Committee on Energy and Commerce, House of Representatives
Subcommittee on Environment and Subcommittee on Digital Commerce and Consumer Protection
Joint hearing entitled "Update on the Corporate Average Fuel Economy Program (CAFE) and Greenhouse Gas Emissions Standards for Motor Vehicles," held December 12, 2017

Questions for the Record for Dr. David W. Cooke

To the Honorable Jan Schakowsky, please find below responses (sans serif) to your questions (in bold).

1. **Please discuss the various options that manufacturers have for maintaining a fleet that complies with Environmental Protection Agency (EPA)'s emissions standards, National Highway Traffic Safety Administration (NHTSA) fuel economy standards, and California Air Resources Board (CARB)'s emissions standards?**
    a. **Can a manufacturer comply with those standards if its fleet does not include electric vehicles?**

All agency modeling by CARB, NHTSA, and EPA shows that manufacturers can comply with the federal standards predominantly with gasoline-powered vehicles. Similarly, independent analysis from a panel of experts at the National Academies of Science, Engineering, and Medicine confirmed this finding, noting that "the gasoline-fueled spark ignition engine will continue to be the dominant powertrain configuration even through 2030."[1] Even analysis paid for by automakers themselves shows that the standards can be met primarily through the deployment of gasoline-powered vehicles.[2,3]

The choices available to each manufacturer to improve conventional vehicles are plentiful, and the agencies modeled a wide range of technology and cost assumptions which may favor different deployment strategies—however, the costs of compliance did not vary significantly between these scenarios. Below is a non-exhaustive list of some key technologies, their approximate potential for improvement, and the fraction of vehicles on the road today with such technology. As Table 1 shows, there are many known technologies which have yet to be widely deployed, offering significant opportunities for fuel reduction from conventional gasoline-powered vehicles (for reference, the 2017-2025 standards now on the books would require a reduction in fuel consumption of about 30 percent, without the use of any off-cycle or banked credits).

Of course, Table 1 is meant merely to be illustrative of the range of potential technologies—in order to fully assess the potential effectiveness of a particular technology package, it is better to do full-vehicle simulation, which can take into account interactions of different technologies and provide a more

[1] "Cost Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles," Committee on the Assessment of Technologies for Improving Fuel Economy of Light-Duty Vehicles, Phase 2, Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences, National Research Council of the National Academies. National Academies Press: Washington, DC (2015).
[2] "Technology Effectiveness—Phase 1: Fleet-level Assessment (v. 1.1): Final Report," Novation Analytics, prepared for the Alliance of Automobile Manufacturers and Association of Global Automakers, October 19, 2015.
[3] "Decomposing fuel economy and greenhouse gas regulatory standards in the energy conversion efficiency and tractive energy domain," Greg Pannone, Brian Betz, and Michael Reale (Novation Analytics) and John Thomas (Oak Ridge National Laboratory), *SAE International Journal for Fuels and Lubricants,* volume 10(1) 202-216, 2017. DOI: 10.4271/2017-01-0897.

accurate assessment of the potential for improvement. And, in fact, the agencies have done exactly that, to ensure the robustness of their modeling results—EPA utilizes its own, publicly available ALPHA model, which it has benchmarked against the most advanced vehicles on the road today thanks to its in-house work at the National Vehicle and Fuel Emissions Laboratory in Ann Arbor; NHTSA has contracted for its own simulation work with Argonne National Laboratory to assess the performance of future technology packages which informs its Volpe modeling.

Table 1. Technology pathways to improve gasoline-powered vehicles through 2025.

Technology	Fuel consumption reduction (%)	Penetration in MY2017 fleet (%)	Remaining potential improvement (%)§
(Dynamic) cylinder deactivation	6.5-8.3% [4]	(0%)§§ 12.3% [5]	5.7-7.3%
(48V) stop-start	3.0-8.5% [1]	(0%)§§ 16.8% [5]	2.5-7.9%
Turbocharged, downsized engines	6.8-11.5% [1]	25.2% [2]	5.1-9.3%
Cooled exhaust gas recirculation (EGR)	3.0-4.9% [1]	0% [6]	3.0-4.9%
High compression ratio engine (Atkinson/Miller)	10% [1]	1.8% [6]	8.1%
High-ratio transmissions (advanced CVT or 8+ speed)	3.5-6.5% [1]	50% [5]	3.7-5.4%
Improved accessories	1.0-3.8% [1]	0% [6]	1.0-3.8%
Mass reduction (lightweighting)	6.1-11.2% [1]	—1.4-3.7% (% wt.) [6]	6.5-9.6%
Drag reduction (improved aerodynamics, brakes, tires)	4.2-9.2% [1]	6.0% [6]	6.4-9.0%
Estimated potential reduction in fuel use from just these technologies:			**29.5-44.9%**

§ Remaining potential improvement includes further improvement from some vehicles in the fleet with the technology already deployed for technologies like transmissions or mass reduction for which further improvements are foreseen. The estimated total potential includes Atkinson engines without cooled EGR at the low end and turbocharged engines with cooled EGR at the upper end, since these engine technologies are not additive. Similarly, the potential improvement for each of these engine strategies factors in the penetration of the other.
§§ Dynamic cylinder deactivation and 48V stop-start systems offer significant opportunity beyond the conventional cylinder deactivation and stop-start, respectively; however, neither technology is present in today's fleet, as noted in the parentheses.

Combining detailed simulation of vehicle technology packages with the fleet-level analysis of EPA's OMEGA model and NHTSA's Volpe/CAFE Model, this thorough and complementary work shows quite clearly the ability for the vehicle fleet to meet future light-duty fuel economy and emissions standards predominantly through the deployment of gasoline-powered vehicles. Showcased first in the Joint Draft Technical Assessment Report released in June 2016 and affirmed in EPA's work supporting its Final

[4] "Efficiency technology and cost assessment for U.S. 2025-2030 light-duty vehicles," International Council on Clean Transportation. March 2017.
[5] "Light-duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 through 2017," Environmental Protection Agency. January 2018.
[6] Volpe CAFE Model 1.2016.6.1, Build 5/2/17. 2015 baseline data.

