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Public Interest Comment[1] on

The National Highway Traffic Safety Administration and The Environmental Protection Agency Proposed Rule

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

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The George Washington University Regulatory Studies Center improves regulatory policy through research, education, and outreach. As part of its mission, the Center conducts careful and independent analyses to assess rulemaking proposals from the perspective of the public interest. This comment on the National Highway Traffic Safety Administration (NHTSA) and Environmental Protection Agency (EPA) proposed rule setting corporate average fuel economy (CAFE) standards for model years 2021–2026 does not represent the views of any particular affected party or special interest, but is designed to evaluate the effect of NHTSA and EPA's proposal on overall consumer welfare.

## Introduction

I am an economist with 25 years' experience analyzing laws, policies and regulations in the U.K., E.U. and U.S. Much of my work has focused on environmental issues, ranging from waste management to climate change. Of particular relevance to these comments, I have written several

[1] This comment reflects the views of the author, and does not represent an official position of the GW Regulatory Studies Center or the George Washington University. The Center's policy on research integrity is available at http://regulatorystudies.columbian.gwu.edu/policy-research-integrity.

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studies assessing the effects of U.S. fuel economy standards and the regulation of greenhouse gas (GHG) emissions, including:

> Baruch Feigenbaum and Julian Morris, *CAFE Standards in Plain English*, Los Angeles: Reason Foundation, 2017.[3]
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> Julian Morris and Arthur Wardle, *CAFE and ZEV Standards: Environmental Effects and Alternatives*, Los Angeles: Reason Foundation, 2017.[4]
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> Julian Morris, *The Effect of Corporate Average Fuel Economy Standards on Consumers*, Los Angeles: Reason Foundation, 2018.[5]
>
> Julian Morris, *Climate Change, Catastrophe, Regulation and the Social Cost of Carbon*, Los Angeles: Reason Foundation, 2018.[6]

The present comments focus on several salient features of the proposed Safer Affordable Fuel-Efficient (SAFE) Rule and the preliminary regulatory impact analysis (PRIA) of that rule. They address the likely effects of the rule on vehicle fuel economy, fuel consumption, the cost of new and used vehicles, safety, and the environment.

In addition, they consider the effects of state regulations that are related to fuel economy, including vehicle tailpipe GHG emission standards and zero emission vehicle standards—and the potential inconsistency of these state regulations with CAFE standards and federal GHG emissions standards.

The agencies estimate that the proposed SAFE rule will have potentially enormous and very widespread benefits to society—saving thousands of lives and hundreds of billions of dollars. At the same time, they estimate that the rule will have very limited effects on the environment.

## Statutory Authority

NHTSA is authorized to establish corporate average fuel economy standards under the Energy Policy Conservation Act (EPCA) as amended by the Energy Independence and Security Act (EISA). EPA is authorized to establish GHG emission standards under the Clean Air Act (CAA).

Specifically, NHTSA is required by EPCA as amended by EISA to establish:[7]

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[3] *See*, https://reason.org/wp-content/uploads/2017/01/pb137_cafe_standards.pdf.

[4] *See*, https://reason.org/wp-content/uploads/2017/08/cafe_zev_standards_environment_alternatives.pdf.

[5] *See*, https://reason.org/wp-content/uploads/2018/03/corporate-average-fuel-economy-standards-consumers.pdf.

[6] *See*, https://reason.org/wp-content/uploads/2018/03/climate_change_social_cost_carbon.pdf.

[7] 49 U.S.C. §32902, https://www.gpo.gov/fdsys/pkg/USCODE-2017-title49/html/USCODE-2017-title49-subtitleVI-partC-chap329-sec32902.htm.

1. CAFE standards for model years 2011 through 2020, with the standard increasing each year, such that the combined fuel economy average for model year 2020 should be at least 35 miles per gallon;
2. CAFE standards for model years 2021 through 2030 that "shall be the maximum feasible average fuel economy standard for each fleet for that model year."

In addition, EPCA authorizes NHTSA to establish a single national standard for vehicle fuel economy, explicitly preempting state regulations that are related to fuel economy.[8]

NHTSA is required to consider the effects of GHG emissions in its CAFE rulemakings.[9]

EPA is authorized to establish GHG emission standards under the CAA and related decisions.[10] The CAA also preempts state regulation of tailpipe GHG emissions but permits EPA to waive this preemption under certain circumstances.[11]

## Compliance with Regulatory Analysis Requirements

The proposed SAFE rule seeks to implement the requirements of EPCA, EISA, and the CAA in a manner consistent with EO 12866, which states that:

> Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling public need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people. In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating.[12]

The CAFE standards NHTSA promulgated under the auspices of EPCA and EISA were predicated on the presumption that the fuel economy of vehicles on U.S. roads was leading to excessive oil

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[8] "When an average fuel economy standard prescribed under this chapter is in effect, a State or a political subdivision of a State may not adopt or enforce a law or regulation related to fuel economy standards or average fuel economy standards for automobiles covered by an average fuel economy standard under this chapter." 42 U.S.C §32919.

[9] Center for Biological Diversity v. National Highway Traffic Safety Administration. 538 F.3d 1172.

[10] S. 202(a)(1) of the CAA states that "the Administrator shall by regulation prescribe (and from time to time revise)…standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles…which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." Following the decision in *Massachusetts v. EPA*, 549 U.S. 497 (2007), the EPA found that GHG emissions do endanger public health or welfare (https://www.epa.gov/ghgemissions/endangerment-and-cause-or-contribute-findings-greenhouse-gases-under-section-202a-clean#Findings).

[11] 42 U.S. Code § 7543. The case for preemption is discussed in more detail below.

[12] Exec. Order No. 12866, Regulatory Planning and Review, §1(a).

consumption. However, the fuel economy standards that have been implemented in compliance with these statutes have frequently not been the least costly way to achieve that objective—and have likely imposed net costs on society.[13]

While the 2016 regulatory impact analysis (RIA) for the current CAFE standards (for the period 2017–2021)[14] found that the standards would have a net benefit to society, the basis for that has been called into question by numerous studies. Specifically, the benefits from the rule, which largely came from reduced cost to consumers and reduced emissions of GHGs, are likely considerably lower than identified in the RIA.[15] Meanwhile, the costs of the rule, in terms of higher cost of vehicles and increased fatalities, specifically, are significantly greater than identified in the RIA.[16] As a result, the current rule almost certainly imposes significant net costs on society.

What is true for the current CAFE standards applies *a fortiori* to the augural (impending) standards that EPA envisaged for the period 2022–2025.[17]

In addition to the CAFE standards, in 2012 EPA promulgated GHG emission standards for vehicles under the auspices of the CAA. The premise for these standards was a presumption that the social benefits of reducing emissions of GHGs from vehicles exceeded the social costs.[18] However, since

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[13] Congressional Budget Office, *The Economic Costs of Fuel Economy Standards Versus a Gasoline Tax*, Washington, DC: Congressional Budget Office, 2003, https://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/49xx/doc4917/12-24-03_cafe.pdf; David Austin and Terry Dinan, "Clearing the air: The costs and consequences of higher CAFE standards and increased gasoline taxes," *Journal of Environmental Economics and Management*, 50 (2005): 562–582; Arik Levinson, "Energy Efficiency Standards Are More Regressive Than Energy Taxes: Theory and Evidence," NBER Working Paper No. 22956, December 2016, https://www.nber.org/papers/w22956; Mark R. Jacobsen, "Evaluating US Fuel Economy Standards in a Model with Producer and Household Heterogeneity," *American Economic Journal: Economic Policy*, 5, no. 2 (2013): 148–87; Mark R. Jacobsen, "Fuel Economy and Safety: The Influences of Vehicle Class and Driver Behavior," NBER Working Paper No. 18012, April 2012, https://www.nber.org/papers/w18012.

[14] Environmental Protection Agency, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles - Phase 2 Regulatory Impact Analysis, August 2016, https://nepis.epa.gov/Exe/ZyPDF.cgi/P100P7NS.PDF?Dockey=P100P7NS.PDF.

[15] Morris and Wardle, *supra* note 4; Morris, *supra* note 5.

[16] NHTSA, *Passenger Vehicle Occupant Injury Severity by Vehicle Age and Model Year in Fatal Crashes, Traffic Safety Facts Research Note*, DOT HS 812 528. Washington, DC: National Highway Traffic Safety Administration, April 2018, https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812528; Sam Kazman, "Fuel Economy Regulations Threaten Vehicle Safety," Washington, DC: Competitive Enterprise Institute, September 7, 2017. https://cei.org/blog/fuel-economy-regulations-threaten-vehicle-safety; Jacobsen (2012), *supra* note 13.

