Institute for Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

October 16, 2023

To: National Highway Traffic Safety Administration, U.S. Department of Transportation

Re: Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years 2027–2032 and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030–2035, 88 Fed. Reg. 56,128 (proposed Aug. 17, 2023)

The Institute for Policy Integrity at New York University School of Law (Policy Integrity)[1] respectfully submits this comment letter on the National Highway Traffic Safety Administration's (NHTSA) proposed corporate average fuel economy standards for passenger cars, light trucks, and heavy-duty pickup trucks and vans (HDPUVs) (collectively, the Proposed Rule).[2] Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy.

As this letter details, tightening vehicle fuel-economy and fuel-efficiency standards can offer substantial social benefits, including fuel savings and reductions in climate pollution. Though the Proposed Rule and its accompanying regulatory impact analysis (RIA)[3] offer useful starting points, NHTSA should take further steps to ensure the complete presentation of regulatory benefits and costs and should select a regulatory option that best promotes social welfare, consistent with the agency's legal obligations. In particular, we offer the following recommendations:

- **NHTSA should presumptively select the alternatives that will maximize net benefits, yet the Proposed Rule fails to do so for both vehicle classes without compelling justifications.** Currently, NHTSA's modeling concludes that the most stringent alternatives would result in greater net benefits than the proposed standards. While NHTSA selects these less net-beneficial alternatives based on its weighing of the statutory factors, its particular analysis of applicable economic factors is unpersuasive.
    - **NHTSA should assess a broader range of alternatives** that decouple increases for light trucks from those for passenger cars and that impose

[1] This document does not purport to represent the views, if any, of New York University School of Law.
[2] Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years 2027–2032 and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030–2035, 88 Fed. Reg. 56,128 (proposed Aug. 17, 2023) [hereinafter Proposed Rule].
[3] NHTSA, Preliminary Regulatory Impact Analysis: Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years 2027 and Beyond and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030 and Beyond (July 2023) [hereinafter RIA].

    - non-linear stringency increases, which could further maximize net benefits.
    - Additionally, **NHTSA should consider flattening its footprint curve to discourage vehicle upsizing as a likely compliance strategy**, as upsizing could undo many of the efficiency gains NHTSA seeks and thereby lower net benefits.
- **NHTSA should conduct additional economic analysis around key parameters to ensure robust consideration of regulatory benefits and costs and to enable the agency to make the most informed choice between alternatives.** In particular, NHTSA should conduct additional analysis using climate-damage valuations and social discount rates from draft guidance documents that reflect the best available science and economics. NHTSA should also conduct additional analysis to ensure the accuracy of its cost, baseline, and scrappage modeling. As detailed below, **such changes would show that the costs of the Proposed Rule and its alternatives are lower—and the benefits greater—than NHTSA currently estimates**.
- While NHTSA appropriately conducts dozens of sensitivity analyses, **it should conduct additional analyses around key parameters to ensure robustness and transparency**. For one, NHTSA should perform additional analyses with the Environmental Protection Agency's (EPA) to-be-finalized tailpipe rule in the baseline. Additionally, EPA should perform an "unconstrained" analysis that considers all likely means of compliance.
- NHTSA should conduct a **more balanced literature review that captures the extensive evidence supporting the energy efficiency gap.**
- NHTSA should **add several arguments to bolster its conclusion that the Proposed Rule is severable.**

Following a short background section, we expand upon these points below.

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Background

NHTSA published the Proposed Rule in July 2023, among other reasons, to "help[] consumers save money on fuel, . . . improve[] national energy security[,] and reduce[] harmful emissions."[4] The Proposed Rule would set fuel economy standards for passenger cars and light trucks for model years 2027–2032. It would also set fuel-efficiency standards for HDPUVs for model years 2030–2035.

The Proposed Rule follows a series of other regulations for these vehicle classes under the Energy Policy and Conservation Act (EPCA).[5] NHTSA promulgated the most recent standards for passenger cars and light trucks in 2022 for model years 2024–2026;[6] that rule is currently being challenged in the U.S. Court of Appeals for the D.C. Circuit.

For passenger cars and light trucks, EPCA instructs NHTSA to set fuel-economy standards at the "maximum feasible average fuel economy level" that "manufacturers can achieve" in each model year.[7] NHTSA must "consider technological feasibility, economic practicability, the effect of other motor vehicle standards of the Government on fuel economy, and the need of the United States to conserve energy" when assessing these standards.[8] However, NHTSA "may not consider the fuel economy of dedicated automobiles," a statutory term of art that includes electric vehicles[9]—even though manufacturers may produce such vehicles to comply with the standards. NHTSA also "may not consider . . . the trading, transferring, or availability of credits"[10]—even though, again, manufacturers may comply using such methods. NHTSA therefore sets those standards using a "standard-setting" analysis that assumes that no manufacturer produces any additional electric vehicles in response to these standards or uses any credits.[11]

For HDPUVs, EPCA instructs NHTSA to set "maximum feasible" standards "that are appropriate, cost-effective, and technologically feasible."[12] The statutory constraints of the "standard-setting" analysis do not apply to HDPUVs, so NHTSA sets those standards using an "unconstrained" analysis in which manufacturers can use all available compliance methods.[13]

NHTSA presents the Proposed Rule's regulatory impacts in the RIA. For passenger cars and light trucks, the agency concludes that the proposed standards—increasing fuel economy over the relevant model years by 2% annually for passenger cars and 4% annually for light trucks (PC2LT4)—would produce considerable benefits, primarily by reducing fuel costs and greenhouse gas pollution.[14] NHTSA also projects that these standards would produce costs,

[4] Proposed Rule, 88 Fed. Reg. at 56,132.
[5] 49 U.S.C. § 32902.
[6] Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks, 87 Fed. Reg. 25,710 (May 2, 2022) [2022 Rule].
[7] 49 U.S.C. § 32902(a).
[8] *Id.* § 32902(f).
[9] *Id.* § 32902(h)(1).
[10] *Id.* § 32902(h)(2).
[11] *See, e.g.*, Proposed Rule, 88 Fed. Reg. at 56,147 ("NHTSA's modeling and analysis to inform standard setting is guided and shaped by these statutory requirements [under EPCA and EISA].").
[12] 49 U.S.C. § 32902(k)(2).
[13] *See, e.g.*, Proposed Rule, 88 Fed. Reg. at 56,147 ("[U]nder NHTSA's distinct statutory authority for setting HDPUV standards, expanding BEV technologies are part of NHTSA's standard setting consideration.").
[14] RIA at 8-42 to 8-43 tbl.8-14.

especially higher technology costs.[15] In total, NHTSA concludes that these standards will result in $46.5 billion in net benefits for calendar years 2022–2050 when using a 3% discount rate for all regulatory effects and the central-damages estimate for the social cost of greenhouse gases.[16] Because of the constraints of the "standard-setting analysis," which yield lower benefits and higher costs than an "unconstrained" analysis, this understates true net benefits.

For HDPUVs, the proposed standards—increasing fuel economy over the relevant model years by 10% annually (HDPUV10)—yield the same general categories of benefits and costs.[17] In total, NHTSA concludes that these standards will result in $2.25 billion in net benefits at the same 3% discount rate.

In addition to these proposed standards, NHTSA also considers various regulatory alternatives for all vehicle classes, including some that are less stringent (PC1LT3 for passenger cars and light trucks, and HDPUV4 for HDPUVs) and some that are more stringent (PC3LT5 and PC6LT8, and HDPUV14).[18] Of the options evaluated, NHTSA finds that its most stringent alternatives—PC6LT8 and HDPUV14—would result in the greatest monetized net benefits. Specifically, NHTSA finds that PC6LT8 would produce $51.0 billion in net benefits (again under the "standard-setting" analysis)[19] and that HDPUV14 would produce $8.00 billion in net benefits[20]—all using a consistent 3% discount rate. For each vehicle class, this is about $5 billion more than the proposed standards. NHTSA considers numerous factors under EPCA and considers its net-benefits estimates to be relevant to its decisionmaking, but not dispositive.[21]

The Proposed Rule, like prior NHTSA fuel-economy rules, is footprint-based, meaning that more stringent fuel-economy requirements apply to smaller vehicles (measured by footprint).[22] NHTSA proposes to maintain the existing footprint curve—i.e., maintain the existing size-to-stringency function—and does not consider alternatives that adjust that curve.

I. NHTSA Should Consider a Broader Range of Alternatives and Should Presumptively Select the Option that Maximizes Net Social Welfare

Under EPCA, as amended by the Energy Independence and Security Act, NHTSA must set CAFE and HDPUV standards to achieve "the maximum feasible" fuel-economy improvement.[23] To help balance the relevant statutory factors, NHTSA continues its longstanding practice in the Proposed Rule of assessing various regulatory alternatives using a monetized cost-benefit analysis.[24] Longstanding executive orders and guidance instruct agencies "choosing among

[15] *Id.*
[16] *Id.* This letter presents values using the central rather than 95th percentile estimates of the social cost of greenhouse gases at a 3% discount rate. Notably, for reasons discussed *infra* Section II.A, this central estimate is widely viewed as understating the true costs of greenhouse gases and is used here only for ease of presentation.
[17] *Id.* at 8-100 to 8-102 tbl.8-27.
[18] *See* Proposed Rule, 88 Fed. Reg. at 56,133 tbl.I–1; *id.* at 56,133 tbl.I–2.
[19] RIA at 8-42 to 8-43 tbl.8-14.
[20] *Id.* at 8-100 to 8-102 tbl.8-27.
[21] *See infra* Sec. II.A.
[22] Proposed Rule, 88 Fed. Reg. at 56,134.
[23] 49 U.S.C. §§ 32902(a), 32902(k)(2).
[24] *See id.* at 1197 (permitting the use of cost-benefit analysis in setting CAFE standards).

alternative regulatory approaches" to "select those approaches that maximize net benefits (including . . . distributive impacts[] and equity)," to the extent permitted by law.[25]

NHTSA should follow this principle in setting these standards. Based on NHTSA's analysis, these principles counsel in favor of more stringent standards than NHTSA's preferred alternatives. In fact, according to the RIA, for both vehicle classes, the most stringent alternatives offer about $5 billion more in net benefits than NHTSA's preferred alternatives, under the calendar-year (CY) approach—the approach we adopt throughout this letter unless otherwise noted, because of its greater accuracy and NHTSA's apparent preference for this approach.[26] That difference jumps to over $150 billion if updated climate-damage valuations and discount rates are applied consistent with recent draft guidance.[27]

NHTSA also fails to consider several sensible alternatives that may yield even more net benefits. A superior weighing of applicable statutory factors, along with applicable executive orders, favors considering more stringent standards. Additionally, NHTSA should consider flattening the footprint curve to avoid perversely incentivizing manufacturers to make larger vehicles that offset efficiency gains.

A. NHTSA Should Consider a Wider Range of Alternatives

Agencies should generally "explore modifications of some or all of a regulation's attributes or provisions to identify appropriate alternatives."[28] NHTSA's analysis yields several sensible alternatives that it should consider.

First, NHTSA should consider alternatives that decouple the stringency of standards for passenger cars and light trucks. Currently, those two vehicle classes increase in stringency together under all alternatives—that is, one class increases in stringency only when the other does. But nothing in EPCA requires that approach; NHTSA may reach the maximum feasible level for one class while still having room to improve the other. For instance, based on its own analysis, there is reason to expect that NHTSA could maximize net benefits by setting much more stringent light-truck standards compared to passenger-car standards.[29] It could set, hypothetically, a "PC2LT8" standard (i.e., a standard that increases fuel economy by 2% annually for passenger cars but 8% annually for light trucks). Such decoupling reflects a sensible—and potentially more net beneficial—alternative that NHTSA should consider.

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[25] Exec. Order No. 12,866 § 1(a), 58 Fed. Reg. 51,735, 51,735 (Oct. 4, 1993); *see also* Exec. Order No. 14,094 § 1, 88 Fed. Reg. 21,879, 21,879 (Apr. 11, 2023) (reaffirming the principles of Executive Order 12,866); OFF. OF MGMT. & BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 2 (2003) [hereinafter CIRCULAR A-4].

[26] RIA at 1-8 tbl.1-2 (showing $5 billion more in net benefits for PC6LT8 under a CY approach and a 3% discount rate compared to PC2LT4); *id.* at 1-8 to -9 tbl.103 (showing $5.75 billion more in net benefits for HPUV14 under a CY approach and a 3% discount rate compared to HPUV10). Unless otherwise noted, this letter reports figures using the CY approach because the alternative model-year approach "usually omits the majority of the effects that establishing standards for a specific model year can have on the number, use, and fuel consumption of vehicles produced during earlier or later model years." RIA at 5-5. While "the CY accounting is also more sensitive to uncertainties in key input values," *id.*, NHTSA provides no reason to conclude that these uncertainties distort its analysis more than omitting effects on earlier and later model years altogether.

[27] *See infra* Secs. II.A–B.

[28] CIRCULAR A-4, *supra* note 25, at 7.

[29] *See* Proposed Rule, 88 Fed. Reg. at 56,342 (noting that, at least under a model-year approach, "[n]et benefits for passenger cars remain negative across alternatives" but that "[n]et benefits for light trucks remain positive across alternatives, with a peak at PC6LT8").

As an illustration, Policy Integrity re-ran NHTSA's CAFE model to analyze the benefits, costs, and net benefits of the PC2LT8 option. As Table 1 demonstrates, the PC2LT8 alternative may be more net beneficial than NHTSA's preferred alternative of PC2LT4, and even perhaps more than any of the alternatives that NHTSA analyzes, depending on the valuation for the social cost of greenhouse gases. Moreover, Table 2 (presented on the next page) confirms that for model year 2032 (as an illustrative example), PC2LT8 entails lower incremental vehicle costs than PC6LT8—the alternative that, as detailed below, NHTSA rejects largely because of incremental costs. These numbers were derived from the undersigned using NHTSA's own CAFE model, keeping all parameters constant besides the regulatory standard.

Table 1: Incremental Benefits and Costs for the On-Road Fleet CY 2022–2050 (2021$ Billions), by Alternative

	PC1LT3	PC2LT4	PC3LT5	PC6LT8	**PC2LT8**
Total Social Costs	116.3	156.8	239.9	385.9	**301.8**
Total Social Benefits					
SC-GHG 5% Avg.	128.2	173.2	221.6	369.0	**302.3**
SC-GHG 3% Avg.	150.5	203.3	260.8	436.9	**358.7**
SC-GHG 2.5% Avg.	166.4	224.8	288.8	485.5	**399.2**
SC-GHG 3%, 95^{th} pctile	210.4	284.3	366.1	619.3	**510.4**
Net Social Benefits					
SC-GHG 5% Avg.	11.9	16.3	-18.2	-16.9	**0.5**
SC-GHG 3% Avg.	34.2	46.5	21.0	51.0	**57.0**
SC-GHG 2.5% Avg.	50.1	68.0	49.0	99.7	**97.4**
SC-GHG 3%, 95^{th} pctile	94.1	127.5	126.3	233.5	**208.6**

Table 2: Per-Vehicle Technology Cost ($), MY 2032 Vehicle

	No Action	PC1LT3	PC2LT4	PC3LT5	PC6LT8	**PC2LT8**
Stellantis	2,740	+820	+1,020	+1,060	+1,810	**+1,840**
GM	2,200	+1,270	+1,270	+1,900	+1,900	**+1,280**
Subaru	2,180	+0	+0	+0	+910	**+750**
Nissan	2,170	+200	+540	+790	+1,580	**+650**
Ford	2,150	+780	+960	+960	+1,290	**+880**
Mercedes-Benz	2,080	+180	+240	+330	+360	**+210**
VWA	2,080	+390	+660	+820	+940	**+800**
Mazda	2,040	+30	+60	+4,960	+9,070	**+8,820**
BMW	1,980	+80	+140	+140	+410	**+110**
Hyundai Kia-H	1,650	+1,530	+1,920	+3,520	+4,440	**+3,400**
JLR	1,640	+610	+630	+630	+630	**+630**
Toyota	1,590	+0	+70	+370	+1,550	**+1,100**
Mitsubishi	1,360	+550	+640	+1,780	+2,040	**+790**
Honda	1,330	+100	+230	+600	+1,550	**+1,040**
Hyundai Kia-K	1,090	+1,010	+2,240	+4,650	+5,530	**+4,450**
Volvo	1,050	+320	+570	+820	+870	**+780**
Industry Avg.	1,890	+540	+730	+1,190	+1,860	**+1,400**

Note: The figures in the "No Action" column represent the total per-vehicle technology costs associated with the No Action Alternative. All other columns display the incremental per-vehicle technology cost increases compared to the "No Action" baseline.