Determination in January 2017, accompanied by thousands of pages of documented technical evidence, this comprehensive technical work continues to show that manufacturers can meet the standards without significant deployment of electric vehicles.

b. How does compliance with the Zero Emission Vehicle program affect manufacturers' compliance with EPA, NHTSA, and CARB' s emissions and fuel economy standards?

State Zero Emission Vehicle standards are in place in more than one-quarter of the new vehicle market (CA, CT, MA, MD, ME, NJ, NY, OR, RI, VT). These standards assure a minimum fraction of new vehicles are sold with a plug and represent a key step in these states to improving air quality and reducing transportation emissions. Any vehicles sold in order to comply with these state requirements will be counted towards compliance with the federal vehicle standards.

In fact, incentives are available under both the NHTSA and EPA programs to drive adoption of electric vehicles. Under the CAFE program, the petroleum equivalency factor results in electric vehicles having a fuel economy equivalent to greater than 300 miles per gallon. Under the EPA program, electric vehicles are currently treated as though the lifetime emissions were 0 g/mi, despite the fact that emissions are generated from the electricity powering these vehicles. Moreover, beginning in 2017, electric vehicles also get to take advantage of a vehicle multiplier, which counts the sales of electric vehicles as greater than what were actually sold (for example, if a manufacturer sells a battery electric vehicle in 2017, for compliance purposes it is as though they sold 2 battery electric vehicles, not 1).

All electric vehicles required under the Zero Emission Vehicle program take advantage of these incentives—this greatly reduces the difficulty for manufacturers to meet their federal requirements with the remaining vehicles.

2. Is it possible for manufacturers to comply with the EPA, NHTSA, and CARB standards if they are selling more SUVs than traditional passenger cars? Is compliance more difficult?

More drivers are buying sport utility vehicles (SUVs) than ever before.[7] However, the fuel economy and greenhouse gas standards are tailored to ensure that the vehicles that automakers make and consumers purchase does not make compliance more difficult—a change in the relative number of the types of vehicles sold does not negatively impact auto manufacturers.

Rather than setting a single fuel-economy target for the average vehicle sold by a manufacturer, which is what previous vehicle standards did, the vehicle standards required by the Energy Independence and Security Act of 2007 consider the size and type of the vehicles sold. Larger vehicles generally require more energy and therefore have lower regulatory targets. For example, if Ford only sold its F-150 in

[7] "U.S. Light Vehicle Sales by Segment Group, 1998-2017," WardsAuto.

2025, the company's targets would be just 32.0 mpg and 261 g/mi,[8] much lower than the industry's future projected targets of 46.3 mpg and 175 g/mi, based on expected vehicles sales.[9]

This policy also encourages automakers to offer efficient vehicles in all sizes and types. A manufacturer whose vehicles achieve their respective targets is well positioned to comply with the regulations, regardless of sales volume in a given year. This means that the automakers benefit from offering more efficient options for consumers across all vehicle types. The latest data shows that the efficiency of cars and trucks on average continues to improve. In fact, SUVs have shown the greatest levels of individual improvement year-over-year.[10]

3. **It has been suggested that if a manufacturer is in compliance with either EPA, NHTSA, or CARB's standards, they should be deemed in compliance with all three because the "One National Program" promised harmonization.**
    a. **Why is this suggestion problematic? What was the promise made when One National Program was established?**

Prior to "One National Program", California had already set its own size-independent vehicle emissions standards through 2016.[11] At the same time, the findings of *Massachusetts v. EPA* required that EPA set federal greenhouse gas standards for passenger vehicles,[12] and the Energy Independence and Security Act of 2007 required that NHTSA set "maximum feasible" CAFE standards which would achieve a fleet-wide fuel economy of at least 35 mpg by 2020. California coordinating with federal regulators under "One National Program" helped assure manufacturers that they could develop a fleet which would comply with standards in all 50 states.

The promise made to manufacturers was crystal clear from the very beginning in 2009:

> "The intent of this coordinated program is to allow auto manufacturers to build a single light-duty national fleet that provides significant reductions in both greenhouse gases and oil consumption."[13]

This was made even more explicit in the finalized rule for 2012-2016, in particular what it means for the program to be harmonized:

> "EPA is finalizing greenhouse gas emissions standards under the Clean Air Act, and NHTSA is finalizing Corporate Average Fuel Economy standards under the Energy Policy and Conservation Act, as amended. These standards apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016, and represent a harmonized and consistent National Program. Under the National Program, automobile manufacturers will be

[8] Based on production-weighted footprint of all versions of the F-150.
[9] "Draft TAR: Midterm Evaluation of LDV Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025," EPA, NHTSA, and CARB, July 2016. EPA-420-D-16-900.
[10] EPA Trends report (see fn 1)
[11] "California exhaust emission standards and test procedures for 2001 and subsequent model passenger cars, light-duty trucks, and medium-duty vehicles," as amended on August 4, 2005, California Environmental Protection Agency Air Resources Board.
[12] Provided that it be determined that greenhouse gases endanger public health or welfare, which EPA did find.
[13] EPA-420-F-09-028

able to build a single light-duty national fleet that satisfies all requirements under both programs while ensuring that consumers still have a full range of vehicle choices."[14]

The agencies worked together to align their respective standards as much as possible, given their different statutory authorities. Given the unique authority and policy goals of the programs, it is made quite clear that at no point does compliance with one program guarantee compliance with the other—rather, a "harmonized" program means that manufacturers *will be able* to build a single fleet which can comply with the programs. Manufacturers are still capable of manufacturing a single fleet to comply with these programs—they simply are choosing not to.

b. It has been suggested that NHTSA's fuel economy standards would be sufficient to achieve improvements in fuel economy, air quality, and reductions in greenhouse gas emissions if EPA's and CARB's standards were weakened or eliminated. Is this suggestions correct?

NHTSA's authority under EPCA does not emphasize the reduction of greenhouse gases but simply the reduction of oil. As such, there are a number of flexibilities which NHTSA employs towards implementing its "maximum feasible" standards which are inconsistent with the goals of reducing greenhouse gas emissions.

For example, "alternative fuel" under EPCA includes fossil-based fuels such as natural gas, propane, and coal-derived liquid fuels—each of these fuels receives a bonus 0.15 multiplier such that CAFE calculates the energy efficiency of a vehicle driven using these fuels as nearly 7 times more than its actual efficiency, based on an outdated calculation from when E85 was the principle alternative fuel. While converting to natural gas may reduce petroleum usage, it has only a small benefit for emissions, especially when considering the full well-to-wheels emissions of a natural gas vehicle. And yet, under EPCA, these vehicles are heavily incentivized.