[17] *See*, https://www.federalregister.gov/d/2018-16820/p-106.

[18] Environmental Protection Agency, Regulatory Impact Analysis: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Washington, DC: Environmental Protection Agency, EPA-420-R-12-016 August 2012. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZI1.PDF?Dockey=P100EZI1.PDF

the promulgation of those standards, the agencies have revised the estimates they use for the social cost of carbon (in its PRIA, for 2030 NHTSA used a figure of $8 per metric ton of $CO_2$ at a 3% discount rate and $1 per metric ton at a 7% discount rate),[19] resulting in a significant reduction in the estimated benefits of the rule.

As a result, it is now appropriate to reconsider the standards and adjust them in order that they better reflect the likely costs and benefits to society. The proposed SAFE rule seeks to mitigate the harm done by the existing CAFE and GHG standards and limit the harm done by future standards.[20] It does so primarily by:

(1) reducing the required fuel economy for passenger cars and light trucks below the originally mandated standard for 2021, keeping it at the same level as required for 2020 (approximately 43.7 mpg for passenger cars and 31.3 mpg for light trucks) and leaving it at the same level through 2026;[21] and
(2) increasing the permitted $CO_2$ emission limits for passenger cars and light trucks from 2020 onwards and, from 2021, ceasing to include emissions from air conditioning refrigerants and leakage, nitrous oxide emissions, and methane emissions for compliance with $CO_2$ standards (so that from 2021 these caps will be approximately 204 grams/mile for passenger cars and 284 grams/mile for light trucks).[22] This action will keep the NHTSA and EPA standards substantially aligned.

## Regulatory Analysis

### *Fuel Economy*

In 1975, Congress enacted CAFE standards as part of the implementation of the Energy Policy and Conservation Act. The intent was to reduce oil consumption in the wake of the Organization of Petroleum Exporting Countries (OPEC) oil embargo of 1973–1974 that had limited oil supplies, causing prices to spike.

Since they were first introduced in 1978, CAFE standards have likely contributed to increases in the fuel efficiency of vehicles in the U.S. But the extent of this effect is difficult to determine because it is impossible to know precisely what would have happened in the absence of such standards. Rising fuel prices during the 1970s and early 1980s resulted in increased demand for

[19] NHTSA, Preliminary Regulatory Impact Analysis, Table 8-24, https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_my2021-26_pria_0.pdf at p. 1075.
[20] Note that critics of the proposal have used the misleading term "rollback" to describe the SAFE rule. In fact, if the SAFE rule is made final, it will impose fuel economy requirements that are more stringent than anything that has been required, or achieved, in the past.
[21] 83 FR 42989.
[22] *Ibid.*

and supply of vehicles that were more fuel efficient than required under the CAFE standards of the day.[23]

However, the subsequent decline in fuel prices, combined with rising incomes and changing tastes led to increased demand for larger, more powerful vehicles.[24] This effect was exaggerated by the lower fuel economy requirements imposed on vehicles classified as "light trucks." Manufacturers developed numerous consumer-oriented vehicles, including SUVs, minivans, and luxury pickups that fell into this category. Because of the less onerous fuel economy requirements, these vehicles were relatively less expensive than lighter passenger cars.[25]

Looking to the future, it seems likely that vehicle fuel economy will increase even without CAFE standards, as vehicle manufacturers implement cost-effective improvements and respond to the felt needs of consumers. In a study published in 2017, Kenneth Small used an adapted version of the National Energy Modeling System to estimate that if NHTSA and EPA were to leave the average CAFE requirement for light duty vehicles (LDVs) at 33.7 mpg, the average fuel economy for new cars would rise from 36.7 mpg in 2015 to 41.7 mpg in 2025, while the fuel economy of new light trucks would rise from 27.3 mpg to 35.6 mpg over the same period.[26] In other words, average fuel economy for new LDVs would rise to 38.9 mpg (i.e., about 2 mpg *more* than the mandated increase under the proposed SAFE rule). Small assumed that the price of a gallon of gasoline would rise to $3.58 by 2025, which is lower than the $3.78 assumed by NHTSA and EPA in their 2012 rulemaking but higher than the $2.93 assumed in the SAFE rulemaking.[27]

These findings are relevant because they suggest that if gas prices are higher than expected in the proposed SAFE rule, the fuel economy standards could cease to be binding, thereby reducing the costs they impose on society. It is difficult to predict the future of gasoline prices, but it seems clear that consumers and manufacturers adjust quickly to unexpected price changes, whereas mandated fuel economy standards run the risk of becoming either ineffectual or seriously harmful.

### Effects of CAFE Standards on Consumers

While existing CAFE standards likely do contribute to increased fuel economy, they also have several other effects. First and foremost, by requiring manufacturers to produce fleets of vehicles

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[23] Crandall, Robert W. **"**Policy Watch: Corporate Average Fuel Economy Standards." *Journal of Economic Perspectives*, Vol. 6 (2). 171–180. Spring 1992.

[24] Congressional Budget Office, supra note 13.

[25] BenDor, Todd K. "The System Dynamics of U.S. Automobile Fuel Economy." *Sustainability*, Vol. 4. 1013–42. 2012.

[26] Kenneth A. Small, The Elusive Effects of CAFE Standards, Working Paper, University of California at Irvine, August 22, 2017, Available at: https://www.economics.uci.edu/research/wp/1718/17-18-03.pdf.

[27] *See*, https://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf at p. 5; *also see*, https://www.federalregister.gov/d/2018-16820/p-638.

with, on average, higher fuel economy than would otherwise be the case, they impose costs on manufacturers, which must invest in the development and implementation of technologies that are able to deliver fuel economy improvements. These additional costs are passed on to consumers through increases in the price of new vehicles.

In addition, the requirement to invest in fuel economy improvements may lead manufacturers to reduce their investments in some other kinds of vehicle improvements, either due to capital constraints or in order to keep down the final purchase price of vehicles, or both. Examples of such foregone investment might include safety enhancements, improvements in comfort, and investments in the development of connected and autonomous vehicles.

CAFE standards are known to have several perverse effects, perhaps most notably the rebound effect and the scrappage effect:

> *The Rebound Effect* refers to the response by drivers to a reduction in the cost of driving as a result of higher fuel economy. Put simply: when driving costs less, people tend to drive more—all other things being equal. This comes partly from people driving instead of using other modes of transport (bus, train, airplane, etc.) and partly from an increase in trips taken or trip length.
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> *The Scrappage—or Gruenspecht—Effect* occurs when vehicle owners respond to the higher price of new vehicles resulting from mandated fuel efficiency increases by keeping existing vehicles longer. This phenomenon decreases the supply of used vehicles, raising their price and reducing the rate at which they are scrapped.[28] Moreover, because fleet-based fuel economy standards incentivize manufacturers to produce fewer gas guzzlers (i.e., vehicles with larger, more powerful engines), demand for used gas guzzlers rises disproportionately—and scrappage rates of such vehicles therefore fall disproportionately.[29]

In their 2016 draft Technical Assessment Report (hereinafter, "draft TAR"), NHTSA, EPA and the California Air Resources Board (CARB) used a rebound effect of 10%.[30] This low value was used in spite of ample evidence from a wide range of studies that estimated much higher rebound effects. In the PRIA for the proposed SAFE rule, NHTSA undertook a more comprehensive review of available studies and concluded that a rebound effect of 20% was more appropriate for use in

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[28] Howard K. Gruenspecht, "Differentiated Regulation: The Case of Auto Emissions Standards." The American Economic Review, Vol. 72, No. 2. Papers and Proceedings of the Ninety-Fourth Annual Meeting of the American Economic Association. May 1982. 328–331.

[29] Jacobsen, Mark R. and Arthur van Benthem. "Vehicle Scrappage and Gasoline Policy." American Economic Review, Vol. 105, No. 3. March 2015. 1312–1338.

[30] 81 FR 49217, July 27, 2016, https://www.federalregister.gov/citation/81-FR-49217.

estimating the effect of the rule and alternatives.[31] From our own review of the evidence, this seems reasonable.[32]

In the original rulemaking and in the draft TAR, the agencies chose not to include any value for the scrappage effect, arguing that it was not able to do so because it had not undertaken the necessary modeling. This led to a significant bias in the estimates of costs and benefits of the rule.[33] In its analysis of the proposed SAFE rule, NHTSA explicitly modeled the scrappage effect.

By incorporating a more realistic estimate of the rebound effect and by explicitly modeling the scrappage effect in its assessment of the draft SAFE rule, NHTSA was able to develop better assessments of the effects of different standards on fuel use, emissions, and safety.

