Appendix A

October 26, 2018

VIA ELECTRONIC SUBMISSION

Heidi King
Deputy Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Andrew R. Wheeler
Acting Administrator
Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

Attn: Docket No. NHTSA-2018-0067

Docket No. EPA-HQ-OAR-2018-0283

Re: Comments of Environmental Defense Fund on National Highway Traffic Safety Administration's and Environmental Protection Agency's Proposed Rule: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, 83 Fed. Reg. 42,986 (Aug. 24, 2018)

Table of Contents

I. Contrary to NHTSA's Claims, the Proposed Roll Back Will Actually Worsen Vehicle Safety 4

A. Summary 4

B. NHTSA's Safety Claims in the NPRM 6

C. Fatality Rate—Not Total Fatalities—is the Longstanding and Appropriate Metric for Evaluating Vehicle Safety 7

D. NHTSA's Own Analysis Refutes Its Deceptive Claim That Rolling Back the Clean Car Standards Will Improve Safety 9

E. NHTSA's Safety Claim is a 180-Degree Reversal of What NHTSA Has Understood and Reported for the Previous Seven Years 15

F. Mass Reduction Does Not Compromise Vehicle Safety 18

G. EDF-Modified Runs of NHTSA's Model, with More Defensible Assumptions, Show That the Roll Back Will Slightly Increase the Fatality Rate and Worsen Safety 26

H. NHTSA Ignores Increased Fatalities Under the Proposed Roll Back Due to Increased PM, NOx and SO_2 Emissions 37

I. NHTSA's Scrappage Model is Fundamentally Flawed and Yields Flawed Outputs 38

II. EPA and NHTSA Must Properly Account for GHG and Non-GHG Emission Reductions and Health Impacts 43

A. EPA and NHTSA's claim that their preferred alternative would have negligible environmental and health impacts is inconsistent with the extensive existing record 43

B. Errors and biases in NHTSA's modeling that render the emission impact estimates incorrect and unusable 44

C. Health impacts of rolling back the current GHG standards are consequential 55

D. NHTSA's emissions and health impact estimates are grossly underestimated and categorically wrong 57

III. The NHTSA Model is Systematically Flawed and Projects Dramatically Overstated Vehicle Technology Costs, Understated Fuel Savings, and Erroneous Net Societal Benefits 57

A. Summary 57

B. Introduction 59

C. NHTSA's Model Fails at its Core Function—to Accurately Predict the Most Cost-Effective Technology Pathways for Automaker Compliance 65

D. Specific Examples of Blatant Flaws and Biases in the NPRM Model That Artificially Inflate its Vehicle Technology Cost Projections 67

E. Specific Examples of Blatant Flaws and Biases in the NHTSA Model That Artificially Reduce Consumer Fuel Savings Projections 73

F. EDF-Modified Cost/Benefit Runs with NHTSA's NPRM Model Show That the Roll Back Yields Net Societal Costs 77

G. EPA's Failure to Use its Own OMEGA Modeling Tool to Inform the NPRM is Arbitrary and Capricious 81

IV. Additional factors further confirm the conclusion that the standards are achievable and appropriate. 83

A. EPA's existing, well-documented findings on consumer behavior support the appropriateness of MY2022-2025 standards 83

B. The Auto Industry Has Made a Dramatic Return to Profitability and Added Jobs 91

C. Clean car standards will continue to benefit and protect automakers, parts suppliers and workers 96

D. Clean car standards help ensure that automakers retain their global competitiveness 99

V. NHTSA Fails to Explain its Incongruous Treatment of Light Duty Trucks Compared to Heavy Duty Pickups and Vans 101

VI. The Agencies' Rejection of Multiple Available Technologies is Inconsistent With the Governing Statutes, Under Which the Relevant Question Is Whether Given Technologies are Feasible and Can Be Deployed Within the Relevant Lead Time, Not Whether They are Currently Extant or Currently on the Market 102

I. Contrary to NHTSA's Claims, the Proposed Roll Back Will Actually Worsen Vehicle Safety

A. Summary

NHTSA[1] claims that rolling back the current Clean Car Standards will reduce fatalities by between 12,700 (for the CAFE standards) and 15,700 (for the GHG standards) under NHTSA's "model year" analyses. The agencies imply that these purported safety benefits are due to safer vehicle designs under the roll back, relative to the current standards, and to faster fleet turnover where there will be more newer, safer cars and fewer older, less safe cars under the roll back. However, nothing could be further from the truth. The agencies have severely mischaracterized the safety impacts of the proposed rule and misled the public by naming the rulemaking "The Safer Affordable Fuel-Efficient Vehicles Rule, or SAFE rule."

NHTSA's safety messaging is deceptive; its projected fatality reductions are demonstrably false; and the agency has utterly failed to explain its departure from years of established practice for fuel efficiency standards and the safety impacts of those standards. Accordingly, NHTSA's reliance on these claims as a basis for the rollback is manifestly arbitrary, capricious, and unlawful.

In fact, 97-99 percent of NHTSA's projected fatality reductions are simply due to assumptions about how people will change their driving habits under the roll back relative to the Clean Car Standards – driving new cars less based on an exaggerated rebound effect and driving used cars less as well due to a new and deeply flawed scrappage model. These assumed changes in vehicle miles traveled ("VMT") have nothing to do with vehicle design or safety. NHTSA's reliance on rebound and scrappage rates and the conclusions it draws with regard to associated fatalities are unsound for at least three independent reasons.

First, because both the rebound and scrappage assumptions involve consumer behavioral changes not directly linked to the standards, their impacts should not be considered attributable to the standards. NHTSA concedes as much with respect to vehicle rebound effects; under the same reasoning, impacts from changes in VMT due to scrappage should not be considered attributable to the standards either.

---

[1] EDF's comments apply to both NHTSA and EPA and to both proposed rules. However, in this section, EDF will generally refer to NHTSA, rather than the agencies or NHTSA and EPA jointly, both for simplicity and for accuracy, as it is well known that NHTSA unilaterally carried out the NPRM analysis without any EPA staff technical input whatsoever. For example, in an EPA memorandum to the Office of Management and Budget dated July 12, 2018, a top EPA staffer stated that "The Preliminary RIA is based on the independent technical assessment from DOT-NHTSA, and the document should reflect appropriately who has authored the Preliminary RIA. EPA's name and logo should be removed from the DOT-NHTSA Preliminary Regulatory Impact Analysis." A recently retired EPA staffer who worked on the Clean Car Standards has cited: "DOT's refusal to have a single technical working meeting with EPA staff since the 2016 election. https://thehill.com/opinion/energy-environment/400051-ignore-the-facts-only-way-to-justify-rollback-of-epas-greenhouse.

Second, in its analysis of the safety impacts of the roll back, NHTSA now completely ignores (and arbitrarily departs from) the concept of fatality rate, or fatalities per mile, the metric that NHTSA itself has long used to evaluate the safety of its programs. Mobility is a societal good, and we contend that it is not NHTSA's job to try to convince people to drive their cars less. People will choose how much they need to drive, and however much driving they do, NHTSA's job is to decrease the fatality rate per mile, not to decrease the number of miles people drive. If NHTSA had evaluated safety impacts using changes in fatality rate (even under its flawed analysis), the agency would find that the current standards have no meaningful impact on safety.

Finally, the absolute numbers NHTSA presents are the product of deeply flawed and irrational economics and modeling assumptions. NHTSA's own NPRM model[2] runs show that approximately half of its projected reduced fatalities under the roll back's model year analysis (covering the lifetimes of new vehicles sold through MY 2029) are due to the absurd scrappage modeling assumption that owners of used cars, completely unaffected by new car standards, will drive nearly a trillion miles less under the roll back than under the current standards. This erroneous modeling assumption alone completely undermines NHTSA's safety analysis. The other large portion of its projected reduction in fatalities is due to the agency's use of a wildly exaggerated rebound effect, which also assumes that owners of new cars will drive nearly another trillion miles less under the proposal's model year analysis. Indeed, EDF's own modeling, which corrects several key deficiencies in NHTSA's analysis, shows a small net safety *benefit* associated with the current standards, compared to over 10,000 fatalities in NHTSA's flawed analysis.

Since 97-99 percent of the reduced fatalities are due to the purported reductions in VMT we discuss above, only a miniscule 1-3 percent can be due to vehicle design and/or "fleet turnover," illustrating the deception behind NHTSA's safety messaging. Even this tiny 1-3 percent of fatalities is wrong, however, as it is based on several biased and unsupportable assumptions all designed to make the current standards look as unsafe as possible. Notably, the agencies concede that the analysis shows that mass reduction (the only impact they assert that might impact vehicle design) is statistically insignificant. Our modeling, which corrects several of the key errors in NHTSA's analysis, shows that the current standards will have net safety benefits.

Even taking NHTSA's biased modeling assumptions at face value (such as the agency's view that automakers will reduce weight from larger and smaller vehicles without consideration of the safety implications), the remaining 1-3 percent of fatalities accounts for about 5-30 fatalities per year. Given that there are about 37,000 annual highway fatalities in the U.S., 5-30 fatalities per year represents 0.01-0.08 percent of all highway fatalities, meaning over 99.9 percent of fatalities are caused by unrelated factors. Even using NHTSA's own biased analytical assumptions, the

---

[2] In this section, EDF refers to the NHTSA NPRM model. In the NPRM, NHTSA refers to its CAFE model, but that is confusing since it uses its model for both CAFE and GHG analyses. In the past, NHTSA has called it the Volpe model, since the model was developed, and is maintained, by the Volpe National Transportation Systems Center. While we refer to the NHTSA NPRM model for simplicity, the model is comprised of many individual modules on specific topics, which are sometimes integrated with other modules and sometimes are not integrated with other modules.

resulting reduction in fatalities estimated in the proposed rule are so minimal as to have zero statistical significance.[3]

EDF has carried out a series of modified safety runs with NHTSA's NPRM model for the model year GHG analysis, with a more defensible set of modeling assumptions, and these runs show that the roll back would actually lead to a slightly increased fatality rate. EDF's conclusion here is consistent with what NHTSA itself repeatedly concluded, in multiple rulemakings and technical assessments, over the seven-year period from 2010-2016: that the current standards would either be neutral or positive in terms of vehicle safety. Contrary to NHTSA's deceptive claims, if anything, rolling back the current Clean Car Standards for eight years will slightly worsen vehicle safety.

The justification at the foundation of this roll back is unsound both in premise – the reliance on absolute fatality figures that are dependent on VMT and not attributable to the policy, rather than on a fatality rate associated with the policy – and in execution – the models used to achieve these fatality figures are beset with flaws and biases. Moreover, the agency has utterly failed to reconcile either its methodology or its conclusions with the record supporting the current standards. These flaws render the rollback fundamentally arbitrary, capricious, and unlawful.

Meanwhile, EPA's adoption of the NHTSA analysis and inherent reliance on these safety considerations is wholly unmoored from the agency's Clean Air Act obligations. Section 202 of the Clean Air Act provides that EPA shall consider "if such device, system, or element of design will cause or contribute to an unreasonable risk to public health, welfare, or safety in its operation or function."[4] The reduced fatalities that the flawed NPRM model projects under the roll back stem entirely from projections of consumer and manufacturer behavior that are far removed from the new vehicle and new engine safety concerns that EPA properly considers under its Clean Air Act obligations.[5]

B. NHTSA's Safety Claims in the NPRM

NHTSA projects that the 8-year preferred alternative roll back of the EPA Clean Car Standards will reduce fatalities by 15,700.[6] Separately, NHTSA projects that the roll back of the CAFE standards would reduce fatalities by 12,700. In fact, the 12,700 reduced fatalities is the single most cited value from NHTSA's technical analysis, featured in the summary paragraph in the

[3] Indeed, NHTSA concedes that these fatalities attributable to vehicle design are statistically insignificant. Preliminary Regulatory Impact Analysis, July 2018, pages 1359-1360.

[4] 42 U.S.C. § 7521(a)(4)(A).

[5] See Joint Coments of Center for Biological Diversity, Conservation Law Foundation, Earthjustice, Environmental Defense Fund, Environmental Law and Policy Center, Natural Resources Defense Council, Public Citizen, Inc., Sierra Club, an Union of Concerned Scientists ("Joint Environmental Comments") for a more detailed discussion of EPA's statutory obligations and constraints with regard to safety considerations.

[6] 83 FR 43352, August 24, 2018. Note that, in other tables, NHTSA shows 15,600 or values between 15,600 and 15,700.

Federal Register notice[7], the only numerical value cited in the safety section of the Overview section of the Federal Register notice[8], and featured in the "by the Numbers" fact sheet released by the Department of Transportation (DOT) and Environmental Protection Agency (EPA) when the Notice of Proposed Rulemaking (NPRM) was released.[9] Similarly, NHTSA and EPA leadership repeatedly claimed that the roll back would lead to safer vehicles.[10] These claims that rolling back the Clean Car Standards will lead to safer vehicle designs or faster and safer fleet turnover are demonstrably false, and, in fact, the opposite is true, as we demonstrate below.

C. Fatality Rate—Not Total Fatalities—is the Longstanding and Appropriate Metric for Evaluating Vehicle Safety

NHTSA typically assesses and reports both total fatalities and fatality rates, i.e., fatalities per mile. But it has always used fatality rate as its metric for evaluating the safety impacts of a regulation. NHTSA stipulates this in its Preliminary Regulatory Impact Analysis when it clearly states: "In this rulemaking document, *'vehicle safety' is defined as societal fatality rates per vehicle mile of travel* (VMT), including fatalities to occupants of all vehicles involved in collisions, plus any pedestrians (emphasis added)."[11] Many NHTSA documents in the literature also focus on fatality rate.[12] There are obvious reasons for doing so.

From a macro-economic perspective, mobility is a societal good as it promotes individual quality-of-life and standard-of-living, as well as national economic development and growth. Accordingly, federal, state, and local governments, and the Department of Transportation (DOT) in particular, encourage mobility through massive public expenditures on roads and other transportation infrastructure. All programs that increase personal mobility while maintaining fatality rates, even when total fatalities increase due to greater vehicle miles traveled, are viewed as positive developments. It is not NHTSA's job to try to convince people to drive their cars less. People will choose how much they need to drive, and however much driving they do, NHTSA's core mission is to decrease the fatality rate per mile. Further, EDF is not aware that DOT has

---

[7] 83 FR 42986, August 24, 2018. See also 83 FR 42995, August 24, 2018.
[8] 83 FR 42995, August 24, 2018.
[9] Fact Sheet: MYs 2021-2026 CAFE Proposal – by the Numbers, EPA-420-F-18-901, August 2, 2018, *available at* https://www.govinfo.gov/content/pkg/FR-2018-08-24/pdf/2018-16820.pdf.
[10] "Trump Administration Unveils Its Plan to Relax Car Pollution Rules," Coral Davenport, New York Times, August 2, 2018.
[11] Preliminary Regulatory Impact Analysis, July 2018, page 1343, footnote 845.
[12] For example, "The Impact of Safety Standards and Behavioral Trends on Motor Vehicle Fatality Rates," DOT HS 810 777, U.S. DOT National Highway Traffic Safety Administration, January 2007" ([following text is in both Abstract and Introduction] "Typically, the metrics the agency uses to set goals are fatality rates based on exposure to risk. This paper describes the process, assumptions, and methods used by the agency to estimate the impact of its safety regulations and behavioral programs on fatality rates, and measures the impact of these programs on those rates."), available at https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/810777v3.pdf. Another of many examples comes from the preamble to the final rule establishing Federal Motor Vehicle Safety Standards for Reduced Stopping Distance Required for Truck Tractors (RIN: 2127-A537) where NHTSA stated "to the extent possible, the agency compares fatal crash involvement rates of vehicle types based upon fatalities per 100 million vehicle miles travelled" (p. 53), posted at https://www.nhtsa.gov/laws-regulations/fmvss.

ever rejected a road construction or maintenance project due to a likely increase in fatalities from greater travel, or that NHTSA has ever projected fatalities associated with DOT funding for such projects, precisely because mobility is a societal good that governments seek to maximize. Indeed, there are many examples of massive governmental expenditures and subsidies related to personal mobility, for example, construction of the trillion-dollar interstate highway system that Americans can access without fees, and similar state and local expenditures to maintain roads.

From a micro-economic perspective, individuals choose how much to drive and they know that, each time they travel, there is a small risk that they will have an accident, and an even smaller risk that they will be killed in an accident. If they choose to drive twice as many miles (e.g., due to a different job location or long family vacation), they understand that the overall probability of a fatality is twice as high as it was when they drove less. Other things being equal, their personal mobility has doubled, their cumulative fatality risk has doubled, but the fatality risk per mile is unchanged. Under a "total fatalities" metric, their safety would be worse. Under a "fatality rate" metric, their safety would be unchanged. Clearly, fatality rate is a more appropriate metric for evaluating safety from an individual perspective.

Finally, from a regulatory perspective, the justification for using fatality rate is also straightforward, as NHTSA recognizes even in places throughout this rulemaking.[13] It would simply make no sense to hold NHTSA responsible if Americans voluntarily choose to drive more (or, alternatively, to credit NHTSA if Americans choose to drive less). No matter how many miles that Americans choose to drive, NHTSA's job is to drive down the fatality rate when feasible and cost effective (we note that this is similar to EPA's vehicle pollution programs, where standards are explicitly expressed in grams per mile rather than total grams or tons). Consider a hypothetical example in which NHTSA successfully reduces the fatality rate by 1% in a given year due to the implementation of a new safety regulation or public education program, but Americans chose to drive 2% more miles in that year. Would the new NHTSA program be considered a safety success because the fatality rate decreased by 1 percent, or would it be considered a safety failure because total fatalities increased by 1 percent? The NHTSA safety program would undoubtedly be considered a success, as otherwise, fatalities would have increased by 2 percent, rather than by just 1 percent.

Incredibly, NHTSA consciously chooses to not provide fatality rate data for the overall safety impacts of the roll back in its Federal Register preamble and Preliminary Regulatory Impact Analysis (yet another instance of the proposal's lack of notice as to critical issues). Doing so would reveal that the proposed roll back would not (as NHTSA has claimed) lead to safer vehicle designs or faster fleet turnover. NHTSA prominently features the fatality rate metric in the Federal Register notice in a background section on safety,[14] but fails to show fatality rate values in any of the scores of tables that purport to summarize safety impacts. For the model year analyses that yield the 12,700 and 15,700 reduced fatalities projections, EDF had to independently run the NHTSA model to generate the absolute fatality and vehicle miles traveled values necessary to calculate fatality rates. NHTSA's failure to include transparent and

[13] See, for example, many references to fatality rate at 83 FR 43137-43143 and in Figures II-5, II-7, II-8, and II-9.
[14] Ibid.

accessible information on fatality rate arbitrarily obscures the true safety impacts of the proposal and reverses the approach the agency has previously taken to assessing safety impacts. This unsupportable reliance on absolute fatalities—as well as the agency's departure from past practice without explanation – as a major justification for the rollback, renders the policy arbitrary and capricious.

D. NHTSA's Own Analysis Refutes Its Deceptive Claim That Rolling Back the Clean Car Standards Will Improve Safety

In order to investigate NHTSA's safety claims in general, and to calculate the impact of the 8-year Clean Car Standards roll back on fatality rates in particular, EDF had to replicate the NHTSA model runs that were featured in the NPRM.[15] The NHTSA analysis projects that fatalities under the roll back's model year analysis will be reduced by 12,700-15,700, and that Americans will drive between 1.5 and 1.8 trillion miles less. EDF has been able to replicate NHTSA's own NPRM model runs for the GHG analysis and has found that 97-99 percent of NHTSA's estimated reduction in fatalities is simply due to NHTSA's projections of reduced VMT and therefore, even using NHTSA's deeply flawed modeling assumptions, the fatality rates under both the current standards and the roll back are essentially unchanged.

[15] See attached report, Richard A. Rykowski, *Review of the Agencies' Technical Analysis Supporting the SAFE Vehicle NPRM* (October 2018) ("Rykowski Report"), for more detailed information about EDF's replication of the NHTSA NPRM model runs and identification of several weaknesses with the NHTSA model. Nevertheless, EDF uses the flawed NHTSA NPRM model as the baseline for both our comments and our recommended model improvements.

Table 1. EDF Replication of NHTSA NPRM Model Runs

Row	NHTSA or EDF Run?	Modeling Scenario	Current Standards			Preferred Alternative			Change—Current Standards to Preferred Alternative		
			Fatalities	VMT (billion miles)	Fatality Rate (per billion miles)	Fatalities	VMT (billion miles)	Fatality Rate (per billion miles)	Fatalities	VMT (billion miles)	Fatality Rate (per billion miles)
1	NHTSA	MY 1977-2029/CAFE[i]	NA	NA	NA	NA	NA	NA	-12,700	-1,471	NA
2	NHTSA	MY 1977-2029/GHG[ii]	NA	NA	NA	NA	NA	NA	-15,680	-1,790	NA
3	EDF	MY 1977-2029/GHG[iii]	492,788	56,836	8.670	477,144	55,048	8.668	-15,644	-1,787	-0.003
4	NHTSA	CY 2017-2050/CAFE[iv]	853,300	104,623	8.156	831,300	101,961	8.153	-22,000	-2,662	-0.003
5	NHTSA	CY 2017-2050/GHG[v]	854,000	104,718	8.155	826,600	101,467	8.146	-27,400	-3,251	-0.009
6	EDF	CY 2017-2050/GHG[vi]	854,188	104,719	8.157	826,665	101,464	8.147	-27,523	-3,255	-0.010

[i] NHTSA reported only changes in fatalities and VMT in Preamble Table VII-88 on page 43,351 and did not report the absolute values necessary to calculate fatality rates. Note that the precise value for reduced fatalities in Table VII-88 is 12,680, this value has been rounded to 12,700 throughout the Preamble and other public documents. EDF has not tried to replicate the NHTSA runs for the CAFE analysis.
[ii] NHTSA reported only changes in fatalities and VMT in Preamble Table VII-89 on page 43352 and did not report the absolute values necessary to calculate fatality rates.
[iii] EDF runs of the NPRM model (for the GHG analysis) released on August 2, 2018 for calendar years 2017 and later. See Rykowski Report for details on EDF runs.
[iv] NHTSA-reported values for individual calendar years in Preliminary Regulatory Impact Analysis Table 11-29 on page 1424, summed by EDF. EDF has not tried to replicate the NHTSA runs for the CAFE analysis.
[v] NHTSA-reported values for individual calendar years in Preliminary Regulatory Impact Analysis Table 11-30 on page 1425, summed by EDF.
[vi] EDF runs of the NPRM model (for the GHG analysis) released on August 2, 2018. See Rykowski Report for details on EDF runs.

Table 1 shows EDF's successful replication of the NHTSA model runs for the GHG analyses. Both in Table 1 and throughout the NHTSA Federal Register preamble and Preliminary Regulatory Impact Analysis (PRIA), there are four base modeling scenarios: the Model Year 1977-2029 CAFE, Model Year 1977-2029 GHG, Calendar Year 2017-2050 CAFE, and Calendar Year 2017-2050 GHG scenarios.[16] EDF has chosen to focus its model replication efforts on the GHG scenarios, but Table 1 also includes data that NHTSA reported for the two CAFE scenarios as well. EDF focused only on the preferred alternative 8-year Clean Car Standards roll back, but the conclusions about the safety impacts associated with the preferred alternative 8-year GHG emissions roll back also apply to the other alternatives that NHTSA considered.

The first three columns in Table 1 simply identify the specific modeling scenario and whether the run was performed by NHTSA or EDF.

The following six columns provide the total values for fatalities, vehicle miles traveled (VMT), and fatality rates, for both the current standards and the agencies' preferred alternative for rolling back the standards.

The final three columns in Table 1 show the changes in the values for the roll back relative to the current standards, i.e., the total value for the preferred alternative minus the total value for the current standards. A negative value means that the total value for the preferred alternative roll back is smaller than the total value for the current standards.

Table 1, Row 1 reflects NHTSA's modeling run for the MY 1977-2029 CAFE analysis. NHTSA only reported the changes in fatalities (-12,700) and VMT (-1,471 billion miles) under the roll back relative to current standards. It is noteworthy that, despite the fact that its NPRM model generates the total values for fatalities and VMT that are necessary to calculate fatality rate, NHTSA chose not to report any of these values. Given the limited time that the agencies were provided for public comment on the proposal, EDF did not have sufficient time to attempt to replicate NHTSA's model runs for the CAFE model year analysis.

Row 2 is NHTSA's run for the MY 1977-2029 GHG analysis. Again, NHTSA only reported the changes in fatalities (-15,680, sometimes rounded to 15,700 elsewhere in this section) and VMT (-1,790 billion miles) and chose not to report the fatality rate or the total values for fatalities and VMT that would allow others to calculate the fatality rate.

Row 3 shows EDF's replication of NHTSA's results for the MY 1977-2029 GHG analysis. EDF's run yields changes in fatalities (-15,644) and VMT (-1,787 billion miles) that are both within 0.2 percent of NHTSA's values. This is excellent agreement and shows that EDF was able to successfully replicate NHTSA's run. EDF then used the total values for both fatalities and

[16] The Model Year analysis accounts for the cumulative impacts over the vehicle lifetimes of all vehicles sold in MY 1977-2029 (while the first year that the standards affect new vehicles is MY 2017, NHTSA includes MY 1977-2016 vehicles to account for its erroneous scrappage module), regardless of the calendar years during which those impacts occur. The Calendar Year analysis simply accounts for impacts in the actual years in which they occur, regardless of the model years of the vehicles involved. Therefore, the results for the two analyses are very different.

VMT to calculate the fatality rate that was not shown in NHTSA's rulemaking documents. Using NHTSA's own biased modeling assumptions, the fatality rate under the current standards is 8.670 fatalities per billion miles, and under the preferred alternative roll back is 8.668 fatalities per billion miles. The change in fatality rate is -0.003 (due to rounding) fatalities per billion miles, which is a 0.03 percent reduction.

Row 4 reflects NHTSA's modeling run for the CY 2017-2050 CAFE analysis. For its calendar year analyses, NHTSA reported (in the PRIA) both the total values and the changes in fatalities and VMT, for each calendar year, which allowed EDF to sum the values for calendar years 2017-2050. The change in fatalities is -22,000, the change in VMT is -2,662 billion miles, and the change in fatality rate is -0.003. This small change in fatality rate represents a -0.04 percent reduction relative to that under the current standards.

Row 5 is NHTSA's run for the CY 2017-2050 GHG analysis. The change in fatalities is -27,400, the change in VMT is -3,251 billion miles, and the change in fatality rate is -0.009. This small change in fatality rate represents a -0.11 percent reduction compared to that under the current standards.

Finally, row 6 shows EDF's replication of NHTSA's results for the CY 2017-2050 GHG analysis. EDF's run yields changes in fatalities (-27,523) and VMT (-3,255 billion miles) that are both within 0.4% of NHTSA's values. This is excellent agreement, particularly since the NHTSA-reported fatality results were rounded to three significant digits. These results show that EDF was able to replicate NHTSA's run. In EDF's run in row 6, the change in fatality rate was -0.010 which represents a -0.12 percent change relative to the current standards.

There are two clear conclusions from Table 1. First, EDF was able to successfully replicate NHTSA's NPRM runs for both the model year and calendar year GHG analyses. Second, the changes in fatality rate between the current standards and preferred alternative roll back for the GHG analysis, even using NHTSA's flawed model and assumptions, are miniscule, ranging from -0.003 fatalities per billion miles (a -0.03 percent reduction) for the model year analysis to -0.010 fatalities per billion miles (a -0.12 percent reduction) for the calendar year analysis. And NHTSA itself has acknowledged that these fatalities are due to mass reduction and are not statistically significant.[17] These negligible changes in fatality rates demonstrate that essentially all the changes in fatalities can be explained by the changes in VMT, which should not be attributed to the standards. In short, NHTSA's own analysis shows that the current standards do not negatively impact vehicle safety.

Table 2 provides additional analysis for the same six runs that were introduced in Table 1 (see Rykowski Report for data for the EDF runs). The first three columns from Table 1 are repeated in Table 2 in order to identify the modeling scenarios and whether the runs were performed by NHTSA or EDF. The fourth ("Fatalities") and sixth ("VMT") columns in Table 2, which show

[17] "None of the estimated effects have 95-percent confidence bounds that exclude zero, and thus are not statistically significant at the 95-percent confidence level. Two [note: out of five] estimated effects are statistically significant at the 85-percent level," Preliminary Regulatory Impact Analysis, July 2018, pages 1359-1360.

the changes in fatalities and VMT going from the current standards to the roll back, are repeated from Table 1. The remaining columns in Table 2 are new and will be explained below.

Table 2. Key Safety Metrics for EDF and NHTSA Runs with NHTSA NPRM Model Assumptions

Row	NHTSA or EDF Run?	Modeling Scenario	Change--Current Standards to Preferred Alternative				Fatalities Due to VMT (%)	Total Non-VMT Fatalities	Total Non-VMT Fatalities Per Year	Fraction of Highway Fatalities (%)
			Fatalities	Fatalities (%)	VMT (billion miles)	VMT (%)				
1	NHTSA	MY 1977-2029/CAFE	-12,700	NA	-1,471	NA	NA	NA	NA	NA
2	NHTSA	MY 1977-2029/GHG	-15,680	NA	-1,790	NA	NA	NA	NA	NA
3	EDF	MY 1977-2029/GHG	-15,644	-3.175%	-1,787	-3.144%	99.0%	-156	-5	-0.01%
4	NHTSA	CY 2017-2050/CAFE	-22,000	-2.578%	-2,662	-2.544%	98.7%	-286	-8	-0.02%
5	NHTSA	CY 2017-2050/GHG	-27,400	-3.208%	-3,251	-3.105%	96.8%	-877	-26	-0.07%
6	EDF	CY 2017-2050/GHG	-27,523	-3.222%	-3,255	-3.108%	96.5%	-963	-28	-0.08%

Table 2, Rows 1 and 2 are shown for consistency, but no new data is presented as NHTSA did not report the total values for fatalities and VMT necessary for additional calculations.

Row 3 shows EDF's model run that replicates NHTSA's results for the MY 1977-2029 GHG analysis. The new fifth column ("Fatalities (%)") shows that the -15,644 fatalities under the roll back reflect a -3.175 percent change in fatalities (based on the total fatalities under both the current standards and preferred alternative roll back shown in Table 1, row 3). The new seventh column ("VMT (%)") shows that the -1,787 billion miles under the roll back represents a -3.144 percent change in VMT (based on the total VMT data shown in Table 1). Dividing the -3.144

percent change in VMT by the -3.175 percent change in fatalities shows that 99.0 percent of the change in fatalities is due to the change in VMT, and this value is shown in the eighth column.[18]

Since 99 percent of the reduced fatalities are explained by the reduced VMT, then only 1 percent of the changed fatalities are due to non-VMT impacts. This value of -156 fatalities[19] is shown in the ninth column ("Total Non-VMT Fatalities Per Year") and the negative value here means that there are fewer projected non-VMT fatalities under the roll back than under the current standards. NHTSA's model year analysis operates over at least 34 calendar years (i.e., calendar years 2017-2050), so the -156 fatalities represents approximately -5 fatalities per year, as shown in the tenth column. NHTSA recently reported that overall motor vehicle fatalities were about 37,000 per year in 2017.[20] Dividing 5 by 37,000 shows that the reduced fatalities represent about -0.01 percent of all annual highway fatalities, or about one out of ten thousand. This is shown in the final column.

Row 4 reflects NHTSA's model run for the CY 2017-2050 CAFE analysis. Here, 98.7 percent of the reduced fatalities under the roll back are due to lower VMT, with about -8 non-VMT-related fatalities under the roll back, representing about -0.02 percent of all annual highway fatalities.

Rows 5 and 6 show that, for the NHTSA and EDF runs for the CY 2017-2050 GHG analysis, about 97 percent of the reduced fatalities are due to the lower VMT under the roll back, and that the remaining non-VMT fatalities are between -25 and -30 per year, representing -0.07 to 0.08 percent of all highway fatalities.

Tables 1 and 2 conclusively show that, even when using NHTSA's biased analytical assumptions, there are essentially no vehicle design or "fleet turnover" safety-related benefits associated with the roll back. Between 97-99 percent of the projected reduced fatalities under the roll back are simply due to lower vehicle miles traveled, and fatality rate is essentially unchanged. The remaining 1-3 percent of the projected reduced fatalities under the roll back, dependent on NHTSA's biased assumptions, represent 5-30 fatalities per year, or 0.01-0.08

---

[18] EDF confirmed this math with a second, separate approach. Using the data from row 3 of Table 1, multiplying the VMT for the roll back of 55,048 billion miles times the fatality rate under the current standards of 8.670 fatalities per billion miles, yields a value of 477,266 fatalities if the fatality rate had remained unchanged under the preferred alternative. But, as Table 1 shows, the fatality rate decreased very slightly under the preferred alternative, and the total fatalities under the preferred alternative are projected to be 477,144. The change in fatalities due to the change in fatality rate is 477,144 – 477,266 = -122 fatalities, and these -122 additional fatalities represent 0.8 percent of the total change in fatalities of -15,644. Since the change in fatality rate explains 0.8 percent of the change in fatalities, the remaining 99.2 percent would be explained by the change in VMT. EDF believes the slight difference between this 99.2 percent and the 99.0 percent shown in Table 2 is due to rounding. For example, when more significant digits are included in the calculations, the results of this second methodology yield the same 99.0 percent.

[19] We note that this number is smaller than the total number of fatalities that NHTSA attributes to mass reduction for the GHG program (468). NHTSA concedes that the mass reduction analysis is statistically insignificant. That means that, setting the mass reduction numbers aside, the overall fleet fatality rate due to changes in VMT actually improves under the current standards.

[20] 2017 Fatal Motor Vehicle Crashes: Overview, U.S. DOT, National Highway Traffic Safety Administration, DOT HS 812 603, October 2018.

percent of all highway fatalities. This is a drop in the ocean, which NHTSA concedes has zero statistical significance.[21]

Even the remaining tiny 1-3 percent of reduced fatalities is analytically flawed, as this projection is dependent on a series of biased assumptions that make the Clean Car Standards look as unsafe as possible. This topic will be addressed in section G below, in which EDF critiques these assumptions and presents modified runs based on a more defensible, unbiased set of modeling assumptions.

In short, even accepting the soundness of NHTSA's modeling inputs, which we do not, analysis of safety impacts using the appropriate metric – fatality rate – shows that the proposal will not provide any safety benefits and so undermines the agencies' justification for the proposed rollback of the Clean Car standards.

E. NHTSA's Safety Claim is a 180-Degree Reversal of What NHTSA Has Understood and Reported for the Previous Seven Years

For seven years from 2010 through 2016, in multiple rulemakings and technical assessment reports, NHTSA concluded that the impacts of the current standards on vehicle safety were either neutral or beneficial.

