. 403, 90th Cong. 1st Sess., at 32 (1967).
[411] *Encino Motorcars*, 136 S. Ct. at 2126; *Fox*, 556 U.S. at 515.
[412] In the past, EPA has taken the position that GHG levels can exacerbate local air pollution problems. *See, e.g.*, 74 Fed. Reg. at 32,763. EPA has addressed this issue in the Proposed Rule by explaining that it believes "any effects of global climate change would apply to the nation, indeed the world, in ways similar to the conditions noted in California." 83 Fed. Reg. at 43,249. And, as the Proposed Rule explains, California's waiver request notably "did not indicate how [its] GHG standards would help California" in addressing its local air pollution issues. *Id.* Nevertheless, it would be useful for EPA to explain in more detail its current views with respect to the relationship between increased GHG levels and local air pollution conditions in California. *Cf.* 74 Fed. Reg. at 32,765.
[413] *See* 83 Fed. Reg. at 43,248-49. The Proposed Rule specifically explains why EPA has concluded that other States would face similar issues with respect to rising sea levels, water supply issues, increased risk of wildfires, and other effects of global climate change. 83 Fed. Reg. at 43,249.
[414] 83 Fed. Reg. at 43,248; *see id.* at 42,996-97 (noting minimal effects on atmospheric CO_2 and global average temperatures from less stringent GHG emissions standards).
[415] 83 Fed. Reg. at 43,248.
[416] 74 Fed. Reg. at 32,766.
[417] *See Fox*, 556 U.S. at 515.
[418] *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

Third, EPA proposes to find that the California GHG and ZEV standards are not consistent with CAA §202(a),[419] and so the waiver is not appropriate under CAA §209(b)(1)(B),[420] because the California standards do not provide sufficient lead time to permit the development of the requisite technology in light of the necessary compliance costs.[421] With respect to the GHG standards, as the Proposed Rule recognizes, this finding follows from EPA's determination that the equivalent federal GHG standards are not feasible under the same standard. The federal and California GHG standards "are equally stringent and have the same lead time."[422]

EPA has likewise set forth an explanation for its proposed determination that the California ZEV standards are no longer feasible. As the Proposed Rule notes, its technical analysis "raises questions as to CARB's technological projections for ZEV-type technologies," and indicates that the requirements based on those projections "are technologically infeasible within the provided lead-time."[423] In addition, the projected levels of ZEV development have become economically impracticable due to "lack of market penetration, consumer demand levels that are lower than projections …, and lack of or slow development of necessary infrastructure."[424] Those factors have increased the projected costs of compliance to the point where it would be reasonable for EPA to conclude the California ZEV standards no longer provide adequate lead time in light of those costs.[425] Especially in light of the "substantial room for deference to the EPA's expertise in projecting the likely course of [technological] development,"[426] the available evidence would support the proposed determination on this ground as well.[427]

Finally, the Alliance agrees with EPA that its proposed GHG standards for MY 2021–2026 and its proposed decision to withdraw the January 2013 waiver are severable.[428] Again, severability "depends upon the intent of the agency and upon whether the remainder of the regulation could function sensibly without the stricken provision."[429] EPA has made clear that it intends its proposed GHG standards and its waiver determination to be severable,[430] and it is wholly clear