Another example of a flexibility which limits the ability of NHTSA to reduce greenhouse gas emissions is the CAFE penalty, which stands today frozen at just $55 per mpg per vehicle, despite Congress's requirement under the Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015. Automakers have already been clear that they have planned their compliance strategy with CAFE acknowledging that they could owe billions of dollars in fines for non-compliance.[15] The existence of the penalty sets a ceiling on the value of both credits and technology which a manufacturer would deploy,[16] and that has been borne out. With automakers clearly stating that they are willing to pay fines in lieu of applying technology, and hundreds of millions of dollars in fines already paid confirming this choice, it seems clear that this penalty is not a significant and reliable deterrent. As such it seems dubious to suggest that a program with such a weak enforcement mechanism could reliably reduce emissions to the same degree as the Clean Air Act, for which the penalties for non-compliance are significantly higher and can result in an issuance of a stop-sale order, preventing a manufacturer from even selling its vehicles in the United States.

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[14] Federal Register 75 (88), May 7 2010, p. 25324.

[15] "Harmonization of Fuel Economy Regulations – FAQ," Alliance of Automobile Manufacturers.

[16] "New Markets for Credit Trading under US Automobile Greenhouse Gas and Fuel Economy Standards," Benjamin Leard and Virginia McConnell, Resources for the Future, May 4, 2017.

Additionally, roughly 10 percent of the greenhouse gas emissions benefits of the current vehicle standards come from the direct reduction in emissions from the air-conditioning system. NHTSA has no authority to reduce such direct emissions from refrigerants with high global warming potential.

4. **At our hearing on December 12, it was suggested that there is broad and strong support from environmental experts for "harmonization" of emission and fuel economy standards, quoting former EPA Administrator Carol Browner as an example, among others. Immediately after the hearing, however, Ms. Browner issued a strong statement denouncing those suggestions. Ms. Browner's statement clarified that she opposes any legislation that weakens standards regarding fuel economy or pollution reduction (see attached). Can you comment on the mischaracterization of Ms. Browner's position and, as an environmental expert, clarify what is the position of the environmental community regarding the need for "harmonization"?**

The statements put up on the screen at the beginning of the hearing were meant to muddy the waters by taking the quotes that groups and individuals said previously about the standards out of context. Many of the quotes that were included on that slide were in response to the success that the federal agencies and the California Air Resources Board have had in setting up One National Program. However, applying these quotes to a situation where the underlying standards are being altered (for instance through legislation that would effectively reduce the stringency of the standards for MY2017-2021 that were finalized in 2012) is a misuse and mischaracterization of the statements, which is presumably why Ms. Browner came out with such a forceful rebuttal to this tactic:

> "I strongly oppose the Fuel Economy Harmonization Act and any other legislation that would weaken standards that improve fuel efficiency and reduce dangerous pollution from vehicles—implying otherwise is misleading and dishonest. America's clean car standards have dramatically improved the fuel efficiency of vehicles, saving consumers billions of dollars and cutting pollution in the process. Instead of rolling back commonsense, successful and popular clean cars standards, we should focus on innovation and technology that will continue the auto industry's growth and the pollution reductions we've achieved since these standards were first established."[17]

This sentiment is echoed by other groups as well—any move to undermine the stringency and integrity of the standards is opposed by the entire NGO community that supports these standards.

As noted in other answers, the standards are sufficiently harmonized and the assertion that the standards are not working is just another example of automakers trying to get out of doing the right thing and going backwards on their promise to drivers across the country, who favor increased fuel efficiency, by wide margins.[18]

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[17] Statement of Carol Browner, December 12, 2017. Online at www.lcv.org/article/carol-browner-corrects-record-dishonest-auto-alliance-statement-house-energy-commerce-committee/.

[18] E.g., Consumers Union survey 2017 (http://consumersunion.org/news/2017-fuel-economy-survey/), Consumer Federation of America survey 2017 (https://consumerfed.org/press_release/new-poll-americans-care-fuel-economy-support-stronger-fuel-economy-standards/), and data presented by Mitch Bainwol, CEO of the Alliance of Automobile Manufacturers, at the SAE Government and Industry Meeting, Washington, DC, January 24, 2018.

5. **Questions have been raised as to whether light-weighting vehicles makes them less safe or has even led to higher crash fatality rates. But don't all vehicles still have to meet the same safety standards established by NHTSA? Is there any evidence that light-weighting or other measures that improve vehicle fuel economy have made vehicles less safe or led to higher crash fatality rates?**

All vehicles must meet the same NHTSA safety standards, and many of the materials used by manufacturers to reduce weight were actually first deployed to improve safety. For example, high-strength steels which are stiffer can help better protect passengers are used for critical crash zones.[19] There are numerous reasons why manufacturers are moving to incorporate more advanced materials, as framed by the National Academies:

> "Automakers are in general agreement that a closer-to-optimal vehicle design is coming, and it will include a more diverse mix of materials . . . . This is referred to as the mixed-material car, and the trend today is along this pathway. The mixed-material car will not be less crashworthy, and it will be better engineered for mass and performance."[20]

Vehicles like the aluminum-bodied F-150 are evidence of how manufacturers can provide increased performance, increased safety, and increased fuel economy all at once by taking advantage of lightweight materials: the redesigned truck not only uses less fuel than its predecessor, but it received higher crash ratings and saw increases in both payload and towing capacity as a direct result of taking weight out of the vehicle.

Reducing weight from vehicles like the F-150 provide a direct social benefit, as well. Detailed statistical analysis shows quite clearly the net social benefit of reducing weight of the largest vehicles, even for the most significant reductions.[21] The fact that automakers across the industry are deploying lighter, stronger materials helps reduce the kinetic energy involved in any vehicle-to-vehicle crashes, and these materials can absorb energy better and provide better passenger protection through improved design.