As a further illustration, Policy Integrity also re-ran the model to assess the impacts of PC6LT5, to show the impact of setting more stringent passenger-car standards relative to light-truck standards. Net benefits for this option exceeded NHTSA's preferred option of PC2LT4, but were lower than the PC2LT8 alternative presented above. However, modeled compliance with the standards was greater under PC6LT5 compared to PC2LT8, presenting NHTSA with another regulatory option if it wishes to increase (but not maximize) net benefits while maintaining high compliance. Modeling results for the PC6LT5 alternative are presented below in the appendix.[30]

Second, NHTSA should consider non-uniform changes in stringency from one year to another. For all vehicle classes, NHTSA considers only uniform annual percentage changes in stringency across the relevant model years. But again, nothing in EPCA requires that approach. NHTSA may potentially find that it can maximize net benefits by setting stringent standards for earlier years to reap attainable efficiency gains most cheaply, then relax the percentage increase in later

[30] *See* Appx. A.

years as costs increase.[31] (Note that Policy Integrity did not run the CAFE model to test this hypothesis, and so we cannot definitively report whether some variation of this approach may increase net benefits.) Again, NHTSA should consider this sensible and plausibly more net-beneficial design alternative, at least for passenger cars and light trucks.

In summary, NHTSA may be able to reap even higher net benefits—and mitigate its cost concerns—by considering a wider range of alternatives. But as detailed below, given that PC2LT4 and HDPUV10 do not maximize net benefits relative to existing alternatives that NHTSA already considers, according to the agency's own analysis, NHTSA should reconsider its preference for those standards even if it does not analyze new alternatives.

B. For Passenger Cars and Light Trucks, NHTSA's Analysis Does Not Adequately Justify Selecting a Less-Stringent Alternative

NHTSA details at some length why it concludes that the most stringent light-duty-vehicle standard, PC6LT8, best meets "EPCA's overarching purpose of energy conservation."[32] Indeed, the RIA illustrates that alternative's substantial energy-saving benefits. Using a 3% discount rate, as compared to PC2LT4 (NHTSA's preferred alternative), PC6LT8 offers $159.3 billion more in fuel savings,[33] $49.6 billion more in climate benefits,[34] $6.8 billion in energy-security benefits,[35] and $3.5 billion in greater health benefits, as through reduced local pollution.[36] Thus, NHTSA's conclusion that this "overarching" factor counsels in favor of the most stringent standard is well grounded.

Despite its greater net benefits, NHTSA proposes not to select PC6LT8 because two statutory factors—technological feasibility and economic practicability—allegedly support PC2LT4.[37] But the reasons NHTSA gives for this conclusion are not compelling. This Subsection outlines why each of these reasons falls short.

<u>NHTSA's 'Technological Feasibility' Analysis Is Incomplete</u>

On technological feasibility, Tables V–2 and V–3 chart out the mix of available non-electrification technologies needed to meet each standard, including PC6LT8.[38] These tables call into question NHTSA's argument that "NHTSA does not see a technology path to reach the higher fuel economy levels that would be required by the more stringent alternatives."[39] This statement carries two possible meanings. First, NHTSA may mean that, within its statutory constraints, achieving these standards within the prescribed timeline is not possible. But that raises the related question of why NHTSA does not consider other alternatives that achieve the

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[31] *See id.* at 56,338–39 figs.V-1 and V-2 (showing greater compliance shortfalls in later model years for passenger cars and light trucks).
[32] *Id.* at 56,330.
[33] RIA at 8-42 to 8-43 tbl.8-14 (difference between $291.0 billion and $131.7 billion).
[34] *Id*. (difference between $89.3 billion and $39.7 billion).
[35] *Id.* (difference between $12.0 billion and $5.2 billion).
[36] *Id.* (difference between $5.5 billion and $2.0 billion).
[37] Proposed Rule, 88 Fed. Reg. at 56,330–50. This comment addresses NHTSA's treatment of the fourth statutory factor, "the effect of other motor vehicle standards of the Government on fuel economy," in Section III.A.
[38] *Id.* at 56,331–32 tbl.V–2 & 56,332 tbl.V–3.
[39] *Id.* at 56,314.

statutory directive to maximize stringency with the limits of feasibility (and maximize net benefits), along the lines of the suggestions above.

Second, NHTSA's statement on technological feasibility may mean that a compliance pathway exists based on available (non-electric-vehicle) technology, but that path would be very expensive. In that case, this analysis essentially collapses into the "economic practicability" factor. And, taking NHTSA's RIA at face value, that factor counsels in favor of PC6LT8 (or another non-analyzed alternative that carries even higher net benefits). NHTSA uses several criteria to assess this factor: the results of its RIA, the application rates of available technologies, other technology-related considerations, the cost of meeting the standards, sales and unemployment responses, and uncertainty and consumer acceptance of technologies.[40] In tentatively concluding that PC6LT8 is economically impracticable, NHTSA cites many of these criteria, including projected increases in vehicle cost[41] and the degree to which some manufacturers could fall short of the standards (and thus pay fines).[42]

Yet the RIA already accounts for these factors and concludes that, on net, the incremental benefits of PC6LT8 more than make up for its incremental costs. Put differently, while the RIA indeed finds that people will pay more for cars, and manufacturers will pay more in noncompliance penalties, it also finds that fuel-cost savings, climate benefits, and other benefits are even larger in magnitude. (And as detailed below, those benefits are much higher than NHTSA itself projects.[43]) NHTSA fails to explain clearly why forgoing the incremental costs of the most stringent standards justifies forgoing the greater incremental benefits that it finds.

NHTSA's Emphasis on High Costs Resembles the "Least-Capable Manufacturer" Approach

The high incremental costs that cause NHTSA to reject PC6LT8 are largely driven by some manufacturers for whom compliance will be especially costly, such as Mazda.[44] As explained below, NHTSA likely overstates the compliance costs for these manufacturers.[45] Furthermore, NHTSA notes elsewhere that it "has long abandoned the 'least capable manufacturer' approach to ensuring economic practicability."[46] This rejection is reasonable: As NHTSA notes, "keying standards to the least capable manufacturer may disincentivize innovation by rewarding laggard

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[40] *Id.* at 56,330–43. As NHTSA summarizes, "'Economic practicability' has consistently referred to whether a standard is one 'within the financial capability of the industry, but not so stringent as to' lead to 'adverse economic consequences, such as a significant loss of jobs or unreasonable elimination of consumer choice.'" *Id.* at 56,314.
[41] *See id.* at 56,336.
[42] *See id.* at 56,339–40. Though not explicitly stated by NHTSA, the agency may be implicitly concerned about the bi-modal net-benefit function for light vehicles by CY, whereby net benefits increase from PC1LT3 to PC2LT4, decrease from PC2LT4 to PC3LT5, and then increase again from PC3LT5 to PC6LT8. However, the cause of the bi-modal outcome appears to be the result of the discrete nature of technology (such as the adoption of Strong Hybrid Electric Vehicles (SHEVs)). In particular, there is a large increase in the prevalence of electrified powertrains in PC6LT8 relative to the other scenarios, particularly SHEVs and, to a much lesser extent, plug-in hybrid electric vehicles. RIA at 8-12 fig.8-9. The result of these non-linear technology shifts is that fuel savings rise and greenhouse gas emissions decline by much larger amounts under PC6LT8 relative to other alternatives. *See id.* at 8-52 to 8-53 figs.8-39 & 8-40.
[43] *See infra* Secs. II.A–B (finding that net benefits of PC6LT8 alternative exceed those of PC2LT4 by about $170 billion using updated climate-damage values and discount rates from draft guidance).
[44] *See* Proposed Rule, 88 Fed. Reg. at 56,281 tbl.IV–14 (showing per-vehicle incremental costs under PC6LT8 of $11,798 for Mazda, and less than $8,000 for all other manufacturers).
[45] *See infra* Sec. II.C.
[46] Proposed Rule, 88 Fed. Reg. at 56,314.

performance, and it will very foreseeably result in less energy conservation than an approach that looks at the abilities of the industry as a whole."[47] Basing the standards so strongly on costs, which are in turn driven so strongly by outliers like Mazda, resembles the rejected "least-capable manufacturer" approach. Such costs should therefore not be a decisive barrier to adopting more stringent standards.

NHTSA's Reasons for Not Relying on Its RIA Results Are Unpersuasive

Another explanation that NHTSA provides in finding PC6LT8 economically impracticable is that its RIA is not dispositive largely because "important benefits cannot be monetized—including the full health and welfare benefits of reducing climate emissions and other pollution, which means that the benefits estimates are underestimates."[48] Yet a fuller accounting of those factors would only favor PC6LT8 *more*, given that the alternative has substantially higher health and climate benefits than NHTSA's preferred alternative.[49] Accordingly, this consideration supports the opposite conclusion—namely, it favors consideration of more-stringent alternatives like PC6LT8.

Stringent Standards' Net Benefits Are Even Higher than NHTSA Finds

In assessing "economic practicability," NHTSA's reasoning for not relying on its RIA, which favors PC6LT8 (or another, non-analyzed alternative that offers even higher net benefits, in line with the above discussion in Section I.A) is even more questionable considering that these net benefits are understated. The analysis understates the net benefits for at least two reasons.

First, NHTSA's benefits estimates are very conservative. Applying lower discount rates and higher climate-damage valuations consistent with the latest available science and economics, as detailed in Sections II.A–B, would even further widen the gap between PC6LT8 (or another alternative with higher net benefits) and PC2LT4. So would extending the calendar-year analysis beyond 2050, given that more stringent standards' net benefits rise quickly in later years.[50] Allowing for consumer substitution toward manufacturers that comply most economically, as discussed in Section II.C, would further decrease cost estimates and thus increase net benefits.

Second, as NHTSA recognizes throughout the Proposed Rule, the compliance-cost estimates of all alternatives for passenger car and light-truck standards are likely overstated. This is partially due to the agency's statutory constraint, since, in reality, manufacturers will likely comply with the standards more efficiently than NHTSA's analysis finds, using vehicle electrification and credit trading.[51] While NHTSA reasonably omits these features from its consideration due to its statutory constraints and should maintain that approach,[52] it is particularly odd for NHTSA to

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[47] *Id.* at 56,315.
[48] *Id.* at 56,343.
[49] *See* RIA at 8-42 to 8-43 tbl.8-14 (at 3% discount rates for all effects, showing that climate benefits constitute \$89.3 billion / \$436.9 billion ≈ 20% of total social benefits, and showing that the climate benefits are the difference between positive and negative net benefits; and showing that PC6LT8 provides greater health benefits than PC2LT4 even with many effects unmonetized); *see also infra* Sec. II.A–B.
[50] *See* RIA at 8-28 fig.8-24; *see also id.* at 5-5 (conceding that NHTSA's "CY accounting inevitably misses a significant portion of the lifetime fuel savings and environmental benefits of higher fuel economy standards for vehicles produced later in the analysis period").
[51] Proposed Rule, 88 Fed. Reg. at 56,340 n.587 ("[C]ompliance looks easier and more cost-effective for many manufacturers under the 'unconstrained' analysis as compared to the 'standard-setting' analysis.").
[52] *See* 49 U.S.C. § 32902(h)(1)–(3).

prioritize compliance costs unduly as a basis to reject the most net-beneficial alternative when it knows that those costs are overestimates.

NHTSA's Priorities in Balancing Its Statutory Factors Are Misaligned

While NHTSA claims broad discretion to balance EPCA's statutory factors,[53] its particular balancing choices are not well reasoned. Specifically, NHTSA prioritizes technological feasibility and certain parts of economic practicability (cost increases and manufacturer shortfall) over other parts of economic feasibility (social welfare) and energy conservation.[54] But good reasons compel the opposite approach. Executive orders and guidance,[55] caselaw,[56] and economic theory all support NHTSA selecting the alternative that maximizes net benefits. And insofar as the analysis is inconclusive, NHTSA should presumably prioritize energy conservation because, as it recognizes, that is "the overarching purpose of EPCA."[57]

Summary

The above arguments lay out why NHTSA's particular reasons for rejecting PC6LT8 in favor of PC2LT4 fall short. If, after a fuller consideration, NHTSA still believes that PC6LT8 is technologically infeasible or economically impracticable, then this again raises the question of whether some other sensible alternatives may be preferable to both PC6LT8 and NHTSA's preferred alternative (PC2LT4). As argued above, NHTSA may satisfy its requirement to maximize net benefits where legally allowed by considering other sensible—and potentially more net beneficial—alternatives. Accordingly, NHTSA should reevaluate its preference for PC2LT4.

C. For HDPUVs, NHTSA's Reasoning for Rejecting the Most Net-Beneficial Alternative Is Similarly Unpersuasive

As with passenger cars and light trucks, the overarching principle from EPCA that animates NHTSA's HDPUV standards is energy conservation.[58] NHTSA concludes that this factor—and the "appropriateness" factor writ large—favors HDPUV14 because that alternative saves the most energy and abates the most greenhouse gas emissions. Specifically, NHTSA reasonably observes that the "appropriateness" factor is driven largely by "the amount of energy conserved by standards" because "the overarching purpose of EPCA is energy conservation."[59] NHTSA then reasonably concludes that HDPUV14 conserves the most energy and results in the greatest energy-security and pollution-reduction benefits.[60] And while NHTSA considers safety and costs to industry as part of this factor, it finds that these effects either support the most stringent alternative or are inconclusive.[61] Given its reasonable statements on the factor, NHTSA should

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[53] Proposed Rule, 88 Fed. Reg. at 56,311 ("NHTSA has broad discretion to balance the statutory factors in developing fuel consumption standards to achieve the maximum feasible improvement.").
[54] *Id.* at 56,348. NHTSA reasonably observes that other factors are either irrelevant or do not clearly point in any particular direction. *See id.*
[55] *See supra* note 25.
[56] *See* Ctr. for Biol. Diversity v. Nat'l Highway Traffic Safety Admin., 538 F.3d 1172, 1197 (9th Cir. 2008) (interpreting EPCA to allow NHTSA to set standards at the level that maximizes net benefits).
[57] Proposed Rule, 88 Fed. Reg. at 56,311 (citing *Ctr. for Biological Diversity*, 538 F.3d at 1197).
[58] *See id.* at 56,320.
[59] *Id*. at 56,320.
[60] *Id.* at 56,351–52.
[61] *Id.*

go one small step further and explicitly conclude that HDPUV14 is the most "appropriate" alternative under the first statutory factor and the one that best serves EPCA's "overarching purpose" of promoting energy conservation.

Nonetheless, based on its analysis of cost-effectiveness and technological feasibility, NHTSA selects the less net-beneficial HDPUV10. But NHTSA's rationales for selecting that option are unpersuasive.

