Comment on: “Reconsideration of 2009 Endangerment Finding and Greenhouse Gas Vehicle Standards” Docket No. EPA-HQ-OAR-2025-0194

Our comments address solicitation C-21 and the economic analysis performed for the proposed rule.

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1. Introduction

We are a group of economists and mechanical engineers who, over the past few decades, have worked on topics related to the decarbonization of the transportation sector, ranging from the measurement of the costs of fuel economy standards to the estimation of individuals' valuation of fuel economy improvements. Several of the papers written by members of our group are prominently cited in the draft regulatory impact analysis (DRIA) or notice of proposed rulemaking (NPRM).

Fuel economy standards and the aligned vehicle greenhouse gas standards in the U.S. remained largely flat for decades until a major tightening began in 2012. Since then, Democratic and Republican administrations have swung the policy pendulum in increasingly dramatic fashion. Obama's 2012 standards targeted 54.4 miles per gallon (MPG) by 2025; Trump's 2020 SAFE rule slowed the trajectory to about 40 MPG by 2026. Biden's greenhouse gas (GHG) standards accelerated the pace, projecting the equivalent of roughly 100 MPG by 2032, while the current EPA proposal would repeal the standards altogether. This cycle of policy whiplash has created a highly uncertain regulatory landscape for automakers. Moreover, the extremes at either end are unlikely to yield economically efficient outcomes.

We observe that the cost-benefit analyses supporting these changes have been steered toward opposite conclusions by cherry-picking assumptions—such as discount rates, technology costs, and consumer valuation of fuel savings. While there remains genuine uncertainty about these parameters and a need for more analysis, we think there is also a critical need to be consistent and transparent about the economic modeling. A durable policy path relies on a consistent economic framework, well-supported parameter assumptions, and can be designed to accommodate new information and include pressure-relief valves. It cannot ignore the reality of costly pollution damages.

The regulation of greenhouse gas emissions from vehicles corrects two potential market failures at the same time: I) it reduces future harms coming from climate change, and II) it corrects for systematic undervaluation of fuel savings by consumers or producers. These two economic rationales for regulation are often termed externalities (the harm from climate damage is external to the vehicle market) and internalities (the harm from undervaluation is internal to vehicle owners), respectively. In proposing to remove greenhouse gas vehicle standards altogether, EPA is arguing that neither of the two market failures holds, and so the welfare costs of any standard therefore exceed the benefits. We discuss both rationales here, though the core focus of our expertise and comment is to do with the second rationale, valuation of fuel economy and the technologies used to improve it.

On the first rationale, there is strong evidence that public health and welfare harms from climate change do result from vehicle greenhouse gas emissions. We keep our discussion of this area brief. While several members of our group have studied this connection, and it is clear that

damages from greenhouse gas emissions are important, other researchers are better positioned to provide precise estimates.

On the second rationale, our group has considerable expertise. We have published numerous peer-reviewed articles dealing with consumer choice of vehicles, the engineering and design of vehicles, and the valuation of energy costs and other vehicle attributes. We observe in this comment that EPA has (a) chosen an extreme parameter value with respect to the degree of undervaluation of fuel cost savings (Section 3.1), (b) used an arbitrary estimate of the gasoline price (Section 3.2), and (c) created an internally inconsistent economic model (Section 3.3). These three choices all work in the same direction: they exaggerate the net benefits of removing greenhouse gas standards (NPRM Tables 6 and 7). Details appear below.

2. Comment on the causal chain between greenhouse gas emissions and public health and welfare damages in the NPRM

The NPRM argues that GHG emissions should not be considered dangerous air pollution because they endanger public health and welfare through “indirect” effects, such as increasing global temperature, air quality, and extreme weather events, rather than through “direct” effects of inhalation or dermal contact. While we acknowledge that determining the scope of the Clean Air Act is a legal question, from an economics perspective, all damages of a pollutant to public health and welfare should be considered, regardless of whether they cause these damages directly or indirectly through intermediate processes. The presence of “indirect” factors in the causal chain explaining the public health and welfare damages of emitting a pollutant does not change the fact that the pollutant caused the damages nor does it diminish the economic value of controlling the pollution.

3. Comments on the cost-benefit analysis and estimates in NPRM Tables 6 and 7

3.1 Assumptions regarding undervaluation

While some evidence suggests that consumers are willing to pay roughly $1 more for a vehicle that saves $1 in discounted gasoline cost (e.g. Busse et al. 2013), other papers, including more recent ones, suggest that consumers undervalue the gasoline savings in a notable way, as we

will discuss below. An analogous measure is the number of years of a vehicle's lifespan whose fuel savings the consumer considers when buying a car. This NPRM assumes that consumers value fuel savings for 2.5 years of the average 15 years of a new car's total lifespan (columns 4 and 5 of Tables 6 and 7). EPA argues this is equivalent to assuming consumers are willing to pay only about $0.21 to get $1.00 of gasoline savings.[1] The theory and empirical literature in economics suggest that undervaluation of this sort has two key components. The first component is that the technology in the car that saves $1 in gasoline may have made the car worse in other dimensions, such as horsepower. This component is what we believe EPA is referring to when they use the term "missing cost" in the analysis. Economists more commonly use the term "hidden costs" for the same concept. The second component is that the consumer (or producer) is failing to pay sufficient attention to future gasoline costs when they choose (or design) a vehicle. Such lack of attention to fuel cost has also been referred to as myopia in an extensive economics literature on the subject. This can be interpreted as creating a "missing benefit" since the originally disregarded fuel savings become a real financial gain once consumers are driving the vehicles. Either or both of these components may be at work when general undervaluation of fuel cost is observed in consumer behavior.