Moreover, the footprint-based standards themselves were explicitly designed to ensure that the "crush distance" around the passenger is not reduced because it is vehicle *footprint*, not mass, which is more critical to the safety of the passenger.[22] These standards were explicitly designed with safety in mind, so it would be incorrect to assert that the current efforts to improve vehicle fuel economy have made vehicles less safe or led to higher crash fatality rates. In fact, the relationship between reducing mass and increased fatality risk is statistically indistinguishable from zero.[23]

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[19] 2015 National Academies report

[20] 2015 National Academies report.

[21] Draft TAR, Chapter 8.

[22] "Assessment of NHTSA's report 'Relationships between fatality risk, mass, and footprint in model year 2000-2007 passenger cars and LTVs," Tom Wenzel, 2012. Prepared for the Office of Energy Efficiency and Renewable Energy, US Department of Energy. LBNL-5697-E.

[23] "Comments on Docket No. NHTSA-2016-0068 and Docket ID No. EPA-HQ-OAR-2015-0827," Tom Wenzel, 2016. EPA-HQ-OAR-2015-0827-5738.

6. **There have been suggestions that the cost of these standards are born by consumers. Some have stated that compliance with fuel economy and emissions standards from NHTSA, EPA, and CARB raises the price of a new car by an estimated $3,000.**
    a. **What is the source of this estimate, and is it an accurate one? [DC]**

This value represents the sum total of the MY2011 CAFE and MY2012-2025 EPA and CAFE standards, based on the agencies' estimated costs of technology needed to be deployed to comply with the standards at the time of finalization of the regulations, compared to a 2008 vehicle. This is a reasonable, but likely overestimated cost of compliance with the entire federal program from 2008 to 2025. It also completely ignores the fuel savings associated with adding efficient technologies. The average new car in 2008 achieved 21 mpg, on-road—by 2025, this will rise to 36 mpg under these standards, cutting fuel costs by more than 40 percent. Over the lifetime of these vehicles, that means more than 4,000 fewer gallons of gasoline consumed, which translates into nearly $9,000 in fuel savings for the vehicle owner, even after discounting future savings, netting nearly $6,000 for the average consumer even after considering potential technology costs.[24]

The cost presented by NADA also does not reflect the most up-to-date analysis of the costs of compliance or the latest technologies, which generally shows that technology costs are coming down. For example, in the Draft TAR EPA and NHTSA noted that "a wider range of technologies exist for manufacturer to use to meet the MY2022-2025 standards, and at costs that are similar or lower than those projected in the 2012 rule."[25] In its Final Determination, EPA showed that costs were further reduced from the TAR based on more comprehensive study of the latest technologies available.[26] Analysis of from the International Council on Clean Transportation shows even further reduced estimated compliance costs, based in part on a series of whitepapers with suppliers who manufacture the very technologies used to reduce fuel use and emissions.[27]

To date, manufacturers have deployed enough technology to comply with EPA standards through MY2019, with compliance costs below those original estimates.[28] This retrospective analysis is consistent with previous studies on the costs to comply with regulation, which generally show that 1) industry far overestimates the costs of compliance and 2) agency estimates are closer but also generally overestimate the costs.[29]

All of this is to say that while the estimate of $3000 for the total technology cost to comply with the federal regulations may be a reasonable one: 1) it is likely an overestimate; 2) nearly half of those technology costs have already been incurred, so it would be disingenuous to assert this as the cost of

[24] "Fuel economy and emissions standards for cars and trucks, MY2017-2025," UCS. ucsusa.org/midtermreview
[25] Draft TAR, p. ES-2.
[26] EPA-410-R-17-001, p. 20.
[27] ICCT efficiency technology and cost assessment for U.S. 2025-2030 light-duty vehicles.
[28] "Comments concerning the reconsideration of the final determination of the mid-term evaluation of greenhouse gas emissions standards for model year 2022-2025 light-duty vehicles and the appropriateness of model year 2021 greenhouse gas emissions standards," David W. Cooke, Union of Concerned Scientists, 2017. EPA-HQ-OAR-2015-0827-9200, pp. 10-13.
[29] "Methods of estimating the total cost of federal regulation," M.P. Carey, Congressional Research Service, 2016; "On the accuracy of regulatory cost estimates," W. Harrington, R.D. Morganstern, and P. Nelson, Resources for the Future, 1999; "Innovation and regulation in the automobile sector: Lessons learned and implications for California's CO_2 standards," R. Hwang and M. Peak, 2006.

the rules moving forward; and 3) it completely ignores the fuel savings reaped by consumers as a result of these technology costs, to the tune of nearly $9,000.

b. How much money have consumers in the U.S. saved as a result of improved fuel economy standards, and how do local communities benefit from these savings?

Thanks to strong fuel economy and emission standards, consumers are already saving nearly $60 million each day in fuel costs -- that's about $55 billion to date, savings that are reinvested in the local economy.[30] And that number will keep on ticking upwards with each new vehicle purchase, since the cars and trucks available today continue to improve in efficiency each and every year.

Using less gasoline puts more of the nation's household income to work, and lowering fuel costs for consumers means that any future price increases would affect a smaller share of household spending. Those financial savings translate into economic growth. The standards will increase GDP by up to $30 billion by 2030, creating 650,000 full-time jobs.[31]

UCS analyzed these benefits for each of the 50 states and Washington, D.C and found that:

- The average household has already pocketed about $250 in fuel savings thanks to these rules.[32]
- As long as policymakers don't weaken these protections, the average household will net nearly $2800 in savings by 2030, even after considering technology costs.[32]
- Despite regional differences due to population density, vehicle mix, and gas prices, all states come out ahead thanks to strong standards.[32]
- The standards are saving money for families across the nation—and when those savings are pumped back into the local economy, they drive growth and put people to work.

c. You wrote in your testimony that improving the efficiency of new vehicles is especially important for lower- and middle-class families, as well as for people in rural areas. Please expand on that concept. Improved fuel efficiency in a vehicle results in lower lifetime operating costs of the vehicle for the consumer. Are there any other vehicle improvements that provide a similar direct payback to the consumer?

Improving the efficiency of new vehicles benefits all drivers, but it is especially critical for lower- and middle-class families and rural drivers, who spend a greater share of their income on transportation.[33]

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[30] Net fuel savings relative to a 2010 baseline. See "Economic savings from fuel economy standards," Union of Concerned Scientists (2017). Online at https://www.ucsusa.org/clean-vehicles/fuel-economy-ticker.