The final rulemaking adopting the MY 2012-2016 GHG and fuel economy standards for new passenger vehicles, issued in 2010, provided an extensive analysis and assessment of the potential for fatalities due to the adopted standards. The agencies concluded the safety effects were much lower than previously estimated and "…may be close to zero, or possibly beneficial if mass reduction is carefully undertaken in the future and if mass reduction in the heavier LTVs [light trucks and vans] is greater (in absolute terms) than in passenger cars."[22] The basic assumptions adopted by the agencies were that the footprint standards would discourage compliance by downsizing vehicles, mass reduction would be solely through methods like material substitution that would maintain structural integrity and other aspects of vehicle safety, and that more mass would be reduced in heavier vehicles than lighter ones (specifically by as much as 10 percent for the heaviest light-duty trucks, but only as much as 5 percent for other vehicles). The NHTSA modeling closely matching these assumptions showed a net reduction in fatalities due to the standards.

Analysis supporting the Phase 2 standards in 2012 confirms that automakers do, in fact, apply mass reduction preferentially to heavier vehicles and that this application reduces fatalities. See section F below for further discussion on this point.

In the final rulemaking for the MY 2017-2025 GHG and fuel economy standards for new passenger vehicles, issued two years later in 2012, the agencies updated their crash data set to

[21] Preliminary Regulatory Impact Analysis, July 2018, pages 1359-1360.
[22] 75 FR 25395, May 7, 2010.

reflect newer data (through the 2007 model year). The agencies also evaluated the results of several new third-party assessments of the updated crash data. Some of the findings of the third-party reviewers were that most of the calculated fatality rates attributed to a 100-pound mass reduction were not statistically significant[23], and the impacts were small and "overwhelmed by other known vehicle, driver and crash factors."[24] None the less, NHTSA decided to continue to use an updated statistical analysis of its historical crash data set as its principal basis for determining fatality impacts, rather than concluding that its data were not statistically strong enough to quantify an effect of mass reduction on fatalities. The agencies proceeded with their assessment of feasible GHG and fuel economy standards by applying mass reduction limits to each of the vehicle classes, favoring greater percentage and absolute mass reduction of larger trucks compared to lighter cars. The result was again that when mass reduction is applied to achieve the standards with fleet safety in mind, the result is a small reduction in fatalities.

The National Research Council of the National Academies issued a study in 2015, funded by NHTSA, on fuel economy technologies for light-duty vehicles. With respect to safety and mass reduction that may be used to comply with the adopted standards for MY 2022-2025, the study reported that: "It is the committee's view that mass will be reduced across all vehicle sizes, with proportionately more mass from heavier vehicles. The most current studies that analyze the relationship between vehicle footprint, mass and safety support the argument that removing mass across the fleet in this manner while keeping vehicle footprints constant will have a beneficial effect on societal safety risk."[25]

The next update of the agencies' safety assessment of GHG and fuel economy standards was presented in the draft Technical Assessment Report (TAR) for the EPA Midterm Evaluation, issued in July 2016.[26] Since the previous evaluation of safety, the agencies performed new evaluations of light weighted vehicles, and again updated the statistical evaluation of the most recent crash data to reflect comments received. A quantitative correction to historical crash data was also developed to reflect the safety benefits of future implementation of adopted NHTSA crash safety standards. The agencies adopted a maximum limit of mass reduction in their technology selection models for each vehicle category—20% for light trucks, CUVs and minivans (for example, 1000 pounds maximum allowed reduction for a pickup), 7.5% for small cars (218 pounds), and 10% for medium cars (268 pounds)— following the same principle used in prior analyses that safety is improved when greater mass reduction is applied to heavier vehicles compared to lighter vehicles. The results of NHTSA's modeling found a net reduction of 61 fatalities due to the fuel economy standards over the lifetime of MY 2017-2025 vehicles, whereas EPA calculated a reduction of fatalities of 6-74 over the lifetime of MY 2022-2025

[23] 77 FR 62747, October 15, 2012.
[24] Ibid, page 62750.
[25] 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, National Research Council of the National Academies, 2015, pages 240-241.
[26] 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, Office of Transportation and Air Quality U.S. Environmental Protection Agency, National Highway Traffic Safety Administration U.S. Department of Transportation, and California Air Resources Board, EPA-420-D-16-900, July 2016.

vehicles. This assessment of fatalities was used in the Final Determination issued by EPA in January 2017, in which the EPA "Administrator finds that the existing MY 2022-2025 standards will have no adverse impact on automobile safety."[27]

Two months later, the agencies announced their intent to reconsider the EPA Final Determination, without mentioning safety concerns, and undertook development of a rulemaking to reconsider the adopted GHG standards and augural fuel economy standards.[28]

In this NPRM, even while conceding that their mass reduction findings are not statistically significant, the agencies ignore their previous findings, reached multiple times over the past seven years, that mass reduction can be applied in a manner that has no effect on, or results in a small reduction in, fatalities. Without even acknowledging its past findings, NHTSA rejects its previous findings even after confirming in this proposed rulemaking that NHTSA's newly developed crash simulation modeling of vehicle design concepts for reducing mass revealed similar trends[29] (i.e. fatalities do not increase if mass reduction is preferentially applied to heavier vehicles compared to lighter passenger vehicles). NHTSA and EPA now propose relaxing the adopted and augural standards for 2021 to 2025 based in part on a new finding that mass reduction used to meet the current standards will increase fatalities, rather than decrease or have no net effect on fatalities as they have found many times in the past.[30] This inexplicable departure from a well-established and reasonable modeling assumption with real influence on the chosen policy presents the hallmarks of an arbitrary and capricious action.

Table 3 summarizes the NHTSA/EPA findings, over the past decade, of fleet fatalities due to mass reduction associated with the current standards.

Table 3. Historical NHTSA/EPA Projections of Impact of Mass Reduction per 100 Lbs. on Fatalities

Date	Document	Impact on Fatalities
2010	MY 2012-2016 Standards Final Rule	Unchanged or Decrease
2012	MY 2017-2025 Standards Final Rule	Decrease
2015	NAS Phase 2 Report on Fuel Economy Standards	Decrease
2016	NHTSA/EPA/CARB Draft Technical Assessment Report	Unchanged
2018	MY 2021-2026 NPRM Standards Roll Back	**Increase**

[27] Final Determination of the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards Under the Midterm Evaluation, U.S. Environmental Protection Agency, EPA-420-R-17-001, January 2017.
[28] 82 FR 14671, March 22, 2017.
[29] Preliminary Regulatory Impact Analysis, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021 – 2026 Passenger Cars and Light Trucks, Chapter 11, page 1340, July 2018.
[30] 83 FR 43117, August 24, 2018, Table II-50.

F. Mass Reduction Does Not Compromise Vehicle Safety

1. Passenger vehicle safety has been improving as fuel economy has increased

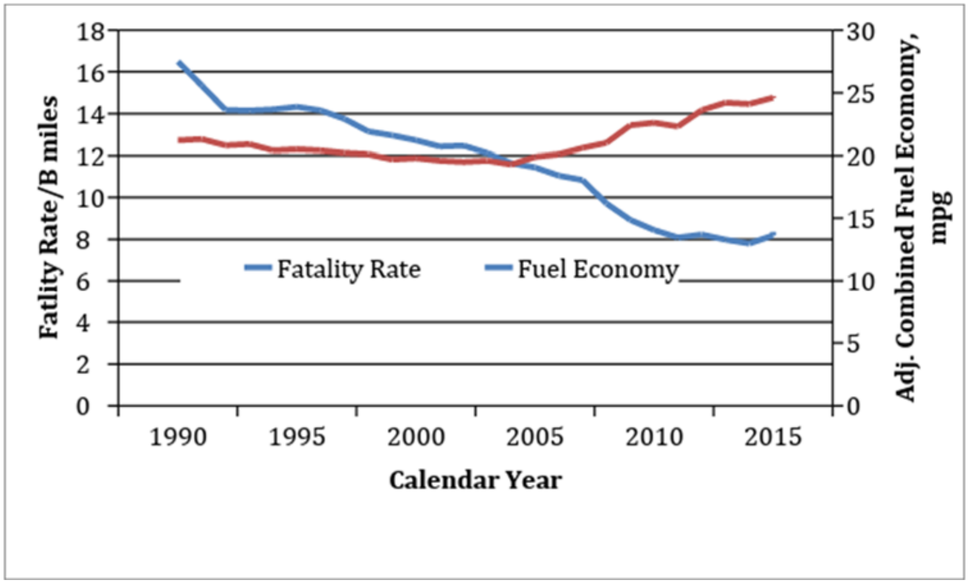
Since 1990, the number of passenger vehicle-related fatalities per billion miles of travel has decreased by almost 50%, a dramatic improvement, as shown in Figure 1. In a 2015 study, NHTSA found that safety devices (e.g. seatbelts, air bags, and stability control) and federal safety standards, reduced drunk driving, and faster medical response following a crash had contributed to a lower fatality rate.[31]

Although passenger vehicle fuel economy remained largely unchanged between 1990 and 2004, it began to rise in 2005 and has continued to do so through 2016, an approximately 17% improvement as indicated in Figure 1. Since 2005, the trend of increasing vehicle weight has stopped, with vehicle weight holding constant, despite increased sales of heavier vehicles such as pickups and CUV/SUVs. Finally, new crash safety tests and standards such as automatic emergency braking, and improved safety information available to consumers, promise additional reductions in fatalities as new safety technologies penetrate the fleet.

These data suggest that fuel economy improvements can be made without increasing fatalities, and while maintaining vehicle weight even in the face of increasing sales of large and more powerful vehicles. We assess this theory in greater detail below.

[31] Kahane, C. J. 2015. "Lives saved by vehicle safety technologies and associated Federal Motor Vehicle Safety Standards, 1960 to 2012 – Passenger cars and LTVs – With reviews of 26 FMVSS and the effectiveness of their associated safety technologies in reducing fatalities, injuries, and crashes." (Report No. DOT HS 812 069). Washington, DC: National Highway Traffic Safety Administration.

Figure 1. Passenger Vehicle Occupant Fatality Rate and Model Year Fuel Economy[32]



2. New, lighter weight vehicles are safe and will continue to improve in safety

New vehicles are required to meet federal vehicle safety standards, which have expanded and become more stringent over the past decades. There are over 60 such standards, the majority of which apply to passenger vehicles.[33] The Insurance Institute for Highway Safety (IIHS) also performs crash tests on new passenger vehicles, and its publicly available rating system and 'Top Safety Picks' influence vehicle manufacturers to improve vehicle safety and may influence vehicle buyers as well.[34] IIHS also analyzes crash data, and periodically reports the driver death rate due to accidents for relatively new vehicles. IIHS' data confirm the improved safety of recent vehicles in protecting the occupants. For example, driver deaths per million vehicle years decreased from 87 for 2002 models to 30 for 2014 models.

Mass reduction of vehicles does not cause an increased risk to the occupants of the lightened vehicle. As reported in a recent Michigan Manufacturing Technology Center (MMTC) review of the safety implications of reducing the mass of passenger vehicles, the crash safety of contemporary automobiles can be assured by use of high-performance materials, energy absorbing vehicle structures and passive occupant protection systems. These elements properly

[32] Fatality rate from https://www.iihs.org/iihs/topics/t/vehicle-size-and-weight/fatalityfacts/passenger-vehicles. Passenger vehicle VMT calculated from https://www.bts.gov/content/us-vehicle-miles. Adjusted combined car and light truck fuel economy from https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100TGDW.pdf.
[33] https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/fmvss-quickrefguide-hs811439.pdf
[34] See Insurance Institute for Highway Safety, https://www.iihs.org.

applied are weight independent, and a lightweight vehicle can protect its occupants as well as a heavier vehicle[35].

Vehicle manufacturers are actively reducing the mass of their vehicles, and most are using a multi-material approach (lightweight steel, aluminum, reinforced plastics and magnesium) to balance mass reduction, material strength and cost, while maintaining vehicle crash-worthiness. Design efforts have been refined and become more efficient by relying on computer simulation models of vehicle structures and the crash conditions specified in the numerous federal safety standards. These simulation tools have been calibrated and demonstrate approximately 90% correlation between the simulation model and actual vehicle crashes. Important design goals are to provide a deformable crush area in the vehicle that can absorb the collision energy, thus reducing g-forces on the occupants, and protecting the passenger compartment from deformation and intrusions.

Manufacturers do not release their crash simulations to the public. However, Table 4 shows that several government studies have been published that demonstrate that 20% or more mass can be removed from a vehicle without compromising the safety of the occupants. The MMTC study evaluates the crash simulation of reduced mass models of a Toyota Venza CUV, a Honda Accord and a Chevy Silverado pickup truck. All three simulations demonstrate that federal safety standards can be met with properly designed structures that reduce mass by 20% or more.

Table 4. Low Mass Redesigns Including Crash Safety Simulation

MY	Model	Study by	Mass, %	Mass, lbs	Cost, %	Safety Evaluation
2012	Venza	Lotus	31	1162	1	Comparable[1]
2011	Accord	EDAG	21	682	2	Comparable
2011	Silverado	FEV	21	1124	9	Comparable

[1] Comparable to the heavier, production model. In case of the Venza, also comparable to other similar CUVs.

The MMTC study also reports on crash ratings for reduced mass production vehicles. The model coming closest to the mass reduction achieved in the three simulation studies is the 2017 Ford F-150, which was about 700 pounds (14%) lighter (depending on the model) than its previous generation. The aluminum intensive 2017 F-150 achieved a 5 star safety rating. Compared to the 2017 Chevy Silverado, also a 5 star rated truck, the 2017 Ford-150 weighs about 450 pounds less, manufacturer recommended price starts at nearly $700 less, and fuel economy is 2 mpg

---

[35] Modern Vehicle Lightweighting: A Review on Safety of Reduced Weight Vehicles, Gregory Peterson, Michigan Manufacturing Technology Center (MMTC), October, 2018, available at https://consumersunion.org/research/modern-vehicle-lightweighting-a-review-on-safety-of-reduced-weight-vehicles/.

better (for the entry level model). This is a clear and convincing real-world example that significant mass reduction does not reduce the safety of occupants, can be achieved economically, and will improve fuel economy and reduce GHG emissions.

The MMTC study notes that an overall reduction of mass in the fleet, over time, should result in less severe crashes because of the lower kinetic energy involved, especially in two vehicle crashes. Lower mass also contributes to better vehicle dynamic response in emergency situations, which can increase crash avoidance or reduce damage in a crash. These benefits have not been adequately considered in the NPRM analysis.

The MMTC study points out that more mass will be reduced from heavier vehicles than lighter weight vehicles for several reasons. One reason is heavier vehicles offer more opportunity to reduce mass than lighter vehicles. In other words, it is easier to remove 100 pounds from a 5000 pound LTV than from a 3000 pound compact. Second, heavier vehicles generally are more expensive and have higher profit margins, so it is economically possible to apply more expensive mass reducing technologies to a heavier vehicle than a lighter weight vehicle. For example, a well-equipped Chevy Silverado retails for over $56,000 and weighs almost 5000 pounds. The price per pound of vehicle is $11.40. On the other end of the spectrum, a subcompact Chevy Spark retailing for about $13,000 and weighing a little over 2200 pounds has a price per pound of vehicle of $5.81, about half of the Silverado. Thus, there is more opportunity to apply somewhat more expensive mass reduction technologies to larger vehicles without pricing them out of their market sector. This is the path vehicle manufacturers are pursuing.[36]

Finally, the future suggests vehicle fatalities will continue to decline due to advancing technology. NHTSA has already reached agreement with most vehicle manufacturers to equip 2022 models with automatic emergency braking, which IIHS predicts will reduce front-to-rear crashes with injuries by 56%.[37] Blind-spot monitoring is becoming available, and IHSS predicts this detection technology could reduce lane-change crashes involving injuries by 23%. Lane departure warning could avoid injury crashes with objects, sideswipes and head-on crashes by 21%. Focusing NHTSA's efforts on facilitating vehicle adoption of these safety technologies, including autonomous driving, appears to offer more real public safety benefit than grossly relaxing the fuel economy standards based on the erroneous belief that these relaxed standards will improve vehicle safety.

[36] Drive Aluminum, Automakers Not Planning to Reduce Weight in Small Cars Under Any Regulatory Scenario, available at http://www.drivealuminum.org/wp-content/uploads/2018/08/Mass-Reduction-Chart.pdf.

[37] IIHS, Real-world benefits of crash avoidance technologies (May 2018), available at https://www.iihs.org/media/3b08af57-8257-4630-ba14-3d92d554c2de/mYL9rg/QAs/Automation%20and%20crash%20avoidance/IIHS-real-world-CA-benefits-0518.pdf.

3. NHTSA's method of assessing safety of mass reduction produces statistically insignificant results and should be identified as such

In this subsection and in subsection 4 below, we specifically address NHTSA's erroneous conclusion in the proposed rulemaking that less mass reduction needed to comply with the preferred alternative will reduce 468 fatalities over the lifetime of 1977 to 2029 vehicles (GHG policy alternative), and reduce 160 fatalities in the CAFE policy alternative, compared to the current GHG and augural CAFE standards.[38] We note that other studies point out that NHTSA's underlying analysis of crash data used to estimate fatalities due to mass reduction is not statistically significant, and the calculated fatality results are relatively small and overwhelmed by other vehicle, driver and crash factors. This suggests the mass-related fatality findings in this proposed rulemaking have no meaningful value in establishing policy.

We further identify that for this proposed rulemaking NHTSA has inappropriately changed a critical assumption regarding how mass reduction is safely applied to vehicles. Throughout the past decade, NHTSA has assumed vehicle manufacturers will remove more mass from heavier vehicles and remove less mass from lighter vehicles. This approach to mass reduction has been shown by NHTSA to have no effect or to slightly reduce fatalities from the fleet as a whole (see Section E). However, unique to this proposed rulemaking, NHTSA has revised its prior modeling assumption to allow unfettered application of mass reduction by vehicle manufacturers across all vehicle sizes without consideration of the safety implications. We present information below that vehicle manufacturers have been and will continue to follow a safe approach of reducing more mass from heavier vehicles, contrary to NHTSA's newly revised and unsupported modeling assumption. We have also modified the NHTSA model by returning to NHTSA's historical assumption of safe application of mass reduction, and find the agency's proposed preferred alternative to flatline the standards increases fatality rate by a small amount, compared to the current standards. This is a finding exactly opposite of NHTSA's finding in this proposed rulemaking.

Reducing the mass of a vehicle is an effective and often cost effective means of improving fuel economy and reducing GHG emissions. The fundamental approach used by NHTSA to assess the safety implications of reducing the mass of vehicles in response to more stringent GHG and fuel economy standards is analysis of FARS crash data collected by NHTSA, which has been updated for this proposed rulemaking to include 2004 to 2011 model year vehicles operating in calendar years 2006 to 2012. The basic approach used by NHTSA in prior regulatory assessments, and in the current NPRM, is statistical analysis of historical crash data to determine the percentage change in fatalities per miles driven for a 100-pound decrease in vehicle mass for five different size classes of vehicles, ranging from smaller passenger cars to heavier truck-based light duty trucks. These percent changes are then used in the CAFE and GHG modeling to assess the change in fatalities due to mass reduction needed to comply with different proposed standards.

[38] 83 FR 43114 and 43117, August 24, 2018, Tables II-47 and II-50.

The approach used by NHTSA has been reviewed by several external parties, and the NPRM summarizes the findings and conclusions of many of their reports. However, it is useful to put the NHTSA approach and results into context, using both statements in NHTSA's PRIA and the most recent report by Lawrence Berkeley National Laboratory (LBNL) assessing NHTSA's safety analyses[39]:

- None of the estimated changes in fatality rate due to a 100-pound reduction in mass for the 5 vehicle classes is statistically significant at the 95% confidence level. Only 2 estimated changes (for small cars and heavier light trucks) are statistically significant at an 85% confidence level. The estimated changes for the remaining 3 vehicle classes are not significant (PRIA, pgs. 1359-1340).

- Mass reductions in lighter cars are estimated to lead to increases in fatalities, and mass reductions in heavier light trucks are estimated to lead to decreases in fatalities. "However, NHTSA does not consider this conclusion to be definitive because of the relatively wide confidence bounds in the estimates." (PRIA, pg. 1360).

- Many of the variables in NHTSA's statistical model used to explain fatalities, such as side air bags and electronic stability control, have much higher estimated effects on fatality risk than mass. "The relatively small estimated effects of mass reduction are overwhelmed by these other vehicle, driver, and crash factors." (LBNL Wenzel, pg. iv).

- To better explain which variables (e.g., mass reduction) explain the range in fatality risk, LBNL analyzed 234 individual vehicle models representing nearly 90% of the fatalities in the crash data base, and found the correlation between fatality risk and mass is very low. "These results indicate that, even after accounting for many vehicle, driver, and crash factors, the variation of risk by vehicle model is quite large and unrelated to vehicle weight". (LBNL Wenzel, p. v).

While NHTSA acknowledges these findings (some of which are theirs), the inputs to their model that produce an estimate of changes in fatalities related to vehicles with reduced mass do not reflect the uncertainties described above. As the citations above demonstrate:

- The results of NHTSA's fatality analysis are not statistically significant at levels commonly used in analyses;

- The fatalities estimated are very small compared to other factors (e.g., driver characteristics) that have a much higher effect; and

- Differences in fatality risk between similar vehicle models of similar mass are much greater than the change in fatality risk NHTSA calculates for that vehicle class (such as

[39] One of the most recent is: Assessment of NHTSA's Report "Relationships Between Fatality Risk, Mass and Footprint in Model Year 2004-2011 Passenger Cars and LTVs" (LBNL Phase 1), LBNL-2001137, Tom Wenzel, Lawrence Berkeley National Laboratory, March 2018.

small passenger cars), suggesting individual vehicle design has a much more important and bigger impact on fatality rate than a hundred-pound reduction in mass.

Because NHTSA itself found that the safety impacts associated with mass reductions are statistically insignificant, it was arbitrary for the agency to attribute *any* change in fatalities to mass changes. Indeed, relying on assumptions consistent with those that NHTSA has previously relied on but from which it has now departed without explanation, the safety effects of retaining the standards are positive. Likewise, NHTSA has arbitrarily failed to explain its decision to apply mass reduction equally across the fleet, despite the extensive evidence outlined below that this assumption does not reflect the reality of how automakers achieve compliance.

4. NHTSA's Mass-Reduction Modeling Approach is Wrong

As discussed above, 97-99 percent of NHTSA's predicted reduction in fatalities from the proposed Clean Car Standards roll back is attributable to a projected reduction in vehicle travel, with only 1-3 percent attributable to all other factors including mass reduction technology to reduce GHG emissions and improve fuel economy. This raises the question: Will the technology of mass reduction used to comply with the current GHG and augural CAFE standards reduce vehicle safety, as NHTSA claims? The answer is no.

The primary reason for NHTSA's claim that mass reduction technology will decrease safety can be traced to a new modeling assumption that differs from all previous NHTSA and EPA safety analyses, as shown in Table 3. As discussed in subsection E, NHTSA has always concluded that applying more mass reduction to heavier vehicles such as pickup trucks, and less to lighter cars, results in either no change or a net reduction in fleetwide fatalities. It has embedded the assumption in previous safety analyses that vehicle manufacturers will apply mass reduction technology safely by favoring reductions from heavier vehicles. However, in this NPRM, NHTSA has adopted a new assumption that vehicle manufacturers may apply mass reduction to any size vehicle without regard to the safety implications of their decision.

NHTSA offers no factual evidence to support its new modeling assumption that removes any limits to how mass reduction is applied by vehicle manufacturers to various sizes and classes of vehicles, an assumption contrary to current and projected industry practice. The explanation offered by NHTSA is "the modeling assumed that mass reduction technology was available to all vehicles regardless of net safety impact".[40] We offer rationale and evidence that NHTSA's new modeling assumption is arbitrary and inconsistent with the underlying record evidence as well as an unexplained departure from its previous analyses. The agencies must therefore return to their original modeling assumption that vehicle manufacturers will apply more mass reduction to heavier vehicles than lighter vehicles. As we show below, this will result in a revised finding

[40] Preliminary Regulatory Impact Analysis, July 2018, page 1341.

that mass reduction technology used to comply with the current adopted and augural standards will be safe, and result in a lower fatality rate than the proposed roll back of the standards.

First, we examine how vehicle manufacturers have applied mass reduction since the GHG and fuel economy standards first went into effect, and how they will apply mass reduction over the upcoming years.

As mentioned in subsection E above, the 2015 report from the National Research Council of the National Academies stated "It is the committee's view that mass will be reduced across all vehicle sizes, with proportionately more mass from heavier vehicles."

A recent study from the Aluminum Association confirms the Academies' finding[41]. Examining the aluminum content of new vehicles, a material used to reduce mass, illustrates how mass is being reduced. For example, the Association's study found that the aluminum content of a 2012 light truck was 18% greater than the aluminum content of a passenger car. However, with progressively more stringent GHG and fuel economy standards going into effect, by 2016, aluminum content of light trucks had increased to 45% greater than the aluminum content of cars, indicating preferential mass reduction has been applied to heavier vehicles. The Aluminum Association's assessment of 2020 models, for which designs were locked in at the time of the referenced study, confirms that greater mass reduction in light trucks compared to cars will continue. This trend is consistent with the agencies' original assumption, relied on for safety analyses over the past seven years, that mass reduction will be focused on heavier vehicles such as pickups and SUVs, and does not support NHTSA's new assumption that mass reduction will be used by vehicle manufacturers without consideration of the safety of the fleet as a whole.

Moreover, as the MMTC report discussed above points out, the heavier weight of light trucks provides more opportunity to reduce a specific amount of mass compared to a lighter passenger car, and the higher price of light trucks provides more opportunity to recoup the cost of lower mass components. This logic also supports the trend that vehicle manufacturers are applying more mass reduction to heavier vehicles.

Finally, vehicle manufacturers are aware of how NHTSA measures the impact on fatalities of mass reduction, so it should be expected that vehicle manufacturers have taken and will continue to take into consideration the safety implications of how they apply mass reduction across different size vehicles they produce. Even if NHTSA believes it cannot assure that vehicle manufacturers will act responsibly regarding the impact of their new vehicles on fleet-wide fatalities, it would be relatively simple for NHTSA to require each manufacturer to demonstrate, using NHTSA's fatality calculation methodology, that it has applied mass reduction to its cumulative sales of a model year's vehicles in a manner that will not contribute to a net increase in fatalities. This approach would be similar to how the manufacturers currently demonstrate compliance with the fleet average GHG and fuel economy standards.

---

[41] Drive Aluminum, Aluminum Content in North American Light Vehicles 2016 to 2028, Summary Report (July 2017), available at http://www.drivealuminum.org/research-resources/ducker2017/.

To verify our conclusion (and the agencies' prior conclusion) that mass reduction is safe, EDF has run the current NPRM model for the MY 1977-2029 GHG analysis, using NHTSA's unfounded new assumption of unfettered mass reduction among vehicle classes, and compared it to a run with a single change—the more logical and supportable assumption NHTSA has used consistently since the beginning of the decade, which assumes vehicle manufacturers apply more mass reduction to heavier vehicles in consideration of overall fleet safety.

Table 5. Mass Reduction Impact on Fatality Rate for NHTSA NPRM Model Runs for the MY 1977-2029 GHG Analysis

Modeling done by:	Modeling Assumption of How Mass Reduction is Applied	Fatality rate (per billion miles)	
		Current Stds.	Roll Back Stds.
NHTSA	No limits on mass reduction, as used in the NPRM analysis	8.670	8.668
EDF	Greater mass reduction applied to heavier vehicles (NHTSA 2016 TAR)	8.657	8.663

Table 5 illustrates two important findings. First, favoring the use of greater mass reduction on heavier trucks, and less on lighter cars—consistent with how manufacturers have actually applied these reductions—reduces the fatality rate of the fleet for both the current standards and the proposed rollback standards, as expected. This is shown in Table 5 by comparing the top row to the bottom row in either column. Second, and most importantly, the EDF analysis (bottom row) shows that proper use of mass reduction results in a lower fatality rate for the current standards and a higher fatality rate for the proposed rollback standards, which is the opposite of what NHTSA claims in the NPRM (top row). NHTSA should revise its analyses to properly reflect the safe application of mass reduction technologies, consistent with both the actual practice of manufacturers and past agency assumptions—and acknowledge in its final rulemaking that the rollback of current standards will increase the fatality rate.

G. EDF-Modified Runs of NHTSA's Model, with More Defensible Assumptions, Show That the Roll Back Will Slightly <u>Increase</u> the Fatality Rate and <u>Worsen</u> Safety

We showed above that even when using NHTSA's biased analytical assumptions, there are essentially no safety-related benefits under the 8-year Clean Car Standards roll back associated with either vehicle design or "fleet turnover." Between 97-99% of NHTSA's projected reduced fatalities under the roll back are simply due to lower vehicle miles traveled, and fatality rate is essentially unchanged. This leaves 1-3% of the projected reduced fatalities that could be associated with either vehicle design and/or "fleet turnover." This final section examines the underlying assumptions that drive this tiny remaining portion of NHTSA's projected reduced fatalities and includes EDF-modified safety runs with better alternatives for some of NHTSA's most indefensible assumptions.

Table 6 provides an overview of six key assumptions in the NHTSA NPRM analysis that affect fatalities and fatality rate, the mechanisms by which these assumptions impact NHTSA's results, a qualitative estimate of the magnitude of the relative impacts on NHTSA's projected fatalities and fatality rates, and EDF's treatment of these key assumptions (retaining in some cases, improving in others) in a series of EDF-modified safety runs using NHTSA's NPRM model.

One important point in Table 6 is that every safety-related assumption has a very small impact on fatality rate; i.e., they are all dwarfed by the much larger impacts of rebound and scrappage VMT on total fatalities.

Table 6. Key Assumptions That Affect Safety Metrics in NHTSA NPRM Analysis (from current standards to roll back)

Factor	Assumptions in NHTSA NPRM			EDF-Modified Safety Runs
	Mechanism	Impact on Fatalities	Impact on Fatality Rate	
Rebound	Higher fuel cost per mile = less new car VMT	Very large decrease as the model shows less VMT when driving costs more	Very small increase due to fewer miles by newer vehicles	Runs for 20% (NHTSA), 10% (EDF), and 0% (EDF)
Scrappage	Reduction of used car VMT unrelated to standards or to increase in new car sales	Very large decrease as the model reduces VMT from the fleet	Very small decrease due to fewer miles by older vehicles	Replace with EDF VMT Neutral Through MY 2029
Sales	Slightly higher sales	Small increase as the model adds vehicles and VMT to the fleet	Very small decrease due to more miles by newer vehicles	Keep NHTSA

Car-Truck Share	Higher car share and lower truck share	Small decrease as cars drive less than trucks per agencies' VMT schedules	Unclear, but extremely small	Keep NHTSA
Mass Reduction	Manufacturers oblivious to fleet safety impacts associated with mass reduction	Small decrease	Very small decrease	Replace with NHTSA 2016 TAR

The following six sub-sections will briefly discuss the issues raised in Table 6 and, most important, describe which NHTSA assumptions that EDF retains, and which we replace, in our modified safety runs.

1. Rebound

The concept of the rebound effect is that some consumers will drive more miles when fuel cost per mile decreases, and fewer miles when the fuel cost per mile increases. With respect to the Clean Car Standards, the theory is that standards will yield more efficient new cars that owners will choose to drive more, while the 8-year roll back will result in less efficient new cars that owners will choose to drive less. NHTSA acknowledges that rebound VMT involves consumer choice (and the benefit of increased mobility) and therefore is not properly attributable to the standards. Therefore, it certainly cannot be a justification for a roll back.

NHTSA uses a 20 percent rebound effect assumption in the NPRM. As Table 6 shows, NHTSA's rebound effect has a very large impact on total fatalities under the 8-year Clean Car Standards roll back. As a threshold matter, NHTSA does not include fatalities attributable to the rebound effect in its cost benefit analysis, a concession that such fatalities are not appropriately valued as direct costs of clean car standards and should be disregarded. Elsewhere, NHTSA projects that the rebound effect accounts for 7,300 of the total 15,600, or just under 50 percent, of the projected reduced fatalities under the MY 1977-2029 GHG analysis of the preferred alternative roll back.[42] On the other hand, because the rebound effect also results in approximately 900 billion miles less travel under the roll back[43], the impact of the rebound effect on the overall fatality rate is small. Under the 8-year Clean Car Standards roll back, the rebound effect decreases the proportion of new car VMT-to-used car VMT, and so it is likely that the rebound effect slightly increases the overall fatality rate under the roll back.

[42] 83 FR 43157, August 24, 2018, Table II-77.
[43] 83 FR 43352, August 24, 2018, Table VII-89.

NHTSA's assumed 20 percent rebound value in the NPRM is twice as high as that used by both NHTSA and EPA throughout multiple rulemakings and technical assessment reports during the seven years from 2010 to 2016.[44] It is also twice as high as the value recommended in a recent report by The Analysis Group, a comprehensive review of the economics literature on the rebound effect.[45] An excessively high rebound effect also illustrates a fundamental internal inconsistency within the NHTSA analysis—in its selection of an extremely high rebound effect, NHTSA inherently presumes that consumers base their decisions on how much to drive only on fuel costs/savings and completely ignore the impact of vehicle prices, while in its new vehicle sales module, NHTSA presumes that consumers only consider vehicle prices and completely ignore fuel costs/savings. These irrational assumptions render the agencies' rebound analysis arbitrary and capricious, and an erroneous justification for rolling back the standards. EDF has separately submitted comments jointly with Union of Concerned Scientists addressing NHTSA's errors with regard to the rebound effect.[46] EDF also supports comments submitted by Professor Kenneth Gillingham, critiquing NHTSA's extraordinarily high rebound-effect assumption.

In our EDF-modified runs that will be discussed below, we use three rebound assumptions: 1) the 20% rebound effect that NHTSA uses in the NPRM, 2) the 10% rebound effect that NHTSA and EPA had long used, and which EDF recommends for the final rule, and 3) a 0% rebound to show the impacts on fatalities and fatality rate when both scrappage VMT and rebound VMT are excluded.

2. Scrappage

In a spectacular modeling error, NHTSA assumes that American drivers who own older vehicles, unaffected by the standards, by changes in new sales, or by a new vehicle rebound effect, will voluntarily choose to "stay home" and drive about 900 billion fewer miles under the roll back than they would under the current Clean Car Standards.[47] A small amount of used car VMT would be expected to be displaced by the extra new car VMT due to a slight increase in sales that NHTSA assumes under the roll back, but the agencies have not modeled this connection. The

[44] 75 FR 25379, May 7, 2010; 77 FR 62716, October 15, 2012; 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, July 2016, page 10-9, https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF; Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, EPA, November 2016, page 3-8, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100Q3L4.pdf

[45] Vehicle Fuel-Economy and Air-Pollution Standards: A Literature Review of the Rebound Effect, Analysis Group (June 28, 2018), available at http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/ag_fuel_economy_rebound_effect_june_2018.pdf.