Benefit-Cost Ratios

As one rationale, NHTSA compares the benefit-cost ratios of the different alternatives, finding that HDPUV10 yields higher ratios.[62] But benefit-cost ratios are disfavored as a basis for selecting an alternative both under both the current version of Circular A-4[63] and its proposed update.[64] And for good reason: Suppose Policy A provided $100 in benefits for $1 in costs, for a benefit-cost ratio of 100 and net benefits of $99. Suppose Policy B provided $1200 in benefits for $1000 in costs, for a benefit-cost ratio of 1.2 and net benefits of $200. While Policy A has a higher benefit-cost ratio, society would prefer Policy B (setting aside distributional considerations) as it provides more than twice the net social benefit. Benefit-cost ratios, including those NHTSA applies here, obscure this fact.

Under Circular A-4's preferred metric of net benefits,[65] HDPUV14 is superior, providing $5.75 billion more in net benefits than NHTSA's preferred alternative, discounting all effects at 3% (and using central damages for the social cost of greenhouse gases).[66] NHTSA's observation that "the step from HDPUV10 to HDPUV14 results in a substantial jump in total costs,"[67] while true, ignores the other side of the ledger (benefits), which sees an even greater jump. Similarly, NHTSA's argument that "under many comparisons, HDPUV10 appears the most cost-effective; under others, HDPUV4 appears the most cost-effective,"[68] while true in a technical sense, misses the point because NHTSA's benefit-cost analysis accounts for all the factors that NHTSA considers in assessing "cost effectiveness," weighs them against each other, and finds that HDPUV14 provides the most net benefits.

Costs Under Particular Sensitivity Analyses

NHTSA also tentatively concludes that "some conservatism" is appropriate for HDPUV standards,[69] pointing to a lack of data rendering its primary analysis potentially unreliable and the higher costs associated to comply with the HDPUV14 standard under a few sensitivity

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[62] *Id.* at 56,352–53 & 56,353 tbls.V–18 & V–19.
[63] CIRCULAR A-4, *supra* note 25, at 10 ("The size of net benefits . . . indicates whether one policy is more efficient than another. The ratio of benefits to costs is not a meaningful indicator of net benefits and should not be used for that purpose. . . . [C]onsidering such ratios alone can yield misleading results.").
[64] OFF. OF MGMT. & BUDGET, CIRCULAR A-4: DRAFT FOR PUBLIC REVIEW 4–5 (2023) [hereinafter DRAFT CIRCULAR A-4 UPDATE] ("Considering such ratios alone can yield misleading results, as such ratios do not clarify which alternative yields the greatest net benefits, and are sensitive to whether negative willingness-to-pay (WTP) or willingness-to-accept (WTA) valuations are subtracted from benefits or added to costs.").
[65] *See supra* note 63.
[66] Proposed Rule at 56,353 tbl.V–20 (reporting $8.00 billion in net benefits for HDPUV14 and $2.25 billion for HDPUV10 at 3% discounting for all effects).
[67] *Id.* at 56,353.
[68] *Id.*
[69] *Id.*

analyses.[70] While accounting for uncertainty through sensitivity analyses is appropriate,[71] NHTSA's rationales for departing from the benefit-maximizing HDPUV14 are unpersuasive.

First, NHTSA bases its analysis on just three out of dozens of sensitivity analyses and does not indicate how likely those sensitivity scenarios are. NHTSA indeed recognizes that "influence is different from likelihood"[72] and disclaims that its sensitivity results "represent likely real-world settings."[73] Given that NHTSA's primary analysis favors HDPUV14, prioritizing a few of the many sensitivity analyses without any analysis of their likelihood is unwise. And without providing something like a Monte Carlo analysis, as endorsed by both the current version of Circular A-4[74] and its recent draft update,[75] there is little reason to conclude that those high-cost scenarios are particularly likely. NHTSA should not place such great emphasis on just a few sensitivity analyses without even analyzing the likelihood of those sensitivities.

Second, NHTSA fails to consider, or even report, the benefits (and net benefits) under these sensitivity scenarios. But those benefits are substantial. For instance, the "battery costs +20%" sensitivity—one of the three sensitivities that NHTSA highlights as grounds for caution—provides $32.34 billion in net benefits under the HDPUV14 scenario,[76] which is more than four times greater than net benefits under the main analysis.[77] Highlighting this sensitivity analysis as a basis for "caution" is unjustified given that it yields substantial net benefits, particularly given that NHTSA does not even report or consider those benefits. The same general takeaway applies to the other two sensitivity scenarios that NHTSA cites as reasons for caution. Net benefits total $26.17 billion for the "tax credit passthrough 75%" scenario[78] and $4.08 billion for the "AEO 2022 low oil price" scenario.[79] In sum, all three scenarios that NHTSA claims provide reason for caution yield much higher benefits—and, in two of those cases, much higher *net* benefits—for HDPUV14. These findings render NHTSA's decision to forgo those higher standards based on these sensitivities particularly unjustified. As it does with HDPUV10, NHTSA should report and consider the magnitude and sources of HDPUV14's net benefits for all sensitivity scenarios. We do so in Table 3 below.

[70] *Id.* at 56,357–58.
[71] CIRCULAR A-4, *supra* note 25, at 3 ("It is usually necessary to provide a sensitivity analysis to reveal whether, and to what extent, the results of the analysis are sensitive to plausible changes in the main assumptions and numeric inputs."); *accord* DRAFT CIRCULAR A-4 UPDATE, *supra* note 64, at 67 (similar).
[72] RIA at 9-1.
[73] *Id.* at 9-6. While this statement is in the context of light-duty vehicles, because NHTSA applies the same scenarios to HDPUVs, the same disclaimer should apply.
[74] *See* CIRCULAR A-4, *supra* note 25, at 41–42.
[75] *See* DRAFT CIRCULAR A-4 UPDATE, *supra* note 64, at 70.
[76] The undersigned performed this analysis using the CAFE Model.
[77] Net benefits for HDPUV under the reference case total $8.00 billion. Proposed Rule at 56,353 tbl.V–20.
[78] RIA at 9-25 fig.9-10 (about $17 billion higher net benefits).
[79] *Id.* at 9-23 fig.9-7 (about $6 billion higher net benefits).

Table 3: Benefits, Costs, and Net Benefits Under NHTSA's Featured HDPUV14 Sensitivities (2021 $Billion)

Sensitivity Scenario	Battery + 20%	Tax Credit 75%	AEO 2022 low oil price
Total Social Costs	64.44	47.11	55.78
Total Social Benefits (SC-GHG 3% Average)	96.78	73.28	59.86
Net Social Benefits (SC-GHG 3% Average)	**32.34**	**26.17**	**4.08**

Third, NHTSA's cost estimates are inflated because, as with light-duty vehicles, it holds manufacturers' market share fixed in response to the standards.[80] This approach does not match expected consumer behavior, as some consumers would predictably switch manufacturers in response to price changes. Economics principles also suggest that some consumers may even switch at least some of their driving from HDPUV vehicles to light-duty vehicles. Thus, as described further below in Section II.C, the cost-increase estimates that NHTSA relies upon[81] are overstated under all model runs and sensitivities.

Accordingly, these sensitivity analyses do not provide sufficient justifications for rejecting HDPUV14. NHTSA should reconsider its approach consistent with the considerations above.

Unquantified Benefits

NHTSA also argues, as it did for passenger cars and light trucks, that the results of its cost-benefit analysis are not dispositive because that analysis does not monetize "the full health and welfare benefits of reducing climate and other pollution."[82] But, like above, that consideration only further supports HDPUV14, which reduces pollution the most. While uncertainties exist, therefore, those uncertainties are only around *how much more* net beneficial HDPUV14 is relative to HDPUV10. Moreover, as with passenger cars and light-duty trucks, the incremental benefit from the most stringent alternative would be even greater if NHTSA applied the discount rates and climate-damage valuations that incorporate the latest science and economics.[83] NHTSA should thus conclude that HDPUV14 is the most cost-effective.

Deviation from Prior Standards

NHTSA also argues that some conservatism is appropriate because the HPDUV "standards have remained stable . . . for many years."[84] Using the fact that NHTSA has not set strong standards recently to justify not setting strong standards now suggests that this state of affairs should never change, no matter the benefits. Indeed, the fact that NHTSA has not recently set strong standards for HDPUVs could cut in the other direction: there may be more room for efficiency-promoting

[80] *See* Proposed Rule, 88 Fed. Reg. at 56,357–58 tbl.V–23; *see also infra* Sec. II.C.
[81] *See* Proposed Rule, 88 Fed. Reg. at 56,357–58 tbl.V–23.
[82] *Id.* at 56,354.
[83] *See infra* Secs. II.A–B.
[84] *Id.*

technology improvements, not less. NHTSA's argument ignores the statutory factors that, as outlined above, justify stronger standards.

In light of the above, NHTSA should reconsider its decision to reject HDPUV14. It should also consider other sensible alternatives that may offer even higher net benefits, as discussed *supra* Section I.A.

D. NHTSA Should Consider Vehicle Upsizing as a Likely Compliance Strategy and Reevaluate the Slope of the Footprint Curve in Light of that Consideration

The Proposed Rule, like prior NHTSA fuel-economy rules, is footprint-based, meaning that more stringent fuel-economy requirements apply to smaller vehicles (measured by footprint).[85] The steeper the footprint curve, the more manufacturers are incentivized to create larger (and less efficient) vehicles to avoid more stringent standards. NHTSA proposes to maintain the existing slope of the footprint curve, suggesting at one point that the current curve is neutral with respect to vehicle upsizing —that is, the curve does not incentivize either an increase or decrease in vehicle size.[86] This approach contrasts with EPA's recent proposal to flatten the footprint curve to discourage vehicle upsizing.[87] NHTSA should more robustly anticipate likely supply shifts from the Proposed Rule and consider flattening the footprint curve to counteract the incentive to upsize.

There has been considerable upsizing in the vehicle market in recent years—a result in line with the anticipated effects of the footprint curve.[88] That is, manufacturers are shifting their production toward larger vehicle classes (for instance, making more trucks instead of passenger cars), in part to the more stringent requirements for smaller vehicles. For instance, NHTSA and EPA both observe a 5.6% increase in sales-weighted footprint from 2012 to 2021 and attribute this increase to a market shift from passenger cars to light trucks.[89] The breakdown of sales-weighted footprint data reveals distinct trends in footprint growth across vehicle classes. Notably, the sales-average footprint of sedans and wagons increased by 3.2% from 2012–2021 (the highest increase among vehicle classes),[90] which aligns with the historically more stringent

[85] Proposed Rule, 88 Fed. Reg. at 56,134.
[86] NHTSA, Draft Technical Support Document: Corporate Average Fuel Economy Standards for Passenger Cars and Light Trucks for Model Years 2027 and Beyond and Fuel Efficiency Standards for Heavy-Duty Pickup Trucks and Vans for Model Years 2030 and Beyond 7-2 (July 2023) [hereinafter TSD] ("[NHTSA] believes that the shape of the footprint curves themselves is such that the curves should neither encourage manufacturers to increase the footprint of their fleets, nor to decrease it.").
[87] *See* Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,184, 29,196 (proposed May 5, 2023) (proposing to flatten footprint curve). NHTSA contends that upsizing at the individual vehicle level may be less feasible for manufacturers due to technological constraints that affect various vehicle attributes. The agency further states that it "continues to believe that footprint is much less susceptible to gaming." TSD at 1-18.
[88] Soren T. Anderson & James M. Sallee, *Designing Policies to Make Cars Greener*, 8 ANN. REV. RES. ECON. 157 (2016); Kate S. Whitefoot, *Design Incentives to Increase Vehicle Size Create from the U.S. Footprint-Based Fuel Economy Standards*, 41 ENERGY POL'Y 402 (2012).
[89] NHTSA cites data from the 2022 EPA Trends Report, which shows that the sales-weighted average footprint increased by 5.6% from 2012 to 2021. NHTSA explains that this increase was primarily driven by a nearly 30% reduction in fleet shares for smaller-footprint sedans and wagons, offset by a 30% increase in fleet shares for larger-footprint truck SUVs and pickups. TSD at 1-18 tbl.1-2.
[90] TSD at 1-18 tbl.1-2. The 5.6% increase in sales-weighted footprint from 2012 to 2021 is greater than the within-class increases due to a significant shift in market shares between vehicle classes. Specifically, the market has seen a shift from passenger cars to light trucks, which generally have larger footprints.

standards for passenger cars compared to light trucks. This pattern suggests that manufacturers already use upsizing as a compliance strategy for passenger cars and could extend this to light trucks in response to the Proposed Rule (which poses a higher rate of stringency increase for light trucks). Upsizing may also become an increasingly attractive option for manufacturers as compliance costs increase, particularly if consumer demand for larger vehicles continues.[91] Notably, the average footprint for "pickup" also increased by 2.2% from 2012–2021, which may indicate a consumer preference for larger, more versatile vehicles.

The evolving landscape also includes the rising market share of battery electric vehicles (BEVs) in the baseline.[92] The influx of BEVs could result in a faster increase in within-class footprint, particularly if manufacturers find it economically advantageous to maintain larger, less fuel-efficient models in their lineup to cater to diverse consumer preferences without negatively impacting the overall fleet fuel economy. Moreover, as BEVs become more prevalent in the sales fleet, a "double-dividend" effect could emerge. Namely, manufacturers might strategically enlarge BEVs, thereby inflating average fuel economy while simultaneously lowering the sales-weighted average standard.[93] EPA has acknowledged such dynamics and emphasized the need to adjust the footprint curve to account for the growing BEV market share in the baseline.[94]

Despite these considerations, however, NHTSA's model currently does not reflect upsizing as a compliance strategy and instead assumes that the Proposed Rule will not affect the relative market share of different vehicle classes. NHTSA should work to correct this modeling limitation. If doing so proves infeasible during this rulemaking process, NHTSA should at least conduct sensitivity analyses to assess the potential impact of upsizing as a compliance strategy. This upsizing could be modeled either directly as a vehicle-level change (i.e., a technology change) or approximated by applying a specific level of sales-weighted average increase to the vehicle class level.[95] In the former case, NHTSA could include footprint technology options, such as increased footprint size by 0%, 5%, 7.5%, 10%, 15%, and 20%, much like NHTSA treats mass-reduction technologies.[96]

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[91] Relatedly, EPA assumes a consumer willingness-to-pay of $200 per square foot of vehicle footprint, noting that this is on the low end of the range suggested by Greene et al. (2018). EPA, Draft Regulatory Impact Analysis: Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light- Duty and Medium-Duty Vehicles 1-7 (Apr. 2023) [hereinafter EPA RIA] (citing David Greene et al., *Consumer Willingness to Pay for Vehicle Attributes: What Do We Know?*, 118 TRANSP. RSCH. PART A: POL'Y & PRAC. 258 (2018)).

[92] Jianwei Xing et al., *What Does an Electric Vehicle Replace?*, 107 J. ENV'T ECON. & MGMT. 102432 (2021).

[93] EPA suggests that "[f]or BEVs (or any ZEV technology), there is no relationship between footprint and tailpipe emissions, so any slope greater than zero should provide manufacturers with a compliance incentive (at some level) to upsize BEVs." EPA RIA, *supra* note 91, at 1-6.

[94] According to EPA, as the fleet transitions to an increasing percentage of zero-emission vehicles, the appropriate slope for the fleet will need to consider not just the current available technology of internal-combustion-engine (ICE) vehicles, but also the ratio of those ICE vehicles sold as a percentage of the entire fleet of new vehicles. EPA RIA, *supra* note 91, at 1-6. NHTSA's approach to BEVs involves the use of a petroleum-equivalency factor for assessing fuel economy, as mandated by statute. This factor can result in larger BEVs having lower calculated equivalent fuel economies, thereby altering the upsizing incentives compared to EPA's approach. *See* TSD at 1-21. Nonetheless, the framework still provides some latitude for upsizing BEVs.