[31] "Fuel economy and emissions standards for cars and trucks, Model Years 2017 to 2025," Union of Concerned Scientists, 2016. Online at http://www.ucsusa.org/sites/default/files/attach/2016/06/Fuel-Economy-Standards-2017- 2025-summary.pdf.

[32] "State benefits of vehicle efficiency standards," Union of Concerned Scientists, 2017. Online at https://www.ucsusa.org/state-benefits-vehicle-efficiency-standard

[33] "The impact of increased fuel economy for light-duty vehicles on the distribution of income in the U.S.: A retrospective and prospective analysis," D. Greene and J. Welch, 2017. Knoxville, TN: Howard Baker Center for Public Policy. Online at http://bakercenter.utk.edu/white-paper-onthe-impact-of-increased-fuel-economy-for-light-duty-vehicles.

Transportation represents the second largest expense for many Americans.[34] The average middle-income household devotes almost 20 percent of its income to transportation.[35] Over one-quarter of that goes to gasoline and motor oil.[36] For low-income households, transportation consumes about 30 percent of total income.[37] These households typically spend more on fuel than on vehicle purchases, so any money saved on fuel has added impact on their budgets.[38]

As sprawl has worsened and access to affordable housing in cities or near transit hubs has decreased, affordable and efficient transportation options have become less likely to serve low-income communities. As a result, many low-income households have placed a greater reliance on personal vehicles as their primary mode of transport.

Rural Americans tend to travel farther to access jobs and services than do city dwellers, making them typically more dependent on personal vehicles. At the same time, lower population densities in rural areas make it more challenging to deploy many transportation options that are relatively common in cities, such as public transportation or bicycling infrastructure. In a survey by the American Public Transportation Association, only 11 percent of rural respondents had public transportation available to their homes, compared with 83 percent in central cities.[39] Relative to urban households, rural households tend to own more vehicles and, as a result, spend more of their total income on vehicle purchases, gasoline and motor oil, insurance, and vehicle maintenance.[40] Providing both rural and urban low-income communities with better transit options and with vehicles that cost less to fuel can help make transportation more affordable and its costs more predictable, protecting drivers from oil price swings.

According to a detailed analysis of Consumer Expenditure Surveys, improvements in fuel efficiency save money for all income groups in America.[38] Low- to middle-income households saved up to an average of 2 percent of their income from 1980 to 2014. The nation's highest earners saved as well, although at a lower level: about an average of 0.5 percent of income across the years of the study.[38]

A 2 percent savings on income is significant for millions of American households. For example, fuel-efficient vehicles saved an average middle-income household as much as $17,000 from 1980 to 2014, providing money that could be used for other essentials, from food and clothing to education, health care, and family savings.[38]

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[34] "Consumer expenditures–2015," Bureau of Labor Statistics (BLS), 2015. Online at www.bls.gov/news.release/cesan.nr0.htm.
[35] "Where does all the money go: Shifts in households spending over the past 30 years," D.W. Schanzenbach, R. Nunn, L. Bauer, and M. Mumford. Online at www. hamiltonproject.org/assets/files/where_does_all_the_money_go.pdf.
[36] "Household spending on transportation," Bureau of Transportation Statistics (BTS), 2016. Online at www.rita.dot.gov/bts/sites/rita.dot. gov.bts/files/Transportation_Economic_Trends_2016_Chapter_6.pdf.
[37] "Housing & transportation cost trade-offs and burdens of working households in 28 metros," P. Haas, C. Makarewicz, A. Benedict, T. Sanchez, and C. Dawkins, 2006. Online at www2.nhc.org/media/documents/chp-pub-hl06-cnt-report.pdf.
[38] Greene and Welch 2017.
[39] "Rural communities, expanding horizons," American Public Transportation Association (APTA). Online at www.apta.com/resources/reportsandpublications/Documents/Rural-CommunitiesAPTA-White-Paper.pdf.
[40] "Urban and rural household spending in 2015," Bureau of Labor Statistics (BLS), 2016. Online at www.bls.gov/opub/ted/2016/urbanand-rural-household-spending-in-2015.htm.

d. After adjusting for inflation, are entry-level vehicles more expensive than they were before the current fuel economy standards were put in place?

Vehicle efficiency standards keep vehicles affordable. Though increasing vehicle efficiency comes at a modest cost, a recent report analyzing 20 years of consumer spending data concluded that the cost of the most affordable vehicles has remained effectively constant over the past decade even though today's vehicles are more efficient and cheaper to drive.[41]

For example, the report notes that the top-selling affordable new vehicles in 2015 actually cost almost the same as those marketed in 2005 (the 2015 Chevrolet Cruze L Manual sold for $16,170; in 2005, a new Honda Civic DX sold for $16,177 in 2015 dollars).[41] At the same time, wages have stagnated and gasoline prices have risen faster than the Consumer Price Index.[41] Fuel economy is more important than ever for working families.

e. Some have suggested that the increased cost of larger cars and SUVs over the last several years is because of the fuel economy standards, while others attribute those increased costs to extra features added on by the manufacturers such as heated seats. Are fuel economy standards the primary reason that large cars and SUVs are costing more?

In examining the increase in car prices since 2008, most of the observed increase is *not* attributable to technology that increases fuel economy. While the average cost of a new car has increased by over $7,000 since 2008, the vast majority of that ($4,300) is simply due to inflation, which affects every good in the U.S.[28] The next largest factor is the increasing share of light trucks, which generally have a higher price tag—that amounts to another $1,600 of the difference in price. That leaves $1,300 for everything else, not just fuel economy technologies but also options like increased connectivity features, luxury trim packages, etc. Thus, efficiency technology costs are either being overestimated, or not being fully passed on to consumers—either way, fuel economy standards are not the primary driver.

When looking within a class of vehicles, we are seeing that manufacturers are selling a greater share of higher-trim packages.[42] That means more luxury content and greater profit margins for automakers. It also means that automakers are increasingly targeting more affluent buyers—households that purchase SUVs have a median income more than $15,000 higher than those who purchase cars,[42] and automakers have been cranking out new products in this segment to attract those buyers. While entry level cars continue to be available and have not seen a price increase beyond inflation, automakers' targeted efforts to woo more affluent buyers to its higher profit, higher-trimmed light trucks have been the primary driver increasing vehicle price, not vehicle standards.