[46] See Comment of Environmental Defense Fund and Union of Concerned Scientists, *Re: Rebound Effect in NHTSA & EPA's Proposed Rule: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks*, 83 Fed. Reg. 42,986, submitted to Docket Nos. NHTSA-2018-0067, EPA-HQ-OAR-2018-0283 (Oct. 26, 2018).

[47] 83 Federal Register 43352, August 24, 2018, Table VII-89.

sales and scrappage models are completely separate. EDF modeling shows that approximately 90 percent of the 900 billion miles lower VMT projected by NHTSA for the used car fleet is "above and beyond" the small reduction in used car VMT needed to offset the higher new car VMT under the roll back compared to the current standards due to slightly higher sales projections.

NHTSA provides no rationale (and there is none) for why overall used car VMT would decrease well beyond the small reduction that might offset the increase in new car VMT due to a slight increase in sales, or why aggregate nationwide VMT would decrease above and beyond the reduction in new car VMT due to the rebound effect. In decades of rulemakings on emissions, fuel economy, and safety, EDF is not aware of any analyst, economist, or public commenter who has even suggested such a possibility, let alone tried to provide a credible rationale. NHTSA admits that the new scrappage module is not linked with the new sales module,[48] and that this lack of integration is almost certainly at the core of this substantial modeling error. It does not appear that there has been any peer review of the results of the NHTSA scrappage module. EDF provides a much more comprehensive critique of NHTSA's scrappage module in subsection I below. EDF also supports the comments submitted by New York University's Institute for Policy Integrity, addressing the fundamental flaws in the agency's scrappage model.

Table 6 shows, as with rebound, that the large decrease in VMT due to NHTSA's scrappage error directly accounts for a large portion of the projected fatalities under the roll back.

NHTSA chose not to explicitly identify the impact of its scrappage assumptions on total fatalities. For example, in one of its key tables, NHTSA groups scrappage with other impacts such as sales and car-truck share under the misleading heading "Sales Impacts" and states that this category accounts for 7,880 of the 15,600 projected reduced fatalities under the MY 1977-2029 GHG analysis.[49] As discussed above, EDF has replicated NHTSA's NPRM runs, and found that nearly all of these 7,880 reduced fatalities are due to the scrappage error. Accordingly, of the total 15,600 reduced fatalities projected by NHTSA, about half are due to rebound VMT reduction and about half are due to scrappage VMT reduction.

Again, as with rebound, the scrappage error only has a small impact on fatality *rate*, and the lower fatalities under the roll back are due to the lower VMT under the roll back. But, this small impact on fatality rate is in the other direction as rebound, and thus the scrappage error, by reducing used car VMT, increases the proportion of new car VMT-to-used (and less safe) car VMT, so the scrappage error slightly decreases the fatality rate under the roll back.

Though the scrappage model is fundamentally flawed, we wanted to make the minimum changes necessary to the NHTSA model and therefore made only incremental adjustments to the model to simply eliminate the large and inexplicable decreases in used-car VMT that the model produces (which we refer to as the "VMT-neutral approach") in an attempt to isolate the impacts this clear error has on NHTSA's safety analysis.

[48] 83 FR 43099, August 24, 2018.
[49] 83 Federal Register 43157, August 24, 2018, Table II-77.

EDF also made one other adjustment with respect to NHTSA's scrappage assumptions. Even though NHTSA refers to its model-year analysis as covering only model years 2017-2029, NHTSA actually allows its scrappage model to reflect the impact of MY 2030+ vehicles as well, which is inconsistent with its stated intention. EDF corrects this by only accounting for scrappage through MY 2029 vehicles to be consistent with NHTSA's stated intention of analyzing the impacts of standards through MY 2029.

Accordingly, as shown in Table 6, we use the VMT Neutral Through MY 2029 scrappage approach in all the EDF-modified safety runs.

It is important to emphasize that, as shown in Table 2 above, the combination of lower rebound VMT and lower scrappage VMT accounts for 97-99 percent of the reduced fatalities in NHTSA's NPRM model, using NHTSA's own assumptions, and these VMT-related reduced fatalities are not attributable to the roll back. Accordingly, all the remaining safety-related assumptions, combined, only affect the remaining 1-3 percent of fatalities.

3. Sales

Throughout multiple rulemakings and technical assessment reports over the previous seven years, NHTSA and EPA never tried to project the impact of the Clean Car Standards on new vehicle sales. There were two reasons for this: 1) no one has ever developed a consumer choice model for the car market that has been validated, and 2) the impact could go either way, given that the standards would result in higher new vehicle costs, but also higher vehicle fuel economy and therefore lower fuel costs, which would be attractive to vehicle purchasers (especially those financing their vehicle purchase, who would see savings from day one). In fact, in the 2016 TAR, the agencies stated that: "It is difficult, if not impossible, to separate the effects of the standards on vehicle sales and other characteristics from the impacts of macroeconomic or other forces in the auto market."[50] Despite these obvious and fundamental barriers, NHTSA has now included a sales module in its analysis.

NHTSA projects sales impacts based exclusively on changes in new vehicle technology costs. In the case of the roll back, because new vehicle technology costs will be lower, new vehicle sales are projected to rise. This is an incredibly simplistic approach, and ignores the many other factors that affect new vehicle sales. In particular, vehicles will be less efficient under the roll back, resulting in higher consumer fuel costs, and this important effect is totally ignored in NHTSA's analysis. In addition, NHTSA's approach is entirely inconsistent with (and does not account for) recent market trends—the Clean Car Standards have become increasingly stringent every year since 2012, and yet sales have been booming. U.S. auto sales have increased in all but one year since 2012, and the last three years (2015-2017) have been three of the four highest

---

[50] 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, Office of Transportation and Air Quality U.S. Environmental Protection Agency, National Highway Traffic Safety Administration, and California Air Resources Board, EPA-420-D-16-900, July 2016.page 6-1.

selling years in U.S. automotive market history.[51] And press reports suggest that 2018 is on pace to also be one of the highest sales years in history.[52] See Rykowski Report for more detail on the sales module.

NHTSA's NPRM model projects that new vehicle sales will increase slightly under the roll back relative to the Clean Car Standards. Because NHTSA's NPRM model does not integrate the sales and scrappage modules, the increase in sales under the roll back would slightly increase fatalities by increasing the vehicle stock and VMT. In the real world, however, an increase in new vehicle sales would slightly reduce fatalities as higher new-vehicle sales accelerate fleet turnover, meaning that there are more newer, safer vehicles entering the fleet and displacing older, less safe vehicles. Still, because the sales increase is relatively small, this sales effect only has a very small impact both on increasing fatalities and decreasing fatality rate under the rollback as shown in Table 6.

While there is no convincing rationale for why the Clean Car Standards rollback would increase new vehicle sales—in fact, recent empirical evidence suggests the opposite—in order to be conservative and minimize the changes in assumptions to only those that truly matter, EDF retains NHTSA's sales module in the safety runs that will be discussed below.

4. Car-Truck Share

NHTSA's NPRM sales module also includes a dynamic fleet share equation that projects changes in new car/new truck market shares compared to prior years. The agency appears to base these changes exclusively on the different fuel cost per mile values for new cars and new trucks. This leads to yet another major internal consistency within NHTSA's model, as changes in total car plus truck sales depend solely on vehicle price, ignoring fuel economy, while changes in new car and new truck shares depend only on vehicle fuel economy, ignoring vehicle price. In other words, NHTSA predicts that consumers will buy more light-duty trucks rather than cars under the current standards because the fuel economy improvement in the light-duty trucks is superior to that of the cars, even though the increase in cost of the light-duty trucks is higher than that of cars under NHTSA's analysis. NHTSA does not even stipulate this major internal inconsistency, let alone provide any rationale for it.

In its NPRM run, NHTSA projects that new car share will increase slightly and that new truck share will decrease slightly under the roll back. Since cars are assumed to drive fewer miles than trucks, this yields a small decrease in fatalities under the roll back. The impact on fatality rate is extremely small. Since car-truck share is part of the broader sales module that EDF is retaining

[51] Alliance of Automobile Manufacturers, Facts About Auto Sales, available at https://autoalliance.org/economy/facts-about-auto-sales/.
[52] Associated Press, US auto sales fell by 4 percent in the third quarter (October 4, 2018), available at https://www.boston.com/cars/car-news/2018/10/04/us-auto-sales-fell-by-4-percent-in-the-third-quarter.

in our modified safety runs to minimize changes to the NHTSA model, the car-truck fleet share is retained as well.[53]

5. Mass Reduction

As discussed above, NHTSA assumes that manufacturers will not take fleetwide safety considerations into account when they make their choices about the application of mass reduction technology. EDF believes that manufacturers will take safety considerations into account, and as discussed above, there is practical evidence that manufacturers have in fact done so with respect to the use of lightweight materials such as aluminum.

As shown in Table 6, EDF recommends that NHTSA reject its assumption that manufacturers will refuse to take fleetwide safety considerations into account in the application of mass reduction technologies and instead return to its own assumptions from the 2016 TAR.

The NHTSA 2016 TAR mass reduction approach is based on the agencies' safety assessment of GHG and fuel economy standards in the draft Technical Assessment Report (TAR) for the EPA Midterm Evaluation[54], issued in July 2016. In the TAR, the agencies adopted a maximum limit of mass reduction in their technology selection models for each vehicle category—20% for light trucks, CUVs and minivans (for example, 1000 pounds reduction for a pickup), 7.5% for small cars (218 pounds), and 10% for medium cars (268 pounds)—following the same principle used in prior analyses that safety is improved when greater mass reduction is applied to heavier vehicles compared to lighter vehicles. EDF uses these same limits in our modified safety runs below.

6. EDF-Modified Safety Runs with NPRM Model

As summarized in Table 6, for EDF's modified safety runs with NHTSA's NPRM model, we retain NHTSA's assumptions for three of the six safety-related assumptions (sales, technology cost, and car-truck share), add two additional rebound scenarios (adding 10% and 0% rebound, in addition to NHTSA's 20% rebound), and replace two of NHTSA's assumptions (scrappage and mass reduction). The general principle was to make changes to those assumptions and modules that are clearly in error and which have large impacts on the model safety outputs, and to retain other assumptions and modules that do have large impacts on safety outputs, even if we

[53] By retaining these assumptions, we do not endorse NHTSA's presumed car-truck fleet share. We retained the assumptions to minimize changes to the model that do not have first-order effects on the fatality numbers and rates.
[54] 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, Office of Transportation and Air Quality U.S. Environmental Protection Agency, National Highway Traffic Safety Administration U.S. Department of Transportation, and California Air Resources Board, EPA-420-D-16-900, July 2016.

consider them to be flawed, to minimize the number of changes. In other words, we did not try to make the model as good as it could be.

Table 7 identifies the specific EDF-modified safety runs using NHTSA's NPRM model for the MY 2017-2029 GHG analysis.

Table 7. Definition of EDF-Modified MY 1977-2029/GHG Runs with NHTSA NPRM Model

Row	NHTSA or EDF?	Model Input Assumptions		
		Rebound	Scrappage	Mass
A	NHTSA	20%	NHTSA NPRM	NHTSA NPRM
B	EDF	20%	NHTSA NPRM	NHTSA NPRM
C	EDF	20%	VMT Neutral Through MY 2029	NHTSA 2016 TAR
D	EDF	10%	VMT Neutral Through MY 2029	NHTSA 2016 TAR
E	EDF	0%	VMT Neutral Through MY 2029	NHTSA 2016 TAR

Rows A and B are included in Table 7 to facilitate comparison with previous tables in this section. Row A is NHTSA's NPRM model run for the MY 1977-2029 GHG analysis, which is also shown as row 2 in Tables 1 and 2 above. Table 7, row B is EDF's replication of NHTSA's NPRM model run and is also shown as row 3 in Tables 1 and 2. By definition, rows A and B both used all of NHTSA's safety-related assumptions.

EDF's modified safety runs are defined in rows C through E. The three EDF-modified safety runs replace NHTSA's horribly flawed scrappage module with EDF's VMT Neutral Through MY 2029 scrappage approach and replace NHTSA's unfettered mass reduction assumption with NHTSA's 2016 TAR approach. The three EDF-modified runs differ only by the rebound assumption—row C uses NHTSA's 20 percent rebound, row D uses EDF's 10 percent rebound, and row E uses a 0% rebound assumption.

Table 8 has the same rows as Table 7. Table 8, rows C through E, provide the quantitative results from the three EDF-modified safety runs for the MY 1977-2029 GHG analysis.

Table 8. EDF-Modified Runs with NPRM Model for MY 1977-2029 GHG Analysis Show Fatality Rates and Vehicle Safety Will Worsen Under the Roll Back

(negative = lower and positive = higher under the roll back)

Row	NHTSA or EDF Run?	Change--Current Standards to Preferred Alternative						Total Non-VMT Fatalities	Total Non-VMT Fatalities Per Year	Fraction of Highway Fatalities (%)
		Fatalities	Fatalities (%)	VMT (billion miles)	VMT (%)	Fatality Rate (per billion miles)	Fatality Rate (%)			
A	NHTSA	-15,680	NA	-1,790	NA	NA	NA	NA	NA	NA
B	EDF*	-15,644	-3.175%	-1,787	-3.144%	-0.003	-0.03%	-156	-5	-0.01%
C	EDF	-5,932	-1.400%	-731	-1.484%	+0.007	+0.08%	+356	+10	+0.03%
D	EDF	-2,606	-0.615%	-323	-0.656%	+0.004	+0.05%	+174	+5	+0.01%
E	EDF	+701	+0.159%	+83	+0.162%	+0.000	0	0	0	0

*NHTSA NPRM analysis replicated by EDF with additional output data not included in NPRM.

The first six columns of data in Table 8 show the change in absolute values and on a percentage basis for fatalities, VMT, and fatality rate going from the current standards to the rollback. The final three columns of data are provided to help the reader place the results in context. A negative value means that the value for the roll back is less than the value under the current standards.

For example, Table 8, row C retains NHTSA's 20 percent rebound assumption, but uses the much more realistic VMT-Neutral Through MY 2029 scrappage estimate and the NHTSA 2016 TAR mass reduction assumptions. As with NHTSA's NPRM run, there are fewer fatalities and lower VMT under the roll back, driven by the 20% rebound assumption. Both fatalities and VMT decrease by about 60%, relative to the NHTSA NPRM results in rows A and B, due to the use of the much more realistic scrappage approach. Most important, however, is that the decrease in VMT under the roll back is slightly higher than the decrease in fatalities, as reflected in the percentage reductions, so the overall fatality rate is higher under the roll back. The absolute increase in the fatality rate under the 8-year Clean Car Standards roll back is +0.007 fatalities per billion miles, for a +0.08 percent increase. This means that there would be a total of 356 additional non-VMT related fatalities under the roll back. NHTSA's model year analysis operates over at least 34 calendar years (i.e., calendar years 2017-2050), so the +356 fatalities represents approximately +10 non-VMT related fatalities per year. Given that there were 37,000 motor vehicle fatalities in 2017, dividing 10 by 37,000 shows that the increased non-VMT related fatalities would represent about +0.03% of all annual highway fatalities, or about three out of ten thousand. This is shown in the final column.

Row D reflects the 10 percent rebound assumption. The fatality rate increases by 0.004 fatalities per billion miles, or +174 total non-VMT related fatalities, or about +5 non-VMT related fatalities per year.

Rows C and D show that fatalities and VMT are lower under the 8-year preferred alternative rollback, relative to the current Clean Car Standards, for both EDF-modified safety runs. This is to be expected, of course, as long as there is a non-zero rebound effect assumption. EDF agrees with NHTSA's stipulation that rebound-related fatalities should not be attributed to the CAFE and GHG standards: "Increased driving associated with rebound is a consumer choice…If consumers choose to do so, they are making a decision that the utility of more driving exceeds the marginal operating costs as well as the added crash risk it entails…Only those safety impacts associated with mass reduction and those resulting from higher vehicle prices are directly attributed to CAFE standards."[55] Of course, the true safety metric, whichNHTSA has long used, is fatality rate.

Row E uses a 0 percent rebound, in order to isolate the safety-related impacts when both the scrappage and rebound VMT impacts are excluded. Both total fatalities and total VMT rise slightly, but the overall fatality rate is unchanged.

The most important conclusion from Table 8 is that under much more realistic and defensible assumptions for scrappage and mass reduction, the 8-year Clean Car Standards roll back will actually increase fatality rate and worsen vehicle safety under non-zero rebound assumptions, and will have no impact whatsoever under a 0 percent rebound assumption.

The negative impacts on vehicle safety for the EDF-modified safety runs in Table 8 are very small, with the fatality rate increases ranging from 0 to +0.007 fatalities per billion miles and the extra non-VMT related fatalities ranging from 0 to +356. These values are similar in magnitude, but opposite in direction, to the -0.003 fatalities per billion miles and -156 non-VMT related fatalities reductions in NHTSA's NPRM model run.

All of the data from this section, including both the NHTSA NPRM runs and the EDF-modified safety runs for the MY 1977-2029 GHG analyses, show that the overall impacts on fatality rate and non-VMT fatalities are extremely small, on the order of at most a few hundred over a 34-year period, or at most 10 per year. Whether a tiny decrease (as in the NHTSA NPRM runs), or a slightly higher but still very small increase (as in the EDF-modified runs), the bottom line is that both the Clean Car Standards and the 8-year roll back will affect total highway fatalities by less than 0.05 percent, which means that over 99.95 percent of highway fatalities will be unaffected.

[55] 83 FR 43107, August 24, 2018.

Another important contextual point is that there are statistical uncertainties in the crash data and methodology that underlie the NHTSA safety calculations. These uncertainties are far greater that the tiny fatality rate impacts shown in Table 8.

Any vehicle related fatality is a tragedy, of course, but it is clear that any safety impacts from the Clean Car Standards are truly needle-in-a-haystack, without any meaningful significance.

NHTSA's safety analysis is arbitrary and illegal for the following reasons:

1) NHTSA has used total fatalities, rather than fatality rate, which would provide a true measure of vehicle safety and to be consistent with NHTSA and DOT past practice. Fatality rate increases under the proposed roll back when the biggest flaws in the NHTSA model are corrected.
2) NHTSA relies on an absurd and totally indefensible scrappage model, which alone accounts for much of the ascribed safety impacts, and has several other important analytical flaws.
3) NHTSA assumes that the industry will ignore fleetwide safety in its application of mass reduction technology, abandoning without explanation its approach in the 2016 TAR.

H. NHTSA Ignores Increased Fatalities Under the Proposed Roll Back Due to Increased PM, NOx and SO_2 Emissions

In the NPRM, NHTSA inexplicably failed to include estimates of premature mortality under the roll back due to changes in emissions of criteria pollutants such as particulate matter (PM), nitrogen oxides (NO_x) and sulfur dioxide (SO_2).

EDF performed an analysis projecting premature mortality (or, in NHTSA's phraseology, fatalities) due to greater emissions of PM, NOx, and SO_2 associated with the proposed GHG standards roll back. This analysis was based on a modified NHTSA NPRM model run for the MY 1977-2029 GHG analysis. EDF's modified run corrected flaws concerning NHTSA's 1) use of an inflated rebound effect, 2) assumption that Americans will drive their used cars nearly a trillion miles less under the rollback, 3) assumption that automakers will voluntarily over-comply with the rollback standards, and 4) assumption that the additional gasoline needed to fuel the rollback's less efficient vehicles will be imported or refined from imported crude oil.

While the 10 percent rebound effect that EDF used in its modeling reduces estimated vehicle tailpipe emissions due to the lower new car VMT under the roll back, these tailpipe emissions reductions would be overwhelmed by much larger emissions increases under the roll back due to much higher levels of "upstream" emissions (oil exploration, drilling, production, and distribution, and gasoline refining and distribution), with the most significant factor being refinery emissions. Even though U.S. oil imports have been steadily decreasing and U.S.

gasoline imports are essentially zero[56], NHTSA assumed that only 50 percent of the extra oil under the roll back would be refined at domestic refineries[57], and of that domestic gasoline, 90 percent of that would be from imported oil. In short, NHTSA assumed that 95 percent of the extra gasoline would come from imported oil and 5% would come from domestic oil. To correct this obvious error, EDF assumes that all the extra oil and gasoline under the roll back would be provided from domestic sources based on recent market trends.

The net result is that while NHTSA projected that criteria emissions impacts would be mixed, with increases for some individual pollutants and decreases for others, EDF shows that there would be increases for every major criteria pollutant. For more detail on this analysis, see Rykowski Report.

Finally, EDF used an EPA assessment tool to project that there would be 4,800 to 10,800 cases of premature mortality under the roll back for the MY 1977-2029 GHG analysis.

EDF has shown that 97-99 percent of all NHTSA projected reductions in fatalities under the roll back are simply based on the unjustified assumption that Americans will choose to reduce their mobility and drive less under the roll back. As shown in Table 8 above, the total non-VMT-related fatality reductions under the roll back, even with the biases, flaws, and statistical uncertainty in the base NHTSA NPRM model, is 156 for theMY 1977-2029 GHG analysis. When EDF corrected for NHTSA's errors with respect to rebound, scrappage, and mass reduction, non-VMT fatalities ranged from zero to an increase of 356 under the roll back.

Accordingly, the 4,800-10,800 cases of increased mortality due to greater criteria emissions under the roll back dwarf any non-VMT related fatalities impacts. NHTSA's choice to ignore this adverse impact of its proposed roll back is clearly arbitrary and capricious.

I. NHTSA's Scrappage Model is Fundamentally Flawed and Yields Flawed Outputs

In the proposed rule, NHTSA develops and uses a scrappage model to determine the impacts of the current vehicle standards on the existing used vehicle fleet. According to NHTSA, the current vehicle standards increase new vehicle prices, thereby increasing the value of existing vehicles, which are substitute goods, which then leads to people holding onto their existing vehicles longer – in other words less vehicles scrapped. This leads to older, less safe vehicles staying on the road longer and increased fatalities.

We find NHTSA's scrappage model to be fundamentally flawed in many respects. First and foremost, NHTSA's scrappage model is completely disconnected from its sales model which makes no economic sense. New and used vehicles are substitute goods and the decision to buy a new vehicle is related to the decision to scrap an existing used vehicle. Yet NHTSA develops

[56] 2018 Annual Energy Outlook 2018, Department of Energy, Energy Information Administration, February 6, 2018, available at https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf.
[57] NHTSA/Volpe Model "Parameters File"

separate and unconnected models to estimate new vehicle sales and existing used vehicles remaining. NHTSA's failure to connect these models leads to nonsensical results such as the significant increase in overall fleet size and vehicle miles traveled (VMT) under the current vehicle standards. NHTSA's scrappage model also omits key input variables or factors that influence scrappage. In fact, when developing its model, NHTSA finds that the model over-predicts the final remaining share of a vehicle model year fleet and has to force its model projections to match observed historic data. NHTSA's validation of its model is also flawed and the input assumptions NHTSA uses are flawed as well, thereby yielding flawed outputs.

1. NHTSA's scrappage model is completely divorced from its sales model

The most fundamental flaw in NHTSA's vehicle scrappage model is its complete disconnection from the vehicle sales model – this means that the results of NHTSA's scrappage model make no economic sense whatsoever. Under NHTSA's logic, the number of new vehicles sold has no relationship to the number of existing vehicles scrapped. However, according to NHTSA's own logic, new and used vehicles are substitute goods so there must be a relationship between new vehicles sold and existing vehicles scrapped. Individuals who need to purchase a vehicle and decide not to buy a new vehicle because of higher new vehicle costs will instead buy an existing vehicle or hold onto their current used vehicle. In other words, the extent to which vehicles are scrapped will influence and be influenced by new vehicle sales.

Indeed, when the California Air Resources Board (CARB) examined the impact of increasing new vehicle prices as part of its 2004 proposal to reduce greenhouse gas emissions from motor vehicles, it included both the addition and deletion of vehicles in its CARBITS vehicle transaction choice model.[58] This allowed CARB to look at vehicle scrappage with replacement and the effect of higher new vehicle prices on vehicle replacement rates.[59] By contrast, NHTSA's model looks at vehicle scrappage in isolation of any replacement. This "non-replacement" scrappage is unsupported by any economic theory or literature. Indeed, none of the literature that NHTSA relies on supports the agency's assumption that higher vehicle prices will lead to non-replacement scrappage.[60]

Yet, according to NHTSA, this non-replacement scrappage results in a significant increase in the total number of vehicles on the road under the current vehicle standards.[61] NHTSA then assumes that each additional vehicle is driven a fixed average number of miles per year equivalent to the average VMT rate of a vehicle of the same age and style without adjusting the per-vehicle VMT based on fleet size increases. This inflates the total VMT and since NHTSA's estimates of fatalities under the current standards are a function of fleet VMT, this in turn substantially inflates the agency's estimates of fatalities.[62]

[58] NHTSA, Preliminary Regulatory Impact Analysis, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021-2026 Passenger Cars and Light Trucks at 1007.
[59] *Id.*
[60] *See* Comments of New York University's Institute for Policy Integrity submitted to this rulemaking docket ("IPI Comments").
[61] NHTSA, Preliminary Regulatory Impact Analysis, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021-2026 Passenger Cars and Light Trucks at 1008, 1063.
[62] *Id.* at 1424.

However, there is no reason to believe that the total overall demand for vehicle miles traveled, or driving, will change with or without the current vehicle standards. To the extent the current standards cause a shift from new vehicles to used vehicles or towards older rather than newer used vehicles, the relative amount of total driving by used versus new vehicles may increase. However, without significant changes to the demand for VMT, any non-rebound related increases will be offset by less driving of new vehicles. Indeed, in comments to NHTSA prior to publication of the proposed rule, EPA noted that with or without the vehicle standards, demand for VMT is unchanged other than through potential changes in the marginal cost of driving, which should already be addressed by the rebound effect.[63] In fact, if anything, an increase in the price of new and used vehicles could lead to individuals switching from driving their own vehicles to using public transportation, another substitute good.[64]

NHTSA's results showing a much larger overall vehicle fleet size and vehicle miles traveled under the current vehicle standards, outside of any rebound effect from cheaper driving due to fuel economy improvements, compared to no standards makes no economic sense. Yet, these nonsensical results are the main driver of the increased fatalities that NHTSA attributes to the current vehicle standards and its justification for rolling back those standards.

2. NHTSA's model omits key input variables or factors that influence scrappage

The decision to scrap a vehicle is influenced by the cost of operating and maintaining the vehicle.[65] The cost of operating or driving a vehicle depends on the price of gasoline and the vehicle's fuel economy. The cost of maintaining a vehicle is essentially the cost of repairs. While NHTSA includes the operating cost of a vehicle (a 'cost per 100 miles of travel' variable) in its scrappage model, the agencyfails to include the cost of maintaining or repairing the vehicle – a key variable that influences scrappage. NHTSA considers vehicle maintenance costs when developing its scrappage model but decides not to include maintenance costs in its model due to statistical insignificance or unexpected impacts on scrappage. For instance, according to NHTSA, including maintenance and repair in the model for vans and SUVs leads to a decrease in scrappage when maintenance and repair costs increase – a result that is opposite to what is expected.[66] This in itself is indication that the model is flawed. Excluding from a model a variable that is known to influence the outcome of the model because its inclusion yields counter-intuitive results is evidence that the model itself is flawed and cannot be relied upon. In fact, maintenance and repair costs have been identified in the literature as significant drivers of scrappage and NHTSA cannot simply disregard these costs.[67]

---

[63] E.O. 12866 Review Materials, File: "Email 5 - Email from William Charmley to Chandana Achanta - June 18, 2018" (June 18, 2018), https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453.
[64] *See* IPI Comments.
[65] Richard W. Parks, Determinants of Scrapping Rates for Postwar Vintage Automobiles, Econometrica, vol. 45, no. 5 (July 1977), p. 1099-1115. See also Franklin V. Walker, Determinants of Auto Scrappage, The Review of Economics and Statistics, Vol. 50, No. 4 (Nov. 1968), pp. 503-506; Antonio Bento, Kevin Roth, and Yiou Zuo, Vehicle Lifetime Trends and Scrappage Behavior in the U.S. Used Car Market (January 18, 2016); Alan Greenspan and Darrel Cohen, Motor Vehicle Stocks, Scrappage, and Sales (October 30, 1996).
[66] NHTSA, Preliminary Regulatory Impact Analysis, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021-2026 Passenger Cars and Light Trucks at 1035.
[67] *See* Richard W. Parks, Determinants of Scrapping Rates for Postwar Vintage Automobiles, Econometrica, vol. 45, no. 5 (July 1977), p. 1099-1115.

NHTSA's model also does not include interest rates or the cost of financing a vehicle, another variable which NHTSA acknowledges affects scrappage. NHTSA itself states that "[a]s the real interest rate increases so does the cost of borrowing and the opportunity cost of not investing. For this reason, it is expected that as real interest rates increase that vehicle scrappage should decline. Consumers delay purchasing new vehicles because the cost of financing increases."[68] Conversely, as real interest rates decrease, vehicle scrappage should increase. Yet, NHTSA chooses not to include interest rates in its model since inclusion of interest rates yields results that are opposite to what is expected – "as real interest rates increase, so does the scrappage rate" in NHTSA's model.[69] As discussed above, this is yet another indication that the model is flawed and cannot be relied upon.

In addition to excluding maintenance costs and interest rates, NHTSA's scrappage model does not explicitly use the actual used vehicle price or value of the used vehicle – the price variable that directly influences the decision to scrap a vehicle. Instead, NHTSA assumes that changes in new vehicle prices will ultimately be reflected in those for used vehicles and relies on a new vehicle price variable as a proxy for used vehicle price without ever evaluating the effect of new vehicle prices on the value or price of used vehicles.[70] In fact, Gruenspecht explained that the disadvantage of modeling scrappage as a function of new vehicle price and not the theoretically correct used vehicle price is that it may produce inaccurate results.[71]

Finally, NHTSA's 'cost per 100 miles of travel' variable for used vehicles that is used in the model to represent the operating cost of a used vehicle is based on initial average fuel economy values and does not account for any changes in average fuel economy of a model year cohort as it ages. NHTSA itself acknowledges that its model does not take changes in average fuel economy of a model year fleet into consideration. According to NHTSA, "[w]ork by Jacobsen & van Bentham suggests that these initial average fuel economy values may not represent the average fuel economy of a model year cohort as it ages."[72] Jacobsen & van Bentham find that the most fuel-efficient vehicles scrap earlier than the least fuel efficient models in a given cohort.[73] This means that the average fuel economy of a model year fleet will become less efficient as the vintage ages, which means it would become more costly to operate. In other words, NHTSA's model underestimates the relative 'cost per 100 miles of travel' for used vehicles, which in turn underestimates scrappage.

[68] NHTSA, Preliminary Regulatory Impact Analysis, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021-2026 Passenger Cars and Light Trucks at 1015.
[69] *Id.* at 1033, 1035, 1037.
[70] *Id.* at 1009.
[71] Howard K. Gruenspecht, Differentiated Regulation: A Theory With Applications to Automobile Emissions Control, Yale University (1982) at 93; *See also* IPI Comments.
[72] NHTSA, Preliminary Regulatory Impact Analysis, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021-2026 Passenger Cars and Light Trucks at 1014, 1033.
[73] *Id.*

3. NHTSA's model over-predicts the final remaining share of a vehicle model year fleet and NHTSA has to force its model projections to match observed historic data

When developing its scrappage model, NHTSA finds that its model's projections over-estimate the final share of a vehicle model year fleet that remains at the end of the fleet's lifetime. NHTSA finds that while its model fits the historical data of car and truck scrappage well, when used to project the scrappage of future model years, the model over-predicts the point of convergence for the final remaining share of the model year fleet.[74] For cars, NHTSA's model predicts the final share of a model year fleet remaining by age 40 to be around 8%, while the observed historical final fleet share is around 1%.[75] For vans and SUVs, the model predicts that the fleet converges to a final fleet share of approximately 11% when the observed final fleet share is around 2.5%.[76] And for trucks, the model predicts that the final fleet share converges to approximately 12%, which is significantly higher than the observed 2.5%.[77] For all body styles, the projected and historical trends appear to deviate after age 20.

To correct for this discrepancy between predicted versus observed scrappage, NHTSA has to force its model to converge by imposing an exponential decay function after age 20.[78] In other words, for vehicles beyond age 20, scrappage would depend on the share of the fleet remaining at age 20, as determined by the scrappage model, as well as the decay rate necessary to ensure that the final fleet share matches the final survival rate assumed for that vehicle class. So for example, for cars, NHTSA's model predicted the final fleet share for future model years to be around 8%, while observed historic final fleet share is around 1%. Once the decay function is added, the projections follow a similar pattern as historic observed data such that only 1% of the model year fleet is projected to remain by age 40. The fact that NHTSA has to force its model to converge is further indication that the model itself is flawed.

4. NHTSA's validation of its scrappage model is flawed

To test the validity of its scrappage model, NHTSA uses the model to forecast the total fleet size for years 2005 through 2015 to see how well its model predicts the fleet size for this period.[79] According to NHTSA, "[t]he last true population the scrappage model 'sees' is the 2005 registered vehicle population. It then takes in known production volumes for new model year vehicles, and dynamically estimates instantaneous scrappage rates for all registered vehicles at each age for CYs 2006 – 2015, based only on the observed exogenous values that inform the model (GDP growth rate, observed new vehicle prices, and cost per mile of operation), fleet attributes of the vehicles (body style, age, cost per mile of operation), and estimated scrappage rates at earlier ages."[80] NHTSA concludes that, except for the years of the recession which represent a significant shock to the size of the fleet, its model produces results within one percent of the actual fleet size.[81]

---

74 *Id*. at 1046.
75 *Id*. at 1047.
76 *Id*.
77 *Id*. at 1048.
78 *Id*. at 1046.
79 *Id*. at 1060.
80 *Id*.
81 *Id*. at 1060-1061.

NHTSA's validation of its model is flawed since it relies on the same data it used to derive the scrappage model as validation of the model's output results. As discussed in the Preliminary Regulatory Impact Analysis, NHTSA develops the scrappage model using historical vehicle and macroeconomic data from the years 1975 through 2015.[82] To validate its model, NHTSA then uses the model it derived using 1975 through 2015 data to predict outcomes for 2005 through 2015. In other words, NHTSA only conducts in-sample testing to validate its model. To properly validate and test the accuracy of the scrappage model, NHTSA should perform out-of-sample testing. In fact, the need for such testing is consistent with agencies' past analysis of scrappage. In its 2016 Proposed Final Determination, EPA rejected the use of a scrappage model because the analysis needed additional examination including out-of-sample validation.[83]

5. *The input assumptions NHTSA uses in its model are flawed*

Setting aside the development and derivation of the model itself, model output results are also influenced by model input assumptions – using incorrect inputs will yield incorrect outputs. In other words, to the extent that model input assumptions are flawed then the model output results will also be flawed.