[419] 42 U.S.C. § 7421(a).
[420] 42 U.S.C. § 7543(b)(1)(C).
[421] *See* 83 Fed. Reg. at 43,240, 43,250-53.
[422] 83 Fed. Reg. at 43,250.
[423] 83 Fed. Reg. at 43,250.
[424] 83 Fed. Reg. at 43,250; *see id.* at 43,252.
[425] EPA also proposes to set aside its prior view that costs of compliance are only excessive if they represent a "doubling or tripling of vehicle cost." 83 Fed. Reg. at 43,251. The reasons for that change in position are more or less apparent on their face—in particular, because the statute does not set any such bright-line rule for when the cost of compliance is so high as to require additional lead-time, and is more naturally read to adopt the holistic approach that EPA proposes to follow. *See* CAA § 202(a)(1), 42 U.S.C. § 7521(a)(2). Nevertheless, in an abundance of caution, EPA should consider making those reasons explicit. *See Fox*, 556 U.S. at 515.
[426] *NRDC v. EPA*, 655 F.2d 318, 331 (D.C. Cir. 1981).
[427] Certain comments in the Proposed Rule suggest that EPA also proposes to find that the California standards should be withdrawn because California's determination that its standards are as protective as federal standards was arbitrary and capricious. *See, e.g.*, 83 Fed. Reg. at 43,244. The Alliance respectfully submits that EPA should provide a more thorough discussion of its reasoning if it decides to take that approach.
[428] 83 Fed. Reg. at 43,253.
[429] *MD/DC/DE Broadcasters Ass'n*, 236 F.3d at 22 (emphasis omitted).
[430] *see* 83 Fed. Reg. at 43,253.

that either of those two actions could function without the other. The requirements for severability are therefore met.[431]

[431] The Alliance also agrees with EPA that each of its three proposed reasons for withdrawing the waiver is sufficient on its own and severable from the others. 83 Fed. Reg. at 43,240, 43,244; *see* CAA § 209(b)(1), 42 U.S.C. § 7543(b)(1) (authorizing EPA to deny a waiver if any of the statutory conditions is not met).

APPENDIX 12 MISCELLANEOUS REGULATORY DRAFTING ISSUES

The Alliance identified a small number of technical issues in the proposed and existing regulatory text that should be addressed as part of the Final Rule. The Alliance views these issues generally as errors in the drafting, and not representative of the intended proposal (or prior final rules); and we provide the following comments in that context.

12.1. Certain Definitions in 49 C.F.R. § 523.2 Reference Non-Existent Regulations

The 2012 light-duty vehicle fuel economy and GHG final rule set definitions in 49 C.F.R. § 523.2 for "mild hybrid vehicle" and "strong hybrid vehicle" as having the meanings given in 40 C.F.R. § 86.1803-01.[432] These specific terms are not currently found in 40 C.F.R. § 86.1803-01, but the similar terms "mild hybrid electric vehicle" and "strong hybrid electric vehicle" are.

In the 2016 heavy-duty vehicle Phase 2 fuel efficiency and GHG standards final rule, "mild hybrid vehicle" was replaced with "mild hybrid gasoline-electric vehicle" and "strong hybrid vehicle" was replaced with "strong hybrid gasoline-electric vehicle." These new terms were defined as meaning a vehicle as defined by EPA in 40 C.F.R. § 86.1866-12(e).[433]

First, a brief search through 49 C.F.R. Subtitle B, Chapter V (broadly including light- and heavy-duty vehicle fuel efficiency regulations) failed to identify any specific use of either the original or amended terms. Thus is it unclear why these terms are defined in 49 C.F.R. § 523.2.

Second, the new terms (referencing 40 C.F.R. § 86.1866-12(e)) have meaningless definitions. Although 40 C.F.R. § 86.1866-12 exists, there is no subsection (e), nor are the specific terms in "mild hybrid gasoline-electric vehicle" or "strong hybrid gasoline-electric vehicle" defined elsewhere in that section.

The Alliance recommends that the terms in question be removed from 49 C.F.R. § 523.2 if they are not used elsewhere in NHTSA's regulations. If similar terms with the same intended meaning are used in NHTSA regulations, the Alliance recommends that the terminology be harmonized within the NHTSA regulations and with the EPA terminology. Furthermore, if the terms in question are needed in NHTSA regulations, the Alliance recommends that the definitions direct the reader to 40 C.F.R. § 86.1803-01, or given their otherwise intended meaning.

[432] 77 Fed. Reg. at 63,189.
[433] 81 Fed. Reg. 74,236, 75,327 (Oct. 25, 2016).