### Affordability and the Total Cost of Ownership

The consequences of higher new vehicle prices are widespread, including effects on the age distribution of the vehicle cohort (the scrappage effect, discussed above) and consequent effects on vehicle-related fatalities (discussed below). The most direct effects, however, are on vehicle affordability and total cost of ownership.

In the 2012 rulemaking, EPA estimated that the combination of final 2017–2021 and augural 2022–2025 GHG standards would result in an increase in average new vehicle prices of $1,800.[34] Including higher lifetime maintenance and insurance costs, as well as taxes and markup, EPA estimated the additional implied discounted cost of a 2025 vehicle would be $2,300 to $2,400 more than an equivalent 2016 vehicle.[35]

For the SAFE NPRM, NHTSA now estimates that the increase in average new vehicle prices attributable to those same standards would be slightly higher, $2,100, resulting in a discounted lifetime increase in costs of $2,700 for new vehicles purchased in 2025 relative to those purchased in 2016.[36]

### Fuel Expenditures

In their 2012 rulemaking for the 2017–2021 standards and 2022–2025 augural standards, NHTSA and EPA found that in spite of the higher costs of buying, insuring and maintaining new vehicles

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[31] *See*, https://www.federalregister.gov/d/2018-16820/p-922.
[32] Morris and Wardle, *supra* note 4.
[33] *Ibid*.
[34] *See*, https://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf at p. 62633.
[35] *See*, https://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf at p. 62775.
[36] *See*, https://www.federalregister.gov/d/2018-16820/p-94

sold by manufacturers subject to the escalating CAFE standards, consumers would obtain substantial net benefits.[37]

Both in the original rulemaking and the draft TAR, NHTSA, EPA (and CARB in the TAR) presumed that consumers significantly undervalue the future benefits of more fuel-efficient vehicles. As a result, they were able to claim that by mandating higher efficiency, consumers would benefit from reduced expenditures on fuel. These claims were made in spite of substantial evidence—available at the time the draft TAR was produced—that consumers do in fact take into consideration much if not all the cost savings accruing to more fuel-efficient vehicles.[38]

In its SAFE PRIA, NHTSA reviews these new studies and concludes that they "call into question any analysis that claims to show large private net benefits for vehicle buyers."[39] The PRIA goes on to note:

> What analysts assume about consumers' vehicle purchasing behavior—particularly about potential buyers' perspectives on the value of increased fuel economy—clearly matters a great deal in the context of benefit-cost analysis for fuel economy regulation. In light of recent evidence on this question, a more nuanced approach than assuming that buyers drastically undervalue benefits from higher fuel economy—and that as a consequence, these benefits are unlikely to be realized without stringent fuel economy standards—seems warranted. One possible approach would be to use a baseline scenario where fuel economy levels of new cars and light trucks reflected full (or nearly so) valuation of fuel savings by potential buyers, in order to reveal whether setting fuel economy standards above market-determined levels could produce net social benefits.
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> Another might be to assume that—unlike in the agencies' previous analyses, where buyers were assumed to greatly undervalue higher fuel economy under the baseline but to value it fully under the proposed standards—buyers value improved fuel economy identically under both the baseline scenario and with stricter CAFE standards in place. *The agencies ask for comment on these and any alternative approaches they should consider for valuing fuel savings, new peer reviewed evidence on vehicle buyers' behavior that casts light on how they value improved fuel economy, the appropriate private discount rate to apply to future fuel savings,*

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[37] "Although the agencies estimate that technologies used to meet the standards will add, on average, about $1,800 to the cost of a new light duty vehicle in MY 2025, consumers who drive their MY 2025 vehicle for its entire lifetime will save, on average, $5,700 to $7,400 (7 and 3 percent discount rates, respectively) in fuel, for a net lifetime savings of $3,400 to $5,000." 77 FR 62627

[38] Morris, *supra* note 5, and references therein.

[39] PRIA Section 8.3.3, p. 939 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld-cafe-co2-nhtsa-2127-al76-epa-pria-180823.pdf.

*and thus the degree to which private fuel savings should be considered as private benefits of increasing fuel economy standards.*[40]

Based on the studies discussed in the PRIA and other analyses, a logically appropriate approach would be to assume that buyers choose vehicles based on their expected total cost of ownership, including the full discounted costs of future fuel expenditures. Thus, the net private costs or benefits of the rule can be calculated based on a comparison of the total costs of ownership with and without the rule.

### Fuel Costs

Using various simplifying assumptions, we can make a quick back-of-the-envelope calculation of the net effects of the proposed changes to CAFE standards under the proposed SAFE rule. We will compare two vehicles: one, A, meets the new mandated fleet average fuel economy for LDVs (i.e., averaging across vehicle types subject to the rule) under the proposed SAFE rule of 37 mpg in 2025; the other, B, meets the minimum fuel economy for LDVs implied by the augural standards for 2025 of 49.7 mpg in 2025. We further assume that A is driven for 12,000 miles (about average).[41] However, we assume that the driver of B responds to the reduction in cost per mile of gas usage by using some of the gasoline "saved" to drive more (the rebound effect described above).

We look at three different scenarios:

1. Gas costs $3/gallon, the rebound effect is 20%, and the discount rate is 6%
2. Gas costs $4/gallon, the rebound effect is 20%, and the discount rate is 5%
3. Gas costs $4/gallon, the rebound effect is 10%, and the discount rate is 4%

Under scenario 1, even if a consumer were to use the vehicle for 12 years, the net present value of savings in gas expenditure in 2025 from car B over car A is only $1,828. (The net present value (NPV) of such savings over a more typical 6-year period would be $1,053.)

In scenario 2, the NPV of savings in gas expenditure in 2025 is $2,438 over 12 years ($1,405 over 6 years).

In scenario 3, the NPV of savings in gas expenditure in 2025 is $2,889 over 12 years ($1,620 over 6 years).

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[40] *Ibid.* Emphasis added.

[41] *See*, https://www.eia.gov/todayinenergy/detail.php?id=36414.

If our archetypal vehicles roughly approximate the average vehicle discussed in the SAFE rule, then we can assume that the total incremental NPV of non-fuel purchase and operating costs of vehicle B in 2025 would be $2,700 greater than vehicle A.

Another factor that affects total cost of ownership is the NPV of the vehicle when sold or exchanged. It might seem reasonable to assume that the resale value of B would be higher than A. But that might not be the case. Using Kelly Blue Book's online tool, I calculated the difference in value between a 12-year-old (2007 model) Toyota Camry XLE (4 cylinder, 2.4 L, 5 speed automatic transmission; rated 24 mpg combined) in good condition with 70,000 miles on the clock and a similar 12-year-old Camry Hybrid with 70,000 miles on the clock (so, not taking account of additional miles that would likely have been driven due to the rebound effect). The Kelly Blue Book trade-in value for the 12-year-old Camry XLE was estimated at $4,259,[42] while the Camry Hybrid was estimated at $3,595.[43] Even if the resale value of B were higher than that of A, it seems unlikely to be *much* higher, especially on older vehicles.

Thus, in scenario 1, the typical consumer almost certainly suffers a substantial financial loss by purchasing vehicle B instead of vehicle A. In scenario 2, the typical consumer also very likely suffers a financial loss by purchasing B rather than A, although the loss would be less than in scenario 1. Only in scenario 3 would a typical consumer be better off purchasing B over A—and then only marginally so. Since the assumptions underlying scenario 3 are arguably the least plausible, it seems fair to conclude that there would be substantial consumer welfare gains arising from keeping the mandated fuel economy at the level set for 2020 rather than increasing it.

Indeed, if scenario 1 is broadly accurate, and new vehicle sales remain at around 17 million per year, the consumer welfare gains would be approximately $15 billion from 2025 new vehicle sales alone.

Of course, this analysis is inherently simplistic. Nonetheless, it provides a quick gut-check to NHTSA's more sophisticated analysis. The fact that its conclusions are broadly in line with those of NHTSA suggests that the agency's conclusions are in the right ballpark. (It is also not impossible that such a simplistic analysis may in some respects be preferable to attempts to undertake a more disaggregated analysis based on presumptions of which cars will be available, the amount that each of them will be driven, the precise trajectory of gas prices, etc.[44]) In any

[42] https://www.kbb.com/toyota/camry/2007/xle-sedan-4d/?vehicleid=84280&intent=trade-in-sell&mileage=70000&pricetype=trade-in&options=6369643|true&condition=good

[43] https://www.kbb.com/toyota/camry/2007/hybrid-sedan-4d/?vehicleid=84284&intent=trade-in-sell&mileage=70000&pricetype=trade-in&options=6470582|true&condition=good

[44] Forecasts of future gas prices are particularly troublesome given the various unknowable factors that affect such prices (including political stability in major oil producing countries and unforeseeable technological innovations that might affect both supply of and demand for oil).

event, a proper respect for consumers' judgment of their own preferences leads to the conclusion that the SAFE rule must necessarily improve consumer welfare.[45]

In addition, by reducing prices of new vehicles relative to the prices under the augural standards, the proposed SAFE standard would increase effective demand for new vehicles, reduce demand for older vehicles and, as discussed below, increase scrappage rates. Of particular relevance in terms of consumer welfare, the reduced demand for older vehicles will result in lower prices of such vehicles, which will especially benefit lower income consumers. Thus, SAFE is effectively progressive in the distribution of its benefits.