This is specifically relevant with regards to the new vehicle price input assumptions that NHTSA uses in its scrappage model. As explained above, NHTSA uses a new vehicle price variable in its model to represent used vehicle prices. As discussed in more detail in Section III of our comments, the new vehicle price values NHTSA uses are artificially inflated due in part to arbitrarily high technology costs. The use of these inflated new vehicle price values in the scrappage model in turn leads to underestimation of scrappage and flawed output results.

II. EPA and NHTSA Must Properly Account for GHG and Non-GHG Emission Reductions and Health Impacts

A. EPA and NHTSA's claim that their preferred alternative would have negligible environmental and health impacts is inconsistent with the extensive existing record

Every recent analysis performed by EPA and NHTSA has consistently shown that the current MY 2025 GHG standards deliver substantial CO2 reductions and important non-GHG emission reduction co-benefits by reducing criteria and air toxic pollutants. The joint EPA/NHTSA Phase 2 Final Rule and supporting Regulatory Impact Analysis, the Draft Technical Assessment Report, California's Midterm Review, and a recent EDF analysis of the impacts of weakening the EPA Phase 2 GHG standards all show that the current GHG standards will reduce GHG

[82] *See Id.* at 1009-1016.
[83] EPA, Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation at A-43 (2016); *See* also IPI Comments.

emissions significantly and provide important non-GHG emission reductions as a co-benefit.[84,85,86,87,88]

Despite this extensive record, EPA and NHTSA have concluded in their August 24, 2018 proposal that their preferred alternative to rollback the current MY 2021–2026 GHG standards to MY2020 levels will result in a "relatively small" increase in CO2 emissions and would not "noticeably impact net emissions of smog-forming or other criteria or toxic air pollutants."[89] The remainder of this section will show that the Agencies' conclusions are based on an analysis that contains numerous errors and biased assumptions. We corrected these flaws and re-ran the VOLPE model. Our results, which we present below, show that EPA and NHTSA have 1) grossly underestimated the impact of their proposed rollback of the standards on GHG emissions and 2) mistakenly concluded that the non-GHG emission and associated health impacts are negligible.

B. Errors and biases in NHTSA's modeling that render the emission impact estimates incorrect and unusable

The underlying analysis that NHTSA used to justify its proposal to roll back the current GHG standards contains numerous biases, questionable assumptions, and outright errors which render the results unusable. EDF and many other stakeholders have highlighted and carefully documented many of these flaws contained in the NHTSA analysis. For purposes of this section on emission impacts, only four fundamental flaws will be discussed. (A more detailed discussion of these flaws can be found in Section I and Section III of these comments and in the appended Rykowski Report.) These flaws are blatant and when corrected substantially alter the conclusions regarding the impact of the rollback on emissions.

First, NHTSA's scrappage model projects that Americans will voluntarily reduce their driving between 1.5 and 1.8 trillion miles under the rollback and puts forth no credible rationale for this effect.[90] EDF is unaware of (and NHTSA has not identified) any outside expert or analysis that would support such an incredible outcome. This erroneous result, of course,

---

[84] EPA & NHTSA, 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule, 77 Fed. Reg. 62624 (Oct. 15, 2012) ("2012 Final Rule").

[85] EPA, Regulatory Impact Analysis: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards (Aug. 2012) ("2012 RIA"), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZI1.PDF?Dockey=P100EZI1.PDF.

[86] EPA, CARB, & NHTSA, 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 (July 2016) ("Draft TAR"), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF.

[87] CARB, California's Advanced Clean Cars Midterm Review (Jan. 18, 2017), https://www.arb.ca.gov/msprog/acc/mtr/acc_mtr_finalreport_full.pdf.

[88] Impacts of Weakening the Existing EPA Phase 2 GHG Standards, EDF Briefing (Apr. 2018), http://blogs.edf.org/climate411/files/2018/04/MTE-Relaxation-Impacts-Final.pdf.

[89] EPA & NHTSA, Notice of Proposed Rulemaking: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, 83 Fed. Reg. 42,986, 42,996-98 (Aug. 24, 2018) ("NPRM").

[90] NPRM, 83 Fed. Reg. at 43,351, Table VII-88; *id.* at 43,352, Table VII-89.

significantly distorts NHTSA's projection of the rollback's emission impacts. Namely, if cars drive less under the rollback, their emissions will be less. EDF corrected this error in the VOLPE model by replacing NHTSA's scrappage model with one that decreases used car vehicle miles traveled ("VMT") (under the rollback) to the level needed to offset increases in new car VMT due to higher new car sales (under the rollback).[91]

Second, NHTSA assumes in their Volpe model that 50% of the gasoline needed to fuel the less efficient vehicles under the rollback standards will be imported. They went further and assumed that 50% of the remaining fuel that is refined domestically would be produced from 90% imported crude oil. These assumptions are at odds with one of NHTSA's asserted bases justifying the proposal—that the U.S. is becoming self-sufficient in crude oil production.[92] Recent data from EIA's 2018 Annual Energy Outlook) and the latest EIA data for 2017 also show only 0.3% of total national consumption of refined fuel came from imports.[93][94][95] These assumptions effectively ignore the vast majority of domestic upstream emission impacts from crude oil production and refining, and significantly understate the domestic emission impacts of the rollback. In EDF's modeling, these assumptions were deleted and replaced with a more reasonable and defensible assumption that 100% of fuel saved under the current standards be refined from domestically produced crude oil.

Third, NHTSA projects significant and ongoing industry-wide over-compliance under the proposed rollback through MY 2032. In addition, NHTSA predicts about a 1% per year continued improvement in fuel consumption beyond MY2032. There is no basis or historical precedent to support NHTSA's claim that auto companies will over-comply with standards and it is inconsistent with the related Phase 2 final rule assumptions and detailed supporting rationale.[96] (See Section III of these comments and the Rykowski Report for a more detailed discussion of this issue.) In fact, auto companies themselves have been advocating for a relaxation of the program because they claim that the current standards create compliance difficulties. NHTSA cannot both credit these claims (which we believe are deeply flawed) and also assume that these same automakers will voluntarily decide to exceed the requirements under the rollback standards. NHTSA's over-compliance projections have the effect of narrowing the difference in fuel saved over time between the rollback and the current standards. This assumption both reduces and obscures the costs and emissions impact of the rollback when compared to the current standards and, most importantly, the Agencies failed to justify its legitimacy in the context of the current standards. Consequently, we eliminated the over-compliance and assumed that the auto companies would meet the standards.

---

[91] We provide a more detailed critique of the scrappage model in Section I and in the Rykowski Report.

[92] We have submitted separate legal comments critiquing this as an impermissible and unfounded rationale that does not support the rollback. See Joint Environmental Comments.

[93] *See* NPRM, 83 Fed. Reg. at 42993 ("[T]he global petroleum market has shifted dramatically with the United States taking advantage of its own oil supplies through technological advances that allow for cost-effective extraction of shale oil. The U.S. is now the world's largest oil producer and expected to become a net petroleum exporter in the next decade.").

[94] Energy Information Administration (EIA), Frequently Asked Questions: How much gasoline does the United States consume? (last updated Aug. 31, 2018), https://www.eia.gov/tools/faqs/faq.php?id=23&t=10.

[95] EIA, Annual Energy Outlook 2018 (Feb. 6, 2018), https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf.

[96] *See* 2012 Final Rule, 77 Fed. Reg. at 62,483-44; 2012 RIA at 3-18 to 3-23.

Finally, NHTSA increased the rebound level from 10% to 20% in its NPRM analysis. The rebound effect is intended to capture how consumers respond to fuel economy improvements. That is, consumers of new vehicles will drive more miles when fuel cost per mile decreases, and less when fuel cost per mile increases. NHTSA's doubling of the rebound effect is inconsistent with the rebound effect used in all of the Agencies' analyses over the last seven years and most recently in the Draft TAR.[97] In addition, the use of a 20% effect runs counter to recent literature reviews that conclude that the appropriate rebound effect is 10% or less.[98] NHTSA's use of a 20% rebound effect overstates increases in vehicle VMT and fuel use which in turn overstates vehicle and upstream emissions. To correct this flawed assumption, EDF modeling returns to the use of a 10% rebound effect.

EDF incorporated the four corrections identified above into the VOLPE model and re-ran the model to determine the GHG and non-GHG emission and health impacts of NHTSA's proposed rollback. For purposes of this analysis, only the NHTSA model runs for its GHG analysis were critiqued and revised. The results from these runs are presented below and are more accurate and defensible as compared to NHTSA flawed modeling results. Furthermore, EDF modeling results show that NHTSA's emissions assessment misrepresents the true impacts of the proposed rollback because of its systematic use of biased assumptions and modeling methods identified above. As a consequence, NHTSA has produced arbitrary and fatally flawed estimates of the impacts of the proposed rollback that are unusable.

1. GHG emission impacts of the rollback are significantly higher than NHTSA and EPA claim

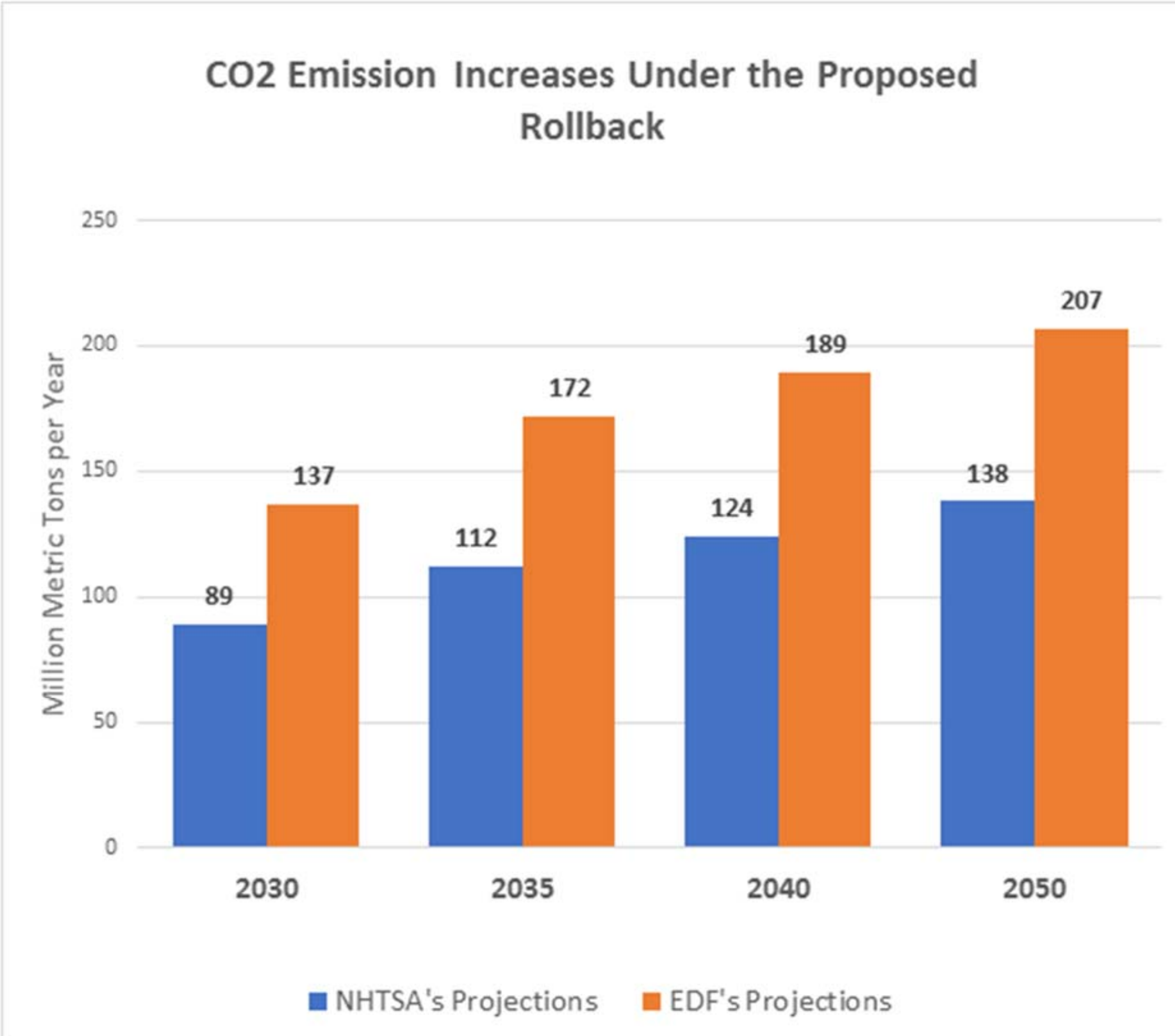
Using the four VOLPE model adjustments described above, the projected CO2 emission impacts the proposed rollback of the standards to MY2020 levels relative to the current standards were determined. The results of EDF's analysis are shown below graphically below.[99] For comparison, the CO2 emission impacts of the rollback using NHTSA's published version of the VOLPE model are also presented.[100] The EDF modeling results clearly show that the NHTSA estimates the CO2 impacts of the proposed rollback are significantly underestimated. In fact, EDF results show that the impacts of the rollback are about 50% larger than NHTSA is claiming in their proposal for all of the model years analyzed.

[97] Draft TAR at 10-10 to 10-20.

[98] Greene, D., Rebound 2007: Analysis of U.S. light-duty vehicle travel statistics, Energy Policy (2010), doi:10.1016/j.enpol.2010.03.083; *see* Comment of Environmental Defense Fund and Union of Concerned Scientists, *Re: Rebound Effect in NHTSA & EPA's Proposed Rule: The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks*, 83 Fed. Reg. 42,986, submitted to Docket Nos. NHTSA-2018-0067, EPA-HQ-OAR-2018-0283 (Oct. 26, 2018).

[99] Rick Rykowski, Supporting Report for Environmental Defense Fund Comment, *Review of the Agencies' Technical Analysis Supporting the SAFE Vehicle NPRM* (Oct. 2018) ("Technical Analysis Review for EDF").

[100] Compliance and Effects Modeling System, The Volpe Model, NHTSA (2018 version) https://www.nhtsa.gov/corporate-average-fuel-economy/compliance-and-effects-modeling-system.



2. Criteria pollutant impacts of the rollback are significant and not negligible as NHTSA and EPA claim

EDF used the same VOLPE runs to assess the impacts of the proposed rollback on criteria emissions. The impacts for the key criteria pollutants – NOx, PM, VOC, and SOx – are presented below in graphical form for calendar years 2030, 2035, 2040, and 2050. A detailed explanation of the model runs and how the projections were derived can be found in the Rykowski Report Except for NOx emissions in 2025, the NHTSA's modeling results show that the rollback will increase NOx, PM, VOC, and SOx emissions for all of the years presented below. Even the Agencies acknowledged in the preamble that in 2035 "NOx, VOC, SO2, and PM2.5 increase" for their proposed rollback of the current standards.[101]

[101] NPRM, 83 Fed. Reg. at 43,330.

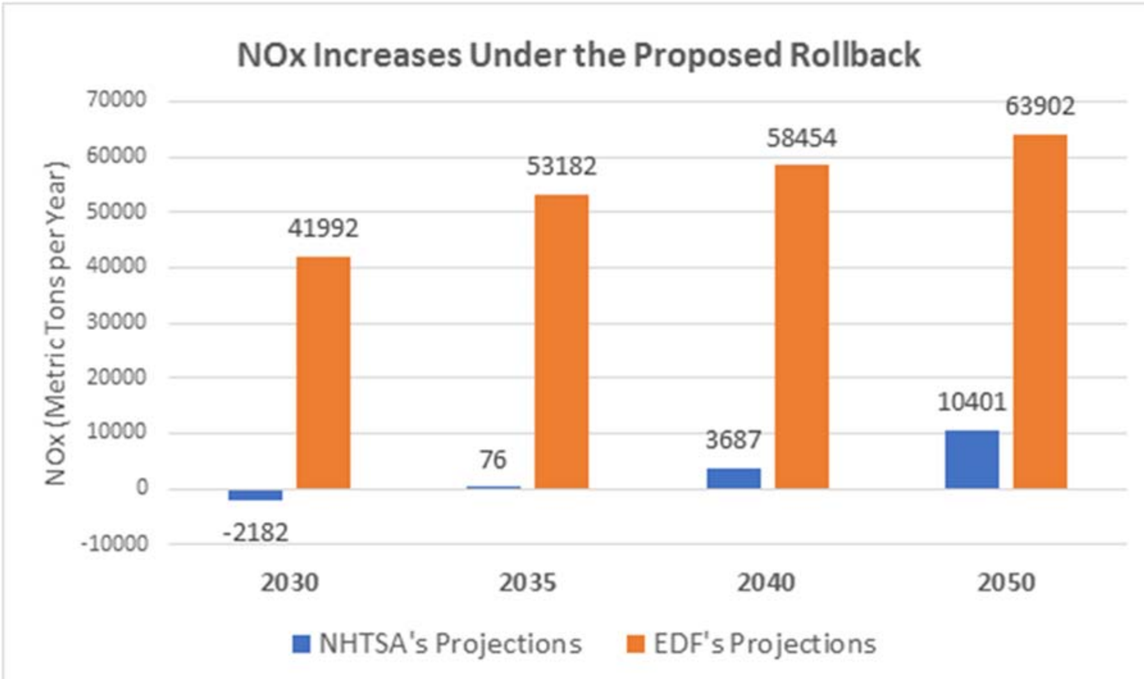
Most noteworthy are EDF's modeling results that show the Agencies have dramatically underestimated the actual impact of the rollback due to their use of flawed and biased assumptions. EDF results clearly illustrate that there will be significant increases in all of the pollutants for 2030 to 2050. These results are also consistent with recent analysis performed by EDF to assess the impact of a rollback. In its comments on EPA's August 21, 2017 request for comment on reconsidering the Final Determination, EDF estimated the impacts of a rollback using a recent version of EPA's Inventory Costs and Benefits Tool (ICBT) model.[102,103] This independent analysis arrived at the same conclusion as the analysis presented below which is based on the use of NHTSA's modeling tools.

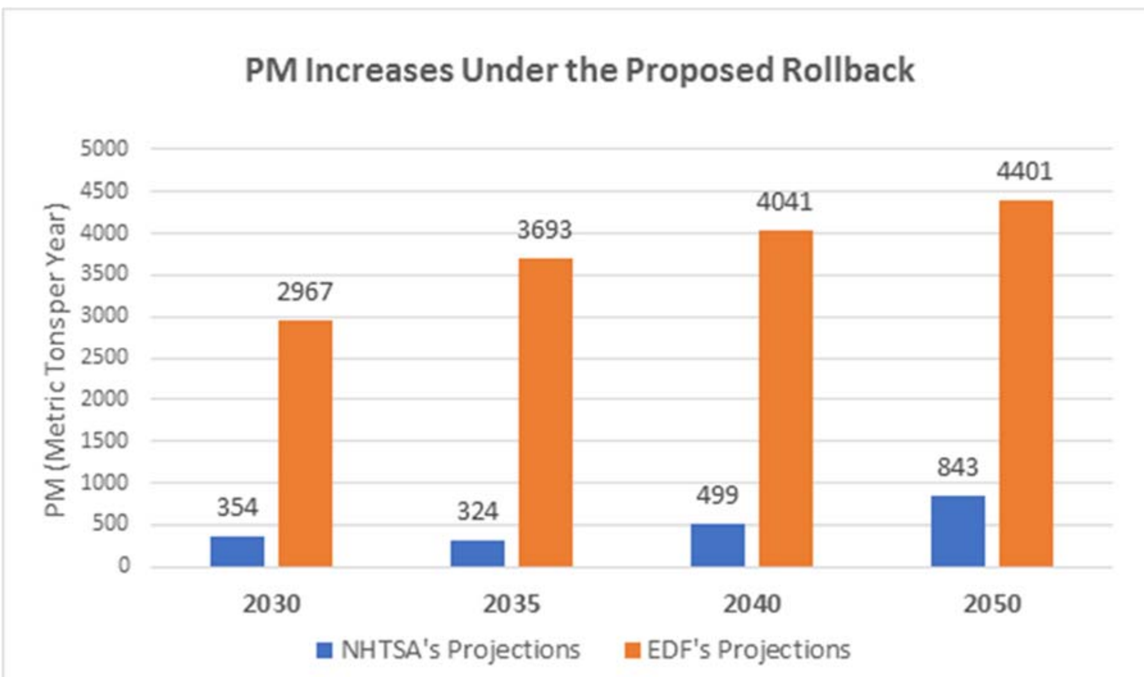
The Agencies' underestimation of the impacts is no small matter. The emissions increases under the rollback are underestimated by many orders of magnitude. These increases clearly demonstrate that there are important co-benefits associated with the existing standards and any rollback will be harmful to public health. Many of these important reductions that the current standards achieve will occur in already overburdened communities, therefore helping to address environmental justice concerns. In addition, the criteria pollutant reductions of the final MY2021-2025 standards are substantial and will be relied upon by states to attain the ambient air quality standards and to accommodate future emissions growth.

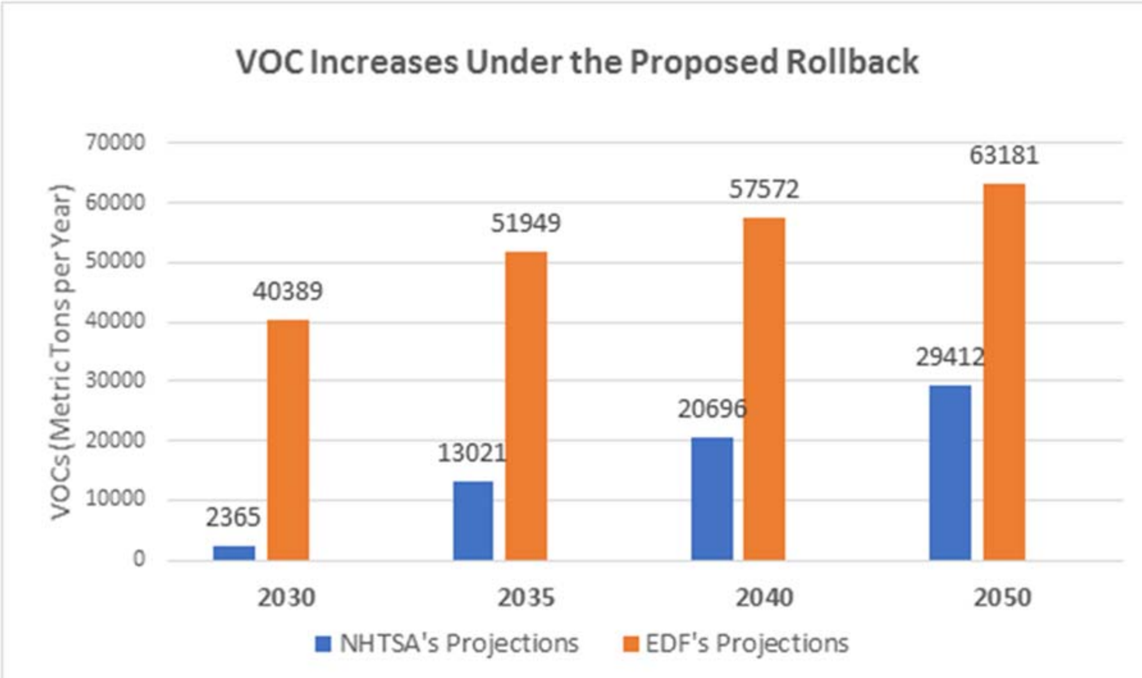
Compared to the recent light-duty Tier 3 rule, the emission increases attributable to the rollback in the 2030 calendar year will offset 24% of the VOC reductions expected from Tier 3, offset 13% of the NOx reductions that are expected from Tier 3, and offset 38% of the PM2.5 reductions that are expected from Tier 3.[104] These are significant amounts of health-harming criteria emissions that the current light-duty Phase 2 GHG standards will reduce in the form of co-benefits. The agencies' assessment of the emissions impacts of the proposed rollback utterly fails to properly and fully account for the climate pollution impacts and criteria emission health and welfare benefits. Moreover, the allowance of these emissions constitutes a clear and unlawful abdication of EPA's statutory duty to protect human health and welfare from health-harming pollution.

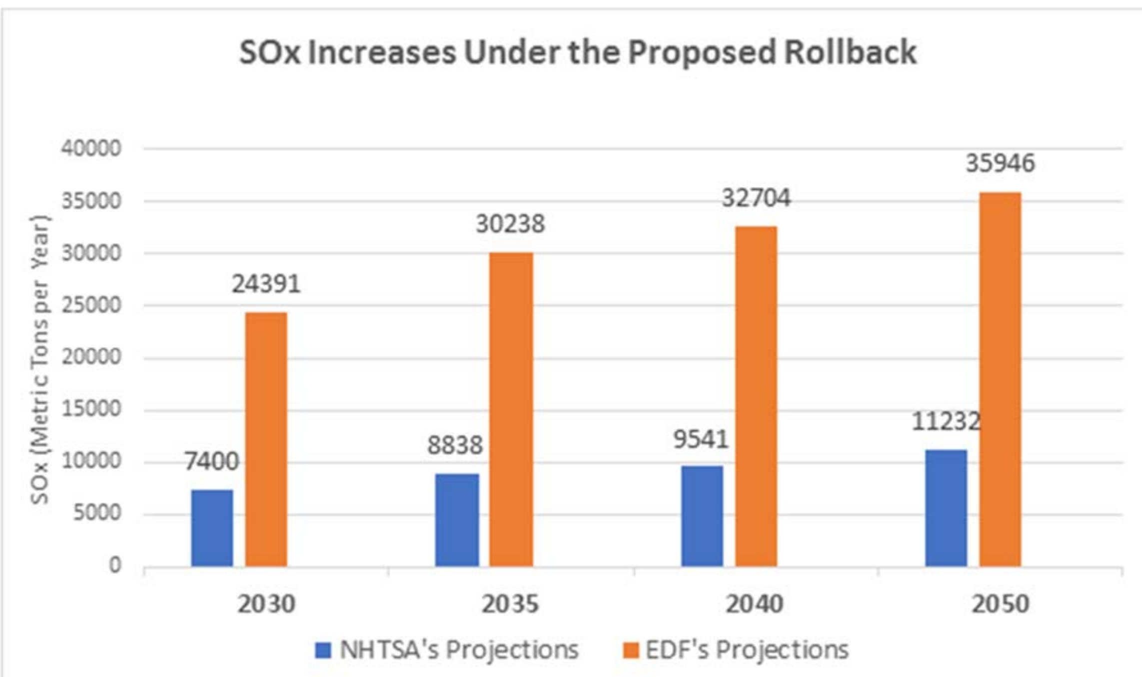
---

[102] Comment of Environmental Defense Fund, Clean Power Campaign, & Center for Energy Efficiency and Renewable Technologies, Re: 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, at 52, 97 (Oct. 5, 2017), https://www.edf.org/sites/default/files/content/final_edf_ld_epa_reconsideration_comments_10.5.17.pdf.
[103] Draft TAR at 12-47.
[104] EPA, Control of Air Pollution From Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards; Final Rule, 79 Fed. Reg. 23,414, 23,443 (Apr. 28, 2014).

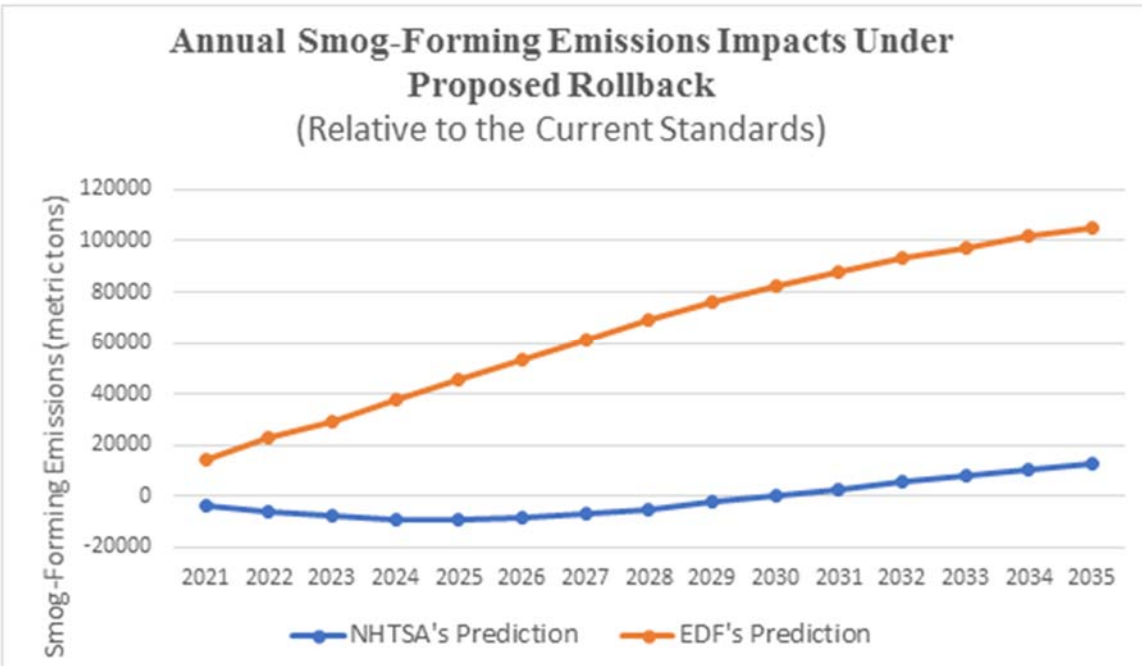

NOx Increases Under the Proposed Rollback
NOx (Metric Tons per Year)
70000
60000
50000
40000
30000
20000
10000
0
-10000
-2182
41992
76
53182
3687
58454
10401
63902
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections


PM Increases Under the Proposed Rollback
PM (Metric Tonsper Year)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
354
2967
324
3693
499
4041
843
4401
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections


VOC Increases Under the Proposed Rollback
VOCs (Metric Tons per Year)
70000
60000
50000
40000
30000
20000
10000
0
2365
40389
13021
51949
20696
57572
29412
63181
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections


SOx Increases Under the Proposed Rollback
SOx (Metric Tons per Year)
40000
35000
30000
25000
20000
15000
10000
5000
0
7400
24391
8838
30238
9541
32704
11232
35946
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections

Since NHTSA has drastically underestimated the impact of the proposal on emissions of ozone precursors (i.e. VOC and NOX), they have mischaracterized the impact of the rollback on ozone formation. The graph below is similar to the one the Agencies presented in the preamble to show that the rollback had a "negligible environmental impact."[105] When EDF added the results from its assessment, the graph starkly illustrates that the true impacts, for smog-forming emission impacts in this case, are significant and grow over time.

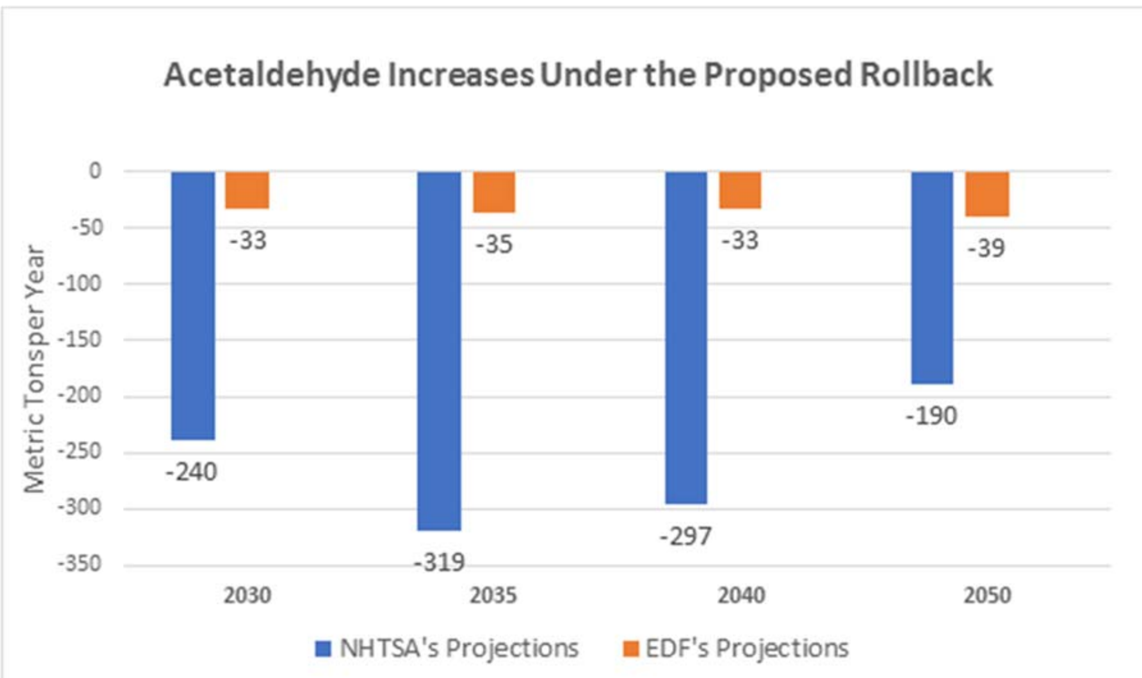


3. Key air toxic emissions impacts are higher than NHTSA and EPA claim

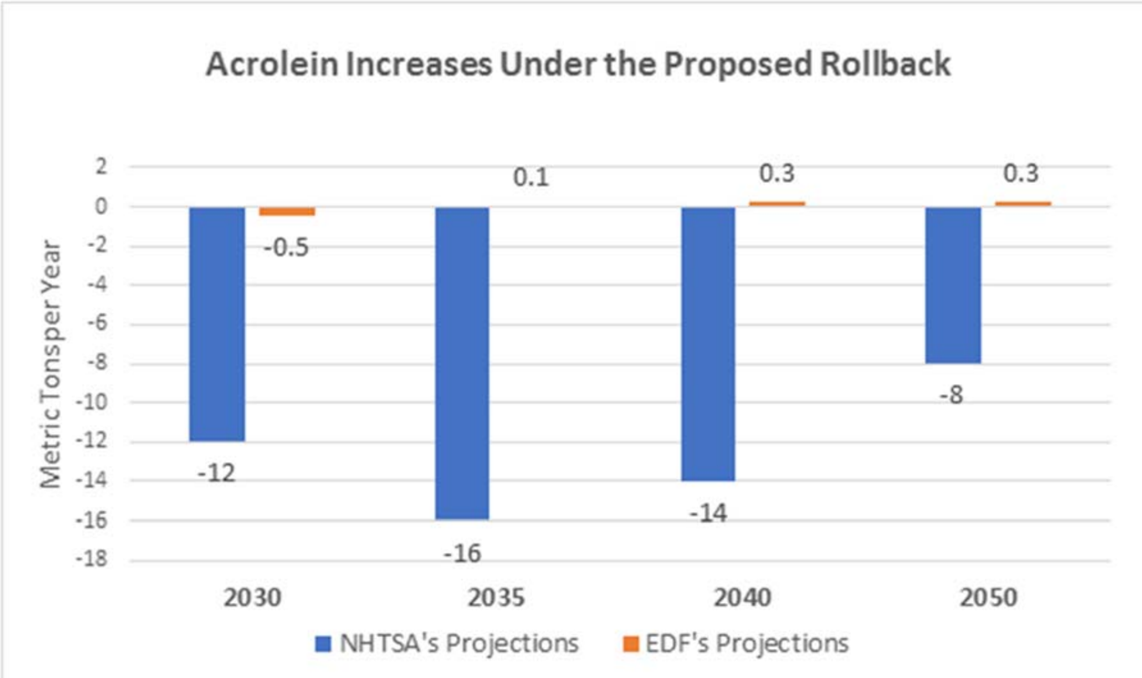
Finally, the EDF modeling assessment also examined the impact of the rollback on several important air toxic pollutants which is described in more detail in the Rykowski Report. The following graphs compare the impacts over time of the rollback compared to the current standards for acetaldehyde, acrolein, benzene, 1,3 butadiene, and formaldehyde. The Agencies' projections show that there are decreases in all of these toxic pollutants which has led them to conclude that the rollback will have a beneficial impact on air toxics.[106] However, this conclusion is wrong because of the flawed modeling runs and their results the Agencies relied upon.