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[41] "More mileage for your money: Fuel economy increases while vehicle prices remain stable," T. Comings and A. Allison, 2017. Online at http://consumersunion.org/wp-content/uploads/2017/03/Synapse-CU-Affordability-Report-3- 15-corrected-1.pdf.

[42] "Affordability of vehicles under the current national program in 2022-2025 for Detroit Three automakers," Alan Baum and Dan Luria, 2016. Ceres Analyst Brief. Online at https://www.ceres.org/resources/reports/affordability-vehicles-under-current-national-program-2022-2025-detroit-three.

7. How have fuel economy standards driven technological innovation by automakers, as well as suppliers, and created good-paying jobs?

The fuel economy and greenhouse gas standards have helped drive American investment in manufacturing by providing certainty for the industry out through 2025. Suppliers have invested nearly $50 billion building and expanding factories in the U.S. over the past decade,[43] and that's a direct result of the certainty these standards provide. Supplier manufacturing jobs outnumber automaker jobs by 3 to 1 and have been a tremendous source of job growth for the manufacturing sector. These jobs have grown by 20 percent since these standards were finalized,[44] and 288,000 (about half) of the supplier manufacturing jobs are directly related to the manufacture of parts to improve fuel efficiency,[45] not to mention the indirect jobs impacted by this local investment. Anything done to weaken the standards and undermine that investment could have drastic consequences for a supplier base with a broad national footprint, with facilities in 48 states and at least 335 Congressional districts.[46]

Enhanced investment to develop, manufacture and incorporate added technology necessary to improve fuel efficiency means added jobs. Studies consistently predict 50,000-100,000 additional manufacturing jobs by 2025-30—above and beyond business as usual industry investments or employment levels—as a result of investment and innovation to meet the standard.[47]

In addition to ensuring drivers of all types of vehicles see fuel savings, today's footprint based standards have meant innovative technology investment across the industry. Achieving big fuel efficiency gains in the Ford F-150 or Chevy Silverado, for example, have meant re-investment and job growth not only at assembly plants, but at components and materials companies across the country.[48]

The auto industry is healthier than ever, and its recovery has been concurrent with ambitious fuel efficiency standards.

8. At the moment, gas prices in the United States are low. Are you concerned that if the U.S. government and automakers back away from their commitments to fuel efficiency, consumers could be hurt by the lack of fuel-efficient options if gas prices rise again? Why?

Weakening the standards because of low gas prices would cost drivers both now and in the future.

In 2012, when the Obama administration finalized strong standards for fuel economy and global warming emissions for passenger vehicles for 2025, oil prices topped $100 per barrel and gasoline prices

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[43] "Suppliers' $48 billion spending spree," D. Sedgwich, Automotive News, August 1, 2016. Online at www.autonews.com/article/20160801/OEM10/308019948/suppliers-%2448-billion-spending-spree.

[44] "Automotive Industry: Employment, earnings, and hours," Bureau of Labor Statistics (BLS). Online at www.bls.gov/iag/tgs/iagauto.htm.

[45] "Supplying Ingenuity II: U.S. suppliers of key clean, fuel-efficient vehicle technologies," Blue-Green Alliance and the Natural Resources Defense Council, 2017.

[46] Interactive map available at www.bgafoundation.org/programs/visualizing-the-clean-economy-autos/

[47] Regulatory Impact Analysis, Environmental Protection Agency (EPA), 2012; "Driving Growth," Center for American Progress, Natural Resources Defense Council (NRDC), and United Autoworkers (UAW), 2010. Online at http://drivinggrowth.org/driving-growth-report/.

[48] "Combating climate change 436,000 pickup trucks at a time," BlueGreen Alliance Issue Brief, 2016. Online at www.bluegreenalliance.org/resources/combating-climate-change-426000-pickup-trucks-at-a-time/

averaged nearly $4 per gallon. Even with these prices cut nearly in half now, strong standards extending out to 2025 put the auto industry and its customers on a more sustainable course.

Fuel economy standards reduce fuel costs to consumers by ensuring they have more choices of efficient vehicles, from sedans to SUVs and pickup trucks. Even at today's historically low gas prices, the average car buyer actually saves money as soon as he or she drives off the lot.[49] The last time prices spiked in the early 2000's, US automakers were headed toward bankruptcy, with a lack of efficient options for consumers and plummeting sales of high-margin SUVs.[50] American households shelled out $2,600 a year for fuel even as their taxes were bailing out General Motors and Chrysler.[51] Given the immense fluctuations since the 1970s, it is more prudent to minimize their impacts rather than assume prices will remain at today's historic lows.

9. **Please describe how credits help automakers comply with emissions and fuel economy standards. If automakers are given full, retroactive expansion of credits they are asking for, how long could they continue to technically comply with the current standards by just transferring or cashing in credits without needing to make any further improvement in fuel economy?**

The averaging, banking, and trading program is meant to allow manufacturers to smooth out their compliance—product cycles are about five years long, so over a typical vehicle's lifetime it will generally earn credits for overcompliance in the first few years after it is redesigned, and then draw down that credit bank over time. Credits are not, in and of themselves, meant to be a compliance mechanism—they are not spawned out of thin air, nor should they be earned without commensurate reductions.

The standards are generated based on specific criteria for earning credits—suddenly changing those rules in the middle of the program directly results in weakening the standards. NHTSA lays this out quite clearly in the 2012-2016 regulations:

> "NHTSA has determined that the current CAFE levels being finalized today are feasible using traditional 'tailpipe technologies' alone. If manufacturers are capable of improving fuel economy beyond that level . . . and wish to receive credit for doing so, then NHTSA believes that more stringent CAFE standards would need to be established. Not raising CAFE could allow manufacturers to leave tailpipe technology on the table . . . which would not result in the maximum feasible fuel savings contemplated by EPCA."[52]

The impact of granting off-cycle credits for the 2012-2016 CAFE program would result in a windfall for manufacturers and would not result in the maximum feasible fuel savings required under EPCA.