[95] NHTSA acknowledges that the correlation between footprint and fuel economy is relatively weak, stating that "[i]n comparison, footprint is also correlated with fuel economy but not as strongly as mass." TSD at 1-18. This counsels in favor of incorporating upsizing into the model as an exogenous factor.

[96] RIA at 8-14 to 8-15.

Depending on the results of this analysis, NHTSA should reevaluate its decision not to adjust the footprint curve. In particular, if flattening the curve would yield much higher net benefits under the suggested analyses, this would indicate that NHTSA should follow EPA's lead in flattening the footprint curve.

II. While NHTSA Comprehensively Analyzes the Proposed Rule's Benefits and Costs, It Should Conduct Additional Analysis Around Key Parameters

NHTSA conducts a thorough analysis of the benefits, costs, and net benefits of the Proposed Rule and its alternatives. Based on this extensive analysis, NHTSA reasonably concludes that the benefits of the Proposed Rule and its alternatives outweigh their costs. (Though, as detailed above, NHTSA does not provide adequate reasons for failing to *maximize* net benefits.)

NHTSA's analysis is commendable in many ways. For instance, as detailed below, the agency estimates many key analytical parameters—such as the marginal elasticity of demand for new vehicles and the rebound rate—consistent with the best available evidence. Nonetheless, NHTSA should perform more analysis around key parameters. For some key analytical parameters—such as the discount rate and the social cost of greenhouse gases—additional valuations reflecting recent guidance incorporating state-of-the-art literature exist and would ensure a more complete analysis showing that the net benefits of the Proposed Rule and its alternatives are greater than NHTSA projects.

NHTSA should also conduct additional analysis around other key parameters including technology cost, the baseline fleet, and scrappage. As detailed below, further analysis around these parameters would likely show that the costs of complying with the Proposed Rule and its alternatives are lower than NHTSA projects.

A. Although NHTSA Reasonably Relies on the Climate-Damage Estimates from an Interagency Working Group, It Should Conduct Additional Analysis Using More Recent Federal Estimates

To monetize the Proposed Rule's climate benefits, NHTSA appropriately relies on valuations produced by the Interagency Working Group on the Social Cost of Greenhouse Gases (Working Group). Those values—though widely agreed to underestimate the full social costs of greenhouse gas emissions[97]—are appropriate to use for now as conservative estimates. They have been applied in dozens of previous rulemakings[98] and upheld in federal court.[99] Policy Integrity, along with six other non-profit organizations, has submitted separate comments to this docket in support of the Proposed Rule's use of the Working Group's climate-damage estimates.

As those joint comments further explain, however, NHTSA should conduct additional analysis using more recent draft climate-damage valuations from the EPA.[100] Though the Working Group's valuations relied on the best science available at the time of their development, their

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[97] INTERAGENCY WORKING GRP. ON THE SOCIAL COST OF GREENHOUSE GASES, TECHNICAL SUPPORT DOCUMENT: SOCIAL COST OF CARBON, METHANE, AND NITROUS OXIDE – INTERIM ESTIMATES UNDER EXECUTIVE ORDER 13,990 at 4 (2021) (acknowledging that current social cost valuations "likely underestimate societal damages from [greenhouse gas] emissions").
[98] Peter Howard & Jason A. Schwartz, *Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon*, 42 COLUM. J. ENV'T L. 203, 270–84 (2017) (listing all uses through mid-2016).
[99] Zero Zone v. Dept. of Energy, 832 F.3d 654, 679 (7th Cir. 2016).
[100] EPA EXTERNAL REVIEW DRAFT OF REPORT ON THE SOCIAL COST OF GREENHOUSE GASES (2022).

underlying data is now largely outdated and their valuations are widely recognized to understate the true costs of climate change. Recognizing this problem, in November 2022, EPA released updated draft climate-damage estimates.[101] While EPA's draft valuations remain underestimates,[102] they more fully account for the costs of climate change by incorporating the latest available research on climate science, damages, and discount rates. Those estimates were subject to public comment and peer review and are now being finalized.

Unsurprisingly, given the developing state of the science and economics around climate change, EPA's draft valuations find that the incremental cost of greenhouse gas emissions is substantially higher than the Working Group projected. Using these valuations would provide a more complete picture of the climate damages from the Proposed Rule and its alternatives. While NHTSA should apply EPA's draft values in sensitivity analysis if it finalizes this regulation before EPA finalizes that update, it should consider applying EPA's finalized valuations in its primary analysis if they are available before NHTSA completes this rule.

As shown below in Table 4 (presented in the next section), using EPA's estimates would further support more stringent alternatives, as their use substantially increases net benefits, particularly for more stringent standards. Given that EPA's estimates are widely viewed as closer to the full value of climate abatement, this supports NHTSA's selection of more stringent alternatives, as discussed in Section I above.

B. NHTSA Should Focus on Consumption-Based Discount Rates and Apply Additional Analysis Using the Proposed Rates in the Draft Circular A-4

In economics, a discount rate translates impacts that occur at different times into a common present value; the higher the annual discount rate, the less impacts further into the future are valued relative to impacts closer to the present. NHTSA reports the benefits and costs of the Proposed Rule using annualized discount rates of 3% (a consumption-based rate) and 7% (a capital-based rate). Although the Proposed Rule and its alternatives are net beneficial under both discount rates, net benefits are higher under the 3% rate because the regulation's benefits, on the whole, occur farther out in time than its costs.[103]

Although it is reasonable for NHTSA to rely on the discount rates provided by Circular A-4, it is now widely recognized that those rates are outdated and too high. Moreover, economic theory now strongly supports the use of consumption-based discount rates (3% in the current Circular A-4) over capital-based rates (7% in the current Circular A-4). For these reasons, the Office of Management and Budget recently released a draft update to Circular A-4 that would do away with capital-based rates altogether (accounting for capital effects using a different method) and would lower the consumption-based rate to 1.7% (Draft Circular A-4 Update).[104] NHTSA should follow the latest available economics on discounting, which entails taking the two steps outlined below.

First, NHTSA should prioritize consumption- over capital-based rates. Because the Proposed Rule will "primarily affect future consumption"—in part due to the pass-through of producer

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[101] *Id.*
[102] *Id.* at 4 ("[B]ecause of data and modeling limitations . . . estimates of the SC-GHG are a partial accounting of climate change impacts and, as such, lead to underestimates of the marginal benefits of abatement."); *id*. at 72.
[103] *See* Proposed Rule, 88 Fed. Reg. at 56,141–42 tbls.I–10 & I–11.
[104] DRAFT CIRCULAR A-4 UPDATE, *supra* note 64, at 74–83.

compliance costs onto consumers—NHTSA correctly recognizes that the consumption discount is "analytically preferred."[105] Nonetheless, NHTSA also presents the results of its analysis using a 7% discount rate "for transparency and completeness."[106] Because leading economic evidence and theory supports the use of consumption-based rates—as reflected in the Draft Circular A-4 Update—NHTSA should further deprioritize the 7% discount rate by either excluding it altogether or including it for sensitivity purposes rather than in the main analysis.

Second, NHTSA should conduct additional analysis using lower consumption-based rates from the Draft Update. Specifically, the Draft Circular A-4 Update proposes to lower the default, risk-free consumption discount rate used in regulatory impact analysis from the current 3% to 1.7%, based on updated data and extensive economic scholarship.[107] These updates are consistent with the best available evidence and widely supported by the field's leading experts.[108] EPA should apply the 1.7% social discount rate from the Draft Circular A-4 Update in sensitivity analysis if it finalizes this regulation before OMB finalizes that update, and consider applying that approach in its primary analysis should OMB finalize the Circular A-4 Update before this rule is finalized.

Table 4 shows the net benefits of all light-duty alternatives using by social cost of greenhouse gases value and social discount rate. Pursuant to this section and the section above, it applies EPA's draft valuation of the social cost of greenhouse gases (using its central 2% Ramsey discount rate) and the 1.7% social discount rate from the Draft Circular A-4 Update.

Table 4: Incremental Net Social Benefits for the On-Road Fleet CY 2022–2050 (2021$ Billions), by Alternative, Social Discount Rate, and Social Cost of GHG

	3% Social Discount Rate				**1.7% Social Discount Rate**			
	PC1LT3	PC2LT4	PC3LT5	PC6LT8	**PC1LT3**	**PC2LT4**	**PC3LT5**	**PC6LT8**
SC-GHG 5% Average	11.9	16.3	-18.2	-16.9	**19.5**	**26.6**	**-15.1**	**-8.5**
SC-GHG 3% Average	34.2	46.5	21.0	51.0	**41.8**	**56.7**	**24.1**	**59.4**
SC-GHG 2.5% Average	50.1	68.0	49.0	99.7	**57.7**	**78.2**	**52.1**	**108.0**
SC-GHG 3%, 95th percentile	94.1	127.5	126.3	233.5	**101.7**	**137.8**	**129.4**	**241.8**
Draft Update SC-GHG 2%	**132.2**	**179.1**	**193.9**	**352.0**	139.8	189.4	197.0	360.3

As Table 4 illustrates, the net benefits of all PCLT alternatives increase substantially when revised climate-damage valuations and discount rates are applied. Additionally, the net benefits of the more stringent standards increase more than the net benefits of less stringent standards.

105 RIA at 5-6 (quoting CIRCULAR A-4, *supra* note 25, at 33 (2003)).
106 *Id.* at 5-7.
107 DRAFT CIRCULAR A-4 UPDATE, *supra* note 64, at 75–76.
108 Peter H. Howard et al., *U.S. Benefit-Cost Analysis Requires Revision*, 380 SCIENCE 803 (2023).

For instance, the net benefits of PC6LT8 exceed those of PC2LT4 by more than $170 billion using the updated climate-damage valuations and discount rates—compared to just $5 billion under NHTSA's primary analysis (at a 3% discount rate for all effects and central climate damages).

C. NHTSA Should Address, or at Least Acknowledge, the Likely Overestimation of Compliance Costs Stemming from Several Modeling Assumptions

Although NHTSA cites compliance costs as a key rationale for choosing less-stringent standards other more net beneficial ones,[109] its modeling of consumer and producer behavior systematically overestimates compliance costs in at least two key ways.

First, NHTSA's model holds each manufacturer's market share constant at model year 2022 levels despite finding highly variable compliance costs between different manufacturers.[110] This assumption leads to an overstatement of compliance costs for the industry as a whole because, in reality, differing compliance costs would lead to changes in market share towards the manufacturers that most efficiently complied with the Proposed Rule. For instance, while NHTSA finds that Hyundai and Mazda could face per-vehicle compliance cost increases of $4,440 and $9,070 in model year 2032 to comply with the PC6LT8 alternative,[111] most consumers would not in fact face that high increase because they would switch to a different manufacturer that complies more cheaply. This effect applies similarly within the HDPUV market, and even between light- and heavy-duty vehicles; in all cases, consumers will shift toward manufacturers that comply more cost-effectively. (This modeling limitation leads not only to an overestimate of cost but also an underestimate of compliance, as manufacturers that comply more cost-effectively and gain market share also achieve higher compliance.) Indeed, whereas NHTSA assumes that consumer preferences affect sales shares exclusively at the industry level (and not the manufacturer level),[112] such an approach overlooks the cross-price elasticity effects that are a natural feature of competitive markets. By failing to account for market adjustments that would naturally occur in response to price changes, the model inflates total compliance costs.

Second, NHTSA's model has limited ability to capture manufacturers' strategic behavior in choosing vehicle technology. Specifically, NHTSA assumes that manufacturers apply the same costly technology to multiple models that share the same vehicle platform (i.e., the car's essential design, engineering, and production components),[113] while also (as noted above) maintaining their market shares irrespective of these cost changes. This dual assumption restricts manufacturers from optimizing their technology strategies. For instance, between different models that share the same platform, NHTSA's modeling prevents manufacturers from deploying new technologies in high-margin models or discontinuing less efficient ones.[114] In

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[109] *See generally supra* Sec. I.
[110] TSD at 4-13.
[111] RIA at 8-16 fig. 8-13.
[112] NHTSA states that its sales share allocation between passenger cars and light trucks "implicitly assumes that consumer preferences for particular styles of vehicles are determined in the aggregate (at the industry level), but that manufacturers' market share of those body styles remain at [model year] 2022 levels." TSD at 4-13.
[113] RIA at 8-16 n.154 (discussing Mazda's use of "platform sharing").
[114] Liu et al. (2014) employ a dynamic model that accounts for the complexities and uncertainties of both manufacturer and consumer behavior over time; their findings indicate that dynamic and strategic technology adoption is crucial for meeting standards, despite initial cost increases. Changzheng Liu et al., *Vehicle Manufacturer*

other words, NHTSA assumes that certain manufacturers maintain the same technology across vehicle platforms even when compliance costs skyrocket. In reality, however, such high price changes would lead manufacturers to change their production processes to reduce cost. Accordingly, the model further overstates compliance costs.

To the extent feasible, NHTSA should update its model to correct for these limitations. Adjusting the model to avoid assuming that manufacturers maintain the same technology across vehicle platforms (i.e., "platform sharing")—particularly when that assumption produces unrealistic price increases that would likely lead to a collapse of market share in the real world (as with Mazda)—should be reasonably straightforward. However, adjusting the model to fix the constant manufacturer share assumption may be infeasible in the short term. At a minimum, NHTSA should acknowledge this limitation and conclude that its compliance cost estimates are overstated because of it.

D. NHTSA Should Update Its Baseline Sales Projections by More Robustly Incorporating the Inflation Reduction Act and Ensuring Modeling Consistency

In regulatory impact analysis, the baseline refers to "the best assessment of the way the world would look absent the proposed action."[115] Developing an accurate baseline is important for conducting benefit-cost analysis, but it can be especially challenging when recent developments add new layers of uncertainty to baseline conditions. That is the case here given the Inflation Reduction Act's (IRA) passage last year.

NHTSA uses two models to project the baseline vehicle fleet for the Proposed Rule. First, it uses the Nominal Forecast model, which incorporates macroeconomic factors such as GDP to predict total new vehicle sales. Second, NHTSA then uses the Legacy Dynamic Fleet Share (Legacy DFS) model to allocate sales shares between passenger cars and light trucks based in part on projections from the Annual Energy Outlook (AEO) 2022.[116] Because AEO 2022 does not include the effects of the later-passed IRA, moreover, NHTSA also uses the Legacy DFS model to incorporate the IRA into the baseline. (NHTSA also outlines and seeks comment on a third model for projecting baseline vehicle share—the Experimental DFS model—but does not appear to incorporate this model into its analysis of the Proposed Rule.)

Although NHTSA's baseline modeling includes many commendable elements, the agency should update its modeling. In particular, NHTSA appears to underestimate the baseline share of BEVs resulting from the IRA during the Proposed Rule's compliance period. This, in turn, likely produces an underestimate of baseline average fuel economy and a corresponding overestimate of compliance cost. Additionally, NHTSA should articulate and substantiate the economic assumptions implied in its sales-share models more.

Technology Adoption and Pricing Strategies Under Fuel Economy/Emissions Standards and Feebates, 35 ENERGY J. 71 (2014). This result underscores the need for models like NHTSA's to incorporate more dynamic elements to accurately capture manufacturers' strategic behavior in technology adoption and pricing, thereby providing a more realistic estimate of compliance costs.

[115] CIRCULAR A-4, *supra* note 25, at 15.