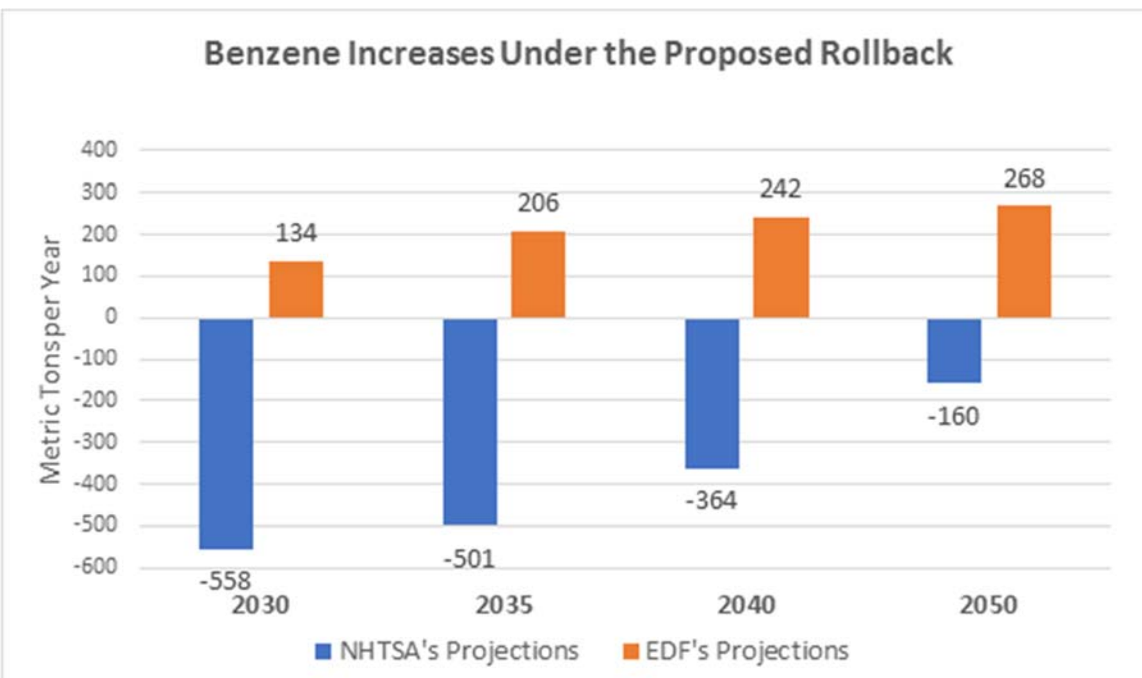
[105] NPRM, 83 Fed. Reg. at 42,996.
[106] NPRM, 83 Fed. Reg. at 43,332-34.

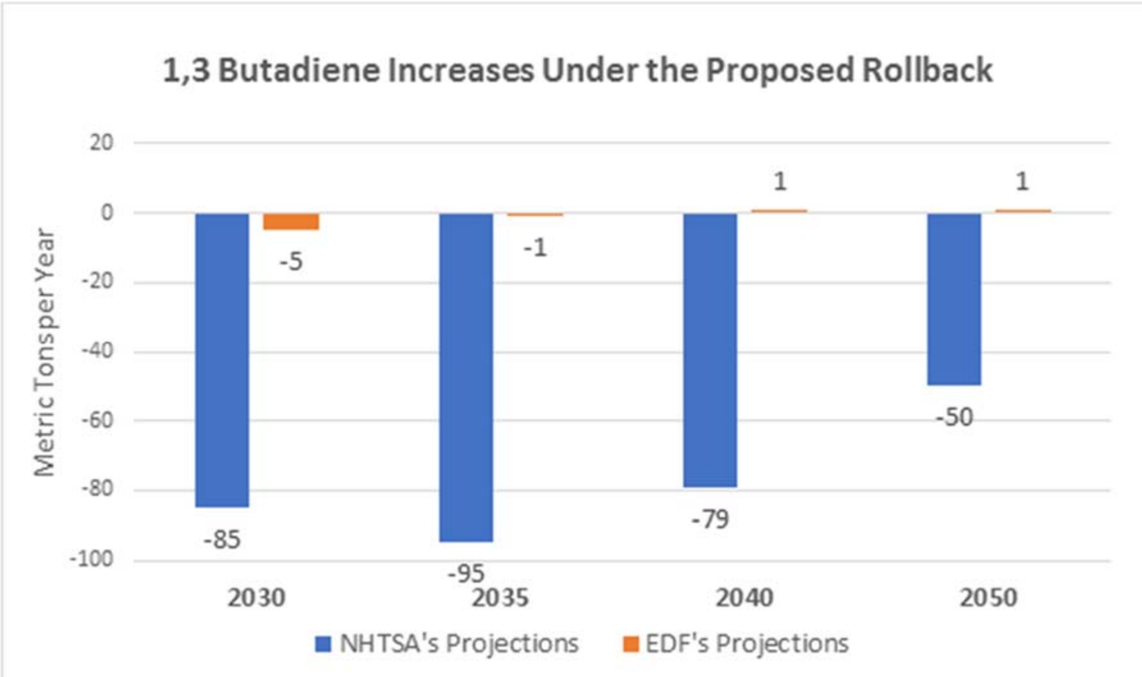
As was done for CO2 and criteria pollutant assessments, EDF corrected these errors. One of these errors discussed above involves NHTSA's arbitrary increase in the rebound effect from 10 to 20%. NHTSA and EPA concluded that their rebound assumptions are the main reason for the air toxics benefits. In fact, the Agencies admit in the preamble that this result was caused by their VMT, rebound, and upstream emission assumptions.[107] EDF's model results, which are based on more defensible assumptions, are at odds with NHTSA's and EPA's conclusions. For all of the air toxic pollutants presented below, the EDF projections show either insignificant effects or increases attributable to the proposed rollback. This result is consistent with all previous assessments performed by NHTSA and EPA. In no case do the EDF projections support a conclusion that the rollback reduces air toxic emissions.

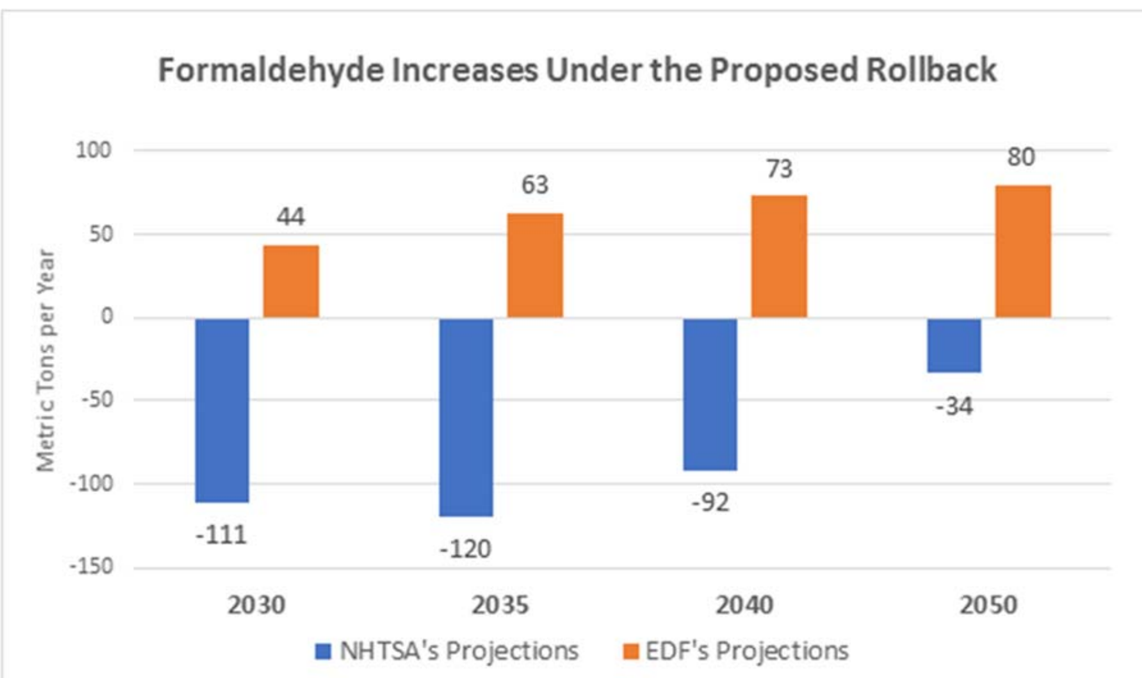


[107] NPRM, 83 Fed. Reg. at 43,332.


Acrolein Increases Under the Proposed Rollback
Metric Tonsper Year
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-12
-0.5
0.1
-16
0.3
-14
0.3
-8
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections


Benzene Increases Under the Proposed Rollback
Metric Tonsper Year
400
300
200
100
0
-100
-200
-300
-400
-500
-600
-558
134
-501
206
-364
242
-160
268
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections


1,3 Butadiene Increases Under the Proposed Rollback
Metric Tonsper Year
20
0
-20
-40
-60
-80
-100
-85
-5
-95
-1
-79
1
-50
1
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections


Formaldehyde Increases Under the Proposed Rollback
Metric Tons per Year
100
50
0
-50
-100
-150
-111
44
-120
63
-92
73
-34
80
2030
2035
2040
2050
NHTSA's Projections
EDF's Projections

C. Health impacts of rolling back the current GHG standards are consequential

In order to put the adverse criteria emission impacts into perspective, EDF used EPA's regulatory assessment tool to translate the emission impacts due to a rollback into mortality and morbidity health impacts and to calculate the monetized value of those impacts. The assessment tool EDF used for this analysis is described in detail in EPA's Technical Support Document titled Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors."[108] A detailed description of EDF's application of this tool can be found in the Rykowski Report.

EDF's assessment was only performed for calendar year 2030, but similar results would be expected for other years since the health impacts and their monetization is roughly proportional to tons of emissions. Table 1 below presents the results of EDF's analysis and shows 1) the monetized value of mortality and morbidity and 2) the specific mortality and morbidity impacts. Moreover, this analysis is conservative because it does not monetize benefits relating to reductions in ozone-precursors, where premature mortality is among the associated health effects. 80 Fed. Reg. at 65308-09 (Oct. 26, 2015)

Table 1 - Effect of the Proposal on PM2.5-Related Health Impacts in 2030 (Derived using EPA Regulatory Analysis Tool)	
Monetized Value of Health Impacts: Mortality and Morbidity ($2016 million)	
3% discount rate	$4393-$9802
Mortality and Morbidity Impacts	
Premature Mortality	440-982
Respiratory emergency room visits	1,195
Acute bronchitis	3,761
Lower respiratory symptoms	48,467
Upper respiratory symptoms	68,586
Minor Restricted Activity Days	1,832,427
Work loss days	310,022
Asthma exacerbation	68,802
Cardiovascular hospital admissions	908
Respiratory hospital admissions	743
Non-fatal heart attacks (Peters)	2,818
Non-fatal heart attacks (All others)	305

[108] Technical Support Document, "Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors," U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711, January 2013.

This summary table above shows that the health impacts and their valuation are important. The two numbers in red are of particular note. First, the premature mortality estimates for calendar year 2030 is 440 to 982 incidences. Second, the monetized value of the mortality and morbidity impacts is $4.4 to 9.8 billion.

In addition to analyzing the health impacts for calendar year 2030, EDF also calculated the cumulative PM-related health impacts from 2017 to 2050 and the results are presented in Table 2 below. It should be noted that the damage functions used to calculate the health impacts were applied conservatively and as a consequence the impacts in the table are likely on the low side. Please see a more detailed description of EDF's methodology in the Rykowski Report.[109] These results show that the cumulative adverse health impacts are stunning. In particular, premature mortality attributed to the rollback is far greater than NHTSA's flawed safety-related fatality projected benefits when expressed on a cumulative basis.[110] The cumulative 14,501-32,362 premature mortality incidences translate into dollar damages of $89 to 197 billion and were totally ignored by the Agencies.

Table 2: Cumulative Effect of the Proposal on PM2.5-Related Health Impacts from 2017-2050 (Derived using EPA Regulatory Analysis Tool)	
Premature Mortality	14,501-32,362
Respiratory emergency room visits	40,089
Acute bronchitis	126,057
Lower respiratory symptoms	1,623,910
Upper respiratory symptoms	2,299,464
Minor Restricted Activity Days	61,424,459
Work loss days	10,395,427
Asthma exacerbation	2,358,166
Cardiovascular hospital admissions	30,418
Respiratory hospital admissions	24,887
Non-fatal heart attacks (Peters)	94,492
Non-fatal heart attacks (All others)	10,222

Finally, EDF also calculated these health impacts over the lifetimes of MY 1977-2029 vehicles which was the same basis NHTSA and EPA used in their NPRM to express cumulative model year impacts for the rollback of the standards.[111] When expressed on this basis, the pollutant-related mortality incidences, which the Agencies did not provide anywhere in the proposal, are estimated at 4,832 to 10,780. To put this in perspective, NHTSA and EPA claim that the rollback would reduce fatalities by 15,700 (a conclusion which we elsewhere show to be

[109] Technical Analysis Review for EDF, at 86.
[110] *Id.*
[111] *Id.*

arbitrary and fundamentally flawed).[112] The monetized value of the health impacts is 43 to 96 billion dollars which would be a cost that is attributable to the rollback. The Agencies' estimate for these same pollutant damages is a cost of $1 billion.[113] By any measure, these impacts are extraordinary and were not properly characterized in the proposal. EDF results show that the proposal is fatally deficit in its attempt to assess the impact of the rollback on emissions and associated health effects.

D. NHTSA's emissions and health impact estimates are grossly underestimated and categorically wrong

In spite of an extensive record demonstrating that the current standards provide significant GHG emission reductions and important non-GHG emission and health benefits, NHTSA and EPA constructed flawed modeling assumptions that systematically distort and dramatically understate the estimated impacts of the proposed rollback of the current standards. EDF corrected these flaws, re-ran the NHTSA Volpe model, and produced a more accurate assessment that shows the Agencies grossly underestimated the GHG, non-GHG, and health impacts of the rollback across the board. In addition, the pollutant-related mortality estimates are staggering and represent many billions of dollars of health damages that are attributable to rolling back the standards.

EDF's revised assessment demonstrates that the Agencies, by erroneously understating the emission impacts of their proposal, are willing to sacrifice the health and welfare of Americans in order to pursue a misguided attempt to gut the current standards. The Agencies got it wrong in their assessment of the emission impact of their proposal and given the significance of these errors they should withdraw their proposal immediately.

III. The NHTSA Model is Systematically Flawed and Projects Dramatically Overstated Vehicle Technology Costs, Understated Fuel Savings, and Erroneous Net Societal Benefits

A. Summary

Over the course of seven years from 2010 through 2016, and in thousands of pages of detailed analyses published in various rulemaking and technical documents, NHTSA and EPA repeatedly used the same core modeling approaches, with incremental refinements, to assess and improve their projections of regulatory costs and benefits associated with the Clean Car Standards.

---

[112] *See* NPRM, 83 Fed. Reg. at 43,231, 43,352, Table VII-89.
[113] NPRM, 83 Fed. Reg. at 43,313.

In late 2017 and early 2018, NHTSA reversed course, fundamentally changing its modeling approach to incorporate multiple new, controversial, and unsupported changes. As a result, the experimental NHTSA NPRM model bears very little resemblance to the one that NHTSA used for the previous 15 years of CAFE rulemakings (or to the realities of how the automotive industry operates). Unsurprisingly, nearly all the experimental changes make the current Clean Car Standards look like they will entail greater costs and deliver fewer benefits, and accordingly, obscure the true and full extent of the harmful impacts associated with the agencies' proposal to roll back these standards. In particular:

- For the previous six years, NHTSA and EPA projected that the incremental MY 2025 vehicle technology costs for the current Clean Car Standards would be about $1,000—now NHTSA projects that the vehicle technology costs will be approximately <u>50 percent</u> higher for the CAFE standards and about <u>twice</u> as high for the GHG standards.
- For the previous six years, NHTSA and EPA projected that MY 2025 lifetime consumer fuel savings would be between $2,200 (current CAFE standards) and $2,800 (current GHG standards)—now NHTSA projects that the fuel savings will be fully <u>one-third</u> lower for both the CAFE and GHG standards
- For the previous six years, NHTSA and EPA projected that the final few years of the current Clean Car Standards would provide net societal benefits of approximately $100 billion—now NHTSA projects that the standards will entail net societal costs of about $200 billion, or a $<u>300 billion reversal</u>

EDF has successfully replicated NHTSA's NPRM model[114] results. Building from these results, we have analyzed a series of EDF-modified runs to demonstrate the fundamental flaws and biases in the NPRM model that lead to unreasonable, nonsensical, and arbitrary results, and certain results that undermine the grounds for the proposed rule.

<u>Technology Costs</u>

- EDF reduced the cost of every individual technology by 50 percent, yet the NHTSA model only projected a 40 percent overall vehicle technology cost reduction
- EDF deleted one technology from the model, and the NHTSA model predicted a <u>lower</u> and nonsensical vehicle technology cost even with fewer technology choices
- EDF adjusted the flawed core technology ranking algorithm to better reflect true cost effectiveness, and vehicle technology costs fell by $350
- EDF corrected a major bias in the NHTSA model that prohibits most manufacturers from using any high compression ratio technology packages, even in MY 2030 and beyond, and overall vehicle technology costs decreased by $600
- EDF cites a Union of Concerned Scientists critique that shows that the NHTSA model assumes that automakers will act irrationally by letting valuable GHG program credits expire, rather than using them to reduce their cost of compliance

[114] In this section, EDF refers to the NHTSA NPRM model. In the NPRM, NHTSA refers to its CAFE model, but that is confusing since it uses its model for both CAFE and GHG analyses. In the past, NHTSA has called it the Volpe model, since the model was developed, and is maintained, by the Volpe National Transportation Systems Center. While we refer to the NHTSA NPRM model for simplicity, the model is comprised of many individual modules on specific topics, which are sometimes integrated with other modules and sometimes are not integrated with other modules.

- EDF documents that the NHTSA model predicts that automakers will over comply with the current Clean Car Standards for several years, most remarkably in MY 2021-2023, years for which the agencies are proposing to completely roll back the standards

Fuel Savings

- EDF documents that the NHTSA model assumes that there will be industry-wide over-compliance under the roll back standards throughout the MY 2021-2032 timeframe as well as beyond MY 2032—there is no historical precedent for such sustained over-compliance, even at much weaker standards
- EDF documents that the NHTSA model "projects" aggregate, nationwide VMT levels for 2016 and 2017 that are about 20 percent lower than formal government estimates by EIA and FHWA

Cost/Benefit

- In EDF-modified runs which retain some NHTSA assumptions and change the most egregious flaws and biases, we show that the roll back would entail net societal costs of up to $300 billion, up to a $500 billion change from the NHTSA NPRM's estimate of $200 billion of net benefits based on a series of indefensible assumptions and model design features

This section clearly shows that the experimental and controversial changes that NHTSA made to its NPRM model exhibit systematic bias and yield a wide array of nonsensical results. Because these changes represent unexplained departures from the agencies' prior approaches and are disconnected from the underlying factual record, they are arbitrary and capricious. In addition, the agencies' reliance on this model to satisfy their statutory obligations under the Clean Air Act and EPCA is manifestly inadequate because the model systematically overstates costs and understates benefits of the current standards in a manner that frustrates the statutory purposes to reduce greenhouse gases and improve fuel economy.

B. Introduction

NHTSA[115] stipulates at the beginning of the Notice of Proposed Rulemaking (NPRM) that "this proposal is entirely de novo, based on an entirely new analysis."[116]

The decision to pursue "an entirely new analysis" is a marked departure from NHTSA's prior approach to assessing the costs and benefits of the Clean Car Standards. NHTSA has used its internal model for many individual CAFE rulemakings since 2001. Most recently, NHTSA used its model for two major rulemakings (the 2010 rule establishing the CAFE standards for MY

---

[115] EDF's comments apply to both NHTSA and EPA and to both proposed rules. However, in this section, EDF will generally refer to NHTSA, rather than NHTSA and EPA jointly, both for simplicity and for accuracy, as NHTSA unilaterally carried out the NPRM analysis without any EPA staff technical input. For example, in an EPA memorandum to the Office of Management and Budget dated July 12, 2018, a senior EPA staffer stated that "The Preliminary RIA is based on the independent technical assessment from DOT-NHTSA, and the document should reflect appropriately who has authored the Preliminary RIA. EPA's name and logo should be removed from the DOT-NHTSA Preliminary Regulatory Impact Analysis." A recently retired EPA staffer who worked on the Clean Car Standards has likewise cited "DOT's refusal to have a single technical working meeting with EPA staff since the 2016 election." https://thehill.com/opinion/energy-environment/400051-ignore-the-facts-only-way-to-justify-rollback-of-epas-greenhouse

[116] 83 FR 42987, August 24, 2018.

2012-2016,[117] and the 2012 rule setting final CAFE standards for MY 2017-2021 and augural CAFE standards for MY 2022-2025[118]), as well as Technical Assessment Reports (TAR) in 2010[119] and 2016.[120] Throughout the 2010-2016 timeframe, NHTSA made incremental refinements to its model to improve its reliability and reasonableness.

In 2017 and 2018, after 15 years of incremental refinement and improvement, NHTSA reversed course, making a large number of fundamental and controversial changes, purportedly in an effort to address newly-identified "problems" that NHTSA had not considered important over the previous 15 years. Individually, each of these experimental changes have the potential to significantly affect the reasonableness and magnitude of the model results. Acting in concert, these major changes have produced massive fluctuations in model outputs and, in some cases, results that are clearly nonsensical. The one theme that ties all these experimental changes together is that they drastically reduce the projected benefits and increase the projected costs of the current standards compared to the roll back.

Some of these experimental changes are discussed elsewhere in EDF's comments. For example, see Section I for a detailed analysis of the new and deceptive modeling assumptions regarding vehicle safety, Section I.I. for a critique of the indefensible scrappage module, and Section I.G.3.for an analysis of the questionable assumptions inherent in the sales module. More detail on all these flawed model features are in the attached Rykowski Report.

This section focuses on the NPRM model flaws and biases that contribute to three key model outputs: vehicle technology compliance cost, consumer fuel savings, and the cost/benefit analysis. The NPRM model projections for all three of these critical outputs are very different from NHTSA and EPA projections in the recent past, as shown in the tables below.

[117] 75 FR 25324, May 7, 2010.
[118] 77 FR 62624, October 15, 2012.
[119] ''Interim Joint Technical Assessment Report: Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2017–2025,'' issued jointly by EPA, NHTSA and CARB, September 2010, available at https://www.epa.gov/sites/production/files/2016-10/documents/ldv-ghg-tar.pdf.
[120] https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas#TAR

Table 1. Comparison of MY 2025 Vehicle Technology Cost Projections for the Current Standards

Analysis	Year of Publication	Source	Model Years	Cost	
				CAFE	GHG
Final Rule[121]	2012	NHTSA	2017-2025	$1,500	
Final Rule[122]	2012	EPA	2017-2025		$1,836
Final Rule/TAR[123]	2012/2016	EPA	2022-2025		$1,070
Draft TAR[124]	2016	NHTSA	2022-2025	$1,245	
Draft TAR[125]	2016	EPA	2022-2025		$894
Final Determination[126]	2017	EPA (Obama)	2022-2025		$875
ICCT Report[127]	2017	ICCT	2022-2025		$551
EPA-to-OMB: modified NHTSA model[128]	2018	EPA	2022-2025		$1,259
EPA-to-OMB: updated OMEGA[129]	2018	EPA	2022-2025		$935
Current NPRM[130]	2018	NHTSA	2021-2025	$1,850	$2,260

Table 1 is a comprehensive comparison of projections of vehicle technology costs to meet the MY 2025 standards. The various analyses are not always perfectly comparable, e.g., while most of the analyses addressed the MY 2022-2025 Midterm Evaluation timeframe, the projections in the first two rows from the 2012 Final Rule addressed a much longer timeframe from MY 2017-2025, and the projections in the final row covered one additional year, MY 2021.

[121] 77 FR 62660, October 15, 2012.
[122] 77 FR 62665, October 15, 2012.
[123] 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, July 2016, page 12-35. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF
[124] Ibid, page ES-9.
[125] Ibid, page ES-9.
[126] Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, EPA, January 2017, page 5. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100QQ91.pdf
[127] Efficiency Technology and Cost Assessment for U.S. 2025-2030 Light-Duty Vehicles, International Council on Clean Transportation, March 2017, https://www.theicct.org/publications/US-2030-technology-cost-assessment
[128] EPA Review of CAFE Model with "GHG" Settings, Meeting with Office of Management and Budget/OIRA, found at PDF page 113 (Apr. 16, 2018), available under the file titled "Email 5" at https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453
[129] Ibid.
[130] 83 FR 43323 and 43324, August 24, 2018.

Considering only the three rows with NHTSA projections for CAFE standards compliance, the NHTSA NPRM cost projection of $1,850 is far higher than previous NHTSA estimates. The NPRM estimate of $1,850 for the five model years 2021-2025[131] is significantly higher than NHTSA's 2012 Final Rule estimate, even though the latter accounted for almost twice as many model years of standards as the NPRM. NHTSA's NPRM estimate of $1,850 is also about 50 percent higher than its Draft TAR estimate of $1,245 just two years ago. The one additional model year covered by the NPRM estimate could explain part of this large difference, of course, but certainly cannot explain the entire 50 percent increase.

The comparison of vehicle technology cost projections for compliance with the GHG standards is even more stark. NHTSA's NPRM projection of $2,260 for MY 2021-2025 is, again, significantly higher than EPA's 2012 Final Rule projection, even though the latter reflects almost twice as many model years of control. There are six additional projections for GHG standards compliance for MY 2022-2025, with a range of $551-$1,259 (the high end of this range comes from an EPA staff analysis in which NHTSA's core NPRM model was used, but with modifications to correct specific errors). Even setting aside the lowest end of the range, a 2017 estimate based on a technology analysis by the International Council on Clean Technology, and accounting for the additional year of control reflected in NHTSA's NPRM estimate, Table 1 shows that the NPRM estimate of $2,260 for GHG compliance is about twice as high as multiple EPA analyses, most of which were performed in the last two years.

[131] The proposed alternative roll back also includes MY 2026, but since the augural CAFE standards for MY 2026 are no higher than for MY 2025, the addition of MY 2026 should have no meaningful impact on the incremental per vehicle technology cost.

Table 2. Comparison of MY 2025 Vehicle Lifetime Consumer Fuel Savings Projections for the Current Standards (3 percent discount rate)

Analysis	Year of Publication	Source	Gasoline Price in 2025-2030	Lifetime Fuel Savings	
				CAFE	GHG
Final Rule[132]	2012	NHTSA	About $4/gal	$6,300	
Final Rule[133]	2012	EPA	About $4/gal		$7,400
Draft TAR[134]	2016	NHTSA	About $3/gal	$2,200	
Draft TAR[135]	2016	EPA	About $3/gal		$2,800
Final Determination[136]	2017	EPA (Obama)	About $3/gal		$2,800
Current NPRM[137]	2018	NHTSA	About $3/gal	$1,470	$1,830

Table 2 shows a comparison of projections (all based on a 3 percent discount rate) of lifetime consumer fuel savings for a MY 2025 vehicle under the current Clean Car Standards. For fuel savings, future gasoline prices are, of course, a key factor. Accordingly, the first two rows, from the 2012 Final Rule, are not comparable with the remaining rows as fuel price projections at the time were around $4 per gallon for the 2025-2030 timeframe. But, setting the first two rows aside, NHTSA's lifetime consumer fuel savings projections for both its CAFE and GHG analyses are considerably lower than other, recent estimates using similar fuel price projections of about $3 per gallon for the 2025-2030 timeframe. NHTSA's NPRM projection for its CAFE standards analysis of $1,470 is 33 percent lower than its own estimate just two years earlier in its TAR analysis. NHTSA's NPRM projection for its GHG analysis of $1,830 is 35 percent lower than EPA estimates in both the TAR and the original Final Determination. The fact that the differences in lifetime consumer fuel savings between the NHTSA NPRM projections and historical projections for both its CAFE and GHG analyses are similar suggests that there were systematic changes in the NHTSA approach for calculating fuel savings in the NPRM.

While it is fairly simple to identify some of the experimental changes made by NHTSA, such as those that led to the major changes in how safety and used vehicle scrappage are treated, and to quantify their impacts on key outputs, the factors underlying the significant changes in NHTSA's vehicle technology cost and lifetime consumer fuel savings projections are harder to identify and quantify. There are three reasons for this. One, it appears that, for both technology cost and fuel savings, the large differences are due not to a major change in one key assumption or model design feature, but rather are due to multiple changes, each of which in isolation probably had a

[132] 77 FR 62661, October 15, 2012.
[133] 77 FR 62926, October 15, 2012.
[134] 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, July 2016, page ES-11. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF
[135] Ibid.
[136] Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, EPA, January 2017, page 7. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100QQ91.pdf
[137] 83 FR 43323 and 43324, August 24, 2018.

relatively small-to-medium impact, but in combination (nearly always acting in the same "direction") had a very large impact. Two, NHTSA has failed to provide adequate information about the changes it has made with respect to these issues and, when it does identify that it made a change, makes little attempt to quantify the impact of the change on important model outputs. Three, accordingly, stakeholders have had to run the NHTSA model numerous times, investing considerable time and effort in trial-and-error mode to attempt to reverse engineer the key drivers influencing NHTSA's dramatic reversal during the limited 60-day comment period. As we describe elsewhere in our joint legal comments, EPA's failure to transparently set forth this information frustrates meaningful comment and violates the agency's obligations under section 307 of the Clean Air Act, including to ensure the proposal sets forth "the methodology used in obtaining the data and in analyzing the data."

Table 3 provides a similar comparison of projections of net societal benefits (i.e., total societal benefits minus total societal costs) for the MY 2025 standards relative to a no-standards baseline assumed in each study. Again, the various analyses are not always perfectly comparable, e.g., while most of the analyses addressed the MY 2022-2025 Midterm Evaluation timeframe, the projections in the first two rows from the 2012 Final Rule address a much longer timeframe from MY 2017-2025, and the projections in the final row from the NPRM cover one additional year, MY 2021.

In terms of net societal benefits, Table 3 shows that NHTSA projections for the CAFE standards and EPA projections for the GHG standards throughout the 2012-2017 timeframe were extremely similar in projecting large net societal benefits. In the Final Rule establishing the standards for the nine years from MY 2017 through 2025, both NHTSA and EPA projected very large net benefits in the $450 billion to $480 billion range. In the 2016 TAR, both NHTSA and EPA projections were for net societal benefits of approximately $90 billion for the four years of standards from MY 2022-2025. The smaller net benefits projections were to be expected, given that the TAR only addressed four years rather than nine, and gasoline price projections in the TAR were lower than in the 2012 rulemaking. Finally, in the original EPA Final Determination of January 2017, EPA projected net societal benefits of about $100 billion for the MY 2022-2025 GHG standards.

The final row in Table 3 shows that NHTSA is now projecting remarkably different results. After many years of projecting that its CAFE standards would have extremely positive societal impacts (and with EPA projecting very similar positive impacts for the corresponding GHG standards), NHTSA is now projecting that the current MY 2021-2029 standards, if maintained, would have net costs of approximately $200 billion during those five years, or, stated differently, rolling back the standards to MY 2020 levels would have net societal benefits of about $200 billion.

Table 3. Comparison of Net Benefits Projections for the Current Standards (billions of dollars, 3 percent discount rate)

Analysis	Year of Publication	Source	Model Years	Net Benefits	
				CAFE	GHG
Final Rule[138]	2012	NHTSA	2017-2025	+476 to +483	
Final Rule[139]	2012	EPA	2017-2025		+451
Draft TAR[140]	2016	NHTSA	2022-2025	+88	
Draft TAR[141]	2016	EPA	2022-2025		+94
Final Determination[142]	2017	EPA (Obama)	2022-2025		+98
Current NPRM[143]	2018	NHTSA	2021-2029	-176	-201

C. NHTSA's Model Fails at its Core Function—to Accurately Predict the Most Cost-Effective Technology Pathways for Automaker Compliance

The agencies rely on the NPRM model to satisfy their respective obligations to establish "maximum feasible" fuel economy standards under the Energy Policy and Conservation Act and to set emission standards that protect public health under the Clean Air Act. So, consistent with those statutory charges, the NHTSA model must reasonably predict how manufacturers can apply new technology to meet future CAFE and GHG standards. If the model cannot do this successfully, then its vehicle technology cost projections will be wrong. And if the vehicle technology cost estimates are erroneous, then other critical projections which depend on vehicle technology cost—such as the sales and scrappage modules, which are primary determinants of fatality costs and non-fatal crash costs in NHTSA's model—will be wrong as well.