Our analysis of the credits granted under H.R. 4011 shows that the credits and credit flexibilities granted under the bill exceed the differences between the EPA and CAFE programs resulting from different statutory requirements. In total, the bill results in a glut of credits equal to nearly 700 million barrels of

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[49] "Fueling savings: Higher fuel economy standards result in big savings for consumers," A. Comings, A. Allison and F. Ackerman, 2016. Online at consumersunion.org/wp-content/uploads/2016/09/Fueling-Saving-Consumer-Savings-from-CAFE-2025.pdf.
[50] "Seven reasons GM is headed to bankruptcy," S.S. Carty, USA Today, May 31, 2009.
[51] "National Strategy for Energy Security: The Innovation Revolution," Securing America's Future Energy (SAFE), 2016. Online at http://secureenergy.org/report/national-strategy-for-energy-security-the-innovation-revolution/
[52] Federal Register 75 (88), May 7 2010, p. 25663.

oil; however, as long as EPA's regulations are not weakened, the progress needed to meet that standard will forestall full utilization of this windfall in credits.

By increasing the transfer cap, automakers can use this windfall of credits to offset improvements in entire segments, potentially undermining continued across-the-board improvements in efficiency. For example, a transfer cap of 6 mpg is so large that it is equivalent to the entire projected improvement for pick-up trucks from 2016-2022—the bill would now allow such improvements to be accommodated entirely by credits instead of technology, limiting consumer choice in this segment.

If the bill is passed, manufacturers will be able to continue to drag their heels, slow walking progress at the same rate they have been on for the past decade, resulting in a fleet in 2021 that is about 3 mpg less efficient than required today. If the bill were enacted in full force and the standards weakened under the mid-term review, the industry would be on course to fall 8 to 10 mpg short of today's 2025 standards.

10. Is it true that California tried to ban black cars?

No, it is not true that California tried to ban black cars. Under the "Cool Cars" regulation,[53] the California Air Resources Board sought to reduce the amount of solar energy entering the passenger cabin—this, in turn, reduces the energy load on climate control systems and can thus save energy and reduce emissions. The two main ways in which this is accomplished are by increasing the solar reflectivity of glass (typically through glazing) and by increasing the solar reflectivity of paint.

Contrary to what Mr. McConnell stated in the hearing, any color car can be made more reflective, including black—most of the sun's energy is not in visible wavelengths. Just like suntan lotion can block the sun's rays without changing your skin color, a car's paint coating can be made to reflect more of the energy in the non-visible spectrum to reduce the temperature of your car as it sits in the sun, regardless of the color of the vehicle.[54]

While California's "Cooler Cars" program ended up being eliminated, the federal fuel economy and greenhouse gas emissions standards currently issue off-cycle credit for the exact same technologies covered under the legislation as part of the standard off-cycle credit "menu" ("thermal technologies" includes glazing and solar-reflective coatings).

11. Do you believe that the midterm evaluation should consider the effect of high octane blends on compliance with the standards? Why or why not?

While higher octane gasoline can improve the efficiency of turbocharged and high-compression ratio engines,[55] the availability of such a fuel is by no means a certainty. Crediting manufacturers based on

[53] For details of the program initiated under AB 32, see www.arb.ca.gov/cc/cool-cars/cool-cars.htm.
[54] "Vehicle paint radiation properties and affect on vehicle soak temperature, climate control system load, and fuel economy," Paul B. Hoke and Christopher M. Greiner, Ford, 2005 Society for Automotive Engineers' World Congress, April 11-14. Paper No. 2005-01-1880.
[55] "Co-Optimization of Fuels & Engines: FY16 Year in Review," National Renewable Energy Laboratory and Sandia National Laboratories, Department of Energy (DOE). 2017.

the promise of the use of a fuel rather than evidence of such use is exactly the mistake which manufacturers exploited under the flex-fuel vehicle (FFV) loophole, and we do not think repeating such an error is prudent or necessary.

Blends of gasoline with 25 percent ethanol have the potential to offer reduced carbon pollution and per gallon fuel prices without a loss in miles per gallon using engine technology that is increasingly prevalent.[56] However, realization of this technical potential requires a practical plan to coordinate the introduction of the new fuel and vehicles designed to use it. Such a plan needs to address demand (e.g. vehicles compatible with or optimized for high-octane E25), fuel distribution infrastructure, regulatory issues, and supply (e.g. availability of sufficient low carbon ethanol and appropriate gasoline blend-stocks). While much of the necessary technical basis for such a plan exists, there is still considerable work required to make specific decisions, move these through several relevant regulatory processes and allow market participants (vehicle makers, fuel producers, and fuel distributors and retailers) time to adapt to the new fuel.

An orderly transition to high-octane fuel would take several years to complete. It will take time for the necessary regulations to be finalized, for vehicles optimized for high-octane gasoline to come to market and to build out the fuel distribution infrastructure to make this fuel broadly available. And even once high-octane gasoline is in use, it will take more time for automakers to phase-in new models optimized for high-octane fuel and to fully replace the legacy E10 fleet. Another factor to consider is that the rising share of high-octane gasoline will be buffered by falling sales of gasoline, given increasing fuel efficiency, such that the overall demand for ethanol will change more slowly.

Our expectation is that high-octane gasoline will not significantly enter commerce before 2026, and subsequently would only gradually gain market share through 2040 (though this is by no means a certainty). There is no realistic prospect of completing this process before 2025, in the timeframe of the mid-term evaluation. The appropriate context for this discussion within vehicle rules is the next round of fuel economy standards, beginning in 2026. Even then, an expeditious rulemaking process will be required to achieve adequate regulatory clarity to facilitate rapid adoption post-2026.

We strongly oppose granting fuel economy credits based on the technical potential of vehicles to operate on high-octane fuel before there is clear evidence that high-octane fuel is in use and the potential fuel economy benefits are being realized on the road. The history of the CAFE flex-fuel vehicle (FFV) program provides clear evidence that credits given based on unrealized potential and in advance of adequate fuel distribution infrastructure are counterproductive. Recent analysis demonstrates that the FFV program actually increased gasoline consumption and emissions without substantially increasing the use of alternative fuels.[57] There is no doubt that repeating such an historical error by prematurely crediting manufacturers based on the promise of alternative fuel use would lead to the same result.

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[56] "The Road to High Octane Fuels," Jeremy Martin, 2016. Online at blog.ucsusa.org/jeremy-martin/the-road-to-high-octane-fuels.