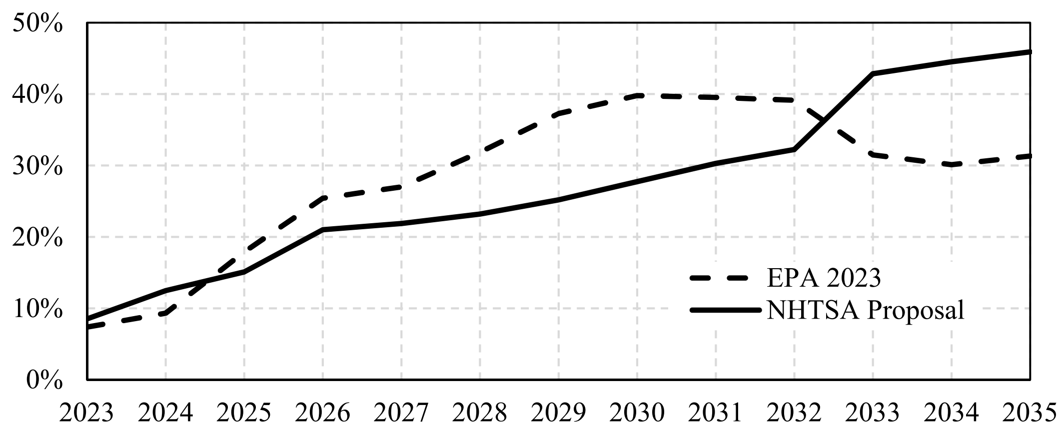
[116] TSD at 4-13 (justifying this choice by stating that "projections from an authoritative outside source were likely to be more reliable than those produced by the candidate approaches [NHTSA] tested").

a. NHTSA Should Address Conceptual Inconsistencies in Incorporating the IRA Tax Credits into Its Baseline Sales

The IRA provides a purchase tax credit of up to $7,500 for BEVs for qualifying purchasers and a tax credit to qualifying battery producers.[117] In its baseline sales-share forecast, NHTSA assumes that the value of these tax credits is split 50-50 between producers and consumers.[118] NHTSA justifies this treatment by explaining that the price elasticities of supply and demand are similar in magnitude, entailing 50% pass-through.[119] But throughout the rest of its benefit-cost analysis, NHTSA assumes 100% pass-through—meaning that all cost changes are fully passed along to consumers.[120] NHTSA's assumption of 50% pass-through for the IRA tax credits is inconsistent with its assumption of full pass-through elsewhere. By only factoring in half of the tax credit into producer decisions on new vehicle lineup and technology (as opposed to all of it), NHTSA assumes a higher BEV sticker price. Accordingly, NHTSA's methodology appears to underestimate the potential market share of BEVs in the baseline sales fleet.

Additional evidence underscores these conceptual inconsistencies and further suggests that NHTSA underestimates the effects of the IRA tax credits. In particular, NHTSA projects a lower baseline of BEVs in the sales share compared to other agencies that have modeled the IRA's impacts—including, most notably, EPA in its recently proposed vehicles rule. Figure 1 shows the discrepancy in the baseline BEV sales share projections between EPA's[121] and NHTSA's[122] proposed standards.

Figure 1: Baseline BEV Sales Share



[117] *See* RIA at 3-8 to 3-9.
[118] TSD at 2-89.
[119] *See id.* at 2-86 n.226.
[120] RIA at 4-3 (explaining that "all costs related to compliance (the cost of technology or civil penalties) are passed through to buyers of new vehicles").
[121] Available for download via EPA's Optimization Model for reducing Emissions of Greenhouse Gases from Automobiles (OMEGA) 'Light-duty central case (zip)' at https://www.epa.gov/regulations-emissions-vehicles-and-engines/optimization-model-reducing-emissions-greenhouse-gases#omega-2.1.0. The relevant file can be found under the directory 'NTR/out/' and is named '2023_03_14_22_42_30_central_3alts_20230314_NTR_summary_results.csv.'
[122] Available for download via NHTSA's CAFE Compliance and Effects Modeling System at https://www.nhtsa.gov/file-downloads?p=nhtsa/downloads/CAFE/2023-NPRM-LD-2b3-2027-2035/Central-Analysis/. The relevant file can be found under the directory 'LD_Central_Analysis/output//LD_ref/reports-csv/vehicles_report_by_sn/' and is named 'vehicles_report_sn0.csv.'

Figure 1 primarily indicates an issue with the reliability of NHTSA's baseline, not EPA's. EPA's baseline projections, though perhaps imperfect, align with intuitive expectations—showing a sharp uptick in the BEV sales share upon the ramp-up of IRA tax credits beginning in 2023. But NHTSA's projection tells a different, counter-intuitive story by forecasting a moderate increase in BEV sales share during the effective period of the IRA tax credits followed by an inexplicable surge in BEV sales share when these credits expire in 2033.[123] This pattern is at odds with other forecasts, which resemble EPA's.[124] The surge also violates one of the most fundamental economic concepts—the law of demand—whereby "when the price of a good rises, the quantity demanded of the good falls."[125]

Given these inconsistencies, NHTSA should rigorously examine its model to understand the underlying reasons for this divergence. NHTSA should adjust the model if it concludes, as the evidence suggests, that its baseline underestimates BEV share during the compliance period. In particular, as noted above, NHTSA relies on AEO 2022 for its baseline projection of vehicle sales share, and then layers on additional forecasting to capture the IRA's effects. But, as detailed above, this approach has yielded considerable discrepancies in the projection of the baseline vehicle fleet that diverge from both economic fundamentals and prevailing market expectations. To address these inconsistencies, NHTSA should consider adopting AEO 2023 for its baseline sales-share calculations and use the baseline as the reference scenario. Indeed, NHTSA does adopt AEO 2023 sales share projections in some of its sensitivity analyses.[126]

Should NHTSA opt to update its baseline to incorporate AEO 2023, it should note that AEO 2023 models only some aspects of the IRA and does not include the producer-side battery tax credit.[127] Nevertheless, the sensitivity analysis in AEO 2023 provides a valuable framework for assessing the IRA's impact under different degrees of IRA uptake.[128] To blunt the potential underestimate of the IRA's full impact in AEO 2023 resulting from its failure to model the battery tax credit, NHTSA should consider using the "High uptake of the IRA" sensitivity case provided in AEO 2023.

b. NHTSA Should More Comprehensively Disclose Its Methodologies for Projecting Baseline Sales Shares

NHTSA documents its methodology for baseline share calculations in the RIA, technical support document, and other input files, but certain inconsistencies across these documents impede a thorough evaluation of the model's outcomes. For instance, NHTSA tabulates parameters for variables, such as fuel economy and horsepower, used in the Legacy DFS model in the model

[123] NHTSA assumes that the credits phase out beginning in MY 2031 for the advanced manufacturing production credit (AMPC) and sunset in MY 2034 for the clean vehicle credits (CVC). TSD at 2-90.
[124] *See, e.g.*, Peter Slowik et al., Energy Innovation & Int'l Council on Clean Transp., *Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States* 12 fig. 6 (2023).
[125] GREGORY N. MANKIW, PRINCIPLES OF MICROECONOMICS 67 (8th ed.). One could theoretically derive a spike in the BEV share as the IRA credits near expiration if, for example, the sales share model was constructed with a dynamic optimization framework or if the model included expectations about future BEV purchase prices appropriately. But neither of these approaches is introduced in NHTSA's current sales-share model.
[126] *See* RIA at 9-9 to 9-21.
[127] U.S. Energy Information Administration, Transportation Demand Module Assumptions 26 (2023), https://www.eia.gov/outlooks/aeo/assumptions/pdf/TDM_Assumptions.pdf.
[128] *See* Projection Tables for Side Cases, Annual Energy Outlook 2023, https://www.eia.gov/outlooks/aeo/tables_side_xls.php.

documentation.[129] However, these parameters are either inconsistent in their values or absent in the model input file used for the actual calculation.[130]

Furthermore, NHTSA does not clearly disclose the exact procedure for incorporating the IRA credits into the baseline. Based on our best interpretation of their documents, it appears that NHTSA uses the Legacy DFS model to integrate the IRA tax credits by using the passenger car and light truck shares from AEO 2022 as a reference and then considering the IRA subsidy as an incremental change in the average vehicle prices. However, it is unclear whether NHTSA updates the share projections to the newly calculated values or maintains them at the referenced AEO 2022 levels.[131]

To enhance transparency, NHTSA should reconcile and clarify the inconsistencies between the model documentation and the input file. NHTSA should also clearly disclose its entire methodology, especially for incorporating IRA credits into the baseline. Further suggestions for improving the rigor and transparency of each of NHTSA's three baseline models are offered below in Appendix A.

E. NHTSA Should Refine Its Scrappage Analysis

Scrappage refers to the rate at which old automobiles are discarded. Scrappage impacts NHTSA's model by determining the number of older vehicles on the road. Because older vehicles are less fuel-efficient and exclude up-to-date safety technologies, scrappage estimates implicate the estimated pollution and fatality impacts of regulatory alternatives.

NHTSA's dynamic scrappage model underlying the Proposed Rule is virtually identical to the version used in its 2020 and 2022 rules.[132] This model corrected many of the flaws from the version NHTSA used in its 2018 proposed rule.[133] Still, the current model retains several shortcomings. Many of the critiques by peer-reviewers,[134] the U.S. Environmental Protection

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[129] Draft CAFE Model Documentation at 104 tbl.20 ("DFS Coefficients").

[130] Available for download via NHTSA's CAFE Compliance and Effects Modeling System at https://www.nhtsa.gov/file-downloads?p=nhtsa/downloads/CAFE/2023-NPRM-LD-2b3-2027-2035/Central-Analysis/. The relevant file can be found under the directory "LD_Central_Analysis/input/" and is named "parameters_ref.xlxs."

[131] The model documentation indicates that when this Legacy DFS model is used, certain types of adjustments to the vehicle shares in these simulations are not possible. This limitation adds another layer of uncertainty to our understanding of whether NHTSA updates these vehicle shares based on new calculations or keeps them fixed at the AEO 2022 values in the baseline fleet share calculation. Draft CAFE Model Documentation at 110–11.

[132] *See* RIA at 4-16 ("The current implementation of the scrappage model is relatively unchanged from the scrappage model used in the 2020 final rule, which had made a variety of improvements as compared to the model used for the prior NPRM and addressed other substantive comments.").

[133] *See, e.g.*, Dave Cooke, *EPA Made So Many Mistakes with Clean Cars Rollback, Even Its Own Lawyers Want to Know What's Up*, Union of Concerned Scientists (July 30, 2020), https://blog.ucsusa.org/davecooke/epa-made-so-many-mistakes-with-clean-cars-rollback-even-its-own-lawyers-want-to-know-whats-up (providing a broad overview of the issues); Robinson Meyer, *Trump's New Auto Rollback Is an Economic Disaster*, ATLANTIC (Apr. 13, 2020) (criticizing the timeline used in the analyses); Inst. for Pol'y Integrity, Comments on The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks 40–46 (Oct. 26, 2018) [hereinafter Policy Integrity 2018 Comments] (explaining other issues).

[134] *See* Nat'l Highway Traffic Safety Admin., Appendix B: Review of New Modules and Phase 2 Reviewer Résumés *in* CAFE MODEL PEER REVIEW (2019) (NHTSA-2018-0067-0055) [hereinafter 2019 CAFE Model Peer Review].

Agency,[135] and public commenters, including the Institute for Policy Integrity,[136] still hold. NHTSA should address these lingering shortcomings.

Preferably, NHTSA should replace its reduced-form dynamic scrappage model with a structural model. The current model does not ensure equilibrium behavior because it looks only at the price for new cars, ignoring used car price. Standard economic theory (and basic intuition) suggests that new cars and used cars are substitutes for one another. Considering price effects only for new cars can therefore produce illogical results. Indeed, if NHTSA had to focus on just one market price to predict scrappage, it should focus on the price effects of *used* cars rather than *new* cars.[137] Because of this indirect connection, a model could produce unreliable results without constraints, which NHTSA does not apply. NHTSA should therefore replace its model with a structural one along the lines of Jackobsen and van Benthem,[138] and Gruenspecht.[139]

If NHTSA instead retains its reduced-form model, it should take several steps to improve its underlying identification strategy. First, NHTSA should reflect that new-vehicle price is endogenous to scrappage. In other words, in addition to new vehicle price affecting scrappage rates (which NHTSA captures), scrappage can directly affect new vehicle price (which NHTSA omits). Furthermore, some variables that NHTSA's model omits could be affected by scrappage, and *those* variables could in turn affect new vehicle price. Indeed, peer reviewers of NHTSA's modeling noted that the scrappage model is a textbook example of simultaneity and endogeneity.[140] To overcome this limitation, NHTSA should use instrumental variables or quasi-experimental data.[141] NHTSA should also explicitly address omitted-variable bias (i.e., the bias that results when a model omits one or more relevant variables), which leads the agency to overlook or mistreat events that simultaneously affect new and used vehicle demand.[142] To the degree feasible, NHTSA should work to incorporate critical variables that are currently missing

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[135] Mark R. Jacobsen et al., RTI Int'l, The Effects of New-Vehicle Price Changes on New-and Used-Vehicle Markets and Scrappage (2021).

[136] Inst. for Pol'y Integrity, Comments on Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks (Oct. 26, 2021).

[137] As economist (and Deputy Administrator at the Energy Information Administration) Howard Gruenspecht explains, "New car price developments would affect scrappage rates solely through their influence on used car prices." Howard K. Gruenspecht, *Differentiated Regulation: The Case of Auto Emissions Standards*, 72 AM. ECON. REV. 328, 329 (1982).

[138] *See* Mark R. Jacobsen & Arthur A. van Benthem, *Vehicle Scrappage and Gasoline Policy*, 105 AM. ECON. REV. 1312 (2015).

[139] *See* Howard K. Gruenspecht, Differentiated Social Regulation in Theory and Practice (1981) (Ph.D. dissertation, Yale University); Gruenspecht (1982), *supra* note 137.

[140] *See* 2019 CAFE Model Peer Review, *supra* note 134, at B-62 ("The estimation of the causal effect of new vehicle prices on scrap rates is subject to biases. . . . Given that prices are clearly an endogenous variable, the regression is exposed to garden variety simultaneity and omitted variable biases. This regression would not pass muster in an academic research article."); *id.* at B-33 to B-34 ("The omission of used vehicle prices is particularly concerning since the linkage between consumer demand for new versus used vehicles is a key theme of the PRIA and the preamble's case for less stringent standards. DOT/EPA should explore adding these variables and report what they learn. While these variables may also be endogenous (like new vehicle prices may be endogenous), that is not an argument for ignoring them.").

[141] *See* Jacobsen et al., *supra* note 135, at 3-8; Policy Integrity 2018 Comments, *supra* note 133, at 88.

[142] *See* Jacobsen et al., *supra* note 135, at 3-7 to 3-8; Policy Integrity 2018 Comments, *supra* note 133, at 59, 91; The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks, 85 Fed. Reg. 24,174, 24,665–67 tbls.V-170 to V-172 (Apr. 30, 2020).

from the equations it uses to determine used-vehicle demand and supply: maintenance and repair prices, iron and steel scrap prices, interest rates, and new vehicle sales.[143]

Second, NHTSA should better reflect how scrapping used vehicles affects new-vehicle sales and total vehicle miles traveled. Currently, NHTSA holds non-rebound vehicle miles traveled (VMT) constant across the baseline and all alternative scenarios; in other words, NHTSA allows the U.S. fleet to decline in size and increase in age in response to more stringent standards through its modeling of new-vehicle demand and used-vehicle scrappage, yet also holds non-rebound VMT constant across these standards, assuming that drivers will drive older and less reliable vehicles more.[144] This ignores the common-sense alternatives to driving that some current drivers would use like taking mass transit or car sharing. To address this issue, NHTSA should enable non-rebound VMT to decline consistent with the projected decline in fleet size.[145] To do this, NHTSA should estimate the cross-price elasticity of demand for these outside options or, at a minimum, conduct sensitivity analysis regarding its value. Alternatively, NHTSA could hold fleet size constant, which, while inaccurate, would at least be consistent with its current practice of holding non-rebound VMT constant.[146] Either option would alleviate NHTSA's current issue of overstating VMT relative to fleet size.