As shown in the NPRM summary tables on societal net benefits for the MY 1977-2029 CAFE and GHG analyses, NHTSA projects that the sum of the costs for just three categories alone—technology costs, non-rebound fatality costs, and non-rebound, non-fatal crash costs—represent about two-thirds of all projected gross benefits under the preferred alternative roll back, and

[138] 77 FR 62629, October 15, 2012.
[139] Ibid.
[140] 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, July 2016, page ES-12. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OXEO.PDF?Dockey=P100OXEO.PDF.
[141] Ibid, page ES-12.
[142] Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, EPA, January 2017, page 7. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100QQ91.pdf
[143] 83 FR 42998, 43310, and 43313, August 24, 2018. Note that the sign for net benefits under the current NPRM is reversed in Table 3, as Table 3 refers to the change from flat (proposed preferred alternative) levels to the current standards, while the NHTSA NPRM tables refers to the change in the opposite direction, from the current standards to flat levels beginning in MY 2021.

approximately double the projected net benefits (i.e., benefits minus costs) associated with the roll back.[144] Simply put, if the NHTSA model cannot reasonably predict how manufacturers will choose new technologies to meet future standards, then the agencies' reliance on the model to establish standards cannot satisfy their statutory mandates.

The automotive industry is a cost-driven business, and the most successful companies are those that can meet consumer demands and regulatory requirements in the most cost-effective manner. NHTSA stipulates this in the NPRM when it states that its model "adds technology, in response to the standards being considered, in a way that minimizes the cost of compliance."[145]

In order to demonstrate how the NHTSA model fails to apply technology in a cost-minimizing manner, EDF ran the NHTSA model in three very different ways, each time changing a single element while maintaining every other aspect of the base NHTSA model. Table 4 shows the NHTSA model projections for fleet wide vehicle compliance costs[146] for meeting the current Clean Car GHG Standards, for the NPRM base run as well as the three EDF runs. We show results for five model years, 2028-2032, when NHTSA suggests that the technology pathways have reached equilibrium. More details on the methodology used for these runs are provided in the Rykowski Report.

Table 4. Vehicle Compliance Cost Projections for Current MY 2025 GHG Standards Under NHTSA Model Base Case and 3 EDF Runs

Model Year	NPRM Base Run	EDF Run 1 50% Cost Reduction	EDF Run 2 Delete Cooled EGR	EDF Run 3 Change from 2.5-Year to 15-Year Fuel Savings
2028	$2,785	$1,682	$2,660	$2,353
2029	$2,815	$1,713	$2,678	$2,380
2030	$2,773	$1,683	$2,627	$2,398
2031	$2,730	$1,649	$2,584	$2,441
2032	$2,707	$1,620	$2,553	$2,486
Average	$2,762	$1,669	$2,620	$2,412

In EDF Run 1, we ran the NHTSA NPRM model with the single change of reducing the cost of each individual technology in the NHTSA model technology input file by 50 percent (columns P through AG of the worksheets for the 10 vehicle subclasses). With all other things being equal, a reasonable cost optimization methodology would continue to select the same technologies and yield an average vehicle compliance cost projection of $1,381, 50 percent lower than NHTSA's projection of $2,762. Instead, the 5-year average compliance cost projection only decreased from $2,762 to $1,669, or by 40 percent, and to a value that is $288 higher than expected. This is a nonsensical result as the NHTSA model picked a much less cost-effective set of technologies

[144] 83 FR 42986, August 24, 2018, Table VII-45 on page 43310 for CAFE and Table VII-51 on page 43313 for GHG.
[145] 43 FR 43002, August 24, 2018.
[146] Note that the cost values in Table 4 are total vehicle compliance costs, which include incremental technology costs plus additional incremental costs such as taxes, insurance, and maintenance, and accordingly the NPRM Base Run values in Table 4 are greater than the $2,260 "technology-only" value shown in Table 1 above.

under the "50 percent cost reduction" constraint, suggesting that there is a fundamental error in its cost optimization algorithm.

EDF Run 2 involved the base NHTSA model with the one change of deleting (or "skipping" in NHTSA's terminology) cooled exhaust gas recirculation 1 (CEGR1) technology. Since this was the only change, there are two plausible outcomes: 1) no change in vehicle compliance cost, if cooled exhaust gas recirculation was so cost-ineffective that it was never chosen in the base NHTSA NPRM run (or if it was chosen in the base run, but there were other technologies with only very slightly worse cost effectiveness that could be used instead), or 2) an increase in vehicle compliance cost, since there is one fewer technology for the model to choose and in some cases CEGR1 may have to be replaced by a less cost-effective technology. Yet, as shown in Table 4, the NHTSA model again produced a nonsensical result as the average vehicle compliance cost decreased by $142 when EDF deleted CEGR1 from the model. In reviewing the NHTSA data in more detail, we found that the base NHTSA model (with CEGR1) predicts that most strong hybrids retain CEGR1, which is irrational and not cost effective as this technology provides little to no additional GHG reduction benefit to a strong hybrid vehicle.

In EDF Run 3, we ran the NHTSA NPRM model with the single change of replacing the model's assumption that automakers will automatically apply any technology that pays for itself in 30-months with a 15-year assumption. This change much more accurately reflects true GHG emissions reduction cost effectiveness, as it more fully reflects the true GHG reduction potential of any given technology over the full vehicle useful life. As Table 4 shows, replacing the 2.5-year fuel savings with 15-year fuel savings forces the NHTSA model to indeed choose more cost-effective technology pathways, with the average vehicle compliance cost projection decreasing from $2,762 to $2,412, or by $350 or 13 percent. This confirms that the base NHTSA NPRM model, with the flawed 30-months fuel savings assumption, fails to truly represent technology and standards compliance cost effectiveness.

The three EDF runs summarized in Table 4 conclusively show, using three very different approaches, that the NHTSA NPRM model produces nonsensical results and fails to accurately predict the most cost-effective technology pathways for meeting future standards. These nonsensical results are indicative of deep and fundamental flaws with the basic design of the NHTSA model. The automotive industry is a highly competitive and cost-driven industry, yet the NHTSA model assumes that automakers will make a series of irrational and inefficient choices and waste money. This fundamental failure to fulfill its single most critical core function demonstrates that it is unreasonable for the agencies to rely on the model to satisfy their statutory obligations under EPCA and the Clean Air Act.

D. Specific Examples of Blatant Flaws and Biases in the NPRM Model That Artificially Inflate its Vehicle Technology Cost Projections

In Table 1 above, we showed that NHTSA's NPRM model yields vehicle technology cost projections for CAFE compliance that are up to 50 percent higher than NHTSA's own estimate from just two years ago, and about twice as high for GHG compliance as a series of EPA estimates in recent years. In subsection C, we showed, by running the base NHTSA NPRM model with individual changes, that the model repeatedly produces nonsensical results and completely fails to provide reasonable projections for technology adoption and costs. Time constraints prevented an exhaustive exploration of every individual element of the NHTSA model, but this section will highlight some of the most important individual examples of flaws and biases that affect the NHTSA vehicle technology cost projections.

1. Use of Flawed "Effective Cost" Technology Ranking Metric

The NHTSA NPRM model uses a metric that it calls "Effective Cost" to rank technologies for automakers to choose from for future compliance. This is an inherently flawed metric that is a critical contributing factor to NHTSA's inflated vehicle technology cost projections.

NHTSA defines Effective Cost for an individual technology as 1) incremental cost associated with adding the technology to a vehicle, minus, 2) vehicle fuel savings associated with the use of the technology over its first 30 months, and, minus, 3) the reduction in CAFE fines for the vehicle based on the improved fuel economy.

The fundamental flaw in NHTSA's Cost Effective definition is that it does not reflect a technology's overall contribution to GHG (or CAFE) compliance. The inclusion of the 30-month fuel savings assumption does reflect a small portion (approximately 20 or 25 percent) of the overall GHG (or CAFE) compliance contribution over a vehicle's full lifetime, but ignoring the majority of its contribution means that the NHTSA NPRM model does not rank individual technologies based on their true cost effectiveness in meeting future standards.[147] Put another way, the model is hard wired to over select more, relatively lower cost technologies, without full consideration of these technologies' ultimate effectiveness in reducing emissions. An approach along these lines would be expected to result in vehicles with more technology and higher costs than would actually come to pass – which is precisely what the NPRM model produces.

Consider the simple example where a manufacturer has two choices to reduce GHG emissions by 10 percent. One option is to choose 10 different technologies that each reduce GHG emissions by 1 percent and cost $100 apiece. The second option is to adopt a single technology that reduces GHG emissions by 10 percent and costs $600. Both approaches yield a 10 percent GHG reduction, but the single technology will do so at a much lower cost. In the NHTSA model, the "effective cost" technology ranking metric for all the 1 percent/$100 technologies will be slightly less than $100 (accounting for the small fuel savings over the first 2.5 years), while the effective cost metric for the 10 percent/$600 technology will be over $100 (after accounting for the relatively larger fuel savings over the first 2.5 years). Accordingly, the NHTSA model will rank the 10 individual technologies as more "cost effective" than the single technology, even though the latter is truly more cost effective as it will provide the same overall emission reduction at a far lower cost.

---

[147] EDF notes that EPA's OMEGA model, inexplicably rejected for use in the proposed NPRM roll back, is far superior in this respect. OMEGA's Technology Application Ranking Factor includes a denominator that accounts for the technology's overall contribution to meeting future GHG standards, essentially representing a cost per gram (or per ton) value, that allows a true ranking based on technology cost-effectiveness and so is consistent with rational automaker compliance decisions.

One simple approach to estimate the minimum magnitude of the error in vehicle technology cost associated with NHTSA's flawed Effective Cost metric is the EDF Run 3 in Table 4 above. In this run, EDF replaced the 2.5-year fuel savings factor with 15-year fuel savings, which is a conservative, but much more reasonable, approximation of lifetime fuel and GHG savings. Table 4 shows that this single change reduced the NHTSA NPRM model's vehicle technology cost estimates in the MY 2028-2032 timeframe by an average of $350.

The Union of Concerned Scientists (UCS) has performed a more detailed critique of NHTSA's flawed Effective Cost algorithm and has estimated that this error likely raises NHTSA's average MY 2028 vehicle technology cost projections by nearly $500.[148] This is consistent with the $350 value above being a minimum estimate.

EDF strongly recommends that NHTSA replace its flawed Effective Cost metric with a true cost-effectiveness approach which would simulate rational decision making by automakers.

2. Constraints on Using HCR1 and HCR2

In addition to using a flawed Effective Cost metric for selecting technologies, NHTSA has further imposed artificial and unreasonable constraints on the use of certain technologies that does not match how automakers are applying them in vehicles today. While time constraints have prevented EDF from conducting a comprehensive review of the impacts of the NHTSA model's technology effectiveness, cost, and constraints assumptions on its vehicle technology cost projections, we have evaluated the impact of NHTSA's constraints on the use of high compression ratio (HCR) engines.

HCR1 represents Atkinson Cycle engine, non-turbocharger, technology that has already been in the marketplace for several years. Mazda has been a leader in bringing HCR1 technology to the market, and a majority of its current U.S. vehicles utilize HCR1. Mazda's success had led to several other manufacturers adopting HCR1 technology, including Hyundai and Toyota on non-hybrid vehicles and General Motors, Ford, and Nissan on hybrid vehicles. Yet, even for MY 2030 vehicles and beyond, NHTSA only allows the use of HCR1 by about 30 percent of the U.S. fleet.[149]

In comments submitted to this rulemaking docket, the International Council on Clean Transportation (ICCT) provided a compelling illustration of how wrong NHTSA has been with respect to its projections of HCR use. In the 2016 TAR, the NHTSA model prohibited Toyota from considering HCR through MY 2025. One year later, Toyota began adopting HCR in some of its 2016 vehicles, proving NHTSA wrong in its assumptions about the use of HCR by Toyota for the next nine years.[150]

HCR2 represents a more advanced version, combining HCR1 with additional technologies such as cylinder deactivation and cooled exhaust gas recirculation. The 2018 Mazda CX-5 and Mazda

[148] See comments of the Union of Concerned Scientists (UCS), submitted to this rulemaking docket ("UCS Comment").
[149] See comments of the International Council on Clean Transportation (ICCT), submitted to this rulemaking docket.
[150] Ibid.

6 both use HCR1 with cylinder deactivation, a package that is not permitted in NHTSA's model.[151] The 2018 Toyota Camry base engine, one of the most efficient spark-ignition engines on the market today, is an HCR1 engine with cooled exhaust gas recirculation, another package that is not permitted by the NHTSA model out to MY 2030 and beyond.[152]

NHTSA's self-imposed constraints of extremely limited use of HCR1 and no use whatsoever of HCR2 through the early 2030s are inconsistent with the rapid increase in market penetration of both base HCR1 and more advanced HCR applications (for example, HCR1 combined with either cylinder deactivation or cooled exhaust gas recirculation).

To evaluate the impacts of these unreasonable constraints, EDF ran the base NHTSA NPRM model with a single change of removing the constraints imposed by NHTSA and therefore allowing the use of both HCR1 and HCR2 technology for all manufacturers by MY 2028. The impacts on the NHTSA model's vehicle compliance[153] cost projections are shown in Table 5. See Rykowski Report for more details on the methodology used for these runs.

Table 5. Vehicle Compliance Cost Projections for Current MY 2025 GHG Standards Under NHTSA NPRM Model Base Case and EDF Run with HCR1/HCR2

Model Year	NHTSA NPRM Base Run	EDF Run with HCR1 and HCR2
2028	$2,785	$2,167
2029	$2,815	$2,192
2030	$2,773	$2,174
2031	$2,730	$2,153
2032	$2,707	$2,144
Average	$2,762	$2,166

Table 5 shows that the single change of allowing the use of HCR1 and HCR2 technology by MY 2028 would reduce NHTSA's vehicle compliance cost projections from $2,762 to $2,166, or by nearly $600 and 22 percent. This is an unreasonable and arbitrary decision by NHTSA, to essentially eliminate a popular technology already being used extensively in the marketplace from its analysis for 10 to 15 years into the future.

3. Credit Constraints

Another major flaw in the NHTSA NPRM model that inflates its vehicle technology cost projections is its treatment of GHG emissions compliance credits. Automakers advocated for

---

[151] Inside Mazda, Mazda CX-5 Adds Numerous Upgrades After Being On Sale Just Nine Months, https://insidemazda.mazdausa.com/press-release/2018-mazda-cx-5-adds-numerous-upgrades/ (last visited Oct. 25, 2018).

[152] James Riswick, Desirable at Last: 2018 Toyota Camry, Camry Hybrid First Drive, https://www.autoblog.com/2017/06/21/2018-toyota-camry-camry-hybrid-first-drive-review/ (last visited Oct. 25, 2018).

[153] Note that the cost values in Table 5 are total vehicle compliance costs, which include incremental technology costs plus additional incremental costs such as taxes, insurance, and maintenance, and accordingly the NPRM Base Run values in Table 5 are greater than the $2,260 "technology-only" value shown in Table 1 above.

various credit mechanisms as a central element of the original Clean Car Standards, and credits remain a very important compliance mechanism for many manufacturers.

The Union of Concerned Scientists (UCS) has performed an in-depth critique of the treatment of GHG credits in the NHTSA NPRM model.[154] It concluded that, in the aggregate, the design of the NHTSA NPRM model incorrectly reflects how manufacturers would use credits by assuming that manufacturers will make two very irrational and economically inefficient decisions—that they will let credits expire instead of using them as a cost-free element of an overall compliance strategy, and then they will have to add additional technology in order to make up for the compliance benefit that the foregone credits would have provided. The automotive industry is a competitive and cost-driven business, and automakers will not make such irrational and wasteful decisions.

UCS identified four specific examples of errors in the NHTSA NPRM model's approach toward credits. One, the model assumes that manufacturers will add certain technologies (those that pass an "Effective Cost" threshold) even if that manufacturer has credits that are about to expire. This is obviously unrealistic. Two, the model does not accurately reflect the one-time exemption from the EPA 5-year credit life for credits earned in the MY 2010-2015 timeframe, and erroneously assumes that these credits will expire after 5 years. This is likewise unreasonable, since the EPA exemption to allow these credits to be used through MY 2021 has been on the books for many years and is common knowledge. Three, NHTSA assumes that there will be absolutely no credit trading between manufacturers. This simplistic and unrealistic assumption is also inconsistent with reality -- there have been over 30 Megagrams of GHG program credit trades already, involving more than 10 different manufacturers. Trading will be even more valuable to manufacturers as standards become more stringent. Finally, the NHTSA NPRM model does not allow the use of credit "carryback" or borrowing from the future. Manufacturers are permitted to carry a compliance deficit for up to three years, and "carryback" credits generated from over-compliance in future years to offset the deficits in past years. While this has not been utilized much or at all yet, it is certainly an option that should be available to manufacturers as standards become more stringent in the future, and NHTSA's decision to constrain it in the model is unreasonable and arbitrary.

Based on runs with the NHTSA NPRM model focused on these credits issues, UCS estimates that the model allowed nearly half of automakers' MY 2011-2015 credits to expire, even though they do not expire until MY 2021. UCS estimated that 141 Megagrams of credits were allowed to expire, with an approximate market value of $6 billion. In terms of the model's MY 1977-2029 analysis, UCS concludes that a more reasonable and realistic use of credits could reduce NHTSA's projections of aggregate technology costs by up to $60 billion and translate to a savings of hundreds of dollars per vehicle.

4. Over-compliance with Current Standards

The final example in this section is the frequency with which the NHTSA NPRM model predicts industry-wide over-compliance with the current Clean Car GHG Standards. The GHG standards

[154] See UCS Comment.

on the books become more stringent each and every year through MY 2025. There is no historical precedent whatsoever for the contention that the industry will over comply with standards that are becoming more stringent each year[155], particularly with gasoline price projections that are relatively stable throughout the entire regulatory timeframe.[156] The over-compliance with the current standards is a particularly egregious consequence of the flawed Effective Cost metric discussed above.

EDF ran the base NHTSA NPRM model for the current Clean Car GHG Standards scenario and calculated NHTSA's projected industry-wide over-compliance with the GHG standards. The results are shown in Table 6. A negative value means that the actual industry-wide GHG compliance value is projected to be less than the industry-wide standard, which means that the industry would be "beating the standard" or over complying. A positive value means that the industry would be under complying with that year's standard.

For the 6-year period from MY 2018-2023, NHTSA projects significant industry over-compliance with the current GHG standards, ranging from 5 grams/mile to 15 grams/mile. The average projected over-compliance during this 6-year period is over 10 grams/mile, which represents an average 5 percent over-compliance relative to the current standards during those years.[157] Meaningful over-compliance persists until MY 2024.

This large and indefensible projected over-compliance in MY 2018-2023 is yet one more example of the unrealistic projections inherent in the NHTSA NPRM model and is another contributing factor to the exaggerated vehicle technology cost projections during that timeframe since over-compliance means that automakers are putting on more technology than required, which increases technology cost. Since this over-compliance ends in MY 2024, it would not affect NHTSA's technology cost projections for MY 2025 and later vehicles.

[155] Later in this section, EDF presents a detailed rationale for why there is no historical precedent for overcompliance even when standards are not increasing. The likelihood of overcompliance when standards are increasing, as discussed in this section, is even less.
[156] 83 FR 43070, Table II-30, shows 2017 Annual Energy Outlook gasoline price projections remaining below $3.00 per gallon through 2028 and only slightly rising to $3.19 per gallon in 2035.
[157] EDF notes that NHTSA's projection that the industry will over comply with the MY 2021 GHG standard by 15 grams/mile (and by 11 grams/mile in MY 2022 and 6 grams/mile in MY 2023) is particularly bizarre, given that the agencies' preferred alternative roll back would freeze the standards at MY 2020 levels and require no improvement whatsoever in MY 2021 or the following five years, let alone reflect the large improvements that would result from overcompliance. EDF also notes that NHTSA predicts a 3 grams/mile overcompliance for MY 2017, when it is common knowledge that the industry-wide fleet has under complied with the MY 2017 standards.

Table 6. Industry-Wide GHG Over-compliance Projections by the NHTSA NPRM Model for the Current Standards

Model Year	Projected Compliance – Projected Standards (grams/mile)
2017	-3
2018	-8
2019	-11
2020	-14
2021	-15
2022	-11
2023	-5
2024	0
2025	+7
2026	+3
2027	+1
2028	-1
2029	-1
2030	-1
2031	-1
2032	-1

E. Specific Examples of Blatant Flaws and Biases in the NHTSA Model That Artificially Reduce Consumer Fuel Savings Projections

In Table 2 above, we showed that the NHTSA NPRM model yields MY 2025 lifetime consumer fuel-savings projections, under the current Clean Car Standards, that are approximately 35 percent less than recent NHTSA and EPA projections in 2016 and 2017. This section addresses two of the most important examples of flaws and biases that affect the NHTSA consumer fuel savings projections.

1. Overcompliance with Proposed Roll Back Standards

The NHTSA NPRM model not only predicts significant industry-wide overcompliance with the current Clean Car GHG Standards for several years, as discussed above, but also predicts ongoing overcompliance with the proposed preferred alternative 8-year GHG emissions rollback standards. EDF believes that the overcompliance with the current standards is also a consequence of the flawed Effective Cost metric discussed above, where the model assumes that manufacturers will adopt technologies that "pay for themselves" with fuel savings over the first 30 months of a vehicle's life.

Again, there is no historical precedent whatsoever for the contention that the industry, as a whole, will over-comply with standards, particularly when gasoline prices are projected to be relatively stable throughout the entire regulatory timeframe.[158] Moreover, NHTSA's projections that manufacturers will voluntarily exceed its proposed preferred alternative is entirely inconsistent with the agency's determination that "maximum feasible" fuel economy standards should remain flat between 2021 and 2026.

In the 2012 Final Rule establishing the MY 2017-2025 GHG and CAFE standards, EPA presented a detailed rationale for its assumption that there would be no decrease in fleetwide GHG emissions performance in the reference case fleet for MY 2017-2025 beyond the GHG emissions performance necessary to meet the MY 2016 standards.[159] Key elements of the rationale were: 1) projections that gasoline prices would be relatively stable out to 2025, 2) historical evidence that during periods of stable gasoline prices and fuel economy standards, the only companies that typically over complied with fuel economy standards were those that produced primarily lighter vehicles that inherently over complied with the older, universal (one size fits all, non-footprint based) fuel economy standards that are no longer relevant, 3) that after meeting increasingly stringent footprint-based GHG and fuel economy standards for the five years from MY 2012-2016, it was likely that most major manufacturers would be constrained by the MY 2017-2025 standards and unlikely to voluntarily over comply, and 4) if there were individual manufacturer over-compliance, that manufacturer would likely generate credits that could be sold to other companies, and therefore not lead to fleetwide over-compliance.

EPA's rationale is even more relevant for the MY 2020-2030 timeframe for the following reasons: 1) current gasoline prices are lower than they were in October 2012 when the MY 2017-2025 final rule was published, 2) Annual Energy Outlook 2017 projections for fuel prices in the MY 2020-2030 timeframe are relatively stable and approximately $1 per gallon lower than the Annual Energy Outlook 2012 Early Release projections which were used in the final rulemaking analysis for the MY 2017-2025 standards, 3) there have been several more years of increasingly stringent footprint-based GHG and fuel economy standards, so we have a more stringent "baseline" and manufacturers are even more constrained by future standards, and 4) due to the additional years of increasingly stringent standards, credits generated in the MY 2020-2030 timeframe are likely to be even more valuable, and even more likely to be sold, than previously. For all these reasons, it seems unlikely that there would be any market-driven decrease in fleetwide GHG emissions performance (i.e., over-compliance) whatsoever in the MY 2020-2030 timeframe.

EDF calculated the annual NHTSA NPRM model industry-wide over-compliance under the preferred alternative roll back GHG standards and the values are shown in Table 7. Again, a negative value means that the actual industry-wide GHG compliance value is projected to be less than the industry-wide standard, which means that the industry would be "beating the standard" or over complying. A positive value means that the industry would be under complying with that year's standard.

Table 7 shows that, despite the lack of any historical precedent, the NHTSA NPRM model predicts significant industry-wide over-compliance under the preferred alternative roll back for

[158] 83 FR 43070, Table II-30, shows 2017 Annual Energy Outlook gasoline price projections remaining below $3.00 per gallon through 2028 and only slightly rising to $3.19 per gallon in 2035.
[159] 77 FR 62843-62844, October 15, 2012, and Regulatory Impact Analysis, pages 3-18 to 3-23.

many years. For the 12-year period from MY 2021-2032, NHTSA predicts consistent and widespread over-compliance, ranging from 4 grams/mile to 11 grams/mile. Over this 12-year period, the average overcompliance is 9 grams/mile or about 4 percent of the standards during that timeframe. For the MY 2027-2032 timeframe, this over-compliance accounts for 10-11 grams/mile, or 15-20 percent of the total 65 grams/mile improvement required by the current standards at that time.

This over-compliance under the preferred alternative roll back minimizes fuel consumption, CO2 emissions, and criteria emissions increases under the roll back because the vehicles are assumed to have lower CO2 emissions and higher fuel economy than they would be required to achieve under the roll back standards. This in turn decreases the consumer fuel savings, CO2 emissions, and criteria emissions reductions under the current Clean Car Standards, which are calculated as incremental relative to those applied to the roll back. It also allows the preferred alternative roll back to be credited with some of the lower cost technologies that would otherwise be available under the current standards. This large and indefensible projected over-compliance is yet another example of the unreasonable projections inherent in the NHTSA NPRM model.

The combination of the NHTSA's model's over-compliance with the roll back standards, and the large reductions in aggregate vehicle miles travelled associated with NHTSA's exaggerated rebound and erroneous scrappage modules under the roll back that are addressed elsewhere in our comments, are likely the primary causes of the 35 percent reduction in lifetime consumer fuel savings, for the current standards, from the NHTSA NPRM model compared to recent estimates by both NHTSA and EPA. This large underestimation of consumer fuel savings has a major effect on the overall cost-benefit analysis.

Table 7. Industry-Wide GHG Over-compliance Projections by the NHTSA NPRM Model for the Roll Back

Model Year	Projected Compliance – Projected Standards (grams/mile)
2017	-2
2018	-2
2019	-1
2020	+1
2021	-4
2022	-7
2023	-8
2024	-9
2025	-9
2026	-9
2027	-10
2028	-10
2029	-11
2030	-10
2031	-10
2032	-11

2. Vehicle Miles Traveled Assumptions

Vehicle miles traveled (VMT) assumptions are critical to any model making emissions and fuel consumption projections, of course, as emissions and fuel savings from more stringent standards depend directly on how many miles vehicles are assumed to travel per year and over the typical vehicle's lifetime.

NHTSA made a major change in its VMT assumptions in its NPRM analysis of the current standards as shown in Table 8.[160]

Table 8. Change in NHTSA's Survival-Weighted Lifetime VMT in NPRM vs Previous Analysis

Vehicle Body Style	Previous NHTSA	Current NHTSA NPRM	Change
Car	179,399 miles	142,119 miles	-37,280 miles = -20.8%
Van	196,725 miles	155,115 miles	-41,610 miles = -21.2%
SUV	193,115 miles	155,115 miles	-38,000 miles = -19.7%
Pickup	188,634 miles	157,991 miles	-30,643 miles = -16.2%

Table 8 shows that NHTSA reduced its survival-weighted lifetime VMT by 30,000 to 42,000 miles across various vehicle body types, or by between 16 percent to 21 percent, compared to its assumptions in previous analyses. Previously, NHTSA had relied on owner-reported data from the National Household Travel Survey, which is carried out by the Department of Transportation's Federal Highway Administration, considered to be the authoritative source on the travel behavior of the American public, and whose data is fully transparent and accessible to all researchers. In the NPRM, NHTSA changed from National Household Travel Survey data to proprietary data from Polk. NHTSA did not describe the Polk data or how it processed the data. Accordingly, it is impossible to compare the Polk approach to the transparent data available from the National Household Travel Survey.

The most straightforward way to evaluate the accuracy of NHTSA's approach is to compare the NHTSA model projections for nationwide light-duty VMT under the current standards to those from formal federal government estimates for recent calendar years. NHTSA entirely failed to do this in the NPRM. EDF makes this comparison in Table 9.

Table 9. Comparison of Nationwide Light-Duty VMT Estimates from the NHTSA Model, EIA/AEO, and FHWA (billions of miles)

Calendar Year	NHTSA NPRM Model	2018 EIA/AEO	FHWA
2016	2224	2747	2850
2017	2295	2794	NA

Table 9 shows that the NHTSA NPRM model significantly underestimates total light-duty vehicle VMT relative to the federal government's two primary sources of VMT data. For 2016,

[160] Preliminary Regulatory Impact Analysis, July 2018, Section 8.9.1.1 page 973.

NHTSA's total light-duty VMT projection is over 500 billion miles less than the estimate in the 2018 Energy Information Administration (EIA) Annual Energy Outlook (AEO), or 19 percent low. NHTSA's 2016 projection is over 600 billion miles, or 22 percent, low relative to the Federal Highway Administration's light-duty VMT estimate. For 2017, NHTSA's estimate is 500 billion miles, or 18 percent, below the EIA/AEO estimate. The utter failure of the NHTSA NPRM model to even come close to accurately reflecting past and current nationwide VMT levels demonstrates that it cannot be depended upon for predictions a decade or two into the future.

F. EDF-Modified Cost/Benefit Runs with NHTSA's NPRM Model Show That the Roll Back Yields Net Societal Costs

NHTSA's NPRM model projection that the preferred alternative Clean Car Standards rollback beginning in MY 2021 would yield net benefits of approximately $200 billion was a 180-degree reversal from all previous NHTSA and EPA estimates. Every estimate made by both NHTSA and EPA in various rulemakings and technical assessments from 2012 through 2017 had come to the opposite conclusion—that the Clean Car Standards would produce large net benefits and therefore rolling them back would yield large net costs to society. As shown in Table 3 above, even as recently as 2016 and 2017, the two agencies had performed three separate analyses that projected that the MY 2022-2025 CAFE and GHG standards would yield net benefits (and therefore that rolling them back would yield net costs) of approximately $100 billion.

Accordingly, the current NHTSA projection reflects a stunning $300 billion reversal relative to the NHTSA and EPA analyses in 2016 and 2017. This massive change in NHTSA's bottom-line modeling output is only possible because NHTSA made a large number of fundamental changes in its modeling design and assumptions, and because nearly every change that NHTSA made has had the same directional impact of skewing the results to minimize the benefits and exaggerate the costs of the current standards and to exaggerate the benefits and minimize the costs of the proposed roll back. It is also relevant to note that NHTSA does not claim that the individual technologies that it expects automakers to adopt to meet the current standards are much more expensive or much less effective than it did in its previous analyses. Rather, the massive shift in costs and benefits in NHTSA's NPRM are primarily due to model design features and assumptions that are completely unrelated to individual technology cost and effectiveness assumptions.

Building on the analysis and critique throughout our comments of NHTSA's biased and nonsensical assumptions and model design features, in this section we discuss two modified modeling scenarios that EDF developed and ran with the NHTSA NPRM model for its MY 1977-2029 GHG analysis to generate more defensible costs and benefits projections for the preferred alternative Clean Car Standards roll back.

The two EDF runs retain several key experimental and questionable changes that NHTSA made to the NPRM model[161]:

[161] By retaining several of these experimental features, each of which is of questionable merit, the EDF-modified runs should be considered conservative. See Appendix A for more discussion of these issues.

- The Sales module, which is a major departure from previous NHTSA analyses, and which projects that new vehicle sales will rise under the roll back
- The Fleet Share module, which projects that new car market share will increase, and new truck share will decrease, under the roll back, which is a major departure from previous NHTSA analyses
- Lifetime VMT per vehicle, which yields aggregate national VMT levels in the near term that are well below formal federal government estimates by EIA/AEO and FHWA, which was a major change from previous NHTSA analyses
- Many internal inconsistencies associated with assumptions about the relative importance of changes in vehicle prices and changes in fuel costs/savings in affecting consumer behavior with respect to new vehicle sales, car/truck market share, and rebound VMT
- Gasoline price projections, which are 40-50 cents per gallon low for 2018, do not reach the October 2018 price of $2.85 per gallon until 2023,[162] do not approach $3 per gallon until 2029, and reach a maximum of $3.46 in 2050

The two EDF runs involve the following changes in the NHTSA NPRM model[163]:

- Rebound is reduced from 20 percent to 10 percent
- Scrappage is changed from NHTSA's absurd approach (which assumes that used car drivers significantly reduce VMT under the roll back far beyond the small decrease necessary to offset higher VMT due to slightly higher new vehicle sales) to the EDF VMT Neutral Through MY 2029 approach (which reduces used car VMT under the roll back by the precise amount needed to offset higher VMT due to slightly higher new vehicle sales)
- Overcompliance is eliminated under both the current standards and roll back scenarios
- Mass reduction is changed to the NHTSA 2016 TAR approach
- The monetized per ton values for CO2, methane, and nitrous oxide emissions savings were increased, based on values from the Interagency Working Group of the Social Cost of Carbon[164]; for CO2 we used values of $50 per metric ton (up to 2020) to $71 per metric ton (2040 and later)
- All incremental gasoline/oil consumption is assumed to be from domestic sources consistent with recent trends of decreasing oil imports and negligible gasoline imports

Both EDF runs use the same assumptions and model design features above but differ in one important respect—the first EDF run uses NHTSA's extremely high NPRM vehicle technology costs discussed above, while the second EDF run assumes a 50% reduction in NHTSA's NPRM vehicle technology costs, still a conservatively high value but far more consistent with previous projections by NHTSA and EPA over the previous eight years as shown in Table 1 above.

---

[162] AAA, October Is Finally Falling Into Cheaper Gas Prices (October 22, 2018), available at https://gasprices.aaa.com/october-is-finally-falling-into-cheaper-gas-prices/.
[163] See Rykowski Report for more details on the changes that were made for the EDF runs summarized here.
[164] IWG, Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (2010) , available at https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/foragencies/Social-Cost-of-Carbon-for-RIA.pdf.

Table 10 shows the societal costs and benefits projections from the NHTSA NPRM model for the roll back, relative to the current standards baseline, using the MY 1977-2029 GHG analysis for three runs: the base run that NHTSA summarizes in Preamble Table VII-51 and the two EDF-modified runs described above. For ease of comparison, Table 10 shows the same rows that NHTSA shows in Preamble Table VII-51, though to aid the reader we have reorganized the rows to group the benefit rows at the top of Table 10 and the cost rows at the bottom of the table. All individual costs and benefits are shown as positive values. Net benefits are simply total benefits minus total costs. The bottom row of Table 10 shows net benefits, where a positive value means that the roll back is projected to yield net societal benefits, while a negative value indicates that the roll back is projected to yield net societal costs.