[57] "Alternative fuel vehicle adoption increases fleet gasoline consumption and greenhouse gas emissions under United States corporate average fuel economy policy and greenhouse gas emissions standards," A. Jenn, I.L. Azevedo, and J.J. Michalek, Environmental Science & Technology, v.50 (5) p.2165-2174 (2016).

12. Some have requested that automakers receive various credits toward fuel economy standards. If Congress allowed such credits, would that have any effect on greenhouse gas emissions?

Senator Roy Blunt (R-Missouri) and Representative Fred Upton (R-Michigan) have introduced corporate welfare bills that would give automakers free credits which they can use to significantly slow their progress on making cars more fuel efficient into the future. The bills undermine the federal fuel economy regulations in three ways: 1) it extends the life of CAFE credits, some of which have already expired, creating so-called "zombie credits"; 2) it awards a credit windfall for vehicles already sold by retroactively granting credits under the off-cycle program which regulators explicitly said they were not granting when setting the stringency of the program; and 3) it allows for manufacturers to focus all their efforts on just one segment of their fleet, undermining the promise to consumers that all types of vehicles—cars, trucks, and SUVs—would become more efficient over time.

The credit life extension provision of this legislation alone would increase oil use by 350 million barrels of oil, increase global warming emissions by 155 million metric tons, and take money ($34 billion!) directly out of American families' wallets rather than helping drivers further on a gallon of gas, something roughly 80 percent of Americans want to automakers to do. Moreover, 30 percent[58] of the 2010 and 2011 credits which have already expired were generated by flex-fuel vehicles—such credits were explicitly not allowed under EPA's early credit program for those same model years, again emphasizing that this "harmonization" is really about windfall.[59]

Retroactively granting off-cycle credits alone would result in 280 million barrels of oil to be consumed and 125 million metric tons of greenhouse gases to be emitted, if automakers were able to take full advantage of this provision of the bill. Automakers will not be able to access all of the credits granted under the bill unless the EPA's greenhouse gas emission program is also weakened—the EPA program acts as a backstop, as compliance is mandatory. However, by putting the industry on a weaker course than required under today's standards amid the ongoing mid-term review of the program, industry would be on a trajectory for up to an 8 to 10 mpg shortfall compared to the current 2025 standards.

Manufacturers have erroneously claimed that because EPA and NHTSA claimed the same amount of fuel savings in the 2017-2025 rule, that these rules cannot result in any loss of oil savings.[60] However, EPA did not attempt to quantify the impact of the flexibilities being requested in the current legislation by manufacturers. In the case of the "zombie credit" provision, EPA's reasoning for excluding such impacts has proven particularly false—while in the final rulemaking they explained that "it would not change the overall CO_2 benefits of the National Program, as EPA does not expect that any of the credits at issue would otherwise have been allowed to expire," history has shown a different story, with these credits allowed to expire under the CAFE program. Resurrecting the "zombie credits" in H.R. 4011 is quite explicitly doubling down on this error.

[58] Weighted by fuel savings, taken on net from the industry.
[59] Federal Register 75 (88), May 7 2010, p. 25340.
[60] E.g., the hearing testimony of Mitch Bainwol, Alliance of Automobile Manufacturers.

13. Do you have concerns with the Trump Administration's decision to place an indefinite delay of the civil penalty increases for CAFE violations that were finalized at the end of last year?

Delaying action on the civil penalty increase has encouraged manufacturers to pay lower fines instead of deploying new technologies. The civil penalty is so low that it is more economically sensible to pay the fine than to deploy many of the technologies needed to reduce fuel use from passenger vehicles.[61] The literature clearly shows that increasingly stringent CAFE standards require increasingly stringent penalties, or manufacturers will simply pay fines for non-compliance.[62] And we have already seen that the current level of fine is not an adequate deterrent for the current standards—manufacturers stand today ready to pay billions in fines as part of a strategy of non-compliance with the CAFE targets.[63]

The GAO long ago recommended that NHTSA increase the fine with respect to inflation.[64] This was the recommendation of a National Academies panel as well.[65] And Congress explicitly required that fines be adjusted to inflation, barring adverse economic impacts.[66] It is clear that the only adverse economic impacts from increasing fines are felt by the consumers deprived of more efficient vehicles.[67] It's long past time to raise the price of violating CAFE regulations.

14. We've heard complaints that the goalposts for compliance were moved in the midterm review. My understanding, though, is that the midterm review simply confirmed that standards set in 2012 were still achievable. Did the midterm review do anything to make compliance more difficult?

The midterm review completed in January 2017 with former EPA Administrator Gina McCarthy's affirmative final determination reflected the facts: the standards are feasible, they're working to improve efficiency vehicle by vehicle, and there's no need to weaken them or undermine them with loopholes. The joint EPA/NHTSA/CARB Technical Assessment Report (TAR) concluded that we could continue to go further in improving efficiency, and highlighted to technologies in use that weren't even anticipated when the standards were designed in 2012.[68] If anything, the TAR showed that the standards could even be strengthened. However, former EPA administrator McCarthy decided to maintain the standards to ensure industry certainty.

The midterm evaluation upheld the standards that were already on the books, standards which manufacturers presumably were planning to meet—affirming the status quo certainly did not make compliance more difficult, and no changes have been made to the program since the rules were finalized in 2012.

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[61] "Re: Reconsideration of final CAFE penalty rule," Luke Tonachel (NRDC). NHTSA-2017-0059-0011.
[62] "A Structural Analysis of Vehicle Design Responses to Corporate Average Fuel Economy Policy," Ching-Shin Shiau, Jeremy J. Michalek, and Chris T. Hendrickson, Transportation Research Part A: Policy and Practice 43 (9): 814–28, 2009.
[63] "Harmonization of fuel economy regulations – FAQ," Alliance of Automobile Manufacturers.
[64] "Vehicle fuel economy: Reforming fuel economy standards could help reduce oil consumption by cars and light trucks, and other options could complement these standards," US GAO, August 2007. GAO-07-921.
[65] *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards*, 2002.
[66] Federal Civil Penalties Inflation Adjustment Act Improvements Act of 2015 (2015 Inflation Adjustment Act)
[67] "Response to Automaker Comments Regarding Raising CAFE Fines," Dave Cooke (UCS). NHTSA-2017-0059-0019.
[68] "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," EPA, NHTSA, and CARB, 2016.