### *The Value of Attributes other than Fuel Economy*

One challenge for estimating the consumer welfare effects of CAFE standards in this way is that consumers do not make vehicle purchasing decisions *only* on the basis of the total cost of ownership. They also value attributes such as acceleration, size, comfort, and safety. As noted above, when manufacturers are forced to increase vehicle fleet fuel economy, they likely reduce investment in improvements to other vehicle features, thereby harming consumers who might have purchased vehicles with those desirable attributes. However, attempting to disaggregate these effects in order to calculate net private costs and benefits is practically impossible.

NHTSA effectively elides this issue by assuming that all the savings manufacturers derive from the less stringent fuel economy standards under the proposed SAFE rule are translated into price reductions for consumers. Practically speaking that seems unlikely, but in the absence of a feasible alternative, it is not unreasonable. To the extent that manufacturers instead invest in other vehicle attributes that consumers want to buy, NHTSA's assumption likely represents a lower bound on the benefits.

### *Effects on Innovation and Future Consumer, Economic, and Social Benefits*

Another related effect of CAFE standards that is practically impossible to estimate is the consequence of resources diverted away from the development of innovative technologies, such as autonomation. Such technologies offer potentially enormous benefits, ranging from reductions in collisions to improved productivity. While it is likely that resources expended on compliance with CAFE standards reduce the amount of capital available to spend on such innovations, it is not possible to know with any degree of precision the extent of this effect.

[45] See Brian Mannix and Susan Dudley, "The Limits of Irrationality as a Rationale for Regulation." Journal of Policy Analysis and Management, Vol. 34, Issue 3. and "Please Don't Regulate my Internalities." Journal of Policy Analysis and Management, Vol. 34, Issue 3 (Summer 2015).

### *Road Safety*

An important component to any benefit-cost analysis relating to the regulation of automobiles is the effect on safety. This has been long recognized by NHTSA and upheld by the courts.[46] EPA has likewise long incorporated the effects of its rules on safety.[47]

There has been ongoing debate in academic circles concerning the effects of CAFE standards on fatalities. Early studies suggested that by incentivizing manufacturers to produce lighter weight vehicles, CAFE standards resulted in an increase in mortality—because lighter vehicles generally provide less protection during crashes, especially when they collide with heavier vehicles.[48]

Some more recent studies have questioned whether this effect has continued. One recent study even suggested that CAFE standards *reduced* fatalities over the period 1989–2005, finding that reductions in mean vehicle weight (which reduces fatality) outweighed the effect of increased weight dispersion (which increases fatalities).[49]

In the proposed SAFE rule and PRIA, NHTSA analyzed the effects of fuel economy standards on road safety in great detail. In its new analyses, NHTSA better accounts for the effects of the likely increase in the price of new vehicles, the consequent effect on scrappage, the rebound effect for consumers purchasing new, more fuel-efficient vehicles, and the new footprint-based standard that reduces the incentives to sell lighter vehicle models (as opposed to reducing the weight of existing models, while maintaining their strength). As NHTSA notes, these factors were not accounted for in the aforementioned study.[50]

The new NHTSA analysis finds that the changes to CAFE standards in the proposed SAFE rule would substantially reduce the number of road fatalities (by as many as 12,700 in total),[51] as a result of a combination of: (1) an increase in the proportion of newer vehicles on the road (since

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[46] *Competitive Enterprise Institute* v. *NHTSA*, 901 F.2d 107, 120 n. 11 (D.C. Cir. 1990); *Competitive Enterprise Institute* v. *NHTSA*, 956 F.2d 321, 322 (D.C. Cir. 1992).

[47] https://www.federalregister.gov/d/2018-16820/p-1657

[48] Robert W. Crandall and John D. Graham "The Effect of Fuel Economy on Auto Safety," *The Journal of Law & Economics*, Vol. 32 (1), 1989, pp. 97–118

[49] Antonio Bento, Kenneth Gillingham, and Kevin Roth, "The Effect of Fuel Economy Standards on Vehicle Weight Dispersion and Accident Fatalities," NBER Working Paper #23340, April 2017. https://www.nber.org/papers/w23340

[50] "NHTSA identified factors in the analysis limiting the inference that can be drawn with respect to CAFE rulemaking going forward. The temporal range of the analysis does not include current footprint-based standards that incentivize light-weighting existing models rather than switching to lighter models. The statistical approach in the analysis does not account for the rebound effect or effects of CAFE on vehicle sales (which affect per mile fatality risk), and Bento et al. also represented annual CAFE compliance costs at a level substantially less than expected costs for model years in this rulemaking." PRIA at p. 1343

[51] https://www.federalregister.gov/d/2018-16820/p-104

newer vehicles tend to be safer[52]); (2) an increase in the average weight of newer cars relative to light trucks (i.e. a reduction in weight dispersion); and (3) a small reduction in the total number of vehicle miles traveled, due to a lower rebound effect.

The EPA, likewise, finds that by raising the cap on $CO_2$ emissions, the SAFE rule would reduce the number of traffic fatalities by as many 15,680 over the lifetime of the vehicles produced through 2029, compared with the previously proposed emission standards.[53]

The statistical analyses of the effects of changes in vehicle mass on fatalities presented by NHTSA and EPA seem directionally plausible. However, the sizes of the effects were subject to considerable uncertainty, so the asserted magnitudes should be treated with caution. The agencies acknowledge that most of the underlying statistics were not "statistically significant" at the 5% level.[54] In itself, this is not necessarily problematic: the conventional 5% significance test is somewhat arbitrary[55] and the overwhelming evidence presented by the agencies offers good support for the direction of the effect. However, problems arise when attempting to use rather imprecise statistical data as the basis for very precise estimates. That said, if the estimates are taken as "ballpark," they seem reasonable. Moreover, given the clear direction of the effect, the agencies' finding that any of the alternative standards would result in higher fatalities, with the extent of those fatalities being directly proportional to the stringency of the standard, also seems reasonable.

### *Environmental Effects*

By more accurately accounting for scrappage and rebound effects, NHTSA is better able to assess the environmental effects of the proposed rule than in previous rulemakings. As such, the finding that the proposed rule would generally have very small effects on net emissions of criteria pollutants seems reasonable, as does the finding that the rule would have a *de minimis* effect on emissions of $CO_2$ (and hence no discernible effect on climate change) relative to the augural rule.

Two caveats are worth noting. First, the SAFE rule decreases net emissions of ozone-forming chemicals (VOCs and NOx), while increasing SOx and $PM_{2.5}$. It is not immediately obvious how one should weigh these two effects against one another.

Secondly, while net emissions remain largely unchanged under the SAFE rule, these net effects mask a change in the distribution of emissions; specifically, tailpipe emissions of VOCs, NOx,

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[52] NHTSA, *supra* note 16.

[53] https://www.federalregister.gov/d/2018-16820/p-1658

[54] PRIA Tables 11-1 and 11-2, pp. 1347–48.

[55] See e.g. Michael Cowles and Caroline Davis, "On the Origins of the .05 Level of Statistical Significance," *American Psychologist*, 1982, Vol. 37, No. 5, 553–558.

SOx, and $PM_{2.5}$ fall, while upstream emissions of those chemicals rise.[56] The actual effects of these changes are thus not entirely clear. To the extent that upstream emissions occur primarily at industrial facilities (that are already subject to regulatory restrictions), while most tailpipe emissions occur in neighborhoods that contain businesses and dwellings, the benefits of marginal reductions in tailpipe emissions is likely to be greater than the marginal cost of additional upstream emissions. A more sophisticated analysis might seek to take these differential costs and benefits into account.

### *Effects on Use of Resources*

As NHTSA notes in the SAFE NPRM, the original justification for CAFE standards was to conserve oil in order to reduce U.S. reliance on foreign oil. Yet, as NHTSA also notes, since the passage of the EPCA in 1975, circumstances have changed dramatically. In particular, U.S. oil production has increased and the U.S. accounts for a declining share of world oil demand. As such, the modest effects of CAFE standards on oil consumption would have little impact either on oil prices or on energy security in the U.S. Meanwhile, when including the rebound and scrappage effect, the cost per barrel of oil "saved" by CAFE standards is likely well over $100—and could be closer to $500.[57] Moreover, as NHTSA notes in the PRIA:

> When the U.S. becomes self-sufficient in petroleum supply—which is now anticipated to occur within a decade—the entire value of increased payments by U.S. petroleum users that results from relaxing CAFE and $CO_2$ standards will become a transfer within the U.S. economy.[58]

At that point, the initial purpose of the EPCA is entirely obviated.