The second column in Table 10 simply reports the values from NHTSA's NPRM model run as shown in Preamble Table VII-51 (and summarized in the Preamble overview as well). NHTSA projects net benefits for the preferred alternative roll back of $201 billion.

The third column in Table 10 reflects the EDF-modified run with the 100% NHTSA vehicle technology costs and the other changes described above. The results are dramatically different and demonstrate the great sensitivity of the NHTSA NPRM model results to the experimental input assumptions and model design features that NHTSA adopted in the NPRM. Even using NHTSA's inflated vehicle technology costs, the preferred alternative roll back yields net societal costs of $139-192 billion, reflecting a change of $300-400 billion relative to NHTSA's base run.

The projected benefits and costs under the roll back for the first EDF run are very different for nearly every row in Table 10. The most important change is that the monetized non-rebound fatality and non-fatal crash rows move from a large benefit in the NHTSA NPRM run ($118 billion) to a small cost in the EDF run ($11 billion), i.e., with a much improved scrappage module and a better mass reduction approach, there are slightly more non-rebound fatalities and crashes under the roll back. Another big change is that the costs associated with higher fuel consumption for the first EDF run are over $100 billion higher. This is due to several factors acting in concert: more realistic VMT assumptions for both rebound and scrappage, and less over-compliance under the roll back scenario. A third major change is that the CO2 damages costs are over $60 billion higher based on better social cost of carbon estimates, better rebound and scrappage assumptions, and the elimination of over-compliance with the roll back standards. Non-GHG emissions costs are also much higher than projected by NHTSA, and based on many factors: better VMT assumptions due to rebound and scrappage, the elimination of over-compliance under the roll back standards, and the assumption that all oil exploration, drilling, and refining would be domestic and therefore the emissions impacts would accrue in the U.S. Finally, the congestion and noise benefits are about $50 billion lower, due to the decreased VMT changes due to more defensible rebound and scrappage approaches.

The final column in Table 10 shows the results of the second EDF-modified run using technology costs equal to 50% percent of the values used by NHTSA. The technology benefits row under the roll back is 50 percent lower than under the first EDF-modified run, of course, but all the other rows are the same as under the first EDF run. Here, the roll back would have net societal costs of $277-330 billion, or a net change of about $500 billion relative to the NHTSA NPRM base run.

Table 10 shows that the NHTSA cost/benefit analysis is extremely sensitive to the experimental model design features and assumptions that NHTSA adopted for the first time in the NPRM, with bottom line values for the NHTSA and EDF runs that differ by as much as $300-500 billion. Simply by correcting the most egregious and systematic errors and biases (most notably scrappage and over-compliance, but also rebound, mass reduction, social cost of carbon, and oil/gasoline sourcing assumptions), Table 10 shows that the preferred alternative roll back would lead to large net societal <u>costs</u> as high as $330 billion, rather than the net societal benefits that NHTSA claims with its indefensible assumptions. This fact demonstrates that NHTSA's model and assumptions are both fundamentally flawed. The agency must fix these flaws, revise the model, re-do its analysis, and re-propose the rule for public comment.

Table 10. The Proposed Roll Back Yields Net Societal Costs with EDF-Modified Assumptions[165]
(billions of dollars, MY 1977-2029 GHG analysis, 3 percent discount rate)

	NHTSA	EDF	
Technology Cost Assumption	100% NHTSA	100% NHTSA	50% NHTSA
Technology Costs (benefits under roll back)	260	275	137
Rebound Fatality	48	22	22
Rebound Non-Fatal Crash	75	35	35
Non-Rebound Fatality	46	--	--
Non-Rebound Non-Fatal Crash	72	--	--
Congestion and Noise	63	12	12
Total Benefits	564	344	206
Pre-Tax Fuel Savings (costs under roll back)	144	258	258
Offsetting Rebound Fatality	48	22	22
Offsetting Rebound Non-Fatal Crash	75	35	35
Non-Rebound Fatality	--	4	4
Non-Rebound Non-Fatal Crash	--	7	7
Mobility	70	32	32
Refueling	9	14	14
Energy Security	12	0.1	0.1
CO2	5	68	68
Other Pollutants (including mortality)	1	43 to 96	43 to 96
Total Costs	364	483-536	483-536
Net Benefits	+201	-139 to -192	-277 to -330

G. EPA's Failure to Use its Own OMEGA Modeling Tool to Inform the NPRM is Arbitrary and Capricious

This section has documented the numerous fundamental flaws and biases in the agencies' NPRM model that lead to unreasonable, nonsensical, and arbitrary results. The EPA OMEGA[166] model was created to allow EPA to properly carry out its statutory obligations under the Clean Air Act and is far superior to the NHTSA model in aiding the development of emission standards that

[165] Note that the values in Table 10 evaluate the proposed preferred alternative roll back relative to the current Clean Car Standards baseline currently on the books. The same values can be used in the "other direction" to evaluate the impact of the current Clean Car Standards relative to a flat GHG baseline, by simply converting Table 10 costs to benefits, and Table 10 benefits to costs, i.e., for the current standards, NHTSA projects net societal costs while the EDF-modified runs project net societal benefits.
[166] Optimization Model for reducing Emissions of Greenhouse gases from Automobiles (OMEGA).

meet EPA's statutory mandate.[167] For example, OMEGA has a much better technology cost optimization algorithm based on true technology cost effectiveness, it places far fewer constraints on the ability of automakers to make rational economic decisions with respect to technology adoption and credit usage, and it uses data and science to inform more realistic assumptions about VMT and mass reduction approaches. EPA used the OMEGA model in the 2010 rulemaking for the MY 2012-2016 standards, the 2012 rulemaking for the MY 2017-2025 standards, and in the Midterm Evaluation. OMEGA has also been extensively peer reviewed, while many elements of NHTSA's NPRM model do not appear to have been peer reviewed. Yet, it is clear from both the NPRM Preamble and the Preliminary Regulatory Impact Analysis that the agencies totally ignored EPA's OMEGA model during the development of the NPRM.

EDF and others have tried to obtain access to the current OMEGA model so that the public could have access to a crucial tool for understanding the feasibility, costs, and benefits associated with the current Clean Car Standards and regulatory proposals. Unfortunately, EDF and our colleagues have been completely rebuffed in our efforts. On March 20, 2018, EDF, the Natural Resources Defense Council (NRDC), the Safe Climate Campaign, and the Union of Concerned Scientists (UCS) submitted a letter to EPA requesting that the agency make publicly available a range of materials relating to the OMEGA model. No response was received. On July 25, 2018, EDF and NRDC submitted a Freedom of Information Act (FOIA) request to EPA for these same OMEGA materials. The statutory deadline passed without any materials being provided. On September 20, 2018, EDF, NRDC, Safe Climate Campaign, and UCS submitted an updated version of their March 2018 letter to EPA, but this letter has also been ignored.

It is known that EPA technical staff have continued to use the OMEGA model for internal technical analyses, as several documents authored by EPA technical staff are in the EPA docket for this rulemaking.[168] In a presentation by EPA technical staff on April 16, 2018 to the Office and Management and Budget, as part of the interagency review of the draft NPRM, EPA staff made several critical points that echo our own criticisms[169]:

- "significant and fundamental flaws in CAFE model (both the CAFE version and the GHG version)"
- "Because of the disconnect with the vehicle sales projections, the use of the scrappage model causes an inappropriate increase in the fatalities impact of the Augural standards, and an inappropriate underestimation of the fuel savings and emissions benefits"
- "This sustained and significant over-compliance projected by the CAFE model implies that the industry will not make use of the larger quantity of banked credits, or year-to-year credit transfer provisions"
- "Overestimation of GHG standards cost. CAFE model is forcing combinations of technologies that are highly cost-ineffective"

[167] See Joint Environmental Comments for a more detailed discussion of the inadequacy of the Volpe model in developing standards consistent with EPA's statutory mandate.
[168] See, e.g., E.O. 12866 Review Materials, File: "Email 5 - Email from William Charmley to Chandana Achanta - June 18, 2018," at 113 (June 18, 2018), https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0283-0453.
[169] Ibid.

- EPA ran the NHTSA model for GHG with corrections for some of its most egregious errors, and found that the modified NHTSA model yielded a MY 2025 vehicle technology cost projection of $1,259; EPA also ran its updated OMEGA model which yielded a MY 2025 vehicle technology cost projection of $935

The failure to provide the public with the OMEGA model or any explanation for why the agency has refused to use its own high-quality modeling tool to inform its regulatory proposal is arbitrary and unlawful.

IV. Additional factors further confirm the conclusion that the standards are achievable and appropriate.

A. EPA's existing, well-documented findings on consumer behavior support the appropriateness of MY2022-2025 standards

EPA comprehensively addressed relevant issues relating to consumer acceptance of fuel economy and GHG reduction technologies in the Draft Technical Assessment Report, Proposed Determination, and January 2017 Final Determination. The issues addressed include effects of the standards on vehicle sales, consumer response to the standards, impacts of the standards on vehicle affordability, and evidence — or lack thereof — of adverse effects on consumer welfare.

As EPA recognized, its standards lead to substantial savings for consumers. Just one of the compelling findings with respect to consumer benefits was that families that purchase a new vehicle in 2025 are expected to save a net $1,650 over the lifetime of that vehicle compared to a vehicle just 3 years older—and possibly much more.[170] Families purchasing on credit would expect to see immediate payback: the increased load cost attributable to control technologies would be more than offset in the first year by fuel savings.[171]

Meanwhile, the agency concluded in its Proposed Determination that there is "little, if any, evidence that consumers have experienced adverse effects from the standards."[172] Likewise, the agency did not find "any evidence that the technologies used to meet the standards have imposed 'hidden costs' in the form of adverse effects on other vehicle attributes."[173] Nor did EPA identify "significant effects on vehicle affordability."[174] Given the ten years of lead-time provided to achieve the MY 2022-2025 standards, EPA reasoned in its initial Final Determination "that any effects of the standards on the vehicle market will be small relative to

---

[170] EPA, Proposed Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, at E-6 (Nov. 2016) ("Proposed Determination"), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100Q3DO.pdf.
[171] Proposed Determination at E-6.
[172] Proposed Determination at 27.
[173] Proposed Determination at A-27.
[174] Proposed Determination at 28.

market responses to broader macroeconomic conditions."[175] As with all other aspects of the 2018 NPRM, there is no evidence that there have been any changes in facts or circumstances that would justify such a change of position.

Reasoned decision making requires that EPA acknowledge and comprehensively take into account and discuss its existing, well-documented and reasoned findings regarding consumer acceptance, in which case it should reach the conclusion that there is no evidence on this issue that would justify flat-lining the federal standards at MY 2020 levels.

i. EPA standards save consumers money

Strong fuel economy and GHG standards for passenger cars benefit consumers by saving them money at the pump. David Greene has estimated that fuel economy improvements from 1975 to 2015 have saved 1.5 trillion gallons of gasoline and roughly $3.8 trillion (in 2015 dollars) in fuel costs.[176] Because of the savings, consumers are demanding more efficient models and automakers are delivering them. And more efficient models in the new car market leads to more efficient options in the used car market, helping low-income families save money on fuel as well.

The current light-duty vehicle standards are already saving consumers money at the pump. For example, each F-150 bought in 2015 uses about 180 fewer gallons of gas a year than prior models, and will save its owner eight trips to the gas station and $300 to $700 per year, depending on the price of fuel.[177] The Consumer Federation of America has estimated that in 2018, consumers are saving on average over $200 a year on fuel compared to 2011, the year before the current standards were implemented."[178]

And the current MY 2022-2025 standards will provide even greater savings – allowing families who purchase a new vehicle in 2025 to save a net $1,650 over the lifetime of that vehicle compared to a vehicle just 3 years older.[179] Further, the savings could double depending on future oil prices. The Consumer Federation of America estimates that under the current standards, consumers buying a new vehicle in 2025 would save $295 more in fuel costs than

[175] EPA, Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation, at 25 (Jan. 2017) ("initial Final Determination"), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100QQ91.pdf; *see also* Proposed Determination at 51-52.
[176] David Greene, *A Trillion Gallons of Gasoline*, The University of Tennessee Howard H. Baker Jr. Center for Public Policy, (Aug. 2017), at 3, http://bakercenter.utk.edu/wp-content/uploads/2017/08/OnPoint-5-2017.pdf.
[177] BlueGreen Alliance, Combating Climate Change 426,000 Pickup Trucks At a Time, (June 2016), https://www.bluegreenalliance.org/resources/combating-climate-change-426000-pickup-trucks-at-a-time/.
[178] Consumer Federation of America, *At-Risk MPG Standards Could Cost Future Labor Day Travelers* (Aug. 28, 2018), https://consumerfed.org/press_release/at-risk-mpg-standards-could-cost-future-labor-day-travelers/
[179] Proposed Determination at E-6.

consumers buying a vehicle under the proposed rollback.[180]

A recent study by MJ Bradley and Associates found that the MY 2025 standards would save the average U.S. family $85 per year for every 50-cent-per-gallon increase in gas prices.[181] The study indicates that the current MY 2025 standards would increase lifetime savings by $2,800 compared to a flatline at MY 2020 levels if oil prices stayed at their current level.[182] It also suggests that if prices increase, the lifetime savings for a car meeting the existing MY 2025 standards could be up to $5,000 compared to the MY 2020 standards.

These savings are particularly significant for families living in states where the state median income is below the national median, but the average miles driven are above the national average. The MJ Bradley report highlights eight states with below median incomes where families can expect higher than average savings; families in Mississippi can expect to save nearly twice as much as the average U.S. family from the 2025 standards.[183]

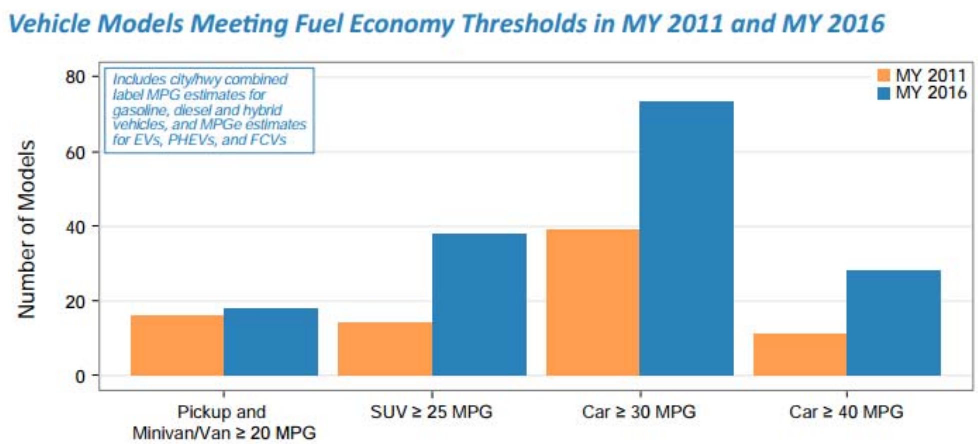
And the nearly 86 percent of Americans who finance their vehicles with a 5-year loan are expected to realize cost savings within the first year.[184] Over the life of the entire Clean Car program, the fuel cost savings to American families and businesses will add up to over a trillion dollars,[185] which is more than double the funds injected into the economy by the American Recovery and Reinvestment Act (aka, the stimulus package).[186] With the benefit of reduced fuel costs, businesses can invest more money and create jobs in local communities.

Because of these fuel cost savings, consumers continue to rate fuel economy as one of their top criteria when shopping for a new car[187] – 81 percent said they support the Clean Car standards.[188] And consumers have more choices in fuel-efficient models across the fleet today (see Figure 1 below). There are more than twice as many SUV models that achieve 25 mpg or more in MY 2016 than there were in MY 2011. The number of car models where at least one variant has a

[180] Consumer Federation of America, *At-Risk MPG Standards Could Cost Future Labor Day Travelers* (Aug. 28, 2018), https://consumerfed.org/press_release/at-risk-mpg-standards-could-cost-future-labor-day-travelers.
[181] MJ Bradley and Associates, *Clean Car Roll-back: Estimated Costs for American Families if U.S. Climate Pollution and Fuel Economy Standards Are Relaxed*, at 4 (July 20, 2018), https://www.edf.org/sites/default/files/MJ_Bradley_Clean_Cars_rollback_report.pdf.
[182] *Id.* at 2.
[183] *Id.* at 8.
[184] Proposed Determination at E-6.
[185] EPA Regulatory Announcement.
[186] Congressional Budget Office, Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from October 2011 Through December 2011 (Feb. 2012), http://www.cbo.gov/sites/default/files/cbofiles/attachments/02-22-ARRA.pdf.
[187] Despite Cheap Gas, Fuel Efficiency Still a Primary Concern, JD Power (Jan. 14, 2015) *available at* http://www.jdpower.com/press-releases/2015-us-avoider-study.
[188] Jack Gillis et al., Automakers Are on the Road to Meeting Fuel Efficiency Standards: An Analysis of Automaker Progress in Meeting 2025 Fuel Efficiency Requirements and A Look At Consumer Attitudes Towards Fuel Efficiency, Consumer Federation of America (April 25, 2016), http://consumerfed.org/wp-content/uploads/2016/04/2016-Fuel-Economy-Report-April-25-2016.pdf.

combined city/highway label fuel economy of at least 30 mpg has grown from 39 models in MY 2011 to more than 70 models in MY 2016. There are 18 MY 2016 pickup and minivan/van models for which at least one variant of the model has a combined city/highway label fuel economy rating of 20 mpg or more.[189]

Figure 1



Source: EPA's Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 – 2015

ii. No reliable evidence demonstrates a negative impact on consumer choice

In its initial Midterm Evaluation, EPA convincingly showed that there is at present no reliable way to quantify the effect of the standards on vehicle sales. EPA engaged in a comprehensive literature search of all existing efforts to develop reliable consumer choice models that could yield quantitative predictions with adequate validity for use in policy making and found that there were no such models.[190] This finding is consistent with the NAS (2015) finding that the role of fuel economy on consumer purchasing decisions is "unresolved."[191]

---

[189] EPA, Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975–2015 (Dec. 2015) ("EPA 2015 Trends Report"), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100OEOE.PDF?Dockey=P100OEOE.PDF.

[190] Automakers have been trying to develop such reliable predictive tools without success. *See* Proposed Determination at A-47 (summarizing comments of the Alliance that industry had tried and failed for a century to develop reliable quantitative consumer choice models). EPA's own efforts to develop such a model were likewise unsuccessful. Draft TAR at 6-4 to 6-5.

[191] EPA, Final Determination on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emissions Standards under the Midterm Evaluation: Response to Comments, at 126 (Jan. 2017) ("Final Determination RTC"), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100QQ9Y.pdf (citing National Research Council, *Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles*, National Academy of Sciences (2015)).

EPA also comprehensively analyzed the willingness-to-pay literature and found that estimates of willingness-to-pay for both fuel economy and performance are so varied (by over five orders of magnitude in the literature) as to preclude the drawing of reliable, quantifiable conclusions.[192] EPA's March 2017 presentation of this analysis continued to conclude that the results vary widely even within studies — raising the issue of robustness of the stated willingness-to-pay values, and further suggesting a lack of robustness in the models used to generate the values.[193]

EPA previously found no evidence of consumer acceptance issues for conventional, non-electrified technologies, which form the overwhelming majority of the compliance path posited convincingly by EPA for the MY 2022-2025 standards.[194] There also is evidence of increased consumer acceptance of electrification based strategies (strong hybrid, PHEV, and BEV vehicles).[195] Moreover, the flood of announcements from major manufacturers — including Ford and GM — of plans to electrify either some or all of their light-duty fleets strongly suggests that manufacturers believe there will be broad consumer acceptance of the technology, and do not view the technology as generating consumer resistance.[196]

EPA concluded that there is no evidence that the current standards have had a negative impact on light-duty vehicle sales.[197] This is consistent with market trends—where industry has experienced strong sales since 2009.[198] In addition, new vehicle prices have remained flat in recent years after adjusting for inflation and quality.[199] Because the record shows no evidence of any impediment to sales, EPA reasonably concluded in its initial Final Determination that there was no reliable way to make reasoned quantitative estimates of the effect of the standards on fleet turnover.[200]

Previous commenters during the Mid-Term Evaluation suggested that the "energy paradox" or "efficiency gap"— consumers' failure to adopt efficiency technologies notwithstanding these technologies' net financial benefits—must mean that there are some hidden costs preventing

---

[192] *See* Proposed Determination App. A at A-51; EPA, 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, at 4-16 (Nov. 2016) ("Proposed Determination TSD"), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100Q3L4.pdf.
[193] David Greene et al., Presentation: Consumer Willingness to Pay for Vehicle Characteristics: What Do We Know? (Mar. 16, 2017), https://benefitcostanalysis.org/sites/default/files/public/C3.1%20Helfand%20et%20al%20WTP%20for%20veh%20char%2020170323.pdf.
[194] Draft TAR at 6-13; Proposed Determination at A-56.
[195] Proposed Determination, App. A at A-63 to A-65.
[196] For example *see* GM, Ford Pledge 33 new models, Electric Vehicles, GREENWIRE (Oct. 3, 2017), https://www.eenews.net/greenwire/stories/1060062413/feed.
[197] Proposed Determination App. A at A-27.
[198] Ahiza Garcia, *Car sales set another U.S. record*, CNN (Jan. 4, 2017), https://money.cnn.com/2017/01/04/news/companies/car-sales-2016/index.html.
[199] Final Determination RTC at 136.
[200] Final Determination RTC at 137.

adoption that EPA failed to account for. But there are multiple potential reasons for the energy paradox that do not require hypothesizing an unidentified hidden, countervailing cost, as EPA has reasonably noted. These reasons include, on the consumer side: lack of adequate information necessary to estimate the value of future fuel savings; mistaken valuation or uncertainty in calculating future fuel savings; a focus on attributes conveying visible status rather than invisible efficiency; and (pre-standards), a lack of available fuel efficient options among vehicles (like SUVs) having other desirable attributes.[201] On the producer side, reasons for the efficiency gap include hesitation to be a first mover in investing in a new technology; the related desire of manufacturers to wait until a technology is further along the learning curve; and another related desire of manufacturers to work on the same technologies at the same time to benefit from arising research synergies.[202]

The record again reflects the copious, reasoned consideration EPA has already given the issue of consumer welfare. The agency previously concluded that it had found no evidence of a so-called hidden cost to the standards.[203] It is clear that consumers value fuel economy, although estimates of how much vary widely.[204] The NAS reached the same conclusion that the range of potential values for consumer willingness to pay for fuel economy is so varied as to preclude easy generalizations as to how much.[205] EPA previously included in its cost estimates the cost of holding all vehicle attributes, including performance, constant in the presence of the added GHG reduction technologies.[206] Beyond this already accounted for cost, there is no credible evidence that the current standards have had, or will have, an adverse effect on other vehicle attributes.[207]

Recent research by the Consumer Federation of America indicates that buyers of SUVs, crossovers, and pickup trucks may prefer more fuel-efficient vehicles.[208] From 2011 to 2017 there was a 70% increase in sales of SUVs, pickups, and crossovers that had a 15% or more increase in MPG. During that same time period there was only a 50% increase in sales of the same vehicles with a less than 15% increase in MPG.[209] A particularly strong example is the Nissan Pathfinder, which saw a 224% annual sales increase when it increased its efficiency by 4

---

[201] Draft TAR at 6-6; 77 Fed. Reg. at 62,914.
[202] Draft TAR at 6-7. As noted below, one benefit of the standards is to eliminate these producer-side issues.
[203] Final Determination RTC at 127.
[204] Final Determination RTC at 124.
[205] *See* Final Determination RTC at 126; NAS (2015) at 318.
[206] Final Determination RTC at 129; Proposed Determination App. A at A-49 and A-50.
[207] Proposed Determination App. A section B.1.4.
[208] Press Release: *SUVs, Crossovers and Pickups with High MPG Percent Increases Sell Better*, Consumer Federation of America (Aug. 15, 2018), https://consumerfed.org/press_release/suvs-crossovers-and-pickups-with-high-mpg-percent-increases-sell-better.
[209] *Id.*

MPG from 2011 to 2017.[210] This correlation suggests that improvements in efficiency will lead to increased sales.[211]

Most importantly—as discussed above—fuel savings far exceed increased expenditures for the emission control technology, so there is a direct, positive welfare benefit to consumers of new light duty vehicles.

iii. The vehicle standards have no discernable negative effect on vehicle affordability

In the original Midterm Evaluation, EPA closely examined the impacts of the standards on vehicle affordability. EPA found, with ample record support, that the standards did not have discernible negative impacts on lower-income households or on the used vehicle market, did not limit access to credit, and had not decreased availability of low-priced vehicles.[212] In particular, lower-income households are more affected by prices of used rather than new vehicles, and, although any effect of the standards on used vehicle prices is swamped by macro-economic factors, the payback period for price increases reflecting GHG emission reduction technology is less than for new vehicles given the depreciated price of a used vehicle but the constant performance of the emission reduction technology.[213] In addition, used car market prices have remained flat.[214] Consumer loans for new vehicles remain widely available, and importantly, if consumers were to buy a new vehicle with standard five-year financing, the payback period would be less than one year.[215]

Strong fuel economy and GHG standards indeed provide a strong co-benefit to used-vehicle purchasers by providing them with more efficient choices. When fuel prices become suppressed, new vehicle purchases can skew towards less efficient vehicles, and when fuel prices are high they tend to purchase relatively more fuel-efficient vehicles. This pattern has important consequences for the used vehicle market, where the supply of each model and vintage is largely determined by the past choices of new-vehicle purchasers, and the supply of a particular used vehicle model is essentially inelastic. That is, the choices of today's new-vehicle purchasers will determine which vehicles are available to tomorrow's used vehicle purchasers, and determine the fuel economy of the fleet for many years after the original purchase date. Strong fuel economy and GHG standards lead automakers to offer more diverse sets of products, including more

[210] *Id.*
[211] *See, e.g., id.* (quoting Jack Gillis, Executive Director for the Consumer Federation of America "Clearly, the more improvement in MPG, the better the sales.").
[212] *See generally* Proposed Determination TSD at sec. 4.3.3.
[213] Proposed Determination TSD at 4-49 and 4-47; Proposed Determination, App. A at A-79.
[214] Proposed Determination TSD at Fig. 4-26.
[215] Proposed Determination TSD at 4-50.

efficient models,[216] which will have the co-benefit of increasing the supply of fuel-efficient used vehicles available for purchase. To the extent that low-income consumers are more likely to purchase a used vehicle, more efficient used vehicle choices will help save low-income families more money at the pump.

iv. EPA fully accounted for vehicle performance

Previous commenters on the Clean Car standards argued that there was a specific hidden consumer welfare cost to the standards in the form of decreased performance. Notwithstanding that EPA already estimated the cost of holding performance in its cost estimates for the current MY 2022-2025 standards,[217] this argument contends that there would be still more performance added but for the standards, and that this lost performance is a consumer welfare loss not accounted for in the agency's cost estimates. The asserted engineering basis for this argument is that there is a necessary tradeoff between fuel economy/GHG emission reduction and performance (acceleration in particular). Some commenters supported their arguments by pointing to consumer willingness to pay studies, maintaining that these studies show a greater willingness of consumers to pay for increased performance than for fuel economy, confirming a hidden cost to the standards not reflected in EPA's cost estimates.

The record convincingly refutes these arguments. Most particularly, the historic tradeoff between performance and fuel economy is far less likely to hold for advanced technology engines.[218] EPA concluded in its Proposed Determination that "the assumption in the previous research that the tradeoffs among acceleration, fuel economy, and weight are constant does not appear to accurately represent the new technologies, and in fact may substantially overestimate the magnitude of the performance-fuel economy tradeoff."[219] Thus, "fuel economy and other vehicle attributes are not mutually exclusive, so there is no necessary tradeoff between fuel economy and other vehicle attributes."[220] And EPA previously included the cost of preserving both.[221] The studies previously submitted to the record purporting to show a hidden cost of foregone increased performance reflected older engine technologies, and so failed to account for these highly relevant technology distinctions.[222]

---

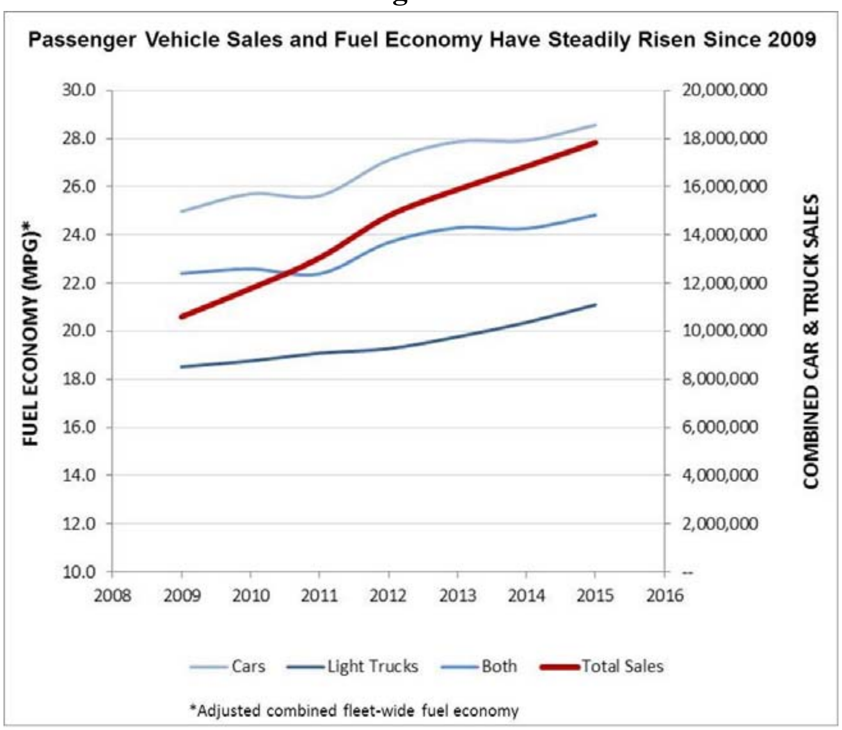
[216] Meghan R. Busse et. al., Who is Exposed to Gas Prices? How Gasoline Prices Affect Automobile Manufacturers and Dealerships, 14 QUANTITATIVE MARKETING & ECONOMICS 41-96 (Mar. 2016), https://dspace.mit.edu/handle/1721.1/103416.
[217] *See* Proposed Determination App. A at A-58.
[218] *See* Proposed Determination TSD at 2-248 and 2-249 showing that gasoline direct-injection engines and turbo downsized engines have much flatter trade off curves than the older, port-fueled engines.
[219] Proposed Determination, App. A, at 4-6.
[220] Final Determination RTC at 127.
[221] *Id.*
[222] A recent paper addressing this issue, Leard, Linn, and Zhou, "How Much Do Consumers Value Fuel Economy and Performance" (2017) likewise assumes that there is a necessary tradeoff between fuel economy improvement and performance, basing this conclusion on Knittel (2011) and Klier and Linn (2016) which studies did not account for the difference in more advanced engine technologies and performance. *See* Proposed Determination App. A at

B. The Auto Industry Has Made a Dramatic Return to Profitability and Added Jobs

During the height of the economic recession in 2008, the American auto industry was on the verge of collapse. This prompted the Obama Administration to develop a bailout package for the industry, which provided the boost the industry needed to help rebound.[223]

The auto industry returned to profitability at the same time fleetwide fuel economy has climbed to its highest level ever (see Figure 2 below). Drivers in the United States bought more cars in 2016 than ever before – setting a record sales high for the seventh year in a row.[224]

Figure 2



Source: Created by EDF from data available from Wards Auto[225] and the EPA Fuel Economy Trends Report[226]

4-6. In addition, Leard et al. (2017) acknowledges that their analysis omits any valuation of standard-based innovation. *Id.* at 27.

223 The Resurgence of the American Automotive Industry, The Obama White House (June 2011), https://obamawhitehouse.archives.gov/sites/default/files/uploads/auto_report_06_01_11.pdf.

224 Ahiza Garcia, *Car sales set another U.S. record*, CNN (Jan. 4, 2017), https://money.cnn.com/2017/01/04/news/companies/car-sales-2016/index.html.

225 *See* Data Center, WARD'S AUTO, *available at* http://www.WardsAuto.com/data-center (last visited Oct. 25, 2018) (including datasets on U.S. light vehicle sales).

226 *See* EPA, *Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 Through 2016* (Nov. 2016), https://www.epa.gov/fuel-economy-trends/download-co2-and-fuel-economy-trends-report-1975-2016.

During its return to profitability the auto industry also added jobs. Since the recession, overall job growth in the industry has been strong, aiding a recovery of domestic manufacturing as a whole. As of 2017, the U.S. auto industry had added nearly 700,000 direct jobs since the low point of the recession in mid-2009 – and these jobs support several million indirect jobs throughout the economy.[227] The growth in direct jobs includes more than 300,000 added jobs in motor vehicle and parts manufacturing and 380,000 added jobs at auto dealers.[228] This brings total manufacturing employment in the industry to 930,000 – representing nearly 50 percent growth since 2009, and bringing employment at auto and parts dealers to 2 million, which is its highest level ever. Indeed, auto-manufacturing jobs accounted for roughly 40 percent of all net jobs added in U.S. manufacturing since the recession.[229]

A study by the BlueGreen Alliance found that nationwide, there are over 1,200 facilities in 48 states specifically building the technology that increases fuel economy and cuts emissions.[230] And those facilities support hundreds of thousands of manufacturing jobs – including nearly 100,000 in Michigan and Ohio alone.[231]

For example, Ford's F-150, the best-selling vehicle in America, has led to additional jobs across the automotive supply chain. Ford reports that the MY 2015 F-150 is more powerful than earlier models.[232] It also gets an average of 21 percent better fuel economy and uses 17 percent less fuel compared to 2010 models that were built before the current standards took effect.[233] The fuel economy savings from just the new F-150s sold since 2011 save 5 million barrels of oil a year and cut carbon emissions by 2.3 million metric tons.[234]

As part of achieving the first phase in fuel economy standards, Ford developed and deployed a number of new technologies, including its "EcoBoost" line of redesigned engines. And for the second phase of standards Ford is using innovative design and materials—advanced high-strength steels and high-strength military-grade aluminum—to make its F-150 lighter and stronger. Emissions gains have also come from suppliers of more efficient components, like advanced electrical steering (EPS) systems.