The evidence from our research and the economics literature more broadly suggests that <u>both</u> of these components are almost certainly present. Our understanding of the current rulemaking, and the DRIA associated with it, is that EPA has taken the extreme view that the second, "inattention", component of undervaluation is zero. This means that in the NPRM the entirety of undervaluation is being assigned to come from worsening attributes of vehicles.[2] We note that the previous 2024 EPA analysis of greenhouse gas standards for vehicles (i.e., the Multipollutant Emissions Standards for Model-Year 2027 and Later, EPA 2024) also took an extreme view, that vehicle attributes could be held exactly fixed and so all undervaluation reflected the inattention of consumers (or inaccurate beliefs about consumer attention on the part of producers). Their argument for doing so in the 2024 Rule is that vehicle attributes were held constant between the baseline and standards cases. This argument makes sense to the extent that the EPA's technology cost curves fully account for the attributes that consumers value and that there are no other potential categories of missing costs outside of those attributes. EPA should provide sound evidence to back up their assumptions on inattention and "missing costs," and an internally consistent analysis allowing both types of undervaluation.

A large portion of the change in costs and benefits between the 2024 and 2025 analyses, which leads to the policy whiplash being experienced by vehicle manufacturers, is attributable to missing economic modeling: EPA should consider both sources of undervaluation and use available empirical evidence and theory to guide the analysis of both.

Assigning all undervaluation to missing costs, and none to inattention, is not supported by the

[1] The exact translation depends on assumptions about discounting, vehicle life, and the pattern of miles driven, but regardless 2.5 years reflects only a small part of the total fuel savings that occur.
[2] Tables 6 and 7 of the NPRM include only 2.5 years of fuel savings in the analysis: this means that all the remaining years of fuel savings never accrue to anyone. By not ever counting these fuel savings in the model, the implicit assumption is that all savings past 2.5 years are being negated by missing costs associated with worsened vehicle attributes.

economics literature.[3] Table 1 of the DRIA includes several important studies and shows that there is a wide range of values in the literature; there is not a consensus on perfect attention. Further, the table leaves out other, and more recent, equally credible estimates, which predominantly find substantial undervaluation of fuel savings due in whole or part to inattention. The table should include:

- Houde et al. (2021): a valuation ratio of 16-39% at a 4% discount rate (13-33% at 1%; 18-46% at 7%; 23-58% at 12%).
- Leard, Linn, and Springel (conditionally accepted at the Journal of Political Economy: Microeconomics): 9-56% across income groups, with a mean of 22% at 3-5% discount rates.
- Grigolon, Reynaert and Verboven (2018): 91% at a 6% discount rate; note that this is estimated in the European context and the EPA has not typically included estimates from outside the United States.

The view on consumer inattention and undervaluation has thus been changing, and the EPA ought to consider the full body of evidence. This more comprehensive set of papers suggests a wide range of estimates and an average valuation ratio below 100%. This has a large impact on the final outcome of the benefit-cost analysis.

In addition to the evidence from the literature that inattention is important, there is also published evidence in the literature that demonstrates the superiority of some EV attributes. For example, recently produced battery electric vehicles (BEVs) have better acceleration performance than their most closely related conventional gasoline vehicles, and increasing battery capacity of BEVs has substantially decreased consumer disutility such that consumer valuation of 300-mile-range BEVs is approximately equal to conventional gasoline vehicles (Forsythe et al., 2023). These must be weighed against any remaining disutility from other EV attributes when determining the appropriate size of attribute-based penalties relative to willingness to pay for fuel cost savings. The literature has also shown that there is significant heterogeneity of consumer preferences (Forsythe et al., 2023; Helveston et al., 2015). At the margin, there are consumers willing to switch to an EV or change other attributes of their vehicle if given only a small nudge. Other consumers would require a large subsidy to voluntarily switch to an EV.

We also note that when standards change significantly the relevant quantity is the valuation of EVs for marginal consumers through the affected range, not the valuation that an average consumer in the economy has for an EV. People who switch to an EV because of regulation were closer to indifferent to start with. There is also evidence on this point, discussing the distribution of consumer valuation of EVs (Forsythe et al., 2023), that EPA needs to consider.