### *Preemption of State Fuel Economy and Related Standards*

One element of the proposed SAFE rule that has already sparked controversy—and a legal challenge[59]—is the decision to revoke the waiver that was previously granted to California for its own GHG and zero emission vehicle (ZEV) standards (and correspondingly to the 12 other states and the District of Columbia that have utilized California's waiver as a means of implementing their own vehicle standards).

California was the first state in the nation to pass emission standards for vehicles, with the introduction of maximum tailpipe emissions of carbon monoxide, in 1966, and for nitrogen oxides

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[56] 83 FR 43331

[57] Morris and Wardle, *supra* note 4.

[58] Draft PRIA, at 1068.

[59] https://oag.ca.gov/system/files/attachments/press_releases/2018-05-01%20Petition%20Revised%20MTE.pdf

in 1971.[60] These standards were justified by the particular circumstances in some Californian cities, notably the Los Angeles basin, which suffered from severe smog problems due to the area's population density, climate, topography, and other factors.[61]

Federal automobile emissions standards were first established under the Motor Vehicle Pollution Control Act of 1965 in order to create a single national standard (and thereby enable the marketing and sale of similar automobiles in all 50 states).[62] The initial standards, which came into force in 1968, were identical to those promulgated two years' earlier in California.[63] New federal standards were set in the 1970 CAA, which in section 209 preempts state and local regulations that exceed the federal standards:

> **(a) Prohibition**
>
> No State or any political subdivision thereof shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines subject to this part. No State shall require certification, inspection, or any other approval relating to the control of emissions from any new motor vehicle or new motor vehicle engine as condition precedent to the initial retail sale, titling (if any), or registration of such motor vehicle, motor vehicle engine, or equipment.[64]

However, recognizing California's circumstances, in particular, the CAA established a process for granting waivers to this preemption:

> **(b) Waiver**
>
> (1) The Administrator shall, after notice and opportunity for public hearing, waive application of this section to any State which has adopted standards (other than crankcase emission standards) for the control of emissions from new motor vehicles or new motor vehicle engines prior to March 30, 1966, if the State determines that the State standards will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards. No such waiver shall be granted if the Administrator finds that—
>
> (A) the determination of the State is arbitrary and capricious,

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60 https://ww2.arb.ca.gov/about/history

61 https://www.sciencedirect.com/science/article/pii/1352231096001537

62 Pub L. 89-272. (70 STAT 992). https://www.gpo.gov/fdsys/pkg/STATUTE-79/pdf/STATUTE-79-Pg992-2.pdfn

63 http://theconversation.com/why-california-gets-to-write-its-own-auto-emissions-standards-5-questions-answered-94379

64 42 U.S.C. 7543 (a)

(B) such State does not need such State standards to meet compelling and extraordinary conditions, or

(C) such State standards and accompanying enforcement procedures are not consistent with section 7521(a) of this title.

(2) If each State standard is at least as stringent as the comparable applicable Federal standard, such State standard shall be deemed to be at least as protective of health and welfare as such Federal standards for purposes of paragraph (1).

(3) In the case of any new motor vehicle or new motor vehicle engine to which State standards apply pursuant to a waiver granted under paragraph (1), compliance with such State standards shall be treated as compliance with applicable Federal standards for purposes of this subchapter.[65]

### California's GHG Emission Standards

In 2002, California passed AB 1493, which required CARB to set the "maximum feasible" reductions in GHG emissions from passenger vehicles and light trucks.[66] Because the standards set by CARB in 2004 exceeded national standards, California applied to EPA for a waiver under the CAA. In 2008, EPA denied this waiver on the grounds that it did not meet the conditions necessary for the waiver. Specifically, the EPA Administrator noted:

> While I recognize that global climate change is a serious challenge, I have concluded that section 209(b) was intended to allow California to promulgate state standards applicable to emissions from new motor vehicles to address pollution problems that are local or regional. I do not believe section 209(b)(1)(B) was intended to allow California to promulgate state standards for emissions from new motor vehicles designed to address global climate change problems; nor, in the alternative, do I believe that the effects of climate change in California are compelling and extraordinary compared to the effects in the rest of the country. Based on this finding, pursuant to section 209(b)(1) of the Clean Air Act (Act), CARB's waiver request for its GHG standards for new motor vehicles must be denied.[67]

However, when California resubmitted its request to EPA in 2009, the agency, then under a new administration, granted the request, asserting that:

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[65] 42 U.S.C. 7543 (b)

[66] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200120020AB1493

[67] FR 12156–7.

> If California needs a separate motor vehicle program to address the kinds of compelling and extraordinary conditions discussed in the traditional interpretation, then Congress intended that California could have such a program. Congress also intentionally provided California the broadest possible discretion in adopting the kind of standards in its motor vehicle program that California determines are appropriate to address air pollution problems and protect the health and welfare of its citizens. The better interpretation of the text and legislative history of this provision is that Congress did not use this criterion to limit California's discretion to a certain category of air pollution problems, to the exclusion of others.
>
> Under that interpretation, I cannot find that opponents of the waiver have demonstrated that California does not need its state standards to meet compelling and extraordinary conditions. The opponents of the waiver have not adequately demonstrated that California no longer has a need for its motor vehicle emissions program. I have also determined that even under the interpretation announced in the March 6, 2008 Denial, opponents of the waiver have not demonstrated that California does not need its greenhouse gas emission standards to meet compelling and extraordinary conditions. In addition, I have interpreted the "compelling and extraordinary conditions" criterion to not properly include a consideration of whether the impacts from climate change are compelling and extraordinary in California. Nevertheless, I have evaluated the comments received and evidence in the record and have determined that the opponents of the waiver have not met their burden in demonstrating why evidence such as the impacts of climate change on existing ozone conditions in California along with the cumulative impacts identified by proponents of the waiver (e.g., impacts on snow melt and water resources and agricultural water supply, wildfires, coastal habitats, ecosystems, etc.) is not compelling and extraordinary.[68]

*Prima facie* this seems like a very peculiar interpretation of section 209(b). The text and legislative history clearly indicates an intention that the waiver be applied under narrow circumstances, notably when there are "compelling and extraordinary conditions," such as those that existed in the Los Angeles basin during the 1960s, *and* that there is a "need" for such stricter standards to address those conditions. The inclusion of "need" is plainly intended to imply that a waiver would only be granted if the higher standards would actually address problems associated with the "compelling and extraordinary conditions." A natural reading of the text suggests that it is the state that bears the burden of demonstrating its need, rather than presuming that it is entitled to an automatic waiver unless some opponents meet some countervailing burden.

[68] 74 FR 32744

In the SAFE rule, the agencies note that "Parts of California have a real and significant local air pollution problem, but $CO_2$ is not part of that local problem."[69] That may be so, but even granting the EPA's 2009 assertion that California is likely to be particularly adversely affected by climate change as a result of the continuing accumulation of GHGs in the atmosphere, practically any assessment indicates that the state's stricter vehicle GHG emission standards would not have a substantive effect on the accumulation of GHGs and so would not in any material way ameliorate the problem.

To the extent that climate change is being caused by GHG emissions, the problem is not limited to emissions in California or the U.S.; it is a result of all global emissions. The emission of one ton of $CO_2$ from California has essentially the same effect as the emission of one ton of $CO_2$ from Iowa, China, or Kazakhstan. In 2016, global GHG emissions were about 49.3 gigatons of $CO_2$ equivalent ($GTCO_2e$).[70] California's total GHG emissions that year were 429.4 million metric tons of $CO_2$ equivalent ($MMTCO_2e$), of which 41% or 176 MMT arose from vehicles.[71] In other words, vehicle emissions in California represented 0.36% of global GHG emissions.

Even if California eliminated all its vehicle emissions, it would reduce global emissions by less than half of one percent. So, if, for example, continued GHG emissions were to result in an increase in global mean temperatures of 3°C by 2100, the elimination of all vehicle emissions from California would reduce this increase by only 0.01°C. It is simply not plausible that such an effect—which is likely far greater than the effect of California's tailpipe GHG emission restrictions—would address any "compelling and extraordinary conditions" pertaining to California.

In other words, even if continued emissions of $CO_2$ are contributing to "compelling and extraordinary conditions" in California, there is no *need* for the state's stricter tailpipe GHG emission standards. Therefore, those standards are preempted by the national GHG emission standards established by EPA under the CAA and may not avail of the exemption under section 209(b).