---

[227] BlueGreen Alliance, *Supplying Ingenuity II: U.S. Suppliers of Key Clean, Fuel-Efficient Vehicle Technologies*, at 5 (May 2017), https://www.bluegreenalliance.org/resources/supplying-ingenuity-ii-u-s-suppliers-of-key-clean-fuel-efficient-vehicle-technologies/ (citing underlying data from U.S. Bureau of Labor Statistics, https://www.bls.gov/iag/tgs/iagauto.htm).
[228] *Id.*; BlueGreen Alliance, *Backgrounder: Sound Vehicle Standards & Policies Drive Strong Job Growth* (June 2016), https://www.bluegreenalliance.org/resources/sound-vehicle-standards-policies-drive-strong-job-growth/
[229] *Id.*
[230] BlueGreen Alliance, *Supplying Ingenuity II*, *supra* n.231, at 4.
[231] *Id.*
[232] BlueGreen Alliance, Combating Climate Change 426,000 Pickup Trucks At a Time, (June 2016), https://www.bluegreenalliance.org/resources/combating-climate-change-426000-pickup-trucks-at-a-time/.
[233] *Id.*
[234] *Id.*

An analysis by the BlueGreen Alliance summarized some of the jobs that Ford has supported through its innovation in the F-150.[235]

- Cleveland, Ohio: Ford's Engine Plant No. 1 employs 1,600 people
- Saginaw County, Michigan: Nexteer, supplier of EPS system, employs 5,000 people, largest employer in the county, after coming back from bankruptcy.
- Alcoa, Tennessee: Alcoa, aluminum producer, invested $275 million and added 200 jobs to expand its rolling mill.
- Davenport, Iowa: Alcoa, invested $300 million in facility where the aluminum is further customized to facilitate bonding between aluminum components.
- Dearborn, Michigan and Kansas City: Ford's Truck Plant and Assembly plant, invested $1.1 billion and added 900 workers before any aluminum body trucks could roll off the line. Kansas City Assembly, represented by United Autoworkers (UAW) Local 249, currently employs 6,450 hourly employees, the highest ever since the plant opened in 1951.
- Cleveland, Ohio: ArcelorMittal, steel mill, employs 1,900 people today after being mothballed in 2009.

There are also numerous other signs of economic health in the auto industry. The granting of patents by the United States Patent and Trademark Office (PTO) is often cited as a measure of inventive economic activity. The Clean Energy Patent Growth Index (CEPGI), published by the Cleantech Group at Heslin Rothenberg Farley & Mesiti P.C. provides an indication of the trend of innovative activity in the Clean Energy sector from 2002 to 2015. The CEPGI tracks the granting of U.S. patents for the following sub-components: Solar, Wind, Hybrid/Electric Vehicles, Fuel Cells, Hydroelectric, Tidal/Wave, Geothermal, Biomass/Biofuels and other clean renewable energy. In 2015, Hybrid/Electric Vehicle (HEV) technologies grew more than all others with a 30 percent increase in patents over 2014. HEV technologies were granted nearly 700 patents and fuel cell technologies were awarded more than 800 patents. The majority of these patents were granted to large automakers, including Toyota, GM, Honda and Ford.[236]

Finally, there is broad support for rigorous greenhouse gas standards by the labor community. Here are some quotes in support of the existing MY 2022-2025 standards:

- "In fact, that is the reason the UAW was central to the original CAFE agreement, which was carefully crafted to reduce emissions, increase fuel efficiency, give manufacturers flexibility to meet stringency standards, and create jobs in vehicle production and advanced technology. The UAW is proud of the role we played in reaching a consensus among a wide variety of

[235] *Id.*
[236] Clean Energy Patent Growth Index (CEPGI) - 2015 Year in Review, CLEANTECH GROUP AT HRFM (Oct. 31, 2016), http://www.cepgi.com/2016/10/cepgi_2015_year_in_review.html.

stakeholders, including the Obama Administration, state and federal regulators, the automobile industry, environmental advocates, elected officials and others to reduce greenhouse gases and raise the average fuel economy of vehicles….Fuel efficiency is our auto industry's future — plain and simple. From electric vehicles to full-sized pickups, fuel efficiency is improving across the industry. Countries around the globe continue to promote greater efficiency and lower emissions. If we ignore these realities, we could see the U.S. auto industry fall behind, hurting the American economy and American workers by ceding the auto markets of the future. Smart, balanced policies will make sure the U.S. auto industry does not fall behind, while also ensuring that these vehicles of the future are produced here, creating good paying union wage jobs." – Gary Jones, 2018 President of United Auto Workers[237]

- "[W]e urge the incoming Trump Administration and the 115th Congress to maintain our nation's commitment to improving fuel efficiency and reducing emissions. The basic structure and design of the One National Program was carefully constructed by a wide array of stakeholders and should be kept intact and not dramatically altered. We cannot afford to go back to the drawing board. Our competitors around the globe are working to strengthen environmental standards and it would be counterproductive to enact policies that provide disincentives for investing in advanced technologies and improving efficiency. History has taught us that a diverse fleet is essential for strong export sales and keeping jobs in the United States. Efficiency and emission standards can and must continue to be a win-win for the environment, working families, domestic manufacturing and the overall economy. The need to address climate change is real and urgent. We must act to protect our future and the future of our children and grandchildren. There is no scientific debate on the connection between fossil fuel consumption, rising carbon dioxide levels in the earth's atmosphere, and climate change. Climate change is real and we ignore it at our own peril. The need for a comprehensive strategy to address climate change could not be clearer and we all have responsibility to act." – Dennis Williams, 2016 President, United Auto Workers[238]

- At a September 2017 public hearing on EPA's reconsideration of the Mid-Term Evaluation, United Steel Workers leaders urged EPA to retain strong fuel economy standards for model year 2022-2025 light-duty cars, trucks, and SUVs to protect the jobs of thousands of Ohio workers building components for today's rapidly innovating auto industry:

[237] Gary Jones, *Labor Voices: Sensible fuel policies can create jobs*, THE DETROIT NEWS (Sept. 25, 2018), https://www.detroitnews.com/story/opinion/columnists/labor-voices/2018/09/25/labor-voices-sensible-fuel-policies-can-create-jobs/1414150002.

[238] Comments of United Autoworkers on the Appropriateness of the Model Year 2022-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards under the Midterm Evaluation, (Dec. 30, 2016), ID: EPA-HQ-OAR-2015-0827-6155.

- "As president of Local 2, I represent workers building cutting-edge technologies that are helping to make our light-duty cars, trucks, and SUVs cleaner than ever. We are part of a much larger group of workers that have benefitted from these clean car standards." Jack Hefner, President of USW Local 2 represents members in Akron at Maxion Wheels, Goodyear, and other automotive industry suppliers.[239]

- "Today's fuel economy standards are proof that sound regulations can go hand in hand with making manufacturing thrive. Ohio and auto sector are proving you can build jobs while cutting pollution and enhancing energy security." Dan Boone, President of USW Local 979 represents members at the ArcelorMittal plant in Cleveland, one of most innovative and productive steel mills in the world that makes lighter, stronger steel primarily for cleaner vehicles.[240]

- "For years the nation has reaped the benefits of these world-leading standards.. . . . Automakers and suppliers have made billions of dollars in investments and created hundreds of thousands of jobs nationwide ensuring that any vehicle a consumer chooses to buy—whether a car, truck, or SUV—gets more efficient every year. Strong standards keep that investment flowing and those jobs secure." – Kim Glas, Executive Director, BlueGreen Alliance[241]

- In a recent blog post co-authored by United Steel Workers President, Leo Gerard, and Natural Resources Defense Council President, Rhea Suh, both expressed strong support for the current federal standards.

  - "Getting more miles per gallon helps reduce our exposure to global oil price shocks we can neither control nor predict. It also reduces the dangerous carbon pollution that's driving the central environmental challenge of our time — global climate change. . . . The clean car and fuel economy standards are helping us do that, while at the same time helping us bring back America's manufacturing leadership and jobs. We owe it to our workers, and we owe it to our children, to stay the course." – Leo

[239] BlueGreen Alliance, Congressman Ryan Joined USW Leaders in Akron to Discuss Their Upcoming Testimony in Washington DC on Keeping Fuel Economy Standards and Ohio Manufacturing Strong (Sept. 5, 2017), https://www.bluegreenalliance.org/the-latest/congressman-ryan-joined-usw-leaders-in-akron-to-discuss-their-upcoming-testimony-in-washington-dc-on-keeping-fuel-economy-standards-and-ohio-manufacturing-strong/
[240] *Id.*
[241] BlueGreen Alliance, Flawed Proposal to Roll Back Fuel Economy and Emissions Standards will Cost Thousands of Jobs (Aug. 2, 2018), https://www.bluegreenalliance.org/the-latest/flawed-proposal-to-roll-back-fuel-economy-and-emissions-standards-will-cost-thousands-of-jobs/.

Gerard, President, United Steelworkers, and Rhea Suh, President, Natural Resources Defense Council[242]

C. Clean car standards will continue to benefit and protect automakers, parts suppliers and workers

In addition to the current robust economic health of the auto industry, there is also strong evidence that automakers and their parts suppliers will continue to make profits under the future Clean Car standards and will be better safeguarded against fuel price shocks. And market stability translates into employment stability for American autoworkers.

In a 2016 analysis, Ceres forecast automaker pretax profits under 5 different fuel price scenarios under the current MY 2022-2025 standards. They concluded that the top 3 U.S. manufacturers (Ford, GM and Chrysler) will be profitable under the current standards in all fuel price scenarios in the study, including the "very low" price scenario. They also found that U.S. automakers will be able to fully recover their compliance costs at any fuel price above the Energy Information Administration's long term forecasted "low price".[243]

Suppliers too stand to gain from the Clean Car standards. Suppliers make up a significantly larger portion of the U.S. economy and of U.S. employment than do the automakers. In April 2016, automakers employed 214,700 people in the U.S., while makers of auto parts employed 564,100 – or 2.6 times as many people. Stronger standards lead to increased supplier revenue because as much as 80 percent of automaker compliance investments are paid to suppliers of fuel-saving technologies. And the regulatory certainty of maintaining the current standards is especially valuable to the suppliers making the majority of fuel-saving technology investments in research, development, and production capacity.[244]

In addition to supporting industry profits, studies have shown that fuel efficiency standards insulate the auto market from fuel price shocks – and that market stability translates into employment stability. In a marketplace without standards, not all manufacturers produce fuel-efficient models. For example, the U.S. automakers relied heavily on less efficient vehicle lines before the Clean Car standards began in 2012. When fuel prices spike in the absence of fuel economy standards, more fuel-efficient vehicles are in greater demand, shifting demand across manufacturers and disrupting sales and employment. Peer-reviewed research suggests that fuel

---

[242] Rhea Suh & Leo Gerard, *Don't Let Donald Trump Roll Back Auto Fuel Economy Standards*, USA TODAY (Aug. 2, 2018, 10:24 PM), https://www.usatoday.com/story/opinion/2018/08/02/stop-trump-rollback-obama-fuel-efficiency-standards-column/833287002/.

[243] Baum, Alan & Dan Luria, ANALYST BRIEF: Economic Implications of the Current National Program v. a Weakened National Program in 2022-2025 for Detroit Three Automakers and Tier One Suppliers, CERES (Jun. 27, 2016), https://www.ceres.org/resources/reports/economic-implications-current-national-program-v-weakened-national-program-2022.

[244] *Id.*

economy and GHG standards have led U.S. automakers to offer more diverse sets of products that are competitive under a wider range of fuel prices, making them better positioned to manage significant fuel price swings.[245] For autoworkers and parts manufacturing workers, strong standards safeguard the industry against negative impacts associated with unanticipated changes in the price of fuel, which could otherwise lead to layoffs and lost wages.

To evaluate whether the current fuel economy and GHG standards are a cost effective hedge (i.e. a correctly priced insurance policy) against future fuel price spikes, Ceres estimated the net losses of weakened standards in the event of a price spike. The analysis concluded that profits by the three largest U.S. automakers (Ford, GM and Chrysler) from U.S. new vehicle sales would plummet more than $1 billion per year in response to fuel price shocks without the Clean Car standards.[246] And because as much as 80 percent of automaker compliance costs are paid to suppliers of fuel-saving technologies, suppliers could lose up to $1.42 billion in the case of a fuel price shock. [247] This could put many American jobs at risk. Alternatively, Ceres also concluded that the U.S. automakers stand to make significant profits under the Clean Cars program, even with low fuel prices, as discussed above.[248]

As the Trump administration has proposed rolling back the Clean Car standards, automakers have expressed concern:

- Two major automaker trade associations, the Alliance of Automobile Manufacturers and the Association of Global Automakers, wrote in letters to California Governor Jerry Brown and President Trump of their commitment to continued increases in fuel efficiency.
    - o "As our CEOs wrote to you in February of 2017, auto manufacturers are committed to continued gains in fuel efficiency and carbon reduction that appropriately balance environmental progress, safety, affordability, and jobs. That commitment has not wavered." – Alliance of Automobile Manufacturers & Association of Global Automakers[249]

- At EPA and NHTSA hearings this fall regarding the proposal to roll back the Clean Car standards, Auto Alliance stated:
    - o "First, let me say climate change is real and automakers are taking action to reduce carbon emissions from new vehicles. Automakers are also committed to continued improvements in fuel economy. Today, consumers have more choice in energy-efficient vehicles than ever before. About 500 models are on sale that achieve 30 MPG or more on the highway, and 80 of those models achieve 40 MPG or more.

[245] Meghan R. Busse et. al., Who is Exposed to Gas Prices? How Gasoline Prices Affect Automobile Manufacturers and Dealerships, 14 QUANTITATIVE MARKETING & ECONOMICS 41-96 (Mar. 2016), https://dspace.mit.edu/handle/1721.1/103416.
[246] Baum et al.
[247] *Id.*
[248] *Id.*
[249] Letter from Mitch Bainwol, President and CEO of the Alliance of Automobile Manufacturers, and John Bozzella, President and CEO of Global Automakers to Governor Jerry Brown, California (Aug. 2, 2018).

Consumers can choose from 45 hybrid-electric models and another 50 plug-in electric and fuel-cell models. And more electrified vehicles are on their way to market." -- Chris Nevers, Vice President, Energy & Environment, Auto Alliance[250]

- "The last five years, we've sold more cars than have ever been sold in the history of the auto industry. It's not just because, but it coincides with these new standards. They're better cars, they're more fuel efficient. It clearly has not dampened sales. . . . We need those manufacturers to keep doing research and building better vehicles like they have been doing. And if they stop because the standards are reversed, it would be bad for us as a business, and for this country." – Adam Lee, Owner, Lee Auto Malls Dealerships[251]

- "We support increasing clean car standards through 2025 and are not asking for a rollback. We want one set of standards nationally, along with additional flexibility to help us provide more affordable options for our customers. We believe that working together with EPA, NHTSA, and California, we can deliver on this standard." – Bill Ford, Executive Chairman, Ford, and Jim Hackett, CEO, Ford[252]

- "Honda is committed to realizing a future of low-carbon mobility that will reduce greenhouse gas emissions that contribute to global climate change. This includes Honda's intention for two-thirds of our global automobile sales to be electrified vehicles by 2030. In addition, Honda supports continued improvements in the fuel economy of the U.S. vehicle fleet as prescribed by federal fuel economy and greenhouse gas (GHG) emissions standards through 2025." -- Robert J. Bienenfeld, Assistant VP, Regulatory Policy, Honda[253]
- "Consistent with Honda's support for the goals of the 2017-2025 (ONP2) program, we believe it is appropriate to maintain topline targets of approximately 5% per year annual improvement (with advanced technology vehicle incentives noted below)." American Honda Motor Co., Comments on The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks (Oct. 25, 2018)).
- "A single, national standard would allow us to focus our resources on innovations that benefit our customers and society as we pursue our vision of a world with zero crashes, zero emissions and zero congestion, instead of diffusing resources to meet different rules within the United States. Regardless of the outcome of these discussions, I assure you we have an absolute and unwavering commitment to improve fuel economy, reduce emissions and invest in technologies to drive an all-electric future. These are the right actions for our customers, our company and our environment." GM CEO Mary Barra, Keeping Our Commitment to an All-Electric Future (May 8, 2018), https://www.linkedin.com/pulse/keeping-our-commitment-all-electric-future-mary-barra/.

---

[250] *Alliance remarks for NHTSA/EPA hearings on fuel economy standards*, Auto Alliance (Sept. 24, 2018), https://autoalliance.org/2018/09/24/alliance-remarks-nhtsa-epa-hearings-fuel-economy-standards/.
[251] Mary Kuhlman, *Maine Auto Leader: Fuel-Economy Rules Good for Business*, PUBLIC NEWS SERVICE (Aug. 3, 2018), https://www.publicnewsservice.org/2018-08-03/climate-change-air-quality/maine-auto-leader-fuel-economy-rules-good-for-business/a63546-2.
[252] Bill Ford & Jim Hackett, *A Measure of Progress*, MEDIUM (Mar. 27, 2018), https://medium.com/cityoftomorrow/a-measure-of-progress-bc34ad2b0ed.
[253] Our Perspective – Vehicle Greenhouse Gas and Fuel Economy Standards, Honda (Apr. 20, 2018), https://hondainamerica.com/views/our-perspective-vehicle-greenhouse-gas-and-fuel-economy-standards/.

Several major automakers have recently made increased commitments to develop electric vehicle technology and invest in electrification. In late 2017, GM announced plans to release 20 new all-electric models by 2023 as part of a commitment to increase EV usage and acceptance.[254] In January 2018, Ford committed to invest $11 billion dollars in electrification and launch 40 electrified models by 2022.[255] The company also just announced plans to start production of the first-ever hybrid-electric F-150 truck in 2020.[256] Automakers' commitments to continue reducing emissions and their support for increasing standards underscore the needless radicalism of this proposal.

D. Clean car standards help ensure that automakers retain their global competitiveness

The Clean Car standards are essential to ensuring that the resurgence for U.S. automakers endures, and that American autoworkers have a strong position in the years ahead. The strong fuel economy and GHG standards have led U.S. automakers to offer a more diverse and more efficient set of vehicles. As a result, their fleets will remain attractive to consumers in the years ahead, even if fuel prices spike again.[257]

Strong fuel economy and GHG standards are essential if the American auto sector is going to keep pace with global trends. Many other nations have adopted fuel economy and GHG emissions standards through 2025 that will drive improved passenger vehicle efficiency in line with the U.S., while some nations are planning to go farther faster. This includes a range of developed and developing countries, including: Canada,[258] the European Union[259], China,[260]

---

[254] Press Release, General Motors, GM Outlines All-Electric Path to Zero Emissions (Oct. 2, 2017), https://media.gm.com/media/us/en/gm/news.detail.html/content/Pages/news/us/en/2017/oct/1002-electric.html (quoting Mark Reuss, General Motors executive vice president of Product Development, Purchasing and Supply Chain, "General Motors believes in an all-electric future….Although that future won't happen overnight, GM is committed to driving increased usage and acceptance of electric vehicles through no-compromise solutions that meet our customers' needs.").

[255] Stephen Edelstein, *Ford Will Launch 40 Electrified Vehicles by 2022*, THE DRIVE (Jan. 15, 2018), http://www.thedrive.com/tech/17681/ford-will-launch-40-electrified-vehicles-by-2022.

[256] Ian Thibodeau, *Ford Rouge complex's next chapter: a hybrid F-150*, DETROIT NEWS (Sept. 27, 2018, 10:03 PM), https://www.detroitnews.com/story/business/autos/ford/2018/09/27/ford-rouge-complex-hybrid-f-150/1443579002/; *see also* Benjamin Raven, *Ford says it will make hybrid F-150 at historic, 100-year-old Rouge complex*, MICHIGAN AUTOMOTIVE NEWS (Sept. 27, 2018), https://www.mlive.com/auto/index.ssf/2018/09/ford_says_it_will_make_hybrid.html.

[257] Meghan R. Busse et. al., Who is Exposed to Gas Prices? How Gasoline Prices Affect Automobile Manufacturers and Dealerships, 14 QUANTITATIVE MARKETING & ECONOMICS 41-96 (Mar. 2016), https://dspace.mit.edu/handle/1721.1/103416.

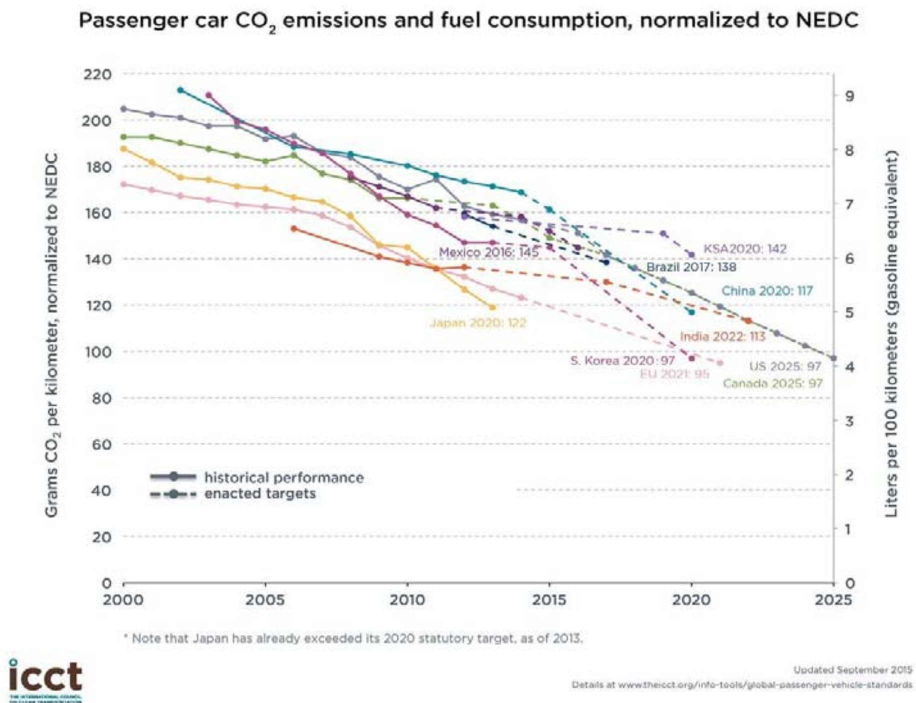
[258] Fact Sheet: Canada, Light Duty Vehicle Efficiency Standards (Jan. 2015), https://www.theicct.org/sites/default/files/info-tools/pvstds/Canada_PVstds-facts_jan2015.pdf.

[259] EU Light Duty: GHG Emissions, TransportPolicy.net, https://www.transportpolicy.net/standard/eu-light-duty-ghg-emissions/ (last accessed Oct. 25, 2018).

[260] China: Light Duty Fuel Consumption, TransportPolicy.net, https://www.transportpolicy.net/standard/china-light-duty-fuel-consumption/ (last accessed Oct. 25, 2018).

India[261] and South Korea[262] (see Figure 5 below). And China – which is seeing the largest market growth worldwide – will require that foreign carmakers start manufacturing electric vehicles in 2019. U.S. automakers who intend to export cars to China will have to earn points from electric vehicles and hybrids equivalent to 10% of vehicles they import into the country, rising to 12% in 2020.[263]

Figure 3



Source: ICCT, *See* http://www.theicct.org/sctp-ldv-e

Looking past 2025, many nations have made commitments to fully phase out the combustion engine over the next couple of decades. Britain and France announced that they would end the sale of gas and diesel-powered vehicles by 2040.[264] Scotland pledged to phase out new petrol and diesel cars and vans by 2032, eight years ahead of the UK target.[265] India is making a vow to start selling only electric cars by 2030. The government's National Electric Mobility Mission

---

[261] India: Light-Duty: Fuel Consumption, TransportPolicy.net, https://www.transportpolicy.net/standard/india-light-duty-fuel-consumption/ (last accessed Oct. 25, 2018).
[262] South Korea: Light Duty: Fuel Consumption and GHG, TransportPolicy.net, https://www.transportpolicy.net/standard/south-korea-light-duty-fuel-economy-and-ghg/ (last accessed Oct. 25, 2018).
[263] *China Sets New deadline for Electric-Car Production*, DOW JONES NEWSWIRES (Sept. 28, 2017), http://www.foxbusiness.com/markets/2017/09/28/china-sets-new-deadline-for-electric-car-production.html.
[264] Stephen Castle, Britain to Ban New Diesel and Gas Cars by 2040, N.Y. TIMES (July 26, 2017), https://www.nytimes.com/2017/07/26/world/europe/uk-diesel-petrol-emissions.html.
[265] Shehab Khan, Scotland to 'Phase Out' New Petrol and Diesel Cars by 2032, INDEPENDENT.UK, (Sept. 5, 2017), http://www.independent.co.uk/news/uk/politics/scotland-petrol-diesel-cars-phase-out-ban-2032-nicola-sturgeon-snp-environment-air-pollution-a7930781.html.

Plan wants annual sales of electric and hybrid cars to hit between 6 and 7 million by 2020.[266] Norway set a target that all new passenger cars and vans sold in 2025 should be zero-emission vehicles. The country is considered a leader in this area. About 40% of all cars sold in the country in 2016 were electric or hybrid vehicles.[267] Austria, China, Denmark, Germany, Ireland, Japan, the Netherlands, Portugal, Korea and Spain have set official targets for electric car sales.[268] A number of governments have also set objectives for EV deployment.[269] To facilitate a deployment of 5 million electric vehicles by 2020, including 4.6 million passenger cars, China plans to implement a new energy vehicle (NEV) mandate that requires 7-10% of new cars sold in 2020 to be NEV vehicles, increasing to 40-50% by 2030.[270] The European Union has also set targets of 15% electric vehicle sales by 2025, and 30% by 2030.[271] Any backtracking on the current 2025 standards would therefore risk leaving U.S. manufacturers behind.

V. NHTSA Fails to Explain its Incongruous Treatment of Light Duty Trucks Compared to Heavy Duty Pickups and Vans

NHTSA touts its prior use of the Volpe and Autonomie models in establishing fuel efficiency and CO2 standards for heavy duty pickups and vans. 83 FR 43002. A more apt comparison is not between the use of those models for each set of standards, but for the appropriateness of year-over-year improvements for the vehicle classes covered by those standards and the standards for light duty trucks subject to this proposed rollback. EPA and NHTSA's joint heavy duty pickup and van standards require year-over-year increase in stringency in miles per gallon of 2.5 percent from model years 2021 through 2027. 81 FR at 73732 (Oct. 25, 2016). Heavy duty pickups and vans use the same fuel efficiency and CO2 emission reduction technologies as their light duty counterparts[272], are made by the same manufacturers and sometimes use identical engine platforms.[273] Compared to the current standards for light duty trucks subject to this proposed rollback, the standards for heavy duty pickups and vans are arguably more challenging to meet, due to fewer averaging opportunities, longer redesign cycles, and in some instances, lower technology efficiency. Heavy Duty RTC at 1342.

---

[266] Jackie Wattles, India to Sell Only Electric Cars by 2030, CNN.com (June 3, 2017), http://money.cnn.com/2017/06/03/technology/future/india-electric-cars/index.html?iid=EL.
[267] Alanna Petroff, These Countries Want to Ditch Gas and Diesel Cars (July 26, 2017), http://money.cnn.com/2017/07/26/autos/countries-that-are-banning-gas-cars-for-electric/index.html.
[268] *Id.*; IEA, Global EV Outlook (2017) see https://www.iea.org/publications/freepublications/publication/global-ev-outlook-2017.html.
[269] International Energy Agency, Global EV Outlook 2018, at 34, Table 2.2 Announced country targets and objectives for EV deployment, 2020-30, https://webstore.iea.org/global-ev-outlook-2018.
[270] *Id.*
[271] *Id.*
[272] See, e.g. Heavy Duty RIA (EPA-420-R-16-900, August, 2016) at 2-56 through 2-64 (engine technologies in common). The exception is certain technologies incompatible with heavy duty pickup towing functionality. Heavy Duty Response to Comment Document (EPA-420-R-16-901, August 2016) at p. 1331.
[273] 81 FR at 73733/2.

Notwithstanding these constraints, the agencies adopted the year-over-year percentage increase standard[274], no entity suggested that a freeze of standards was a reasonable alternative, and no entity challenged the promulgated standards. The agencies do not acknowledge, let alone provide a rational explanation for, this anomalous treatment of similarly situated vehicles.

VI. The Agencies' Rejection of Multiple Available Technologies is Inconsistent With the Governing Statutes, Under Which the Relevant Question Is Whether Given Technologies are Feasible and Can Be Deployed Within the Relevant Lead Time, Not Whether They are Currently Extant or Currently on the Market

We have shown elsewhere that the agencies' grounds for rejecting various of the advanced technologies, in particular HCR2, HCCI, and Miller cycle engines, are without factual basis. But the grounds assigned are also without *legal* basis. The agencies, for example, reject HCR2 as a "speculative technology" without "observable physical demonstration" and because it is a "theoretical application of additional technologies in combination…" and so is "entirely speculative, as no production engine as outlined in the EPA SAE paper has even been commercially or even produced as a prototype in a lab setting".[275] Similarly, HCCI is not considered because "manufacturers were not manufacturing HCCI engines at the time of the 2012 rulemaking, and accordingly there was a lack of conclusive and independently verifiable effectiveness, cost, and mass market implementation data available."[276] And the well-established, mass-produced Miller cycle engine technology is excluded from consideration because of the purported lack of engine maps.[277]

The fundamental legal error in all of these formulations is that agencies mandated to engage in technology-forcing determinations, as are EPA[278] and NHTSA[279] here, are required to look beyond technology presently in commercial application, are not limited to consideration of current technology, and are not hamstrung by absence of this or that type of performance

[274] See 81 FR at 73801 (rejecting less stringent alternative still requiring emission reductions and increased fuel efficiency).
[275] 83 Fed. Reg. 43038;
[276] PRIA p. 240.
[277] 83 Fed. Reg. 43051 n. 174.
[278] Standards under section 202 (a)(1) are "expected to press for the development and applicability of improved technology rather than be limited by what exists. Standards should be a function of the degree of control required, not the degree of technology available today". S. Rep. No. 91-1146 at 23. Congress "expected [EPA] to press for the development and application of improved technology rather than be limited by that which exists today". *NRDC v. EPA*, 655 F. 2d 318, 328 (D.C. Cir. 1981) (construing section 202 (a)(1), see id. at 324-27 and 337). See 77 Fed. Reg. 62,624 at 62,777 (Oct. 15, 2012) ("Under section 202(a), EPA is called upon to set standards that provide adequate lead time for the development and application of technology to meet the standards.")
[279] "Congress created mandatory vehicle fuel economy standards, intended to be technology forcing, with the recognition that 'market forces...may not be strong enough to bring about the necessary fuel conservation which a national energy policy demands." *Center for Auto Safety v. Peck*, 793 F.2d 1322, 1339 (D.C. Cir. 1986), *citing* S. Rep. No. 179, 94th Cong., 1st Sess. 2 (1975), U.S.C.C.A.N. 1975 at 9; see also 77 Fed. Reg. at 62668 (NHTSA is "not limited in determining the level of new standards to technology that is already being commercially applied at the time of the rulemaking…").

information. The plain text of the relevant statutes makes this clear: The Clean Air Act directs EPA to identify "such period as the Administrator finds necessary to permit the development and application of the requisite technology," 42 U.S.C. 7521(a)(2). EPCA's fuel economy mandate is "intended to be technology forcing, with the recognition that 'market forces...may not be strong enough to bring about the necessary fuel conservation which a national energy policy demands.'" *Center for Auto Safety*, 793 F.2d at 1339, quoting S. Rep. No. 179, 94th Cong., 1st Sess. 2 (1975). NHTSA itself recognized that it is "not limited…to technology that is already being commercially applied at the time of the rulemaking" but rather "can, instead, set technology-forcing standards." 77 Fed Reg at 63,015; see also 75 Fed. Reg. 25,324, 25,605 (May 7, 2010).

Not only does a technology-forcing mandate "not constrict the agency to technology that is now available", it "permit[s] the agency to set standards based on projections of technology that is not currently available."[280] To prevent occurrence of "stagnating technology" and to further the Congressional objective to "promot[e] advances in emission control technology", the agency is "to engage in reasonable predictions and projections in order to force technology".[281] The D.C. Circuit has made clear that lack of existence of test data is not a bar to adopting technology-forcing standards based on technology and levels of performance not currently in commercial or theoretical application.[282] Courts have also held that EPA can infer that a technology is demonstrated as a whole based on operation of component parts which have not, as yet, been fully integrated.[283] *A fortiori*, the HCR2 package, where most of the components *have* been operated in combination already, cannot lawfully be rejected as "speculative" as the agencies dismissively do.

EPA's task is thus to identify the major steps necessary for "development and application of the requisite technology," and then the respective standard "*shall* take effect."[284] These individual decisions are highly consequential: as noted above, without changing anything else about the agencies' analysis, allowing HCR2 would reduce augural compliance costs by $619—or about

---

[280] *NRDC v. Thomas*, 805 F. 2d 410, 429 (D.C. Cir. 1986).
[281] 805 F.2d at 430.
[282] See *Portland Cement Ass'n v. Ruckelshaus*, 486 F. 2d 375, 401-02 (D.C. Cir. 1973)(interpreting CAA section 111 (a) (1)'s requirement of standards reflecting performance of "best system of emission reduction … adequately demonstrated" as being satisfied "not on the basis of tests on existing sources or old test data in the literature, but on extrapolations from this data, on a reasoned basis responsive to comments, and on testimony from experts and vendors". The same case reiterates that a technology need not be in commercial application to be considered, since this technology-forcing provision "looks toward what may fairly be projected for the regulated future, rather than the state of the art at present." *Id*. at 391 n. 59.
[283] See *Lignite Energy Council*, 198 F. 3d at 933-34 (none of the components of the selected best system had been operated at industrial boilers, much less "applied … in combination" (83 Fed. Reg. 43038); *Sur Contra La Contaminacion v. EPA*, 202 F. 3d 443, 447 (1st Cir. 2000) (upholding "best available technology" determination under CAA section 169(3) based on a "novel combination of three proven control technologies" that "ha[d] not been used before"); *Native Vill. of Point Hope v. Salazar*, 680 F. 3d 1123, 1133 (9th Cir. 2012) upholding standard where "most major components for [the] system [were] available and ha[d] been [individually] field tested").
[284] *NRDC v. EPA*, 655 F. 2d 318, 333 (D.C. Cir. 1981)(interpreting CAA section 202 (a)(1) and (2)); *NRDC v. Thomas*, 805 F. 2d at 428-30 (same).

30% of the total difference between the augural and rollback scenarios.[285] The proposal's rejection of these technologies nowhere justifies how the (unfounded and cursorily justified) concerns accord with the agency's limited discretion under Section 202(a)(2) and duty to "press for the development and application of improved technology rather than be limited by that which exists today."[286]

[285] PRIA Table 13-4. See also the comments in this docket of the International Council on Clean Transportation.

[286] *NRDC v. EPA*, 655 F. 2d at 328; *see also id.* at 331 ("If the agency is to predict more than the results of merely assembling pre-existing components, it must have some leeway to deduce results that are not represented by present data."). Ironically, the agencies reject even a technology, the HCR2 package, which does consist of assembling pre-existing components.