Ideally, given that NHTSA models electric vehicles in its baseline, it should also address differences in scrappage rates between electric and combustion-engine vehicles. Given the technological differences, there is reason to expect that people will not scrap electric vehicles and combustion-engine vehicles at the same rate. While batteries may need to be replaced over time, and while consumers have less experience with electric vehicles, they also have fewer moving parts than combustion engine vehicles and lower maintenance requirements.[147] Near-term technology improvements may further improve their reliability and lower their maintenance requirements. Neglecting this distinction further skews NHTSA's scrappage estimates and thereby further skews attendant safety and pollution costs. This should be addressed quantitatively if sufficient data is available, or qualitatively if not.

Given the challenges of identifying what variables affect vehicle price, NHTSA should conduct out-of-sample tests to compare its dynamic scrappage models with its static scrappage model to determine which performs best. Because most scrappage is due to age-related factors that are unrelated to price,[148] the impact of modeling scrappage caused by the Proposed Rule should be

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[143] NHTSA explains these omissions as owing to unavailable data and modeling constraints. *See* RIA at 4-34. However, it includes some of these variables elsewhere in the model, rendering this explanation questionable. *See* TSD at 4-17, 4-34.

[144] TSD at 4-46.

[145] *See* Hunt Allcott & Nathan Wozny, *Gasoline Prices, Fuel Economy, and the Energy Paradox*, 96 REV. ECON. & STAT. 779 (2014); Hunt Allcott & Christopher Knittel, *Are Consumers Poorly Informed About Fuel Economy? Evidence from Two Experiments*, 11 AM. ECON. J.: ECON. POL'Y 1 (2019); Jacobsen et al., *supra* note 135, at 3-9, 7-1; Antonio M. Bento et al., *Estimating the Costs and Benefits of Fuel-Economy Standards*, 1 ENV'T & ENERGY POL'Y & ECON. 129, 141 (2020).

[146] This is consistent with Gruenspecht (1981), *supra* note 139; and Gruenspecht (1982), *supra* note 137.

[147] U.S. Dep't of Energy, Maintenance and Safety of Electric Vehicles, https://afdc.energy.gov/vehicles/electric_maintenance.html (last visited Sept. 28, 2023).

[148] Antonio Bento et al., *Vehicle Lifetime and Scrappage Behavior: Trends in the U.S. Used Car Market*, 39 ENERGY J. 159, 178 (2018) ("The inelasticity of this parameter suggests that accurately modeling vehicle lifetime is of first order importance, as most scrappage will occur due to age-related, exogenous scrappage rather than policy induced, endogenous scrappage.").

low, implying that static scrappage models may perform equally well or better.[149] If NHTSA develops a structural scrappage model as suggested above, NHTSA should apply a similar out-of-sample test using all three models.

F. NHTSA Appropriately Models Price Elasticity and Rebound

In the Proposed Rule, NHTSA follows its practice from the 2022 Rule and prior regulations for rebound and price elasticity of demand. Although NHTSA briefly altered both of these methodologies in its 2020 Rule, the estimates that it applies here are well supported by the academic literature.

Price elasticity. Price elasticity of demand refers to the effect that changes in the sticker price have on sales. This is an important parameter because it determines how much new-vehicle sales decline (and thereby reduce the Proposed Rule's net benefits) due to the sticker-price increase resulting from the Proposed Rule. Here, NHTSA applies a price elasticity of demand of -0.4—implying, in other words, that a "10 percent increase in new vehicles' average price causes a 4 percent decline in their total sales."[150] The use of a -0.4 parameter is consistent with NHTSA's modeling of the 2022 Rule,[151] which marked a shift away from the agency's brief practice in the 2020 Rule of using a price elasticity parameter of -1.0.[152]

NHTSA's price-elasticity estimate of -0.4 is well supported by the economics literature. A recent survey of peer-reviewed estimates of vehicle price elasticity finds that -0.4 reflects both the mean and median of long-run elasticity estimates since 2000 (with outlier estimates removed).[153] NHTSA's current estimate also reflects the mean of all estimates published since 2010 (the median estimate since 2010 is even lower: -0.3).[154] In contrast, as the same survey further explains, NHTSA's price-elasticity estimate of -1.0 from the 2020 Rule was poorly justified and incompatible with the available evidence.[155]

Rebound. The "rebound effect" refers to the additional energy consumption that may arise from the introduction of a more efficient, lower-cost energy service.[156] All else being equal, greater rebound estimates would presumptively reduce the net benefits of the Proposed Rule because they would increase driving and thereby reduce fuel-savings and climate benefits while increasing congestion and fatalities.

In the Proposed Rule, NHTSA reasonably—and consistently with prior rules other than the 2020 Rule[157]—assumes 10% fuel-economy rebound effect, which "implies that a 10 percent increase

[149] Policy Integrity 2018 Comments, *supra* note 133, at 63.
[150] RIA at 7-8.
[151] Final Regulatory Impact Analysis: Final Rulemaking for Model Years 2024–2026 Light-Duty Vehicle Corporate Average Fuel Economy Standards 70 (2022).
[152] Final Regulatory Impact Analysis The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Year 2021–2026 Passenger Cars and Light Trucks 868 (2020) [hereinafter 2020 RIA].
[153] Peter Howard & Max Sarinsky, Inst. for Pol'y Integrity, *Turbocharged: How One Revision in the SAFE Rule Economic Analysis Obscures Billions of Dollars in Social Harms* 7–8 (2020).
[154] *Id.*
[155] *Id.* at 5–6.
[156] RIA at 4-4 ("As new vehicles become more efficient, the cost-per-mile of driving them decreases, which is assumed to spur additional demand for travel.").
[157] *See* 2020 RIA, *supra* note 152, at 972.

in fuel economy will produce a 1 percent increase in average annual driving."[158] NHTSA's adoption of a 10% rebound rate is widely supported by the literature.[159] Most notably, a recent literature review finds that "recent literature . . . tends to point to an estimate of around -0.1, which corresponds to a 10 percent rebound effect."[160]

III. NHTSA Should Conduct Additional Analyses to Ensure Robustness and Transparency

NHTSA conducts more than 80 sensitivity analyses showing how the benefits, costs, and net benefits of the Proposed Rule shift under different assumptions.[161] These analyses provide extensive information about how different parameters affect NHTSA's results. For transparency, NHTSA should present the results of its sensitivity analyses for all regulatory alternatives.

To further ensure analytical robustness and transparency, NHTSA should perform at least two additional analyses. First, NHTSA should perform a benefit-cost analysis that includes EPA's to-be-finalized tailpipe rule in the baseline. Second, for transparency only, NHTSA should perform an "unconstrained" analysis for passenger cars and light trucks.

A. NHTSA Should Perform Additional Analysis that Incorporates EPA's To-Be-Finalized Tailpipe Rule into the Baseline

When setting fuel-economy standards, NHTSA must "consider . . . the effect of other motor vehicle standards of the Government on fuel economy."[162] As NHTSA notes, "[s]ince the Obama Administration, NHTSA has considered the [greenhouse gas] standards set by EPA.'"[163] Despite this, "NHTSA has not incorporated EPA's proposed CO_2 standards for MYs 2027–2032 as part of the analytical baseline" for its main analysis[164] or any sensitivity analyses.[165]

NHTSA should perform additional analysis that incorporates EPA's rule into its analytical baseline, consistent with analytical guidance. Specifically, Circular A-4 provides that "[w]hen more than one baseline is reasonable and the choice of baseline will significantly affect estimated benefits and costs, you should consider measuring benefits and costs against alternative baselines. In doing so you can analyze the effects on benefits and costs of making different assumptions about other agencies' regulations . . . ."[166] The draft update to Circular A-4 is even more emphatic, instructing agencies to include in the baseline "proposed rules or other previously announced policy changes that . . . [are] reasonably certain [to] be finalized before the rule under consideration" and further "encourag[ing]" agencies to "consider the likely path of future government programs" in either "the primary [baseline] or in a supplemental baseline."[167]

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[158] *Id.* at 7-10.
[159] *See* Inst. for Pol'y Integrity, Comments on Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks 36–38 (Oct. 26, 2021) (NHTSA-2021-0053-1579) (supporting the 10% rebound rate and explaining that use of 20% rebound rate in 2020 Rule was unjustified).
[160] Kenneth T. Gillingham, *The Rebound Effect and the Proposed Rollback of U.S. Fuel Economy Standards*, 14 REV. ENV'T ECON. & POL'Y 136, 137 (2020).
[161] *See* RIA at 9-2 to 9-6 (listing sensitivity analyses).
[162] 49 U.S.C. § 32902(f).
[163] Proposed Rule, 88 Fed. Reg. at 56,315.
[164] *Id.*
[165] *See generally* RIA ch. 9.
[166] CIRCULAR A-4, *supra* note 25, at 15.
[167] DRAFT CIRCULAR A-4 UPDATE, *supra* note 64, at 12–13 (footnote omitted).

This guidance helps ensure that a single effect is not attributed to multiple regulations. To illustrate, suppose a manufacturer will switch from producing 10,000 new gas-powered SUVs to producing 10,000 new hybrid sedans under both EPA's and NHTSA's analyses. At present, the benefits and costs of that switch are attributed to both the EPA and NHTSA rulemakings. This leads to a double-counting of many benefits and costs.

Here, NHTSA can be reasonably sure that EPA will finalize its proposed tailpipe standards. Because NHTSA is already "coordinat[ing] with EPA" to set these standards,[168] it could wait until EPA is sure of what standards will be in the final rule and run the analysis with those in the baseline. Alternatively, if that is infeasible, NHTSA could incorporate EPA's proposed standards into its analysis. This could be in a sensitivity analysis—but, given that "the choice of baseline will significantly affect estimated benefits and costs,"[169] this analysis should be reported somewhere. (EPA and NHTSA should consult with one another, and the White House Office of Information and Regulatory Affairs, to ensure analytical consistency in their presentation.)

Moreover, NHTSA already analyzed the impacts of other legally incomplete standards in its baseline by accounting "for the impacts of anticipated manufacturer compliance with California's ZEV mandate (and its adoption by [other] states)."[170] NHTSA does this "to better ensure that [it] has the clearest possible understanding of the effects of the decision being made, as opposed to the effects of many things that will be occurring simultaneously."[171] The same logic supports capturing the EPA's to-be-finalized tailpipe standards in the baseline.

B. For Informational Purposes, NHTSA Should Perform an "Unconstrained" Benefit-Cost Analysis for Passenger Cars and Light Trucks

For passenger cars and light trucks, NHTSA "may not consider" compliance credits and "the fuel economy of" alternative-fueled vehicles (AFVs), including electric vehicles, in setting the fuel-economy standard.[172] But, as NHTSA acknowledges, in reality "manufacturers are free to use dedicated and dual-fueled AFVs and credits in achieving compliance."[173] Because these flexibilities will allow manufacturers to comply more cost-effectively than NHTSA's "standard-setting" analysis suggests, NHTSA reasonably "acknowledges that compliance looks easier and more cost-effective for many manufacturers under the 'unconstrained' analysis as compared to the 'standard-setting' analysis."[174]

The constraints of NHTSA's "standard-setting" analysis have generated some confusion and misleading claims. For example, two attorneys recently argued in an op-ed that the Proposed Rule's "fuel economy [standards] for passenger cars will harm society" by increasing cost.[175]

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[168] Proposed Rule, 88 Fed. Reg. at 56,140.
[169] CIRCULAR A-4, *supra* note 25, at 15.
[170] Proposed Rule, 88 Fed. Reg. at 56,316. NHTSA acknowledges that "EPA has not yet granted a waiver of preemption" for California's program. *Id.* at 56,176 n.146.
[171] *Id.*
[172] 49 U.S.C. § 32902(h). The meaning of this provision is the subject of ongoing litigation before the D.C. Circuit. This comment letter assumes that NHTSA's current interpretation of this provision is lawful.
[173] Proposed Rule, 88 Fed. Reg. at 56,319.
[174] *Id.* at 56,341 n.587
[175] Michael Buschbacher & James Conde, *Shocking Candor on Fuel Standards*, WALL ST. J. (Aug. 23, 2023), https://www.wsj.com/articles/transportation-department-fuel-standards-car-ev-electric-vehicle-auto-industry-climate-change-388d6dd0. This op-ed was misleading on multiple grounds, including by suggesting that the

But, among other fundamental issues,[176] this conclusion draws from NHTSA's "standard-setting" analysis, which entails artificially inflated costs. It would therefore be useful to aid the public in understanding and contextualizing the benefits and costs of NHTSA's proposals to report an "unconstrained" benefit-cost analysis for passenger cars and light trucks. That would help the public transparently understand the *true* costs of NHTSA's proposed alternatives.

NHTSA could conduct and report such an "unconstrained" analysis without running afoul of its Section 32902(h) restrictions. NHTSA should emphasize that it performed those analyses for transparency and informational purposes only and accorded them no weight in its standard-setting decisions. Such "for-transparency-only" analyses are common. For example, while the Clean Air Act "does not permit the EPA to consider costs in setting" national ambient air quality standards,[177] EPA routinely produces regulatory impact analyses for these standards "for informational purposes only."[178] Similarly, while cost considerations are limited under the Endangered Species Act,[179] implementing agencies still assess the costs of their regulations under those parts of the Act to comply with applicable executive orders.[180]

Moreover, NHTSA has already performed an unconstrained analysis of environmental effects in its draft environmental impact statement.[181] While NHTSA draws a distinction between EPCA and the National Environmental Policy Act,[182] nothing in EPCA prevents it from reporting the benefits and costs of the same analysis for informational purposes. For transparency, NHTSA should do so.

IV. NHTSA Should More Clearly Affirm that These Standards Help Correct Market Failures that Prevent Consumers from Optimizing Fuel Savings

NHTSA appropriately recognizes that the Proposed Rule helps correct a market failure known as the "energy efficiency gap" whereby consumers "systematically undervalue future fuel savings when choosing among competing vehicle models."[183] NHTSA also appropriately recognizes that the energy efficiency gap has numerous causes on both the consumer and producer side.[184]

Proposed Rule is net costly in total when in fact NHTSA found merely that it is net costly for passenger cars under the model-year perspective (and neither for light trucks nor under the more realistic CY perspective).

[176] *See supra* note 175.

[177] Whitman v. American Trucking Ass'ns, Inc., 531 U.S. 457, 465 (2001).

[178] Reconsideration of the National Ambient Air Quality Standards for Particulate Matter, 88 Fed. Reg. 5558, 5563 (Jan. 27, 2023).

[179] Tenn. Valley Auth. v. Hill, 437 U.S. 153, 184 (1978).

[180] *See* Endangered and Threatened Wildlife and Plants; Revision of Regulations for Interagency Cooperation, 88 Fed. Reg. 40,753, 40,760–61 (June 22, 2023) (reporting benefits and costs because "OIRA has determined that this proposed rule is significant" under Executive Order 12,866).

[181] NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., DRAFT ENVIRONMENTAL IMPACT STATEMENT: CORPORATE AVERAGE FUEL ECONOMY STANDARDS FOR PASSENGER CARS AND LIGHT TRUCKS, MODEL YEARS 2027–2032, AND FUEL EFFICIENCY STANDARDS FOR HEAVY-DUTY PICKUP TRUCKS AND VANS, MODEL YEARS 2030–2035 at 2-19 (2023).