### California's ZEV Standard

Since 1990, CARB has implemented a Low Emission Vehicle (LEV) program, which set maximum emission levels for certain criteria pollutants (initially, formaldehyde, non-methane organic gases, and carbon monoxide) emitted by vehicles qualifying as "low emission" under the

[69] https://www.federalregister.gov/d/2018-16820/p-123

[70] http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2017-trends-in-global-co2-and-total-greenhouse-gas-emissons-2017-report_2674.pdf

[71] https://www.arb.ca.gov/cc/inventory/data/data.htm

program.[72] It also set minimum fleet production levels of Zero Emission Vehicles (ZEVs), which were set at 2% for model year (MY) 1998–2000 and would rise to 10% for MY 2003 and later.[73]

Because the LEV standards exceeded federal requirements, California sought a waiver for the standard.[74] Because the LEV standard affects emissions of locally harmful criteria pollutants, it was granted a waiver under section 209(b) of the CAA,[75] as were subsequent amendments.[76]

In 2012, CARB adopted the Advanced Clean Cars program, which created standards for new vehicles in California through 2025. A key provision of the program requires that, starting in 2018, major motor vehicle manufacturers sell a minimum proportion of ZEVs (i.e., electric cars) or combination of ZEVs and "Transitional Zero Emission Vehicles" (TZEVs—i.e., plug-in hybrids). For model year 2018, the minimum is 4.5%, including at least 2% ZEVs. This floor rises annually, reaching 22% in 2025, of which at least 16% must be ZEVs.[77]

California was again granted a waiver by EPA.[78] Other states have also been permitted to adopt the same standards as California under section 177 of the CAA. So far, nine states have sought waivers for the implementation of ZEV standards: Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont.[79]

While LEV standards in general plausibly fall within the criteria established for obtaining a waiver under section 209(b), ZEV standards arguably do not. At first this may seem paradoxical; after all ZEVs by their nature emit fewer pollutants than other LEVs. However, what matters is not just the emissions from the vehicles themselves but the overall effect. ZEV standards effectively raise the average price of all vehicles, as the agencies explain in the current rulemaking:

> This regulatory mandate has required automakers to spend tens of billions of dollars to develop products that a significant majority of consumers have not adopted, and consequently to sell such products at a loss. All of this is paid for through cross

[72] https://www.arb.ca.gov/msprog/levprog/cleandoc/cleancomplete%20lev-ghg%20regs%204-13.pdf

[73] *Ibid.* at v.

[74] https://www.arb.ca.gov/cc/docs/waiver.pdf

[75] 64 FR 42689 https://www.gpo.gov/fdsys/pkg/FR-1999-08-05/pdf/99-20200.pdf

[76] 70 FR 22034. https://www.federalregister.gov/documents/2005/04/28/05-8529/california-state-motor-vehicle-pollution-control-standards-notice-of-within-the-scope-determination;

[77] Air Resources Board. *Zero-Emission Vehicle Standards for 2018 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles*. Sacramento: Air Resources Board, 2016. https://www.arb.ca.gov/msprog/zevprog/zevregs/1962.2_Clean.pdf

[78] 76 FR 61095 https://www.federalregister.gov/documents/2011/10/03/2011-25399/california-state-motor-vehicle-pollution-control-standards-within-the-scope-determination-and-waiver

[79] https://www.federalregister.gov/d/2018-16820/p-1777

> subsidization by increasing prices of other vehicles not just in California and other States that have adopted California's ZEV mandate, but throughout the country.[80]

By raising the cost of new vehicles nationwide, ZEV mandates reduce demand for those new vehicles, causing consumers to continue to drive or to purchase older vehicles. Since older vehicles tend to be heavier, less safe, and less fuel-efficient and to generate more pollution, the ZEV mandates cause considerable harm to consumers and possibly also to the environment, even in states where they do not apply.

In addition, even if ZEV mandates on net reduce local pollution in the locations in which the ZEV vehicles are driven, they may increase pollution in other places. This occurs in two ways: first, most ZEVs are owned by wealthier consumers, so while pollution in locations dominated by wealthy people might be significantly reduced by high adoption of ZEVs, the direct effect of ZEV ownership in poorer locations is likely to be far less.[81] At the same time, the higher cost of new vehicles will result in poorer consumers, especially, holding on to their older more polluting vehicles for longer, thereby offsetting the reduction in pollution from ZEVs and possibly resulting in a net increase in local pollution in those areas. As can be seen from Figure 1, the uptake of ZEVs as a proportion of new vehicles sales in Los Angeles is relatively low (less than 5%), as is median annual income ($51,000), so it seems quite plausible that in the California city that is arguably most adversely affected by criteria pollutants, the effect of the ZEV standard has been to increase local pollution relative to what might have happened in the absence of the standard. Moreover, the differential effects of ZEV mandates violate principles of environmental justice.[82]

Second, while ZEVs might reduce local pollution in the locations in which they are driven, much of the electricity they utilize is produced by burning hydrocarbons, which generates criteria pollutants in the locations in which it is generated. It is true that much of the electricity generated *in* California is produced from relatively clean sources of fuel, such as natural gas, nuclear, and hydropower, however, it is connected to the Western Grid and imports about one third of its electricity from generators in other states, much of which is generated from coal.[83] Indeed, a 2015 report from S&P Global Market Intelligence found that at times as much as 50% of Southern California's electricity comes from coal-burning plants.[84] Thus, not only are ZEVs in California causing significant emissions of criteria pollutants, they are causing emissions of these pollutants in other states.

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[80] https://www.federalregister.gov/d/2018-16820/p-127

[81] International Council for Clean Technologies, *California's continued electric vehicle market development*, May 2018. https://www.theicct.org/sites/default/files/publications/CA-cityEV-Briefing-20180507.pdf

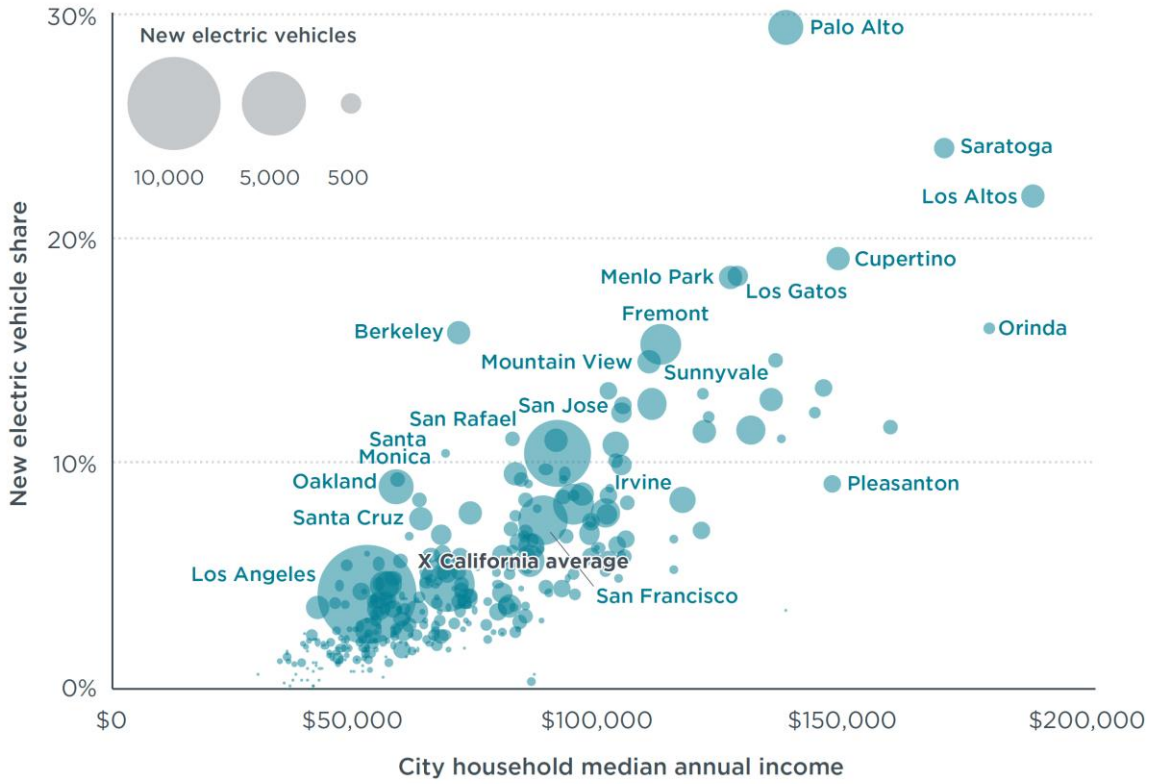
[82] https://www.federalregister.gov/d/2018-16820/p-2229

[83] California Energy Commission. Almanac. "Total System Electric Generation." http://www.energy.ca.gov/almanac/electricity_data/total_system_power.html

[84] Christian, Molly. "UPDATE: California's quiet market for coal." SNL, Oct. 12, 2015. https://www.snl.com/InteractiveX/Article.aspx?cdid=A-34113318-14128.