Finally, in considering the possibility of missing costs associated with attribute changes, we note that EPA argues that the 2024 standards would dramatically increase EV sales. If the missing costs EPA seeks to represent are those that would come from switching to EVs, they should use

[3] Likewise, assigning all undervaluation to inattention and none to the missing costs of attribute changes, as was assumed in previous EPA analyses, is also incorrect.

fuel economy valuation estimates that relate to that switch. The 2.5-year payback period estimate, in contrast, appears to come from a time period prior to EVs. Citations for that statistic, and reasoning on why it is appropriate to continue to apply when consumers are switching to EVs, are needed. Section 3.3 of this comment discusses this point further in the context of consistently modeling consumer and manufacturer behavior.

3.2 Future fuel price parameters in the NPRM Tables 6 and 7

Estimates of future fuel prices also figure importantly in the NPRM. Note the large reduction in the estimated cost of removing greenhouse gas standards that appears between columns 2 and 3 of Tables 6 and 7. This is because if future gasoline and diesel prices are very low, then the cost of removing regulation, and consequently needing to buy more fuel, is not very large. Because the fuel price is so directly influential to the economic analysis, we believe EPA should be using the best available estimate.

However, instead of using the latest estimates (EIA 2025) published by the U.S. Energy Information Administration (EIA), which is typically what EPA uses (perhaps with some sensitivity analysis from well-regarded industry projections), we notice that EPA has apparently made an ad hoc assumption by simply taking the 2023 EIA Annual Energy Outlook projection and subtracting $1.00 per gallon of gasoline. The rationale given for this is that the Trump Administration's "energy dominance" agenda will further lower gasoline prices. However, this is contrary to nearly all industry projections and the 2025 U.S. EIA projections. Furthermore, the DRIA correctly shows that the proposed rule would actually *increase* gasoline prices by raising demand for fuel in the United States due to less-efficient vehicles. The bottom line is that simply subtracting $1.00 per gallon of gasoline from an older EIA projection in Tables 6 and 7 of the NPRM (or Tables 2 and 3 in the DRIA) is unsupported by evidence and is not justified based on standard projections by reputable sources.

3.3 Attribute changes and model consistency

As mentioned above, in the 2024 analysis of greenhouse gas standards, EPA assumed that vehicle quality and attributes would remain fixed. The technology cost curves developed for that analysis intentionally reflect the cost of saving fuel while holding attributes like horsepower and perceived performance fixed. Consistent with the idea that vehicle attributes and quality would not worsen when technology is applied to meet the standard, the 2024 analysis also assumed that consumers would not bear missing costs from worsening attributes. One may reasonably question whether compliance would in fact have been achievable without changing attributes in ways that are viewed as costly by consumers, but the EPA analysis was internally consistent in

the idea that vehicle driving experience and utility would not be compromised.

As we observe above, the present EPA analysis assigns large missing costs of regulation to consumers to reflect their distaste for vehicle attribute changes. However, the present EPA analysis is still using the old cost curves that reflect the costs of improving fuel economy while preserving driving experience and utility of vehicles. This inconsistent combination makes the cost of regulation appear high (by requiring technologies that don't allow attribute tradeoffs), and it makes the benefits of regulation appear small (by assuming that most fuel savings get negated by missing costs associated with worsened vehicle attributes).

If EPA wishes to model missing costs of regulation associated with worsened vehicle attributes, then it needs to make two changes. The first is to model technologies that include tradeoffs between fuel savings and attributes. These technologies would then be available in addition to technologies that save fuel without compromising other features of the vehicle. Manufacturers would then choose between (presumably more expensive) technologies that preserve vehicle attributes, or, to the extent the tradeoffs are not too severe, instead pick technologies that somewhat worsen the experience for the consumer but are lower-cost.

Second, EPA should directly model consumer behavior and attention to fuel cost savings versus attention to other attributes. This is necessary because manufacturers would need to weigh consumer perceptions of the fuel cost and attribute changes when deciding their compliance strategies. We suspect that achieving internal consistency would mean a very significant reduction in estimates of the cost of technology used to meet greenhouse gas regulations, net of attribute tradeoffs. It would therefore greatly reduce the estimated economic benefit of the proposed removal of standards.

It is important to note that the missing costs associated with worsening vehicle attributes are specific to the technology (e.g., HEVs vs. PHEVs vs. BEVs), attributes within a technology (e.g., BEV range), and outside factors that affect consumer preferences for these attributes (e.g., charging station availability). There is evidence that missing costs (i.e., consumer disutility) for BEVs has decreased as BEV attributes and outside factors have changed over time (Carley et al., 2019; Forsythe et al., 2023). When conducting their analysis, EPA should consider how missing costs may vary across different vehicle technologies and how they may vary over time with technological advances and changing conditions.

We encourage EPA to revise their analysis of undervaluation and missing cost, to use current best estimates of diesel and gasoline cost, and to build an economic model with an internally consistent framework to capture the costs and benefits of technologies that improve fuel economy.

Yours sincerely,

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