[182] *See id.* ("NEPA . . . does not impose [EPCA's statutory] constraints on analysis . . . .").

[183] RIA at 2-4.

[184] *Id.* at 2-7; *accord id.* at 9-55. For a more extensive discussion of the market failures that produce the energy efficiency gap, see Rachel Rothschild & Jason A. Schwartz, Inst. for Pol'y Integrity, *Tune Up: Fixing Market Failures to Cut Fuel Costs and Pollution from Cars and Trucks* 11–14 (2021) (cited in RIA at 2-7, 9-53) (discussing loss aversion, information costs and asymmetries, myopia and inattention, positional externalities, manufacturer market power, first-mover disadvantages, split incentives, and network externalities).

Accordingly, and consistent with past practice, NHTSA monetizes the full value of fuel savings as a regulatory benefit of the Proposed Rule and its alternatives.

Despite ultimately crediting the fuel efficiency gap, NHTSA understates the evidence supporting this market failure and even briefly suggests that it may not exist at all. NHTSA should provide a more balanced presentation of the economic literature and, based on that literature, more decisively recognize that consumers substantially undervalue fuel savings.

A. NHTSA Should Present a More Balanced Literature Review of Fuel Valuation

Although NHTSA ultimately recognizes the existence of the energy efficiency gap, one reading the RIA may be uncertain of that. NHTSA begins its discussion of the energy efficiency gap by alleging "an active debate about whether such a gap actually exists"[185] and devotes much of its analysis to several studies that conclude that consumers may fully or mostly value fuel savings.[186]

While there is debate about the magnitude of the energy efficiency gap, NHTSA greatly overstates the degree of debate over the gap's existence. Specifically, NHTSA focuses primarily on four studies that find that consumers either fully or mostly value fuel savings, yet fails to recognize that these studies are generally high-end estimates and that a wide body of literature finds a substantial fuel efficiency gap. For instance, as NHTSA briefly recognizes, Gillingham et al. (2021) find that consumers value only 16–39% of fuel savings in purchasing decisions.[187]

NHTSA should provide a more balanced literature review. In September 2021, Resources for the Future published an article (Ankney et al. (2021)) summarizing recent economic literature on the magnitude of the fuel efficiency gap. They conclude that while a few papers (which NHTSA highlights) suggest that the fuel efficiency gap may be small or potentially nonexistent, other recent papers find that consumers substantially undervalue fuel savings at the time of purchase.[188] A literature review in Gillingham et al. (2021) suggests a similar conclusion.[189] Estimates discussed in those two articles are presented in the chart below.

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[185] RIA at 2-4.
[186] *Id.* at 2-5 to 2-6 (discussing Sallee et al. 2016; Allcott & Wozny, 2014; Busse et al., 2013; and Leard et al., 2023)
[187] Kenneth T. Gillingham et al., *Consumer Myopia in Vehicle Purchases: Evidence from a Natural Experiment*, 13 AM. ECON. J: ECON. POL'Y 207 (2021) (cited in RIA at 2-7).
[188] Kevin Ankney et al., *What Should Federal Agencies Assume for How Much Consumers Are Willing to Pay for Fuel Cost Savings*?, RES. FOR THE FUTURE, https://www.resources.org/common-resources/what-should-federal-agencies-assume-for-how-much-consumers-are-willing-to-pay-for-fuel-cost-savings/ (Sept. 22, 2021).
[189] Gillingham et al., *supra* note 187, at 209.

Table 5: Estimates of Fuel Savings Valued

Study	Percentage of Fuel Savings Valued
Estimates presented in Ankney et al. (2021)	
*Bussee et al. (2013)[190]	100
*Allcott & Wozny (2014)[191]	76
*Sallee et al. (2016)[192]	100
Leard et al. (2019)[193]	27
Gillingham et al. (2021)[194]	16–39
*Leard et al. (2023)[195]	54
Ankney & Leard (2023)[196]	64–73
Additional estimates in Gillingham et al. (2021)[197]	
Kahn (1986)[198]	33–50
Grigolon et al. (2018)[199]	91
Leard, Linn, and Springel (2019)[200]	<30

* = highlighted prominently in RIA

As Table 5 illustrates, many studies find that consumers considerably undervalue fuel savings, and the studies that NHTSA highlights in the Proposed Rule represent high-end estimates. A recent meta-analysis further supports this conclusion.[201] There, the authors analyzed 95 papers that assessed consumer valuation of a $0.01 per-mile reduction in fuel costs. The authors find an average valuation of 49.5% of fuel savings among the studies that corrected for endogeneity of

[190] Meghan R. Busse et al., *Are Consumers Myopic?*, 103 AM. ECON. REV. 220 (2013).
[191] Hunt Allcott & Nathan Wozny, *Gasoline Prices, Fuel Economy, and the Energy Paradox*, 96 REV. ECON. & STATS. 779 (2014).
[192] James M. Sallee et al., *Do Consumers Recognize the Value of Fuel Economy? Evidence from Used Car Prices and Gasoline Price Fluctuations*, 135 J. PUB. ECON. 61 (2016).
[193] Benjamin Leard et al., Pass-Through and Welfare Effects of Regulations that Affect Product Attributes (Res. for the Future Working Paper 19-07) (2019).
[194] Gillingham et al., *supra* note 187. Ankney et al. (2021) cites a single specification from the paper of 0.17.
[195] Benjamin Leard et al., *How Much Do Consumers Value Fuel Economy and Performance?*, 105 REV. ECON. & STATS. 158 (2023). In Ankney et al. (2021), this paper is referenced as "Leard et al. (forthcoming)."
[196] Kevin Ankney & Benjamin Leard, *How Much Do Consumers Value Fuel Cost Savings?*, Res. for the Future Working Paper 21-27 (updated Apr. 2023). Ankney et al. (2021) refers to the 2021 version of Ankney & Leard, which found a lower estimate of 0.29.
[197] Gillingham et al., *supra* note 187, at 209.
[198] James A. Kahn, *Gasoline Prices and the Used Automobile Market*, 101 Q.J. ECON. 323 (1986). Gillingham (2021) explains that "Kahn (1986) [found] that used-car prices adjust only one-third to one-half the amount that would be expected." Gillingham et al., *supra* note 187, at 209.
[199] Laura Grigolon et al., *Consumer Valuation of Fuel Costs and Tax Policy: Evidence from the European Car Market*, 10 AM. ECON. J.: ECON. POL'Y 193 (2018).
[200] Benjamin Leard et al., *Pass-Through and Welfare Effects of Regulations that Affect Product Attributes*, Res. for the Future Working Paper 19-07 (2019). (Note that Gillingham et al. (2021) refers to this paper as "Leard, Linn, and Springel (2019).") The full range of estimates from Leard et al. (2019) is 6–76%. As Gillingham et al. (2021) notes, however, "most of their estimates are below 0.30" or 30%. Gillingham et al., *supra* note 187, at 209.
[201] David Greene et al., *Consumer Willingness to Pay for Vehicle Attributes: What Do We Know?*, 118 TRANS. RES. PART A: POL'Y PRAC. 258 (2018).

fuel price.[202] Similarly, among models with fixed coefficients (as opposed to models with random coefficients[203]), the authors report an average valuation of 47.7% of fuel savings in revealed-preference studies and 58.9% in market sales studies.[204] The authors also find evidence that consumers may overstate their willingness to pay for fuel efficiency.[205] The authors conclude that marginal willingness to pay studies suffer from considerable variation, despite improvements in methodology.

In addition to being unrepresentative, the studies that NHTSA emphasizes do not credibly question the existence of the energy efficiency gap nearly as much as the agency suggests. For one, the underlying identification strategy underlying Allcott & Wozny (2014), Busse et al. (2013), and Sallee et al. (2016) has been questioned by one of the study's authors, Hunt Allcott, for including identification flaws that result in upwardly biased estimates.[206] Specifically, Allcott explained that the findings of these papers may result from failing to account for the fact that higher gas prices could make consumers temporarily more attentive to fuel efficiency.[207] Moreover, the studies that NHTSA emphasizes still suggest some undervaluation of fuel savings. For instance, as NHTSA recognizes, Allcott & Wozny (2014) find an average valuation of only 76%.[208] Likewise, results from Busse et al. (2013) "imply that vehicle prices reflect 60 to 100 percent of future fuel costs," while Leard et al. (2023) report a central value of just 54% valuation of fuel savings.[209] And while Sallee (2016) finds complete fuel valuation on average, they "find modest undervaluation" in certain key situations.[210]

Based on a balanced literature review, evidence for the energy efficiency gap is robust. NHTSA should supplement its current review to reflect that reality.

B. NHTSA Properly Concludes that Fuel Economy Need Not Come at the Expense of Other Performance Attributes, and It Should Expand Its Discussion

In the Proposed Rule, like in prior CAFE regulations, NHTSA's central analysis assumes that improved fuel economy will not come at the expense of other performance attributes. In reaching this conclusion, NHTSA highlights research finding "that the presence of fuel-saving

[202] *Id.* at 271 tbl.8. The authors report a mean willingness to pay of $569 for a $0.01 reduction in fuel savings, which they value at $1150. This comes out to approximately 49.5%. The authors report an average valuation of 91.9% ($1057 out of $1150) when including all studies, including those that do not correct for endogeneity. *Id*.
[203] The authors also report results among models with random coefficients, but the reported results are hard to explain and do not provide confidence in the underlying studies. *See id.* at 271 tbl.7. For instance, that table finds a negative willingness to pay for fuel savings in market sales studies, but a far greater than 100% willingness to pay in revealed- and stated-preference studies.
[204] *Id.* at 271 tbl.6. The authors report a mean willingness to pay of $549 in the revealed-preference studies and $678 in the market sales studies. The percentages above were derived using the denominator of $1150. Including stated preference studies—which are often seen as less reliable than revealed-preference studies and market sales studies—the authors found a mean of 74.1% ($853) among all studies with fixed coefficients. *Id.* The authors also report mean willingness to pay estimates from random effects models, but they produce theoretically inconsistent results.
[205] The authors report that stated preference studies find valuations of fuel savings above 100% compared to the substantially lower valuations reported above from models using market data and revealed-preference findings. *Id.* at 271 tbl.6 (mean valuation of $1,225 from stated-preference surveys from models with fixed coefficients).
[206] *See* Hunt Allcott, *Paternalism and Energy Efficiency: An Overview*, 8 ANN. REV. ECON. 145, 156 (2016)
[207] *See id*.
[208] RIA at 2-5 to 2-6.
[209] *Id.* at 2-6.
[210] *Id.*

technologies has not led to adverse effects on other vehicle attributes"[211] and concludes that the energy-efficiency gap, not any alleged implicit opportunity costs, is likely to blame for consumer reluctance to purchase more fuel-efficient vehicles.[212] Nonetheless, some opponents of the Proposed Rule insist that consumers face implicit opportunity costs.[213] Consistent with the best available evidence, NHTSA should remain firm in rejecting that theory.

In the Proposed Rule, NHTSA already provides extensive rationale for assuming in its primary analysis that consumers do not face performance trade-offs from fuel-economy standards.[214] NHTSA also conducts sensitivity analysis in which it assumes, contrary to the best available evidence, that consumers will face performance trade-offs due to the Proposed Rule.[215] As NHTSA explains, this sensitivity analysis understates net benefits in the sensitivity case because it fails to account for the fact that manufacturers would face lower compliance costs if they compromised other attributes.[216]

NHTSA should also explain, consistent with its sensitivity analysis, that net benefits from the Proposed Rule would still be positive assuming performance trade-offs (even with this overestimate of cost under the sensitivity case). Using a consistent 3% discount rate, NHTSA finds net benefits of $4.8 billion in its "implicit opportunity cost" sensitivity case for its preferred light-duty standards[217] and $1.13 billion for its preferred heavy-duty standards.[218] NHTSA should further highlight these sensitivity results.

V. NHTSA Should Further Support Its Conclusion that the Proposed Rule Is Severable

NHTSA notes that it "intends that the various aspects of the proposal be severable, and specifically, that each proposed standard and each year of each proposed standard is severable, as well as the various compliance proposals."[219] To support this, NHTSA notes that "[a]ny of the proposed standards could be implemented independently if any of the other proposed standards were struck down," cites "EPCA's overarching purpose of energy conservation," and explains that "[e]ach proposed standard is justified independently on both legal and policy grounds."[220]

Although these generic explanations offer some support for severability, NHTSA should add more specifics to aid a reviewing court in finding why it is so.[221] For a court to sever an invalid portion of a rule, it must find both (1) that the agency would have intended to promulgate the

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211 *Id.* at 9-54. As Policy Integrity has cataloged in prior comments, substantial evidence supports this conclusion. Inst. for Pol'y Integrity, Comments on Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks 5–8, 17–25 (Oct. 26, 2021) (NHTSA-2021-0053-1579).
212 *Id.* at 9-53.
213 *E.g.*, Buschbacher & Conde, *supra* note 175.
214 RIA at 9-53 to 9-56.
215 *See id.* at 9-54 (discussing sensitivity analysis).
216 *Id.* at 9-54 to 9-55.
217 RIA at 9-10. This (and the calculation in the following footnote) uses the social cost of greenhouse gases estimates using a 3% discount rate with central damages.
218 *Id.* at 9-26.
219 Proposed Rule, 88 Fed. Reg. at 56,359.
220 *Id.*
221 *See* Adelaide Duckett & Donald L. R. Goodson, Inst. for Pol'y Integrity, *Administrative Severability: A Tool Federal Agencies Can Use to Address Legal Uncertainty* (2023) (encouraging agencies to provide detailed severability analysis), https://policyintegrity.org/files/publications/Administrative_Severability_Issue_Brief_v2.pdf.

remaining portion and (2) that the remainder can function independently.[222] NHTSA should provide more argument as to why these two requirements are met, since courts are more likely to be persuaded by detailed severability analyses than generic ones.[223]

Because changing manufacturing processes for one product class or model year could affect those processes for another, NHTSA should explain why these technical processes are sufficiently independent that individual standards for each year could be applied separately. In particular, NHTSA may wish to discuss how it has traditionally set light-duty and heavy-duty standards separately and so compliance with one set of standards has historically been independent from compliance with the other. NHTSA may also wish to consider whether the regulations could apply independently to vehicle classes within each standard—i.e., passenger cars versus light trucks and heavy-duty pickups versus vans. If NHTSA wishes to maintain severability across model years, then it should explain why manufacturing processes allow that kind of independence—i.e., why changing requirements for just one model year would not spill over into other model years.

In assessing severability, NHTSA should also consider many structural elements of the rule, such as the many tables disaggregating technology paths and effects by vehicle class and model year.[224] And it should discuss aspects of the automotive industry and its enforcement procedures to show that each model year- and vehicle class-specific standard is independently achievable and valuable.[225]

Respectfully,

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[222] *See* K Mart Corp. v. Cartier, Inc., 486 U.S. 281, 294 (1988); Charles W. Tyler & E. Donald Elliott, *Administrative Severability Clauses,* 124 YALE L.J. 2286, 2294–97 (2015).

[223] Duckett & Goodson, *supra* note 221, at 2–3 ("[B]oilerplate clauses have some value. But agencies hoping to craft the most effective severability clauses should learn from trends in the case law and draft detailed and specific severability clauses.").