For these reasons, ZEV mandates do not meet the criteria necessary to qualify for the waiver under section 209(b) of the CAA.

**Figure 1: Share of sales of ZEV's in California as a proportion of new vehicle sales by city median household income.**




Source: International Council for Clean Technologies, *California's continued electric vehicle market development*, May 2018.[85]

### Preemption under the EPCA

NHTSA presents arguments to the effect that: (1) EPCA created broad preemption of state regulations that are "related to fuel economy standards"[86] and (2) California's tailpipe emission standard is "related to" CAFE standards;[87] (3) this preemption applies even if a state has obtained a waiver from the EPA under section 209(b) of the CAA; (4) thus, California's tailpipe GHG

[85] *Supra* note 81.

[86] "When an average fuel economy standard prescribed under this chapter is in effect, a State or a political subdivision of a State may not adopt or enforce a law or regulation related to fuel economy standards or average fuel economy standards for automobiles covered by an average fuel economy standard under this chapter." https://www.federalregister.gov/d/2018-16820/p-1689

[87] https://www.federalregister.gov/d/2018-16820/p-1704

emission standard is preempted. Meanwhile, for similar reasons "because the purpose of the ZEV program is to affect fuel economy, ZEV mandates directly relate to fuel economy and are thereby expressly preempted."[88]

This line of argument seems plausible. Its success will depend, crucially, on the claim that tailpipe GHG emission standards and ZEV standards are "related to fuel economy standards." Given the very close connection between fuel economy and GHG emissions, the contention seems reasonable. Whereas it is possible to reduce emissions of other criteria pollutants without increasing fuel economy (indeed, some technologies for reducing criteria pollutants, such as catalytic converters, can reduce fuel economy), it is currently not practical to achieve the same result for $CO_2$.

Moreover, as noted above, the costs of complying with state ZEV standards effectively impose costs on all vehicle consumers, further distorting the effects of CAFE standards not only within the state that has implemented a ZEV rule but in every state. ZEV standards are thus in direct conflict with the purpose of the EPCA, which seeks to create a single national standard.

As such, tailpipe GHG emission standards and ZEV standards are ineluctably related to fuel economy standards and are preempted by the EPCA.

### *The Treatment of Alternative Fuel Vehicles*

The proposed SAFE rule notes:

> EPCA's statutory incentive for dual-fueled vehicles at 49 U.S.C. 32906 and the measurement methodology for dual-fueled vehicles at 49 U.S.C. 32905(b) and (d) expire in MY 2019; therefore, NHTSA had to examine the future of these provisions in the 2017 and later CAFE rulemaking. NHTSA and EPA concluded that it would be inappropriate to measure duel-fueled (*sic*) vehicles' fuel economy like that of conventional gasoline vehicles with no recognition of their alternative fuel capability, which would be contrary to the intent of EPCA/EISA. Accordingly, the agencies proposed that for MY 2020 and later vehicles, the general provisions authorizing EPA to establish testing and calculation procedures would provide discretion to set the CAFE calculation procedures for those vehicles. The methodology for EPA's approach is outlined in the 2012 final rule for MYs 2017 and beyond at 77 FR 63128 (Oct. 15, 2012). NHTSA seeks comment on the current approach.[89]

The approach taken by EPA in the final rule for MYs 2017 and beyond is as follows:

[88] https://www.federalregister.gov/d/2018-16820/p-1770

[89] https://www.federalregister.gov/d/2018-16820/p-2488

> For gaseous alternative fuels (such as natural gas), the methodology generally determines a gasoline equivalent mpg based on the energy content of the gaseous fuel consumed, and then adjusts the fuel consumption by effectively only counting 15 percent of the actual energy consumed. For electricity, the methodology generally determines a gasoline equivalent mpg by measuring the electrical energy consumed, and then uses a petroleum equivalency factor to convert to a mpg-equivalent value. The petroleum equivalency factor for electricity includes an adjustment that effectively only counts 15 percent of the actual energy consumed. Counting 15 percent of the fuel volume or energy provides an incentive for alternative fuels in the CAFE program.[90]

Superficially, this approach seems reasonable. However, it fails to consider the full life-cycle energy use and emissions associated with the vehicles, which would take into account both *production* and use. This is particularly problematic for electric and electric-hybrid vehicles. A 2013 study calculated energy use and emissions of carbon dioxide equivalent (a composite measure of GHGs emitted) during the manufacture and use of different kinds of automobiles.[91] The study found manufacturing electric cars involves higher levels of energy use and GHG emissions than manufacturing of gas and diesel cars, while energy use and emissions during use are lower. When averaged over the life-cycle of a typical vehicle, the study found that for the U.S., ZEVs emit the same amount of GHGs as gas and diesel cars (325 grams of carbon dioxide equivalent per mile travelled).[92]

Since both the incentive for dual-fueled vehicles and measurement methodology expire in 2019, NHTSA will not be obliged to apply the same going forward (unless Congress passes legislation requiring it to do so). In light of that fact, it would be appropriate for EPA and NHTSA to adopt a methodology that more accurately accounts for the full life-cycle energy use and emissions of alternative fuel vehicles, including electric and electric-hybrid vehicles.

In addition, under current EPA emission rules, manufacturers may count each electric and electric-hybrid vehicle sold as more than one vehicle.[93] Given the above-noted concerns regarding life-cycle emissions of such vehicles, this is inappropriate. Instead, each vehicle should be counted as a single vehicle, regardless of its fuel source, unless the manufacturer can convincingly

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[90] https://www.federalregister.gov/d/2012-21972/p-416

[91] Wilson, Lindsay. "Shades of Green: Electric Cars' Carbon Emissions Around the Globe." Shrink that Footprint. February 2013. Available at: http://shrinkthatfootprint.com/wp-content/uploads/2013/02/Shades-of-Green-Full-Report.pdf

[92] One problem with this comparison between GHG emissions of electric, gas and diesel cars is that it uses GHG emissions data from 2009 but emissions from electricity generation have since fallen. However, emissions from new gas and diesel vehicles have also been falling, so these effects may cancel out.

[93] https://www.federalregister.gov/d/2012-21972/p-236

demonstrate that the average net life-cycle emissions of a particular vehicle is significantly less than a similar vehicle powered by gasoline or diesel.

### *Compliance and Flexibilities.*

#### Accounting for A/C leakage, methane emissions and nitrous oxide emissions

In the 2012 rulemaking for GHG emission standards, EPA had included emissions from air conditioning (A/C), as well as other GHG emissions (specifically methane and nitrous oxide):

> EPA seeks comments on whether to proceed with this proposal to discontinue accounting for A/C leakage, methane emissions, and nitrous oxide emissions as part of the $CO_2$ emissions standards to provide for better harmony with the CAFE program or whether to continue to consider these factors toward compliance and retain that as a feature that differs between the programs. EPA seeks comment on whether to change existing methane and nitrous oxide standards that were finalized in the 2012 rule. Specifically, EPA seeks information from the public on whether the existing standards are appropriate, or whether they should be revised to be less stringent or more stringent based on any updated data.[94]

Since air conditioning is not an inherent feature of automobiles and use of A/C is highly variable, it seems wholly inappropriate to consider emissions associated with A/C use in determining emissions standards.

While methane and nitrous oxide emissions are GHGs, in combination they represent less than one percent of all GHG emissions from transportation (in terms of their global warming potential).[95] By contrast, $CO_2$ accounts for nearly 97% of such emissions. Moreover, many actions taken to reduce $CO_2$ emissions (including lightweighting and improving engine efficiency) will also reduce methane and nitrous oxide emissions. As such, including emissions of these chemicals as part of the overall GHG emission reduction obligation is unnecessary—and contributes disproportionately to the cost of the rule. Their inclusion should thus be discontinued in the final SAFE rule.

#### Fines and Alternative Compliance

CAFE standards are based on the average fuel economy for each manufacturer's fleet. Manufacturers typically produce a range of vehicles of differing fuel economy, some of which do not meet the CAFE standards. Until 2011, if a manufacturer was unable to persuade consumers to

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[94] https://www.federalregister.gov/d/2018-16820/p-1406

[95] EPA, Fast Facts: U.S.Transportation Sector Greenhouse Gas Emissions 1990 –2016, Washington, DC: Environmental Protection Agency, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100USI5.pdf

buy a sufficient proportion of high fuel economy vehicles, they were required to pay a fine in proportion to the number of vehicles sold in breach of the standards. Since 2011, manufacturers have had the option of being able to purchase credits from manufacturers who exceeded the standards, or to use their own credits earned in previous years. Manufacturers unable to use or procure sufficient credits must pay a fine.

In 2016, NHTSA issued an interim final rule that would increase the penalty for each non-compliant vehicle sold from $5.50 to $14.[96] In March 2018, NHTSA proposed to retain the existing fine of $5.50.[97] In the proposed SAFE rule, NHTSA asks whether it would be appropriate to maintain or increase the fine.

While the credit trading system has reduced the burden of compliance with CAFE standards, NHTSA notes that this burden is likely to increase in coming years:

> Prior to trading and transferring, on average, manufacturers paid $29,075,899 in civil penalty payments annually (a total of $814,125,176 from model years 1982 to 2010). Since trading and transferring, manufacturers now pay an annual average of $15,260,480 each model year. The agency notes that five manufacturers have paid civil penalties since 2011 totaling $76,302,402, and no civil penalty payments were made in 2015. However, over the next several years, as stringency increases, manufacturers are expected to have challenges with CAFE standard compliance.[98]

The SAFE NPRM finds that manufacturers would avoid fines totaling $2.1 billion (discounted at 7%) relative to the fines that would have been incurred under the 2021 standard and 2022–2025 augural standards.[99] Recent studies indicate that is likely close to the correct figure. Zielinski et al. modeled the effects of implementing the original 2017–2025 standards and found that over time it would become increasingly difficult for manufacturers to comply with the standards, as the introduction of new fuel-saving technologies would become increasingly costly, raising the price of new vehicles and reducing demand for the most fuel-efficient vehicles.[100] As a result, they estimated that vehicle manufacturers would incur increasingly large fines. As can be in Figure 2, the fines paid would accelerate rapidly after 2020. By 2025, they estimated that the annual cost of fines could reach $700 million. This would be a truly perverse outcome: not only would the proportion of vehicles meeting CAFE standards fall, but manufacturers would effectively divert

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96 https://www.federalregister.gov/documents/2016/07/05/2016-15800/civil-penalties

97 https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/nprm_cafe-fines-03262018_0.pdf

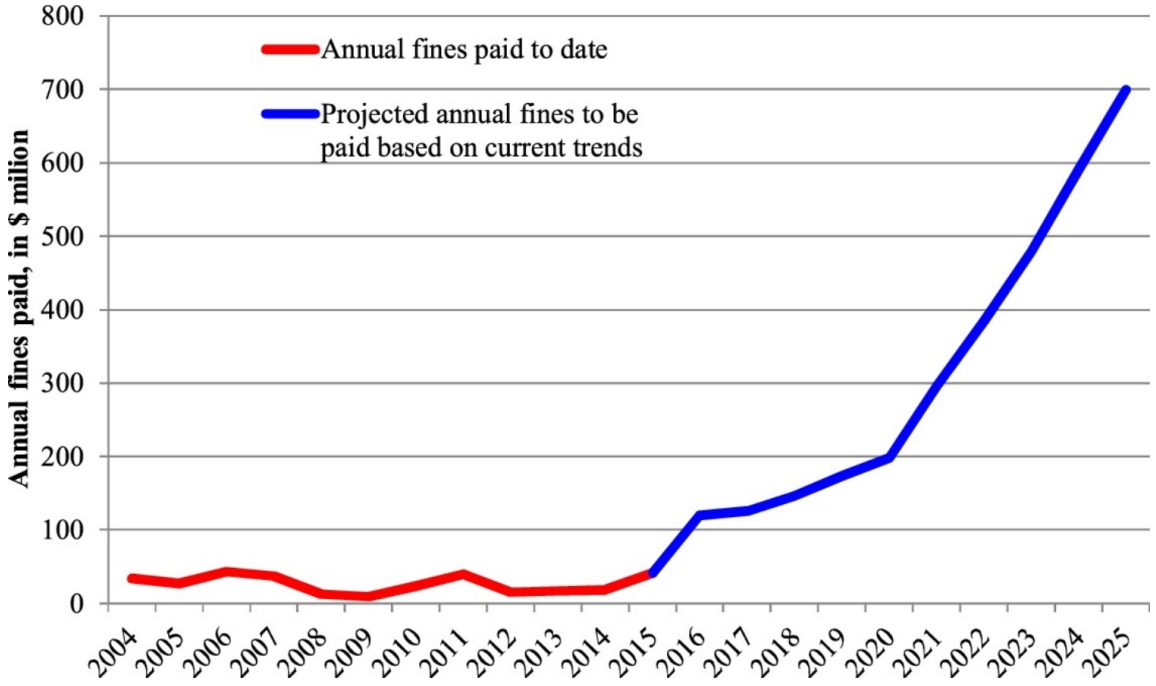
98 https://www.federalregister.gov/d/2018-16820/p-2440

99 SAFE NPRM Table II-26. FR 43064.

100 Jessica Zielinski, Rebecca Andreucci, Neethi Rajagopalan, Can B. Aktasa, "Prospects for meeting the corporate average fuel economy standards in the U.S." *Resources, Conservation and Recycling*, Vol. 136, September 2018, pp. 466–472.

hundreds of millions of dollars to paying fines rather than investing those resources in developing better vehicles.

**Figure 2: Projected Fines**




Source: Zielinski et al. Prospects for meeting the corporate average fuel economy standards in the U.S.[101]

If Zielinski et al.'s estimates are within the ballpark, application of the current standards for 2020 and augural standards for 2021–2025 would impose on consumers a double whammy: in addition to the billions of dollars diverted to developing vehicles that are more fuel efficient than consumers want, billions of dollars would be diverted to the payment of fines. As a result, the vehicles consumers prefer would become significantly more expensive than necessary. Moreover, vehicle manufacturers would have fewer resources available to invest in research and development of new vehicles. This would particularly harm domestic manufacturers, whose domestic market share is much higher than their international market share.[102]

By contrast, the proposed amendment to the CAFE standards for MY 2021 and the proposed standards for MY 2022–2026, combined with the proposal to keep the per-vehicle fine at $5.50 rather than increase it to $14, would likely result in significantly lower compliance costs. Indeed,

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101 *Ibid.*

102 GM and Ford have over 30% of the domestic US auto market but only 11% of the global market (see: https://www.statista.com/statistics/249375/us-market-share-of-selected-automobile-manufacturers/; https://www.statista.com/statistics/316786/global-market-share-of-the-leading-automakers/).

it is likely that compliance costs would fall after 2020, as continued innovation and better understanding of actual demand for vehicles with varied emission characteristics enables manufacturers better to adapt to the CAFE standards with minimal penalties. This alone could save auto makers billions of dollars—much of which will be passed on to consumers in the form of better and less expensive vehicles.

## Conclusion

In this comment, I have assessed the plausibility of the analyses undertaken by NHTSA and EPA in relation to the proposed SAFE rule. I found that the agencies have undertaken a thorough—one might even say exemplary—analysis, improving considerably on earlier analyses undertaken by the agencies of previous rules relating to CAFE standards and GHG emission standards. Of particular note, the agencies included more realistic estimates of the rebound effect, developed a sophisticated model of the scrappage effect, and better accounted for various factors affecting vehicle fatality rates.

The proposed rule represents a substantial improvement over the existing CAFE and GHG emission standards for MY 2017–2021 and an enormous improvement over the augural standards for 2022–2025. The rule will plausibly save consumers and manufacturers tens if not hundreds of billions of dollars, freeing up resources to be spent on innovation that will increase rates of economic growth and result in vehicles that consumers actually prefer. It will also plausibly reduce fatalities from traffic accidents, perhaps considerably. Meanwhile, it is unlikely to have a significant negative effect on the environment, nor will it much affect U.S. imports of oil.

I also commented on several questions raised by the agencies, including:

- How to account for consumer benefits (I suggested a total cost of ownership approach based on the presumption that consumers rationally incorporate future savings from fuel economy);
- Accounting for alternative fuel vehicles (noting the need to consider life-cycle energy use and emissions rather than presuming that such vehicles necessarily result in lower energy use and emissions);
- The inclusion of GHGs other than $CO_2$ (noting that including such emissions is unnecessary and adds undue complexity);
- Addressing emissions unrelated to vehicle performance such as from air conditioning (noting that these should not be included because they vary dramatically depending on the use of the vehicle and are unrelated to the intention of EPCA/EISA); and
- The severity of fines (noting that it would be inappropriate to raise the per-vehicle fine for non-compliance as this would harm consumers and deter innovation).