[224] *See, e.g.*, Proposed Rule, 88 Fed. Reg. at 56,331–32 tbl.V-2 & 56,332 tbl.V-3 (projecting a technology path for each proposed alternative and model year for passenger cars and light trucks); *id.* at 56,355 tbl.V-21 (same for HDPUVs); *id.* at 56,334 tbl.V-4 & 56,335 tbl.V-5 (estimating incremental price changes by manufacturer, model year, and regulatory alternative for passenger cars and light trucks); *id.* at 56,356 tbl.V-22 (estimating technology availability by manufacturer, select model years, and regulatory alternatives for HDPUVs).

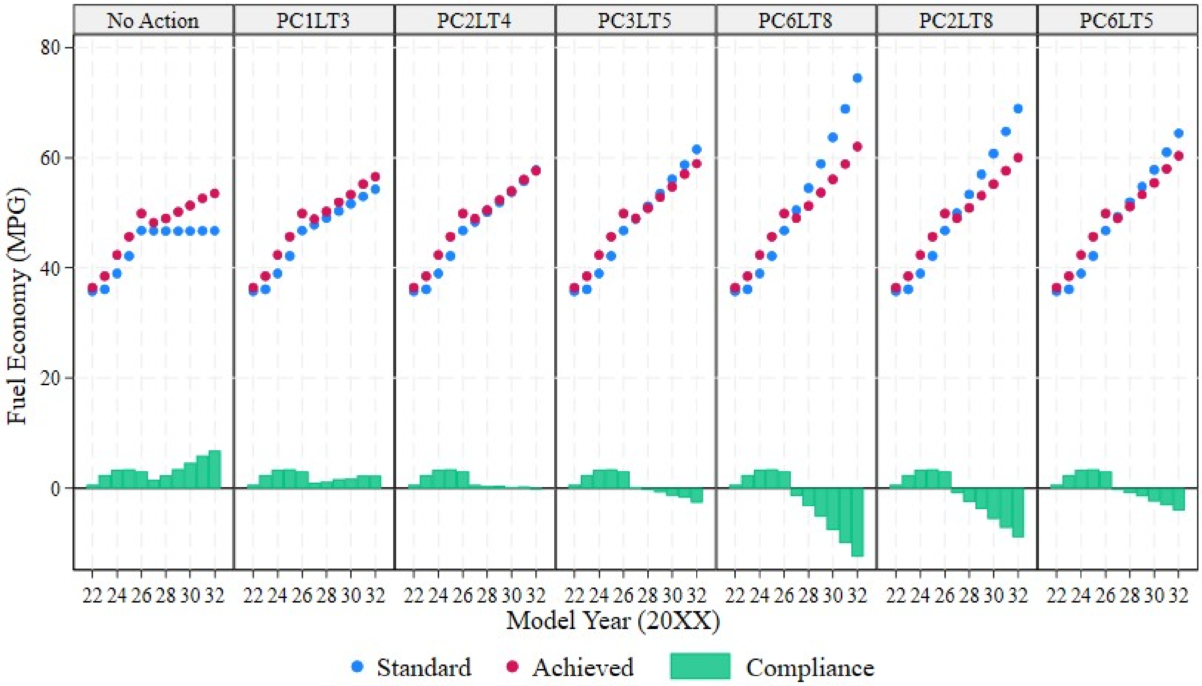
[225] *See* Am. Fuel & Petrochemical Mfrs. v. Env't Prot. Agency, 3 F.4th 373, 384 (D.C. Cir. 2021) (upholding severability when one section "establish[ed] a single, unified program" that operated independently of another section); *cf.* Sierra Club v. Fed. Energy Regul. Comm'n, 867 F.3d 1357, 1366 (D.C. Cir. 2017).

Appendix A: Tables and Figures for PC2LT8 and PC6LT5

Table A1: Incremental Benefits and Costs for the On-Road Fleet CY 2022-2050 (2021$ Billions), by Alternative (3% Discount Rate)

	PC1LT3	PC2LT 4	PC3LT5	PC6LT8	PC2LT8	PC6LT5
Technology Costs	77.7	104.7	170.5	270.0	209.4	207.8
Maintenance & Repair Cost	0.0	0.0	0.0	0.0	0.0	0.0
Sacrifice in Other Vehicle Attributes	0.0	0.0	0.0	0.0	0.0	0.0
Consumer Surplus Loss	0.1	0.1	0.5	1.9	1.1	0.8
Safety Costs Internalized by Drivers	10.4	13.7	17.7	26.4	20.9	21.8
Subtotal-Private Cost	**88.2**	**118.5**	**188.7**	**298.2**	**231.4**	**230.4**
Congestion and Noise Costs	7.4	9.7	12.6	18.9	15.5	15.3
Safety Cost not Internalized by Drivers	1.0	1.8	4.1	7.7	3.8	6.4
Loss in Fuel Tax Revenue	19.7	26.8	34.5	61.1	51.1	40.2
Subtotal-Social Costs	**28.1**	**38.3**	**51.2**	**87.7**	**70.4**	**62.0**
Total Social Costs	**116.3**	**156.8**	**239.9**	**385.9**	**301.8**	**292.3**
Reduced Fuel Cost	97.6	131.7	170.6	291.0	241.7	201.1
Benefits from Additional Driving	17.6	22.8	29.2	41.7	33.8	35.2
Less Frequent Refueling	0.6	1.9	0.0	-2.7	-4.8	0.9
Subtotal-Private Benefits	**115.8**	**156.4**	**199.8**	**330.1**	**270.6**	**237.2**
Reduction in Petroleum Mkt. Externality	3.8	5.2	6.7	12.0	10.0	7.8
Reduced Health Damages	1.5	2.0	2.7	5.5	3.9	4.0
SC-GHG @5% DR	7.1	9.6	12.4	21.3	17.7	14.6
SC-GHG @3% DR	29.3	39.7	51.6	89.3	74.2	60.7
SC-GHG @2.5% DR	45.3	61.2	79.6	137.9	114.6	93.6
SC-GHG @ 95th pctile at 3% DR	89.3	120.8	156.9	271.7	225.8	184.5
Total Social Benefits						
SC-GHG 5% Avg.	**128.2**	**173.2**	**221.6**	**369.0**	**302.3**	**263.7**
SC-GHG 3% Avg.	**150.5**	**203.3**	**260.8**	**436.9**	**358.7**	**309.7**
SC-GHG 2.5% Avg.	**166.4**	**224.8**	**288.8**	**485.5**	**399.2**	**342.7**
SC-GHG 3%, 95th percentile	**210.4**	**284.3**	**366.1**	**619.3**	**510.4**	**433.6**
Net Social Benefits						
SC-GHG 5% Avg.	**11.9**	**16.3**	**-18.2**	**-16.9**	**0.5**	**-28.7**
SC-GHG 3% Avg.	**34.2**	**46.5**	**21.0**	**51.0**	**57.0**	**17.4**
SC-GHG 2.5% Avg.	**50.1**	**68.0**	**49.0**	**99.7**	**97.4**	**50.3**
SC-GHG 3%, 95th percentile	**94.1**	**127.5**	**126.3**	**233.5**	**208.6**	**141.3**

Figure A1: Yearly Standard and Achieved Fuel Economy (MPG), by Alternative



Appendix B:
Recommendations for Each Sales Model

As discussed in Section II.D, NHTSA should work to improve the transparency and robustness of its three sales-share models: the Nominal Forecast model, Legacy DFS model, and Experimental DFS model. In particular, NHTSA should: (1) more clearly state the assumptions and hypotheses about the economic mechanisms implied in each model, (2) provide empirical evidence to support these assumptions and hypotheses, and (3) ensure these assumptions and hypotheses are consistent with other elements of their analysis, such as their characterization of consumer preferences and economic conditions. The following sections delve into specific recommendations for each model.

1. Nominal Sales Forecast Model

The Nominal Forecast model[226] is foundational for establishing the baseline fleet. Designed to forecast U.S. new vehicle sales from model years 2023 through 2050, the model relies on historical data for calibration. NHTSA recently updated this dataset through 2022, adding years during which economic conditions were greatly influenced by the COVID-19 pandemic.[227] This extension has introduced unprecedented volatility in key variables such as vehicle sales, GDP, and consumer sentiment,[228] leading to notable shifts in the model's parameter values from those in 2022 Rule, as detailed in Table A1. The differences illustrated in this table counsel a full assessment of the parameters, including consideration of whether parameter changes of this magnitude reflected underlying economic changes or rather the pandemic's unique disruptions.

Table B1: Parametric Assumptions for Nominal Forecast Model[a]

	Proposed Rule	2022 Final Rule
Constant	0.15889993	0.2126917
Sales per household (Lag)	0.9644362	0.6989812
Past 3-year average sales per household	-0.1664209	-0.07718095
GDP	0.2532349	0.4357694
GDP (Lag)	-0.2672494	-0.4541888
Consumer sentiment	0.00028914380	0.0002942706
Consumer sentiment (Lag)	0.00004701544	-0.00001357582

[a] *The dependent variable is the sales per household.*

[226] The Nominal Forecast model serves as the first component of NHTSA's sales response model for light-duty vehicles. This model functions with a limited set of inputs to project the size of the new vehicle market for each calendar year under the baseline. It is used to forecast sales in the baseline scenario only. TSD at 4-7.

[227] The sample period in the 2022 Rule was 1970 to 2016. Technical Support Document: Final Rulemaking for Model Years 2024-2026 Light-Duty Vehicle Corporate Average Fuel Economy Standards 423 (2022). The Proposed Rule's sample goes from 1973 to 2022.

[228] For instance, the consumer sentiment index reached its lowest level since 2011. *See* Evan Sully & Lindsay Dunsmuir, *U.S. Consumer Sentiment Plummets in Early August to Decade Low*, Reuters (Aug. 13, 2021). And U.S. new vehicle sales in 2020 fell to their lowest level since the Great Recession. Jack R. Nerad, *Auto Sales Tumble in 2020, Industry Optimistic About 2021*, J.D. Power (Jan. 6, 2021).

NHTSA has commendably provided a qualitative assessment of the projected sales, suggesting that the projection's early-year oscillations in sales levels are likely influenced by the COVID-19 pandemic and supply chain disruptions.[229] The agency also cross-validates its sales projections with data from AEO 2021 and AEO 2022 and finds its prediction lies within a reasonable range. To build upon this assessment, NHTSA could consider alternative model specifications. For instance, incorporating an indicator variable specifically for the COVID-19 pandemic years could help isolate the anomalous effects introduced by the pandemic. For further refinement, NHTSA should also consider consulting similar predictive models to understand how they have accounted for the pandemic's impact.

2. Legacy Dynamic Fleet Share Model

As we have noted in prior comments,[230] NHTSA should further refine the Legacy DFS model. As noted above, this model plays a crucial role in determining sales shares between passenger cars (PCs) and light trucks (LTs). NHTSA should reconsider some of its structural and methodological aspects to enhance its predictive accuracy.

First, the current fleet share equations in the Legacy DFS model appear to favor an increasing prevalence of light-duty trucks over passenger cars. While this may be an accurate reflection of some market trends, it could potentially lead to an underestimation of fuel usage in the baseline, as passenger cars generally offer better fuel economy. This could also result in an overestimation of emissions in the baseline fleet, given that light-duty trucks typically emit more pollutants. Recalibrating the fleet share equations could remove the apparent bias towards light-duty trucks, providing a more balanced estimate of future fleet composition.

Second, the Legacy DFS model currently estimates the sales shares of PCs and LTs independently and combines them later. This approach may not fully capture the market interdependencies and substitution effects between the two vehicle types. For example, changes in vehicle attributes could lead consumers to shift their preferences from one vehicle class to another. NHTSA could enhance the model by capturing market interdependencies between PCs and LTs, possibly through the integration of econometric methods that consider substitution effects and other market dynamics in a more explicit manner.

3. Experimental Dynamic Fleet Share Model

In the Proposed Rule, NHTSA introduces (but does not appear to apply) an Experimental Dynamic Fleet Share model[231] to forecast the market shares of PCs and LTs. This new model is a positive development, as it estimates the relative sales share of PCs and LTs jointly and incorporates the projected trend toward LTs in the baseline fleet.[232] This joint modeling approach aligns well with Policy Integrity's previous recommendations.

However, NHTSA could do more to improve the model's transparency and justifications for its underlying economic assumptions. For instance, while the model accounts for factors like fuel

[229] TSD at 4-10.
[230] Inst. for Pol'y Integrity, Comments on Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks, 86 Fed. Reg. 49,602 (Sept. 3, 2021) (NHTSA-2021-0053-0012).
[231] CAFE Model Documentation at 104.
[232] NHTSA projects that the share of passenger cars in the light-duty fleet will decline from just under 40% to about 30% between 2022 and 2050. TSD at 4-13.

prices and fuel economy, it does not include other potentially significant variables such as safety features and performance attributes.[233] This is an area where further clarification would be beneficial, especially since the Proposed Rule is expected to affect these attributes across different vehicle classes.[234]

Another area for refinement is the model's treatment of consumer preferences, which are assumed to be homogeneous in two interconnected ways. First, the model utilizes a logit functional form, suggesting that the sales shares of PCs and LTs become most responsive to changes in attributes like fuel economy when each holds a roughly equal market share. While this approach is grounded in economic theory,[235] it might benefit from further examination to ensure it fully captures the diverse consumer preferences in the auto market. For instance, if LT consumers prioritize factors other than fuel economy compared to PC consumers, the point of highest sensitivity to fuel economy changes might not necessarily occur when both vehicle types hold a 50% market share. Second, the model posits a symmetrical impact of changes in vehicle attributes, such as fuel economy, on the market shares of PCs and LTs. This assumption could be revisited to account for the possibility that consumers might weigh fuel economy differently when choosing between PCs and LTs. Both of these considerations counsel for additional empirical justification for the chosen functional form[236] and consideration of alternative specifications that could enhance the modeling of consumer preferences.

Despite potential for further refinement, the Experimental DFS model also provides important economic insights into the nuanced consumer preferences around fuel economy. Specifically, the model suggests that the sensitivity of sales share to changes in fuel economy is shaped by a variety of market conditions. These include fuel prices, income levels, and the relative market shares of PCs and LTs. For example, as income levels increase, the market share of PCs seems to become less influenced by improvements in fuel economy. On the other hand, higher fuel prices appear to make consumers more responsive to fuel economy improvements. Moreover, the model suggests that when the market share of PCs is smaller, even slight improvements in fuel economy can significantly increase that share. These insights generally resonate with empirical evidence and are in line with NHTSA's own viewpoints.[237]

In summary, the Experimental DFS model offers valuable perspectives on consumer behavior, especially concerning fuel economy, income, and fuel prices. While these insights are useful, they could be further strengthened by empirical evidence and more consistent integration into the agency's broader analytical framework.

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[233] The term 'performance attributes' encompasses a range of vehicle capabilities that can influence consumer choice, including but not limited to acceleration, torque, horsepower, towing capacity, and payload.
[234] For example, NHTSA acknowledges that different vehicle classes "respond differently to technology applied to meet the standards technologies applied to meet standards." TSD at 7-75.
[235] Economic theory posits that consumers are more likely to switch between two goods when they are similar. In the context of the logit functional form, this similarity is implied by the choice probability. Specifically, if there is a 50% chance of one good being chosen over another, it suggests that the two goods are similar to consumers.
[236] Adding a bias term to the exponent in the logit function could offer a way to adjust the inflection point of the logit share equation. This term would allow the model to reflect varying degrees of substitutability between PCs and LTs at different market shares. However, such a modification would require rigorous empirical justification.
[237] For instance, NHTSA outlines its perspective that "high-income buyers are more likely to purchase luxury vehicles" in the context of incorporating household income restrictions for eligibility under the Inflation Reduction Act's EV purchase subsidy. TSD at 2-89. Additionally, the agency acknowledges the significant role that fuel price assumptions play in both the model's analysis and real-world fuel economy improvements. *Id.* at 54.